

LCRM: Stage 1 Risk Assessment

LAND ADJACENT 42 LONG CROFT STREET, GOLCAR

Project Ref: GUK-0426-05

For: Mr J. Lindley

CLIENT:

Mr J. Lindley

PROJECT:

Residential Development

SITE REFERENCE:

**Land adjacent 42 Long Croft Street,
Golcar**

REPORT REFERENCE:

GUK-0426-05/Rp-001



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EXECUTIVE SUMMARY

This summary presents the salient points of the Report but should not be referred to in isolation of the body text. There will be other information contained within the Report which puts into context the findings of the Executive Summary. No reliance should therefore be placed on the Executive Summary until the Report has been read in full. The recommendations given are considered reasonable based on available information and the assessment of the Site as carried out by Groundsmiths (UK) Ltd at this time.

1 ENVIRONMENTAL CONSTRAINTS

Ground Investigation: A general environmental ground investigation is not considered necessary given the very low level of risk identified in relation to the proposed development of the Site and its continued residential end use.

Ground Gases: No credible biogenic ground gas sources have been identified. A BS8485 Characteristic Situation 1 classification is considered appropriate. Specific protection measures are not required.

Radon: Groundsure data indicates that radon presents a low-level constraint to the proposed development and that a basic level of protection is considered necessary. The installation of radon protective measures in the floor construction should be completed in consultation with Building Control.

General Soil Contamination: No significant sources of soil contamination have been identified on the basis of the Site's history and setting. Contamination is not expected to be present, and no further assessment is considered necessary.

Soils Remediation Requirements: Remediation is not anticipated. However, should any unforeseen soil contamination be encountered during development, it should be addressed in accordance with current guidance, with appropriate remedial measures and validation undertaken as required.

Risk to Construction Workers: All works to be undertaken should be specifically assessed as part of a health and safety evaluation to mitigate the exposure of workers to any dusts as may be generated during development.

Controlled Waters Receptors: A very low risk is anticipated in relation to the potential for any mobile contaminants to enter controlled waters receptors, based on the Site's contaminative potential, underlying geology, and absence of nearby surface water features. No further assessment is considered necessary.

Invasive Plants Species: Risk from invasive plant species has not been identified. However, all specialist ecological assessments should be completed as required.

2 GEOTECHNICAL & GENERAL DEVELOPMENT CONSTRAINTS

Ground Investigation: A formal assessment of the Site should be completed for geotechnical purposes to confirm ground conditions and inform foundation/slab/retaining structure design.

Buried Concrete: Protection to buried concrete will be required where soils exhibit elevated sulphate concentrations. Final design parameters should be confirmed following completion of any necessary laboratory testing.

Anticipated Foundations & Ground Slab: To be determined in consultation with the project structural engineer.

General Ground Stability: Whilst no significant regional instability is indicated by the available published data, slope stability and retaining wall/foundation interactions should be considered further by the project structural engineer. Where required, this should be supported by appropriate intrusive ground investigation and geotechnical assessment to confirm ground conditions, groundwater/seepage conditions, and relevant design parameters.

Heave Precautions: To mitigate against heave, foundations would need to be constructed in accordance with current guidelines where they are found to lie within influencing distance of removed, existing, or proposed planting when in cohesive soils. The geotechnical testing of soils would be required to determine this.

Excavation Obstructions: Significant obstructions are not anticipated; however, shallow bedrock could potentially be encountered, which may require localised breaking-out during excavation for foundations and service connections. Appropriate plant should be allowed for within the construction methodology.

Potable Water Supplies: Testing in general accordance with UK Water Industry Research published guidance should be completed as required so that informed decisions may be made about the potable water supply pipework to be used in development. Further consultation should be made with the water provider.

Surface Water Drainage: Drainage for the proposed development should be designed on the basis of non-infiltration methods, such as connection to the public sewer network or other appropriately designed surface water management systems, subject to agreement with the LPA. Further consultation should be explored with a competent drainage engineer.

Pavement: Where new pavement is to be formed, it is considered that the localised excavation and replacement of any unsuitable material with compacted engineered fill would be needed. Since the minimum permitted design CBR is 2.5%, it is recommended at this stage that this conservative value for subgrade be used. Frost susceptibility should be assumed.

Archaeology: The potential for below-ground archaeology has not been identified within the remit of this assessment.

3 MINING LEGACY CONSTRAINTS

Review of available Mining Remediation Authority (MRA) data indicates that the Site is located within a Development Low Risk Area, with no recorded coal mining features or hazards affecting the Site. On this basis, coal mining legacy is not considered to present a constraint to the proposed development, and no further assessment or intrusive investigation is required.

No credible sources of mine gas have been identified. The potential for mine gas to affect the Site is considered to be very low, and no specific gas protection measures are required.

1 INTRODUCTION

1.1 Appointment

Groundsmiths (UK) Ltd ('Groundsmiths') were appointed by Mr J. Lindley (the 'Client') to provide professional services in relation to the preliminary geo-environmental assessment of land located adjacent to 42 Long Croft Street, Golcar, Huddersfield (herein referred to as the 'Site').

Groundsmiths have prepared this report (the 'Report') for the sole use of the Client that commissioned it in accordance with the agreement under which our services are performed. No other warranty, expressed or implied, is made as to the professional advice included in this Report. Any unauthorised third parties using the information presented in this Report do so entirely at their own risk and are duly excluded from any warranty, duty of care, or skill.

No part of this Report shall be reproduced or redistributed without the prior written consent of Groundsmiths. However, the Report may be issued by the Client or their Agent to the Local Planning Authority (the 'LPA') to support the discharge of any pre-commencement or other such pre-occupancy planning condition as may be imposed in relation to the Site's redevelopment under the Town and Country Planning Act 1990.

1.2 Report Context and Status

The Site currently comprises a parcel of land forming part of the curtilage of No. 42 Long Croft Street (Drawing Ref: 2589-D-20-001). It is understood that the Client proposes to redevelop (and retain) the Site for residential end use, comprising the construction of a single detached dwelling with associated access and hardstanding for parking, together with the retention of areas of soft landscaping.

The principal aim of this Report is to present a preliminary assessment of potential land contamination conditions at the Site, the general layout of which is indicated on appended Drawing Ref: 2589-D-20-003. The assessment is based on a review of currently available published geological, hydrogeological and geo-environmental information, and has been undertaken in accordance with the general requirements of BS 10175 ^[1], BS 5930 ^[2], and Land Contamination Risk Management (LCRM) guidance ^[3]. This assessment identifies potential sources of historical ground contamination, evaluates the potential risks to identified sensitive receptors, and highlights where further risk assessment and/or intrusive ground investigation may be required. The assessment has been undertaken within the context of a generic residential with home-grown produce end-use scenario, as defined by the Environment Agency ^[4].

A cursory review of geotechnical considerations has been included for context, where possible; however, detailed geotechnical design falls outside the scope of this assessment. Further assessment and/or ground investigation should be completed, subject to consultation with the project structural engineer and/or Building Control.

The interpretations and recommendations presented in this Report are specific to the Site and the proposed development described herein and should not be relied upon for adjacent land or alternative site uses. Should the proposed development proposals change, or if additional information becomes available, the conclusions and recommendations of this Report may require review in accordance with current guidance.

1.3 Objectives

The primary objectives of this Report are to:

- Obtain current information from published sources with respect to any environmental designations, SSSI, visual and cultural designations, and agricultural and/or habitat designations as may exist on-Site or within the immediate area of development;
- Obtain current information from published sources about the likely soil and groundwater conditions within the area of development;
- Identify and assess the potential for any ground related environmental hazards, including the potential for where any adverse ground gas regime may represent constraints to the proposed development;
- Define a preliminary Conceptual Site Model ('CSM') of plausible source-pathway-receptor linkages and undertake a qualitative assessment to evaluate the level of risk associated with each linkage in accordance with the proposed development end use scenario;
- Outline preliminary development recommendations, and
- Provide advice on any additional stages of LCRM assessment that may need to be completed to satisfy the concerns of the regulatory authorities, this including Stage 1 generic or detailed quantitative risk assessment with ground investigation, Stage 2 options appraisal ^[5], and/or Stage 3 remedial actions ^[6].

1.4 Scope of Works

Further to the Site walkover on the 27th April 2026, assessment undertaken within the context of this Report comprised a review of the following sources of publicly available data:

- British Geological Survey ('BGS') 1:50,000 and 1:10,000 scale series (solid & drift edition) geological mapsheets ^[7,8]
- British Geological Survey Onshore GeoIndex records database ^[9]
- Groundsure - Enviro+GeoInsight Data Report (Appendix A) ^[10]
- Groundsure - Historical Ordnance Survey ('OS') Plans (Appendix B) ^[11]
- Zetica UXO ^[12]

1.5 Previous Reports

Groundsmiths are not aware of any ground investigation-related studies having been completed for the Site.

1.6 Limitations of Study

This Report has been compiled subject to the limitations detailed in Section 8 and any other limitations stated separately in the body text.

Where further environmental works are identified, these should be undertaken within the framework of LCRM and in accordance with current UK legislation and guidance. No intrusive ground investigation works have been completed as part of this assessment.

2 SITE SETTING

2.1 Details & Description

A general summary of the Site’s setting is given in Table 2.1, below. This is based on current information and the walkover.

Table 2.1 - General Site Details

National Grid Reference	The National Grid Reference (NGR) for the Site is indicated to be 410262mE 415575mN.
Area of Development	The area of development is indicated to be 0.03ha.
Ground Elevations	General topographic data for the Site indicates that the upper part lies broadly at 144.50m AOD, reducing to between 140.00-141.00m AOD at the lower (garden) level.
General Site Description	For reference, a photographic record of the walkover is presented as Plates 1 to 12. The Site currently forms part of the existing residential curtilage to No.42 Long Croft Street. Its upper area consists of hardstanding and is used for parking, whilst the lower level (beyond a concrete retaining structure) is private garden space.
Adjacent Land Use	Land immediately surrounding the Site is predominantly residential in nature. To the north, adjacent land comprises established residential properties fronting Long Croft Street. To the east and west, the Site is bounded by neighbouring residential plots and associated garden areas, too. To the south, beyond the lower garden area, the land falls away into a lower-lying corridor associated with a railway line, with surrounding land comprising vegetated embankments. No significant commercial or industrial land uses are located immediately adjacent to the Site.
Invasive Species	Invasive plant species were not observed at the time of the walkover, although all other assessments in this regard should be completed as required.

2.2 Anticipated Geology & Hydrogeology

A summary of the salient geological data for the Site is given in Table 2.2, below and overleaf.

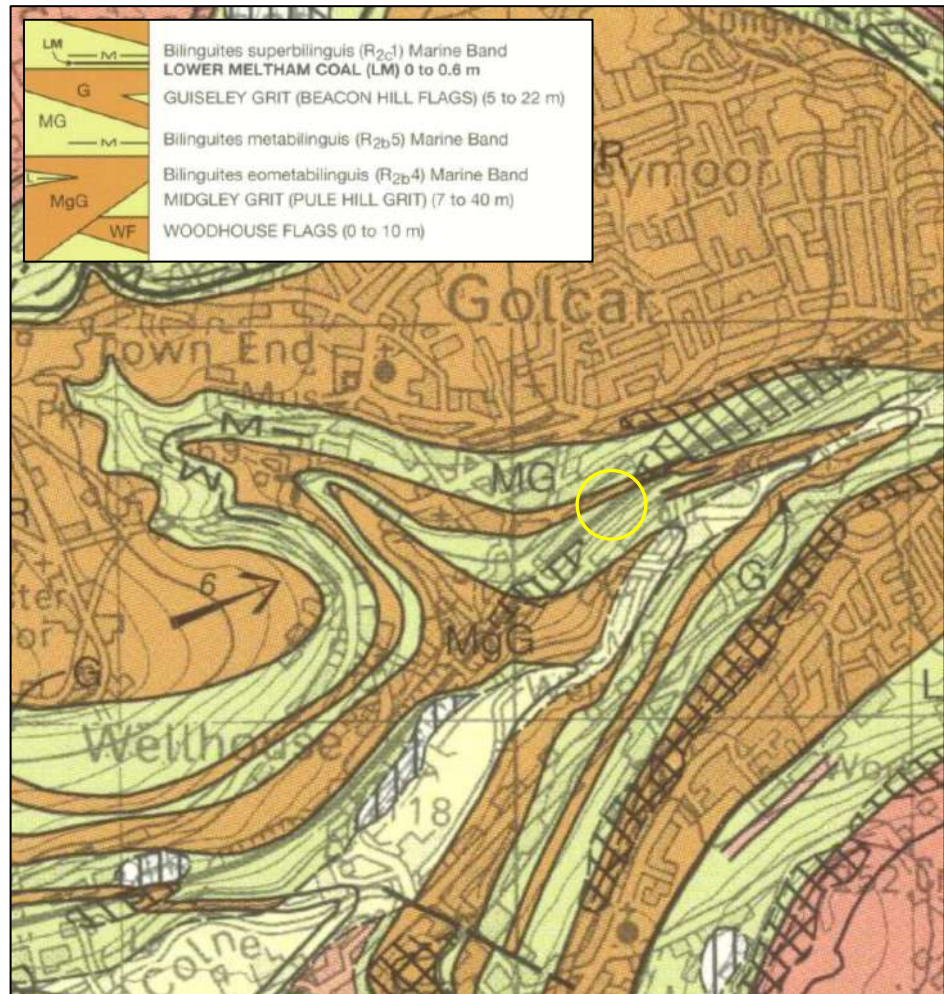
Table 2.2 - Published Geological Conditions

Radon	Between 3% and 5% of properties are estimated to exceed the Radon Action Level. Basic radon protective measures are indicated as being required in construction on this basis.
Superficial Geology	Data obtained from the BGS indicates that there are no superficial deposits present on-Site.

Contd./

Bedrock Geology

The solid geology underlying the northern half of the Site is indicated, based on published BGS DiGMapGB mapping datasets, to comprise sandstone of the Guiseley Grit, whilst the southern half of the Site (or at least part of it, allowing for any discrepancy in geological boundary position) is underlain by mudstone and siltstone of the Marsden Formation (Millstone Grit Group). NOTE: *Earlier mapping (BGS, 2003) describes the underlying strata more generally as mudstone and siltstone within the Millstone Grit Group.*



Source: BGS Mapsheet 77 (2003) 1:50,000 scale

The Guiseley Grit typically comprises a sequence of medium- to coarse-grained sandstone, generally strong and well-cemented. The unit is commonly thickly bedded and may locally contain subordinate siltstone or mudstone partings. The sandstone is typically grey to buff in colour and is relatively competent, although weathering near surface can result in some weakening and increased fracturing. Its general thickness is recorded as being between 5-22m.

The underlying strata comprise interbedded mudstone and siltstone, typically grey in colour and of variable strength. These materials are generally weaker and more compressible than the overlying sandstone and may be prone to weathering and softening when exposed. The sequence may also include occasional thin sandstone bands.

Contd./

Coal	<p>The Lower Meltham Coal is locally recorded above the Guiseley Grit within the regional stratigraphy; however, given that the Site is indicated to be underlain by Guiseley Grit sandstone, this coal is not anticipated to be present beneath the Site. Its occurrence is considered to be discontinuous and locally absent.</p> <p>Mining Remediation Authority data indicates that the Site lies within an area classified as Development Low Risk. No records of shallow coal workings, probable unrecorded coal workings, surface workings, or mine entries are identified that would be expected to affect the proposed development.</p> <p>A recorded void is identified within the Groundsure dataset. However, historical mapping indicates that a railway cutting has been present immediately to the south of the Site since at least 1854. In the absence of any evidence of underground coal workings or mine entries, the recorded feature is considered to be associated with this long-established railway cutting, rather than subsurface mining activity. No further assessment is considered necessary.</p>
Bedrock Faults	<p>There are no apparent recorded geological fault lines within at least 500m.</p>
Artificial Deposits	<p>Groundsure data does not record the presence of any made ground/artificial deposit within the boundary to the Site. Unspecified ground working is noted from 103m to the north-east, with this appearing to be associated with former quarrying at Scar Wood in the 1850s - 1890s. Tipping within the southern part of Scar Wood is noted on the 1960s OS plans.</p>
Worked Ground	<p>There is recorded worked ground (void) from 0m distance, which is assumed to be associated with the London & North Western Railway (cutting) that has been mapped to the south of the Site since the first edition OS plans in 1854.</p>
Hydrogeology	<p><u>Aquifer within Superficial Deposits on Site:</u> Not applicable.</p> <p><u>Aquifer within Bedrock on Site:</u> Secondary A (formerly minor aquifers given their potential to support water supplies at a generally local scale).</p> <p><u>Source Protection Zones:</u> There are no source protection zones within 500m.</p> <p><u>Source Protection Zones within Confined Aquifers:</u> There are no source protection zones within confined aquifers within 500m.</p> <p><u>Groundwater Vulnerability Zones:</u> The soil/surface leaching potential is classed as being high (>70% infiltration with >550mm/year dilution), whilst the vulnerability of the bedrock geology is also indicated to be high. Any groundwater flow through the bedrock would be via secondary porosity.</p> <p><u>Groundwater Vulnerability – Soluble Rock Risk:</u> No soluble rocks are identified as being present beneath the Site.</p>
Hydrology	<p>Review of available mapping indicates that the nearest recorded surface water feature relates to the Huddersfield Narrow Canal from 122m to the south-east. A direct hydrological connection between Site and the canal is not considered likely.</p> <p>Further to the above, the Site is indicated to lie within the catchment of a Water Framework Directive surface water body, this being associated with:</p> <ul style="list-style-type: none"> • River Colne from Wessenden Brook to River Holme (Ref. GB104027063330).

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The Site is also indicated to lie within a Water Framework Directive groundwater body catchment. Data provided by the Environment Agency ^[13] indicates that the groundwater body associated with the 'Aire & Calder Carboniferous Limestone, Millstone Grit & Coal Measures' achieved an overall classification of 'Poor' in 2019.

2.3 Designations

The Groundsure report provides details on property-specific environmental designations in addition to other potential actions associated with non-environmental search returns such as planning constraints. The following salient information is presented in Table 2.3, below and overleaf.

Table 2.3 - Published Designations & Other Potential Actions

SSSI	There are no statutory protection sites within 2km.
Ramsar	There are no records relating to conserved wetland areas under the Convention of Wetlands of International Importance within 2km.
SAC	There are no records of Special Areas of Conservation having been designated under the EC Habitats Directive within 2km.
SPA	There are no records of sites having been classified by the UK Government under the EC Birds Directive within 2km.
NNR	There are no records relating to important natural or semi-natural terrestrial ecosystems within 2km.
Nature Reserves	There are no records relating to local nature reserves within 2km.
Designated Woodland	There are no recorded areas of ancient woodland within at least 1.1km.
Green Belt	The South & West Yorkshire Green Belt is mapped from 40m to the north-east.
Nitrate Sensitivity	There are no records relating to nitrate sensitive areas within 2km.
Nitrate Vulnerability Zones	There are no records relating to nitrate vulnerable zones within 2km.
Visual & Cultural Designations	There are no world heritage sites, areas of outstanding natural beauty, national parks or registered parks and gardens within at least 250m.
Conservation Area	The Site lies within the Golcar (Kirklees) conservation area.
Habitat Networks	Groundsure data indicates that there are deciduous woodland from 41m to the north-east, but no habitat networks, open mosaic habitat, or limestone pavement orders within 250m. As such, habitat connectivity is not considered to represent a constraint to the proposed development.

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Archaeology	The potential for below-ground archaeology has not been identified within the remit of this assessment.
UXO	Information obtained from Zetica suggests that the Site lies within a low-risk zone from unexploded ordnance. Further detailed risk assessment is unlikely to be required.

2.4 Environmental Records

A summary of salient published environmental data is presented in Table 2.4, below and overleaf.

Table 2.4 - Published Environmental Data

Landfill	<p>Groundsure data records a former refuse heap beyond the southern railway line from 58-70m, and a former refuse heap to the north-east from 71m (at Scar Wood). There's also an historic 'waste works' site from 244m north, although no further details are available.</p> <p>There appear to be no BGS/EA recorded active, recent, or historic landfills within 500m, other than for The Folly, Cowersley Lane, Linthwaite (472m south-east).</p>
Flooding	<p>Assessment of risk against flooding events is not within the remit of this study, so specialist advice should be sought as required, with all necessary studies and reports being completed to obtain regulatory sign-off.</p> <p><u>River & Coastal Flooding:</u></p> <p>The Site is not indicated to lie within either Flood Zone 2 or Flood Zone 3.</p> <p><u>Surface Water & Groundwater Flooding:</u></p> <p>The highest risk level from on-Site surface water flooding is indicated to be negligible, whilst within 50m it is 1:100 years (0.1-0.3m). The highest risk level from on-Site groundwater flooding and within 50m is indicated to be negligible.</p>
Potable, Surface, and Groundwater Abstractions	Groundsure data indicates the nearest active groundwater/potable abstraction to be located 984m to the south-west, whilst the nearest active surface water abstraction is 295m to the south-east.
Public Register of Contaminated Land	There are no sites determined as being Contaminated Land under Part 2A of the Environmental Protection Act (1990).
Dangerous or Hazardous Sites	There are no COMAH recorded sites within at least 500m.
Radioactive Substances	There are no live radioactive substance authorisations within 500m.
Fuel/Garage Sites	There are no records of any active or historic petrol stations or garages within 500m.
Industrial Land Use	No historical industrial land uses are recorded within the Site or within 50m. However, features including mills, tanks, railway infrastructure, sewage works, quarries, and refuse heaps are recorded within the surrounding area (c.50–500m).

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	These uses represent potential sources of contamination (e.g. hydrocarbons, metals and made ground), although given their off-site location, the risk to the Site and its proposed redevelopment is considered to be very low.
National Grid	There are no records relating to National Grid high pressure gas transmission pipelines or high voltage underground electricity transmission cables within 500m.
Mine Gases	No record of mine gas emissions is indicated by the Mining Remediation Authority.
Hazardous Substance Storage/Use	There are no recorded consents for any site to hold hazardous substances at or above defined limits within at least 500m.
Pollutant Release to Surface Water	There are no recorded Red List discharges within at least 500m.
List 1 Dangerous Substances	There are no recorded List 1 discharges within at least 500m.
Pollution Incidents	There nearest recorded (EA/NRW) pollution incident is from 142m to the south-east. This relates to the release of crude sewage in 2001. Only a minor impact to water receptors was recorded, although no further details are available. This presents no risk to the Site's redevelopment.

2.5 Site History

It is not the intention of this Report to reproduce or describe in detail all of the changes that may have occurred on, or within a radius of approximately 250m to the Site, although a general review of available historical OS maps dating between 1854 and 2015 has been undertaken to identify any potentially contaminative former land-uses that may significantly impact upon the proposed development.

It should be noted that defined boundary on some of the maps may not fully align with the Site's position. Furthermore, some of the OS map editions may not be fully complete. It is possible, therefore, that additional land uses to those presented on the plans could have occurred in the past. A general chronology of the historical land use at the Site and within its surrounding area is presented in Table 2.5, below and overleaf.

Table 2.5 - Principal Historical Ordnance Survey Features

Year	Principal On-Site Features	Principal Off-Site Features
1854-1870	The first edition OS mapping (1854) shows the Site as open, undeveloped land, likely comprising grassland or agricultural use.	The surrounding area is largely rural and undeveloped, with limited scattered buildings present. Scar Wood is prominent to the north-east, with evidence of quarrying along its northern edge. A railway line and associated cutting are established immediately to the south, forming a prominent engineered feature within the landscape. Various woollen mills are present across the valley to the south-east, and Golcar railway station is located to the south-west.

Contd./

1880-1907	No change; the Site remained undeveloped.	Long Croft Street is shown projected (1892) to the north of the Site, with early residential development emerging to the north. Industrial activity, including the various mills, is present across the wider area, alongside some localised quarrying and ground workings.
1910-1920	The 1918 OS mapping indicated the Site remained undeveloped, although some regrading/clearance appeared to have occurred in preparation for development.	Residential development becomes more established along parts of Long Croft Street by c.1918-1919. The railway remains in operation, with evidence of continued industrial activity and ground disturbance within the wider area.
1930-1950	By 1932, the Site lies within the curtilage of No. 42 Long Croft Street and is assumed to be in use as garden.	Continued residential development has occurred along Long Croft Street, and expansion within Golcar to the north and west. The railway remained operational, with limited industrial features persisting within the wider area.
1960-1970	No significant changes are noted; the Site remained undeveloped within the curtilage of No. 42.	Residential use predominates. Spoil tipping is recorded within Scar Wood, particularly along its southern margins adjacent to the railway. Additional tipping is evident within the wider area south of the railway. Tipping appears to have ceased prior to 1970, with areas subsequently restored, remaining wooded, or left in passive use.
1980-1990	No further changes to the Site are indicated.	Continued residential expansion is mapped, including infill development along Long Croft Street during the mid- to late-1980s. The railway corridor and associated vegetated embankments remain a consistent feature.
1993-2015		The surrounding area is established and predominantly residential in character. No significant new industrial or potentially contaminative land uses are identified.

In summary, historical mapping indicates that the Site has remained largely undeveloped throughout the available record, initially comprising open land before becoming incorporated into the curtilage of No. 42 Long Croft Street during the early 20th century. Since that time, the Site appears to have been used for garden and associated residential purposes.

The surrounding area historically comprised a mix of rural, industrial and transport-related land uses, including railway infrastructure, localised quarrying and woollen mills within the valley to the south and east. Areas of spoil tipping and ground disturbance were also present within the wider locality during the mid-20th century, particularly within Scar Wood and beyond the railway corridor. These activities appear to have been localised and subsequently ceased, with the affected land either restored, remaining wooded, or reverting to passive use.

No evidence of significant potentially contaminative land uses has been identified within the Site boundary. Whilst historical industrial and tipping activities are recorded within the wider

area, the potential risk to the Site is considered limited given their off-site nature, separation distances, and the absence of any obvious pollutant linkages.

3 PRELIMINARY ENGINEERING APPRAISAL

3.1 Soils

Artificial Deposits

There is no record of made ground within the Site in the available datasets. However, historical mapping indicates that the Site originally comprised sloping open ground falling towards the railway cutting to the south. The current configuration of the Site as a partially levelled platform, together with the presence of a retaining structure along its central section, suggests that the Site has been subject to localised regrading and levelling with fill soils. Anecdotal information obtained during the walkover supports this interpretation, indicating that natural bedrock material arising from historic foundation excavation works on nearby residential plots (given the largely benched nature of the hillside) was used to infill ground in front of the retaining structure for a previous owner.

Historical mapping does not indicate any on-site industrial land uses or other activities typically associated with potentially contaminative made ground. Although areas of spoil tipping are recorded within the wider locality, including within Scar Wood and to the south of the railway, there is no evidence to suggest that such activities encroached onto Site given the long-standing residential nature of Long Croft Street.

Notwithstanding the above, and whilst detailed geotechnical assessment falls outside the scope of this study, the inferred presence of infill soils indicates that intrusive ground investigation should be undertaken to confirm on-Site ground conditions and to inform the design of foundations and any new retaining structures for the proposed development. This should be progressed in consultation with the project structural engineer and other relevant parties.

Natural Strata

Bedrock geology is indicated to comprise sandstone of the Guiseley Grit, with underlying mudstone and siltstone of the Marsden Formation (Millstone Grit Group). However, given the scale of mapping and local geological variability, the precise distribution of these units and the boundary between them beneath the Site is uncertain. In particular, it is possible that the Site may be wholly underlain by mudstone and siltstone, or comprise variable transitions between sandstone and finer-grained materials across the Site.

The mudstone and siltstone units are typically weaker and more fissile than the overlying sandstone and may therefore be susceptible to weathering and softening, particularly where exposed or near surface. As such, variability in bedrock composition and condition may influence near-surface ground conditions.

Furthermore, the inferred presence of localised infill soils associated with historical regrading of the Site indicates that the depth to natural strata may vary across the Site, with potentially greater thicknesses of reworked material present towards the upper (northern) part of the Site, and shallower bedrock anticipated towards the lower garden area.

Accordingly, intrusive ground investigation should be undertaken to confirm the underlying ground conditions and variability in bedrock profile beneath the proposed development, and to inform the design of foundations and any proposed retaining structures.

Groundwater

Given the hillside setting and the presence of the railway cutting immediately to the south, groundwater would be anticipated to occur at depth within the underlying bedrock, with the potential for localised perched groundwater to occur within near-surface soils and along the interface between infill material and the underlying natural strata.

Groundwater flow is expected to be generally directed downslope towards the railway corridor. The presence of regraded ground and retaining structures may also give rise to localised variations in drainage and the potential for seasonal seepage, particularly following periods of prolonged rainfall.

Whilst groundwater is not anticipated to present a significant constraint to the proposed development, the variability associated with the Site's topography and inferred ground conditions indicates that groundwater levels and any localised seepage should be confirmed through intrusive investigation. This would allow appropriate consideration to be given to foundation design and any required drainage measures.

3.2 Landslip (Mass Movement Deposits)

The available Groundsure data does not record mass movement deposits or mapped landslip features within the Site or locally to it. However, given the hillside setting, the presence of a railway cutting immediately to the south, the anticipated mudstone and siltstone bedrock, and the inferred presence of localised infill/reworked soils retained within the Site, some potential for localised instability cannot be fully discounted.

Mudstone and siltstone strata may be more susceptible to weathering, softening, and degradation where exposed or where groundwater/seepage is present. In addition, the existing retaining structure and any changes in ground levels associated with redevelopment could potentially influence local stability conditions.

On this basis, whilst no significant regional instability is indicated by the available published data, slope stability and retaining wall/foundation interactions should be considered further by the project structural engineer. Where required, this should be supported by appropriate intrusive ground investigation and geotechnical assessment to confirm ground conditions, groundwater/seepage conditions, and relevant design parameters.

3.3 Foundations & Ground Slab

The scope of this desk-based assessment does not extend to the design or specification of foundations. The type and depth of foundations required for the proposed development will be dependent upon the ground conditions encountered, including any variability in the inferred fill material and underlying bedrock profile.

The selection and design of foundations should be undertaken by the project structural engineer, informed by site-specific ground conditions to be confirmed through intrusive investigation, as required. The scope and specification of any intrusive investigation to be completed should be agreed with the project structural engineer and other relevant parties to ensure that all necessary geotechnical parameters are obtained.

3.4 Heave Precautions

The combination of shrinkable soils and trees, hedgerows, and shrubs represents a potential hazard to foundations and supported structures due to the effects of volume change and ground movement.

For information at this time, all foundations would need to be provided in accordance with current heave precautionary guidelines^[14] if they lie within the zone of influence of removed, existing, or proposed planting when in cohesive soils (which includes mudstone and siltstone) or where seasonally desiccated soils are present at the time of construction. Information with respect to the plasticity indices and worst-case volume change potential of any proven or suspected cohesive soils would need to be obtained to assist with foundation design.

The need for any precautions in construction and how these interact with the foundation solution should be discussed further with the project structural engineer once ground investigation and laboratory analytical works have been completed.

3.5 Superstructure Precautions

The requirement for any superstructure precautions will be dependent upon the final development layout, foundation solution, retained ground levels, and the actual ground conditions encountered. Given the potential for variable near-surface conditions, including reworked/infilled soils, variable bedrock, and possible localised differential movement, appropriate consideration should be given to the interaction between the proposed foundations, retaining structures, and superstructure.

The specification of any superstructure precautions falls outside the scope of this desk-based assessment and should be determined by the project structural engineer. Where required, this should be informed by site-specific ground investigation data and any associated geotechnical assessment.

3.6 Excavation Stability

Given the indicated presence of localised infill/reworked soils within the northern part of the Site, excavation conditions should be expected to be locally variable and potentially unpredictable. Both artificial soils and the weathered underlying natural strata may be locally unstable where exposed within unsupported excavations.

Excavation faces may be prone to collapse, particularly where steep or unsupported cuts are formed. Instability may be exacerbated during periods of wet weather, where excavations are deep, left open for extended periods, or where perched groundwater or seepage is encountered. Under such conditions, excavation faces may deteriorate or widen due to localised collapse.

All excavation works should be undertaken in accordance with current HSE guidance, *Structural Stability During Excavation* ^[15]. Where there is potential for weak or unstable ground to be present, including across site boundaries, a geotechnical risk assessment should be carried out prior to excavation. Temporary or permanent support measures should be implemented as necessary to maintain stability.

3.7 Natural Ground Subsidence

Groundsure data indicates a very low susceptibility to shrink–swell, compressible, collapsible and running sand deposits, and negligible risk associated with soluble rock dissolution. A worst-case low susceptibility to landsliding is identified, which is considered consistent with the Site’s hillside setting and underlying geological conditions. Overall, natural ground subsidence risks are considered to be low.

3.8 Obstructions in Excavation

Whilst no subsurface obstructions are recorded within the available datasets, the potential presence of localised obstructions and/or shallow bedrock should be anticipated. In particular, variability in bedrock levels may give rise to locally variable excavation conditions across the Site.

Where shallow or near-surface bedrock is encountered, excavation may be more difficult and may require the use of appropriate plant or breaking techniques. Conversely, where infilled soils are present, excavation faces may be less stable and more susceptible to localised collapse. Such variability may influence excavation methodology, foundation formation levels, and construction sequencing. Accordingly, these conditions should be confirmed as part of any intrusive ground investigation and taken into account in the design and construction of the proposed development.

3.9 Concrete

Protection would be required where buried concrete is to be in contact with soils that exhibit elevated concentrations of sulphate. Advice should be sought from the project structural engineer to confirm the ACEC and Design Chemical class of concrete to be adopted at the design stage, following representative sampling and testing of the underlying soils as required. Reference should be made to BRE Special Digest 1 ^[16] for the classification of the ground, and to BS8500-1 ^[17] for the specification of the concrete.

3.10 Stress Relief

Where bedrock is encountered at shallow depth, excavation may result in localised stress relief within the upper horizon. This can give rise to loosening, fracturing or softening of the rock mass, particularly within mudstone and siltstone strata, which are more susceptible to degradation when exposed. Such conditions may influence the behaviour of excavation faces and the performance of foundation formations if not appropriately managed. Accordingly, any exposed rock should be assessed at the time of excavation, and foundation levels adjusted or prepared as necessary to ensure suitable bearing conditions.

3.11 Pavement

The proposed access and parking areas to the development are understood to be limited in extent and located within the northern part of the Site. Subject to confirmation of ground conditions during construction, it is anticipated that preparation would comprise removal of unsuitable near-surface materials and appropriate compaction of the exposed subgrade prior to construction of the pavement build-up.

Given the limited scale and domestic nature of the proposed hardstanding, detailed pavement design testing, such as CBR testing, is not considered necessary at this stage. However, should soft, loose, wet, or otherwise unsuitable soils be encountered at formation level, further assessment and/or localised excavation and replacement may be required, to be agreed with the project designer or structural engineer.

3.12 Site Drainage

Given the anticipated presence of fissile bedrock, together with the hillside setting of the Site and infill materials, infiltration drainage is unlikely to be appropriate. The low permeability of the underlying strata and the potential for perched groundwater and downslope flow may limit the effectiveness of infiltration systems and could give rise to localised instability or seepage.

Accordingly, drainage for the proposed development should be designed on the basis of non-infiltration methods, such as connection to the public sewer network or other appropriately designed surface water management systems, subject to agreement with the LPA.

The detailed design of the drainage system falls outside the scope of this assessment and should be undertaken by the project drainage engineer or other suitably qualified designer.

4 PRELIMINARY ENVIRONMENTAL APPRAISAL

4.1 Introduction

Current UK legislation on contaminated land is set out in Part 2A of the Environmental Protection Act 1990 ^[18], which was retrospectively inserted by Section 57 of the Environment Act 1995 ^[19]. The Contaminated Land Regulations 2000 ^[20] were amended in 2005. The Environmental Protection Act 1990: Part 2A Contaminated Land, Statutory Guidance, Edition 2 (2006) promulgates the revised statutory guidance with respect to the operation of the Contaminated Land Regime following the implementation of the Contaminated Land Regulations, 2005. The definition of contaminated land is central to the operation of Part 2A.

Legislation adopts the principle of a 'suitable for use' approach for the assessment of contaminated land, the rationale being reflected in the site-specific risk assessment and determination of remedial strategy; action is only required if unacceptable risks are posed to human health or to the environment, considering the site's land use and geo-environmental setting.

The legislation places a responsibility on the LPA to determine whether the land under its jurisdiction is contaminated by consideration of whether:

- The presence of substances (potential contaminants) are present at concentrations that are causing significant harm or have the significant possibility of causing significant harm;
- There are receptors which may be harmed (e.g. the water environment, human health, buildings, fauna and flora), and
- There is in existence a pathway between the identified sources and receptors.

To qualitatively assess the level of risk at the Site, the above rationale has been applied. This approach is consistent with the preliminary risk assessment procedure defined in LCRM. The following section summarises the preliminary CSM which has been produced following the review of available pertinent third party information. The CSM summarises Groundsmiths' current understanding of the surface and sub-surface features, potential sources of contamination, likely transport pathways, and the receptors, in order to support the identification and assessment of plausible potential contaminant linkages.

4.2 Potential Sources of Contamination

A potential source is defined as 'a contaminant which is in, or under the land and has the potential to cause harm to human health or to cause contamination of controlled waters receptors'.

Historical mapping and available environmental data indicate that the Site has not been subject to any known industrial land uses or other activities typically associated with significant contamination. The Site has historically formed part of the residential curtilage to No. 42 Long Croft Street and is currently predominantly hard paved.

The Site has been subject to localised infilling and regrading associated with the formation of the existing development platform. Information obtained during the walkover indicates that the infill soils comprise locally won natural materials arising from historic excavation works on

nearby residential plots. Contamination is not generally associated with such residential development or with the use of locally derived natural strata. Although railway, quarrying and tipping activities are recorded within the wider locality, there is no evidence to suggest that these activities extended onto the Site or otherwise represent a significant source of contamination to the proposed development.

Although no formal investigation has been undertaken within the remit of this assessment, the overall risk to the proposed development and future Site end users is considered to be very low given the Site's history and setting. As with any site, however, the presence of unforeseen contamination cannot be entirely discounted. Whilst there is no evidence to suggest that significant soil contamination or adverse ground gas conditions (other than for low-level radon potential) are likely to be encountered, a limited number of potential source–pathway–receptor linkages have nevertheless been assessed on a precautionary basis for completeness. These are summarised in the tables below.

Table 4.1 - Summary of Potential Sources and Contaminants

Potential Sources	Typical Contaminants (If present)
i – localised unforeseen contamination within reworked infill soils	Metals, metalloids, inorganic contaminants, phytotoxic contaminants, sulphate, and PAH (e.g. Benzo(a)pyrene)
ii – ground gas sources (off-Site historical tipping/infilled ground)	Carbon dioxide (CO ₂), methane (CH ₄)
iii – underlying natural strata	Radon

4.3 Potential Migration Pathways

Migration pathways are routes by which contaminant sources may come into contact with receptors. Potential pathways for different types of contaminants vary depending on the properties of the contaminant, the mechanism of its release and the nature of the receptor. The principal potential contaminant pathways by which receptors might become exposed to the potential contamination sources, as identified, are summarised as follows.

Table 4.2 - Summary of Potential Plausible Pathways

Potential Sources	Potential Pathways
i - localised unforeseen contamination within reworked infill soils	Direct ingestion, dermal contact and inhalation of dust associated with the soils
	Leaching and/or direct contact with potable water supply pipes

Contd./

... Contd./	Vertical or lateral migration of leachable contaminants through soils and/or fractured bedrock
	Plant root uptake
ii – ground gas sources (off-Site historical tipping/infilled ground)	Migration of ground gases and/or accumulation in void spaces via transport through service conduit, any permeable fill material and/or any permeable layers and horizons within the underlying natural strata
iii – underlying natural strata (radon)	Migration and/or accumulation in void spaces via transport through service conduit, any permeable fill material and/or any permeable layers and horizons within the underlying natural strata

4.4 Potential Receptors

A receptor is the potential target of the source contaminant, to which either significant harm or deterioration in quality may be caused. The potential sensitive receptors with respect to the potential contamination hazards identified above are considered below.

Table 4.3 - Summary of Potential Receptors

Potential Receptor	Comment
Human Health	Site end-users in the residential with home-grown produce end use scenario Site operatives (during construction phase only) Future workers involved with any in-ground maintenance works
Property / Infrastructure	Potable water supply pipes Foundations and buried concrete Localised areas of soft landscaping
Controlled Waters	'Secondary A' bedrock aquifer (there are no nearby surface watercourses)

4.5 Environmental Risk Assessment

Risk assessment and the procedure of identifying sources, pathways and receptors is recognised as an approach to determine the extent and significance of contamination either within the context of Part 2A (when assessing current site status or when considering the acquisition of an existing development) or the planning process (for the redevelopment of an existing site, or when considering the acquisition of a site for redevelopment purposes). Either way, the 'suitable for use' approach is adopted when assessing risk and the source-pathway-receptor assessment defines the conceptual model for the site.

The statutory guidance describes a risk assessment methodology in terms of 'significant contaminants' and 'contaminant linkages', using the 'source-pathway-receptor' scenarios for the site. Contaminant linkages are formed when there is a linkage between a contaminant source and a receptor by means of a pathway. The existence of a contaminant linkage is

dependent on site use, as well as environmental conditions. If no contaminant linkages can be proven, then the risks may be discounted. However, it is not to say that remediation is required if contamination is proven. The identified potential contaminants and receptors have been considered in relation to the pathways that may link them. The risk classification has been estimated in accordance with those methods prescribed in CIRIA C552 ^[21]. Risk is regarded as a combination of the likelihood of an 'event' occurring and its severity: both elements must be considered when assessing risk. The method for risk assessment, or evaluation, is purely qualitative. As defined in CIRIA C552, the magnitude of the potential 'severity' of risk occurring may be assessed against:

- **Severe (acute):** short term risk to human health likely to result in significant harm as defined under Environmental Protection Act 1990, Part 2A. Short term risk of pollution to sensitive water receptor (may result in death).
- **Medium (chronic):** long term risk and significant harm to human health, contamination of sensitive water resource or significant change to an ecosystem or specific organism (may result in death).
- **Mild (chronic, but applicable to less sensitive receptors):** contamination of non-sensitive water resource but significant damage to crops, buildings, structures and services or the environment.
- **Minor (not significant):** harm, which may result in financial loss, or expenditure to resolve. Non-permanent effects to human health. Easily repairable effects of damage to buildings, structures, and services.

Similarly, the classification of the magnitude of the 'probability' of the risk occurring may be assessed against:

- **High Likelihood:** a contaminant linkage exists and an event appears very likely in the short term, or almost inevitable in the long term, or contamination is causing harm at the receptor. Urgent action is required.
- **Likely:** a contaminant linkage exists and it is probable that an event will occur. An event may not occur, but it is possible in the short term and likely over the long term.
- **Low Likelihood:** a contaminant linkage exists and it is possible that an event will occur. It is not certain that an event will occur over time, but it is less likely in the short term.
- **Unlikely:** a contaminant linkage exists but it is not possible to say if an event will occur even over a very long time.

Following completion of the severity and probability assessment, classifications can be compared to indicate the actual risk each contaminant linkage presents: this can only be undertaken where there is a possibility of there being an active linkage. The risk categories which can be assigned are presented in Table 4.4, overleaf, and range between 'very high' to 'very low'.

Table 4.4 - Risk Categorisation

		Consequence			
		Severe	Medium	Mild	Minor
Probability	Highly Likely	Very High	High	Moderate	Moderate / Low
	Likely	High	Moderate	Moderate / Low	Low
Probability	Low Likelihood	Moderate	Moderate / Low	Low	Very Low
	Unlikely	Moderate / Low	Low	Very Low	Very Low

Source: Table 6.5, C552 (2001).

- **Very High** – there is a high probability that severe harm could arise or that severe harm is occurring. Urgent investigation and remediation are likely to be required.
- **High** – harm is likely to occur, and that urgent investigation and remediation may be needed in the short term, but are likely over the longer term.
- **Moderate** – harm could occur. It is unlikely to be severe, most probably relatively mild. Investigation is normally required to clarify the risk with some remedial works being required in the longer term.
- **Low** – it is possible that harm could occur, but if it did, at worst it would be mild.
- **Very Low** – low possibility of harm arising, and that if it does it is not likely to be severe.

The identified potential contaminants and receptors have been considered in relation to the potential pathways that may link them. The resulting potentially active contaminant linkages are presented in Table 4.5, overleaf (NB – it is not possible to classify an identified risk as ‘no-risk’ within the framework of current UK contaminated land guidance).

Table 4.5 - Summary of Environmental Risk (Current Site Condition without Mitigation)

Potential Sources	Potential Receptors	Plausible Pathways	Probability	Severity	Risk Rating	Comment
i - localised unforeseen contamination within reworked infill soils	<u>Human Health</u>	Direct ingestion, dermal contact with soils or inhalation of dust (Site end user)	Unlikely	Mild	Very Low	An overall very low risk is anticipated with respect to contamination within the underlying soils on the basis of the Site's history, identified potential sources, and environmental setting. No significant contaminative sources have been identified and further assessment is not considered necessary at this stage.
	Site end-users, inc. maintenance workers, and construction workers (short term risk during redevelopment)	Direct ingestion, dermal contact with soils or inhalation of dust (in-ground worker)	Unlikely	Mild	Very Low	
	Potable Water Supply Pipes	Direct contact/leaching (tainting)	Unlikely	Mild	Very Low	It would be expected for standard PE pipework to be suitable for use, subject to consultation with the water provider and any soils testing they may require.
	Vegetation	Uptake via root system in soft landscaping	Unlikely	Mild	Very Low	The existing garden area is to be retained. No further works are considered necessary given the Site's history and long-standing use in the residential setting.
	Foundations	Direct contact/leaching	Unlikely	Mild	Very Low	Although considered to be a very low risk, the need for sulphate precautions for new buried concrete products should be confirmed as required.
	Controlled Waters	Vertical and/or lateral migration to aquifer	Unlikely	Mild	Very Low	No particular risk is anticipated. Further works are not considered necessary.

Contd./

Potential Sources	Potential Receptors	Plausible Pathways	Probability	Severity	Risk Rating	Comment
ii – ground gas sources (off-Site historical tipping/infilled ground)	Site End Users	Inhalation (via ingress and accumulation into buildings)	Unlikely	Medium	Low	A potential pathway could theoretically exist between the former worked/tipped ground within the wider area to the Site. However, given the separation distance and the requirement for sustained gas generation and migration to cause a risk, the likelihood of a significant ground gas regime developing beneath the Site is considered to be very low, and conditions are unlikely to exceed BS8485 ^[22] Characteristic Situation 1.
iii - underlying natural strata (radon)			Unlikely	Medium	Low	The need for basic radon precautions in construction are identified in the Groundsure report.

General Soil Contaminants

On the basis of the available information and the preliminary risk assessment presented herein, it is anticipated that the on-Site soils present a very low risk to human health with respect to the potential presence of elevated concentrations of inorganic and organic contaminants above applicable residential with home-grown produce generic assessment criteria (GAC), including DEFRA Category 4 Screening Levels ^[23], LQM/CIEH Suitable 4 Use Levels ^[24], and other in-house derived GAC values calculated by Groundsmiths for organic contaminants ^[25].

The Site currently comprises hardstanding and soft landscaped areas associated with No. 42 Long Croft Street. Historical mapping indicates that the Site remained largely undeveloped prior to its incorporation into the residential curtilage and has remained in residential use thereafter.

Whilst, as with any site, the presence of unforeseen contamination cannot be entirely discounted, there is no evidence to suggest that significant contamination is likely to be encountered. On this basis, the risk to future Site end users from soil contamination is considered to be very low, and no further assessment is considered necessary.

Unforeseen Soil Contamination - Discovery

As with any development site, there is the potential for contamination to be present that has not been identified at this stage. This is unavoidable, so allowance for additional investigation and assessment should be made as required.

If any currently unforeseen contamination was identified during development, a representative level of supplementary sampling and testing with risk assessment would be required, with appropriate remediation being undertaken subject to the outcome of the works. Consultation with the LPA would be required at that time.

Ground Gases

Significant risk from biogenic ground gases has not been identified on the basis of the Site's setting or its underlying geology. On this basis, the risk to future Site users from ground gas is considered to be very low, and no specific gas protection measures are considered necessary. A Characteristic Situation 1 determination is postulated.

Basic radon precautions are required in construction. Their installation and certification should be overseen in conjunction with Building Control. An overall low risk is postulated.

Controlled Waters Receptors

Whilst potential vertical migration pathways can exist within weathered and fractured bedrock horizons, the limited scale and anticipated distribution of any contamination within the on-Site soils is such that a credible pollutant linkage to the underlying aquifer has not been identified.

The overall risk to controlled waters is therefore considered to be very low and not significant within the context of the proposed development. No further assessment is considered necessary.

Potable Water

Water providers are required to maintain the safety of staff, contractors, and customers. On this basis, water providers work with a range of trigger values when laying mains pipes or services in contaminated ground, in the same way that assessment is made by contaminated land practitioners.

Testing in general accordance with UK Water Industry Research ('UKWIR')^[26] published guidance should be completed as required so that informed decisions may be made about the potable water supply pipework to be used in development, although it is considered that the need for protection consistent with brownfield development (e.g. Protecta-Line) is unlikely to be required. Any testing should include for corrosiveness (electrical conductivity and redox potential).

Soils Disposal (Waste Acceptance Criteria)

Where any arisings are generated during redevelopment works, and they are intended for disposal to landfill, there is a requirement to determine if they would be classified as inert, non-hazardous or hazardous. Technical Guidance WM3^[27], which was introduced on the 1st July 2015 and is adapted from the third edition of Technical Guidance WM2¹, sets out the requirement for classification. The classification assesses the composition of the material and determines the concentrations of hazardous substances within it, in relation to particular thresholds.

Given that it is a statutory requirement to ensure that wastes are characterised to meet specific acceptance criteria if disposal to landfill is to be undertaken, Waste Acceptance Criteria (WAC) testing would need to be completed in parallel with standard soils analysis. This testing would need to be undertaken on representative samples of any soils that are to be disposed of (e.g. from foundation excavations), prior to being removed from Site.

¹ Environment Agency (2011). Technical Guidance (WM2). Hazardous Waste: Interpretation of the Definition and Classification of Hazardous Waste (2nd Edition, Version 2.3).

5 FURTHER WORKS

5.1 Introduction

The overall objective of this preliminary assessment was to contribute towards an understanding of the ground conditions underlying the proposed development site located at 42 Long Croft Street, Golcar, Huddersfield. Research into the history and evolution of the Site up to the present day has been undertaken, which allows an informed assessment of potential risks to the proposed development to be made at this stage.

It is considered that the study has provided sufficient background data in terms of the historical land use of the Site and its surroundings, together with details of the general geology, hydrogeology, mining legacy, and potential sources of soil and ground gas contamination.

The preliminary environmental risk assessment, when considered within the context of the proposed end use, indicates that the risk from contamination and ground gas is very low. No significant pollutant linkages have been identified, and there is no evidence to suggest that contamination or ground gas is likely to be encountered. On this basis, no further environmental investigation is considered necessary. It should be noted, however, that a programme of intrusive investigation should be completed for geotechnical purposes to confirm ground conditions and inform foundation/slab/retaining structure design.

5.2 Objectives of Investigation

In relation to the proposed development, the objectives of an intrusive (geotechnical) ground investigation would be to:

- a. Investigate the general nature of the infill soils and underlying natural strata within the area of proposed new-build;
- b. Determine the geotechnical parameters of the underlying natural strata via laboratory based analysis, and in situ testing as ground conditions allow, notably given the split-level nature of the Site;
- c. Report the presence of any in-ground obstructions and/or other such difficulties encountered during the works;
- d. Investigate the shallow-depth hydrogeological regime beneath the Site;
- e. Undertake sulphate analysis to assist with buried concrete design, testing to UKWIR guidance, and Waste Acceptance Criteria testing for any soils disposal purposes, and
- f. Provide general advice in relation to any unforeseen environmental or geotechnical issues associated with the Site and/or any other recommendations needed to facilitate the proposed development, including, where necessary, identifying any additional phases of investigation, assessment, or remediation that may need to be carried out.

5.3 Laboratory and Field Testing

Geotechnical

Intrusive ground investigation is considered necessary to support the proposed development. The scope and specification of such works should be agreed with the project structural engineer and any other relevant parties, including Building Control, as appropriate. The extent of investigation and testing should be sufficient to characterise the underlying ground conditions within the development area and to provide the geotechnical parameters necessary to inform foundation (and any retaining structure) design.

All works should be undertaken in general accordance with the requirements of BS5930, BS10175, BS EN 1997-1^[28] and BS EN 1997-2^[29]. Investigation works should be logged on-Site by a competent engineer, with standard descriptions of the strata encountered in general compliance with BS EN ISO 14688-1^[30], BS EN ISO 14688-2^[31] and BS EN ISO 14689^[32].

Environmental

Any environmental sampling undertaken as part of the Site's assessment would need to be in general accordance with those guidelines prescribed in BS10175 and any specific requirements of the testing laboratory. All environmental soil samples would need to be collected in a combination of 500ml plastic tubs with sealable lids, 250ml glass amber jars and 60ml glass amber vials (this being subject to analytical requirements). This would also be the case for where WAC samples were taken for soils disposal purposes.

Care would need to be taken to minimise cross contamination between sampling. All of the environmental samples would need to be packed into cool boxes and transported to an MCERTS and UKAS^[33] accredited laboratory of Groundsmiths' choosing for analysis and subsequent storage / disposal. Standard retention times would apply.

5.4 Outline Remediation Requirements

Soil

The need for soil remedial activities is not expected given the Site's history and its continued use within a residential context. However, should any unexpected contamination be encountered during development, any required remediation should be undertaken in accordance with guidance prescribed by the Yorkshire & Lincolnshire Pollution Advisory Group ('YALPAG')^[34] and/or any other LPA-specific guidance. Where any remediation is to be completed, appropriate LCRM Stage 3 proposals and verification methodology would need to be prepared and submitted to the LPA in the form of a standalone Remedial Strategy.

Ground Gas

A BS8485 Characteristic Situation 1 classification is considered appropriate for the Site. On this basis, no specific gas protection measures are considered necessary. This approach should be confirmed with the LPA. Basic radon protection is required in the ground floor construction to the dwelling.

6 REGULATORY APPROVAL

This preliminary risk assessment Report has been compiled in accordance with good practice guidance for the assessment and management of land that may be affected by geotechnical and land contamination hazards.

The recommendations presented are considered reasonable on the basis of available information and the assessment of the Site as carried out by Groundsmiths. However, it remains the responsibility of the Client to ensure that the Site poses no significant risk to any sensitive receptor(s) and that it remains aligned with the proposed end-use and assessment framework adopted in this Report and any accompanying reports.

If at any time in the future, additional information comes to light that puts into doubt the accuracy of the professional opinion or third party information presented herein, be it in relation to contamination or geotechnical matters then it would be necessary to revisit this assessment.

Works undertaken cannot be guaranteed to gain approval by the regulatory authorities and / or your Warranty provider, so copies of this Report should be made available to the relevant organisations for comment and approval, prior to undertaking any irrecoverable works associated with the Site.

7 INFORMATION SOURCES

The following references have been cited in the production of this report:

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- 22 BS8485 (2015+A1:2019) Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings.
- 23 Department for Environment, Food & Rural Affairs (2014). SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document.

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 - 25 Environment Agency. Contaminated Land Exposure Assessment (CLEA) software version 1.071. <https://www.gov.uk/government/publications/contaminated-land-exposure-assessment-clea-tool>.
 - 26 UKWIR (2011). Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. Ref. 10/WM/03/21).
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8 REPORTING LIMITS

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The findings and opinions provided in this Report are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described. Factual information including, where stated, a visual inspection of the Site, has been obtained from a variety of sources. Groundsmiths assumes that third party data is reliable but cannot independently confirm this as the validity and accuracy of this information is outside our control. No guarantee can therefore be given as to the completeness of the information gathered during the study and no responsibility is accepted for errors or omissions in the third party information used. Groundsmiths' professional judgement and experience is however used to ensure that uncertainties are reduced to a level appropriate to the Site's conditions, the purpose of the investigation and the resources devoted to it by the Client.

Whilst every effort has been made to carry out a qualitative assessment that enables a realistic preliminary characterisation of the parameters to be identified, the possibility of variation in actual ground and groundwater conditions existing cannot be discounted. The findings and opinions presented in this Report are relevant to the time this assessment was undertaken but should not necessarily be relied upon to represent conditions at a substantially later date. Further information, ground investigation, construction activities, change of site use, or the passage of time may reveal conditions that were not indicated in the data presented and therefore could not have been considered in the preparation of this Report. Where such information might impact upon stated opinions, Groundsmiths reserve the right to modify the opinions expressed in this Report. Where opinions expressed in this Report are based on current available LCRM guidelines and/or other legislation, no liability can be accepted for the effects of any future changes to such guidelines and legislation. New information or improved practices and changes in legislation may require reinterpretation of the Report as a whole, or in part.

The conclusions and recommendations presented in this Report are based on the Site-specific assessment but utilising third party documentary information as appropriate. They are, however, limited to those that could be reasonably made at the time the assessment was undertaken. Where assessments of Site areas affected in particular ways are given, these are approximate.

This Report does not constitute an archaeological, ecological, arboriculturalist / invasive plant species, or detailed UXO survey. Any comment given in relation to these is for information only. Further assessments to assess these may be required as part of any planning condition and should therefore be undertaken by suitably qualified experts as required.

Groundsmiths reserve the right to edit and / or retract any conclusion or recommendation made in this Report should any further information, with respect to the Site, become available.

Groundsmiths disclaim any obligation to update the Report for events taking place after the time during which the assessment was carried out.

Groundsmiths do not provide or purport to provide legal advice. Should the Client require such advice then that of lawyers should be sought.

Groundsmiths accept no responsibility if any findings given in this Report are not implemented by the Client or their agents.

Groundsmiths accept no responsibility if any further works, as requested by the LPA in the discharge of their duty of care, are not implemented by the Client or their agents.

This Report could be reassigned to a third party if they require reliance on it in the event that the Site is sold at any time in the future. An administrative fee would be applicable in such instances, payable prior to transfer.

