



Phase I Geoenvironmental Site Assessment
Grey Mare Lane Site 1, Manchester

Reference: 16-908-R1
Date: June 2023



PHASE I GEOENVIRONMENTAL SITE ASSESSMENT

Land off Grey Mare Lane
Beswick
Manchester
M11 3TF

Prepared for:

Shape Consulting Engineers Limited

Report Ref: 16-908-R1
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EXECUTIVE SUMMARY

Site Address	Grey Mare Lane, Beswick, Manchester, M11 3TF
Grid Reference	E 386954, N 398294
Site Area	0.47 Ha
Proposed Development	The client intends to construct a 3-5 storey high-rise residential development comprising a total of 51 apartments with associated communal areas, cycle store, landscaping and parking courtyard.
Current Site Use	The northern part of the site is currently covered with grass softstanding with a line of mature trees along the northern boundary. The southern portion of the site is currently unoccupied and covered in asphalt hardstanding. The central portion of the site used to contain the former public house however since its demolition to slab level, the area has been left as concrete hardstanding. An area of the central section is currently used as car parking for local residents. Curbs and street furniture are prevalent through this area along highway access to the former pub and car park. There are no structures currently present within the site boundary.
Site History	The site was recorded as residential housing in the north and south with an additional large building in the centre noted as 'nurses home'. In circa 1930 residential housing in the west of the site was redeveloped into a Picture Theatre continuing off-site. The Nurses Home was fully redeveloped pre-1977 to construct the club (recently demolished). All buildings were demolished circa 2019 and the site has remained vacant since then.

ENVIRONMENTAL SETTING

Geology	Drift Geology	Glacial Till, Devensian – Diamicton
	Bedrock Geology	Pennine Upper Coal Measures Formation – Mudstone, Sandstone and Siltstone
	Faults	The nearest fault is located circa 650m east of the site recorded at rockhead between two geological stratum. Outcropping Coal seams are noted 44m north of the site and are noted as linear features.
Geomorphology	A review of relevant records indicates that the site has not been subject to significant anthropogenic changes with the current site topography broadly representing natural landform. From the main highway at the north of the site, the grassed area generally falls in towards the site – the remainder has been largely regraded from development phases. There is no evidence currently to suggest that the club have basement features and so there is expected to be a shallow Made Ground to facilitate construction in this area.	
Hydrogeology	Secondary A bedrock aquifer with Secondary Undifferentiated superficial aquifer.	



	No groundwater abstractions are located within 500m of the site.
Hydrology	There are no surface water features within 250 m of the subject site. Based on the local topography and location of surface watercourses it is considered likely that shallow groundwater, if present, will flow in a westerly direction, along Ashton New Road and towards the River Medlock circa 760m west. Unaffected by flooding from rivers.
Utility Locations	A formal drainage survey has not been completed, however, manholes were noted along the northern and eastern boundaries of the site. Additionally, the south of the site was previously used as a Public House and therefore it is assumed any drainage, sewers or services present will be in the south. Street lighting is present along the northern and eastern boundaries of the site.
Landfill Sites and Ground Gases	No landfill sites (current or historic) are located within 250 m of the site. The site has undergone some historic development and ground working, the Made Ground associated with the historic development may produce hazardous ground gases such as methane and carbon dioxide.
Radon	The Groundsure report indicates that the site is situated in an area where less than 1% of homes are above the “Action Level” and that the BGS reports that full protective measures are not necessary for the construction of new dwellings or extensions.
Hazardous Installations	No hazardous installations that could potentially prejudice the proposed construction of highly sensitive residential dwellings have been identified within influencing distance of the subject site.

PRELIMINARY CONTAMINATED LAND ASSESSMENT

Human Health	Due to the previously developed nature of the site, it is likely that Made Ground deposits will underlie the site throughout, mainly associated with residential housing and the Public House. However, the picture theatre through the 1930’s may have potential contaminants present similar to those of photographic processing industry. The DOE industry profiles suggest where this is the case, modern photographic materials are coated with gelatin layers containing silver halide salts including Silver Chloride, Silver Bromide and Silver Iodide. During exposure to light some of the chemicals included in the process reduce to silver and bromine or chlorine gas. An intrusive investigation will be required to confirm the initial conceptual site model.
Controlled Waters	Volatile contamination may be present within the Made Ground deposits associated with previous on-site development as identified in human health section. The presence of impermeable clay soil deposits may reduce the leachate produced from contaminated soils, and therefore reduce the impact to groundwater.



	Based on the presence of the underlying Secondary A Aquifer, risk to controlled waters is considered to be moderate. Though the risk to surface water features is considered low due to their distance from site. Further detailed assessment will be required.
Ground Gas	Infilled features are not anticipated to be encountered on site, and as such, limits the potential for ground gas. However, shallow Made Ground is anticipated on site and has the potential to produce hazardous ground gases such as methane and carbon dioxide in low levels. Given the site's location within a coal mining area there is a potential for mine related gases at the site, though currently there are no reports of significant emissions. Furthermore, based on the site's history there is a potential for bromine or chlorine gasses at very low levels that might occur as VOC, detectable during gas monitoring. Completion of an RB17 assessment or installation of monitoring wells is required to assess for the presence of ground gases and facilitate further risk assessment

PRELIMINARY COAL MINING ASSESSMENT

Coal Mining/Land Stability	The site is located in a development high risk area. There are no mine entries located on site however one is situated 25m north east of the site. The mine entry is known to be in association with the Bradford Colliery which is situated approximately 20m north east of the site. Known workings have been recorded 114m bgl under the site. It is likely that the site may be influenced by worked seams at a shallow depth given the position of shafts and outcrops in the area, putting the site at high risk from coal mining related land instability. Based on the above, a high risk of unrecorded coal mining at shallow depth has been identified within the site boundary. The Coal Authority, as a statutory consultee, will require a series of rotary open holes across the site to determine the presence of any coal on-site and to understand the nature of any coal workings.
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PRELIMINARY GEOTECHNICAL ASSESSMENT

Initial Geotechnical Assessment	Historical slabs and foundations are present in the centre of the site associated with the previous use as a public house. Furthermore, relict foundations are likely to be encountered in the north of the site, on the site of the old theatre. All existing underground foundations and obstructions beneath the proposed development will require grubbing out in their entirety, however it is considered that most of this hard material will be suitable for reuse in construction once excavated and processed. As the proposed development is a high-rise apartment block, a piled foundation solution may be required socketed into the underlying bedrock. Further investigation should be undertaken to assess the strength and suitability of the bedrock for piling. However, should any coal workings require grouting beneath the site, piled foundations may not be suitable.
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Civil and Structural	All existing underground foundations and obstructions beneath the proposed development will require grubbing out in their entirety and backfilling with a suitably engineered fill to create a suitable development platform. There is potential for shallow groundwater to be present as perched groundwater due to the site being underlain by impermeable glacial till. If shallow groundwater is encountered localised dewatering may be required during the construction phase.
Abnormal Foundations	Given the high rise nature of the proposed structures it is expected that the foundations will be designed by a specialist. Depending on the structural loadings and presence of coal workings a pile type design may be required.

CONCLUSIONS AND RECOMMENDATIONS

An intrusive investigation, including coal investigation, is recommended to confirm the findings in this report and develop the initial conceptual site model for the site.



Table of Contents

EXECUTIVE SUMMARY	1
1. INTRODUCTION	7
1.1. Background	7
1.2. Proposed Development	7
1.3. Objectives	7
1.4. Sources of Information	8
1.5. Limitations	8
1.6. Risk Classification	8
1.7. Confidentiality	8
2. SITE SETTING	9
2.1. Site Details	9
2.2. Current Site Use	9
2.3. Surrounding Area	10
3. SITE HISTORY	11
3.1. On-Site Historical Development	11
3.1.1. Summary Of On-Site Historical Development	16
3.2. Off-Site Historical Development	16
3.3. Planning History	17
3.4. Anecdotal Information	17
3.5. Previous Reports	18
4. ENVIRONMENTAL SETTING	19
4.1. Geology and Hydrogeology	19
4.2. Hydrogeology	19
4.3. Natural Landform and Geomorphology	20
4.4. Radon Risk Potential	20
4.5. Hydrology	20
4.6. Landfill Sites and Waste Treatment Sites	21
4.6.1. Waste Management Licenses & Environmental Permits	21
4.7. Unexploded Ordnance	21
4.8. Industrial Land Uses	22
4.9. Site Sensitivity Assessment	22
4.10. Regulatory Database	23
5. PRELIMINARY COAL MINING ASSESSMENT	25
5.1. Coal Mining	25
5.2. Coal Mining Information	25
5.3. Coal Authority Plan	28
5.4. Coal Mining Geology	29
5.5. Anecdotal Information – Bradford Colliery	29
5.6. Preliminary Mine Gas Assessment	31
5.7. Coal Mining Risk Assessment	32
6. PRELIMINARY GEOTECHNICAL ASSESSMENT	33
6.1. Geotechnical Data	33
6.2. Subsidence	33
6.3. Preliminary Geotechnical Assessment	33
6.4. Preliminary Geotechnical Risk Register	34



7. INITIAL CONCEPTUAL SITE MODEL.....	35
7.1. Initial Conceptual Site Model.....	36
8. CONCLUSIONS	40
8.1. Site Summary.....	40
8.2. Contaminated Land Assessment	40
8.3. Coal Mining	41
8.4. Geotechnical Assessment	41
APPENDIX I	43
LIMITATIONS	43
APPENDIX II GLOSSARY	45
APPENDIX III RISK CLASSIFICATION	48
APPENDIX IV DRAWINGS	50
APPENDIX V PHOTOGRAPHS	52
APPENDIX VI HISTORICAL MAPS	55
APPENDIX VII COAL AUTHORITY REPORT AND MINE ABANDONMENT PLANS	56

Drawing List

16-908-R1-001 - Site Location Plan
16-908-R1-002 - Proposed Development Plan
16-908-R1-003 - Historical Features Plan
16-908-R1-004 - Site Features Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P has been commissioned by Shape Consulting Engineers Limited to undertake a detailed Phase I Geoenvironmental Site Assessment of land off Grey Mare Lane, Manchester; herein referred to as the site.

This report is required to determine potential contaminated land and geotechnical liabilities for the proposed site redevelopment.

1.2. PROPOSED DEVELOPMENT

The client intends to construct a 3-5 storey high-rise residential development comprising a total of 51 apartments with associated communal areas, cycle store, landscaping and parking courtyard. Drawing 16-908-002 (Appendix IV) identifies the proposed development layout.

A snapshot of the proposed development layout is indicated in Figure 1.1.

FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT



1.3. OBJECTIVES

The objectives of the geoenvironmental site assessment are as follows:

- Review historical plans, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority information available in order to complete a desk study in line with Environment Agency (EA) document *Land Contamination: Risk Management (LCRM) (2021b)*.



- ✿ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site concerning the site's future use and in relation to off-site receptors.
- ✿ Assess the desk study information and, where possible, provide preliminary recommendations concerning foundations, pavement construction, general geotechnical issues, floor slabs and coal mining related issues.
- ✿ Provide recommendations regarding future works required.

1.4. SOURCES OF INFORMATION

- ✿ Groundsure Enviro+Geo Insight Search Reference-GS-Y4F-NCS-G8Z-3K1;
- ✿ Historical mapping dated 1849-2023. A selection of historical maps are reproduced in Appendix VI;
- ✿ Online planning records held by Manchester City Council;
- ✿ Consultations with representatives of Manchester City Council;
- ✿ Consultations with representatives of the Coal Authority;
- ✿ Coal Authority Consultants Report (Reference MR-51003357117001-1684942338268);
- ✿ Magic Map Groundwater Vulnerability Map;
- ✿ Radon: Guidance on protective measures for new buildings (BRE Document BR 211, 2007);
- ✿ British Geological Survey Map and Borehole Records;
- ✿ UXO - <https://zeticauxo.com/downloads-and-resources/risk-maps/>; and,
- ✿ Flood Risk - <https://flood-map-for-planning.service.gov.uk/location>

1.5. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.6. RISK CLASSIFICATION

The description of risk classification and the likely action required as set out in CIRIA C552 are included in Appendix III.

1.7. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such consent.



2. SITE SETTING

2.1. SITE DETAILS

Site Address	Grey Mare Lane, Bradford, Manchester, M11 3TF
National Grid Reference	E 386954, N 398294
Site Area	0.47 Ha

The Glossary presented in Appendix II defines all acronyms used within this report.

A site location map is presented in Appendix IV as Drawing 16-908-001.

2.2. CURRENT SITE USE

A site walkover was completed by an E3P engineer on 02/06/2023, with the full details included in Table 2.1.

TABLE 2.1 SITE DESCRIPTION

Occupancy/Use	The northern part of the site is currently covered with grass softstanding with a line of mature trees along the northern boundary. The southern portion of the site is currently unoccupied and covered in asphalt hardstanding. The central portion of the site used to contain the former public house however since its demolition, the area has been left as concrete hardstanding. An area of the central section is currently used as car parking for local residents with street lighting. Curbs and street furniture are prevalent through this area along highway access to the former pub and car park.	
Surface Cover (%)	Buildings	0%
	Hardstand	60%
	Soft Cover	40%
Structures	There are no structures present within the site boundary.	
Retaining Structures	No retaining structures are present within the site boundary.	
Access	Vehicular access is present from Newcombe Close, to the south-west of the central portion of the site.	
	Pedestrian access can be gained from the south along Newcombe Close, and also through a footpath to the north of the site, off Ashton New Road. A third footpath is present along the south of the western branch of the site.	
Slope	From the main highway at the north of the site the grassed area generally falls in towards the site – the remainder has been largely regraded from development phases.	
Vegetation/Ecology	The site is predominantly covered in hardstanding and softstanding, however there are areas of mature trees along the northern and southern boundaries with sporadic semi-mature trees across the centre of the site.	
Hazardous Material Storage	No authorised industrial processes are identified at the subject site within data searches. Records of recent industrial activities indicate that these have only included Telecommunications Masts and Electrical Substations.	



	Given the largely residential history of the site there is not considered any source of large scale hazardous materials storage having occurred on site.
Asbestos-Containing Material (ACM)	The buildings previously present on-site were constructed prior to 1992 and therefore ACM may have been used within the building fabric and may still be present within Made Ground deposits. However, as ACM cannot be entirely discounted, it is recommended that copies of any asbestos surveys / registers are requested from the vendor where available. An intrusive survey should look to investigate the presence of ACMs and asbestos fibres within the soil.
Polychlorinated Biphenyls (PCBs)	Recent industrial activities on site have included masts and substations, both of which have the potential to contain PCBs and associated contamination present within the site.
PFAS/PFOA	General low levels sources of PFAS and PFOA are likely to have been present on site as historical residential objects and fire fighting apparatus within previous site buildings. Significant sources of PFAS pollution are unlikely given the site's previous uses.
Waste Storage	None known within the site boundary and no licenced waste activities are identified within data searches on-site.
Drainage	A drainage survey has not been complete, however given the nature of the site it is likely that drainage is present within the site boundary connecting with the infrastructure present within the adjacent highway.

2.3. SURROUNDING AREA

The surrounding area land uses are summarised in Table 2.2.

TABLE 2.2 SURROUNDING LAND USES

DIRECTION	LAND USE
North	Ashton New Road, Etihad Campus.
East	Grey Mare Lane, Food Shops.
South	Derelict land.
West	Residential Properties.



3. SITE HISTORY

3.1. ON-SITE HISTORICAL DEVELOPMENT

A review of historical mapping and historical aerial imagery pertinent to the site is summarised in Table 3.1. In addition, historical site features are presented on Drawing 16-908-003 in Appendix IV.

TABLE 3.1 HISTORICAL DEVELOPMENT

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1889-1893 1:2,500	The west of the site is occupied by terraced housing with a road running north to south through this portion of the site. The south-eastern area is also occupied by housing and associated gardens. A large building is located in the centre of the site, surrounded by open space with a track running through it. Trees are noted to line the northern boundary.	

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1908 1:2,500	A small extension has been constructed to the south of the large building in the centre of the site. Furthermore, one of the buildings in the south of the site is now recorded as a club. The trees in the north of the site are no longer recorded.	
1922 1:2,500	A portion of the terraced houses on the western branch of the site have been transformed into a 'Picture Theatre'. There are no further significant changes.	



MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1931-1933 1:2,500	The large centralised building is now recorded as a Nurses Home. There are no further significant changes.	
1948-1949 1:1,250	The picture theatre in the west has been renamed to the 'New Royal Picture Theatre', with the Nurses Home in the centre no longer recorded. The club in the south is also no longer recorded	



MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1953-1956 1:1,250	A conservative club is marked in the south of the site. There are no further significant changes.	
1977-1979 1:1,250	The site has been entirely redeveloped with all buildings in the western branch of the site being removed. The south-east of the site has been transformed into a large public house named 'Crossroads', with associated parking and open space.	



MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
2003 1:1,250	There are no significant changes when compared with the previous map.	
2023 1:10,000	The site is marked as vacant and it remains in this layout to the present day.	



3.1.1. SUMMARY OF ON-SITE HISTORICAL DEVELOPMENT

The following summary points have been highlighted after a detailed review of the historical mapping series.

POTENTIAL HISTORICAL CONTAMINATION ISSUES

- ☛ Due to the historic developments noted across the site, there is a potential for areas of Made Ground across the site.
- ☛ Contamination may be present on site in the form of Silver Chloride, Bromide and Iodide as a result of the site's historical use in the photographic processing industry. Chlorine gas could also pose a gassing issue, associated with the reduction of photographic chemicals during exposure to light.
- ☛ Volatile contamination may be present within the Made Ground deposits associated with previous on-site development.

POTENTIAL HISTORICAL GEOTECHNICAL ISSUES

- ☛ Relict foundations/obstructions are anticipated across the site, particularly in the areas of former public house buildings. All relict foundations will require grubbing out prior to construction.
- ☛ Former utility infrastructure may be present beneath the site. Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill.
- ☛ Heave precautions may need to be considered given the underlying cohesive clay deposits and both historical and current tree locations.

3.2. OFF-SITE HISTORICAL DEVELOPMENT

A review of potentially contaminative uses identified on historical Ordnance Survey maps within a 150 m radius of the site is summarised in Table 3.2.

TABLE 3.2 SURROUNDING HISTORICAL DEVELOPMENT

SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Scrap Metal Yard ...then no longer recorded	20m	Pre1953 – Pre1979 Pre1979 – Present	South
Clothing Works ...then no longer recorded	50m	Pre1953 – Pre1979 Pre1979 – Present	North
Works (Elec Eng) ...then no longer recorded	70m	Pre1948 – Pre1979 Pre1979 – Present	South
Warehouses ...then no longer recorded	90m	Pre1948 – Pre1979 Pre1979 – Present	South
Bradford Colliery ...then named as Depot ...then no longer recorded	100m	Pre1889– Pre1979 Pre1979 – Pre2003 Pre2003 – Present	North-east



Bradford Iron Works ...then named as Works ...then no longer recorded	100m	Pre1889 – Pre1979 Pre1979 – Pre1995 Pre1995 – Present	North
Town's Yard ...then named as Corporation Yard ...then no longer recorded	110m	Pre1889 – Pre1908 Pre1908 – Pre1979 Pre1979 – Present	South-east
Tramway Depot ...then no longer recorded	130m	Pre1889 – Pre1908 Pre1908 – Present	East

3.3. PLANNING HISTORY

E3P has undertaken a review of Manchester City Council planning website with the following environmentally pertinent information identified:

- 🔗 125187/FO/2019 – 17/10/2019 – Demolition of existing public house building (Use Class A4) and associated hardstandings – Approved
- 🔗 CDN/20/0039 – 22/01/2020 – Discharge of planning condition 5 (wheel washing) associated with planning permission 125187/FO/2019 – Approved
- 🔗 CDN/20/0274 – 20/04/2020 – Discharge of condition 4 (site reinstatement) attached to planning permission referenced 125187/FO/2019 – Approved

3.4. ANECDOTAL INFORMATION

A web-based search of the subject site has recovered the following pertinent information:

FIGURE 3.1 CROSSROADS PUBLIC HOUSE AS PICTURED IN 2009



Source: Manchester Evening News



The Crossroads Public House was demolished in March 2020 after being closed to the public in December 2019. The pub was built in the 1970s and began life as a Bass House.

One Manchester, a housing association, have confirmed that they bought the building with the intention of demolishing it as part of a planned regeneration scheme of the Grey Mare Lane estate.

FIGURE 3.2 NEW ROYAL PICTURE THEATRE



Source: <https://cinematreasures.org/theaters/37346>

The theatre opened in 1914, named the Royal Picturedrome, before being taken over by the Associated British Cinemas (ABC) in 1929. This was demolished in 1930 with the New Royal Picture Theatre built on the same site. The theatre was closed and converted into a bingo hall in 1962, before being closed permanently in 1969.

3.5. PREVIOUS REPORTS

No previous site investigation reports have been provided to E3P for review.



4. ENVIRONMENTAL SETTING

4.1. GEOLOGY AND HYDROGEOLOGY

The British Geological Survey (BGS) map for the site, (Sheet 85) and online records indicate the site is underlain by the geological sequence presented in Table 4.1.

TABLE 4.1 SUMMARY OF UNDERLYING GEOLOGY

GEOLOGICAL UNIT	CLASSIFICATION	DESCRIPTION	AQUIFER CLASSIFICATION
Drift	Till, Devensian	Diamicton – Clay, Sand, Silt	Secondary Aquifer - Undifferentiated
Solid	Pennine Upper Coal Measures Formation	Mudstone, Siltstone and Sandstone	Secondary A Aquifer

E3P has reviewed the BGS database, which identified a borehole in close proximity, from which to compare the published geology above.

The borehole logs are summarised in Table 4.2 below.

TABLE 4.2 SUMMARY OF BGS BOREHOLE RECORDS

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
30 m N (ref:SJ89NE1428)	13.42 m	0.00-2.80 m	CLAY 2.80-12.70 m	MUDSTONE and SANDSTONE > 12.70 m
50 m NE (ref:SJ89NE1418)	50.85 m	0.00-1.50 m	CLAY 1.50-16.10	MUDSTONE and SILTSTONE > 16.10 m (Bands of coal at 18.15-18.60, 21.55-21.89, 27.44-27.65, 28.26-28.39, 44.28-44.80 and 50.28-50.33m)

The BGS mapping also identifies the location of faults, as presented in Table 4.3.

TABLE 4.3 SUMMARY OF FAULTS

LOCATION	DEPTH
44m NE	Coal seam, inferred
167 m NE	Coal seam, inferred
650 m E	Geological Fault

4.2. HYDROGEOLOGY

The Envirocheck report indicates that the site is not located within a groundwater source protection zone. Furthermore, there are no groundwater/potable abstractions within 500m of the site.



Based on the local topography and location of surface watercourses it is considered likely that shallow groundwater, if present, will flow in a westerly direction, along Ashton New Road and towards River Medlock.

4.3. NATURAL LANDFORM AND GEOMORPHOLOGY

Based on the initial geological assessment, a review of available topographic data and pertinent mapping, E3P has undertaken a preliminary geomorphological evaluation of the landform and its possible mechanism for formation.

A review of relevant records indicates that the site has not been subject to significant anthropogenic changes with the current site topography broadly representing natural landform.

No surface water features are located within 250m of the site, and as such, are unlikely to have previously influenced the sites' topography

It is possible that the historical level raising has resulted in a greater thickness of Made Ground overlying the natural glacial till.

4.4. RADON RISK POTENTIAL

The Envirocheck report indicates that the site is situated in an area where less than 1% of homes are above the "Action Level" and that the BGS reports that full protective measures are not necessary for the construction of new dwellings or extensions.

4.5. HYDROLOGY

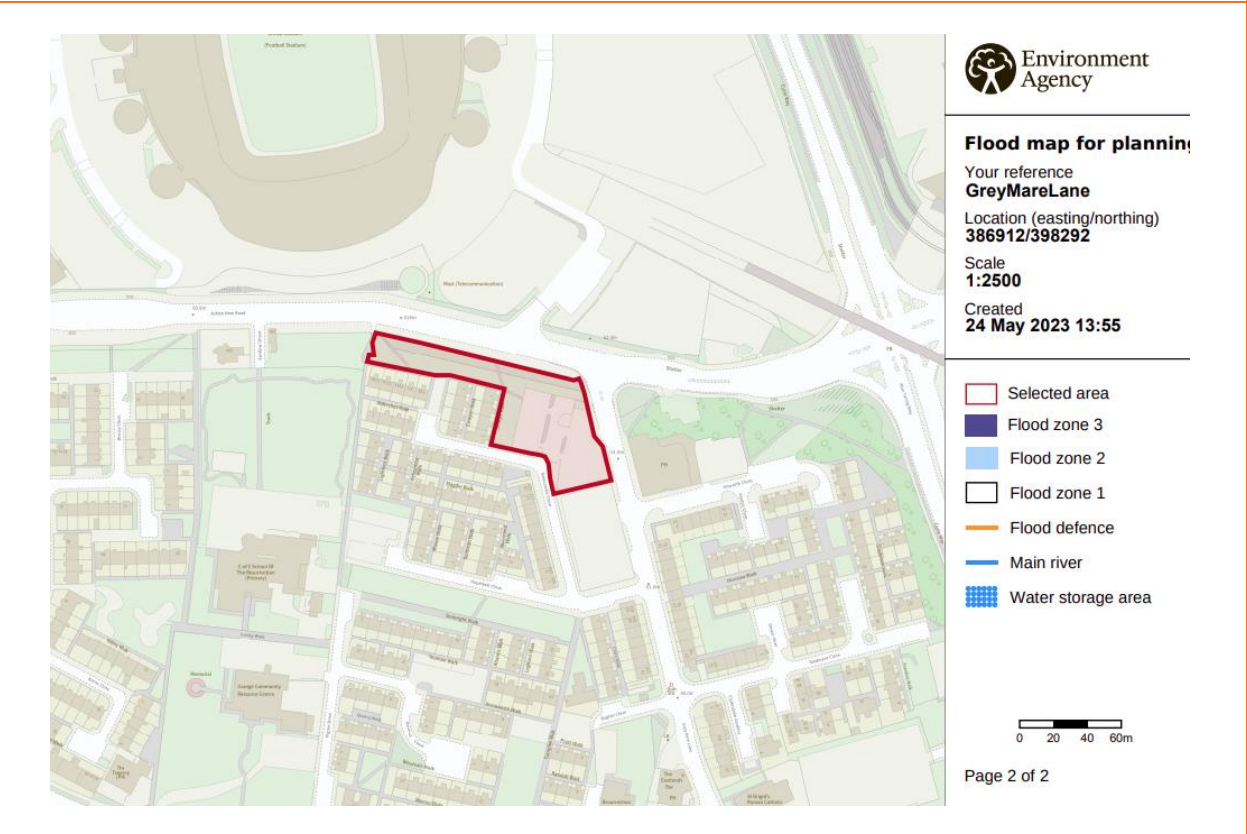
There are no surface water features within 250 m of the subject site.

The site is predominantly located within a currently defined area deemed as not being at risk from river, coastal or surface water flooding. Small areas within the site boundary are defined as having a medium risk of surface water flooding. A record associated with surface water flooding may relate to drains not be able to cope of an extreme rainfall event. It is recommended that any drains at the site be subject to regular maintenance.

The EA Flood Risk Map is presented in Figure 4.1.



FIGURE 4.1 EA FLOOD RISK MAP



Source - <https://flood-map-for-planning.service.gov.uk/location>

4.6. LANDFILL SITES AND WASTE TREATMENT SITES

No active or historical landfill sites have been identified within 250m of the site.

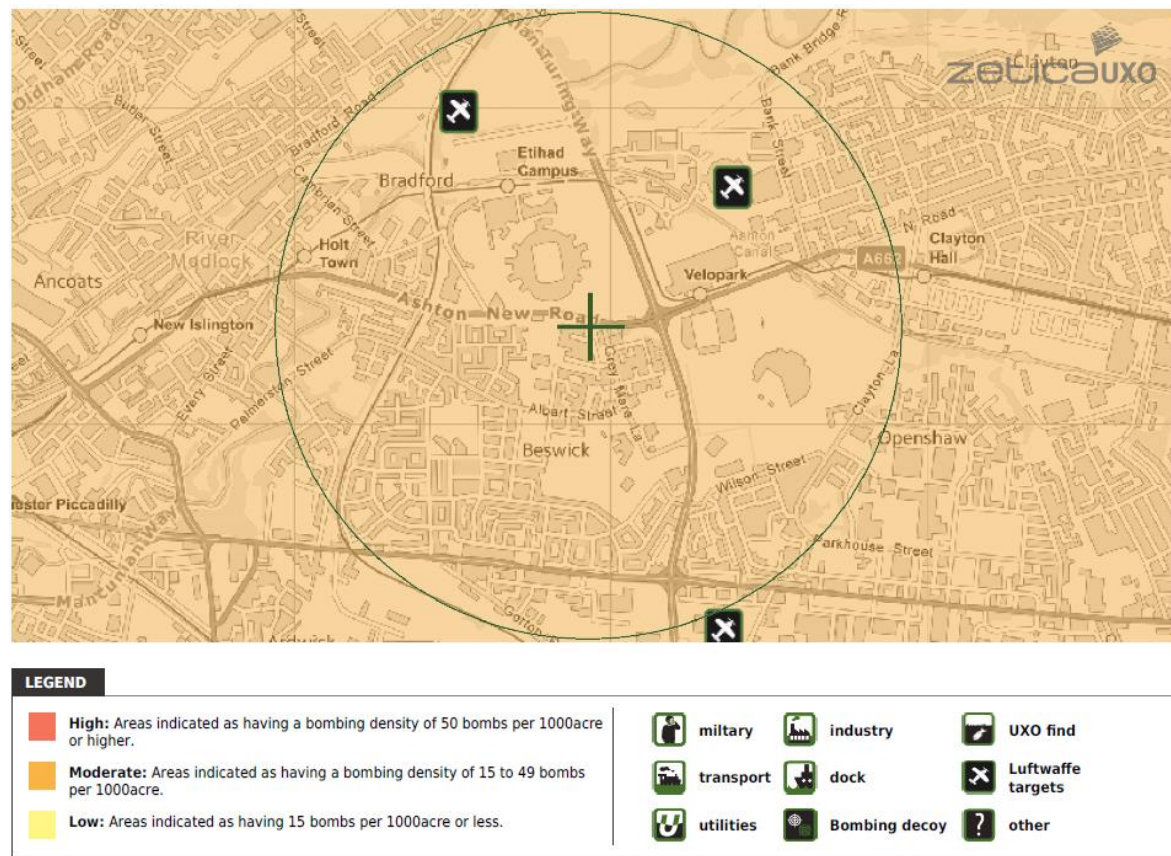
4.6.1. WASTE MANAGEMENT LICENSES & ENVIRONMENTAL PERMITS

No Waste Management Licenses or Environmental Permits have been identified in the environmental database for the site and surrounding area.

4.7. UNEXPLODED ORDNANCE

The regional unexploded bomb risk map from Zetica (2014) indicates that the Site is in an area at moderate risk from possible unexploded ordnance (UXO) resulting from the Second World War. The Zetica UXO Risk Map is presented in Figure 4.2.

FIGURE 4.2 ZETICA UXO RISK MAP



Source - <https://zeticauxo.com/downloads-and-resources/risk-maps/>

4.8. INDUSTRIAL LAND USES

There are 2 active industrial land uses within 250 m of the site boundary which are summarised in Table 4.4.

TABLE 4.4 INDUSTRIAL LAND USES

COMPANY	ACTIVITY	DISTANCE (m)	DIRECTION
Mast (Telecommunication)	Telecommunications Features	36m	NW
Electricity Sub Station	Electrical Features	126m	SE

4.9. SITE SENSITIVITY ASSESSMENT

The site is assessed to be located within a “Moderate” sensitivity setting as discussed within Table 4.5.



TABLE 4.5 SITE SENSITIVITY ASSESSMENT

SENSITIVITY PROFILE	DISCUSSION	RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	None identified.	Low
Distance to the Closest Groundwater Abstraction Point	731 m East	Low
Aquifer Classification in Superficial Drift Deposits	Secondary Undifferentiated	Low
Aquifer Classification in Bedrock	Secondary A	Moderate
Is the Site Underlain by Low-Permeability Drift to Depths in Excess of 10 m?	BGS records indicate that drift strata, comprising predominantly clay, is present to ca. 16 m bgl.	Low
Is the Site Located Within 50 m of a Surface Watercourse?	No surface water features are located within 250m of the site boundary.	Low
Sensitive Land Uses Within Close Proximity (e.g. Residential, School, Nursery, Local Nature Reserves)	The closest residential properties are located adjacent to the southern boundary of the site. The site is located within a SSSI Impact Risk Zone.	Moderate
OVERALL SITE ENVIRONMENTAL SENSITIVITY		Low/Moderate

4.10. REGULATORY DATABASE

The information summarised in Table 4.6 has been obtained from a commercially available environmental database. The summary table only includes records from within 250 m of the subject site and not otherwise detailed in the report.

TABLE 4.6 SUMMARY OF ENVIRONMENTAL DATA

RECORD	ENTRIES WITHIN 250 m	DETAILS
Contaminated Land Register Entries and Notices	0	None Identified.
Authorised Industrial Processes (IPC/IPPC/LAPPC)	0	None Identified.
Fuel Stations Entries	0	None Identified.
Licensed Radioactive Substances	0	None Identified.
Enforcements, Prohibitions or Prosecutions	0	None Identified.
Discharge Consents	0	None identified.
Pollution Incidents	0	None Identified.



RECORD	ENTRIES WITHIN 250 m	DETAILS
Consents Issued Under the Planning (Hazardous Substances) Act 1990	0	None Identified.
Control of Major Accident Hazard (COMAH) Sites	1	171m E – Rhodia Ltd – Historical NIHHS Site



5. PRELIMINARY COAL MINING ASSESSMENT

5.1. COAL MINING

The Groundsure report states the site is in an area that may be affected by coal mining.

A CA mining report was obtained (Ref: 51003357117001) dated May 2023.

The CA operates a risk-based approach to the assessment of potential instability issues associated with future development of land located within the predefined CA consultation areas. This risk-based approach subdivides the potential risk into “low” and “high” risk categories.

The risk categories can be defined as:

Low-Risk Sites – Deemed to be land where coal mining has taken place, however it was at such depth not to pose a risk to new development and it therefore contains no known recorded risks and as such no further assessment is required.

For low-risk sites, the CA categorically states:

If your proposed development is within the Development Low Risk Area, there is no need for you to submit any coal mining information with your planning application and The Coal Authority will not be consulted by the LPA. The LPA will include our Standing Advice as an informative note within the decision notice.

High-Risk Sites – Deemed to be landholdings located within an area known to contain legacy risks that include:

- ✿ Mine entries (shaft or adit);
- ✿ Shallow coal workings (recorded and probable);
- ✿ Workable coal seam outcrops;
- ✿ Mine gas sites and areas;
- ✿ Recorded coal-mining-related hazards;
- ✿ Geological features (fissures and break lines); and
- ✿ Former surface mining sites (sometimes using historic opencast extraction methods).

5.2. COAL MINING INFORMATION

Prior to the enactment of the Coal Mines Regulation Act (1872), which came into force on the 1st January 1883, there was no statutory requirement to record the extent of abandoned mine workings and as such the CA has no knowledge of extensive workings throughout the UK Coal Fields where shallow workings are present at a depth that could result in a subsidence event in the future (through successive cavitation) associated with failure of support mechanism.

To determine if a site may have unrecorded or recorded coal mine workings requires the consideration of a wide range of information and E3P has completed a review of relevant information in relation to potential coal mining activities.



In the first instance, E3P has reviewed the Coal Authority Online Viewer and an excerpt of this is presented as Figure 5.1. This map shows that the site lies within a high-risk development area. Furthermore, there are coal seams to the north-east of the site, which may dip below the Site. The map also identifies a disused mine shaft to the north-east of the site.

FIGURE 5.1 EXCERPT OF THE COAL AUTHORITY ONLINE VIEWER

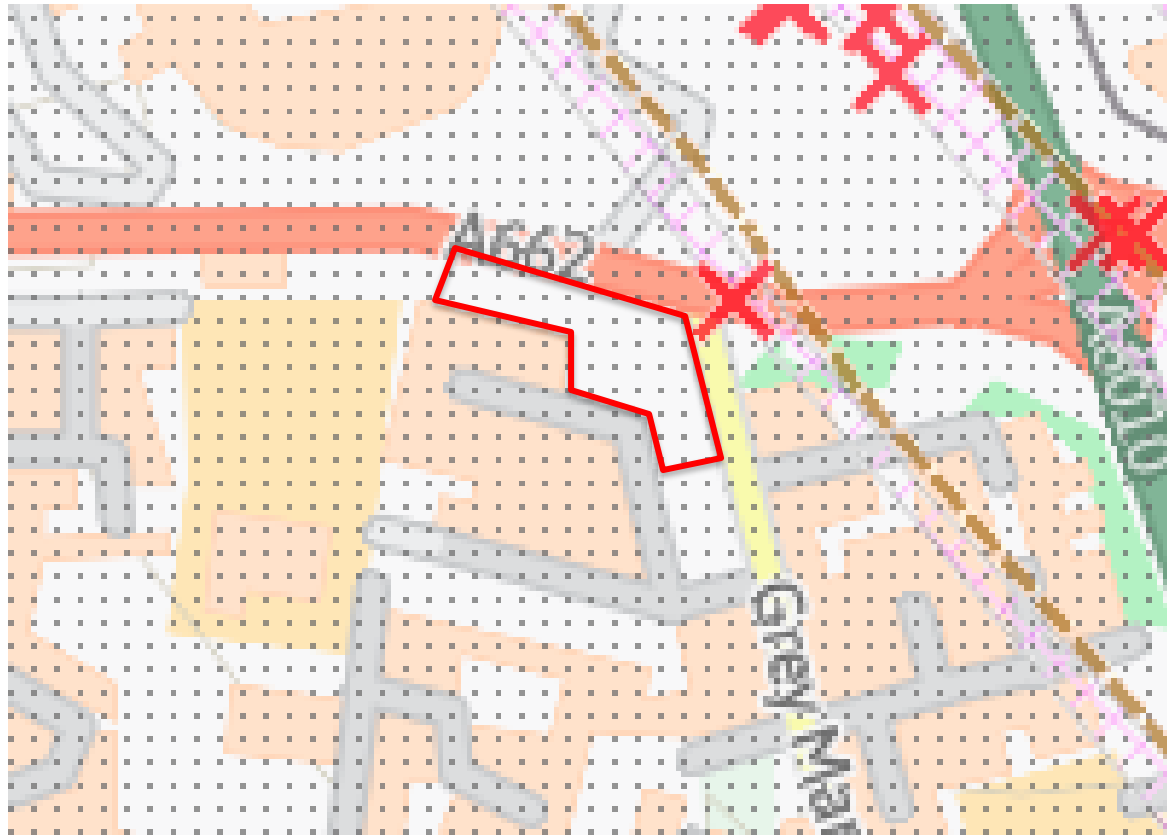


Table 5.1 provides a summary of pertinent coal mining information with this report.

TABLE 5.1 COAL MINING INFORMATION

SOURCES OF INFORMATION	SUMMARY				
	SEAM	ANGLE OF DIP	EXTRACTION THICKNESS	DEPTH	YEAR LAST MINED
Known Past Underground Mining	Bradford Four Feet	14.0	130cm	114m	1880
	Bradford Four Feet	18.4	120cm	121m	1760
	Bradford Four Feet	18.4	120cm	147m	1760
	Yard	18.0	90cm	206m	1880
	Parker	18.0	80cm	552m	1935
	Parker	18.0	80cm	559m	1935
	Parker	18.0	80cm	569m	1935
	Parker	18.0	80cm	648m	1935
	Crombouke	16.5	120cm	898m	1929
	Crombouke	17.0	120cm	900m	1913
	Crombouke	16.5	120cm	908m	1932



SOURCES OF INFORMATION	SUMMARY
Probable Unrecorded workings	None.
Spine Roadways at Shallow Depth	No spine roadway recorded at shallow depth.
Mine Entries within 100m of the Site	Shaft – Grid ref: 386991, 398319 – 386398-015 – 25m NE
Mine Abandonment plans	Yes – available on request
Known outcrops	Openshaw – Workable: Yes
Faults / Fissures	No faults, fissures or breaklines recorded.
Opencast mines	None recorded within 500m of the enquiry boundary.
Coal Authority Managed Tips	None recorded within 500m of the enquiry boundary.
Remediated Sites	None recorded within 50m of the enquiry boundary.
Coal Mining Subsidence	None recorded within 50m of the enquiry boundary.
Mine Gas	None recorded within 500m of the enquiry boundary.
Mine Water	None recorded within 500m of the enquiry boundary.
Future Underground Mining	None recorded.
Coal Authority Development Advice	The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.
British Geological Survey Mapping	The 1:10,000 geological mapping for the area notes the Openshaw Mine coal seam present circa 40m to the north-east of the site. The Charlotte Mine coal seam is located further north-east of the site. All four coal seams shown outcropping in close proximity to the Site are shown to be dipping in a north-westerly direction at circa 8°, therefore being present beneath the Site.
Review of Coal Authority Archive	No CA archives/mine abandonment plans are made available.
Historical Ordnance Survey Mapping	A review of the 1:10,000 Ordnance Survey mapping from circa 1850, which has records of mine workings that predate the Mining & Regulation Act of 1872, identified the following features indicative of historical mine workings in proximity to the application site:  Bradford Colliery – 20 m Northeast  Coal pits – 200 m North, 300 m East, 300 m West, 450 m North. In consideration of the historical mining features in proximity to the Site and potential for coal close to the surface it is considered possible that coal extraction has occurred, underlying the Site at relatively shallow depths; further investigation would be required to determine the extent and depth of any worked seams.
Historical Site Investigations	E3P has not been provided with any historic site investigation reports. An historical investigation has been recorded to the north of the site – details have been requested from the Coal Authority.

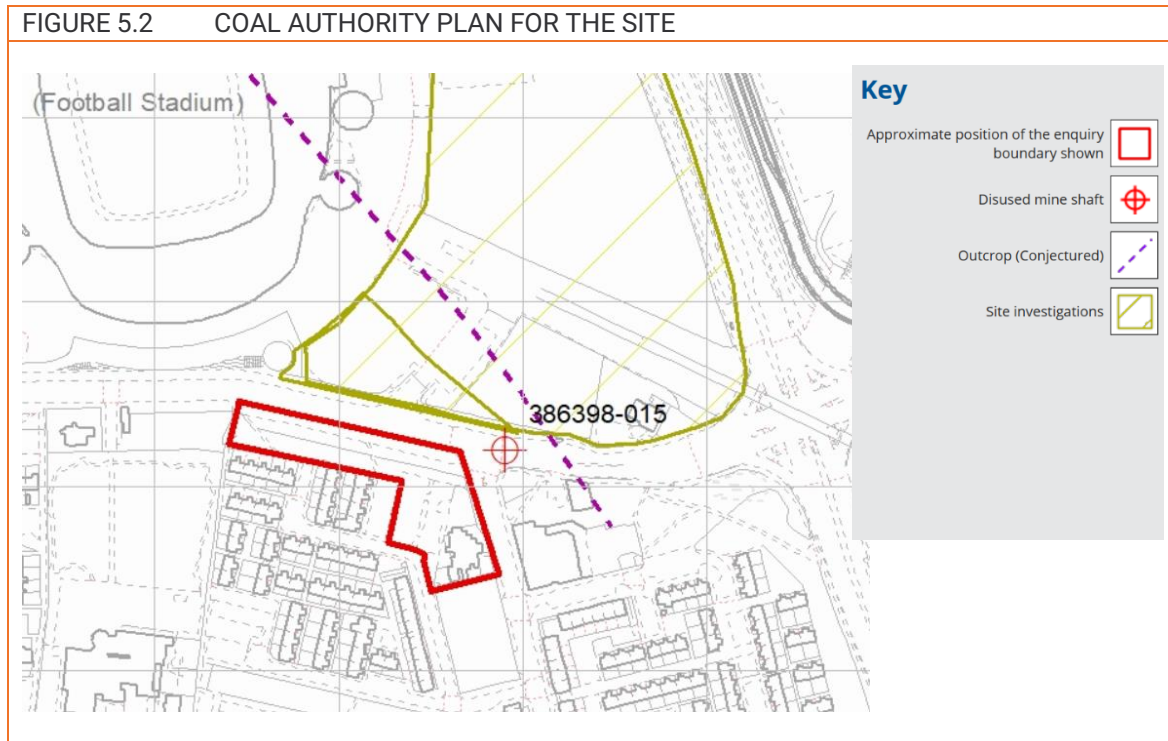


5.3. COAL AUTHORITY PLAN

The Coal Authority plan referenced: MR-LARGE-PLOT-51003357117001-1684942335019 shows there is a mine shaft (Ref: 386398-015) to the north east of the site. This mine shaft is noted to be disused, and known to have been capped.

The Bradford Colliery is noted to the northeast of the site, with an outcrop running northwest – southeast to the north of the site.

FIGURE 5.2 COAL AUTHORITY PLAN FOR THE SITE

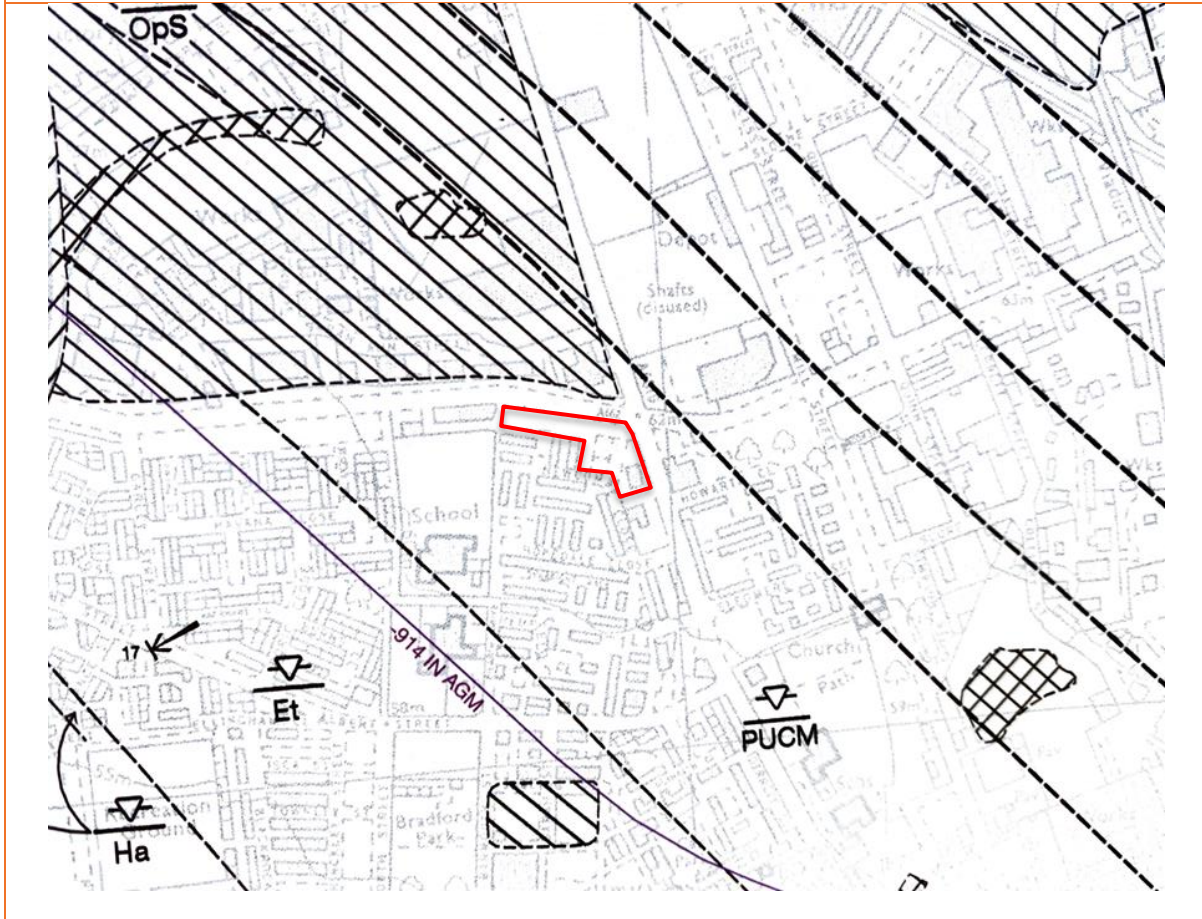


5.4. COAL MINING GEOLOGY

Figure 5.3 is a photograph of the 1:10,000 plan for the site which shows a coal outcrop to the north-east of the subject site and which is recorded to dip below the site.

This seam would therefore potentially pose a risk to the subject site.

FIGURE 5.3 PHOTOGRAPH OF THE 1:10,000 PLAN FOR THE SITE



5.5. ANECDOTAL INFORMATION – BRADFORD COLLIERY

The Bradford Colliery and associated workings are present across a large section of the north and east of Manchester.

Figure 5.4 indicates the location of the Colliery, which is situated directly north of the site.

A shaft at Bradford Colliery, now underlying the Etihad stadium to the north of the site, sunk in 1854 and reached a depth of over 870m (almost 2,900ft), which was once one of the UK's deepest pits.

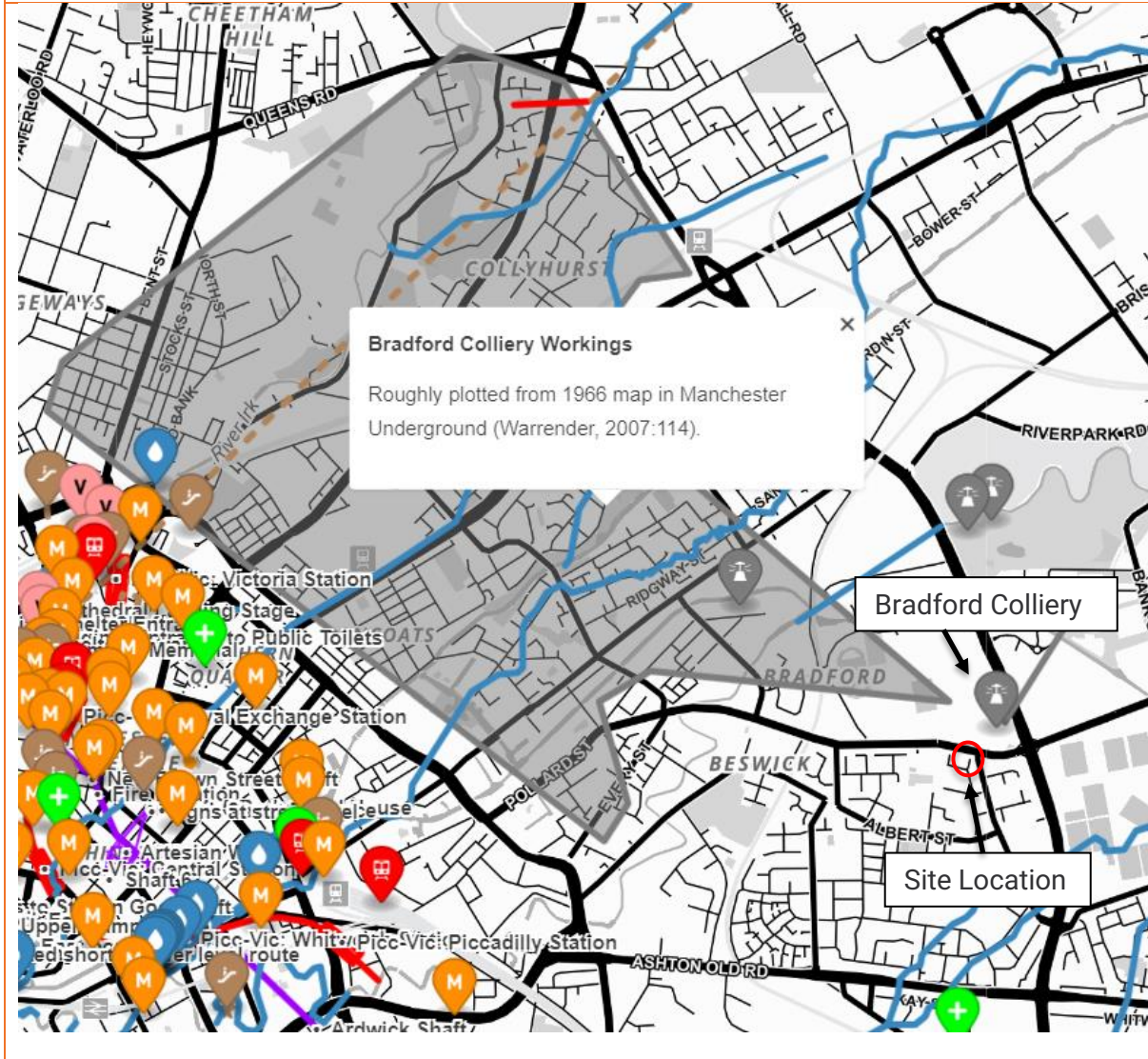
The second shaft was sunk in 1902 before the site was reconstructed in 1958 with four faces in operation in two seams; three faces in Roger mine and one face in the Crombouke mine. Both shafts were 900 feet (Approx. 270 m) deep and were in the format of horizon coal mining. The insets to the Parker and Roger Mines are at depths of about 543 yards (Approx. 500m) and 946 yards (Approx. 865m) respectively and the Crombouke Mine is 26 yards (Approx. 24m) above the Roger Mine.



The shafts were both noted to have been capped with reinforced concrete in a scheme costing £8 million.

The colliery had long been connected to the nearby coal-fired power station in Stuart St by means of a 500-yard tunnel containing a conveyor belt to transport coal directly to the boilers. The colliery was shut in 1968 due to the expansion of Manchester city centre and related subsidence costs.

FIGURE 5.4 PHOTOGRAPH OF THE 1:10,000 PLAN FOR THE SITE



Source: <https://hidden-manchester.org.uk/>

5.6. PRELIMINARY MINE GAS ASSESSMENT

If coal mining is present below the site, this may be a potential source of ground gas that could pose a risk to site end users. A preliminary mine gas assessment is provided in Table 5.2.

TABLE 5.2 PRELIMINARY MINE GAS ASSESSMENT

SCENARIO	DISCUSSION	RATING
Are there known coal seams beneath the Site?	Yes – four known coal seams dip below the Site.	Moderate
Are there coal seams within 150m of the top of bedrock?	Yes – the coal seams beneath the Site are known to be as shallow as 114m bgl.	Moderate
Are there any known workings below the Site?	Yes – there are known workings as shallow as 114m bgl	Moderate
Are the underlying drift deposits impermeable?	Yes – the Site is underlain by circa 16m of clay	Low
Are there any mine entrances within the site boundary or within 50m of the Site?	Yes – there is one mine shaft located in close proximity to the site situated 25 m northeast.	Moderate
Are there any faults below the Site or in close proximity?	No	Low
Is there any records of mine gas emission on or within 50m of the Site	No	Low
Is there any record of historical mine stabilisation works?.	No	High
Evidence of rising groundwater in flooded mine workings?	Not known	Moderate
OVERALL MINE GAS RISK (IF MODERATE/ HIGH THEN FURTHER ASSESSMENT IS REQUIRED)		Moderate
Conclusions:		
Source: The Site is underlain by known coal workings at relatively shallow depth, which are a potential source of ground gas. Pathway: The Site is underlain by 16m of permeable clay; therefore, the likelihood of mine gas migration through the clay to the ground surface is low. However, there are known mine shafts and faults in proximity to the site, which could create a preferential pathway for mine gasses to reach the ground surface. Recommendations: Further assessment is required to assess the potential for mine gas to migrate up mine shafts or faults to the ground surface.		



5.7. COAL MINING RISK ASSESSMENT

This risk assessment comprises a desk-based review of all available information on coal mining issues that are relevant to the application site deemed to be located within a high-risk area. This includes:

- ✳ Interpretation of information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues;
- ✳ Setting out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development; and
- ✳ Demonstrating to the local planning authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

The coal mining risk assessment is summarised in Table 5.3.

TABLE 5.3 SUMMARY OF COAL MINING RISK ASSESSMENT

Coal Mining Risk Assessment	Yes/No	Risk Assessment
Recorded Underground Coal Mining at Shallow Depth (< 30 m)	No	Low
Recorded Underground Coal Mining at Shallow Depth (> 30 m)	Yes	Moderate
Evidence of Unrecorded Surface Extraction of Coal Outcrop	No	Low
Unrecorded Underground Coal Mining at Shallow Depth (< 30 m)	Yes	Moderate
Mine Entries (Shaft/Adits)	Yes (Circa 30m NE)	Moderate
Coal Mining Geology – Fractures/Fissures	No	Low
Recorded Gas Emissions	No	Low
Recorded Mining Surface Hazard	No	Low
Surface Mining (Opencast)	No	Low

Due to the presence of historical coal working located beneath the site, additional site assessment work will be required. This includes Rotary Boreholes to determine the presence and depth of coal seams beneath the site. A detailed coal mining risk assessment will be included as part of the Phase II Geoenvironmental Site Assessment.



6. PRELIMINARY GEOTECHNICAL ASSESSMENT

6.1. GEOTECHNICAL DATA

Geotechnical data presented within a commercially available environmental database is summarised in Table 6.1.

TABLE 6.1 SUMMARY OF GEOTECHNICAL DATA

HAZARD	DESIGNATION
Shrink-Swell Clay	Very low risk
Landslides	Very low risk
Ground Dissolution	Negligible risk
Compressible Ground	Very low risk
Collapsible Deposits	Very low risk
Running Sand	Very low risk

6.2. SUBSIDENCE

Information within the Groundsure Report states the site is within an area of no hazard to very low hazard from rock solubility.

6.3. PRELIMINARY GEOTECHNICAL ASSESSMENT

Based on the desk-study information, the following geotechnical assessment has been made:

- Given the developed nature of the site, it is likely there will be limited Made Ground fill deposits and obstructions. In the area of the historical Public House, all relict foundations will require grubbing out before the proposed development's construction.
- The site is located in a coal mining reporting area with potential for ground instability arising from underlying coal workings. Further assessment may be required in relation to coal mining.
- The site has little to no topographical variation and it is anticipated that significant earthworks will not be required to create a level developable platform to construct high-rise residential development.
- Piled foundations may be utilised in the construction of the high-rise building, which will likely sit on underlying bedrock. However, coal workings, which will require grouting, may be present beneath the site, potentially impacting the installation of piled foundations
- Heave precautions may need to be considered given the underlying cohesive clay deposits and both historical and current tree locations.



6.4. PRELIMINARY GEOTECHNICAL RISK REGISTER

POTENTIAL CONSTRAINT	ABNORMAL	LOCATION ON SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Remediation of contaminated soils		On Site	TBC	Made Ground deposits will be present on site due to previous development. It is likely that some remediation may be required prior to any development.
Bedrock		N/A	N/A	Bedrock is not anticipated to be encountered within 15m bgl.
Obstructions		All	100	Obstructions have been noted across the site in association with former drainage and historic foundations.
Artificially levelled and filled platforms		N/A	N/A	The site appears to have been artificially levelled from historic developments. The site slopes down from the northern boundary in the soft standing area which is likely to have anthropogenic influence.
Mature trees		Along northern boundary	25	Further assessment will be required in relation to the mature trees along the northern boundary and underlying root systems.
Volume change potential clay		On Site	100	The underlying glacial till is predominantly clayey soils, therefore an intrusive site investigation will be required to determine the Volume Change Potential of the clay.
Concrete design		TBC	TBC	Concrete classification will depend on sulphur levels present within the underlying strata. Investigation will be required to determine the design parameters.
Low-permeability ground		Across Site	100	Clayey glacial till is anticipated to be present beneath the site.
Abnormal foundation solutions		N/A	N/A	Given the high rise nature of the proposed structures it is expected that the foundations will be designed by a specialist. Depending on the structural loadings it is expected a pile type design will be most viable.
Areas not investigated		Across site	100	Intrusive investigation will be required across the site as no previous investigations have been provided to E3P.
Mining		Across site	100	Coal workings have been identified across the site. Further assessment will be required in relation to ground instability and subsidence.
Sensitive on-site or off-site infrastructure		N/A	N/A	Services are anticipated to run underneath the footpath to the north of the site, connected with the street lighting in the car park in the west of the site. It is likely further services will connect to existing properties adjacent to the site.



7. INITIAL CONCEPTUAL SITE MODEL

Under EA LCRM (2021b) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), and BS EN ISO 21365:2021 (Soil Quality – Conceptual models for potentially contaminated sites), E3P has developed a Tier 1 Risk Assessment comprising an initial conceptual site model (CSM) to identify potential contamination sources, migration pathways and receptors within the study area. An initial screening of the on and potential off-site sources of contamination has been undertaken in Table 7.1, with the more detailed initial CSM included overleaf as Table 7.2.

TABLE 7.1 INITIAL CONTAMINANT SOURCE SCREENING

SOURCE	SOIL	GROUNDWATER	GROUND GAS
ON-SITE			
Made Ground in association with historic developments	Heavy Metals, TPHs, Asbestos Containing Materials (ACM) PAHs, Volatile compounds (TPHs)	Heavy Metals, TPHs, VOCs,	Potentially elevated CO ₂ and CH ₄ gases.
Picture Theatre	Inorganic compounds, PAHs, ACM, Heavy Metals, TPHs, chlorides, iodides	Inorganic compounds, PAHs, ACM, Heavy Metals, TPHs	Chlorine gas associated with reduction of photographic chemicals
OFF-SITE			
Colliery	Heavy Metals, Asbestos Containing Material (ACM), non-volatile PAHs, volatile compounds (TPHs)	TPHs, VOCs - unlikely	Potentially elevated CO ₂ and CH ₄ gases as a result of mine workings.
Iron Works	Heavy Metals, Inorganic compounds, PAHs, TPHs	Unlikely	Unlikely
Dye Works	Heavy Metals, Inorganic compounds, PAHs, TPHs, VOCs, acids	TPHs, VOCs - unlikely	Unlikely
Warehouses	Heavy Metals, Asbestos Containing Material (ACM), non-volatile PAHs, volatile compounds (TPHs)	Unlikely	Unlikely



7.1. INITIAL CONCEPTUAL SITE MODEL

Upon assessment of the information collated for the Phase 1 desk study, the initial conceptual site model shown in Table 7.2 has been prepared for the site.

TABLE 7.2 INITIAL CONCEPTUAL MODEL

CONTAMINANT LINKAGE			PLAUSIBLE LINKAGE?	COMMENTARY AND PROPOSED RESPONSE
SOURCES	MIGRATION PATHWAYS	RECEPTORS		
SOIL				
Made Ground Sulphate from potential ash within the Made Ground.	Sulphate attack on concrete. PL6	Building concrete	Yes	Significant ash deposits have been identified within the Made Ground underlying the site. The potential for sulphate in ash deposits is high which may impact the proposed building concrete. Recommendation: Intrusive investigation will be required to confirm the concrete classification. Construction works to be completed with appropriate PPE and welfare facilities.
Made Ground Organic contaminants such as hydrocarbons, solvents	Ingestion of tainted water supply. PL7	Human Health – End Users Water pipeline	Yes	Likely probability as contaminant exceedences are considered possible at pipeline depth across the site (0.75–1.35 m). Recommendation: It is possible barrier pipe will be required across the site, however further intrusive investigation is required to confirm this.
Made Ground Phytotoxic contaminants	Direct contact (plant uptake). PL8	Flora	Yes	Unlikely probability as although contamination which may be taken up by flora in soft landscaping/gardens, is considered possible, significant soft landscaping is not considered to be part of the proposed development. Recommendation: Intrusive investigation required.



CONTAMINANT LINKAGE			PLAUSIBLE LINKAGE?	COMMENTARY AND PROPOSED RESPONSE
SOURCES	MIGRATION PATHWAYS	RECEPTORS		
Made Ground Asbestos (Asbestos containing materials (ACM) and loose fibres)	Inhalation (of fibres). Construction works disturbing bound material and releasing fibres. PL3	Human Health - Site personnel, end land users, and users of adjacent sites	Yes	Asbestos may be present within Made Ground deposits on-site from previous development. Risk of inhalation of fibres during Ground Investigation and construction works. Disturbance of ACMs and dust derivatives from construction would increase the risk. Recommendation: Further intrusive investigation will be required to determine the presence of ACMs and develop appropriate mitigation measures. Construction works to be completed with appropriate PPE and welfare facilities.
Made Ground Heavy metals - aluminium, copper, lead, iron, tin, zinc Inorganic compounds - iodides, chlorides, bromides	Soil Ingestion. PL1 Dermal contact and ingestion. PL2 Ingestion of tainted water supply. PL7	Human Health - Site personnel, end land users, and users of adjacent sites Water Pipeline	Yes	The picture theatre through the 1930s may have potential contaminants present similar to those of photographic processing industry. The DOE industry profiles suggest where this is the case modern photographic materials are coated with gelatin layers containing silver halide salts including Silver Chloride, Silver Bromide and Silver Iodide. During exposure to light some of the chemicals included in the process reduce to silver and bromine or chlorine gas. Contaminant exceedences associated with the above Made Ground are likely to be present pipeline depth (0.75–1.35 m) Recommendation: Further intrusive investigation will be required to determine the presence of inorganic compounds within the Made Ground.
CONTROLLED WATERS				
Leaching contaminants from the underlying Made Ground	Leaching of contaminants from Made	Controlled waters, underlying	Yes	The presence of impermeable clay soil deposits may reduce the leachate produced from contaminated soils, and therefore reduce the impact to groundwater.



CONTAMINANT LINKAGE			PLAUSIBLE LINKAGE?	COMMENTARY AND PROPOSED RESPONSE
SOURCES	MIGRATION PATHWAYS	RECEPTORS		
Groundwater	Ground through infiltration and percolation of rainwater. PL5	Secondary A aquifer		Based on the presence of the underlying Secondary A Aquifer, risk to controlled waters is considered to be moderate. Though the risk to surface water features is considered low due to their distance from site. Further detailed assessment will be required.
		Infrastructure and services	Yes	The presence of impermeable clay soils will reduce the leachate produced from contaminated soils. Infrastructure and services will need to be designed to resist chemical attack and ingress.
	Contact with contaminated groundwater. PL2	Human Health – site personnel	No	Groundwater is known to be below construction level and as such, is not expected to rise above final ground level.
	Contaminants leached from the Made Ground and from off-site sources may be mobilised to greater distances through advective flow. PL5	Human Health – end users	No	Impacted groundwater is unlikely to transport contaminants vertically or horizontally through impermeable strata. Furthermore, the site works will be undertaken above the water table. Groundwater will need to be considered for surrounding developments.
GROUND GAS				
Ground gases (methane and carbon dioxide within the Made Ground deposits)	Inhalation of ground gas. PL4 Accumulation of ground gas in confined spaces (asphyxiation or explosion)	Human Health – site personnel	Yes (limited)	Based on the sites history, there is a potential for bromine or chlorine gasses at very low levels that might occur as VOCs. During excavation work, removal of confining strata may expose workers to volumes of pocketed gas. Protective measures during the works required. Limited linkage based on expected gas concentrations within the ground.
		Human Health – end users	Yes (limited)	The design may include confined spaces below the building, where ground gas has potential to collect. Ventilation may be required dependent on ground gas levels identified during intrusive investigation.
		Infrastructure and services	Yes (limited)	Service conduits may need to be designed with passive venting systems.



Main exposure pathways:

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants.



8. CONCLUSIONS

8.1. SITE SUMMARY

Current Site Use	The northern part of the site is currently covered with grass softstanding with a line of mature trees along the northern boundary. The southern portion of the site is currently unoccupied and covered in asphalt hardstanding. The central portion of the site used to contain the former public house however since its demolition to slab level, the area has been left as concrete hardstanding. An area of the central section is currently used as car parking for local residents. Curbs and street furniture are prevalent through this area along highway access to the former pub and car park. There are no structures currently present within the site boundary.
Historical Site Use	The site was recorded as residential housing in the north and south with an additional large building in the centre noted as 'nurses home'. In circa 1930 residential housing in the west of the site was redeveloped into a Picture Theatre continuing off-site. The Nurses Home was fully redeveloped pre-1977 to construct the club (recently demolished). All buildings were demolished circa 2019 and the site has remained vacant since then.
Site Sensitivity	The closest groundwater abstraction point is located 731 m east of the site at Manchester City Football Club Limited. The closest residential properties are located adjacent to the southern site boundary. The site has been given an overall sensitivity rating of low/moderate.
Environmental Data	No pollution incidents have been recorded on site.

8.2. CONTAMINATED LAND ASSESSMENT

Human Health	Due to the previously developed nature of the site, it is likely that Made Ground deposits will underlie the site throughout, mainly associated with residential housing and the Public House. However, the picture theatre through the 1930's may have potential contaminants present similar to those of photographic processing industry. The DOE industry profiles suggest where this is the case, modern photographic materials are coated with gelatin layers containing silver halide salts including Silver Chloride, Silver Bromide and Silver Iodide. During exposure to light some of the chemicals included in the process reduce to silver and bromine or chlorine gas. An intrusive investigation will be required to confirm the initial conceptual site model.
Controlled Waters	Volatile contamination may be present within the Made Ground deposits associated with previous on-site development as identified in human health section.



	The presence of impermeable clay soil deposits may reduce the leachate produced from contaminated soils, and therefore reduce the impact to groundwater. Based on the presence of the underlying Secondary A Aquifer, risk to controlled waters is considered to be moderate. Though the risk to surface water features is considered low due to their distance from site. Further detailed assessment will be required.
Ground Gas	Infilled features are not anticipated to be encountered on site, and as such, limits the potential for ground gas. However, shallow Made Ground is anticipated on site and has the potential to produce hazardous ground gases such as methane and carbon dioxide in low levels. Given the site's location within a coal mining area there is a potential for mine related gases at the site, though currently there are no reports of significant emissions. Furthermore, based on the site's history there is a potential for bromine or chlorine gases at very low levels that might occur as VOC, detectable during gas monitoring. Completion of an RB17 assessment or installation of monitoring wells is required to assess for the presence of ground gases and facilitate further risk assessment

8.3. COAL MINING

Coal Mining	The site is located in a development high risk area. There are no mine entries located on site however one is situated 25m north east of the site. The mine entry is known to be in association with the Bradford Colliery which is situated approximately 20m north east of the site. Known workings have been recorded 114m bgl under the site. It is likely that the site may be influenced by worked seams at a shallow depth given the position of shafts and outcrops in the area, putting the site at high risk from coal mining related land instability. Based on the above, a high risk of unrecorded coal mining at shallow depth has been identified within the site boundary. The Coal Authority, as a statutory consultee, will require a series of rotary open holes across the site to determine the presence of any coal on-site and to understand the nature of any coal workings.
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8.4. GEOTECHNICAL ASSESSMENT

Geological	Historical slabs and foundations are present in the centre of the site associated with the previous use as a public house. Furthermore, relict foundations are likely to be encountered in the north of the site, on the site of the old theatre. All existing
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	underground foundations and obstructions beneath the proposed development will require grubbing out in their entirety, however it is considered that most of this hard material will be suitable for reuse in construction once excavated and processed. As the proposed development is a high-rise apartment block, a piled foundation solution may be required socketed into the underlying bedrock. Further investigation should be undertaken to assess the strength and suitability of the bedrock for piling. However, should any coal workings require grouting beneath the site, piled foundations may not be suitable.
Civil and Structural	All existing underground foundations and obstructions beneath the proposed development will require grubbing out in their entirety and backfilling with a suitably engineered fill to create a suitable development platform. There is potential for shallow groundwater to be present as perched groundwater due to the site being underlain by impermeable glacial till. If shallow groundwater is encountered localised dewatering may be required during the construction phase.
Abnormal Foundations	Given the high rise nature of the proposed structures it is expected that the foundations will be designed by a specialist. Depending on the structural loadings and presence of coal workings a pile type design may be required.

END OF REPORT



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.2.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
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10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme



MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)		



APPENDIX III

RISK CLASSIFICATION

RISK CLASSIFICATION

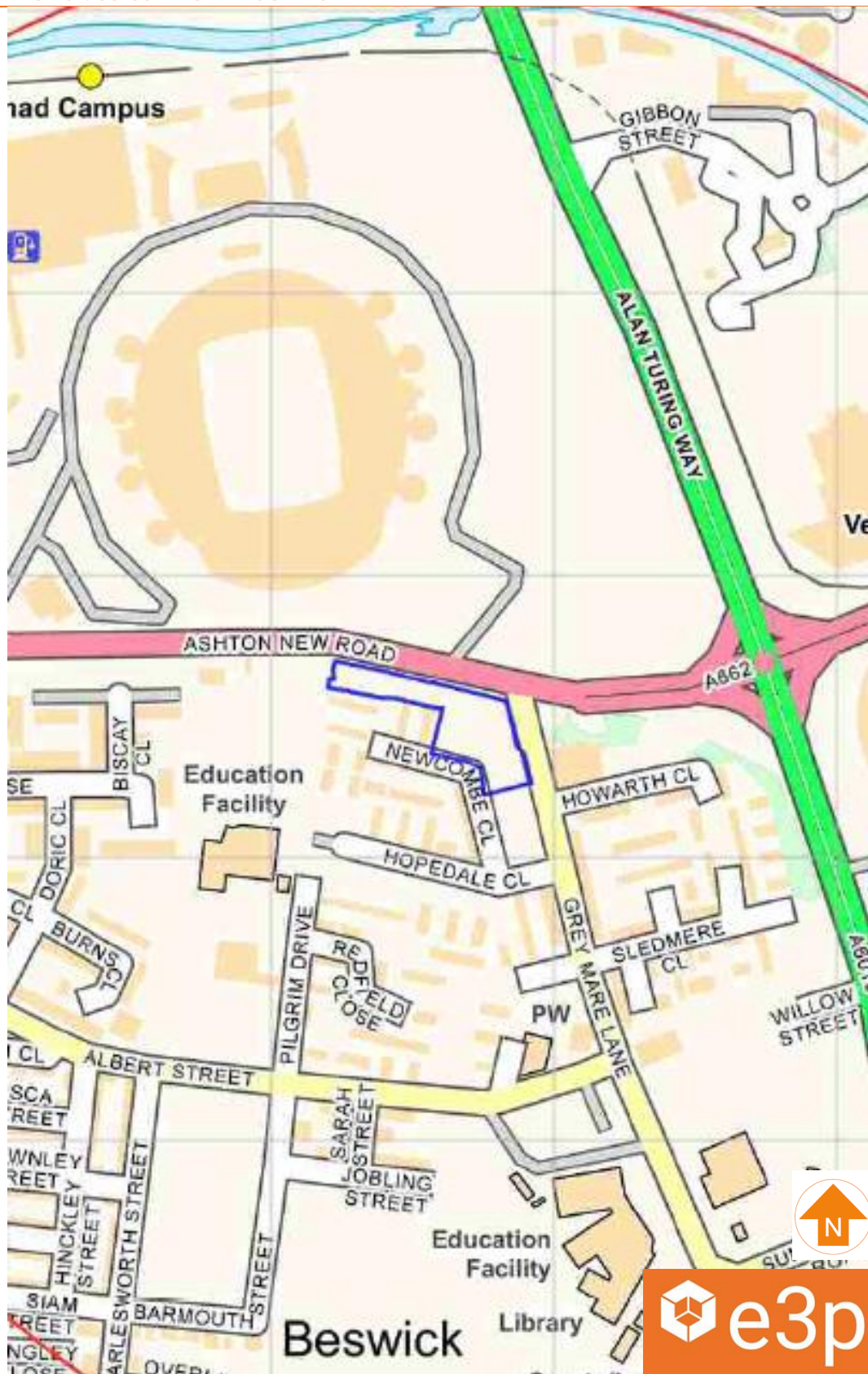
RISK	DEFINITION
Low	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property.
Low Moderate	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property with regard to the proposed use. However, minor issues may require further consideration in the event of future redevelopment of the Site.
Moderate	Some potential contaminated land liabilities/geotechnical constraints are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue but the purchaser/developer may wish to make further enquiries of the vendor or undertake further environmental improvements. Redevelopment of the Site will likely require further site investigation.
Moderate High	Some potentially significant contaminated land liabilities/geotechnical constraints have been identified at the property that requires further assessment, including intrusive ground investigations.
High	Significant potential contaminated land liabilities/geotechnical constraints have been identified at the property. Further assessment including intrusive ground investigation will be required to determine the level of risk and associated liability.



APPENDIX IV

DRAWINGS

DRAWING 16-908-001 – SITE LOCATION PLAN



APPENDIX V

PHOTOGRAPHS

PLATE 1 **CENTRAL SECTOR – RELICT FOUNDATIONS AND SLAB**



PLATE 2 **VIEW OF SITE FACING SOUTH**



PLATE 3 **WESTERN BRANCH OF SITE**



PLATE 4 **VIEW FROM CAR PARK – FACING EAST**



APPENDIX VI

HISTORICAL MAPS

APPENDIX VII

COAL AUTHORITY REPORT

AND MINE ABANDONMENT

PLANS