

PHASE 1 CONTAMINATED LAND RISK ASSESSMENT ERECTION OF NEW SLURRY STORAGE TANK

Bark House Dairy Farm, Huddersfield Road, Shelley, Huddersfield, HD8 8LJ.

Report Ref: TH/BARK/PHASE1/01/Mar2024

25th March 2024



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Document Control

Project title	PHASE 1 – Slurry Tank – Barkhouse Farm, Huddersfield Road, Shelly, HD8 8LJ		Project Ref	TH/BARK/Rep 01
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Issue No.	Status	Amendment Details	Approved for issue	
1	Draft	-	KT	
2	Final	Minor Amendments	KT	

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1.0 INTRODUCTION

1.1 Terms of Reference

In January 2024, on the instructions of the Project Planning Consultants (Tom Warren, Prism Agriculture Ltd) acting for the owner (Ms Janet Cartwright) Earth-Tech Consulting Ltd were asked to review various design considerations and prepare a **Phase 1 Contaminated Land & Preliminary Risk Assessment (PRA)** on agricultural land at Bark House Dairy Farm, Huddersfield Road, Shelley, HD8 8LJ.

The development proposal is to construct a new covered **Slurry Tank** to support the activities of the operational Dairy Farm, and specifically to comply with the requirements of the *Water Resources (Control of Pollution) (Silage, Slurry and Agricultural Fuel Oil) (England) Regulations 2010 (SSAFO)*. The SSAFO Regulations have recently been superseded by *The Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018*, otherwise known as the *Farming Rules for Water (FRfW)*. Currently the Farm does not have the minimum 6 month storage requirement, and a new structure is required to meet the legal obligations of the FRfW:



Fig 1 - Aerial photograph & Schematic: Land at Bark House Dairy Farm, Huddersfield Road, Shelley, HD8 8LJ.

The development proposal consists of the erection of a new slurry tank to meet the EA requirements:

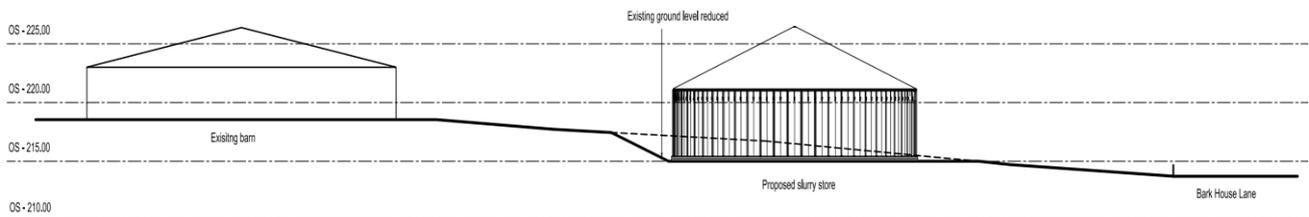


Fig 2 – Site Sectional Drawings showing proposed Slurry Tank at Bark House Dairy Farm, Huddersfield Road, Shelley, HD8 8LJ.

The Planning Consultants have advised that the Local Planning Authority are likely to require further information regarding the suitability of the site for the proposed development: in particular, further details of the history of the site, specifically in relation to potential land contamination, ground stability, legacy coal 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	Land at Bark House Dairy Farm, Huddersfield Road, Shelley, HD8 8LJ.
Client/Owner	c/o Ms Janet Cartwright
Key Stakeholder	Environment Agency (Contact: Kim Bailey) T: 07795 521993 E: kim.bailey@environment-agency.gov.uk
Planning Consultant	Prism Agriculture Ltd (Contact: Tom Warren)
Geotechnical Consultants	Earth-Tech Consulting Ltd (Contact: Mr T. M. Hyett MSc BSc CGeol FGS, MCIQB) Unit 6 Thornes Office Park Monckton Road Wakefield WF2 7NQ T: 07790 581478 E: timhyett@hotmail.co.uk

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 desk study includes a review of the available geological, past investigations (where applicable) 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 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 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 pollution linkage concept introduced by the Environmental Protection Act 1990:

SOURCE-PATHWAY-RECEPTOR

1.8 Limitations and Exceptions of this report

This report was undertaken for the owner (Ms Cartwright) 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 map surveys. 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 location, off Huddersfield Road, Shelley, in Huddersfield, West Yorkshire HD8 8LJ.



Fig 3 – General Location in West Yorkshire - Bark House Dairy Farm, Huddersfield Road, Shelley, HD8 8LJ.

The site is located at off Huddersfield Road / Bark House Lane and is part of the existing Bark House Dairy Farm on the outskirts of the village of Shelley, near Shepley in Huddersfield, elevated some 700ft above sea level.

- Shelley (sometimes known as *Shelley Woodhouse*) is a village in the civil parish of Kirkburton in the county of West Yorkshire. It lies 3 miles (5 km) north of Holmfirth and 6 miles (10 km) southeast of Huddersfield.

- Shepley is an adjacent village, also in the civil parish of Kirkburton, in Kirklees, West Yorkshire, and it lies 8 miles (13 km) south-south-east of Huddersfield and 6 miles (9.7 km) north-west of Penistone.

2.2 Layout of Proposed Development

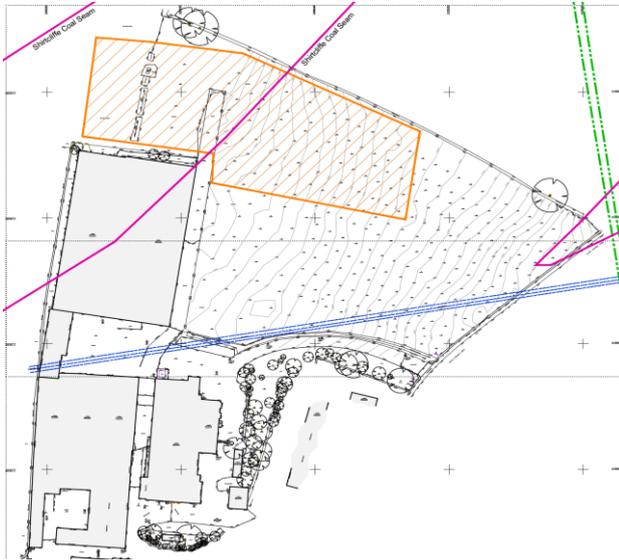


Fig 4 - Existing Site – Land at Bark House Dairy Farm, Huddersfield Road, Shelley, HD8 8LJ.

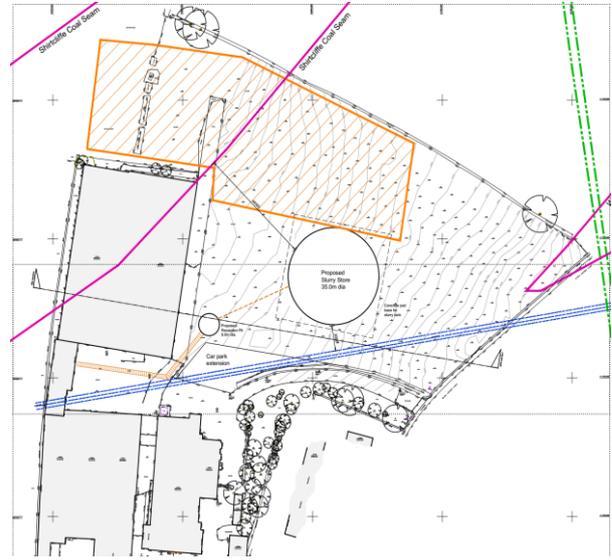


Fig 5 - Development as Proposed - Land at Bark House Dairy Farm, Huddersfield Road, Shelley, HD8 8LJ.

2.3 Historical Aerial Photographs



Capture Date 30.05.2021



Capture Date 29.06.2018



Capture Date 26.03.2012



Capture Date 10.07.1999

3.0 SITE HISTORY & LANDSCAPE CHARACTER

3.1 General

Originally, the area was a cornmill servicing a small farming community. In the early 19th century, Sir Joseph Radcliffe from Milnsbridge House was *Lord of the Manor*. He was knighted for his role in suppressing the *Luddites* in the Huddersfield area following the murder of Marsden mill owner William Horsfall in 1812. In 1868 Shepley was described as '*a township and chapelry in the parish of Kirkburton, upper division of Agbrigg Wapentake, West Riding County York*'. The village was also recorded as having 30 tailor's shops in a population of around 1,000. These would have sprung up as a result of the four mills around the villages manufacturing fine woollen worsteds.

Farming would have been the predominant industry, but manufacturing and quarrying was also present, and the wool trade started to grow from the 14th century onwards, gaining momentum following the *Dissolution of the Monasteries*. As the woollen mills further up-stream were built, for example at Brookhouse and Bank Bottom, they in turn used the river Colne for power and so streams and rivers were diverted often to the detriment of the corn mills. Shepley Corn-Mill (where this site is located) was on that stretch of the river - half-way up Dam Hill - and historical records show numerous feuds and arguments took place to establish rights to the watercourse, leading to the Shelley Dike (close to where the subject building now sits) becoming the line that effectively divided Shepley and Shelley over the years.

Various industries developed using waterpower from the river, such as corn milling, wire drawing and various wool and cloth processes. Most of these are now gone, and the villages are currently popular dormitories for the urban district of Huddersfield and serve as a commuter belt for the cities of Manchester, Leeds, and Sheffield. Shepley is connected by the A629 (Rotherham - Skipton road) to Huddersfield through to Barnsley, Penistone and Sheffield and by the A635/A636 to Wakefield through to Holmfirth. Shepley railway station is on the Penistone rail line which runs from Huddersfield to Sheffield via Barnsley.

In terms of key gateways and historic turnpike roads, climbing up the hill on the A629 from Shepley towards Lane Head, *Toll Bar Cottage* appears on the left just after the main gates of Cliff House. The cottage marked the place where gates once stood across the Barnsley and Shepley Lane Head Turnpike which was built by Blind Jack of Knaresborough in 1825 following an Act of Parliament passed two years earlier. As the name of the building suggests, a toll was collected at this point from travellers. The tolls were abolished on 1 August 1875.

Lane Head is a hamlet to the south of the village of Shepley which had a Quaker meeting house, built in 1696 and which has been a private dwelling since 1706. It had connections with the even older High Flatts Quaker meeting house in Birdsedge. Lane Head is also famous for the quarries that have provided stone used at Buckingham Palace in London, and

other famous landmarks. The Lindley family used to own the quarry situated on Carr Lane, but it has now become part of the Marshalls Group, as have Appleton Quarries situated on Holmfirth Road. The son of a previous owner was once buried under a single tree next to the Round Wood above the quarry following a tragic accident in the late 1970s.

3.2 Prehistoric Period

Earliest evidence of human habitation of the wider area dates to the pre-historic period with flint tools and stone axes found on the moors and earthworks at Denby Common, Langsett and Roughbitchworth. Other indicators are marked on old Ordnance survey maps as 'Castle Hill' or 'Castle Dyke' and provide clues about early settlers within the area.

Evidence exists of early occupation in the area at Castle Hill, a small hilltop above Birdsedge that contains defensive works which might have been either a Roman or tribal look-out station. Some local historians claim that the ancient ridge above the Sovereign public house, known as '*Burnt Cumberworth*' contained ancient furrows before they were destroyed by quarrying in the late 20th century.

Shepley is also situated on one of several local leys comprising *Crossley, Longley, Shepley, Shelley, Emley, East Midgley, Coxley, Stanley, Scholey, Methley* and *Astley*. The 'ley' idea was introduced by antiquarian Alfred Watkins in his book '*The Old Straight Track*' in 1925. He suggested that the ancient British used high points and hill tops as sighting points to help them navigate in a straight line and that 'ley' or 'leigh' place names actually mean "*a grassy track across country*". He perceived that many later Roman roads followed these straight ancient tracks.

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.

- Although Roman finds do exist in the wider district, 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 earliest mention of nearby Shepley is in the Domesday Book where it is called 'Sceaplie', as it is believed to derive from Old English *sceap* ('sheep') and *leah* ('clearing'), thus meaning 'a clearing or meadow where sheep are kept'. The population suffered during William the Conqueror's *Harrying of the North* 1069–1070 when the king laid to waste towns and villages between the Scottish border and the River Humber in order to put down a northern rebellion against his Norman rule. Thousands of people were put to the sword. However, the village was soon back in political favour, as in 1217, a certain *Matthew of Sheplei* was knighted and his name appears in the records of the Beaumont family of Whitley Beaumont and later of Bretton Hall near Wakefield. There is also a reference to Shepley in the *Inquisitions Post Mortem*, written in the 33rd year of Henry III's reign (1249):

"Extent: The vigil of St. Matthew, 33 Hen. III. *Scheplay alias Sepeleya town, a capital messuage, 6l. rents from free tenants, 6s. 10d. from cottars, a mill, a little wood, &c. tenure unspecified.*"

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 earliest map covering the study area is the 1771 Thomas Jeffrey map of Yorkshire. This early edition shows the whole county in some detail in the pre-industrial era with many of the most prominent features marked on it. Huddersfield is marked, but there is no reference for the village of Shelley, signifying this as being a much smaller, less important settlement. Notably, Penistone to the south-east is discernible, written in bold type and capital letters which signifies it as a large settlement of some importance in the district.

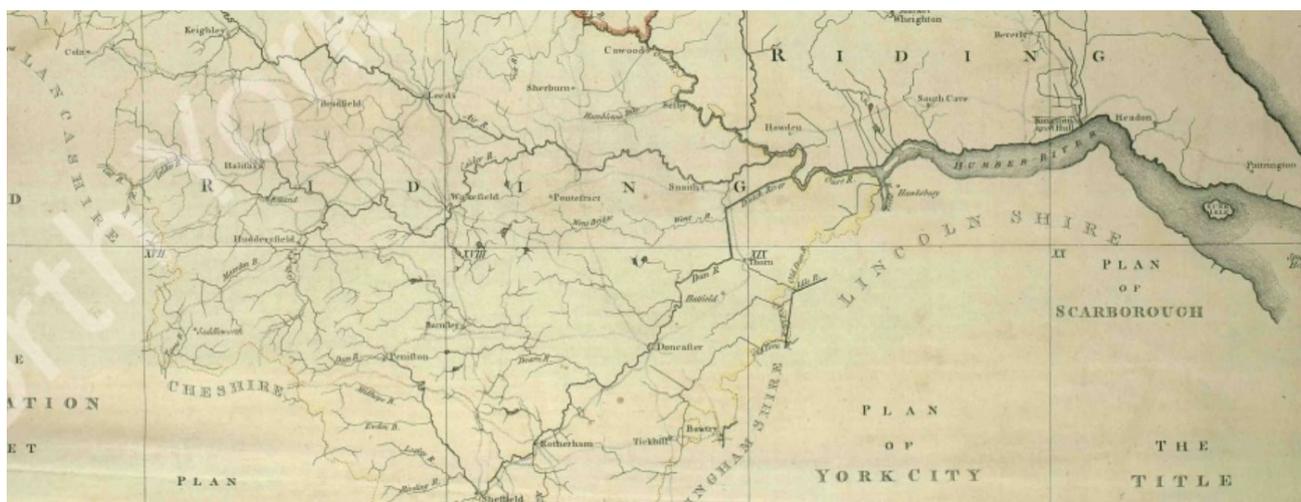


Fig 6 – 1771 Thomas Jeffrey Map of Yorkshire

Some years after Thomas Jeffrey's survey, the nucleus of Shelley village would have been Emmanuel Church, the village main street, with the surrounding area of a rural character. During the 1800's the population of the country grew rapidly and the Church of England was having difficulty in providing churches for so many people. Parliament made grants available for setting up new parishes and building new churches. Wealthy landowners were quite prepared to donate the odd acre of land on which these new churches would be built.

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 wider district was focussed on manufacturing.

Mining for iron ore became important in this district in the 12th century, when monks came from Fountains, Byland, Roche, and Rievaulx Abbeys. The Tankersley Ironstone Bed lies within the Coal Measure shales and is 35 cm thick. The monks worked this iron ore along its outcrop towards the north and east, from Bentley Grange, near Emley, which was the main centre of the iron ore industry. Old pit mounds show evidence of iron mining at Bentley Springs. In the early years of mining the monks used to dig either long trenches or bell pits depending on the depth of the ore. A series of holes or shafts was dug to the depth of the mineral layer and then the ore was extracted in all directions, forming a bell shape beneath the surface. When the likelihood of roof collapse was imminent the pit would be abandoned. The excavation of a new shaft would then begin a short distance away.



Bell pit mining was the only method then available to reach minerals covered by layers of other rock. After the ore had been extracted it was taken to primitive furnaces called bloomeries, situated near to the bell pit workings and made into wrought iron.

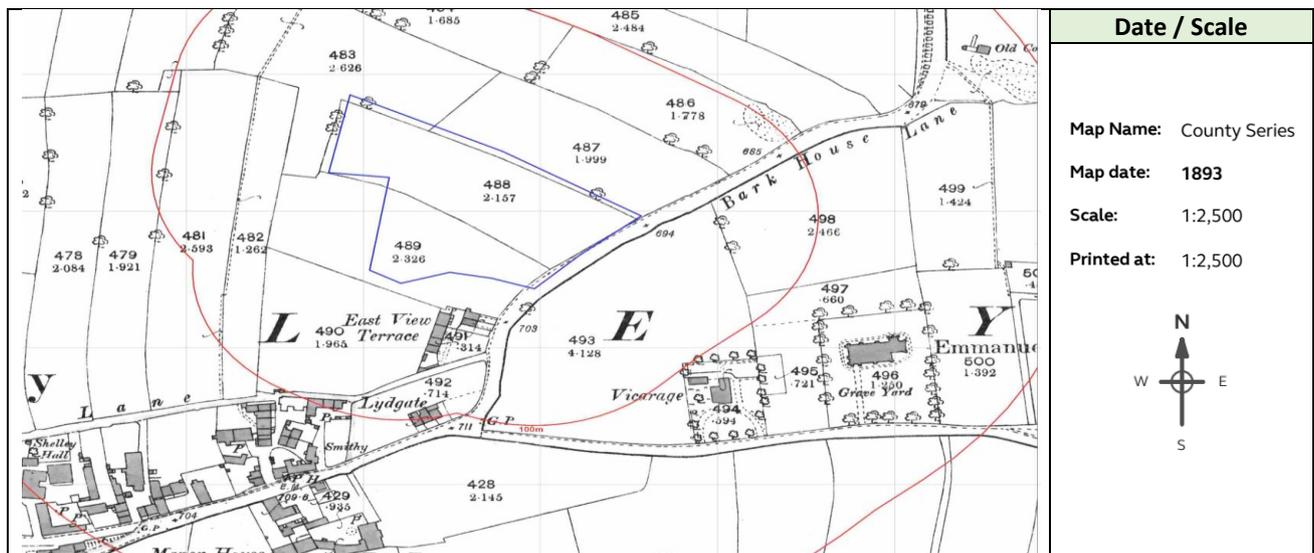
Nearer to Huddersfield at Bradley Wood, the Black Bed ironstone yielded ore of great economic value with 30% iron content. Iron Mining was important for about 200 years, but no ironstone has been worked since the 17th century.

Fig 7 – Bell pit mounds at Bentley, near Emley

The other main mineral to be exploited was coal. Mining was started by the monks from Byland Abbey in the Flockton area, possibly before the 14th century. As well as the bell pit method miners also dug what were called day holes or day eyes. These were worked by tunnelling a near horizontal adit into the shales from the side of the hill to obtain coal. Often miners who worked bell pits also had their own day hole for domestic use. Later the introduction of mechanisation and deeper shafts increased the coal mining industry’s extraction of the mineral as it gave access to deeper seams.

The coal seams at Huddersfield dip towards the east, concealed by younger rocks. One of the larger coal mines in the district was the Denby Grange pit, north of Flockton, where several shafts were sunk. The pit was worked for 150 years in thin seams less than a metre thick from which a large tonnage of coal was extracted. In 1778 a new lease from the Denby Grange estate enabled more shafts to be sunk nearby which included Caphouse Colliery, now the National Mining Museum for England.

3.7 Site Usage from Historical Maps



On-Site Features	Off-site Features
<ul style="list-style-type: none"> Open fields; Plot 488/489 – surrounded by open fields 	<ul style="list-style-type: none"> Bounded by open fields in all directions. Old Colliery noted to the north-east (<500m) Emmanuel Church and Vicarage south-east (,500m)

	Date / Scale
	<p>Map Name: National Grid</p> <p>Map date: 1989-1992</p> <p>Scale: 1:2,500</p> <p>Printed at: 1:2,500</p> <div style="text-align: center;"> </div>
On-Site Features	Off-site Features
<ul style="list-style-type: none"> No significant change 	<ul style="list-style-type: none"> No significant change Bounded by open fields in all directions. Electric Sub-station noted to the north-east (<500m) Emmanuel Church and Vicarage south-east (,500m)

The full suite of Historic Maps is attached at **Appendix D**.

3.8 Summary of ON-SITE Features

Dates	Features (within 250m)	Distance	Direction
1893 - present	Agricultural Land / Fields in all directions	On site	All

3.9 Summary of OFF-SITE Features

Dates	Features (within 250m)	Distance	Direction
1893 – present	Agricultural Land / Fields in all directions	<500m	All directions
1893 – 1906	Old Colliery	<500m	North-East
1906 – (unknown)	HV Electric Sub-station	<500m	North-East
1893 – present	Emmanuel Church	<500m	South-East

Research confirms the site was unoccupied land surrounded by open fields as far back as the records exist. The site itself has remained unchanged since then, becoming part of Bark House Dairy Farm, which developed from c.1960 onwards. The open-fields surrounding the site have remained largely undeveloped since records began, with the exception of farm buildings / cattle sheds to the north and north west.

The Historical Maps are not particularly exhaustive for this location, and many map sheets bridge across the site with data missing from the records. This is not considered significant in terms of key infrastructure / key features - with the exception of a **High Pressure (HP) Gas Pipeline** installed across the field towards the south / south-eastern boundary.

- Most likely this major pipeline will have been installed in the 1970s / 1980s, as the UK gas transmission network was under re-development, although it is not shown on the historic mapping at Appendix D. (see below)

There is no evidence from the historical maps (or anecdotally) to suggest that the broader site and the position within the land parcel proposed for development was used directly for any industrial or mechanical processes other than that which might be associated with farming and agriculture through to the present day, all located within a consistent rural setting when the wider environs were developed on a **very low scale** from c.1960 onward for dairy farming - which remains the current business of the site owner(s).

3.10 Land Character

The site is located in a pocket of land bordered on all sides by fields and various pockets of woodland of the Local Character Profile area referred to as **LCA E6: Fenay Beck Valley Rural Fringes**. The area is understood to fall within the local area character assessment as *woodland brown field*.

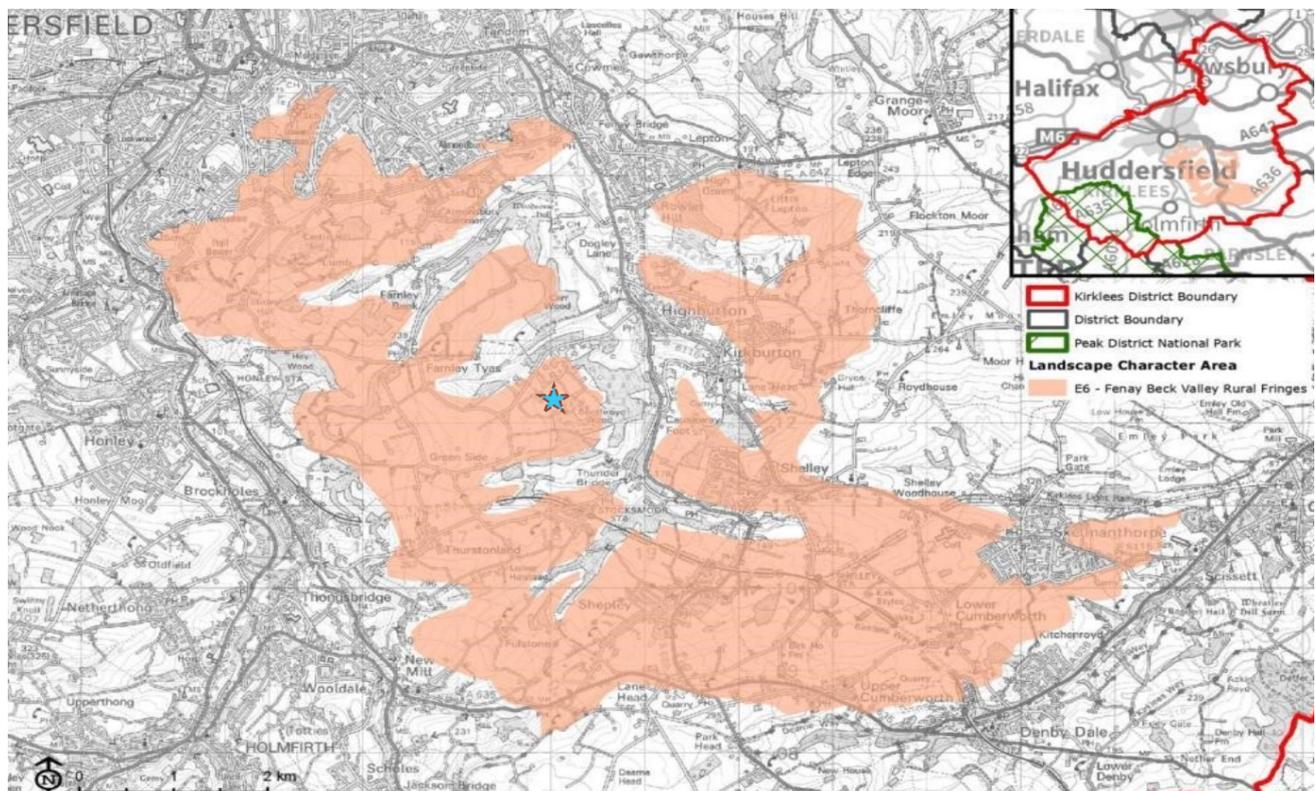


Fig 8 – Local Character Profile area LCA E6: Fenay Beck Valley Rural Fringes

The dominant landscape characteristics of this area is the mature and ancient woodland which edges the villages to the south and south-west, and further to the north-west, passed Shelley, open-farmland is usually laid to pasture or grassland, although there are a small number of isolated arable fields. There are also some areas with paddocks for equestrian / agricultural grazing. Fields tend to be divided by hedgerows and dry stone walls. There are also a number of semi-natural habitats (including some *Biodiversity Action Plan (BAP) Priority Habitats*) including riparian vegetation, semi-improved grassland, moorland, and abundant ancient woodland.

4.0 SITE CONTEXT

4.1 Site Visit & Walkover

A site walkover survey was undertaken on Tuesday 6th February 2024, by Mr T. M. Hyett MSc CEng MIEI CGeol FGS, a Chartered Consultant Engineering Geologist at Earth Tech Consulting Ltd. The survey was carried out 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 site identified for locating the Slurry Tank is field plots 488/489 adjacent to the Dairy Farm to the West and the Cattle Sheds to the North / North-West, with independent access opportunities from off Bark House Land (or) from the Dairy Farm entrance road/track. The field plot is broadly rectangular and slopes gently towards the South and South East.
Description of surrounding area	The immediate area is agricultural (in all directions) with low-scale residential housing to the South (only). The site has been open-fields and is unchanged since 1893.
Surrounding Land Usage	North Agricultural Fields
	East Agricultural Fields
	South Residential (Dairy Farm + Low Scale housing) - rural village setting
	West Agricultural Fields / Farm Sheds
Access	Off Bark House Lane (or) from Bark House Dairy Farm (directly)
Structures	No structures are present on the site of any significance.
Surfacing	The site is grassed, with topsoil underneath, overlaying drift deposits probably comprising layers of dark brown, <i>soft to firm</i> , CLAY
Vegetation	Vegetation on site is sparse comprising bushes and hedgerows bordering the whole field with grassed areas for grazing.
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/gardening machinery; no evidence of an incinerator or any past burning of wastes in the area comprising the site of the proposed slurry tank(s).
Air emissions	No evidence of significant sources of air emissions were observed at the site – the site is non-residential and located in proximity to a main road (Bark House Lane) - the natural screening of the site means that air pollution is unlikely to have added to the contamination risk over time.
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 1:10560 scale sheet 261SW and 1:50,000 scale sheet 86) the following prevalent geological sequence can be assumed:

Superficial soils: "TOPSOIL, with possible thin layer(s) of intermittent filled ground (ARTIFICIAL FILL DEPOSIT) overlying natural "yellowish brown, soft to very soft, slightly to very silty CLAY with sands and gravels - gravels are angular tabular fine to medium sandstone and mudstone litho-relics." (GLACIOFLUVIAL DEPOSITS)."

Solid geology: Predominantly "Weathered Sandstone" (GRENOSIDE SANDSTONE and PENISTONE FLAGS SANDSTONE) and "Weathered, moderately strong Mudstone, Siltstone and Sandstone" (PENNINE LOWER COAL MEASURES FORMATION).

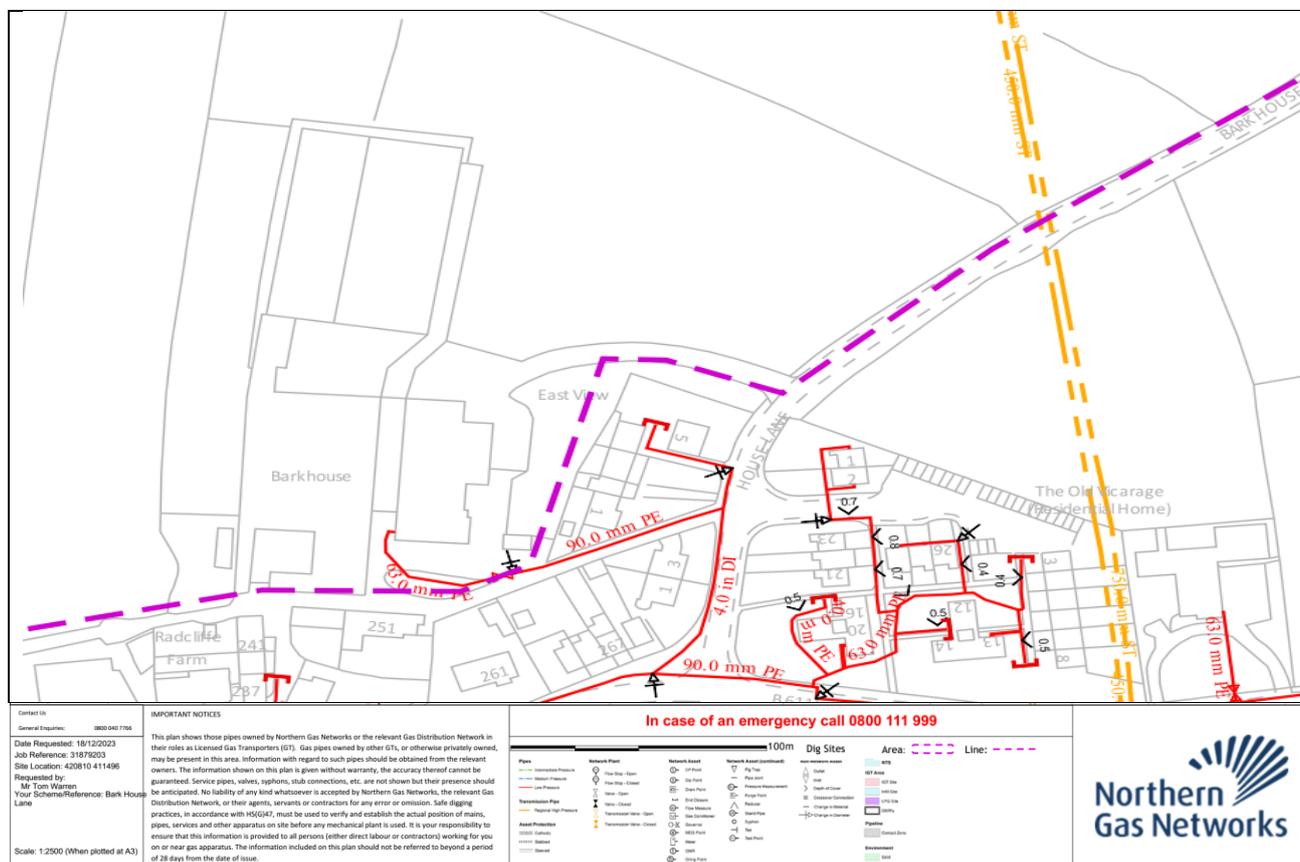
4.3 Contamination

From the walkover survey, and from close inspection of exposed geology, there was no unusual colouration or odours to any of the soils and no evidence from the observations to suggest the site had any previous heavy industrial or engineering use, and there were no visual or olfactory indicators to suggest the presence of hazardous contaminants in particularly high (or any) concentrations.

- There was no evidence from the observations during the walkover that the site had any contemporaneous previous industrial use and it has been used as garden (only).
- 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.

4.4 High Pressure Gas Pipeline

A twin 750mm & 150mm diameter HP Gas Pipeline is located in close proximity (Plot 487) to the site as shown below:



Working in proximity to HP Gas Pipelines presents a variety of challenges, and considerable steps need to be taken if the proposed Slurry Tank is situated within 15m of the asset. The developer MUST follow the guidance contained within the following publications:

- Safe working in the vicinity of high-pressure gas pipelines and associated installations.
- Avoiding injury when working near gas pipes up to 7 bar.
- Avoiding injury when working near gas pipes

Specifically, the guidance states;

It's essential that all procedures in this document are complied with because damage to a high-pressure gas pipeline or its coating can result in failure, causing hazardous consequences for anyone nearby. If NGN thinks any work is in breach of this document, they'll stop the work until the correct procedure is being followed.

Regulation 15 of the Pipelines Safety Regulations states: 'No person shall cause such damage to a pipeline as may give rise to a danger to persons'. This means that if you don't follow these requirements the Health and Safety Executive (HSE) could also prosecute you.

All the requirements in this document are in line with the HSE's and the Institution of Gas Engineers and Managers (IGEM) recommendations. You can find these in HSE's guidance document HS(G)47 Avoiding Danger From Underground Services. They are also available in document IGE/SR/18 Edition 2 - Safe Working Practices To Ensure The Integrity Of Gas Pipelines And Associated Installations. Third parties must also make sure that all work follows the requirements of the Construction and Design Management Regulations and all other relevant health and safety legislation.

NOTE (1) - What does this mean?

This means that, whilst it is feasible to situate the Slurry Tank towards the South / South-West of the field plot, consideration should be given to keeping the structure a suitable distance from the pipeline.

Equally, whilst it is theoretically possible to site the Slurry Tank to the East of the existing HP Gas Pipeline, this would require a 'crossing' of the pipeline for the pipe-work needed to feed the tank. Obtaining consent from NGN to cross beneath a 750mm HP Gas Pipeline would be challenging, and the Engineering Work required to ensure no surface settlement damage occurs would be considerable, most likely involving state-of-the-art Trenchless Techniques, and the process would be considerable.

As such, the near field plot (488) should be considered as the **optimum location** for the Slurry Tank – a safe distance away from the *High Risk* pressurised gas infrastructure. This would render the preferred site location to the West of the HP Gas Pipeline as a **LOW HAZARD POTENTIAL** for the purposes of **Construction**.

4.5 Ground Gas (non-coal mining)

It is well known that unnatural features, such as historic coal workings and old quarries etc., that may/may not have been used for landfill etc., have the possibility of generating varying levels of ground gases which have the potential to present a risk to human harm.

Methane is the dominant constituent of most ground gas and can form an explosive mixture in air at concentrations of between 5% and 15%, thus 5% methane in air is known as the *Lower Explosive Limit* (LEL). Concentrations less than this do not normally ignite. Carbon dioxide can also be a potential problem, especially where it occurs in concentrations greater than 1.5%.

Very basic in-situ methane gas tests (by soil spiking) were carried out in probe holes made in the sides of the natural ground slopes using a portable RS-Pro gas detector (shown below) which measures the methane content as its percentage volume in air.



Fig 9 - Portable RS-Pro methane detector (above) & (right) in use during survey at Bark House Farm on 06.02.2024

RS-PRO PORTABLE GROUND GAS MONITOR							
GAS DETECTOR FEEDBACK FOR METHANE CONCENTRATION LEVELS							
Low Sensitivity White Light ON = 0 ppm	High Sensitivity Yellow Light ON = 0 ppm	Level Lights					Audible Alert Beeping OFF
		L1	L2	L3	L4	L5	
1... 100ppm	1... 1000ppm	ON	OFF	OFF	OFF	OFF	1 cyc/sec
100... 400ppm	1000... 4000ppm	ON	ON	OFF	OFF	OFF	1.2 cyc/sec
400... 700ppm	4000... 7000ppm	ON	ON	ON	OFF	OFF	1.65 cyc/sec
700... 1000ppm	7000... 10000ppm	ON	ON	ON	ON	OFF	3.25 cyc/sec
> 1000ppm	> 10000ppm	ON	ON	ON	ON	ON	6.25 cyc/sec

Earth Tech are fully aware that probe hole monitoring (soil spiking) is considered by some authors somewhat limited in its ability to provide a highly reliable measure of soil gas regime on affected sites, and that CIRIA C665 states that ‘sole reliance on soil spiking data is not recommended. Further investigations with permanent installations would always be required’ etc., but we are equally aware that CIRIA recognizes that risk-based decision making is part of the technical framework for dealing with contamination from historical or natural sources, and that cost-benefit analysis is an inherent part of the risk assessment process:

- CIRIA C665 also states, inter alia; ‘Visual inspection required: It is important to determine and record the nature of the underlying ground conditions (for example visual and olfactory evidence) to assist in the definition of the soil gas regime. This will ensure an appropriate description of the soils and help to identify potential sources of gas’.
- CIRIA 659 (Assessing risks posed by hazardous ground gases to buildings. 2006) (at para. 4.2.10) also states, inter alia; ‘The various exploratory techniques entail different costs (Table 4.1)... On [large] sites it may be possible to reduce the overall costs of an investigation and increase accuracy by the appropriate use of a non-intrusive or temporary technique before an intrusive permanent technique. For example, the use of either aerial false colour, infra-red photography, or soil spiking may help to target areas of high gas concentrations.’

NOTE (2) - What does this mean?

This means that, whilst the site is considered a **LOW HAZARD POTENTIAL** for the purposes of non-coal mining related ground gas, a program of structured **Ground Gas Monitoring** may be required, at the intrusive Site Investigation stage, subject to further evaluation of *Legacy Coal Mining Risk*. (see below)

4.6 Trees

Advice on arboriculture issues is generally considered to be outside the scope of this report except for their effect on the foundations to proposed buildings (where applicable). This proposed scheme is a non-residential essential **farm related infrastructure development** comprising the erection of a **slurry tank** (only). 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 on all the sites we investigate.

- **No issues associated with Japanese Knotweed were observed during the Site Walkover.**

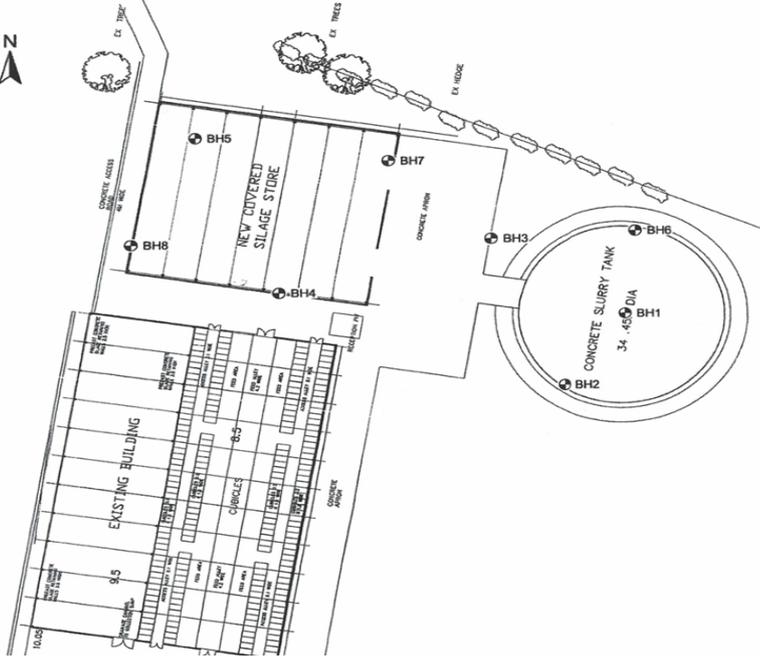
5.0 GEO-ENVIRONMENTAL SETTING

This section is based principally upon a search of information available on public registers through a GroundSure Enviro-Insight Report attached at Appendix A.

5.1 Geology and Mining

From the walkover survey: the examination of various Geological Map Extracts from the BGS - British Geological Survey (specifically 1:10560 scale sheet 261SW and 1:50,000 scale sheet 86) the following geological sequence can be assumed:

Additional sources of information	British Geological Survey (BGS) – 1:10,000 scale geology data sheets and 1:50,000 scale geology data sheet 261SW and 1:50,000 scale sheet 86, and sheet EW086_glossop_v4. BGS 1:10,000, County Series BGS and Coal Authority internet-based information
Made ground	A review of published geological plans indicates there is no made ground on site or within close proximity.
Superficial deposits	TOPSOIL, with possible thin layer(s) of intermittent filled ground (ARTIFICIAL FILL DEPOSIT) overlying natural “ <i>yellowish brown, soft to very soft, slightly to very silty CLAY with sands and gravels - gravels are angular tabular fine to medium sandstone and mudstone litho-relics.</i> ” (GLACIOFLUVIAL DEPOSITS).

Solid geology	<p>Predominantly <i>Weathered Sandstone</i> (GRENOSIDE SANDSTONE and PENISTONE FLAGS SANDSTONE) and <i>Weathered, moderately strong Mudstone, Siltstone and Sandstone</i> (PENNINE LOWER COAL MEASURES FORMATION).</p>																					
BGS borehole records	<p>The BGS holds records of 2No. investigations carried out in proximity of the site.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #e0e0e0;"> <th>ID</th> <th>Location</th> <th>Grid reference</th> <th>Name</th> <th>Length</th> <th>Confidential</th> <th>Web link</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>11m NW</td> <td>420880 411480</td> <td>BARK HOUSE FARM SHELLEY</td> <td>154.0</td> <td>N</td> <td>57135</td> </tr> <tr> <td>2</td> <td>177m SE</td> <td>421100 411200</td> <td>PENNINE GARDEN CENTRE HUDDERSFIELD ROAD SHELLEY</td> <td>137.0</td> <td>N</td> <td>18526322</td> </tr> </tbody> </table> 	ID	Location	Grid reference	Name	Length	Confidential	Web link	1	11m NW	420880 411480	BARK HOUSE FARM SHELLEY	154.0	N	57135	2	177m SE	421100 411200	PENNINE GARDEN CENTRE HUDDERSFIELD ROAD SHELLEY	137.0	N	18526322
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2	177m SE	421100 411200	PENNINE GARDEN CENTRE HUDDERSFIELD ROAD SHELLEY	137.0	N	18526322																
Other Records	<p>A Site Investigation for the purposes of a similar Planning Permission application was carried out in 2014 for the late Mr G Dearnley. The Site Investigation was carried out by Structural Soils Ltd (Report Ref: 763096) - but was not undertaken after a proper Phase I Desk Study, and as such BHs were located arbitrarily.</p> 																					
	<p>THE SITE INVESTIGATION CARRIED OUT BY STRUCTURAL SOILS IN 2014 (REF: 763096) IDENTIFIED EXTENSIVE VOIDS ASSOCIATED WITH POTENTIAL LEGACY COAL MINING. THE REMEDIATION MEASURES TO MITIGATE RISKS ASSOCIATED WITH THE SIGHTING OF THE SLURRY TANK AS PROPOSED (ABOVE) WERE CONSIDERED PROHIBITIVELY EXPENSIVE FOR THE OWNER, AND WHILST PLANNING PERMISSION WAS GRANTED FOR THE SLURRY TANK, THE WORKS WERE NEVER CARRIED OUT DUE TO THE RISKS IDENTIFIED (See Further Commentary Below).</p>																					

Coal Mining - YES	The site is located within a coal mining area as defined by the Coal Authority: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th style="background-color: #cccccc;">Location</th> <th style="background-color: #cccccc;">Details</th> </tr> </thead> <tbody> <tr> <td>On site</td> <td>The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site. This can be ordered directly through Groundsure or your preferred search provider.</td> </tr> </tbody> </table>	Location	Details	On site	The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site. This can be ordered directly through Groundsure or your preferred search provider.
Location	Details				
On site	The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site. This can be ordered directly through Groundsure or your preferred search provider.				
Underground Workings – YES	See below				
Other Mineral Extraction - YES	See below				

5.2 Hydrology & Hydrogeology

From local knowledge of the area, ground water can be reliably assumed to be well below the zone of influence of the proposed 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 garden 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.
Watercourses	None within 500 metres
WFD Surface water bodies	None within 500 metres
WFD Groundwater bodies	None within 500 metres
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

There is a medium potential for groundwater within the *Pennine Lower Coal Measures* solid geology beneath the site. This is 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. The foundations of the dwellings are unlikely to be affected and/or impact any aquifer in the bedrock.

- 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 these horizons although small quantities may be present in thin interbedded sandstones.

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 500 metres

5.4 Pollution controls and industrial land use

Industrial Land Uses	None within 500 metres
Recent industrial land uses	None within 500 metres
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 – NO	Location	Estimated properties affected	Radon Protection Measures required
	On site	Less than 1%	None

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.

- None within 500 metres

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

- None within 500 metres

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.

- None within 500 metres

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
A	217m E	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
A	246m E	WMGR-ARTDP	Infilled Ground	Artificial Deposit
1	271m NE	WMGR-ARTDP	Infilled Ground	Artificial Deposit
2	363m NE	WMGR-ARTDP	Infilled Ground	Artificial Deposit

ID	Location	LEX Code	Description	Rock description
1	465m SW	SLIP-UKNOWN	Landslide Deposits	Unknown/unclassified Entry

6.2 Solid Geology (bedrock)

ID	Location	LEX Code	Description	Rock age
1	On site	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
2	On site	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age

6.3 Linear Features – (faults)

ID	Location	Category	Description
3	On site	ROCK	Coal seam, inferred
4	16m NW	ROCK	Coal seam, inferred
7	208m NE	ROCK	Coal seam, inferred
A	271m NE	ROCK	Coal seam, observed
A	271m NE	ROCK	Coal seam, observed
9	363m NE	ROCK	Coal seam, observed
10	448m NW	ROCK	Coal seam, observed

6.4 Permeability

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

Records within 50m	0
---------------------------	----------

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

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
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.

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.

NOTE (3) - What does this mean?

This means that there are **no significant natural ground instability issues** indicated in the vicinity of the site:

- No weak or unstable rocks that could slip downhill on steep slopes (greater than c. 5 degrees) or into excavations ('Landslides (slope instability)') (LEVEL C).
- No evidence of *running sands*, and no specific need to check for *plasticity of clay soils* (PI).
- Not likely that any *collapsible* 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.

The site is considered a **LOW HAZARD POTENTIAL** for the purposes of **Construction**.

6.5 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** to **HIGH** risk of unrecorded shallow workings.

ID	Location	Details	Description
3	177m W	Name: Shelley Coal Pits Address: Shelley, HUDDERSFIELD, West Yorkshire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
4	214m SW	Name: Shelley Coal Pits Address: Shelley, HUDDERSFIELD, West Yorkshire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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	255m SW	Name: Shelley Address: Shelley, HUDDERSFIELD, West Yorkshire Commodity: Sandstone 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

6.6 Historical Surface Working Features

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

ID	Location	Land Use	Year of mapping	Mapping scale
A	86m E	Refuse Heap	1892	1:10560
A	89m E	Refuse Heap	1948	1:10560
A	89m E	Refuse Heap	1904	1:10560
A	89m E	Unspecified Heap	1932	1:10560
A	89m E	Unspecified Heap	1932	1:10560
A	92m E	Unspecified Heap	1993	1:10000
A	92m E	Unspecified Heap	1979	1:10000
A	92m E	Unspecified Heap	1967	1:10560
A	94m E	Unspecified Heap	1951	1:10560
B	211m E	Refuse Heap	1904	1:10560
B	215m E	Refuse Heap	1892	1:10560
B	215m E	Unspecified Heap	1932	1:10560

6.7 Coal Mining

The following *Coal Mining Records* are provided by the British Geological Survey:

Location	Details
On site	The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site. This can be ordered directly through Groundsure or your preferred search provider.

6.8 Non-Coal Mining & Other Underground

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

ID	Location	Site Name	Mineral	Type	Planning Status	Planning Status Date
1	On site	Cross Lane Mine	Fireclay	Working is wholly underground	Valid	Not available
2	130m N	Cross Lane Mine	Fireclay	Working is wholly underground	Valid	Not available
C	345m NE	Green House Mine	Fireclay	Mineral working is partly on the surface and partly underground	Valid	Not available
C	345m NE	Green House Mine	Fireclay	Working is wholly underground	Valid	Not available

6.9 Previous Site Investigation (2014) - Structural Soils

The Structural Soils Ltd Site Investigations dated 2014 (carried out for the late Mr G Dearnley) identified various shallow voids that are likely associated with shallow coal mining:

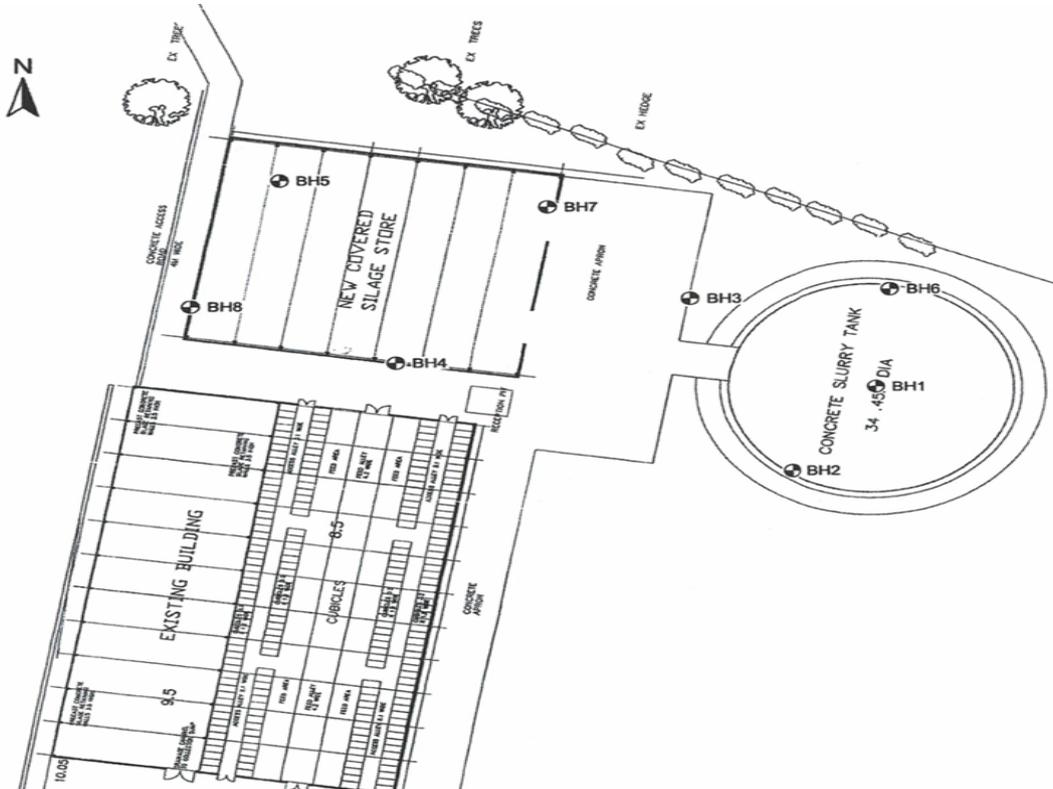


Fig 10 – Boreholes Drilled as part of the Structural Soils Survey – 2014 with Slurry Tank shown in the Northern part of the site.

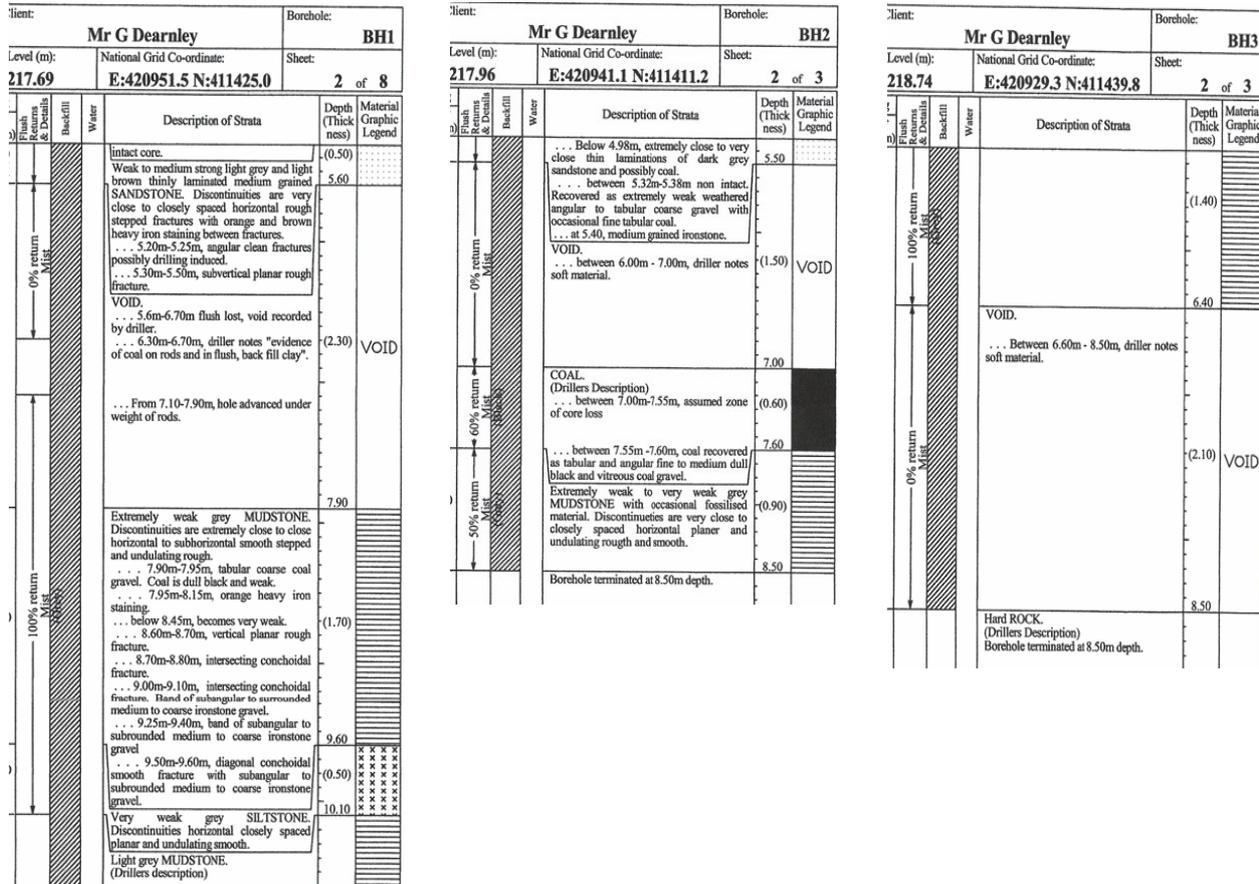
The Site Investigation identified various geo-hazard features in the BHs and concluded that **Shallow Mine Workings** had been encountered, with voids ranging from **300mm to 700mm** with up to 1.80m of stowed material or backfill left in the workings. This was an assumption as backfilled material was not recovered during the site investigation, but observations / comments were made by the drillers, who reported ‘soft consistency’ materials in proximity. A thin lay of coal was also observed in each BH, varying in quality and approximately 500m thick, indicating the base of the historic workings.

	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8
Workings	5.60m - 7.90m	5.50m - 7.00m	6.40m - 8.50m	6.90m - 8.55m	/	/	7.30m - 9.60m	9.20m - 9.90m
Void	5.60m - 6.30m	5.50m - 6.00m	6.40m - 6.80m	6.90m - 8.55m	/	/	7.30m - 8.00m	9.20m - 9.90m
Backfill	6.30m - 7.90m	6.00m - 7.00m	6.80m - 8.50m	7.30m - 8.55m	/	/	8.00m - 9.60m	/

Fig 11 – Table of conjectured Shallow Mine Working Depths - Structural Soils Survey (2014)

The Structural Soils Report concludes that the findings (above) are consistent with methods of working described by Colin Spencer (1987) that suggests coal was mined by hand in tunnels approx. 6.0m apart with excavated waste being immediately stored in the sides of the dug-out areas (i.e. not removed from the tunnel).

An example of the Geo-hazard data (voids / loss of flush) provided by the previous SI is shown below:



NOTE (4) - What does this mean?

This means that there are **potential underground mining hazards** indicated in the vicinity of the site:

- The site is located within a coal mining area as defined by the Coal Authority
- Therefore, a **Consultant's Coal Mining Report** is required. (see below...).
- Additionally, a dedicated *Coal Mining Risk Assessment (CMRA)* **may** be required ahead of any proposed *Phase II Site Investigation*.

6.10 Coal Mining Risk

In accordance with the recommendations (above), a Consultant's Coal Authority Report was commissioned for the site at Bark House Farm, Huddersfield Road, Shelley, HD8 8LJ. (Ref: 51003406136001 - See Appendix B).

This identifies that there is no recorded past mining, but that there are **Probable Unrecorded Shallow Workings**. Details of all recorded underground mining relative to the enquiry boundary will usually only include past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination. *Probable Unrecorded Shallow Workings* are areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Mine entries inquiries provide details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board. The following Mine Entries and Coal Outcrops are noted:

Mine entries

Entry type	Reference	Grid reference	Treatment description	Mineral	Conveyancing details
Shaft	420411-015	420827 411490		Coal	
Shaft	421411-024	421017 411497		Coal	

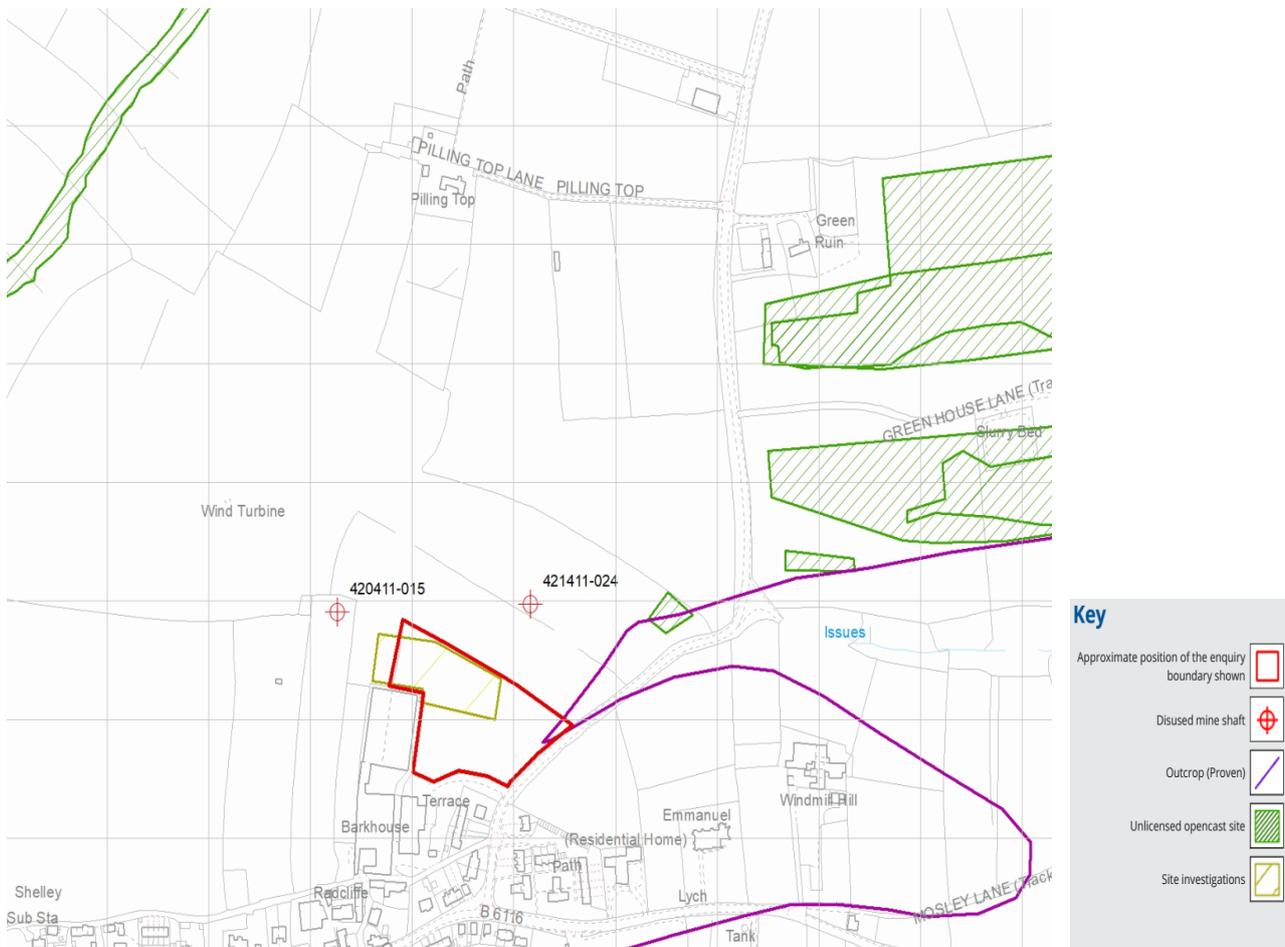
Outcrops

Seam name	Mineral	Seam workable	Distance to outcrop (m)	Direction to outcrop	Bearing of outcrop
WHINMOOR	Coal	Yes	Within	N/A	45



Summary of findings

The map highlights any specific surface or subsurface features within or near to the boundary of the site.



NOTE (5) - What does this mean?

This means that there are **significant Coal Mining hazards** indicated in the vicinity of the site:

- There is a requirement to investigate the risk of shallow coal mine workings in the location of the Slurry Tank as proposed.
- There is a requirement for a dedicated Coal Mining Risk Assessment (CMRA), that should accompany the Phase I Desk Study, relative to the current proposed location.

The site is considered a **HIGH HAZARD POTENTIAL** for the purposes of *Construction* and *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.

- There are no potentially Contaminative uses identified within 500m of the site.
- There are no entries associated with unspecified commercial / industrial usage thought to be associated with coal mining legacy, and where they are referenced, all are sufficiently distanced from the proposed site not to be considered a significant risk.

7.2 Contamination Objectives

The aim of this desk study and the 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.

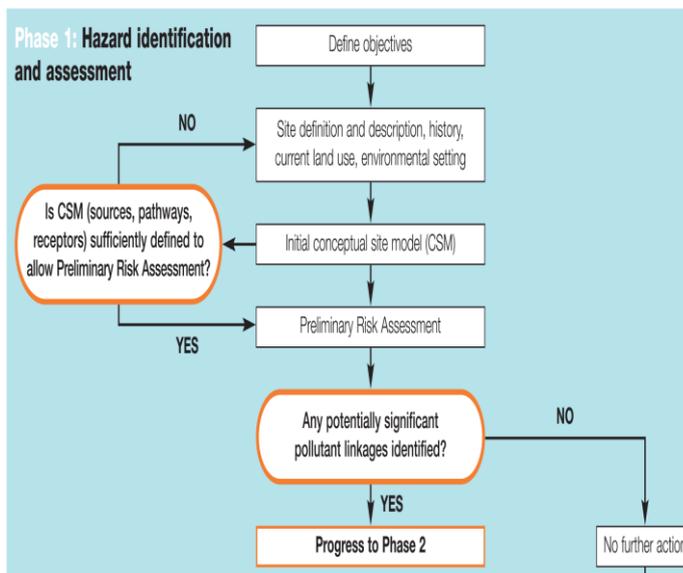


Table from NHBC 'Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008 Vol.1

All the visible soils during the Site Walkover (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 above (courtesy on NHBC):

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).

7.5 Background Ground Gas Regime (from the Structural Soils GI - 2014)

The Structural Soils Ground Investigation carried out in 2014 included Ground Gas monitoring for the usual gases associated with Mine Workings (e.g. Methane etc.) which provides a good estimate of the *Background Gas Regime* within 50m of the current study area boundary, which confirms the following:

CALIBRATION FIELD SHEET - DAILY GAS QC REPORT										
Date/Time	Project Instrument Reference	Carbon Dioxide		Methane		Oxygen		QC Check Passed YES / NO	Calibration Operator	General Remarks
		Reading	QC Passed YES/NO	Reading	QC Passed YES/NO	Reading	QC Passed YES/NO			
12/04/2014 11:40:40	I	0.0	Yes	0.0	Yes	21.2	Yes	Yes	SHaynes	SH1
15/06/2014 14:34:40	I	0.0	Yes	0.0	Yes	21.7	Yes	Yes	SHaynes	SH1
12/06/2014	I	0.0	Yes	0.0	Yes	21.4	Yes	Yes	SHaynes	SH3
12/06/2014 16:00:40	I	0.0	Yes	0.0	Yes	21.4	Yes	Yes	SHaynes	SH4
12/06/2014 16:24:40	I	0.0	Yes	0.0	Yes	21.5	Yes	Yes	SHaynes	SH4
17/06/2014	I	0.0	Yes	0.0	Yes	21.4	Yes	Yes	SHaynes	SH8
17/06/2014 09:34:40	I	0.0	Yes	0.0	Yes	21.5	Yes	Yes	SHaynes	SH7
19/06/2014 11:31:40	I	0.0	Yes	0.0	Yes	21.4	Yes	Yes	SHaynes	SH7
19/06/2014	I	0.0	Yes	0.0	Yes	20.9	Yes	Yes	SHaynes	SH2

Calibration check procedure: Check gas concentrations as follows: Carbon dioxide reading is within 4.5-5.5% range; Methane reading is within 4.5-5.5% range; Oxygen reading is within 5.4-6.6% range.
Calibration gas concentrations: Carbon dioxide = 3%, Methane = 3%, Oxygen = 4%.

STRUCTURAL SOILS The Potteries Pottery Street Castleford W. Yorkshire WF10 1NJ	Compiled By	Date	Checked By	Date	Contract Ref
		14/07/14			
Contract: Bark House Farm					Page:

ENV_LIBRARY_VN_05010 - E-GAS MON-QC-GAS-700001 - BARK HOUSE FARM (01 - 14/07/14 11:36 - 01)

Fig 13 – Background Ground Gas Monitoring - Extracted from the Structural Soils Survey (2014)

NOTE (6) - What does this mean?

This means that, based on testing from the Structural Soils Ltd Site Investigation (2014):

- The site can reasonably be considered a **LOW HAZARD POTENTIAL** for the purposes of general soil contamination;
- and
- The site can reasonably be considered a **LOW to MEDIUM HAZARD POTENTIAL** for the purposes of Ground Gas.

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 defines the so-called 'conceptual model' of the site. Examples of pathways and effects (after PPS 23) include:

8.1.1 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.

8.1.2 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.

8.1.3 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.

8.2 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
---------------------	---	---

Severity (S)

1. Negligible	<i>Human Health:</i> no chance of injury <i>Environment:</i> no chance of harm to the environment <i>Project:</i> no impact on construction works
2. Minor	<i>Human Health:</i> minor harm with short term effects <i>Environment:</i> nuisance and minor disturbance to flora and fauna <i>Project:</i> minor changes required to achieve construction objectives with low costs and/or delivery implications
3. Moderate	<i>Human Health:</i> major injury or disability or ill-health with long term effects <i>Environment:</i> potentially fatal to flora and fauna for days / weeks <i>Project:</i> major changes required to achieve construction objectives with significant costs and/or delivery implications
4. Severe	<i>Human Health:</i> permanent disability / death <i>Environment:</i> detrimental to local eco-systems for months / years <i>Project:</i> 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	<i>Risk is negligible – no action required</i>
1-2	LOW	<i>Risk is controlled as far as is reasonably practicable, no further control measures necessary</i>
3-4	MODERATE	<i>Risk should be evaluated and controlled as far as is reasonably practicable</i>
6-9	HIGH	<i>Hazard should be avoided – Ground remedial measures required</i>

8.3 Potential Sources

The site has had no previous industrial use and has been open fields since records began (1850). As such, other than legacy coal mining risk, there are only **low risk** potential contamination sources:

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

In addition, even though the site is non-residential, theoretically there could be a range of substances and pathogens that 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 consideration should also be given to:

- *Previous use of the site (low risk)*
- *Atmospheric deposition (low risk)*
- *Composts and fertilizers (medium to low)*

8.4 Summary of Hazards, Pathways & Receptors

Source	Potential Pollutant	Pathways	Receptor	Risk
Possible past minor spillages of materials. Possible contaminants from previous agriculture.	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.
			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.
		1	D. Controlled waters.	RR=1 Very Low Risk.
			E. Ecosystems	RR=1 Very Low Risk.
		1	F. Building Materials and Services.	RR=1 Very Low Risk provided no extraordinary construction materials /methods proposed.
Possible contaminants from previous structures	Asbestos	0	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, VOCs	7	A - F	RR=7 High Risk. underground coal workings likely – special measures may be required.
	Radon	1	A - F	RR=1 Very Low – radon not identified. No action is required.
Surface Workings	Past tipping, uncontrolled wastes, fill material anthropogenic debris, e.g. ash, clinker	3	D - E	RR=3 Medium Risk
Waste Materials	Past tipping, uncontrolled wastes	1	D - E	RR=1 Very Low Risk. No identifiable wastes observed and requiring to be removed from site

9.0 FURTHER WORK & RECOMMENDATIONS

9.1 Evaluation of Risks

Based on the above **Phase I Risk Assessment** the site is assessed to present the following risk levels:

- There is a **HIGH HAZARD POTENTIAL** with respect to **Underground Mining**.
- There is a **VERY LOW HAZARD POTENTIAL** with respect of **Radon**.
- There is a **MEDIUM HAZARD POTENTIAL** In terms of **Geology / Stability** for **Construction**.
- There is a **LOW HAZARD POTENTIAL** for **Contaminants** and **Ground Gases**.

There is a low residual possibility that there may be areas of 'infilled ground' and/or areas where 're-worked' soils are found which may contain a range of substances and pathogens that theoretically could 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. [**Note! - it should also always be acknowledged that the mere presence of a hazard at a site where agricultural / farming activity takes place does not mean that there will necessarily be attendant risks to construction workers or farm workers*].

9.2 Recommendations for Further Work

Intrusive Site Investigation

Based on best practice, taking account of the general non-residential nature of the proposed development there is still a requirement to undertake an intrusive *Phase II Site Investigation* with laboratory testing of sampled soils to fully mitigate the risks identified above. The primary concern relates to **Legacy Coal Mining** risk and shallow workings, therefore moderately deep boreholes will be required to prove the bedrock formation:

- **A minimum of 3No. Rotary Boreholes to 30m deep on the footprint of the Tank**

There will be a requirement to obtain a Coal Authority Permit to carry out the works, and this application will require a *Method Statement* and *Risk Assessment*, demonstrating the drilling will be carried out with water flush (only) and appropriate personnel gas monitoring for drilling.

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 boreholes = 3No. soil samples in total. 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**.

Soil 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.

Ground Gas Monitoring

Regarding **Ground Gas**, the site is considered a *LOW HAZARD POTENTIAL* site, and previous gas monitoring showed no residual hazard. There is no requirement to install *CS₂ Gas Membranes* as there is no immediate Radon risk, and the structure is non-residential. However, as the presence of coal is likely in the boreholes, and known shallow workings in the vicinity, there is a requirement to undertake a suitable **Phase of Ground Gas monitoring**. 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.

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 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 Engineering Geologist on site undertaking the watching brief.

9.3 Basis of Assessment

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.

- A separate **Coal Mining Risk Assessment (CMRA)** is recommended.
- Regarding *Land Contamination*, it is a **LOW HAZARD POTENTIAL** site - but regarding **Legacy Coal Mining Risk** the site is considered a **HIGH HAZARD POTENTIAL**. As such it is necessary to undertake a formalised **Phase 2 Site Investigation** in accordance with Industry requirements and the requirements of the Coal authority (CA).

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 MCIQB
 Chartered Consultant Engineering Geologist
 Earth-Tech Consulting Ltd
 25th March 2024

Appendix A Groundsure Enviro-Insight Report Ref: **GS-CLB-HTX-T9H-6CA**

Appendix B Coal Authority Consultants Report Ref: **GS-2S6-207-1V3-Z7L**

Appendix C Radon Report Ref: **GS-XKT-GOS-5BN-3P3**

Appendix D Historical Mapping Ref: **GS-XGB-VJY-T9L-X9B**

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