

PHASE 1 CONTAMINATED LAND RISK ASSESSMENT PROPOSED REPLACEMENT DWELLING

Land at 81 Swallow Hill Road, Low Barugh, Barugh Green, Barnsley, S75 1LY

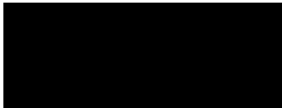
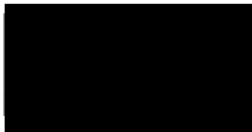
Report Ref: TH/Swallow/PHASE1/01/Sep2024

25th September 2024



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Project title	PHASE 1 - Replacement Dwelling – 81 Swallow Hill Road, Barugh Green, S75 1LY.		Project Ref	TH/SWALL/Rep 01
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Issue No.	Status	Amendment Details	Approved for issue	
1	Final	-	KT	

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1.0 INTRODUCTION

1.1 Terms of Reference

In early September 2024, on the instructions of the Planning Consultant (Mr Tom Warren, Prism Agriculture Ltd) acting for the site owner (Mr Needham), Earth-Tech Consulting Ltd were asked to prepare a **Phase 1 Contaminated Land & Preliminary Risk Assessment (PRA)** on land to the side of 81 Swallow Hill Road, Low Barugh, Barugh Green, Barnsley, S75 1LY, which is the subject of a proposal to replace the existing with a new build dwelling.

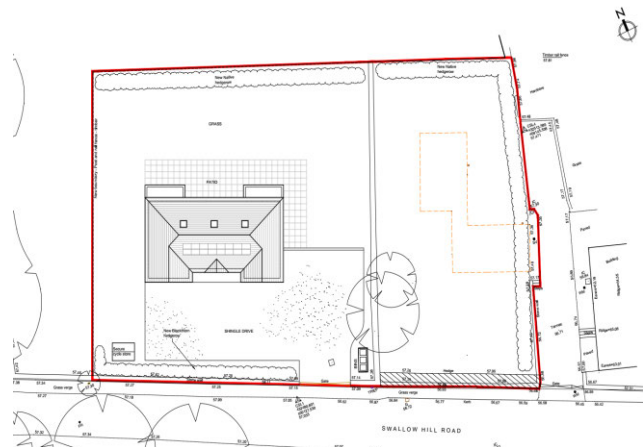


Fig 1 - Aerial photograph & schematic – 81 Swallow Hill Road, S75 1LY.

The development proposal consists of the replacement of the existing dwelling situated to the east of the plot, with a new build dwelling located more centrally and towards the west, as shown above.

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	81 Swallow Hill Road, Low Barugh, Barugh Green, Barnsley, S75 1LY
Client/Owner	Mr Needham
Planning Consultant	Prism Agriculture Ltd Mr Tom Warren
Geotech 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 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 Preliminary 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

- *CI: AIRE Research Bulletin 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 Swallow Hill Road, in Low Barugh Green, also referred to locally as part of the village of Mapplewell - a former mining village in the metropolitan borough of Barnsley in South Yorkshire, that historically was part of the West Riding of Yorkshire.



Fig 2 – General Location in South Yorkshire: 81 Swallow Hill Road, S75 1LY.

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. Barugh Green was historically a hamlet in the ancient *Wapentake of Staincross*. As it grew in size it began to merge with the neighbouring hamlets (Mapplewell and Staincross) and ever since the histories of the villages have been linked together. As in Staincross, nail making was an important industry in locality in the 17th century. From then onward the village and its environs were 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

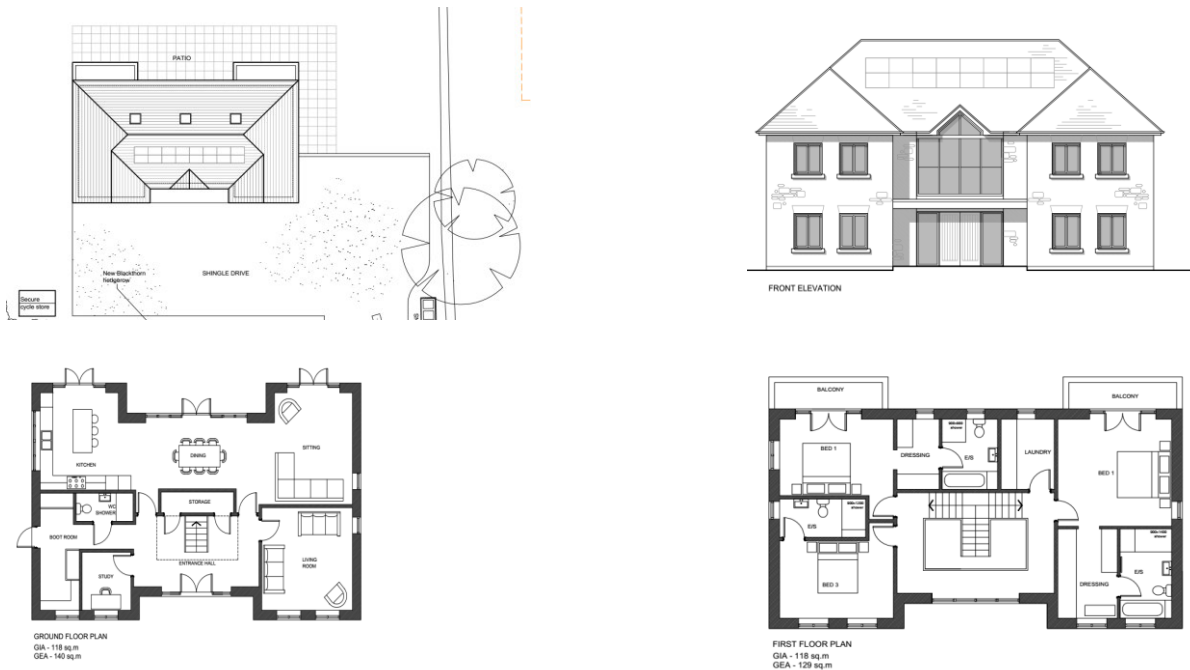


Fig 3 – Proposed new build replacement dwelling - 81 Swallow Hill Road, S75 1LY.

The new build site lies within the curtilage of the former/existing 81 Swallow Hill Road and appears to have been predominantly agricultural/ gardens in the past. From inquiries with the planning consultant the existing dwelling house (No.81) is to be demolished to make way for the replacement dwelling in the grounds/gardens. There is no indication from local knowledge, research, or observations in the field to suggest the site has had any significant previous industrial use, although there is some suggestion that terraced housing may have occupied part of the site in the past.

2.3 Historical Aerial Photographs



Capture Date 01.07.2018



Capture Date 26.03.2012



Capture Date 11.09.2009

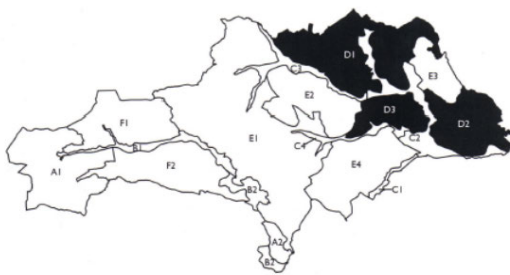


Capture Date 10.07.1999

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 in 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 the study 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 81 Swallow Hill Road:

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

Barugh Green and Mapplewell have long been associated with nearby Staincross and Darton, and today it is unclear where the original boundaries between the 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. Numerous former collieries are located in the wider district, the most notable being the *North Gawber Mine* which emerged at a time coalmining was fast developing at the time when the nail making industry 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 Medieval 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.

3.6 Industrialisation and Urbanisation

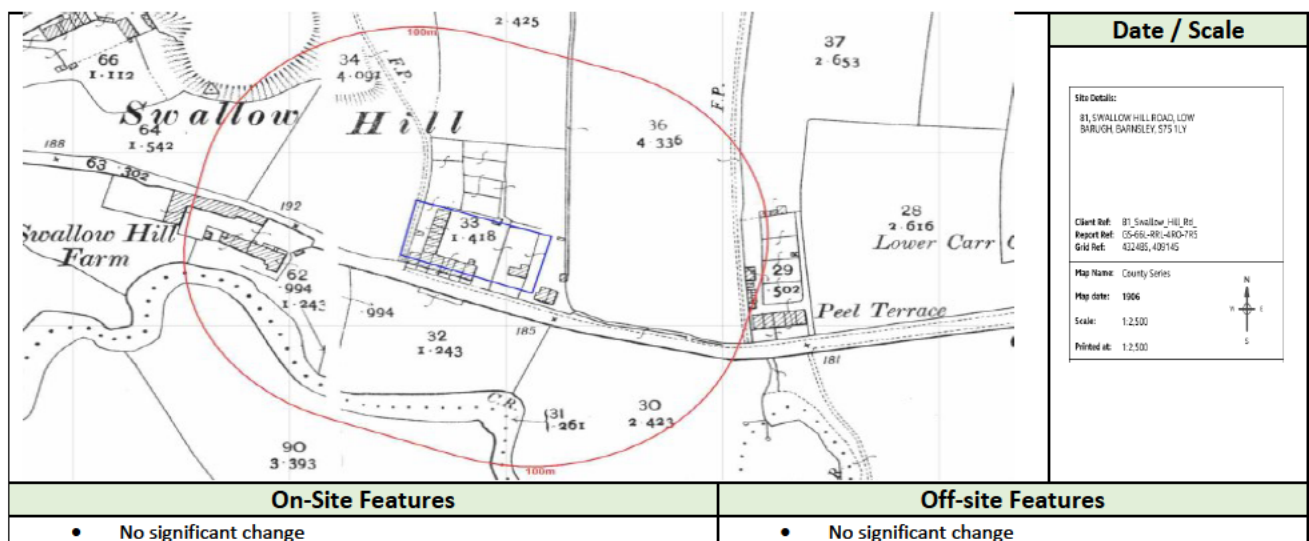
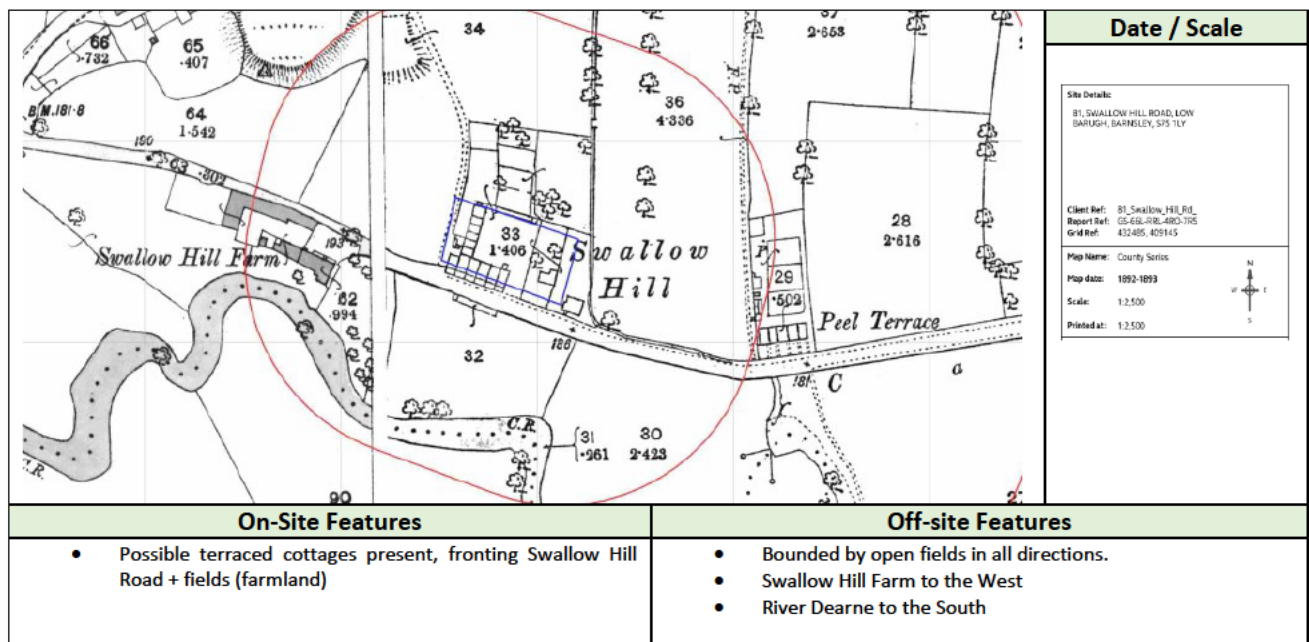
The 17th and 18th Centuries were periods of re-building of the common people's cottages and farms (increasingly of stone with stone roofs rather than timber and thatch) and the country houses of the gentry and aristocracy and prior to the arrival of the coal industry, the district was focussed on manufacturing: Barnsley and nearby villages were known for a

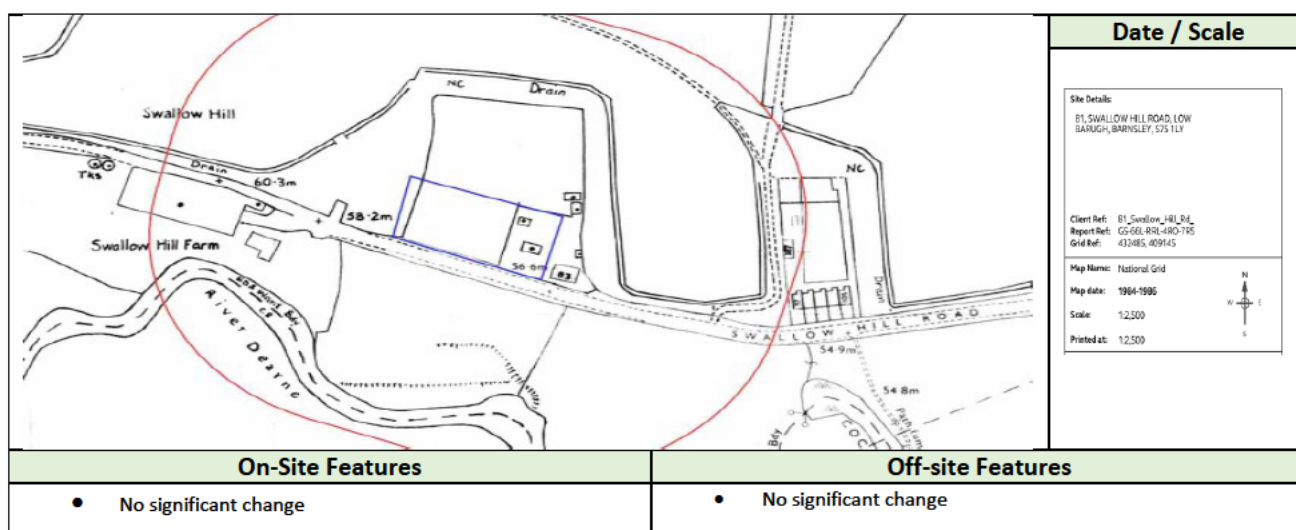
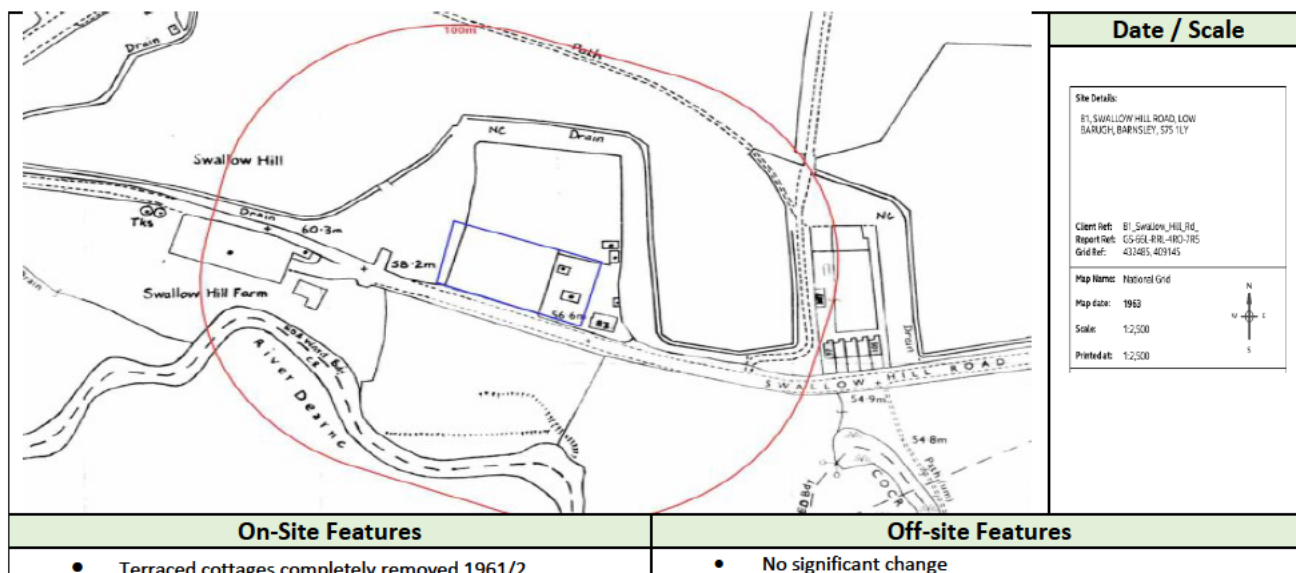
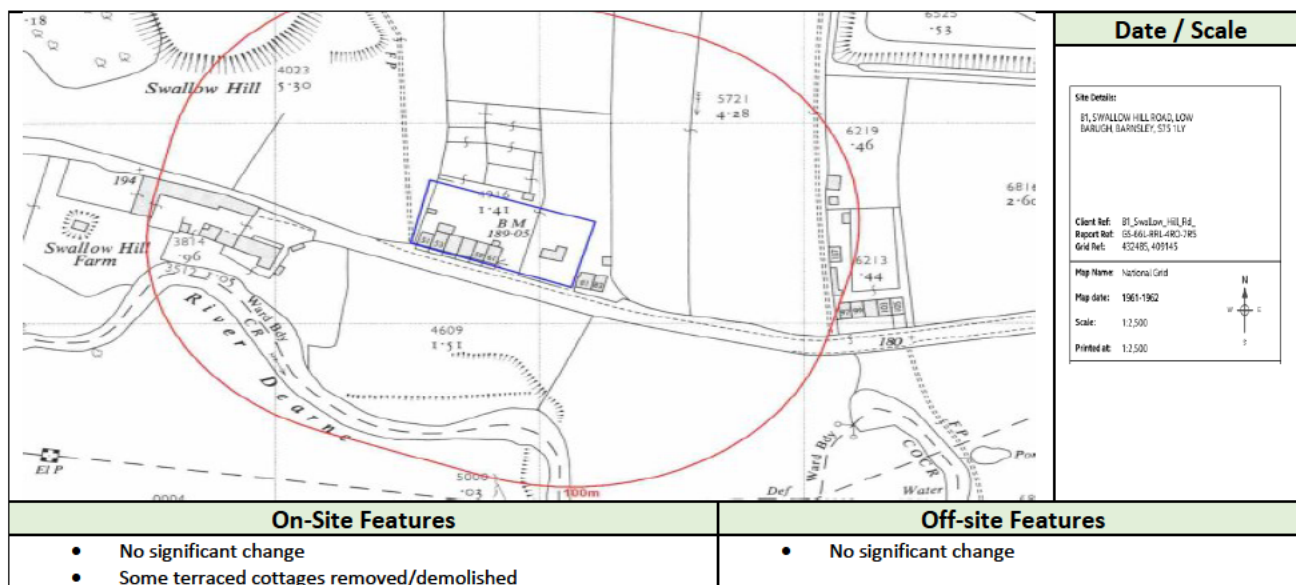
thriving linen trade, with wire and glass manufacturing emerging. Specifically, the village of Mapplewell became synonymous with 'nail making'.

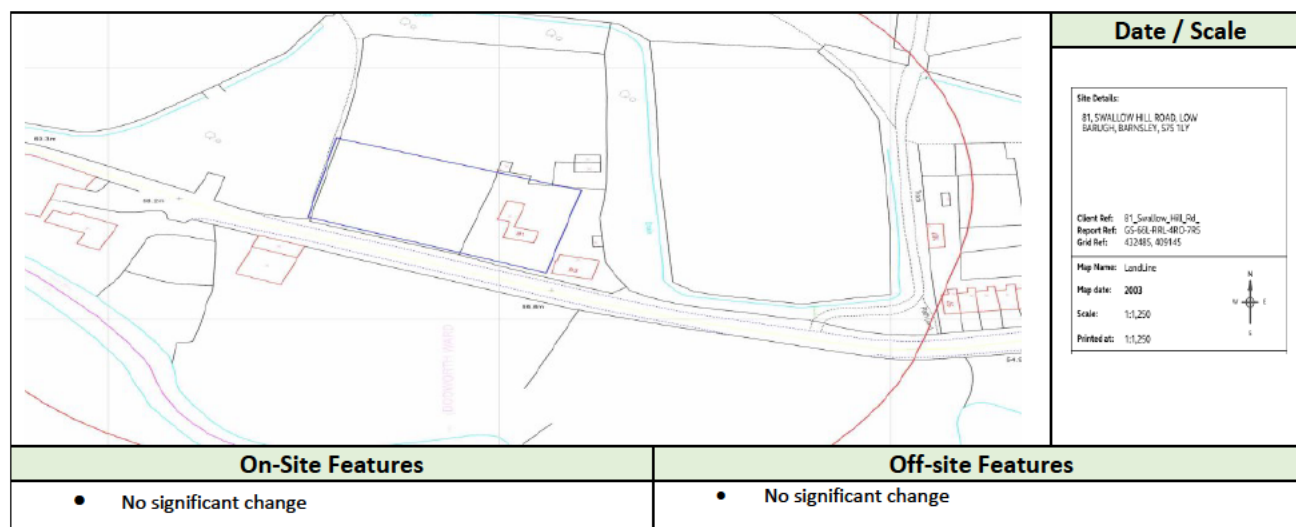
From the 1850s onwards, a large number of coal pits were opened, mostly in the villages surrounding Barnsley, especially those to the east, attracting incomers from across the country. In terms of proximity to the subject site at Hill End Farm, North Gawber Colliery was the biggest attraction, after 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 since closed, the last to shut being Goldthorpe Colliery in 1994.

3.7 Site Usage from Historical Maps







3.7 Summary of ON-SITE Features

Dates	Features (within 250m)	Distance	Direction
1892-1962 1962-present	Terraced Cottages present Agricultural Land / Fields in all directions	On site	All

3.8 Summary of OFF-SITE Features

Dates	Features (within 250m)	Distance	Direction
1892-present	Swallow Hill Farm	<500m	West
1892-present	River Dearne	>500m	South

Research confirms the site was predominantly rural, surrounded by open fields as far back as the records exist, which have remained largely unchanged since then. There is evidence of terraced buildings on the site from 1892 to 1962, when they were evidently demolished. There is no evidence or local knowledge to explain the reason why these buildings were removed, but it is a possibility (unconfirmed) that this could be related to legacy coal mining and coal mining related subsidence. It is also known from Coal Authority reports that the property is in an area where a notice to withdraw support was given in 1979, and local knowledge suggests the presence of mine shafts/entries in proximity. It also known (from Earth Tech archives) that historic mining in the vicinity to the west and north-west associated with the Dearne Side Colliery pre-date the current historical maps available. Generally, these sites were recorded as disused by 1891.

The major North Gawber Colliery is shown on larger scale maps to the north-east. This emerged in the late 1800s, and from other research we know the initial shafts were sunk in 1854. This colliery expanded progressively over the next century and closed in 1980s. It is now fully restored, and the site areas given up to development and local housing. Other than the apparent terraced structures occupying the site to c.1962, there is no evidence from the historical maps, from previous owners (or anecdotally) to suggest that the site was used directly for any industrial or mechanical process.

4.0 SITE CONTEXT

4.1 Site Visit & Walkover Survey

A site walkover survey was undertaken on Tuesday 3rd September 2024 following 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. 0.22a situated off Swallow Hill Road around 1km to the south of Mapplewell, in Barnsley, South Yorkshire. The plot is broadly rectangular and generally flat, sloping very gently towards the west and south-west: 
Description of surrounding area		Semi-rural villages of Mapplewell and Staincross immediately to the north and northeast and open farmland to the south, west and east. Various recent housing to the north and northeast on the outskirts of the conurbations of Mapplewell on restored former tip sites of North Gawber Colliery.
Surrounding Land Usage	North	Open fields towards medium scale housing
	East	Open fields with low scale housing
	South	Open fields
	West	Open fields
Access		Off Swallow Hill Road via No. 81
Structures		Various existing structures including 81 Swallow Hill Road (to be demolished).
Surfacing		The entrance to the site is off Swallow Hill Road. The field plot is grassed and the areas surrounding the existing structure are variously grassed and hard-standing with different coverings for previous access/materials storage provisions. The topography is generally flat and the current access into the site via No. 81 is suggestive of minor historic / localised infilling with what appears to be broadly inert soils, and some hardcore elements to regularise the site and create a generally level curtilage.
Vegetation		Vegetation on site is mixed comprising trees, bushes, and hedgerows to the west and around the existing bungalow 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 SE30NW (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.

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 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.**

4.6 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.**

4.7 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 & SE30NW (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 proximity, which if 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 <i>Made Ground</i> is identified beneath the study area by research - typically to depths of between 2.0m and 3.0m (estimated) .
Solid geology	Predominantly Pennine Middle Coal Measures (PSMCM) which consist of mudstone, siltstone and sandstone with occasional coal, ironstone etc.
BGS borehole records	The BGS holds records of 5No. boreholes carried out by various bodies to the south of the subject site. These are 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:  — Site Outline Search buffers in metres (m) - Natural cavities (Area) - Natural cavities (Point) - BritPits - Surface ground workings - Underground workings - Historical Mineral Planning Areas - Mining Cavities Non Coal Mining - Sporadic underground mining of restricted extent possible - Localised small scale underground mining possible - Small scale mining possible - Underground mining known or likely within or in close proximity - Underground mining known within or in very close proximity

5.2 Hydrology & Hydrogeology

The existing bungalow at 81 Swallow Hill Road is connected to the main YW drainage network via an established drainage system, and this may be supplemented with some soakaway drainage to the north of the property. Groundwater was not observable in any locations surrounding the site during the walkover, but from local knowledge of the area ground water can be reliably assumed to be below the zone of influence of the existing building's foundations and/or below any new drainage connection trenches for the replacement dwelling.

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 to the west 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 several 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. <table><tr><th>ID</th><th>Location</th><th>Type</th><th>Water body catchment</th><th>Water body ID</th><th>Operational catchment</th><th>Management catchment</th></tr><tr><td>A</td><td>On site</td><td>River</td><td>Dearne from Cawthorne Dyke to Lundwood STW</td><td>GB104027063171</td><td>Dearne</td><td>Don and Rother</td></tr></table>	ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment	A	On site	River	Dearne from Cawthorne Dyke to Lundwood STW	GB104027063171	Dearne	Don and Rother				
ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment													
A	On site	River	Dearne from Cawthorne Dyke to Lundwood STW	GB104027063171	Dearne	Don and Rother													
WFD Groundwater bodies	There is 1No. recorded Groundwater documented under the Directive within 1000m of the site: <table><tr><th>ID</th><th>Location</th><th>Type</th><th>Name</th><th>Water body ID</th><th>Overall rating</th><th>Chemical rating</th><th>Ecological rating</th><th>Year</th></tr><tr><td>9</td><td>373m S</td><td>River</td><td>Dearne from Cawthorne Dyke to Lundwood STW</td><td>GB104027063171</td><td>Moderate</td><td>Fair</td><td>Moderate</td><td>2019</td></tr></table>	ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year	9	373m S	River	Dearne from Cawthorne Dyke to Lundwood STW	GB104027063171	Moderate	Fair	Moderate	2019
ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year											
9	373m S	River	Dearne from Cawthorne Dyke to Lundwood STW	GB104027063171	Moderate	Fair	Moderate	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.

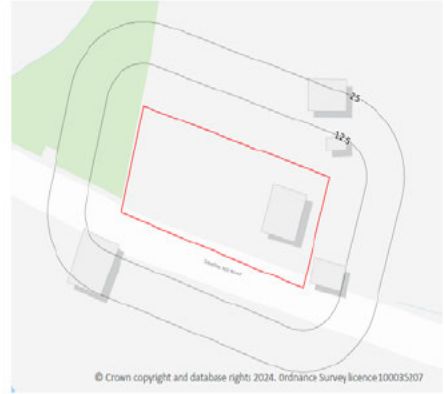
5.3 Landfill sites and waste management

Additional sources of information	Environment Agency; internet-based information
Local authority recorded landfills	None within 500 metres
BGS/EA recorded landfills	None within 500 metres
Other Historical Records of Unspecified Heaps / Wastes	None within 500 metres
Other waste management facilities	None within 500m

5.4 Pollution controls and industrial land use

Industrial Land Uses	None within 250m There are several minor recorded industrial land uses within 1000m of the site. These are referenced as being low-scale and 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	None within 250m
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	81, SWALLOW HILL ROAD, LOW BARUGH, BARNSELY, S75 1LY Professional opinion  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 within 2000m 0

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	43m SW	ALV-XCZ	Alluvium - Clay And Silt	Clay And Silt

This data is sourced from the British Geological Survey.

5.3 Solid Geology (bedrock)

ID	Location	LEX Code	Description	Rock age
1	On site	PMCM-SDST	Pennine Middle Coal Measures Formation - Sandstone	Bolsovia Sub-age - Duckmantian Sub-age
2	On site	PMCM-MDSS	Pennine Middle Coal Measures Formation - Mudstone, Siltstone And Sandstone	Bolsovia Sub-age - Duckmantian Sub-age

5.4 Linear Features – (faults)

ID	Location	Category	Description
3	25m NW	ROCK	Coal seam, observed
5	74m W	FAULT	Normal fault, inferred
7	90m NE	FAULT	Normal fault, inferred
9	91m NE	FAULT	Normal fault, inferred
16	186m W	ROCK	Coal seam, inferred
17	202m NW	ROCK	Coal seam, observed
18	207m SW	FAULT	Normal fault, inferred
19	210m N	ROCK	Coal seam, observed
21	214m S	FAULT	Normal fault, inferred
22	216m S	ROCK	Coal seam, inferred
23	224m W	ROCK	Coal seam, inferred
26	241m E	FAULT	Normal fault, inferred
29	250m SE	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
29m NW	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
On site	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	Negligible	Ground conditions predominantly non-plastic.
On site	Very low	Ground conditions predominantly low plasticity.

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.
35m SW	Negligible	Deposits with potential to collapse when loaded and saturated are believed not 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

24

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

Features are displayed on the Mining and ground workings map on [page 44](#) >

ID	Location	Land Use	Year of mapping	Mapping scale
L	221m NW	Disused Colliery	1956	1:10560
O	373m NW	Colliery	1948	1:10560
M	400m N	Air Shaft	1948	1:10560
M	400m N	Air Shaft	1904	1:10560
M	403m N	Air Shaft	1956	1:10560
O	433m NW	Colliery	1904	1:10560
R	467m N	Air Shaft	1948	1:10560
R	467m N	Air Shaft	1904	1:10560
R	473m N	Air Shaft	1956	1:10560
T	502m NE	Colliery	1982	1:10000
T	603m NE	Colliery	1948	1:10560

5.7 Historical Surface Working Features

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

Records within 250m

24

ID	Location	Land Use	Year of mapping	Mapping scale
C	61m NW	Unspecified Heap	1948	1:10560
C	61m NW	Unspecified Heap	1904	1:10560
C	64m NW	Unspecified Heap	1938	1:10560
C	64m NW	Unspecified Heap	1938	1:10560
D	64m NW	Unspecified Ground Workings	1973	1:10000
D	83m NW	Unspecified Heap	1966	1:10560
D	86m NW	Unspecified Heap	1929	1:10560
D	86m NW	Unspecified Heap	1904	1:10560
D	86m NW	Unspecified Heap	1891	1:10560
E	111m S	Sewage Works	1993	1:10000

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:

ID	Location	Name	Commodity	Class	Likelihood
A	On site	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
B	On site	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.

ID	Location	Details	Description
1	5m SE	Name: Swallow Hill Colliery Address: Darton, BARNSELEY, South Yorkshire Commodity: Coal, Surface Mined Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority

5.9 Non-Coal Mining & Other Underground

The following dataset comprises an extract of 1:10,560, 1:10,000, 1:2,500 and 1:1,250 scale historical Ordnance Survey maps held by Groundsure, dating back to the 1840s. It shows shakeholes, deneholes and other 'holes' as noted on these maps. Deneholes are medieval chalk extraction pits, usually comprising a narrow shaft with a number of chambers at the base of the shaft. **Shakeholes* are an alternative name for suffusion sinkholes**, most commonly found in the limestone landscapes of North Yorkshire but also extensively noted around the Brecon Beacons National Park. Not all 'holes' noted on Ordnance Survey mapping will necessarily be present within this dataset.

ID	Location	Type	Date of mapping
1	353m N	Unspecified Hole	1904

[***NOTE!** – There may be some significance to the name 'Swallow Hill' in relation to this 1904 incident].

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. There are several minor entries within 1000m 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 preliminary 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):

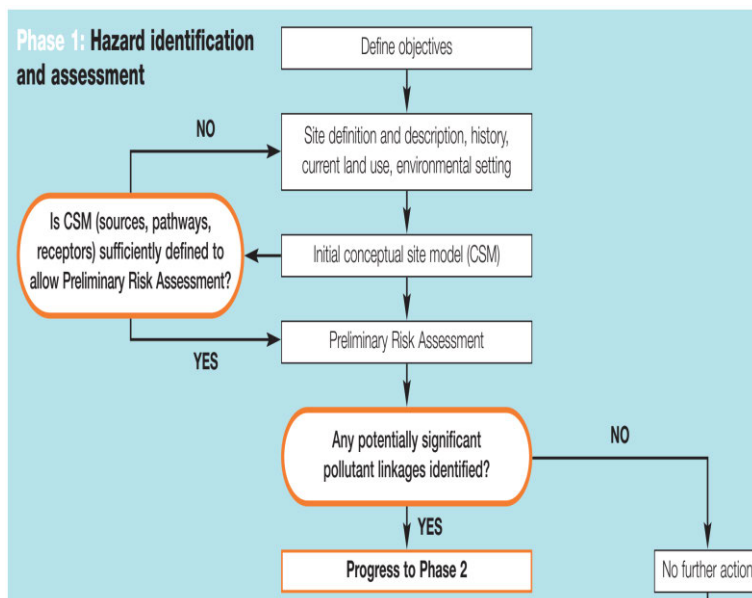


Table from NHBC 'Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008 Vol.1

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	100 - 200 mg/kg	60 - 120 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
On site	15 - 25 mg/kg	No data	100 - 200 mg/kg	60 - 120 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
On site	15 - 25 mg/kg	No data	100 - 200 mg/kg	60 - 120 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
On site	15 - 25 mg/kg	No data	100 - 200 mg/kg	60 - 120 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 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 km²).

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 and typically we would use chemical testing in the laboratory for standard metals, PAH 16 speciation, TPH (CWG banded) and asbestos, and any additional analysis, depending on the history of the site.

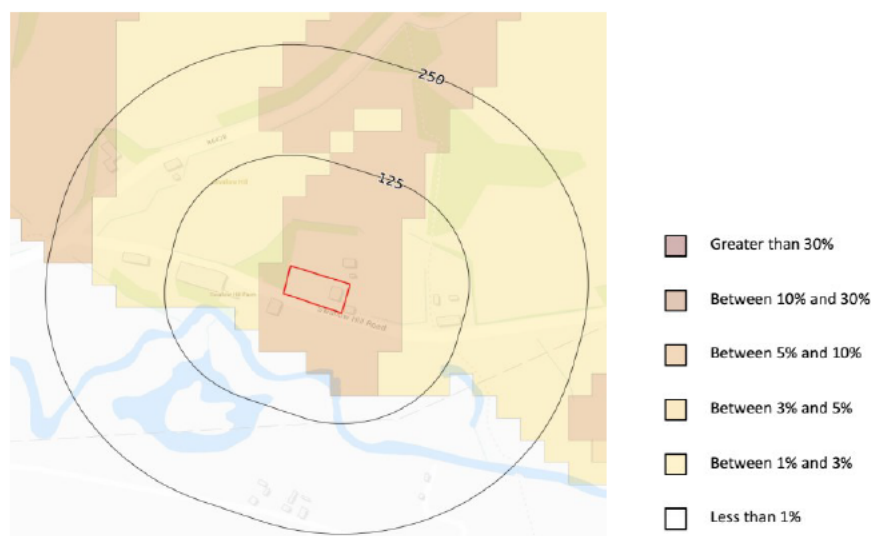
In most cases the above six C4SLs is usually acceptable for the purposes of *Part 11A of the Environmental Protection Act 1990* and whilst there is some ongoing debate regarding the practicalities of using **Soil Screening Values (SSV)** versus published **Soil Guidance Values (SGV)** - which are theoretically different and are derived from computer-based applications of the CLEA Model 2002 - Earth Tech consider the following Screening Levels to be broadly appropriate for the development as proposed, and for reference during the Phase II Site Investigation:

Contaminant	Soil Screening Value (SSV)
Heavy Metals	
Arsenic	20mg/kg
Chromium	130mg/kg
Cadmium	1mg/kg at pH6
Cadmium	2mg/kg at pH7
Cadmium	3mg/kg at pH8
Mercury	3mg/kg
Lead	450mg/kg
Nickel	50mg/kg
Selenium	35mg/kg
Polyaromatic Hydrocarbon (PAH)	
Total PAH	40mg/kg
Total Petroleum Hydrocarbon (TPH)	
Total TPH	<100mg/kg
BTEX	
BTEX benzo(a)pyrene	1mg/kg
BTEX BenzeneA	1mg/kg
BTEX TolueneA	1mg/kg
BTEX Ethyl BenzeneA	1mg/kg
BTEX XyleneA	1mg/kg

7.7 Radon.

The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

Location	Estimated properties affected	Radon Protection Measures required
On site	Between 5% and 10%	Basic



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.
- **Ecotoxicological 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.

$$\text{Risk Rating (RR)} = \text{Severity (S)} \times \text{Probability(P)}$$

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
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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 structural aspects relating to possible terraced buildings dating back to 1962 and beforehand - but no heavy industrial or engineering use - and from 1962 it has had a predominantly agricultural aspect, 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 presence 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 <u>absolute</u> obligation under CDM2015).
			C. Future workers, visitors and members of the public.	RR=2 Low Risk possible presence of exposing areas of <i>Infilled Ground</i> associated with the works for foundations, drainage and associated infrastructure.
		2	D. Controlled waters.	RR=2 Low Risk.
		2	E. Ecosystems	RR=2 Low Risk.
			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	1	D - E	RR=3 Low Risk

	debris, e.g. ash, clinker			
Waste Materials	Past tipping, basements, demolition rubble uncontrolled wastes	3		RR=3 Medium Risk. No identifiable wastes observed but we know buildings were present prior to 1962 and there may be buried foundations , rubble fill etc.

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 POTENTIAL** for contaminants and ground gases.

There is a residual possibility that there may be areas of 'infilled ground', buried foundations 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 our opinion, it is highly unlikely that hydrocarbons will be present in significant or high (or any) concentrations associated with the proposed development works.**

9.2 Recommendations for Further Work

1. Based on the proximity of historical quarries and coal mining activity there is a requirement to undertake a formal **Coal Mining Risk Assessment (CMRA)**.
2. Based on the same historical activity, and the possible presence of buried foundations etc., there is a requirement to undertake a formal 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 2No. Rotary Boreholes to 30m deep.**

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

3. 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**.
4. **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 and each borehole = **4No. 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.
5. Regarding **Ground Gas**, the site is considered a **LOW** risk due to the absence of extensive sections of infilled ground and/or proximity to landfill - but it is a **MEDIUM** risk due to past coal mining activity – known to be a credible source of ground gas.
 6. 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]

7. Provisionally, we would recommend a minimum of **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 3 months** at the discretion of the Chartered Geologist on site undertaking the watching brief.
8. 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 development 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



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25th September 2024

Appendix A Groundsure Geo-Insight Report Ref: GS-E4K-1RT-TYD-NRQ

Appendix B Radon Report Ref: GS-LGQ-HWN-E8T-PPR

Appendix C Historical Mapping Ref: GS-66L-RRL-4RO-7R5

[*NOTE – Appendices are provided in separate attachments due to file size]