EARTH ENVIRONMENTAL
& GEOTECHNICAL

GeoEnvironmental Desk Study

Knowl Grove

Mirfield

November 2020

On behalf of

Kirklees Neighbourhood Housing Ltd

Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business & Arts Centre
Houldsworth Street
Stockport
SK5 6DA

Tel : 0161 975 6088

Email info@earthenvironmental.co.uk
www.earthenvironmental.co.uk

KNOWL GROVE

MIRFIELD

PHASE I GEOENVIRONMENTAL DESK STUDY

FOR

KIRKLEES NEIGHBOURHOOD HOUSING LTD

Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business & Arts Centre
Houldsworth Street
Stockport
SK5 6DA

www.earthenvironmental.co.uk

Tel: 0161 975 6088

Report No. A3800/20 **NOVEMBER 2020**

Report Title:	**Knowl Grove, Mirfield** **Phase I GeoEnvironmental Desk Study**
Report Reference:	**A3800/20**
Client:	**Kirklees Neighbourhood Housing Ltd**
Issue Date:	**28th November 2020**
Drafted By:	**A Ellams**
Reviewed By:	**A Czarnecki**
Authorised By:	**A Czarnecki**

EARTH ENVIRONMENTAL & GEOTECHNICAL

CONTENTS

FIGURES

TABLES

APPENDICES

1.0 INTRODUCTION

Appointment

1.1 Earth Environmental & Geotechnical Ltd has been commissioned by BTP Architects on behalf of Kirklees Neighbourhood Housing Ltd (the Client) to undertake a Phase I GeoEnvironmental Desk Study for the proposed development on the land southeast of Knowl Grove, Mirfield.

1.2 It is understood that the Client wishes to construct three new residential properties with associated soft landscaping and driveways.

1.3 Existing vehicle access will be retained.

1.4 A proposed development plan for the site is shown in Figure 1 below.

Figure 1 Proposed Development Plan

Objective

1.5 The purpose of the Desk Study is to collate available geological and environmental data for the site (and its environment) and provide a preliminary geotechnical and geo-environmental appraisal, with a site-specific conceptual model. This enables a preliminary assessment of geo-environmental risks to be undertaken and, if necessary, provides information for the design of a Phase 2 Ground Investigation.

Scope

1.6 The Phase I Environmental Desk Study comprises of a site reconnaissance visit and a review of the following information sources, some of which was provided by the client.

- British Geological Survey online maps.
- Google Earth imagery.
- Environment Agency online mapping data.
- Historical Ordnance Survey maps.
- The site and surrounding areas environmental, geological and mining data presented in the site specific GroundSure Reports (Appendix 1).
- Coal Authority Interactive Viewer.
- Kirklees Council Planning Portal.

2.0 SITE LOCATION AND DESCRIPTION

2.1 The site is located in Mirfield, Kirklees, West Yorkshire approximately 0.25km from Mirfield Town Centre. The approximate National Grid Reference for the centre of the site is SE 20154 20197 (X: 420154, Y: 420197) with the closest postcode being WF14 9RF.

2.2 The site is a near rectangular shaped parcel of land with current access via Knowl Grove to the west. The maximum dimensions of the proposed site are 44m north to south and 51m west to east. The site occupies an area of approximately 0.14Ha.

2.3 The site is currently occupied by 22 storage compartments and soft cover landscaping with a bus shelter in the northern corner of the site.

2.4 The general surrounding area comprises predominantly of residential dwellings.

2.5 A location plan is shown below as Figure 2, together with a recent site photograph as Figure 3 (overleaf).

Figure 2 Site Location Plan

Figure 3 Site Photograph

Site Utility Services

2.6 Site service plans have not been obtained for the site on behalf of the client. The status of all services should be checked prior to any development (including site investigation) commencing.

3.0 ENVIRONMENTAL SETTING

3.1 The geology of the site is covered by British Geological Survey (BGS) online data and the site specific GroundSure Enviro+Geo Insight report (Appendix 1).

3.2 Environmental conditions are covered by Environment Agency (EA) and British Geological Survey (BGS) online data, and the site specific GroundSure Enviro+Geo Insight report (Appendix 1).

Geology

3.3 The BGS states that the site is not underlain by artificial deposits.

3.4 The site is not underlain by superficial deposits.

3.5 The solid geology beneath the site is shown to be the Pennine Lower Coal Measures Formation, comprising mudstone, siltstone, coal seams and sandstone.

3.6 There are 16 records of linear features within 500m of the site. There is a geological fault located on site, orientated NW-SE. The closest record off site refers to a fault located 139m southwest of the site.

3.7 There are no records of landslips within 500m of the site boundary.

3.8 There are 14 borehole records identified within 250m of the site. The closest record is located 39m northwest of the site (BGS Reference: SE22SW214), drilled in 1974 by a cable percussive rig is summarised below:

- Topsoil to 0.10m
- Firm grey/brown mottled Clay to 0.40m
- Grey/brown silty Clay with sandstone fragments (completely weathered sandstone) to 1.00m

3.9 The site is in an area where the hazard rating is very low with regard to shrink swell clays, landslides and collapsible deposits and negligible with regard to running sands, dissolution of soluble rocks and compressible deposits.

Ground Workings

3.10 There are 2 records of historical surface ground working features identified within 250m of the site. Both records refer to an unspecified heap located 179m southeast of the site, dated 1981-1988.

3.11 According to the BGS, there are no records of a British Pit within 500m of the site.

Mining and Other Underground Workings

3.12 The site is located within an identified coal mining area. Reference to the Coal Authority Interactive viewer shows the site is not located within a Development High Risk Area but is within an area of probable shallow coal mine workings.

3.13 There are no records for non-coal mining areas located within 1km of the site.

3.14 There are no areas of brine extraction, gypsum extraction, tin mining or clay mining within 1km of the site.

3.15 There are no records for non-coal cavities or natural cavities identified within 1km of the site.

3.16 There are 4 records for historical underground working features identified within 1km of the site. All of these records refer to a colliery located 600m north of the site, dated 1892-1948.

Radon Potential

3.17 The property is not located in a Radon Affected Area, as less than 1% of the properties are above the Action Level. Therefore, no radon protection measures are necessary.

Hydrogeology and Hydrology

3.18 The site is not underlain by superficial deposits.

3.19 The Pennine Lower Coal Measures Formation is classified by the Environment Agency (EA) as a Secondary A Aquifer with a fracture flow type and a high to low permeability. The BGS states the following:

> ***Secondary A Aquifer*** *'Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.'*

3.20 The groundwater vulnerability and soil leaching potential of the site has been classified as a low vulnerability. The BGS states:

> *'Low vulnerability- Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.'*

3.21 There are 16 ground water abstraction licence records within 2km of the site. The closest record refers to a historical ground water source at a well located 963m southwest of the site.

3.22 There are 3 surface water abstraction licence records within 2km of the site. The closest record refers to an active source in the River Calder – Holme Bank Mills, located 1.1kmm southeast of the site.

3.23 There are no potable water abstraction licence records within 2km of the site.

3.24 The site is not located within 500m of a Source Protection Zone or Source Protection Zone within a confined aquifer.

3.25 There are no water network entries within 250m of the site.

3.26 There are no surface water features identified within 250m of the site.

3.27 There is 1 record of a Water Framework Directive (WDF) surface water body located on site. The record refers to River WB catchment in Calder from River Colne to River Chald. The water body was a fail chemical rating and moderate ecological rating in 2016.

3.28 There is 1 record of a Water Framework Directive (WDF) groundwater body located on-site. The record refers to Aire and Calder Carb Limestone/Millstone Grit/ Coal measures which was a poor chemical rating in 2015.

Landfill & Waste Management Activity

3.29 There are 8 records of potentially infilled land from historical mapping records within 500m of the site. The closest record refers to Made Ground (Undivided) located 313m southwest of the site.

3.30 There are no records for current Environment Agency/Natural Resource Wales landfill records within 500m of the site.

3.31 There are no records of historic Environment Agency/Natural Resource Wales landfill sites within 500m of the site.

3.32 There are no records of BGS/DoE non-operational landfill sites within 500m of the study site.

3.33 There is no record of a historical waste site from the Local Authority and Historical Mapping Records within 500m of the site.

3.34 There are 19 records of a waste treatment, transfer or disposal site within 500m of the site. The closest record refers to a treating waste exemption site located 206m south of the site. The site is described as sorting and de-naturing of controlled drugs for disposal, non-agricultural waste only.

3.35 There are 2 records of current Environment Agency/Natural Resources Wales licensed waste sites within 500m of the site. Both records refer to a Fold Head Mills located 470m south of the site, license surrendered in 2000.

Industrial Land Use Information

3.36 There are 107 records of potentially contaminative historical land uses identified within 500m of the site, the closest record refers to railway sidings located 161m southwest of the site dated 1951. Other records in the vicinity refer to more railway sidings, railway buildings, unspecified heaps, unspecified malthouses, unspecified mills, malthouses, a fire engine station, refuse heaps, cuttings, hospitals, a railway station, unspecified quarries, police stations, etc.

3.37 There are 3 records of current potentially contaminative land uses identified within 250m of the site. The closest record refers to an electricity substation located 116m west of the site. Other records in the vicinity refer to another electricity substation and a consumer products business.

3.38 There are 22 records of historical tanks identified within 500m of the site. The closest record refers to two unspecified tanks located 5m northwest of the site, dated 1922 and 1933.

3.39 There are 28 records of historical energy features identified within 500m of the site. The closest records refer to three electricity substations, all located 115m west of the site, dated 1967-1973.

3.40 There is 1 record for current petrol or fuel sites within 500m of the site. The record refers to a garage located 286m south of the site with an obsolete status.

3.41 There are no records of historical petrol or fuel sites within 500m of the site.

3.42 There are 15 historical garage and motor vehicle repair site records identified within 500m of the site. The closest record refers to a garage located 273m southwest of the site, dated 1989.

3.43 There are no National Grid high voltage underground electricity transmission cables within 500m of the site.

3.44 There are no National Grid high-pressure gas transmission pipelines within 500m of the site.

3.45 There are 15 historical railway and tunnel features identified within 250m of the site. The closest record refers to railway sidings located 161m southwest of the site, dated 1951.

3.46 There is 1 historical railway line identified within 250m of the site. This record refers to a dismantled line located 147m south of the site.

3.47 There are no current active railway line records identified within 250m of the site.

3.48 There are no underground railway lines or tunnels identified within 250m of the site.

3.49 The site is not within 500m of the route of the High Speed 2 rail project.

3.50 The site is not within 500m of the route of the Crossrail 1 rail project.

Environmental Permits, Incidents and Registers

3.51 The Groundsure Report includes records of environmental permits, incidents and registers within 500m of the site, which are summarised in Table 1 overleaf.

Table 1: Environmental Permits, Incidents and Registers within 500m of the Site

Permit/Incident/Register	Number
Historical Licensed Industrial Activities (IPC)	0
Part A (1) and IPPC Authorised Activities	0
Pollutant Release to Surface Waters (Red List)	0
List 1 Dangerous Substances Inventory Sites	0
List 2 Dangerous Substances Inventory Sites	0
Part A (2) and Part B Activities and Enforcements	0
Category 3 or 4 Radioactive Substance Authorisations	0
Licensed Discharge Consents	1
Planning Hazardous Substance Consents and Enforcements	0
Dangerous or Hazardous (COMAH and NIHHS) Sites	0
Sites Determined as Contaminated Land under Part 2A EPA 1990	0
Regulated Explosive Sites	0
Pollutant Release to Public Sewer	0
Substantiated Pollution Incidents (Category 1 and 2)	1
Pollution Inventory Substances, Wastes and Radioactive Wastes	0

3.52 There is 1 record of Licensed Discharge Consents within 500m of the site. This record refers to sewage discharges – pumping station – water company located 371m southeast of the site.

3.53 There is 1 record of Substantiated Pollution Incidents (Category 1 and 2) within 500m of the site. This record refers to sewage materials (storm sewage) released 141m northeast of the site. The pollutant was a category 2 (significant) impact on land, category 3 (minor) impact on air and category 4 (no impact) on water.

Environmentally Sensitive Sites

3.54 There are 6 records of Ancient Woodland within 2km of the site. The closest record is Briery Bank located 1.3km south of the site.

3.55 There is 1 record of Local Nature Reserves (LNR) within 2km of the site. This record refers to Sunny Bank Ponds located 1386m north of the site.

3.56 There is 1 record of Nitrate Vulnerable Zones (NVZ) within 2km of the site. This record refers to the existing Spen Beck from Source to River Calder NVZ located on site.

3.57 There are 2 records of Greenbelt land within 2km of the site. The records refer to South and West Yorkshire Green Belt located 563m southwest of the site.

3.58 There are no other Environmentally Sensitive Sites within 2km of the site.

Ecology

3.59 An ecological assessment of the site falls outside the brief of this report. Where considered necessary, advice should be sought from an ecological specialist in this respect.

3.60 However, the site is classified as urban land.

Archaeology

3.61 An archaeological assessment falls outside the brief of this report. Where considered necessary, advice should be sought from an archaeological specialist in this respect.

3.62 However, there are no records of World Heritage Sites, Listed Buildings and Scheduled Ancient Monuments with 250m of the site.

Potential Flood Risks

3.63 Detailed assessment of flood risks is outside the scope of this report. However, the site does not lie within 50m of an Environment Agency Zone 2 or Zone 3 floodplain.

3.64 There is no risk of flooding from rivers and sea (RoFRaS) within 50m of the site.

3.65 There are no records of flood defences located within 250m of the site.

3.66 There are no records of areas benefitting from flood defences within 250m of the site.

3.67 There are no records of areas used for flood storage within 250m of the site.

3.68 The highest risk of surface water flooding occurring on-site is 1 in 30 year, 0.1m – 0.3m.

3.69 The highest risk of groundwater flooding occurring on-site is negligible.

Previous Site Investigations

3.70 Earth Environmental & Geotechnical Ltd are not aware of any previous site investigations carried out for the site.

4.0 SITE HISTORY

4.1 The historical development of the site has been determined by reference historical plans and Google Earth imagery. The reviewed historical plans comprise only readily available records and may be limited; however, the information available to date indicates that additional searches are unlikely to add to our understanding of the site. The earliest available historical mapping covering the site dates back to 1855.

4.2 The site history is summarised in Table 2, below, followed by selected extracts from maps and aerial photographs.

Table 2: Summary of Site History

Date	On-Site History	Surrounding Land Use History
1855 1:10,560	The site is occupied by and Old Tanhouse in the northern part of the site. The southern part of the site is agricultural field.	The rest of the Old Tanhouse is located adjacent to the north of the site. Knowl Lane is located adjacent to northeast boundary. Agricultural fields surround the site to the south, west and north. A circular structure is located 100m north of the site which could be a gasometer, bandstand or well. Knowl House is located 100m north of the site. Little Moor and Snake Hill are located 300m southwest of the site. Knowl is located 300m northwest of the site. A river (later the River Calder) is located 400m southwest of the site. Lancashire and Yorkshire railway line (later Manchester and Normanton Line) is located 550m southwest of the site.
1892 1:10,560 1892-1893 1:2,500 1890 1:500	The Old Tanhouse is located in the northwestern part of the site and Broad Royd Cottage occupies the northern corner.	A nursery is located adjacent to the southern boundaries of the site. An Aviary is located 20m west of the site. Residential properties are located 50m south of the site. A small pond is located 90m southwest of the site. Knowl Grove is located 90m northwest of the site. Residential properties are located 100m north of the site. Westfields is located 200m northeast of the site. A malthouse is located 260m southwest of the site. A malthouse is located 270m southeast of the site. Mills are located 500m south of the site.

Date	On-Site History	Surrounding Land Use History
1904-1905 1:10,560 1907 1:2,500	No significant change.	The nursery is no longer present. Heaton Lodge and Wortley Railway line and associated viaduct and embankments are located 150m south of the site. Railway sidings and goods shed are located 200m west of the site. A station is located 450m west of the site. A memorial hospital and associated mortuary are located 450m east of the site. Woodend Malt Kiln is located 500m southwest of the site. Mills are located 500m west of the site. An engine shed is located 550m southwest of the site.
1930-1931, 1938 1:10,560 1922, 1933 1:2,500	No significant change.	Allotment gardens are located 150m east of the site. A drill hall is located 200m west of the site. There is more residential development to the northwest of the site.
1948, 1951-1956, 1965-1967 1:10,560 1967 1:2,500 1957, 1958-1963, 1965-1968 1:1,250	The Old Tanhouse is no longer present. By 1967 all buildings on site have been demolished and replaced by 23 storage compartments.	By 1967 Knowl Grove and residential properties are located adjacent to the northern boundaries of the site. Knowl Grove is now occupied by Ministry of Labour & National Insurance Offices Knowl Park is located 20m east of the site. Knowl Grange (Home for the Aged) is located 80m northwest of the site. An electricity substation is located 100m west of the site. Allotment gardens have been replaced by Knowl Park House (Home for the Aged). An industrial training centre is located 120m west of the site. By 1967 the railway south of the site has been dismantled.
1974-1975 1:10,000 1972-1973 1:1,250	No significant change.	A surgery is located 100m southeast of the site.
1981-1985, 1988-1993 1:10,000 1989-1993 1:1,250	No significant change.	A joinery is located 200m south of the site.
2001 1:10,000	No significant change.	Residential properties now located adjacent to the southern boundary of the site.

Date	On-Site History	Surrounding Land Use History
2003 1:1,250		
2011 Aerial Photograph	A bus shelter is located in the northeast corner of the site.	No significant change.

Figure 4 OS Map Extract 1890

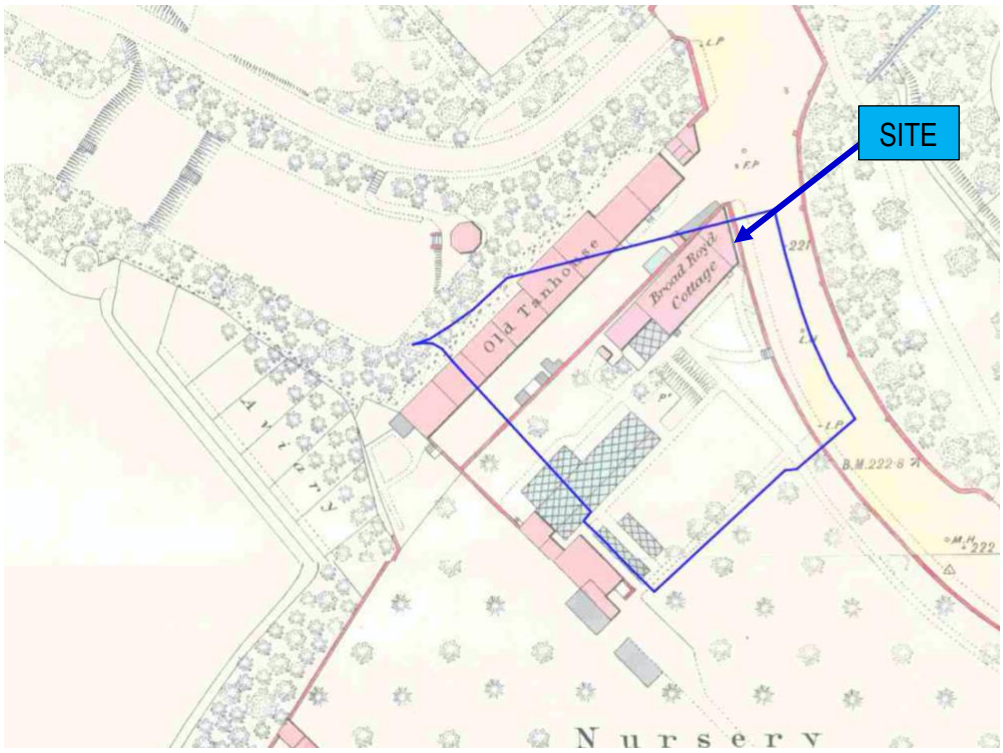


Figure 5 OS Map Extract 1907

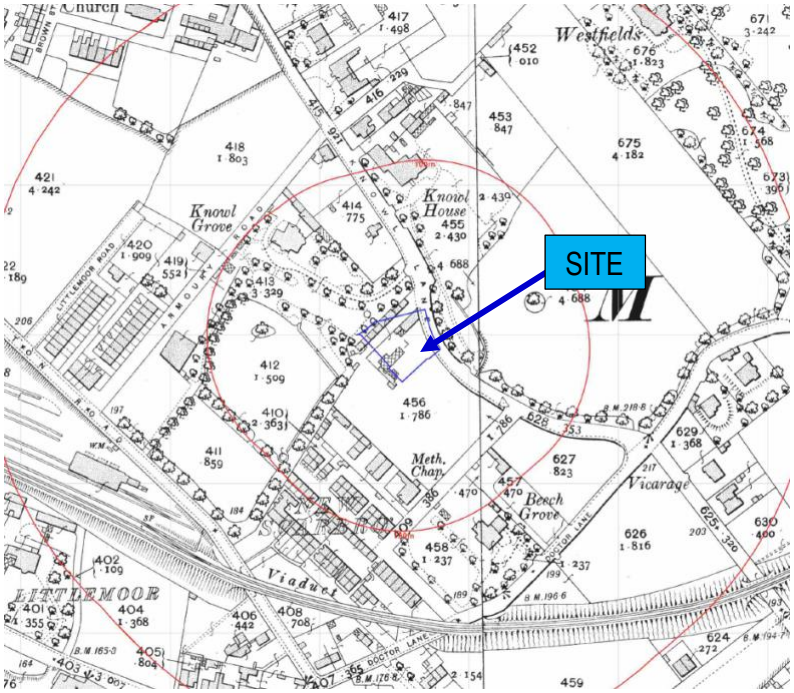


Figure 6 OS Map Extract 1965-1968

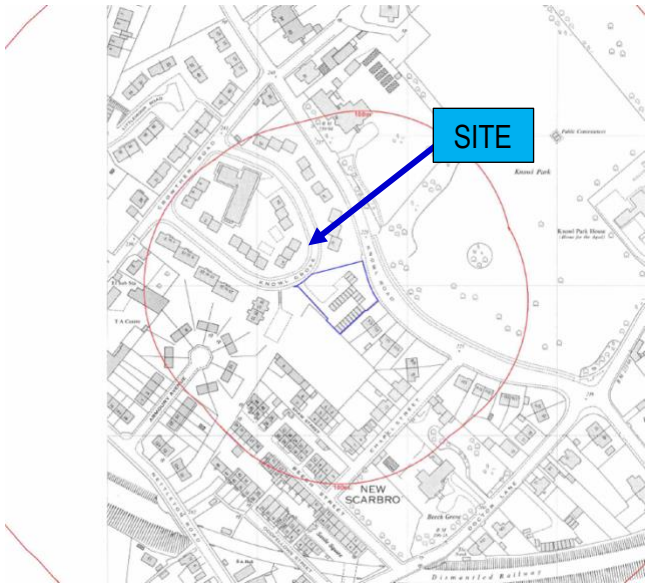


Figure 7 Aerial Photograph 2011

5.0 WALKOVER SURVEY

5.1 A walkover survey was completed on 23rd November 2020. The photographs and notes from this survey are appended to this report as Appendix 2 and Appendix 3 respectively.

5.2 The site is accessed via Knowl Grove to the west of the site.

5.3 The site currently comprises 23 storage compartments with hardstanding access and areas of soft landscaping. A bus shelter is located in the north corner of the site.

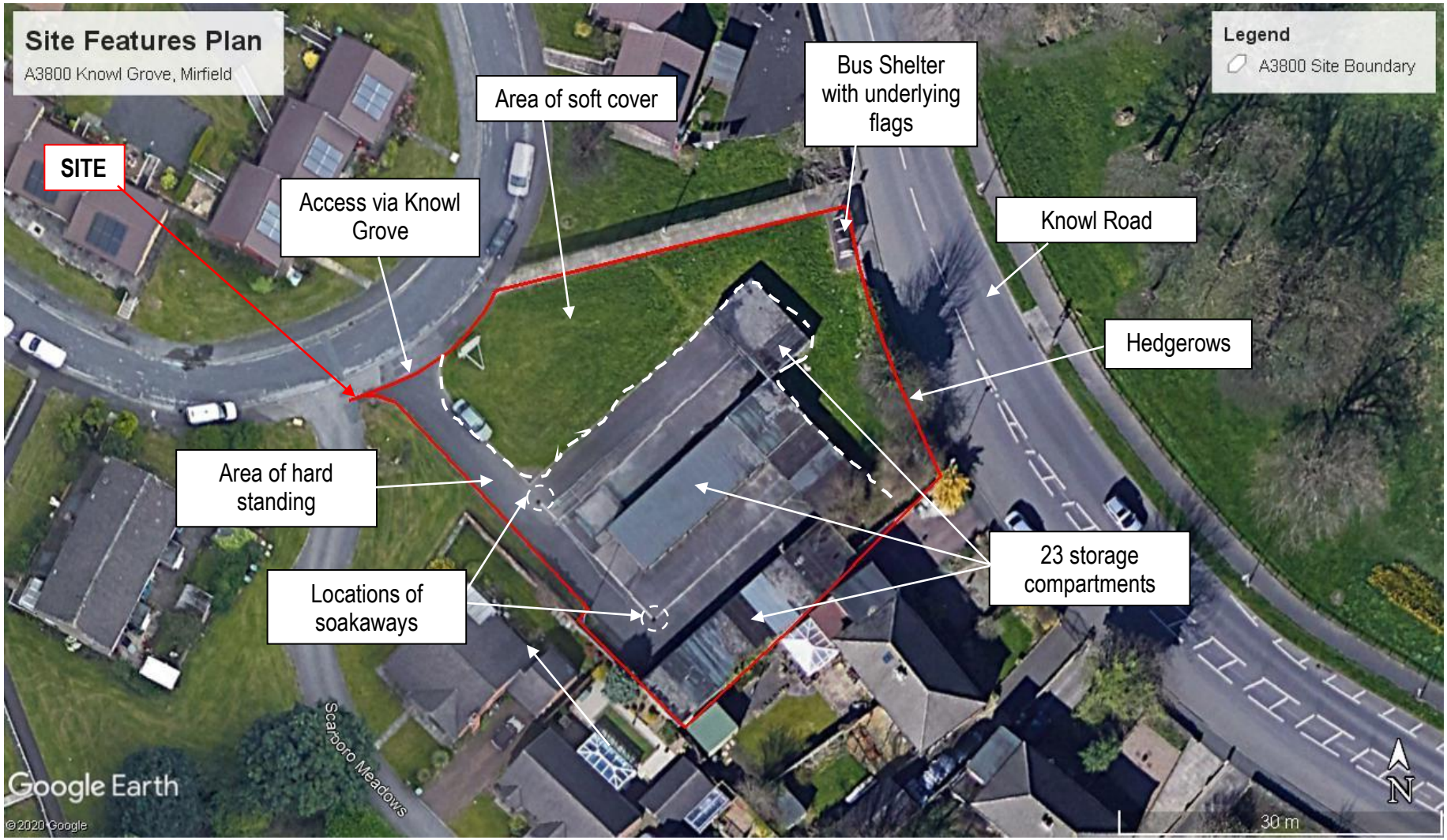
5.4 There is a change in topography across the site. The site slopes down towards the south from the adjacent Knowl Drive to the north.

5.5 The site is demarcated by the storage compartments along the southeast boundary and a metal fence along the southwest boundary. The northern part of the site is open but marked by a foot path and hedgerows.

5.6 To the northeast of the site is Knowl Road and residential properties surround the rest of the site.

5.7 A site features plan is presented as Figure 8 overleaf.

Figure 8 Site Features Plan



6.0 PRELIMINARY CONTAMINATION RISK ASSESSMENT

Introduction

6.1 The following paragraphs outline a Preliminary Risk Assessment (PRA) for the site based on the above desk study information as defined by DEFRA and the EA Model Procedures for the Management of Land Contamination, CLR11(2004).

6.2 Table 5 provides a Preliminary Conceptual Model (PCM) which considers the source-pathway-receptor linkages present alongside the likelihood, severity and risk level as defined within Table 3 and Table 4 below. The assessment of probability, a modified risk table, and certain consequence definitions are based on CIRIA C552 and CLR11.

6.3 Table 5 considers whether a pollution linkage is potentially present and provides a preliminary qualitative assessment of risk based on the information currently available. Where a possible linkage is identified, it does not necessarily mean that a significant risk exists, but indicates that further information is required through appropriate site investigation to substantiate the conceptual model.

6.4 The PCM/PRA is based on a proposed residential end use.

Table 3: Consequence, Probability and Risk

Probability	Consequence,	Risk
High Likelihood- There is a pollution linkage and an event either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution	Very High – acute risk to the human health likely to result in significant harm. Risk of severe or irreversible effect on ground/surface water quality. Catastrophic damage to buildings / property.	Very High – there is a high potential that the source-pathway-receptor scenarios may give rise to harm to human health or the environment and remedial action is likely to be required.
Likely – there is a pollution linkage and all the elements are present, which means that it is probable an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.	High – Severe or irreversible effect on human health. Temporary severe or irreversible effect on ground/surface water quality. Reduction of water quality rendering groundwater or surface water unfit to drink and/or substantial adverse impact on groundwater dependant environmental receptors.	High – it is likely that the source-pathway-receptor scenarios may give rise to an impact on human health or the environment, which may require remediation and/or control measures to mitigate risks
Low likelihood– there is a pollutant linkage and circumstances are possible for an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term	Moderate – Long term or short term moderate effect on human health. Moderate effect on ground/surface water quality, reversible with time. Reduced reliability of a supply at a groundwater or surface water abstraction source	Moderate – it is possible that the source-pathway-receptor scenarios may give rise to an impact on human health or the environment, however it is either relatively unlikely that such are would be severe, or if any harm were to occur it is more likely that harm would be mild.
Unlikely – there is a pollution linkage but circumstances are such that it is doubtful that an event would occur even in the very long term.	Low – Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.) Slight effect on ground/surface water quality, reversible with time. Marginal reduced reliability of a supply at a groundwater or surface water abstraction source.	Low – it is possible that harm could arise at the source, however it is likely that this would at worst be mild.
		Very Low – it is unlikely that the source-pathway-receptor scenarios will give rise to an impact on human health or the environment.

Table 4: Estimation of Level of Risk by Comparison of Consequence and Probability

		Consequence			
		High	**Moderate**	**Low**	**Very low**
Probability	**High Likelihood**	Very High	High risk	Moderate risk	Moderate to low risk
	Likely	High risk	Moderate risk	Moderate to low risk	Low risk
	Low Likelihood	Moderate risk	Moderate to low risk	Low risk	Very low risk
	Unlikely	Moderate to low risk	Low risk	Very low risk	Very low risk

Potential Sources

6.5 Historically the site comprised part of an Old Tanhouse and Broad Royd Cottage until the 1950s when the Old Tanhouse was demolished. The cottage remained on site until 1960s when all buildings were demolished and replaced by 23 storage compartment s. There were no changes on site until 2011 when a bus shelter was constructed in the northeast corner of the site.

6.6 Potential off-site sources of contamination include the railway line and associated buildings and embankments, the historical nursery adjacent to the site, construction of nearby residential properties and a Substantiated Pollution Incident that occurred 141m to the southwest which involved the release sewage materials with a category 2 (significant) impact on land.

6.7 There is potential for the presence of contamination associated with the following:

- Areas of Made Ground from various phases of on-site development
- Asbestos containing materials (ACM) from former and present structures
- Leaks and spillages from historical Tanhouse and nursery

Potential Receptors

6.8 The following receptors have been considered for the construction and operational stages of the proposed redevelopment.

- Current site users;
- Adjacent land users;
- Future land users;
- Construction workers during site development works;
- Surface water and Groundwater within the underlying aquifer

Potential Pathways

6.9 The following pathways have been considered for the construction and operational stages of the proposed redevelopment.

- Dermal contact, ingestion, inhalation pathways of potentially contaminated soils;
- Downward vertical migration of leachate to surface waters and shallow groundwater;
- Vertical or lateral migration of ground gas.

Table 5: Preliminary Conceptual Model

Source	Pathway	Receptor	Probability	Consequence	Risk	Comment
Potential soil contamination E.g. Heavy Metals, PAH, TPH, BTEX and ground gases.	Dermal contact, ingestion and inhalation of soils dust	Current Site Users	Unlikely	Moderate	Low	The site is currently storage compartments and only visited occasionally by public. The risk is therefore considered to be **LOW**.
		Adjacent land users	Unlikely	Moderate	Low	Residential properties predominantly surround the site. Usual dust control measures should be implemented as part of good site working practices during construction to reduce dust generation. Therefore, the risk is considered **LOW.**
		Future land users	Low Likelihood	Moderate	Moderate to Low	The proposed development consists of new residential dwellings. The risk to future site users via direct exposure is considered to be **MODERATE to LOW.** This assessment is based on the potential for contamination to be present beneath the site.
		Construction Workers	Low Likelihood	Moderate	Moderate to Low	Construction workers may be exposed to potentially contaminated soils during construction works, however exposure duration will be short-term only. The risk to construction workers is considered **MODERATE** to **LOW.** Appropriate health and safety measures (in line with CDM and other relevant health and safety guidance) will reduce the risk to **LOW.**
	Downward vertical migration of leachate to shallow groundwater	Groundwater within the Underlying Aquifer	Low Likelihood	Moderate	Moderate to Low	There are no underlying superficial soils. There are 16 abstraction licences within 2km. The risk to groundwater is therefore considered **MODERATE** to **LOW.**
	Lateral migration in surface waters	Surface water	Unlikely	Moderate	Low	There are no surface water features within 250m of the site. Therefore, the perceived risk to surface waters is considered to be **LOW.**
	Vertical or lateral migration of ground gas	Current Site Users	Unlikely	Moderate	Low	The site is currently storage compartments and only visited occasionally by public. Areas of Made Ground associated with former structures are anticipated. The site is not located in radon affected area. The risk to current site users from ground gas is therefore considered **LOW.**
		Adjacent land users	Unlikely	Moderate	Low	Residential properties predominantly surround the site. Areas of Made Ground associated with former structures are anticipated. There is no potential for radon gas. The risk to adjacent site users from ground gas is therefore considered **LOW.**
		Future land users	Unlikely	Moderate	Low	The proposed development consists of new residential dwellings. There is no potential for radon gas and therefore the risk is considered **LOW**.

Source	Pathway	Receptor	Probability	Consequence	Risk	Comment
		Construction Workers	Low Likelihood	Moderate	Moderate to Low	Construction workers may be exposed to ground gas/depleted oxygen conditions in confined spaces and excavations, however, the duration will be short term. The risk to construction workers from ground gas is considered **MODERATE** to **LOW**
Asbestos Containing Material (ACM)		Current Site Users	Unlikely	Moderate	Low	The site is currently storage compartments and only visited occasionally by public. Asbestos may be present in small areas of the site associated with former and present structures, albeit unlikely. Asbestos is only harmful when disturbed. The risk to current site users is considered to be **LOW.**
		Adjacent land users	Unlikely	Moderate	Low	Residential properties predominantly surround the site. Asbestos may be present in small areas of the site associated with former and present structures, albeit unlikely. Disturbance of soil during the construction phase may allow fibres to become airborne. Dust control measures (dampening down) should be implemented as part of good site working practices. Therefore, the risk is considered **LOW**.
		Future land users	Low Likelihood	Moderate	Moderate to Low	The proposed development consists of new residential dwellings. The risk is therefore considered **MODERATE** to **LOW.** A contamination assessment of the existing on-site soils would be required to determine the level of risk and necessary mitigation measures.
		Construction Workers	Low Likelihood	Moderate	Moderate to Low risk	Construction workers may be exposed to potential asbestos in Made Ground soils associated with former and present structures. However, this potential area is small. The risk is considered **MODERATE** to **LOW.** A contamination assessment of the existing on-site soils would be required to determine the level of risk and necessary mitigation measures.

7.0 CONCLUSIONS & RECOMMENDATIONS

Conclusions

7.1 The site was historically part of an Old Tanhouse with Broad Royd Cottage located in the northeast corner of the site until the 1950s when the old Tanhouse was demolished. The cottage remained on site until 1960s when all buildings were demolished and replaced by 23 storage compartments . There were no changes on site until 2011 when a bus shelter was constructed in the northeast corner of the site.

7.2 Potential on-site sources of contamination were identified to be Made Ground and asbestos associated with former and present structures, as well as acids and solvents from the former tan house.

7.3 The proposed development of the site includes construction of residential properties with associated areas of soft landscaping and car parking.

7.4 The site is not underlain by superficial deposits and the solid geology of the Pennine Lower Coal Measures Formation (Secondary A Aquifer) underlies the site.

7.5 The property is not located in a Radon Affected Area, as less than 1% of the properties are above the Action Level.

7.6 Given the potential contaminative land uses, the overall risk from soil contamination to end users and construction workers is concluded to be **MODERATE** to **LOW**.

7.7 The risk to controlled waters is concluded to be **MODERATE** to **LOW** based on the absence of underlying granular superficial soil.

7.8 The risk from ground gas to end users and construction workers is considered to be **MODERATE** to **LOW** given the anticipated extent of Made Ground.

7.9 The site is not located within a Zone 2 or Zone 3 floodplain. The risk of groundwater flooding is **NEGLIGIBLE**.

7.10 The site lies within an area of probable shallow unrecorded mineworkings but not within a Coal Authority Development High Risk Area.

Recommendations

7.11 An intrusive investigation should be undertaken to establish geotechnical parameters for the design of foundations, floor slabs and pavement construction for the proposed new structures and surrounding area.

7.12 As part of the geotechnical investigation, it is recommended that samples of soil are recovered for contamination testing and to confirm whether there are any potential risks.

APPENDIX 1

GROUNDSURE REPORTS

APPENDIX 2

SITE PHOTOGRAPHS

Earth Environmental & Geotechnical Ltd

Tel: 0161 975 6088
Email: info@earthenvironmental.co.uk
Web: www.earthenvironmental.co.uk

SITE PHOTOGRAPHS

EARTH ENVIRONMENTAL & GEOTECHNICAL

Job No.: A3800/20

Site: Knowl Grove, Mirfield

Plate 1 Viewing southeast showing the site entrance from Knowl Grove. Note the metal fence along the southwest boundary.

Date: 23rd November 2020

Plate 2 Viewing southeast showing the location of the 2 soakaways and site drainage.

Date: 23rd November 2020

Plate 3 Viewing northeast showing the eastern part of the site and the storage compartment fronts.

Date: 23rd November 2020

Plate 4 Viewing east showing the northern part of the site and the north boundary. Note the location of the bus shelter.

Date: 23rd November 2020

Earth Environmental & Geotechnical Ltd

Tel: 0161 975 6088
Email: info@earthenvironmental.co.uk
Web: www.earthenvironmental.co.uk

SITE PHOTOGRAPHS

EARTH ENVIRONMENTAL & GEOTECHNICAL

Job No.: A3800/20

Site: Knowl Grove, Mirfield

Plate 5 Viewing east showing northeast part of the site behind the northern storage compartments.

Date: 23rd November 2020

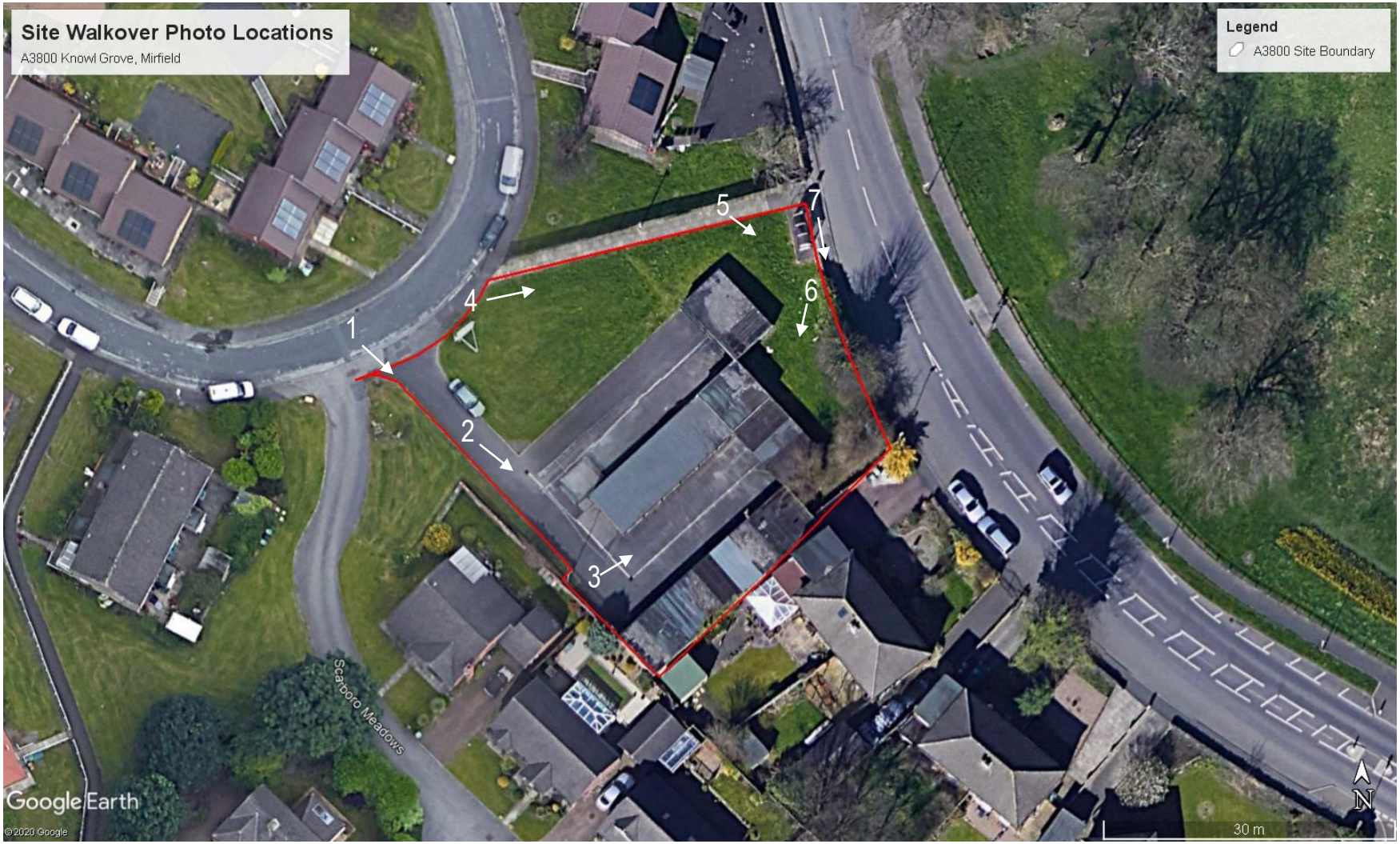
Plate 6 Viewing south showing behind the rest of the storage compartments in the softcover area to the northeast of the site.

Date: 23rd November 2020

Plate 7 Viewing southeast showing the eastern boundary of the site along Knowl Road.

Date: 23rd November 2020

Figure 9 Site Walkover Photo Locations



APPENDIX 3

SITE WALKOVER NOTES

EARTH ENVIRONMENTAL & GEOTECHNICAL

WALK OVER SURVEY REPORT

Site: Knowl Grove, Mirfield **Date:** 23/11/20

Job No: A3800/20 **Undertaken By:** Amy Ellams

Purpose of Site Walkover:
1) Provide further information for the Desk Study Report;
2) Identify potential contamination sources, pathways and receptors;
3) Identify geotechnical features and potential geohazards;
4) Determine locations for exploratory boreholes.

Desk Study features checked during site visit	**Feature and Information required**	**Present**	**Description / Comments**
Site Setting	Description required for: Town/Country/Suburb Setting Industrial/Residential/Retail Usage Current Site use (if undertaking security and access to the site)		Town setting Storage garages and areas of softcover with a bus shelter in the north corner.
Evidence of Past Activities	Are there: Any relevant street names in area? Features or relics which indicate past history?	Yes/~~No~~ ~~Yes~~/No	The site is located to the southeast of Knowl Road N/A
Geographic Setting	Description required for: Low lying flood plain/dry valley/rolling hills etc.		Low lying.
Ground Conditions	Is there any evidence of: Mining, Mine entries Subsidence Landslip/slope erosion Former investigation works	 ~~Yes~~/No ~~Yes~~/No ~~Yes~~/No ~~Yes~~/No	 N/A

Desk Study features checked during site visit	**Feature and Information required**	**Present**	**Description / Comments**
Topography	Description required for: Are there apparent differences between site and surrounding area? (If yes describe the presence of retaining walls, and slopes). Is there evidence of Made Ground / Fill on site?	Yes/~~No~~ ~~Yes~~/No	There is a change in topography across the site. Along the northern boundary stays the same but the site slopes down to the storage compartments towards the southeast corner. The land to the south of the site is topographically lower than the site.
Site Boundaries and Neighbours	Description required for: Type of boundary demarcation (if any) on each side of site, usage of adjacent land and name of industrial/commercial occupiers. Note any adjacent features such as water course and other potentially environmentally sensitive uses (residential, school, infirmary, SSSI etc)		The site is demarcated by the storage compartments along most of the southeast boundary and a metal fence along the southwest boundary. The northwest boundary is demarcated by a foot path and the northeast boundary by hedgerows. Residential properties predominantly surround the site.
Vegetation	Are there any vegetation/trees on or close to site (if yes describe locations, type, maturity, etc) Is there any evidence of poor health / distress?	Yes/~~No~~ ~~Yes~~/No	Hedgerows are located along the northeast boundary of the site and some of the site is grass soft cover. N/A
Ground Surface	Are there areas of hardstanding and estimate the split between hard and soft cover? (If yes describe locations, types and conditions). Is the any evidence of any spillages or staining?	Yes/~~No~~ ~~Yes~~/No	60% hardstanding located in the southern part if the site and 40% softcover located in northern part of site. Flags located around the bus shelter. None visible on the site walkover.

Desk Study features checked during site visit	Feature and Information required	Present	Description / Comments
Site Drainage	Are there any drain covers / soakaways (if yes describe locations) Are there any outfalls/water courses on site (note the condition of water courses in open water courses. discolouration, odour, eutrophication, oily sheen, gas bubbling water, clear or cloudy) Where a watercourse runs alongside or crosses a site are there any differences in visible water quality upstream and downstream of the site?	Yes~~/No~~ ~~Yes~~/No ~~Yes~~/No	2 soakaways are located close to the end of a storage compartment block towards the south of the site. N/A
Electrical Equipment	Are there any electricity sub stations on or adjacent to the site? Are there any electrical transformers, capacitors, pylons etc on site?	~~Yes/~~No	N/A
Buildings	Is there any evidence of asbestos construction materials e.g. roofing, insulation materials. Do any buildings have basements? Do any buildings have a boiler room (if yes, describe fuel type and storage arrangements)?	~~Yes/~~No ~~Yes~~/No ~~Yes~~/No	None visible on the site walkover. None visible on the site walkover. None visible on the site walkover.

Desk Study features checked during site visit	Feature and Information required	Present	Description / Comments
Landfilling	Is there any evidence of gas protection measures (gas membrane, gravel-filled trenches, venting pipes, etc)?	~~Yes~~/No	But small vents along back of storage compartments.
Process Air Emissions	Point Source: Are there any stacks / vents / cooling towers / abatement equipment?	~~Yes~~/No	N/A
	Fugitive Source: is there any stockpiled material / windblown dust / vapour process?	~~Yes~~/No	N/A
Storage of fuels & Chemicals	Are there any drums / containers (if yes, describe quantity, full /empty, stored on hard standing / soft landscaping, bunding)?	~~Yes~~/No	N/A
	Are there any above ground fuel tanks (if yes, describe locations, volumes, how many, bunding, used / disused, condition?)	~~Yes~~/No	N/A
	Is there any evidence of underground fuel tanks (fuel pumps, covers, vent pipes, how many and how large, fill point, used / disused, and condition)?	~~Yes~~/No	N/A
Accidents	In the event of a large spillage would runoff affect any vulnerable watercourse/culverts?	~~Yes~~/No	N/A
	Are emergency procedures / equipment in place?	~~Yes~~/No	

Desk Study features checked during site visit	Feature and Information required	Present	Description / Comments
Waste	Are there any waste skips present on site?	~~Yes~~/No	N/A
	Are waste storage facilities adequate?	~~Yes~~/No	N/A
	Is there any litter/fly tipped material?	Yes~~/No~~	Minimal windblown litter
Atmospheric	Are there any fumes, odours originating from site or affecting site from neighbouring sites?	~~Yes~~/No	
Access / Further Investigations	If a Phase 2 Investigation is likely to be required, describe any access problems including headroom where relevant, services, overhead cables, restricted access areas, confined spaces, trafficked areas, etc that are likely to affect investigation scope/techniques.		The site is openly accessible from Knowl Grove. No access into storage compartments as all are individually locked.
	Identify possible site office and storage locations.		On hardstanding present on site.
	Identify possible water supply		-
Site Environs	Are there any local features that could have a harmful influence e.g. landfill, industrial processes, railway land?	~~Yes~~/No	N/A
	Are there any sensitive water features/courses near to the site?	~~Yes~~/No	N/A
Local Knowledge / Anecdotal Evidence			N/A
Site Dimensions	Describe shape of Site in plan and measure dimensions.		The maximum dimensions of the proposed site are 44m north to south and 51m west to east. The site occupies an area of approximately 0.14Ha.

APPENDIX 4

REPORT LIMITATIONS

LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget and staff resources allocated to the project.

Other than that expressly contained in the above paragraph, Earth Environmental & Geotechnical Ltd provides no other representation or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Earth Environmental & Geotechnical Ltd.

If a third party relies on this report, it does so wholly at its own and sole risk and Earth Environmental & Geotechnical Ltd disclaims any liability to such parties.

It is Earth Environmental & Geotechnical Ltd understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was an important factor in determining the scope and level of the services. Should the purpose for which the report is used, or the proposed use of the site change, this report will no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without Earth Environmental & Geotechnical Ltd review and advice shall be at the client's sole and own risk.

The report was written in 2020 and should be read in light of any subsequent changes in legislation, statutory requirements and industry best practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

The observations and conclusions described in this report are based solely upon the services that were provided pursuant to the agreement between the client and Earth Environmental & Geotechnical Ltd. Earth Environmental & Geotechnical Ltd has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report.

Earth Environmental & Geotechnical Ltd is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, Earth Environmental & Geotechnical Ltd did not seek to evaluate the presence on or off the site of electromagnetic fields, lead paint, radon gas or other radioactive materials.

The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified.

No responsibility can be accepted for errors within third party items presented in this report. Further Earth Environmental & Geotechnical Ltd was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Earth Environmental & Geotechnical Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to Earth Environmental & Geotechnical Ltd and including the doing of any independent investigation of the information provided to Earth Environmental & Geotechnical Ltd save as otherwise provided in the terms of the contract between the client and Earth Environmental & Geotechnical Ltd.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.