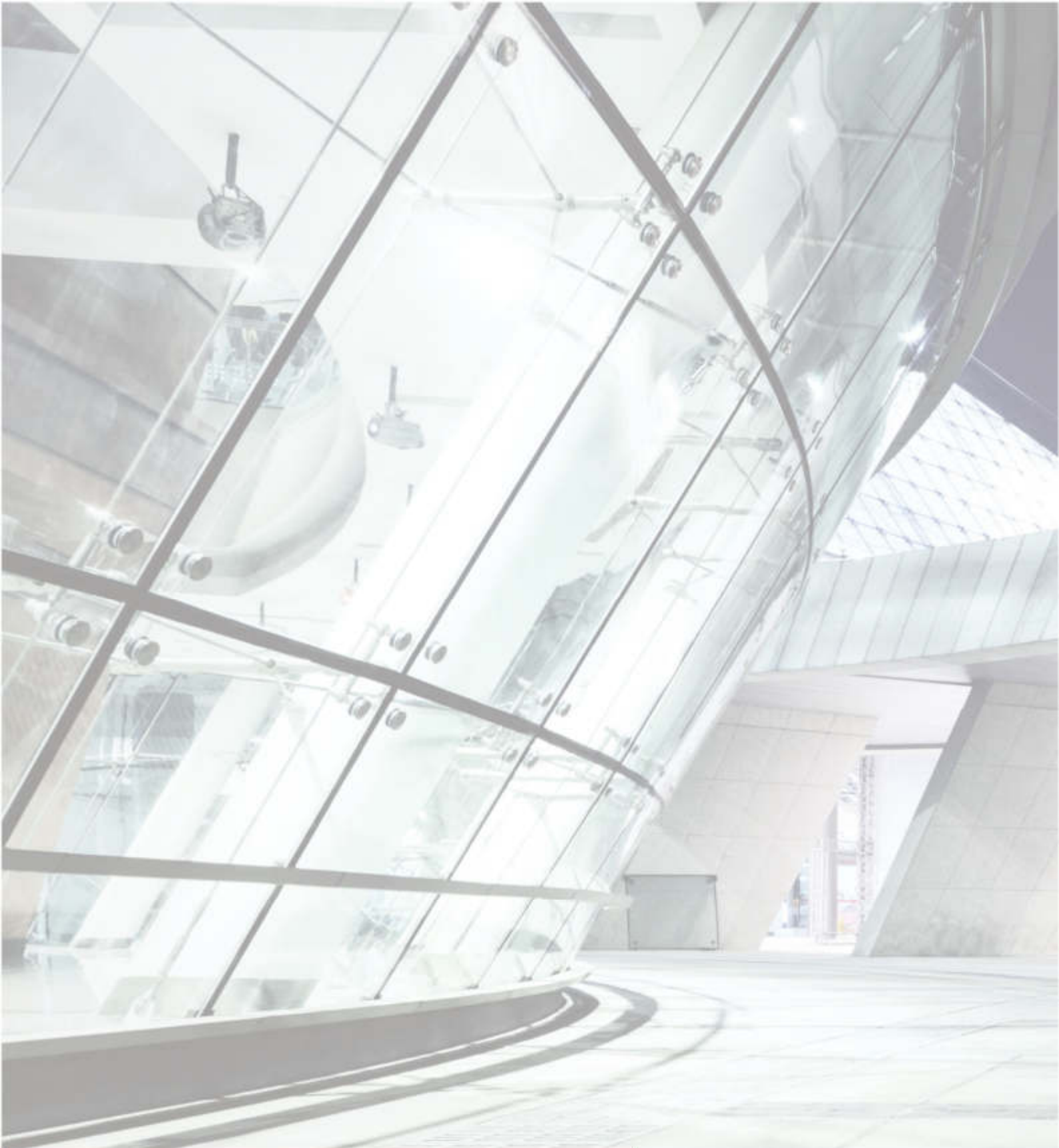




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Plans		
Plan Reference	Revision	Title
GRO-23038-P01	-	Project Location Plan
GRO-23038-P02	-	Preliminary Development Constraints Plan
GRO-23038-P03	-	Illustrative Preliminary CSM

1.0 INTRODUCTION

1.1 Project Objectives

Groundtech Consulting Limited have been instructed by 21 Living Limited to undertake a Preliminary Risk Assessment for a site at The Rock in Bury.

The objectives of the Preliminary Risk Assessment were to establish the sites environmental and geotechnical background in order to generate a Conceptual Site Model to identify any potential constraints and linkages which may affect the redevelopment of the site.

The report has been undertaken to fulfil the requirements of a preliminary risk assessment in accordance with LCRM "Land Contamination Risk Management".

1.2 Proposed Development

The proposed development is residential end use comprising the conversion and extension of the existing property in the south and a new two-storey residential building to the rear in the north. The conversion of the existing southern building will include adding an additional storey onto the already three-storey development.



1.3 Limitations

This Preliminary Risk Assessment is based on information obtained from a number of sources, and the information is assumed to be correct.

Other conditions may exist on the site that have not been taken into account in this assessment as they are outside the scope of works. Groundtech Consulting are not responsible for these circumstances that are not outlined in the report.

The assessment has been prepared for the exclusive use of the client. No third parties may rely on or reproduce the contents of the report without the written permission of Groundtech Consulting Limited. If any unauthorised

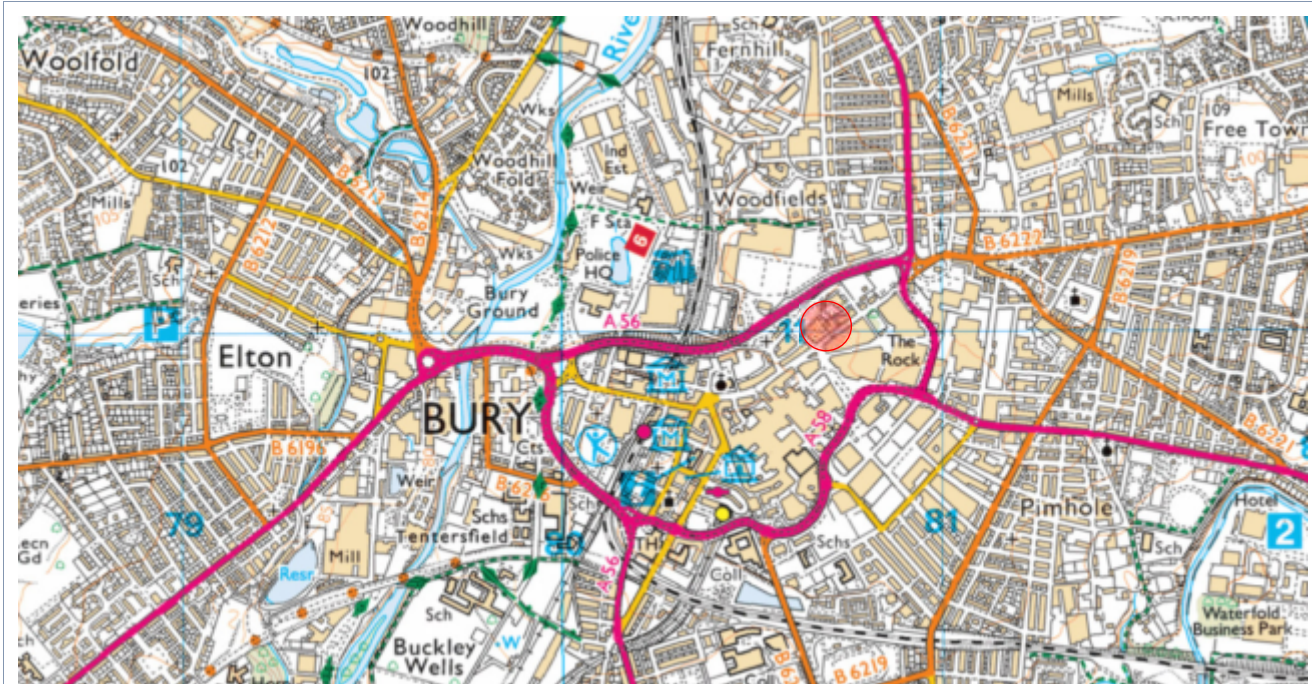


third party comes into possession of the report, they rely on it at their own risk and Groundtech Consulting Limited will not be obliged to provide a duty of care.

2.0 SITE SETTING

2.1 Location

The site is located circa 0.4km north east of Bury Town Centre as shown on the Project Location Plan *GRO-23038-P01* and is approximately centred on National Grid Reference 380708, 411012.



Project Location

Access to the site is gained from The Rock to the south of the site.

2.2 Site Description

The site is approximately rectangular in shape, covers 0.03 ha and the topography is generally level.

Onsite Features

The site is fronted by a disused three-storey building of brick and stone block construction, the windows at the rear are boarded up. It appears that the ground floor was used commercially and the upper two floors residentially. Evidence of subsidence was observed at the rear of the property where a significant crack was present beneath an existing window and the building was generally in poor condition.

Access to the rear of the property is gained via an alleyway which passes beneath the existing structure. The ceiling of the underpass is in a state of disrepair.

Single storey extensions exist at the rear of the three-storey property which extend towards the northern site boundary.

A disused concrete surfaced yard lies adjacent to the single storey buildings at the rear. The yard is overgrown and contains much rubbish, wooden pallets and a cage containing gas canisters.

Significant vegetation in the form of trees is not present onsite.

Boundaries and Surrounding Features

The southern and eastern site boundaries are formed by the external walls of the building on site and to the west and north by walls of neighbouring commercial buildings.

The site is predominantly surrounded on all sides by commercial premises and car parking areas.

Photographs are presented in *Appendix 2*, and any relevant features are recorded on the Preliminary Development Constraints Plan *GRO-23038-P02*.

3.0 ENVIRONMENTAL SETTING

3.1 Site History

Available historical maps have been obtained, a list of dates and scale are listed in the table below:

Scale	Date
1:500	1891
1:1,056	1849
1:1,250	1957-59, 1958, 1973, 1978-83, 1982-85, 1985-87, 1989-92, 1992-93, 1993, 2003
1:2,500	1890-91, 1910, 1930, 1937-39, 1959-60

The plans were examined and potential issues have been identified and summarised in the table below:

Date	Site	Surrounding Area
1849	Site predominantly covered by buildings including a public house. A pump is indicated along central western boundary. A central yard is present amongst the buildings.	Site is predominantly surrounded by commercial and residential buildings. Bowling green c.20m north west. Timber yard c.60m north east, 75m east and 100m west. Iron works and Cotton Works c.90 m south east. Burial ground c.100m east. Iron foundry c.110m north east.
1890-91	Buildings onsite depicted as a hotel. Pump no longer present.	Timber yard located c.60m north no longer present. Burial ground c.110 m north extending northwards. Reservoirs c.110m east, 230m east and 250m north. Brass foundry c.125m north east. Fustian Mills and Woollen Mills c.130m to 250m to the east. Small tannery c.175m north east. Timber yard and Saw Mill c.230m north.
1891	No significant change.	Timber yard and chimney c.50m north west.
1910	Site used as a public house.	Saw Mills c.40m north. Large refuse heap c. 100m north west. Tannery no longer depicted to the north east. Reservoir c.250m north no longer present, probably infilled .
1930	No significant change.	Timber yard c.50m north west is no longer present. Reservoir c.110m east no longer present, probably infilled . Cotton weaving mill c.120m south. Timber yard and Saw Mills c.180m west. Peel Tannery c.250m west.
1937-1939	No significant change.	Timber yard and Saw Mills c.180m west increased in size. Printing works c.170m south west.
1957-1959	No significant change.	Garages present c.150m west and 175m to 225m north east. Reservoir located c.230m infilled . Tannery to the west depicted as a Works .
1973	No significant change.	Numerous mills and works in the area now used as warehousing and car parking. Colour works c.110m south east. Electricity substation c.150m north east.
1982-85	No significant change.	Supermarket present to the immediate west.
2023	No significant change.	No significant change.

The historical plans are presented in *Appendix 3*.

3.2 Geology

The following British Geological Survey (BGS) records and other available information were inspected to accurately determine the geology underlying the site:

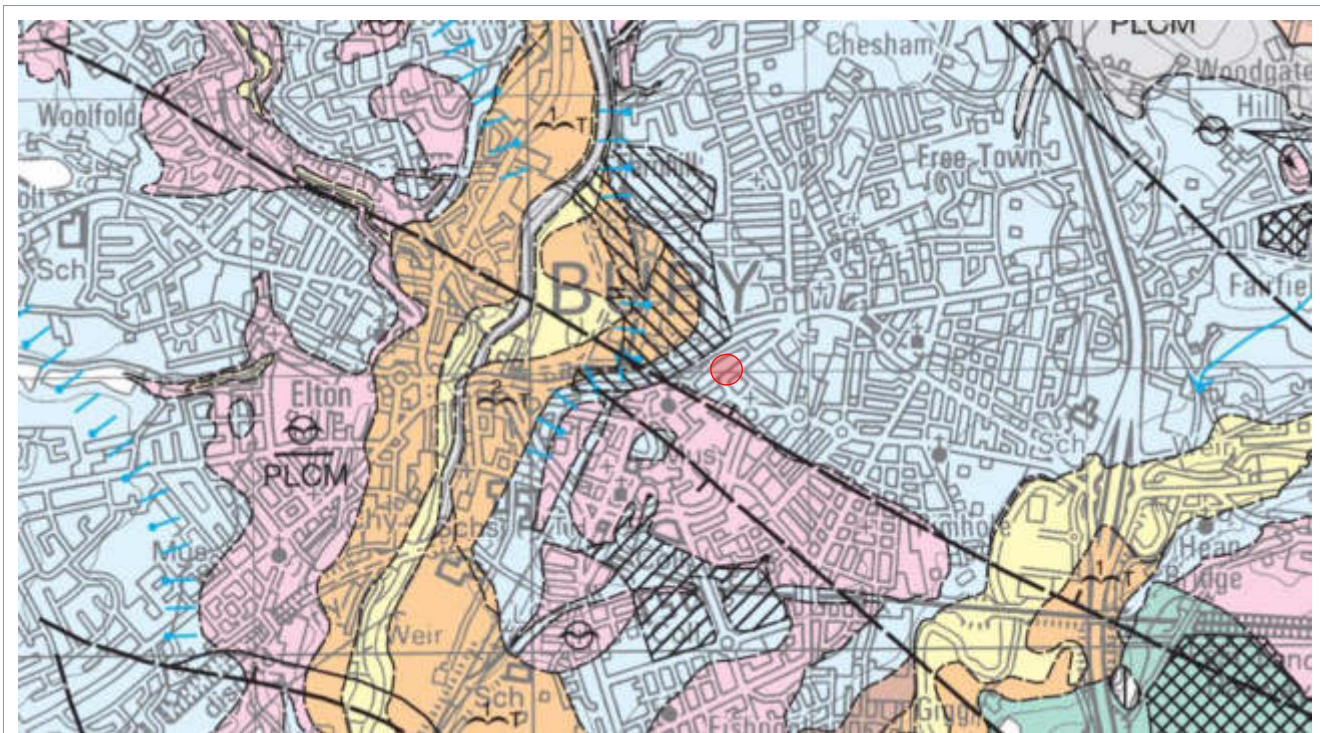
- *1:50,000 Scale Geological Sheet 85, Manchester – Bedrock and Superficial*
- *1:50,000 Scale Geological Sheet 85, Manchester - Bedrock*
- *Sheet 85 Memoir.*
- *BGS Records*

Made Ground

The available geological plans do not indicate any Made Ground beneath the site however, it is anticipated due to the already developed nature of the site. An area of Made Ground associated with artificially raised ground including spoil tips and landfills is shown circa 100m to the north west.

Superficial Deposits

The site is indicated to be underlain by Glacial Till which characteristically comprises a mixture of clay, silt, sand, gravel.



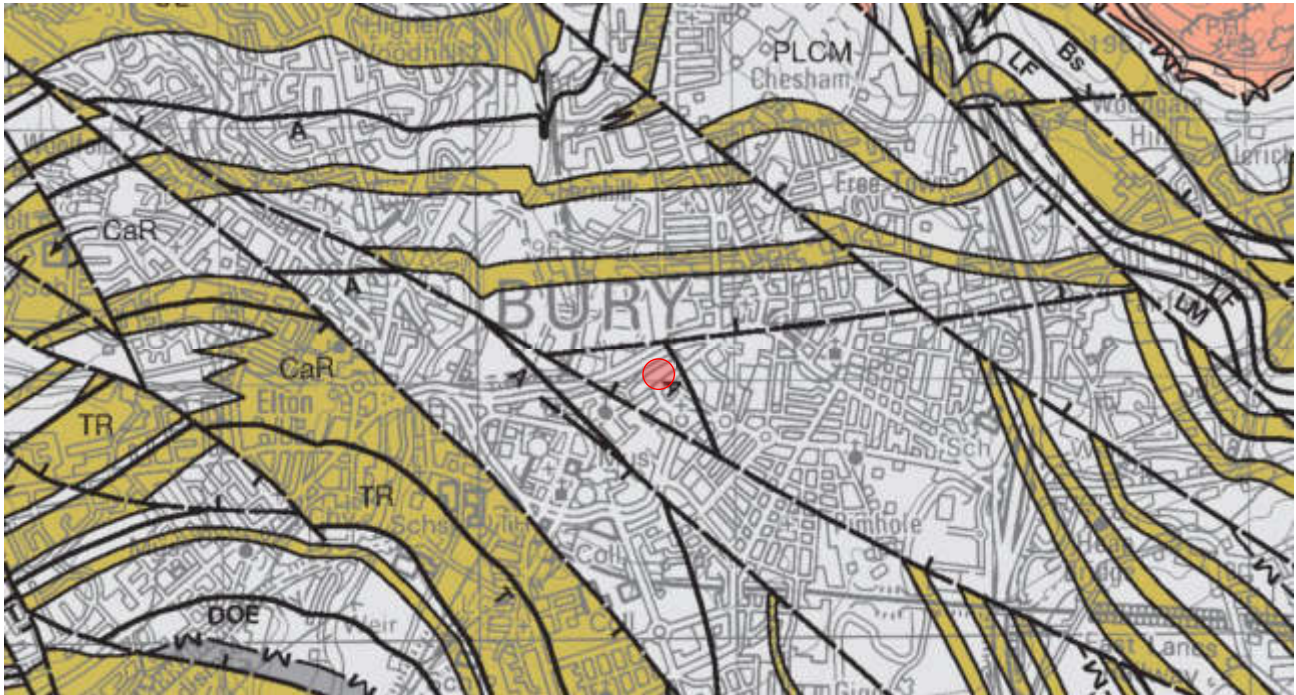
Geological Map – Superficial Deposits

Solid Geology

The solid geology underlying the site is the Pennine Lower Coal Measures Formation. This stratum typically comprises mudstone, siltstone, sandstone and coal seams.

The nearest coal seam is the Arley seam subcropping circa 75m to the east of the site. The seam is dipping to the west towards the site. There are no nearby dip angle indicators on the BGS map. However, the nearest dip reading

is 15° to the south west. Based on a 15° dip to the west, the Arley seam is anticipated to underlie the site at a depth of circa 20.0m bgl.



Geological Map – Solid Geology

The Arley coal seam is indicated as being 0.9m to 2.0m in thickness and the type of working included deep mining, crop working and surface mining (opencast).

Geological Faults

No faults are shown onsite. The nearest is 125m north trending east to west with strata downthrown to the north and a second faults is 145m south west trending north west to south east with strata downthrown to the north east.

BGS Records

Three BGS records are present approximately 120m to the north east of site where boreholes were drilled to a maximum depth of 12.7m bgl.

The boreholes indicate that Made Ground is present to depths of between 1m and 3m bgl and was underlain by interbedded soft, firm and stiff Clay and medium dense to dense Sand to depths of between 9.5m and 10.6m bgl where Mudstone bedrock was encountered.

The BGS records are presented in *Appendix 4*.

3.3 Hydrogeology

The superficial Glacial Till deposits in this area are classified by the Environment Agency as a Secondary Undifferentiated Aquifer. This designation is assigned where it is not possible to attribute either category A or B to a soil type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the drift type.

The Lower Pennine Coal Measures bedrock is classified as a Secondary A Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

The site is not located within 500m of a Source Protection Zone (SPZ).

There are no active groundwater or potable water abstractions within 2000m.

3.4 Hydrology

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

Environment Agency information indicates that the site is outside a flood risk zone and the Risk of Flooding from Rivers and Seas is negligible.

The nearest surface water abstraction at 1392m north of the site. This relates to lake and pond throughflow from surface and non-tidal waters.

There are no discharge consents within 500m of the site.

3.5 Environmental Consultations

A request has been submitted to the Contaminated Land Officer at Bury Council for information pertaining to the site. This information is presented in *Appendix 5* and a summary of the relevant findings is presented below.

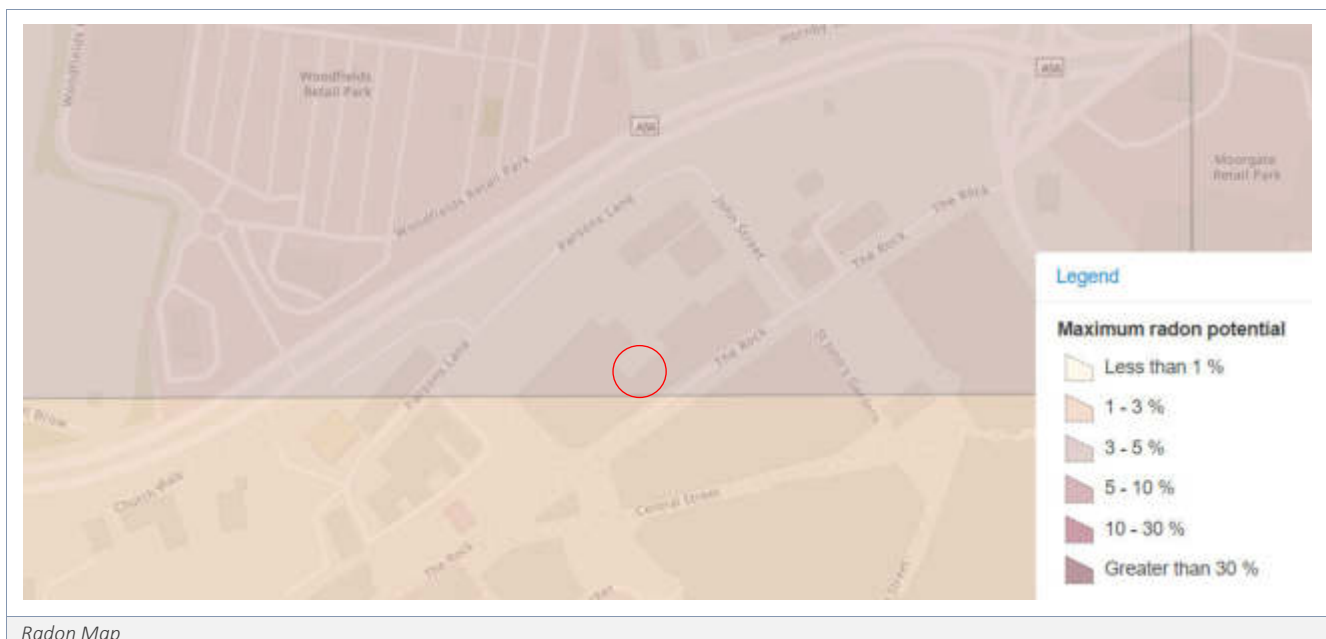
- *The site and surrounding area were already developed by 1848, with the current building being present on the site since at least 1893. The building is labelled on the historical maps as a Hotel, and later as a Public House, and then the Black Bull Hotel (PH). It is understood that the building has since been converted to shop units and offices.*
- *Previous uses in the surrounding area have included Vulcan Iron Works, sawmills and timber yards, Paradise Leather Works, cotton weaving, spinning and waste mills, a confectionary works, unspecified works, factories and mills, warehouses, a paper works, a tyre depot, reservoirs and evidence of landfilling activities.*
- *The council are aware of one registered landfill within 250m of the site. The site is an infilled former graveyard, previous uses include an old landfill and tannery. The site was filled with domestic and commercial waste up to 11m deep. The site was filled between 1893 and early 1970s, prior to the licensing act. The site is now in use as a retail park. A vent trench has been installed along the north and south boundary and a cut off wall at the eastern boundary. A passive venting system has been installed within the Tesco site.*
- *No areas of land at or near the site have been determined as Contaminated Land under Part 2A of the Environmental Protection Act (EPA) 1990.*

An environmental search has been conducted through Groundsure, which accesses British Geological Survey and Environment Agency databases. The complete Groundsure Report can be found in *Appendix 6* and a summary of the more relevant points is presented in the table below.

Record	<250m	250 – 500m	Description
Authorised Processes	4	8	Part B permit 162m west and 225m south west associated with Unloading of Petrol into Storage at Service Stations.
Pollution Incidents	1	20	Nearest was 127m south west in 2001 where Gas and Fuel Oils caused no impact to water, land or air.
Landfill and Waste Treatment	3	48	Historic landfill 103m north west at Woodfields accepting industrial, commercial, household and liquid sludge waste.
Discharge Consents	0	0	-
Petrol Filling Stations	2	2	One open petrol station located 146m west. Three obsolete located 210m south east, 259m south and 418m west.
Current Industrial Uses	19	-	Vehicle repair garage 68m north east and 77m north. Unspecified works 108m north east. Electricity substation 135m west.

3.6 Radon

Map 17 Lancashire, south Cumbria and western North Yorkshire from BRE 211 and HPA were examined which defines areas which require radon protective measures. The maximum radon potential is 3 – 5 % and No. 137 The Rock in Bury is in an area requiring basic radon precautions in foundations in accordance with BRE Report 211 'Radon – Guidance on protective measures for new dwellings' 2015 Edition.



The radon data in the Groundsure report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland and contradicts the above recommendations giving a probability of less than 1 % indicating the site lies in an area not requiring radon measures. The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered

when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

It is recommended that a site-specific search is carried out through the BGS to confirm the exact radon measures that are required.

3.7 Coal Authority Consultation

The site lies in an area where the Law Society and Coal Authority recommends a mining search is undertaken due to past or current mining possible affecting the site.

A search was carried out with the Coal Authority. The report is presented in *Appendix 7* and the main findings are outlined below.

Past Mining

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. This coal may have been worked at some time in the past.

Present Mining

The site is not within a surface area that could be affected by present underground mining.

Future Mining

The property is not in an area where the Coal Authority are determining whether to grant a licence to remove coal by underground workings.

The property is not in an area likely to be affected at the surface by any planned underground workings.

Reserves of coal exist in the local area that may be worked in the future.

No notice of the risk of land being affected by subsidence has been given under section 46 of the Coal Mining Subsidence Act 1991.

Mine Entries

There are no records of any mine entries on or within 20m of site boundary.

Coal Mining Geology

The Authority is not aware of any damage arising due to geological faults or lines of weakness that have been affected by coal mining.

Opencast Coal Mining

The property is not in an area affected by past or present coal mining extracted by opencast methods. The property is also not in an area affected by a proposed opencast coal mine.

Subsidence

The Coal Authority has not received a damage notice or claim for the subject property or within 50 m since 31 October 1994.

Mine Gas

There is no record of mine gas emission requiring action by the Coal Authority within the boundary of the property.

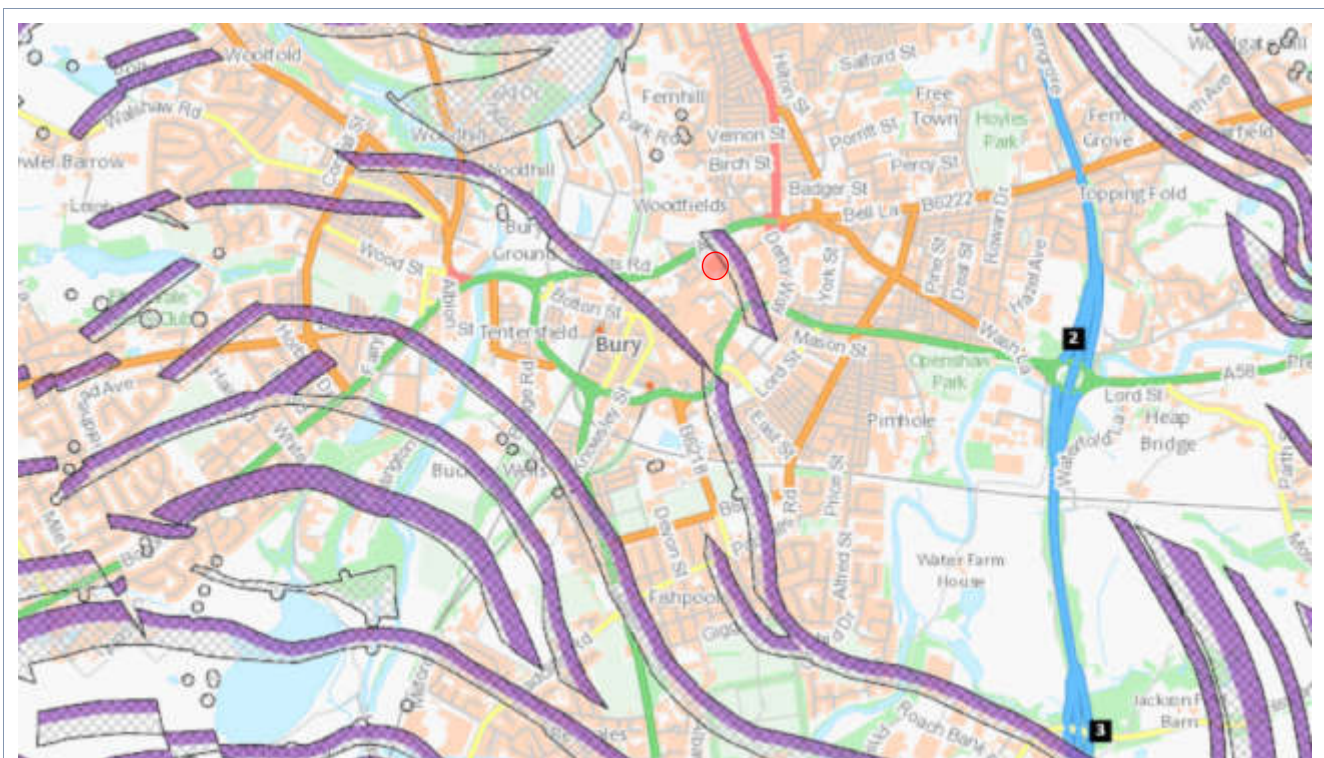
Withdrawal of Support

The property is not in an area which notice of entitlement to withdraw support has been published.

Online Interactive Coal Authority Map

The following information has been gained from the online interactive Coal Authority map:

- No mine entries are shown on or within influencing distance of the site.
- The area to the immediate east of the site and the eastern portion of the site is shown to be within a Development High Risk Area.
- The site is not in an area affected by surface mining (past or current).
- The site is not in an area of recorded past shallow coal mine workings.
- The eastern side of the site is close to or within an area of probable shallow coal mine workings.
- The Arley coal seam is shown to subcrop to the east of the site.



Interactive Map – Coal seam subcrop (purple), Development High Risk Area (cross hatch)

Recommendations

The eastern side of the site is within or immediately adjacent to a Development High Risk Area and an area of probable shallow coal mine workings, associated with the Arley seam which is anticipated to underlie the site at circa 20.0m bgl. The recorded thickness of the Arley seam is between 0.9 – 2.0m and it is recorded to have been mined historically. The Coal Authority believes there is coal at or close to the surface of the site.

There is potential for workings to be present beneath the site and based on the maximum potential worked seam thickness, there may be insufficient competent rock cover to mitigate the risk from instability of any workings.

The depth to bedrock in the area is generally circa 10m bgl, therefore approximately 10m of rock cover is likely to exist over the Arley seam. Based on the maximum seam thickness, up to 20m of competent rock cover will be required over any workings to mitigate the risk. Allowing for 1.5m high roadways as a minimum, 15m of competent rock cover would be required to mitigate the risk from any workings. Any workings present are likely to be extensively collapsed based on their age if they are unrecorded.

Three two-storey residential flats are proposed within the existing courtyard area of the site in the north. The existing building in the south has been on site since at least 1849 and it is proposed to construct an additional storey on this building as part of the conversion. Evidence of possible subsidence was observed during the site walkover where a significant crack had formed beneath an existing window. This may be due to ground subsidence associated with mine workings or due to the poor general condition of the building which requires some maintenance. Photos are provided in Appendix 2.

New buildings are to be constructed in the north and an additional load is to be placed on the existing building in the south. Shallow mine workings may be present based on the desk-based information and intrusive investigation is recommended, including drilling rotary boreholes to identify the presence of shallow coal mine workings.

4.0 LAND QUALITY CONCEPTUAL SITE MODEL AND RISK ASSESSMENT

4.1 Introduction

The potential level of risk posed by contaminants in soil and/or groundwater will be influenced by the type and concentration of the contamination at source, the likelihood of exposure occurring, the potential pollution linkages and the likely chronic or acute effects on the receptors.

A contaminant is defined as a substance that has the potential to cause harm, a risk is considered to exist if such a substance is present at sufficient concentrations to cause harm and if a pathway is present a receptor could be exposed to the contaminant.

Section 4.0 compiles the information from the previous sections to assemble a Conceptual Site Model to inform the risk assessment process. The potential sources identified on the site and off the site that are within influencing distance are assessed to determine if pollution linkages exist and an unacceptable risk is posed to human health and controlled waters. The assessment has been carried out on a qualitative basis and aims to produce a complete and comprehensive Preliminary Conceptual Site Model, the potential pollution linkages are displayed on Plan GRO-23038-P02 - Illustrative Preliminary CSM.

Three potential types of impacts exist for a site and all three need to be considered in the qualitative preliminary risk assessment:

- *Impacts from sources on the subject site.*
- *Impacts to the surrounding area from the subject site.*
- *Impacts to the subject site from the surrounding area.*

4.2 Potential Contamination Sources

Onsite Sources and Associated Contaminants (CoC)

From the information obtained during the preliminary risk assessment, a potential onsite source of contamination has been identified which may affect the redevelopment of the site for residential end use.

Made Ground is anticipated to be present beneath the site associated with the historic development. Dependant on the nature and depth of the Made Ground, this could be a source of heavy metals, speciated PAHs, asbestos and permanent ground gases.

The existing buildings onsite could also be a source of asbestos.

Offsite Sources and Associated Contaminants (CoC)

Several potential offsite sources of contamination have been identified through the PRA and include the following:

- *Numerous timber yards and saw mills nearest being c.40m north.*
- *Cotton Works c.90m south east and 120m south.*
- *Burial ground c.100m east and 110m north.*
- *Large refuse heap c.100m north west.*
- *Iron foundry c.110m north east.*
- *Infilled reservoirs c.110m east, 230m east and 250m north.*
- *Colour works c.110m south east.*
- *Brass foundry c.125m north east.*
- *Fustian Mills and Woollen Mills c.130m to 250m to the east.*

- *Electricity substation c.150m north east.*
- *Garages present c.150m west and 175m to 225m north east.*
- *Printing works c.170m south west.*
- *Small tannery c.175m north east and Peel Tannery c.250m west.*

The timber yards and saw mills located around the site could be potential sources of metals, solvents, PCBs, hydrocarbons, acids, creosols, phenols, and asbestos.

The cotton mills, textile factories, printing works and colour works are possible sources of metals, metalloids and their compounds, inorganic compounds, chlorinated organic solvents, organic compounds, water repellents and fire/flame retardants, soaps and detergents, pesticides, dyes, fuels and oils, asbestos and PCBs.

The iron and brass foundry works could also be a source of metals and metalloids, inorganic compounds, acids and alkalis, hydrocarbons, asbestos and PCBs.

The burial ground, infilled reservoirs and refuse heap could be sources of permanent ground gases.

The electricity substation may be a source of PolyChlorinated Biphenyls (PCBs) used as cooling agents in transformers.

The garages could be a source of fuel derived hydrocarbons.

Pathogens, metals, solvents, acids, alkalis, hydrocarbons, asbestos, cresols, phenols, PAHs, oils and biocides could be associated with the nearby former tanneries.

4.3 Pollution Linkages

The definition of a pollution linkage is a medium which allows a contaminant to impact a receptor. Potential pollution linkages have been recognised for the residential development from the identified contamination sources that exist.

At this stage, the contaminants identified above are considered to potentially pose an unacceptable risk human health and controlled waters through the following pollution linkages:

- *Direct soil and dust ingestion.*
- *Dermal contact with soil both indoors and outdoors.*
- *Indoor air inhalation from soil and vapour.*
- *Outdoor inhalation of soil and vapour.*
- *Migration and accumulation of ground gas into internal spaces.*
- *Impaction of groundwater from soil contamination (diffuse and point).*
- *Impaction of groundwater from groundwater plume.*
- *Migration of soil and groundwater contamination impacting surface waters.*

4.4 Receptors

Receptors generally fall into the categories of human health or controlled waters within the river basin system. The recognised receptors are listed below:

- *Residential site end users.*
- *Adjacent site users.*

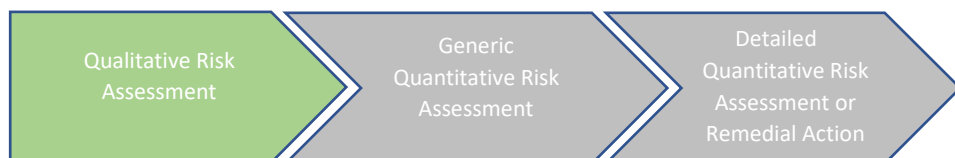
- *Underlying bedrock Secondary A Aquifer.*
- *Clean potable water supply pipes.*

There are no surface water features within 250m.

4.5 Preliminary Conceptual Site Model (CSM)

The factual information obtained from the searches and summarised in Section 2.0 and 3.0 has been used to compile a Preliminary CSM. Using Source-Pathway-Receptor assessment criteria that is applicable in the UK, a risk assessment has been completed to determine if a plausible pollution linkage exists between the identified contaminants and receptors. The risk classification has been estimated in accordance with the CIRIA C552 assessment criteria outlined in *Appendix 8*.

Human Health Pollution Linkage Assessment



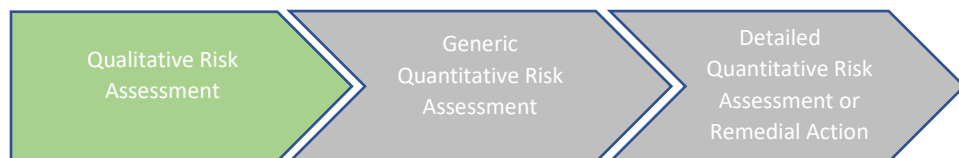
- The table below represents the first stage in the land quality risk assessment process - **the Qualitative Risk Assessment**.
- In order for a development site to be deemed 'suitable for use' the level of risk needs to be reduced to an acceptable level - low to negligible risk. The purpose of each stage of risk assessment is to establish if there is a requirement for additional stages of assessment in order to have sufficient confidence to support a risk characterisation or remedial action.

Conceptual Site Model					Qualitative Risk Assessment	
PL	Potential Source	Pollution Linkage	Likelihood	Consequence/ Severity	Risk Rating	Rationale and Action
PL1	Contaminated Soils	Ingestion of soil and dust. Dermal contact with soil.	Unlikely to Low Likelihood	Medium	Moderate to Low	Pollution Linkage 1 refers to proposed site users coming into contact with contaminated soils on the site. The site at present is disused with a one to three storey present onsite which was formerly used as a public house and more recently as shops and offices. Significant onsite sources of contamination have not been identified through the PRA however, limited Made Ground is anticipated to be present beneath the site associated with the existing development. Heavy metals, PAHs and asbestos may be present in the Made Ground soils. Numerous possible offsite sources of contamination, including timber yards, saw mills and cotton mills, have been identified surrounding the site. However, significant mobile contamination is not likely to have been associated with these features and the Glacial Till in the general area will have restricted the lateral migration of potential contaminants migrating onto site.

Conceptual Site Model					Qualitative Risk Assessment	
PL	Potential Source	Pollution Linkage	Likelihood	Consequence/ Severity	Risk Rating	Rationale and Action
						The sites proposed plans indicate most of the area will be cover with hardsurfacing which will break the pathway to potentially contaminated Made Ground. However, a potential pollution linkage will exist in areas of soft landscaping in the centre of the site.
PL2	Contaminated Soils	Inhalation of vapour.	Unlikely	Medium to Severe	Low	This pollution linkage refers to volatile vapours migrating into confined spaces within the proposed development. No sources of hydrocarbons or volatile contamination have been identified onsite through the PRA. Therefore, a plausible pollution linkage is not considered to exist.
PL3	Contaminated Soils	Inhalation of soil dust by adjacent site users.	Unlikely	Medium	Low	Pollution Linkage 3 relates to contamination on the subject site affecting adjacent site users. Mobile contamination is not anticipated to be present beneath the site and more impactful sources of contamination have been identified in the surrounding areas. Therefore, a realistic pollution linkage is not considered to exist.
PL4	Contaminated Soils	Attacking potable water supply pipe.	Unlikely	Medium	Low	Pollution Linkage 4 refers to the possible contaminants permeating potable water pipes and consumption by the future site end users of the tainted water supply.

Conceptual Site Model					Qualitative Risk Assessment	
PL	Potential Source	Pollution Linkage	Likelihood	Consequence/ Severity	Risk Rating	Rationale and Action
						The site has been developed since the mid-1800s therefore a significant thickness of Made Ground is not anticipated to be present beneath the site and new water supply pipes are likely to be laid in natural soils. It is not known if potable water supply pipes will be included as part of the development however, if they are to be included, a local water company risk assessment may be required prior to construction to advise on the level of protection required for the potable water supply.
PL5	Ground Gas	Migration and accumulation of ground gas in internal spaces.	Likely	Medium to Severe	Moderate	Made Ground is anticipated but deep made ground is considered unlikely due to the sites limited development since the mid-1800s. Significant potential offsite sources of ground gases have been identified in the form of a historic landfill, infilled reservoirs and burial ground. These are all potential sources of ground gas which could have an impact on site end users. If shallow mine workings are present beneath the site, these may be a source of mine gases. The superficial deposits in the general area of the site mainly consist of Glacial Till, this may be granular and cohesive so has the potential to provide a pathway for gas migration, ultimately impacting the end user. The site lies in an area potentially requiring basic radon precautions within foundations. This requires confirmation with a site-specific BGS radon report.

Controlled Waters Pollution Linkage Assessment



- The table below represents the first stage in the land quality risk assessment process – **Qualitative Risk Assessment**.
- In order for a development site to be deemed 'suitable for use' the level of risk needs to be reduced to an acceptable level - low to negligible risk. The purpose of each stage of risk assessment is to establish if there is a requirement for additional stages of assessment in order to have sufficient confidence to support a risk characterisation or remedial action.

Conceptual Site Model					Qualitative Risk Assessment	
PL	Potential source	Pollution linkage	Likelihood	Severity	Level of risk	Rationale
PL6	Contaminated Soils	Impaction of groundwater from soil contamination (diffuse and point). Impaction of groundwater from groundwater plume.	Unlikely	Mild	Very Low	The site has been developed with a Public House/Hotel since the mid-1800s and these buildings have been used for commercial purposes until recently. Therefore, significantly contaminated Made Ground is unlikely to be present beneath the site and no mobile contamination is anticipated. Geological maps indicate that the site is underlain by superficial Glacial Till (Secondary Undifferentiated Aquifer) and the bedrock is the Pennine Lower Coal Measures Formation (Secondary A Aquifer) which comprises mudstone, siltstone, sandstone and coal seams. The Glacial Till deposits are likely to be cohesive which will have restricted the downward migration of any mobile contaminants towards the Secondary A Aquifer. The site is not within 500m of a SPZ and therefore, the groundwater is not considered to be a sensitive resource. In addition, there are no potable water abstractions within 2000m.

Conceptual Site Model					Qualitative Risk Assessment	
PL	Potential source	Pollution linkage	Likelihood	Severity	Level of risk	Rationale
						Furthermore, the proposed development will be mostly covered with hardsurfacing and a new drainage system installed. This will considerably reduce infiltration and leaching of potential contaminants. As a source of mobile contamination has not been identified, a pollution linkage is not considered to exist.
PL7	Contaminated Soils	Migration of soil and groundwater contamination impacting surface waters.	Unlikely	Mild	Very Low	Pollution Linkage 7 refers to the impaction of surface water features from contaminated soils and groundwater. There are no surface water features within 250m of the site and a source of mobile contamination has not been identified. Therefore, a pollution linkage is not considered to exist.

5.0 GROUND ENGINEERING RECOMENDATIONS AND POTENTIAL LIMITATIONS

5.1 Preliminary Foundation Assessment

A proposed development includes the renovation of the existing three-storey building (including basement) and an extension to the rear of the building along with a new two-storey residential building at the north side of the site.

Historically, the site has been occupied by a former Public House since the mid-1800s. Access was not gained into the building onsite therefore, it is unclear as to whether there is a basement beneath the existing property.

Deep Made Ground is not expected to be present beneath the site given the limited development after the construction of the public house. The site is indicated to be underlain by superficial Glacial Till deposits therefore, traditional strip/trench fill foundations may be a feasible option for the proposed residential development at the site. However, the nearest BGS records to the north east encountered soft silty Clay between 5.8m and 9.3m bgl which may preclude the use of a shallow foundation solution.

Any new foundations should be designed such that they do not undermine existing foundations or nearby buildings and a movement joint should be incorporated between the existing building and proposed extensions.

If a new basement is intended, this should be designed such that it does not undermine the existing structure.

If coal mine workings are present at shallow depth within an influencing distance of the proposed development then a programme of drilling and grouting may be required prior to the construction phase. This should be confirmed by an intrusive investigation.

The above preliminary foundation recommendations are based on desk-based information and should be confirmed by a ground investigation in accordance with current guidance.

5.2 Additional Limitations

The eastern side of the site is within or close to the boundary of a Development High Risk area due to probable shallow mine workings associated with the Arley coal seam which may underlie the site at a shallow depth of circa 20.0m bgl. An intrusive investigation, including drilling rotary boreholes is recommended to quantify the risk.

The natural Glacial Till underlying the area is cohesive so could have some impermeable qualities meaning SuDS drainage may not be a viable option.

6.0 CONCLUSIONS AND GROUND INVESTIGATION SCOPE RATIONALE

6.1 Land Quality

The site at present is disused with a one to three storey present onsite which was formerly used as a public house and more recently as shops and offices. The public house has been present onsite since the mid-1800s.

Significant onsite sources of contamination have not been identified through the PRA however, limited Made Ground is anticipated to be present beneath the site associated with the existing development. Heavy metals, PAHs and asbestos may be present in the Made Ground soils.

Numerous possible offsite sources of contamination have been identified surrounding the site however, significant mobile contamination is not likely to have been associated with these features and are unlikely to have affected the subject site.

The risk to human health is considered to be *Moderate to Low* as potentially contaminated Made Ground may be present beneath the site and areas of soft landscaping area to be included in the proposed development.

A source of mobile contamination has not been identified therefore, the risk to controlled waters is *Very Low*.

Potential onsite and offsite sources of ground gases have been identified through the PRA. This risk is currently considered to be *Moderate*.

The site lies in an area potentially requiring basic radon precautions within foundations. This requires confirmation with a site-specific BGS radon report.

6.2 Ground Engineering

The site is indicated to be underlain by superficial Glacial Till deposits therefore, traditional strip/trench fill foundations may be a feasible option for the proposed residential development at the site. However, the nearest BGS records to the north east encountered soft silty Clay between 5.8m and 9.3m bgl which may preclude the use of a shallow foundation solution.

Any new foundations should be designed such that they do not undermine existing foundations or nearby buildings and a movement joint should be incorporated between the existing building and proposed extensions.

If a new basement is intended, this should be designed such that it does not undermine the existing structure.

If coal mine workings are present at shallow depths beneath the site then a programme of drilling and grouting may be required prior to construction.

6.3 Additional Considerations

The risk from shallow coal mine workings should be investigated through an intrusive investigation, including drilling of rotary boreholes.

The natural Glacial Till underlying the area is cohesive so could have some impermeable qualities meaning SuDS drainage may not be a viable option.

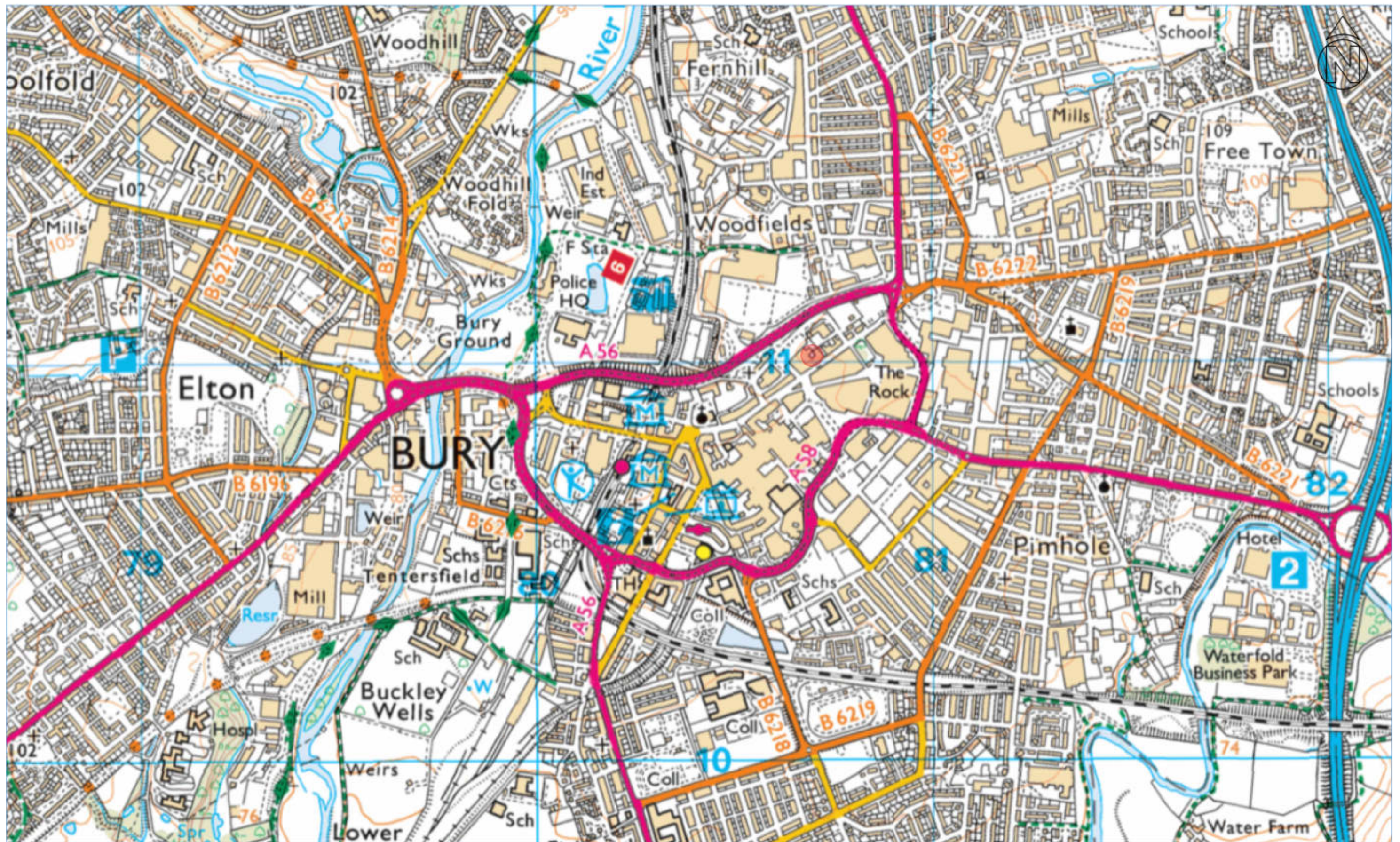
6.4 Recommended Ground Investigation Scope of Investigation

Based on the information in this report we consider a main investigation is required in accordance with BS 10175:2017 and BS 22475. The following scope of works is recommended based on the Preliminary CSM compiled, additional works may be required as the result of planning conditions for the proposed development:

Method of Investigation	G / E
<i>3 No. boreholes to c.10m bgl.</i>	<i>G / E</i>
<i>Rotary drilling to identify shallow coal mine workings to a minimum 30m bgl.</i>	<i>G</i>
<i>Shallow gas monitoring installations.</i>	<i>E</i>
<i>Chemical testing comprising Metals, PAHs and asbestos.</i>	<i>E</i>
<i>Geotechnical testing comprising aggressivilty, classification, strength and stiffness analysis.</i>	<i>G</i>
<i>Ground gas monitoring.</i>	<i>E</i>

Note **Environmental (E) / Geotechnical (G)**

APPENDIX 1 - Plans



GROUNDTECH
CONSULTING



CLIENT	21 LIVING LIMITED
PROJECT TITLE	137 THE ROCK, BURY
PLAN TITLE	PROJECT LOCATION PLAN

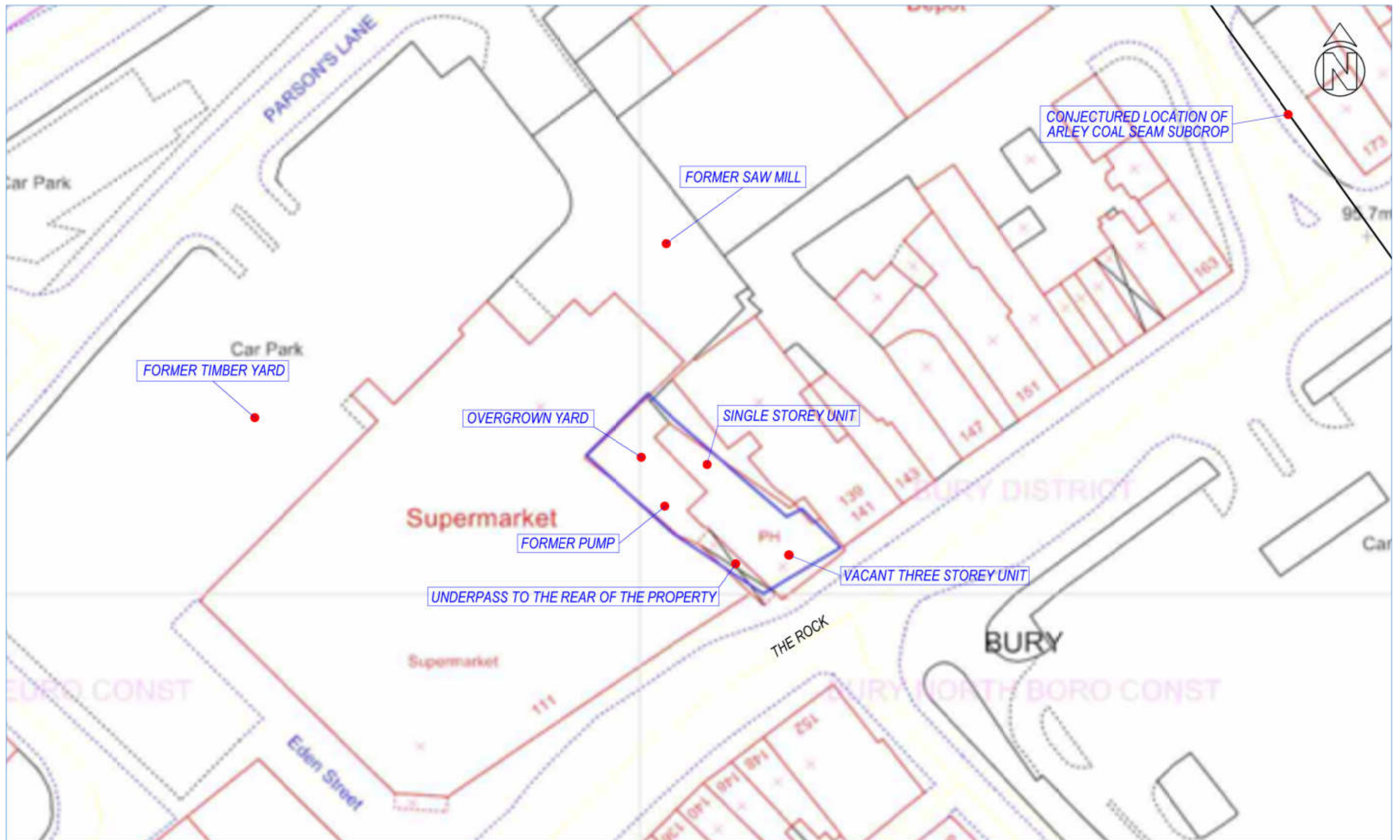
DATE	FEBRUARY 2023
SCALE	NTS
PLAN NUMBER	GRO-23038-P01

Rev.	Details	Date

Status	
Preliminary	
Draft	
Issued	●
For Comment	
Approved	

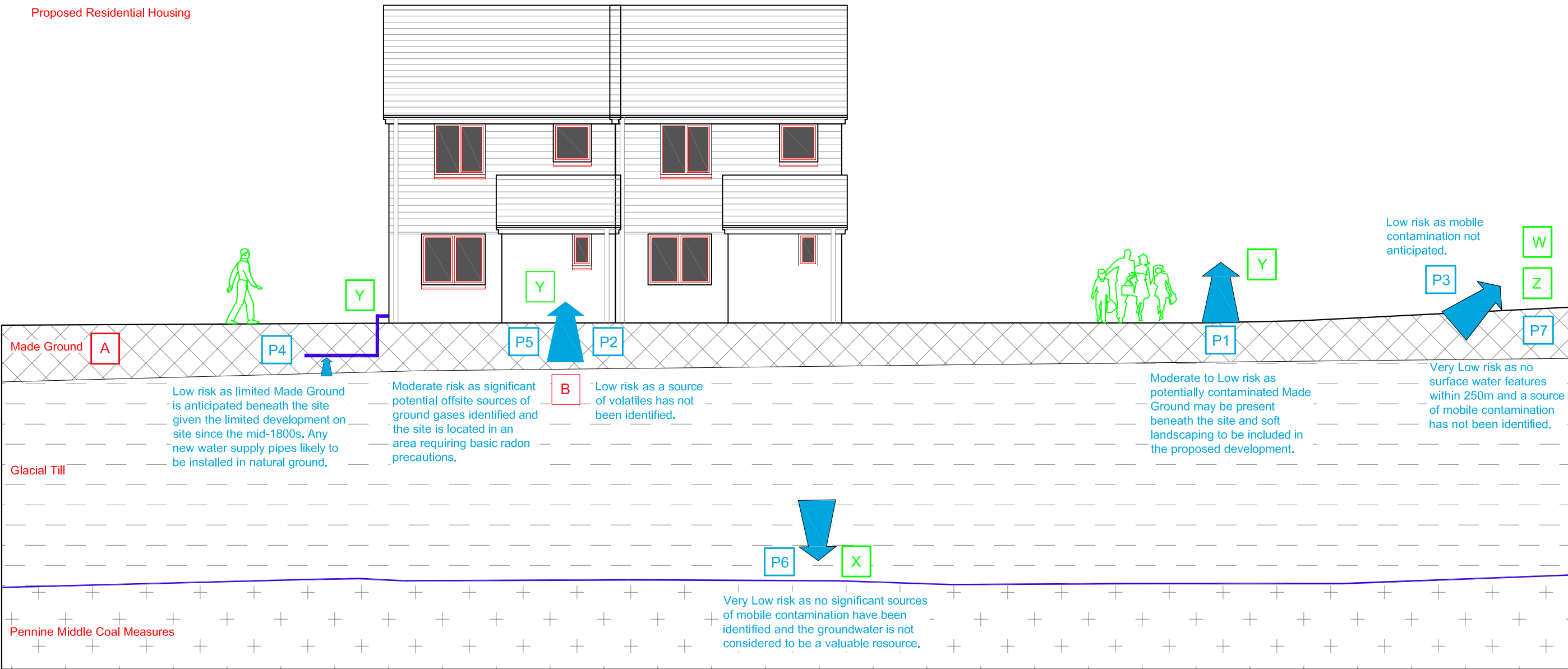
Notes	
● - Site Location	





GROUNDTECH CONSULTING 	CLIENT	DATE				Status	Notes  - Approximate site boundary
	21 LEVEL LIMITED	FEBRUARY 2023				Preliminary	
	PROJECT TITLE	SCALE				Draft	
	137 THE ROCK, BURY	NTS				Issued	
	PLAN TITLE	PLAN NUMBER				For Comment	
	PRELIMINARY DEVELOPMENT CONSTRAINTS PLAN	GRO-23038-P02	Rev.	Details	Date	Approved	

SOURCES	POLLUTION LINKAGES	RECEPTORS
A. Contaminated soils / Made Ground. B. Ground gas.	P1. Ingestion of soil and dust. P2. Inhalation of vapour. P3. Inhalation of soil dust by adjacent site users. P4. Attacking of potable water supply pipe. P5. Migration and accumulation of ground gas in internal places. P6. Impaction of groundwater from soil contamination. P7. Migration of soil and groundwater contamination impacting surface waters.	W. No surface water features within 250m of the site X. Groundwater within the Secondary A Aquifer Y. Site end users Z. Adjacent site users



GROUNDTECH CONSULTING	CLIENT	DATE				Status		Notes
	21 LIVING LIMITED	FEBRUARY 2023				Preliminary		
	PROJECT TITLE	SCALE				Draft		
	137 THE ROCK, BURY	NTS				Issued		
	PLAN TITLE	PLAN NUMBER				For Comment		
	ILLUSTRATIVE PRELIMINARY CSM	GRO-23038-P03	Rev.	Details	Date	Approved		

APPENDIX 2 - Photographs



Photograph 1 - Front elevation of the property from The Rock.



Photograph 2 - Rear elevation of the property.



Photograph 3 - Rear buildings and central western courtyard.



Photograph 4 – North east boundary wall and container storage.



Photograph 5 - North boundary wall and central western courtyard.



Photograph 6 - Subsidence damage on existing building in the south.



Photograph 7 - West boundary wall, central western courtyard and alley on the west side of the property.