

DEWSBURY MARKET AND ARCADE
DEWSBURY OPEN MARKET, CLOTH HALL STREET
DEWSBURY, WF13 1QE



PHASE 1 PRELIMINARY GEO-ENVIRONMENTAL RISK ASSESSMENT

Prepared by

SILKSTONE ENVIRONMENTAL LTD

For

BDP

On behalf of

KIRKLEES COUNCIL

Report Ref: 21157/P1/0

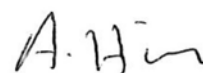
Dated: September 2021

DOCUMENT ISSUE RECORD

| | |
|-----------------------|---|
| Project No. | 21157 |
| Client | Kirklees Council |
| Project | Dewsbury Market and Arcade, Dewsbury Open Market, Cloth Hall Street, Dewsbury, WF13 1QE |
| Document Title | Phase 1 Preliminary Geo-Environmental Risk Assessment |

Prepared by:

Andrew Hives BSc (Hons) MSc FGS
Engineering Geologist
Silkstone Environmental Ltd.



Prepared by:

Alan Ashburn BSc (Hons) MSc CGeol
Senior Geologist
Silkstone Environmental Ltd.



Reviewed By:

Nick Pickard BSc CEnv MRICS
Chartered Environmental Surveyor
Silkstone Environmental Ltd.



Certified by:

Mark Barrett BSc (Hons) MSc CEng MIMM MIQ
Managing Director
Silkstone Environmental Ltd.



REVISION RECORD

| Revision | Date | Description | Prepared by |
|----------|------------|---|-------------|
| 0 | 30/09/2021 | Phase 1 Preliminary Geo-Environmental Risk Assessment | AH |
| | | | |
| | | | |

EXECUTIVE SUMMARY

| | |
|-----------------------------|--|
| Site Location | Dewsbury Market and Arcade are located off the junction of Cloth Hall Street, Foundry Street and Corporation Street on the edge of Dewsbury town centre on National Grid Reference 424654, 421899. |
| Proposed Development | Refurbishment of the existing covered market buildings, the demolition of the existing façade and the construction of a single story mezzanine in the market and creation of new stairs, a lift, wall opening and repair work in the arcade. |
| Existing Features | The market area includes a large indoor market building, outdoor market, several brick built buildings and numerous small wooden stalls. The arcade area comprises a block paved pedestrian access with shops on either side, and a glass roof covering. |
| History | The site has a history of industrial and commercial development going back to before 1855 and has included a reed works and woollen mills, saw mill, smithies, warehouses and garage. The market was first developed in the south eastern part of the site by 1907 when the glass canopy to the arcade was also first shown at the southern end of the site, but not identified as the arcade until 1922. By 1965 the whole northern area of the site was identified as a market and included a car park. |
| Anticipated Geology | Made Ground (manmade fill) recorded to depths of between 2.13 and 3.30m begll from pre-existing boreholes on site and comprising ash, clinker, brick and masonry rubble with fragments of sandstone and timber. Alluvial clay, silt, sand and gravel. Pennine Lower Coal Measures Formation incorporating the Emley Rock (sandstone) and interbedded mudstone, siltstone, sandstone and occasional seams of coal. |
| Coal Mining | The site is considered at risk from potential unrecorded shallow mine workings in the 2 nd Brown Metal seam. Phase 2 drilling recommended to prove presence/absence of workings. |
| Hydrogeology | Both the superficial and bedrock geology is designated a Secondary A Aquifer and groundwater has a medium to high vulnerability to potential contamination and is overlain by soils of mostly high leaching class. |
| Hydrology | The nearest watercourse to the site is the Dewsbury Beck which is culverted beneath the site. |
| Flood Risk | Part of the site extending mostly along the line of Dewsbury Beck within the north eastern part of the site is located within a Flood Zone 3 (high probability of flooding) and therefore a flood risk assessment will be required for the site. |
| Radon | The site is located in a Radon Affected Area necessitating the provision of basic radon protection measures for new buildings. |
| Unexploded Ordnance | The <i>Detailed UXO Threat and Risk Assessment</i> report has determined the site to have a 'High' UXO rating requiring risk mitigation measures during intrusive works. |
| Risk Overview | In the context of the proposed development the assessment has derived the overall level of environmental risk to human health and the wider environment from on and off-site sources to be Low to High . The main risks relate to the following: <ul style="list-style-type: none"> To construction workers from potential contaminants within the underlying Made Ground, ground gas when entering deep excavations (principally methane and carbon dioxide) and disturbance of potential unexploded ordnance (UXO). To site end users (site workers and visiting public) from potential contaminants within the Made Ground (soft landscaped areas only) and ground gas (within permanent buildings only) from Made Ground on site and surrounding areas of infilled ground, worked ground, an historic landfill within 250m and unrecorded shallow coal mine workings. To the proposed development (buildings) from ground instability / differential settlement from unrecorded shallow coal mine workings, unrecorded mine entries and compressible deposits. |
| Recommendations | A Phase 2 (intrusive) geo-environmental site investigation involving: <ul style="list-style-type: none"> Dynamic (window) sampling boreholes with establishment of gas monitoring wells; Machine excavated trial pits with infiltration/water ingress tests in line with BRE Digest 365; Cable percussive (shell and auger) boreholes within the market hall; Hand dug trial pits around the perimeter of the existing covered market to expose and record details of the existing foundations; On site CBR testing in areas of proposed hard landscaping and highways; Recovery of representative soil samples from the exploration holes to be submitted for appropriate geotechnical laboratory testing and contamination analysis and groundwater if encountered; WAC testing to determine the category of landfill for the disposal of site excavated material surplus to requirements; A programme of gas (and groundwater level) monitoring. A Phase 2 (intrusive) coal mining legacy investigation involving four rotary open-hole boreholes under a Coal Authority license to determine the presence/absence of old workings within the north / north eastern area of the site. Gas monitoring apparatus to be installed into the old workings (if encountered) for inclusion in the gas monitoring programme outlined above. Risk mitigation measures to reduce the risk from UXO during intrusive works to levels to as low as reasonably practicable (ALARP). A refurbishment/demolition survey for asbestos containing materials (ACMs) for the existing buildings that will be affected by the proposed development. |

This Executive Summary should be read in conjunction with the entire report as it is only a brief account highlighting the key findings of the report.

CONTENTS

| | | |
|------------|--|-----------|
| 1.0 | INTRODUCTION | 6 |
| 1.1 | Brief..... | 6 |
| 1.2 | Legislative and Regulatory Context | 7 |
| 1.3 | Guidance and Information Sources Used Within This Report | 7 |
| 1.4 | Report Limitations | 7 |
| 2.0 | ENVIRONMENTAL SETTING | 8 |
| 2.1 | Site Location | 8 |
| 2.2 | Historical Land Use | 8 |
| 2.3 | Site Description | 10 |
| 2.4 | Geology..... | 12 |
| 2.5 | Background Soil Contamination | 12 |
| 2.6 | Mining, Coal Mining Legacy Risk and Ground Stability | 13 |
| 2.7 | Historical Borehole Data | 15 |
| 2.8 | Hydrogeology | 16 |
| 2.9 | Hydrology | 17 |
| 2.10 | Flood Risk | 17 |
| 2.11 | Landfills and Licenced Waste Management Facilities | 19 |
| 2.12 | Ground Gases | 19 |
| 2.13 | Air Quality..... | 20 |
| 2.14 | Other Potentially Significant Information Relating to the Site | 20 |
| 2.15 | Environmental Designations | 21 |
| 2.16 | Habitat Designations | 22 |
| 2.17 | Visual and Cultural Designations | 22 |
| 2.18 | Agricultural Designations | 22 |
| 3.0 | CONCEPTUAL SITE MODEL AND PRELIMINARY RISK ASSESSMENT | 23 |
| 3.1 | Potential Pollutant Linkages | 23 |
| 3.2 | Potential Sources of Contamination..... | 23 |
| 3.3 | Potential Pathways | 25 |
| 3.4 | Receptors..... | 25 |
| 3.5 | Outline Conceptual Site Model | 26 |
| 3.6 | Preliminary Environmental Risk Assessment..... | 28 |
| 4.0 | CONCLUSIONS AND RECOMMENDATIONS | 30 |

APPENDICES

| | |
|------------|--|
| Appendix A | Figures and Drawings |
| Appendix B | Historical Maps |
| Appendix C | Environmental Data Report |
| Appendix D | Photographic Record |
| Appendix E | Coal Mining Report |
| Appendix F | Environment Agency Flood Map for Planning (Rivers and Sea) |
| Appendix G | Unexploded Bomb Risk Information |
| Appendix H | Guide to the Risk Assessment Process under CIRIA C552 |
| Appendix I | Proposed Rotary Drilling Locations for Coal Mining Investigation |

TABLES

| | |
|----------|--|
| Table 1 | Geological Summary |
| Table 2 | Summary of Potential Risks Associated with Coal Mining |
| Table 3 | Natural Ground Stability Hazards |
| Table 4 | Borehole Records |
| Table 5 | Active Licensed Groundwater Abstractions |
| Table 6 | Active Licensed Surface Water Abstractions |
| Table 7 | Recorded Landfill Sites |
| Table 8 | EA Licensed and Other Waste Sites |
| Table 9 | Environmental Designations |
| Table 10 | Visual and Cultural Designations |
| Table 11 | Potential Sources of Contamination |
| Table 12 | Outline Conceptual Site Model |
| Table 13 | Risk Classification Definitions from CIRIA C552 |
| Table 14 | Preliminary Environmental Risk Assessment |

KEY REFERENCES

- A *Land Contamination Risk Management*, Environment Agency (April 2021)
- B *Guiding Principles for Land Contamination*, Environment Agency (March 2010).
- C Town and Country Planning Act 1990.
- D National Planning Policy Framework (July 2018).
- E Revised Statutory Guidance dated April 2012 implementing the contaminated land provisions under Part 2A of the Environmental Protection Act 1990.
- F CIRIA 665 '*Assessing Risks Posed by Hazardous Ground Gases to Buildings*' (2007).
- G BR 211 *Radon, Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)*, BRE, 2015.
- H CIRIA Report C758D, *Abandoned Mine Workings Manual*, CIRIA, 2019.

1.0 INTRODUCTION

1.1 Brief

Silkstone Environmental Ltd (SEL) has prepared a Phase 1 Preliminary Geo-Environmental Risk Assessment for Dewsbury Market and Arcade, Cloth Hall Street, Dewsbury, WF13 1QE (the site) following receipts of PO references 3300287732 and 3300287733 from Kirklees Council (the Client), dated 25th August 2021.

The site comprises an indoor and outdoor market area and arcade area. The market area includes a large indoor market building, several brick built buildings and an outdoor market area with rows of wooden stalls and a carpark along the northern boundary with Whitehall Way between the car park and market area. There is also an electrical substation next to the carpark. The arcade area comprises a block paved path with shops on either side covered by a glass roof.

This report has been requested for the proposed refurbishment of the existing covered market buildings, the demolition of the existing façade and the construction of a single story mezzanine in the market and creation of new stairs, a lift, wall opening and repair work in the arcade.

The report follows the completion of the a *Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment* prepared by 6 Alpha Associates on behalf of the Client, report reference 9163, dated 24th August 2021.

The stated purpose of this work is to carry out a Phase 1 Preliminary Geo-Environmental Risk Assessment which will assess the potential for historic contamination at the site which may adversely impact upon human health and/or the wider environment. Geotechnical issues have also been considered and a review made of the potential for instability at the surface from former coal mining legacy operations. The report has been compiled in general accordance with Refs. A & B as a 'Preliminary Risk Assessment', as defined therein.

This preliminary assessment will provide background information to support further assessment via an intrusive (Phase 2) investigation, the scope of which has already been specified by the Client. This Phase 1 assessment includes the following:

- A review of the site history including previous surrounding land uses.
- Determination of the environmental setting by reference to geology, mining / quarrying, hydrology, flood risk, hydrogeology, risks associated with hazardous gases (such as radon, landfill gas, mine gas), proximity to infilled ground, permitted industrial processes and other activities such as Control of Major Accident Hazard (COMAH) and explosive sites.
- A description of the site from a site walkover and inspection.
- An assessment of anticipated ground conditions including potential contaminants.
- An assessment of anticipated foundation and engineering issues associated with any redevelopment.
- An inspection of historical and geological maps and information provided by the Local Planning Authority, Environment Agency, British Geological Survey and the Coal Authority, as appropriate.

- A risk assessment in the context of the site proposals based on an appraisal of the potential contamination sources, pathways and receptors in an outline conceptual site model.

Conclusions are given alongside any further recommendations. No other site investigations are known, or have been made available to SEL.

1.2 Legislative and Regulatory Context

If land proposed to be developed is suspected of being contaminated either historically or by its current use, an investigation will be requested by the Local Authority under the Town and Country Planning Act (1990) (Ref. C) and the National Planning Policy Framework (Ref. D) to determine the level of risk and if remediation is necessary or whether there may be grounds for the land to be considered contaminated under Part 2A of the Environmental Protection Act 1990 (Ref. E). Under this regime investigations are carried out to determine if the current condition of the site is suitable for its proposed use.

1.3 Guidance and Information Sources Used Within This Report

This report has been produced in line with relevant guidance and best practice and in particular references A, B, C, D, E, F, G and H. This list includes all of the cited references. It is not exhaustive and comprises only the principal references used in conducting this risk assessment.

1.4 Report Limitations

The conclusions reached in this report are necessarily restricted to those which can be determined from available information and may be subject to amendment in the light of additional information becoming available or to changes in relevant legislation.

This report is strictly confidential to the party to whom it is addressed and may only be relied upon by that party or their other professional advisors, for the specific purpose to which it refers. Any third party using this report does so entirely at their own risk and SEL accepts no responsibility or liability for any costs, claims, damages or expenses (including consequential damages) as a result of this report or any part of its contents being used by any third party.

Except in connection with the specific purpose for which this report has been prepared, neither the whole nor any part of this report, nor any reference thereto, may be included in any published document, circular or statement, nor published in any way, nor disclosed orally to a third party, without the written approval from SEL of the form and context of such publication or disclosure. Such approval is required whether or not SEL are referred to by name and whether or not the report is combined with others.

SEL are unaware of any conflicts of interest in the preparation of this report.

2.0 ENVIRONMENTAL SETTING

2.1 Site Location

Dewsbury Market and Arcade are located off the junction of Cloth Hall Street, Foundry Street and Corporation Street on the north eastern edge of Dewsbury town centre. Site location and layout plans are presented as Figures 1 and 2 in Appendix A, on which the site boundary is outlined red.

The National Grid Reference (NGR) for the centre of the site is 424654, 421899. The site is approximately 1.99ha in area and situated at an approximate height of 39-43m Above Ordnance Datum (AOD), sloping from north-west to south-east.

2.2 Historical Land Use

Information relating to the historical uses of the site and surrounding area has been determined from a review of the following:

- The large scale (1:500, 1:1250 and 1:2500) and small scale (1:10,560 and 1:10,000) historical Ordnance Survey (OS) maps dating from 1855 to 2021 (Appendix B);
- Google Earth aerial imagery dated 1999 to 2020; and
- A Groundsure environmental data report for the site (Appendix C).

It is important to note that any date referred to in this section refers to the date a feature appears on the map, not necessarily the date the actual feature was first present. Additionally, the marked site boundary may appear to move with respect to successive editions. This is predominantly due to minor variations in the OS with time.

A summary of the features noted from the historical mapping is described below.

Within the Site

The earliest mapping (1855) shows the site to be located within an urbanised area associated with Dewsbury. In the southern half of the site there are several buildings of unspecified use. Some of these buildings are labelled Steads Buildings. The majority of the southern area has been developed with buildings of unspecified use. The setting of all the buildings on site suggests a retail or commercial use.

The 1890 map shows Dewsbury Beck in the northern area of the site. The Dewsbury Beck is culverted beneath an unspecified building (possibly forming part of the Cloth Hall Reed Works near the north-western boundary). Several buildings have been developed in the northern area and the layout suggests commercial or industrial uses. Some of the buildings are annotated such as a saw mill, the Cloth Hall Reed Works and two warehouses. Four chimneys and a crane are also identified. The station hotel and a glass canopy structure are shown on the north-eastern boundary. Cloth Hall Street is also shown on site.

The layout of the buildings in the southern area suggest commercial or retail uses as some of the buildings are annotated, such as the Man and Saddle Hotel, King's Arms Inn, Black Bull Inn, New Inn and the Dusty Miller Inn. Two small glass covered structures are also shown.

By 1894 all of the chimneys and the crane in the northern area had been removed. Sometime between 1894 and 1905 the Dewsbury Beck had been culverted beneath the site in the northern area.

The 1907 map shows some changes to the layout of the buildings in the northern area as the saw mill and Cloth Hall Reed Works have been replaced with Woollen Mills. New buildings have also been built in the north-west corner, one of which is annotated Hippodrome. Also on the southern eastern boundary, a group of small buildings has been replaced by one large building labelled market. In the southern area, the Inns are no longer shown, two more hotels have appeared and a long narrow glass covered structure is shown.

The 1922 map shows another area in the northern part of the site labelled market. This is an outdoor market as no buildings or structures are shown. A chimney is also shown adjacent to the north of the Woollen Mills. A smithy is also identified. In the southern area the long narrow glass structure is labelled 'Arcade'.

The 1931 map shows that the Woollen Mills and the Hippodrome in the northern area had been demolished. A glass structure now covers the open market area at this time. The 1938 map shows many of the smaller buildings in the northern area to have been demolished.

The 1954 map shows the northern area to have been developed into an indoor/outdoor market area. An electrical substation is shown in the northern corner and part of a garage is shown on the northern boundary. The 1966 map shows a car park and shelter and multiple small structures added to the northern area.

The 1978 map shows the market area in the northern part of the site to have undergone substantial development with many small structures added. The glass structure that was on the north-eastern boundary has been removed. By 1983 the garage had been removed. In 1988 the car park near the north western corner had been removed and replaced by multiple small structures. The warehouse on the north-eastern boundary had been removed and a new car park was shown on the north-eastern boundary.

By 2003 the electrical substation in the northern corner of the site had been removed and the site has remained largely unchanged since this time.

Surrounding Area

The earliest mapping (1855) shows the site to be located within an urbanised area surrounded by buildings of unspecified use. New Wakefield Woolen Mill is located approximately 100m north-east, sandstone quarries are located approximately 100m north, Kiln Croft Colliery approximately 70m east, an old sandstone quarry approximately 170m east, a railway station is shown approximately 150m south-west and Spink Well Mill is located approximately 160 north-west.

By 1892/1893 the surrounding area of Dewsbury had undergone much development with new residential, retail, commercial and industrial areas having been built along with two new railway lines and stations, one of which adjoined the site to the east.

An old iron and brass foundry adjoined the site to the west at this time. Cloth Hall Mills with associated chimney adjoined the site to the north. A smithy, Town Mill (flour) with associated chimney and a warehouse are also shown to the south-east. A chimney is located approximately 50m south-east and a saw mill approximately 70m to the west. Two mill ponds which are associated with the New Wakefield Mill are shown north of the mill.

The 1893 map also shows a works approximately 100m north and 100m south-west, Mills and a railway line are shown 110m north-west, warehouses are shown 50m, 150m north-west, 100m, 150m west and 250m south-west. Goods sheds are shown 120-150m west and 150m south-east. Lancashire and Yorkshire railway station is shown approximately 60m south. The Camroyd Carbonizing Works is located approximately 300m north-east.

The 1907 map shows two tanks associated with the New Wakefield Mills. A warehouse is shown approximately 20m to the north. The 1922 map shows the old foundry adjacent to the west and the group of buildings adjacent to the east of the southern area of the site to have been demolished. Tramlines are shown adjacent to the west. A fire engine station is located approximately 130m south-east. The Excelsior Confectionary Works and associated chimney are shown approximately 70m north.

The 1933 map shows some development adjacent to the west where the old foundry used to be. The layout of the buildings suggests retail uses. The 1938 map shows some development along the eastern boundary of the southern area of the site. The layout of the buildings suggest retail uses. The tramlines have also been removed.

The 1954/1955 map shows sporadic areas of buildings to the north-east to be no longer shown. This could possibly have been caused by bombing during WWII. Groups of warehouses are shown approximately 70-110m north and 50m north-east. A Timber and Joinery works is shown approximately 60m north-west. A civil defence training and social centre is shown adjacent to the north. The tanks associated with the New Wakefield Mills are no longer shown.

The 1983-1987 mapping shows the Mills adjacent to the north to have been demolished. The civil defence training and social centre is also no longer shown. The New Wakefield Mill to the north east is shown to have been demolished and associated mill ponds infilled. Another 1987 map shows the New Wakefield Mill to have been replaced by a car park. The 1988-1992 mapping shows the ring road to the north and north east to have been built. No significant changes to the surrounding area have been noted since this time.

2.3 Site Description

A site walkover was carried out by a SEL representative on 27th August 2021 in dry weather conditions. A photographic record from the visit is presented in Appendix D.

The site comprises of two areas, the market area and the arcade. The market area comprises a large indoor market building, several brick built buildings and numerous small wooden stalls in the market area which is all block paved. The outdoor market area includes rows of wooden stalls, several brick built buildings and a carpark along the northern boundary with Whitehall Way. There is also an electrical substation next to the carpark. The arcade area comprises a block paved pedestrian access with shops on either side and covered by a glass roof.

Existing Indoor Market Building

The existing indoor market building is a large open plan building with a high roof and metal beams and covers rows of wooden stalls and small shops. The flooring inside the building is block paved.

There was no obvious evidence to suspect the presence of any asbestos containing materials to the external fabric of the building, but due to the age of the buildings, this possibility cannot be discounted.

External Areas in the Market Area

The outdoor market comprises rows of wooden stalls and several brick built buildings, including public toilets. The area includes Cloth Hall Street which is pedestrianised along with the rest of the outdoor market. The hardstanding surface of the outdoor market is concrete block and brick paved.

Adjacent to the north of the outdoor market is Whitehall Way and a carpark, both of which are bituminous surfaced. There are some small landscaped areas next to the car park with semi-mature trees. Also next to the carpark is an area where large bins are stored and an electrical substation.

No obvious evidence of any significant potential sources of contamination were noted on site and no evidence for the presence of invasive non-native plant species such as Japanese knotweed.

Arcade Area

At the time of the walkover the arcade area was closed off for access, but observation through the gate, a block paved access path could be seen with shops either side along the full length of the path. The arcade was covered with a glass roof. No obvious evidence of any significant potential sources of contamination were observed.

There was no obvious evidence to suspect the presence of any asbestos containing materials to the external fabric of the building, but due to the age of the buildings, this possibility cannot be discounted.

Surrounding Area

The area in which the site is located is dominated by retail shops and fast food restaurants and takeaways.

2.4 Geology

An assessment of the artificial ground, superficial and solid (bedrock) geology relating to the site has been gained from British Geological Survey (BGS) and other sources and is summarised in the following Table.

Table 1: Geological Summary

| | |
|---|--|
| Maps / Publications Referenced | BGS 1:50,000 Sheet 77 (Huddersfield), Bedrock and Superficial dated 2003. BGS Geology of Britain Viewer, BGS lexicon of named rock units and BGS Onshore Geoindex webpages. Groundsure Enviro & Geo Insight Report (Appendix C). Coal Authority Interactive Viewer website. |
| Artificial Ground | Artificial Ground recorded on site from borehole records (see Section 2.7), comprising ash, clinker, brick and masonry rubble with fragments of sandstone and timber to depths of between 2.13 and 3.30m begl. |
| Superficial Deposits & Landslips | Alluvium consisting of clay, silt, sand and gravel covers most of the site apart from areas in the north-east and south-west. No landslips recorded within 500m. |
| Solid Geology (Bedrock) | Pennine Lower Coal Measures Formation incorporating the Emley Rock, a fine grained flaggy sandstone with mudstone partings covering most of the northern and eastern area, above interbedded mudstone, siltstone, sandstone and occasional seams of coal extending beneath the whole site. |
| Dip of Solid Strata | 2.4-3.0° E/SE according to the Coal Authority online viewer. |
| Faults | 1 no. recorded at the northern end of the site trending NE/SW. |
| Coal Seams / Mining / Quarrying Natural Cavities etc | Site within a Coal Mining Reporting Area (see section 2.6 for review of coal mining legacy issues). 2 no. coal seams recorded outcropping onsite. No natural cavities recorded within 500m. 2 no. records on the Britpits database of currently active and closed surface and underground mineral workings within 250m, nearest being 112m north. 20 no. records of surface ground workings within 250m nearest being ponds / reservoirs 56m north-west. 4 no. records of underground workings within 250m, all recorded as a tunnel 106m east and 142m SE. No non-coal mining recorded within 250m. No mining cavities recorded within 250m. |

According to the Soilscales on-line viewer from the Cranfield Soil and AgriFood Institute, supported by DEFRA¹, the natural soils (if present) within the north eastern area of the site are slowly permeable, seasonally wet acid loamy and clayey soils with impeded drainage and low fertility. The natural soils within the south western area of the site are loamy and clayey floodplain soils with naturally high groundwater and moderate fertility.

2.5 Background Soil Contamination

The Groundsure environmental data report records the BGS estimated background soil chemistry with particular reference to concentrations of arsenic, cadmium, chromium, nickel and lead. Reference has also been made to the on-line BGS maps on 'Contaminant distribution in soil' for arsenic, cadmium, copper, nickel and lead dated 2013.

¹ <http://www.landis.org.uk/soilscales/>

SEL have compared the contaminant values from both datasets against levels of concern for human health currently applicable in the UK for Public Open Space (POS) park use to provide an indication of natural background soil contamination levels:

| | Estimated On Site | Max (POS use)² |
|---------------|--------------------------|----------------------------------|
| Arsenic (As) | 25-35mg/kg | 170mg/kg |
| Cadmium Cd) | >0.33-1.8mg/kg | 560mg/kg |
| Copper (Cu) | 35-64.2mg/kg | 44,000mg/kg |
| Chromium (Cr) | 60-180mg/kg | 33,000mg/kg |
| Nickel (Ni) | 15-45mg/kg | 800mg/kg |
| Lead (Pb) | 47.1-200mg/kg | 1300mg/kg |

It should be noted that these are estimated background levels for the area and should not be relied upon as reflecting the actual chemical status of soils on site, which can only be determined by site specific sampling and testing.

2.6 Mining, Coal Mining Legacy Risk and Ground Stability

The site lies within an identified Coal Mining Reporting Area (also known as CON29M Coal and Brine Consultation areas). A Coal Mining Report (CMR) has been obtained by the Client, a copy of which is presented as Appendix E.

The following comments are made regarding on-site coal mining legacy issues:

- The northernmost part of the site falls within a *Development High Risk Area (DHRA)* that is the site has one or more recorded coal mining features which has the potential for instability or a degree of risk to the surface.
- The site is “*not within a surface area that could be affected by any past recorded underground coal mining.*”
- However, the site is “*in an area where the Coal Authority believes there is coal at or close to the surface*” and “*this coal may have been worked at some time in the past.*” “*The potential presence of coal workings at or close to the surface should be considered, particularly prior to any site works or future development activity.*”
- No coal mine entries are recorded within, or within 20 metres of the property boundary. However, “*based on the Coal Authority’s knowledge of the mining circumstances...., there may be unrecorded mine workings in the local area.*”
- No future mining is planned, but there are reserves of coal in the local area which could be worked at some time in the future.
- The site has not been subject to past opencast coal mining.

SEL have assessed the potential for the future extraction of coal beneath the site. After consideration of the current economic, planning and governmental factors that affect coal mining in the UK, SEL consider the risk from future mining to be negligible.

Table 2 summarises the potential risk associated with coal mining legacy issues and has been compiled based on The Coal Authority document entitled ‘*Risk based approach to development management - Guidance for Developers*’ (Version 4, 2017).

² LQM & CIEH 2015 and DEFRA C4SL 2014

Table 2: Summary of Potential Risks Associated with Coal Mining

| Coal Mining Issue | Coal Mining Risk | | Risk Assessment |
|--|------------------|----|--|
| | Yes | No | |
| Past recorded underground coal mining at greater than 30m deep | | ✓ | |
| Past shallow recorded underground coal mining (<30m deep) | | ✓ | |
| Past shallow unrecorded underground coal mining (<30m deep) | ✓ | | The 2 nd Brown Metal seam present at or close to the surface, which may have been worked at some time in the past. |
| Present underground coal mining | | ✓ | |
| Future underground coal mining. | | ✓ | Negligible risk considering current economic, environmental and planning constraints. |
| Recorded mine entries (shafts/adits) | | ✓ | No mine entries recorded within 20m of the site. |
| Unrecorded mine entries (shafts/adits) | | ✓ | Potential hazard. Risk usually negated on the establishment of foundations for development structures, when it is usual practice to undertake a site scrape. |
| Coal mining geology (fissures etc) | | ✓ | |
| Past opencast (surface) coal mining | | ✓ | |
| Present/future opencast coal mining | | ✓ | |
| Coal mining subsidence | | ✓ | |
| Record of past mine gas emissions | | ✓ | |
| Recorded surface hazards related to coal mining | | ✓ | |

Having reviewed the coal mining legacy issues, SEL consider the site **is at risk from legacy coal mining activities**, namely the presence of a coal seam (the 2nd Brown Metal seam) at or close to the surface which may have been worked at some time in the past, but not recorded.

The Coal Authority has also identified potential for unrecorded mine entries to be present on site. This is due to the past occasional incidence of unrecorded shafts/adits in the Kirklees area, where coal seams occur on, or close to outcrop. SEL recognise this as a valid, but lower risk hazard. The risk would normally be negated on the establishment of foundations for development structures, when it is usual practice to undertake a site scrape. Should workers observe any unexpected features such as brickwork, voids or any unidentified or infilled structures, the advice of an appropriately qualified person should be sought. The Coal Authority should be notified if mine entries are encountered during development works.

Regarding non-coal mining activities, the environmental data report (Appendix C) does not have any record of such activities within 2km of site.

There are no natural cavities or mining cavities recorded within 500m of the site.

The BGS Britpits database of currently active and closed surface and underground mineral workings records two workings within 250m of site. These being sandstone quarries located 112m north and 205m east.

There are twenty records of surface ground workings recorded from the historical mapping within 250m of the site, the closest being ponds / reservoirs located 56m west.

There are four records of underground workings identified from the historical maps within 250m of site. All four relate to two tunnels 106m east and 142m south-east.

With regard to natural ground stability hazards, the environmental data report (Appendix C) refers to six BGS defined natural ground stability hazard datasets which provide a hazard rating for ground subsidence arising from natural ground conditions. These are detailed in the following table.

Table 3: Natural Ground Stability Hazards

| Ground Condition | Hazard Potential | Comment |
|-------------------------------------|------------------------|--|
| Shrink-Swell Clays | Negligible to Very Low | |
| Landslides | Very Low | |
| Ground Dissolution of Soluble Rocks | Negligible | |
| Compressible Deposits | Negligible to Moderate | Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site. |
| Collapsible Deposits | Negligible to Very Low | |
| Running Sands | Negligible to Low | Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water. |

2.7 Historical Borehole Data

The British Geological Survey (BGS) records six historic boreholes onsite, two of which are confidential and one of which extends to a depth of 10.50m for a location at the north western end of the site and summarised below.

Table 4: Borehole Records

| Borehole Ref. – SE22SW560 | | |
|---|---------------|------------------|
| Rock Description | Thickness (m) | Depth to Top (m) |
| Made Ground: Ash and clinker | 2.2 | 0.0 |
| Made Ground: Clay, ash and timber fragments | 1.1 | 2.2 |
| Sand and gravel | 1.5 | 3.3 |
| Clay | 1.2 | 4.8 |
| Sand and gravel in clay matrix | 0.2 | 6.0 |
| Sandstone | 0.7 | 6.2 |
| Mudstone | 0.7 | 6.9 |
| Coal | 0.1 | 7.6 |
| Mudstone | 1.3 | 7.7 |
| Mudstone with coal laminations | 0.5 | 9.0 |
| Carbonaceous silty mudstone | 0.2 | 9.5 |
| Mudstone | 0.8 | 9.7 |
| Base of borehole 10.50m | | |

2.8 Hydrogeology

Both the onsite superficial geology and bedrock geology are designated as a Secondary A aquifer. Formerly known as minor aquifers, these rocks are 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.

With respect to groundwater vulnerability, the superficial aquifer extending beneath the majority of the site is described as having a medium vulnerability with soils of high leaching class. The bedrock aquifer extending across the majority of the site is described as having a high vulnerability with a flow mechanism of well-connected fractures and overlain by soils of mostly high leaching class with an infiltration value of <40%.

The Environment Agency's (EA's) on-line Catchment Data Explorer map shows the site to be located in the Aire and Calder Carboniferous Limestone/Millstone Grit/Coal Measures operational catchment of the Humber Groundwater Management Catchment, where the chemical quality of bedrock groundwater between 2013 and 2019 has been classified as 'Poor'. The reason for the poor status is stated as being due to mining and quarrying.

Groundwater protection zones are zones designated in England and Wales by the EA as major groundwater sources (from wells, boreholes and springs) used for drinking water supply. The site is not located within 500m of a groundwater Source Protection Zone either with respect to potable abstraction sites, or with respect to a confined aquifer.

There are three active EA licensed groundwater abstractions recorded within 2km, the details of which are summarised below in Table 5.

Table 5: Active Licensed Groundwater Abstractions

| License Holder (& Licence No.) | Location | Purpose | Point | Expiry Date |
|---|----------|--|----------|-------------|
| Thomas Chadwick and Sons Ltd, 2/27/13/169 | 591m SE | General use relating to secondary category | Borehole | - |
| Thomas Chadwick and Sons Ltd, 2/27/13/169 | 633m S | General use relating to secondary category | Borehole | - |
| Calder Dyeing Ltd, 2/27/13/226/R01 | 1429m S | General use relating to secondary category | Borehole | - |

There are no recorded potable groundwater abstractions (for drinking water supply) licenced by the EA within 2km of the site.

Based on the information reviewed above, the sensitivity of groundwater as a receptor to any potential contamination at this location is considered to be of reasonable significance.

2.9 Hydrology

The nearest surface water feature to the site is Dewsbury Beck which flows within a culvert beneath the north eastern and eastern edge of the site. This flows south to the River Calder which is located approximately 490m south of the site.

The EA's on-line Catchment Data Explorer map shows the site is located within the Calder Lower Operational Catchment where Batley Beck from its source to the River Calder has a 'Moderate' ecological classification and 'Fail' chemical classification for 2019³.

There are three active EA licensed surface water recorded within 2km of the site, the details of which are summarised in the following Table:

Table 6: Active Licensed Surface Water Abstractions

| License Holder (& Licence No.) | Location | Purpose | Point | Expiry Date |
|--------------------------------------|----------|--|-------------------------------|-------------|
| Henry Day & Sons Ltd. 2/27/13/163 | 497m S | General use relating to secondary category | River Calder, Dewsbury | - |
| Calder Masonry. 2/27/13/191 | 587m S | General use relating to secondary category | River Calder (2 x points) | - |
| Lawton Yarns Ltd. 2/27/13/211/R01 | 1954m S | General use relating to secondary category | River Calder, Ravensing Mills | - |

There are no recorded potable surface water abstractions (for drinking water supply) licenced by the EA within 2km of the site.

There are two active EA licensed discharge consents to controlled waters located within 250m of the site, one of which is on site and is for sewage storm overflow from a combined sewer on Wood Street into Dewsbury Beck.

There are no EA recorded pollution incidents within 250m of the site which have had an impact on water.

Based on the information reviewed above, the level of sensitivity of surface water resources to any potential contamination that may arise from the site is not considered to be highly significant, because of the poor chemical quality of surface water resources in the wider catchment area and the permitted discharge consent of storm sewage overflow into Dewsbury Beck.

2.10 Flood Risk

Rivers and the Sea

The EA Flood Map for Planning on the Gov.UK website records the site as being within a Flood Zone 3 flood plain with a high probability of flooding. A copy of the EA Flood Map for Planning (Rivers and Sea) is provided in Appendix F⁴. The Flood Zone 3 area extends mostly along the line of Dewsbury Beck within the north eastern part of the site.

³ The chemical classification for the years of 2013 and 2014 was also 'Fail', but 'Good' for the years 2015 and 2016.

⁴ Reproduced under Open Government Licence <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

A Flood Zone 2 area extends back from the Flood Zone 3 area across much of the remaining area of the site, with exception of the south eastern part which is within Flood Zone 1 (low probability of flooding).

A review of the EA map of long term risk of flooding from rivers and the sea available on the Gov.UK website indicates that most of the north eastern area of the site and along the southern boundary is in an area with a 'Medium risk', which means that each year the chance of flooding is between 1% and 3.3%. A small area of the northern part of the site and along the Dewsbury Beck is an area with a 'High risk' which means that each year the chance of flooding is greater than 3.3%

There are no records of historic flood events, flood defences or areas benefitting from flood storage within 250m of the site. There are fourteen records of areas benefitting from flood defences within 250m, the closest being 44m north-west.

Surface Water (Pluvial)

The EA map showing the long term risk from surface water (pluvial) flooding (also viewed on the Gov.UK website), identifies much of the south western part of the site and an area within the south eastern corner as being at a 'Very low risk' with areas in the north eastern part of the site as being at 'Low risk' (with a 0.1-1% chance). There are also some small areas of 'Medium risk' (with a 1%-3.3% chance) and 'High risk' (greater than 3.3% chance) of flooding along the line of Dewsbury Beck and in the south western corner of the site.

Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding. The environmental data report (Appendix C) identifies the highest risk of surface water flooding on site to be a 1 in 30 year event at a depth between 0.3m and 1m.

Groundwater

With respect to groundwater flooding, that is, the potential for the water table to rise to above ground level or within underground structures such as basements or cellars, the environmental data report identifies the site to be located in an area of 'Low' risk.

Reservoirs

The EA map showing the flood risk from reservoirs on the Gov.UK website shows that much of the site within the north eastern part and at the southern end of the site is located in the potential path which water would follow if a reservoir dam or embankment was to fail.

However, this is a worst case scenario and reservoir flooding is extremely unlikely to happen, since all large reservoirs must be inspected regularly and essential safety work carried out supervised by reservoir engineers.

In England and Wales, the Environment Agency has a regulatory role for reservoir safety, under the Reservoirs Act 1975. It ensures that reservoirs are regularly inspected and essential safety works are carried out. The Environment Agency has the power to prosecute reservoir owners for failure to carry out essential safety works, and where emergency works are required, it has the power to carry out these works itself.

Flood Risk Assessment

Regulators are entitled to require a standalone flood risk assessment for a site in addition to this Phase 1 Preliminary Risk Assessment should they consider it necessary. The site is located within a Flood Zone 3 (high probability of flooding). Therefore a Flood Risk Assessment will be required for the site.

2.11 Landfills and Licenced Waste Management Facilities

The influencing distance of a gassing landfill is dependent on a number of variables, including the type of waste, geology, hydrogeology, site engineering etc. Therefore, owing to the specific nature of each of these factors, it is not possible to guarantee that a site is not within the influencing distance of a known landfill site. However, it is normal practice to consider a 250m consultation zone around the property.

The Groundsure environmental data report (Appendix C) includes EA, BGS, DoE and Local Authority and other records and identifies one EA recorded historic landfill within 250m of the site (Table 7).

Table 7: Recorded Landfill Sites

| Site Name, Address (& Operator) | Location | Accepted Waste Types | First Input Date | Last Input Date |
|--|----------|----------------------|------------------|-----------------|
| Land at Greaves Road, Crackenedge Lane, Dewsbury. (Kirklees MBC) | 126m N | Inert, Commercial | 31/12/1985 | 30/06/1990 |

With respect to other waste sites, the review has identified no records of EA licenced waste treatment, transfer or disposal sites, or records of EA waste sites within 250m (Table 8).

Table 8: EA Licenced & Other Waste Sites

| Site Name, Address & Operator | Location | Type of Site | Date | Reference No. |
|-------------------------------|----------|--------------|------|---------------|
| None recorded within 250m. | | | | |

The environmental data report identifies four recorded waste exemptions (for activities involving the storage, treatment, use or disposal of waste that are exempt from requiring a permit) within 250m of the site. The nearest is a treating waste exemption located on Wellington Road, Dewsbury, 141m south for sorting and de-naturing controlled drugs for disposal.

2.12 Ground Gases

CIRIA Report C665 (Ref. F) identifies potential sources of hazardous ground gases (principally methane and carbon dioxide) that may be generated from infilled land and other sources and provides guidance on assessing the risks from these features. It is normal practice within the industry that where potentially infilled land occurs within 250m of a site, it should be assessed for risk from ground gas.

The environmental data report has identified an historic inert and commercial waste landfill 126m north.

The environmental data report records six areas of Artificial and Made Ground located within 250m of the site. These include areas of Made Ground 109m west, 138m south-east, 150m north-west, areas of infilled ground 134m east, 221m west and an area of worked ground 177m north.

There are twenty records of surface ground workings recorded from the historical mapping within 250m of the site. The nearest is related to ponds 56m northwest.

A review of past coal mining activities has identified a potential for unrecorded shallow coal mine workings and unrecorded mine entries which may present potential sources of mine gas.

Having reviewed the factors described above, it is considered that ground gas monitoring will be required as part of any Phase 2 site investigation.

Regarding radon gas, reference to the online Public Health England Maps of Radon Affected Areas⁵ shows that the site is located within a Radon Affected Area where the highest radon potential is 3-5% across the majority of the site and 5-10% within the northern corner. Reference to radon guidance report BR 211 (Ref. G) indicates that basic radon protection measures are required for new development in this area.

2.13 Air Quality

Section 82 of the Environment Act 1995 requires every Local Authority to review the air quality within its area and section 83 requires them to designate an Air Quality Management Area (AQMA) where air quality objectives put in place to protect human health and the environment are not being achieved, or are not likely to be achieved, as set out in the Air Quality (England) Regulations 2000.

The revised NPPF (Ref. D) requires AQMAs and Clean Air Zones to be taken into account in planning policies and decisions.

Reference to the on-line interactive map of Air Quality Management Areas managed by DEFRA⁶ shows that the site is located within the Kirklees AQMA 10, which has declared pollution objectives for nitrogen dioxide (NO₂).

2.14 Other Potentially Significant Information Relating to the Site

Reference has been made to the Groundsure environmental data report (Appendix C) from which SEL has screened out the historical uses, current industrial uses and permit authorisations within a 250m radius and these are summarised below.

The report identifies thirty-five *Recent industrial land uses* within 250m. Two relate to onsite for an electrical substation and a curtain and blinds retailer at F. Wilby. The others include five electrical substations 36m north-west, 66m south, 131m south, 162m south and 180m west, a chimney 65m north and three unspecified works 66m north-east, 87m north-west and 213m south-east.

⁵ <https://www.ukradon.org/information/ukmaps>

⁶ <https://uk-air.defra.gov.uk/aqma/maps>

A review of *Historical industrial land uses* identified from 1:10,000/10,560 scale mapping has identified one hundred and twenty one records within 250m of site. Two of those relate to onsite uses for railway sidings (far eastern corner of the site). The records for the surrounding area include railway infrastructure (4m NE, 9m E & 60m S), unspecified foundries (4m SW), unspecified mills (20m NE) and unspecified commercial/industrial uses, goods sheds, unspecified tanks and a colliery.

There are ten records on the *Historical tanks* database from 1:1250 and 1:2500 scale mapping within 250m. The nearest are for an unspecified tank 53m south and 59m north.

With respect to the *Historical energy features* database from 1:1250 and 1:2500 scale mapping, there are thirty-one records within 250m. Three of these are for an electricity substation located onsite. The nearest others within 100m are also electricity sub stations located 23m north west, 67m south and 80m south west.

With respect to the *Historical garages* database from 1:1250 and 1:2500 scale mapping, there are ten records within 250m, with three being onsite and all relating to a location in the northernmost corner of the site.

The environmental data report records no historic military land within 500m of the review area. Inspection of the Zetica unexploded ordnance (UXO) risk maps web page identifies the site to be located within a zone of low risk from WWII UXO (see Appendix G).

A *Detailed UXO Threat and Risk Assessment* report has been completed on behalf of the Client by 6 Alpha Associates dated 7th April 2021. This determined the site to have a 'High' UXO rating in which all types of aggressive intrusive engineering activities could generate a significant risk pathway, thereby requiring risk mitigation measures during intrusive works.

The environmental data report identifies two licenced pollutant releases within 250m. The nearest is 199m east for unloading of petrol into storage at a service station under an historical Part B permit from the Local Authority and for which no enforcements were recorded. The second relates to an active Part B permit for a waste oil burner at a location 223m north-west.

One authorisation for the discharge of substances identified on List II of the European Directive E 2006/11/EC, has been identified within 250m. The status is identified as 'Not Active', but authorised the discharge of chromium, copper and zinc by Hill Containers from a location on Mill Street within the south western corner of the site.

2.15 Environmental Designations

Reference has been made to the Groundsure environmental data report (Appendix C) which has identified the following environmental designations within 1km of the site.

Table 9: Environmental Designations

| Designation | Location | Name |
|-------------|----------|--------------------------|
| Green Belt | 245m NE | South and West Yorkshire |

The review area is located within an SSSI Impact Risk Zone, although the proposed development should not require consultation regarding this.

2.16 Habitat Designations

The environmental data report has recorded eleven habitat designations listed on the Priority Habitat Inventory relating to six locations within 250m. These are areas of deciduous woodland located 179m east, 191m east, 203m north east, 207m north east 210m south and 222m south.

2.17 Visual and Cultural Designations

The environmental data report identifies ten visual and cultural designation onsite, the details of which are summarised in the following Table.

Table 10: Visual and Cultural Designations

| Designation | Location | Name |
|----------------------------|----------|---|
| Listed Building – Grade II | Onsite | Station Hotel, Dewsbury, Kirklees, WF13 |
| Listed Building – Grade II | Onsite | 15,17,19 and 21, Market Place, Dewsbury, Kirklees, WF13 |
| Listed Building – Grade II | Onsite | 27, Market Place, Dewsbury, Kirklees, WF13 |
| Listed Building – Grade II | Onsite | The Black Bull Public House, Dewsbury, Kirklees, WF13 |
| Listed Building – Grade II | Onsite | 23 and 25, Market Place, Dewsbury, Kirklees, WF13 |
| Listed Building – Grade II | Onsite | 29, Market Place, Dewsbury, Kirklees, WF13 |
| Listed Building – Grade II | Onsite | 1-22, The Arcade, Dewsbury, Kirklees, WF13 |
| Listed Building – Grade II | Onsite | 14 and 16, Corporation Street, Dewsbury, Kirklees, WF13 |
| Listed Building – Grade II | Onsite | 18 and 20, Corporation Street, Dewsbury, Kirklees, WF13 |
| Conservation Area | Onsite | Dewsbury town centre (and extending beyond the site to the NW, SW & S). |

2.18 Agricultural Designations

In the environmental data report the site and wider surrounding area is classified as 'Urban land'.

3.0 CONCEPTUAL SITE MODEL AND PRELIMINARY RISK ASSESSMENT

3.1 Potential Pollutant Linkages

To determine the potential for a pollutant linkage to be present, the preliminary risk assessment process involves the identification of potential sources, pathways and receptors. A pollutant linkage can only be present if all three of these factors are involved. In this model there must be a **source** of contamination present (normally a contaminant or pollutant), with a **pathway** representing a route for the contaminant to migrate within the environment towards a **receptor** which may be susceptible to impact from the contamination. A receptor can be a natural feature such as surface or groundwater and humans, but may also include ecological systems and property.

This approach is in accordance with the contaminated land provisions under Part 2A of the Environmental Protection Act 1990. Under the 2014 revised Statutory Guidance implementing these provisions (Ref. E), land is defined as being contaminated if:

- Significant harm is being caused or there is a significant possibility of such harm being caused to human health, or relevant non-human (ecological or property), receptor; and / or
- Significant pollution of controlled waters is being caused, or there is a significant possibility of significant pollution of controlled waters being caused.

The Conceptual Site Model for this assessment is based on the proposed refurbishment of the existing covered market buildings, the demolition of the existing façade, the construction of a single story mezzanine in the market and creation of new stairs, a lift, wall opening and repair work in the arcade.

3.2 Potential Sources of Contamination

Potential sources of contamination and associated contaminants which may be present on site are shown in Table 11.

Table 11: Potential Sources of Contamination

| Potential Sources | Potential Contaminants |
|---|---|
| On Site | |
| <p>Buildings of unspecified use. Railway infrastructure (E). Reed works & woollen mills (centre N). Saw mill (N). Warehouses (SE, S & NE). 2 no. smithies (SE & SW). Garage (N). 2 no. electrical substations (N & NE). List II discharge of Cr, Cu & Zn (not active) (SW). Car parks (NW & NE). Crane. Chimneys. Public toilets. Made Ground (from historical uses). Asbestos containing materials (ACMs) within fabric of buildings. Building demolition. Unrecorded shallow coal mining. Unrecorded mine entries. Unexploded WWII ordnance (UXO). Radon gas.</p> | |
| Off Site | |
| <p>Railway infrastructure (adj. E, 104m W, 111m S, 115m SW). Garage (adj. N). Foundry – iron & brass (4m SW). Mills (adj. NW & SE, 20m NE, 26m NE, 123m W). Electrical substation (23m NW, 67m S, 80m SW). Tanks (53m S, 59m N). Confectionary works / warehouse (58m N). Rex Freight Forwarding (62m NE). Gordons Refinishing Services Ltd (65m NW). Unspecified works (66m NE, 87m NW, 171m NE, 213m SE). Wilson's Autocare (69m NE). Timber & joinery works (70m NW). Dyeing & cleaning mills (70m NE). Collieries (70m E & 215m SE). Fire Station (79m SE). Historic inert & commercial waste landfill (126m N). Infilled reservoirs (152m E). Chapel Auto Garages (185m W). Service station – petrol storage (199m E). Bus station (213m S). Chimneys. Asbestos containing materials (ACMs) within fabric of buildings. Building demolition. Unrecorded shallow coal mining. Unrecorded mine entries. WWII UXO. Radon gas.</p> | <p>Asbestos containing materials. Metals / metalloids including As, B, Cd, Cr, Cu, Ni, Pb, Hg, Zn, Se. Polycyclic aromatic hydrocarbons (PAHs). Petroleum Hydrocarbons (TPHs). Volatile and semi-volatile organic compounds (VOC & SVOCs). Polychlorinated biphenyls (PCBs). Explosives (UXO). Ground gas (methane and carbon dioxide).</p> |

3.3 Potential Pathways

The potential pathways representing the routes by which contaminants may migrate or harm be caused are listed as follows:

- Ingestion and inhalation of soil / water / dust;
- Dermal contact with soil / water / dust;
- Migration and / or inhalation of gases and vapours;
- Migration / leaching of contaminants through soil / groundwater;
- Volatisation of contaminants to indoor or outdoor air;
- Surface water runoff;
- Service pipes;
- Physical disturbance;
- Ground instability / differential settlement.

3.4 Receptors

3.4.1 Human Health

Chronic Risks

The chronic risks to human health take into account those risks to end users of the site (general public) and neighbouring occupants.

Acute Risks

Acute risks are considered with respect to construction workers / engineers on site.

NB: During any intrusive ground works appropriate health and safety measures should be adopted to protect site workers from any potential risks associated with contamination in the ground. This should include the use of the appropriate personal protective equipment necessary and a general awareness of any possible risks to safety and human health on site.

3.4.2 Controlled Waters

Groundwater

The chemical quality of groundwater regionally is poor and there are no groundwater Source Protection Zones within 500m. However, there are three active EA licensed groundwater abstractions within 2km and the vulnerability of groundwater is medium to high with surface soils of high leaching class. Groundwater is therefore considered a reasonably sensitive receptor to potential contamination.

Surface Water

The level of sensitivity of surface water resources to any potential contamination that may arise as a result of redevelopment of the site is not considered to be of high significance because of the poor chemical quality of surface water resources in the wider catchment area and the permitted discharge of storm sewage overflow into Dewsbury Beck.

3.4.3 Non-Human Receptors

Ecological Systems

Potential ecological receptors include an area of Green belt 245m north-east at its closest point and several deciduous woodland priority habitat designations, the closest being 179m east. Areas of commercial and retail buildings exist between these receptors and the site.

Property (buildings / structures / crops / livestock)

Property receptors include the existing and proposed buildings on site, the nine Grade II listed buildings onsite, local road infrastructure and utilities (including electrical substation) and neighbouring commercial/retail buildings.

3.5 Outline Conceptual Site Model

Based on all the information determined from previous sections of this report, the outline Conceptual Site Model (CSM) identifies the potential pollutant linkages which may exist on the site and is presented as Table 12.

Table 12: Outline Conceptual Site Model

| Potential Pollutant (Source) | Potential Linkage (Pathway) | Receptor |
|--|--|--|
| <p><u>On Site:</u> Buildings of unspecified use. Railway infrastructure (E). Reed works & woollen mills (centre N). Saw mill (N). Warehouses (SE, S & NE). 2 no. smithies (SE & SW). Garage (N). 3 no. electrical substations (N & NE). List II discharge of Cr, Cu & Zn. Car parks Crane. Chimneys. Public toilets. Made Ground (from historical uses). Asbestos containing materials (ACMs) within fabric of buildings. Building demolition. Unrecorded shallow coal mining. Unrecorded mine entries. Unexploded WWII ordnance (UXO). Radon gas.</p> <p><u>Off Site:</u> Railway infrastructure. Garage. Foundry (iron & brass). Mills. Electrical substations Tanks. Confectionary works / warehouse. Rex Freight Forwarding. Gordons Refinishing Services Ltd. Unspecified works. Wilsons Autocare. Timber & joinery works. Dyeing & cleaning mills. Collieries. Fire Station (79m SE). Historic inert & commercial waste landfill (126m N). Infilled reservoirs. Chapel Auto Garages. Service station – petrol storage. Bus station. Chimneys. Asbestos containing materials (ACMs) within fabric of buildings. Building demolition. Unrecorded shallow coal mining. Unrecorded mine entries. WWII UXO. Radon gas.</p> | <p>Migration and inhalation of gases / vapours.</p> <p>Inhalation of soil, water or dust.</p> <p>Dermal contact with / ingestion of contaminated soil, water, dust.</p> <p>Migration / leaching, runoff and percolation through soils and rock joints.</p> <p>Volatilisation of contaminants to indoor or outdoor air.</p> <p>Service pipes.</p> <p>Physical disturbance.</p> <p>Ground instability / differential settlement.</p> | <p>Construction workers.</p> <p>Site end users (workers & public).</p> <p>Neighbouring occupants (commercial/retail).</p> <p>Groundwater in Secondary A Aquifer (medium to high vulnerability).</p> <p>Surface watercourse onsite.</p> <p>Property (site buildings, road infrastructure, listed buildings onsite, onsite substation and surrounding commercial/retail buildings).</p> <p>Ecology (Greenbelt and deciduous woodland priority habitats).</p> |

3.6 Preliminary Environmental Risk Assessment

This section aims to expand the outline CSM to assess the level of risk for each potential pollutant linkage.

Risk is a combination of the ‘probability’ (likelihood) of an event occurring and the magnitude of its ‘consequence’ (severity). Therefore, in order to assess risk, both the probability and the consequence of an event must be taken into account. SEL has adopted guidance provided by CIRIA C552⁷, for use in the production of risk assessments for contaminated land and a simple guide to this process is provided in Appendix H.

The risk categories that are ultimately determined as the basis for assessing the likelihood of the site being described as contaminated, are provided with their respective definitions in Table 13.

Table 13: Risk Classification Definitions from CIRIA C552

| Risk Rating | Definition |
|-------------|---|
| Very High | There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation and remediation are likely to be required. |
| High | Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the longer term. |
| Moderate | It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that such harm would be severe, or if any harm were to occur it is more likely that the harm would be mild. Investigation is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term. |
| Low | It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild. |
| Very Low | There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe. |

The pollutant linkages from the outline CSM and resulting risks are now considered in Table 14.

⁷ CIRIA C552 *Contaminated land risk assessment. A guide to good practice*, CIRIA 2001

Table 14: Preliminary Environmental Risk Assessment

| Receptor | Potential Pollutant Linkage | Estimated Degree of Risk to Receptor | |
|---|---|--------------------------------------|--------------|
| Construction Workers | Migration and inhalation of ground gas (methane & carbon dioxide). | Low/moderate | |
| | Migration and inhalation of radon gas. | Low | |
| | Unexploded WWII UXO. | Moderate/high | |
| | Inhalation of soil, water or dust. | Low/moderate* | |
| | Dermal contact with/ ingestion of contaminated soil / water / dust. | Low/moderate* | |
| | Volatisation of contaminants to indoor or outdoor air. | Low | |
| Site End Users (Workers & Visiting Public) | Migration and inhalation of ground gas (methane & carbon dioxide). | Low/moderate | |
| | Migration and inhalation of radon gas. | Low*** | |
| | Inhalation of soil/water or dust | Proposed soft landscaping | Low/moderate |
| | | Buildings / hardstanding | Low |
| | Dermal contact with/ingestion of contaminated soil/water/dust. | Proposed soft landscaping | Low/moderate |
| | | Buildings / hardstanding | Low |
| | Volatisation of contaminants to indoor or outdoor air. | Low | |
| Neighbouring Occupants | Migration / leaching / runoff. | Low** | |
| | Inhalation of soil, water or dust. | Low** | |
| | Dermal contact with/ingestion of contaminated soil/water/dust. | Low** | |
| Surface Water | Migration / leaching / runoff. | Low** | |
| Groundwater | Migration / leaching / runoff. | Low** | |
| Ecological Systems | Migration / leaching / runoff. | Low** | |
| Property (Land & Buildings) | Migration, accumulation and ignition of methane. | Low | |
| | Migration / leaching / runoff. | Low ** | |
| | Ground instability / differential settlement | Low to High | |

* Assumes basic PPE is used.

** Assumes good site construction practice, including, relevant reports, control of runoff / spillages and dust control.

***Assumes provision of basic radon protection measures to new buildings.

In this preliminary qualitative risk assessment, an overall **Low to High** risk has been attributed for the site.

4.0 CONCLUSIONS AND RECOMMENDATIONS

This Phase 1 Preliminary Geo-Environmental Risk Assessment report has reviewed the available data for the study area in the context of the proposed refurbishment of the existing covered market buildings, the demolition of the existing façade and the construction of a single story mezzanine in the market and creation of new stairs, a lift, wall opening and repair work in the arcade.

The assessment has derived the overall level of risk to human health and the wider environment from on and off-site sources to be **Low to High**. The risks mainly relate to the following:

- To construction workers from potential contaminants within the underlying Made Ground, ground gas when entering deep excavations (principally methane and carbon dioxide) and disturbance of potential unexploded ordnance (UXO).
- To site end users (site workers and visiting public) from potential contaminants within the Made Ground (soft landscaped areas only) and ground gas (within permanent buildings only) from Made Ground on site and surrounding areas of infilled ground, worked ground, an historic landfill within 250m and unrecorded shallow coal mine workings.
- To the proposed development (buildings) from ground instability / differential settlement from unrecorded shallow coal mine workings, unrecorded mine entries and compressible deposits.

A Phase 2 intrusive site investigation would be recommended for site redevelopment in order to assess the contamination status and potential ground gas risk to the proposed development and the broad scope for this has already been specified by the Client.

The objectives of the Phase 2 investigation are to:

- Benchmark the contamination status of the site including the presence of contaminated Made Ground.
- Assess the risk from ground gas to construction workers and building occupants.
- Provide geotechnical data to characterise ground conditions, delineate zones of ground stability risk and inform the design of foundations to the proposed structures on site.
- Refine the outline Conceptual Site Model.
- Revise the Preliminary Environmental Risk Assessment.
- Provide data for any remedial work that may be required.

Phase 2 Geo-Environmental Site Investigation

The proposed scope for the Phase 2 (intrusive) site investigation is summarised as follows:

- Dynamic (window) sampling to characterise the nature of the underlying soils, establish gas monitoring wells, provide geotechnical information for the proposed development, including ground bearing information (Standard Penetration Tests) and to assess contamination status.
- Machine excavated trial pits to aid site coverage and to facilitate infiltration/water ingress tests in line with BRE Digest 365.

- Cable percussive (shell and auger) boreholes at the location of proposed mini-piles within the market hall to provide geotechnical information relating to the underlying soils, including ground bearing information and to assess contamination status.
- Hand dug trial pits around the perimeter of the existing covered market, at the location of the proposed mezzanine and in the arcade to expose and record details of the existing foundations and obtain soil samples for geotechnical and contamination testing as appropriate.
- On site CBR testing in areas of proposed hard landscaping and highways.
- Recovery of representative soil samples from the exploration holes to be submitted for appropriate geotechnical laboratory testing and contamination analysis. Samples for contamination testing to be varied across the site and determined based on historical uses and observations during the fieldwork and to include metals / metalloids, speciated polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs), polychlorinated biphenyls (PCBs), volatile and semi-volatile organic compounds (VOC & SVOCs) soluble sulphate, pH and the presence of asbestos, as appropriate.
- Any groundwater (if encountered) should also be sampled and tested for a similar range of contaminants to inform the risk to controlled waters.
- WAC testing to determine the category of landfill for the disposal of site excavated material surplus to requirements.
- A programme of gas monitoring (and monitoring of groundwater level) from wells established at the window sampling locations at approximate two weekly intervals until the completion of six visits in order to assess gas risk upon completion of the monitoring.

Phase 2 Coal Mining Legacy Investigation

The Coal Authority is a statutory consultee in the planning process and has the right to object to any surface development it considers may be at risk from legacy coal mining issues. The burden of discounting risk is placed on the developer. Having reviewed the coal mining legacy issues, SEL consider that the site is at risk from potential unrecorded shallow mine workings in the 2nd Brown Metal seam which lies at or close to the surface.

SEL therefore recommend the following investigation be undertaken to clarify the risk:

- Four rotary open-hole boreholes should be drilled to determine the presence/absence of old workings in the 2nd Brown Metal seam and their depth, thickness and disposition. The boreholes should be drilled in the north and north eastern area of the site (see Appendix I), to the depth of the coal seam/workings plus 2m of floor strata. One of the boreholes should be drilled to a depth of 30m to confirm the absence of multiple worked coal horizons. This location should ideally be located adjacent to the Dewsbury Ring Road.
- Gas monitoring apparatus should be installed into the old workings (if encountered) to record the potential presence of mine gases in accordance with CIRIA guidance C665 and incorporated into the gas monitoring programme outlined above.
- The boreholes should be drilled under a Coal Authority licence. The requirement for an air or water flush drilling medium will be determined by the Coal Authority having reviewed the proximity of potential receptors to the site. The Authority normally requires water flush drilling where residences occur within 50m of a site.

Unexploded Ordnance (UXO)

The *Detailed UXO Threat and Risk Assessment* report determined the site to have a 'High' UXO rating in which all types of aggressive intrusive engineering activities could generate a significant risk pathway, thereby requiring risk mitigation measures during intrusive works.

The recommended risk mitigation measures to reduce risk levels to as low as reasonably practicable (ALARP) during intrusive works in all previously undisturbed ground (i.e., that which has not previously been excavated, probed, drilled or otherwise intrusively disturbed since it was potentially contaminated with UXO) requires the following:

1. An operational UXO Emergency Response Plan.
2. UXO Safety & Awareness Briefings.
3. Non-intrusive UXO survey and/or EOD Engineer in the watching brief role for trial pits, excavations and trenching into previously undisturbed ground.
4. Intrusive UXO survey for window sampling, piling and drilling into previously undisturbed ground.

Radon Gas

The site is located within a Radon Affected Area requiring basic radon protection measures for new buildings.

Asbestos Containing Materials within Buildings

It is recommended that a refurbishment/demolition survey for asbestos containing materials (ACMs) is undertaken within the existing buildings that will be affected by the development to identify any ACMs requiring safe removal prior to demolition. This is a requirement of the Control of Asbestos Regulations 2012.

Flood Risk

The site is located within a Flood Zone 3 flood plain with a high probability of flooding. A flood risk assessment is therefore required to be completed prior to development of the site.

The site is located in the potential path which water would follow if a reservoir dam or embankment was to fail. However, this is a worst case scenario and reservoir flooding is extremely unlikely to happen, since all large reservoirs must be inspected regularly and essential safety work carried out supervised by reservoir engineers.

Other Factors

Should the use of plastic pipes or other materials be proposed for underground services as part of the redevelopment works, it should be noted that soil sampling requirements can vary between different service providers. For this reason prior to fully commissioning any ground investigation, it is recommended that the Client agrees any additional sampling requirements that may be required with each service provider.

Prior to intrusive site investigations, records of services should be obtained to accurately locate the existing services on site in order to prevent damage by the use of excavation equipment during intrusive investigations.