



**BROWNFIELD
SOLUTIONS LTD**

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

JOE BATTYE

Bradford Road, Batley

Phase I Geo-Environmental Assessment Report

TH/C4575/14464

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PROJECT QUALITY CONTROL DATA SHEET

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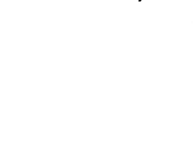
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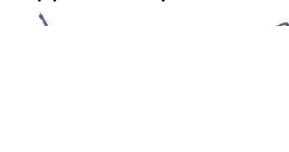
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DRAWINGS

Drawing Number	Rev	Title
0356_BAT-102	-	Proposed Site Plan
C4575/01	-	Site Location Plan

APPENDICES	
Appendix	Title
Photographs	Site Walkover Photographs
Appendix A	BSL Methodology and Guidance
Appendix B	Historical Maps
Appendix C	Geo-Environmental Data Report
Appendix D	Exploratory Hole Records
Appendix E	Mining Search Report
Appendix F	UXO Screening Map

1.0 INTRODUCTION

1.1 Context

This report describes a desk-based Phase I Geo-Environmental Assessment Report carried out by Brownfield Solutions Limited (BSL) for Joe Battye (the Client) on a parcel of land off Bradford Road, Batley (hereinafter referred to as “the site”) and has been completed in general accordance with the following guidance:

-
- Environment Agency guidance - Land Contamination: Risk Management (LCRM, 2023).
 - BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites.
 - BS5930: 2015+A1:2020 Code of Practice for Ground Investigations.
 - BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design. General rules plus UK National Annex.
 - BS EN 1997-2:2007 Eurocode 7 Geotechnical design. Ground investigation and testing plus UK National Annex.
-

Definitions of terms and acronyms used within this report is presented in Section 8.0.

1.2 Proposed Development

The proposed development is for a commercial unit/office alongside the existing gym building (JD Gyms). The proposed structure is a 2-storey warehouse unit which is 280m² in footprint. This building will not adjoin the neighbouring structures.

1.3 Previous Reports

The following reports have been produced for the site and the immediately surrounding area and should be read in conjunction with this assessment (in date order):

-
- JPG Civil and Structural Engineering Ltd. Geoenvironmental Ground Investigation. Reference: RM/GI/4575v1. Dated November 2014.
 - BSL Phase I Desk Study Assessment Report. Reference: AH/C4575/9450 Rev A. Dated January 2021.
 - BSL Geo-Environmental Assessment Report. Reference: MS/C4575/9676 Rev C. Dated November 2022.
 - BSL Supplementary Ground Investigation at Zucchini’s Restaurant. Reference MS/C4575A/9825. Dated February 2021.
-

1.4 Objectives and Scope

The objectives of this assessment were to determine the environmental setting and ground conditions of the site, highlighting potential areas of concern that may govern the redevelopment.

The scope of works comprises a Phase I Assessment and site walk-over, with a review of the site, surroundings, previous reporting, historical uses and environmental setting in order to develop a preliminary Conceptual Site Model (CSM).

This report is intended to meet the requirements of a Preliminary Investigation as defined in BS10175:2011+A2:2017 and has been produced in general accordance with the recommendations for a Tier 1 Preliminary Risk Assessment as described in LCRM guidance.

A summary of previous investigations carried out at the site has also been undertaken.

1.5 Limitations

This Phase 1 Geo-Environmental Assessment Report has been prepared in accordance with the relevant legislative framework, guidance and risk assessment methodology as outlined in Appendix A.

The findings and opinions conveyed via this assessment are based on information obtained from a number of sources as detailed within this report, BSL have assumed this information is correct and reliable. Nevertheless, BSL cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

BSL have used reasonable skill, care and diligence in the production of this report. There may be other conditions prevailing on the site which are outside the scope of work and have not been highlighted by this assessment and therefore have not been taken into account by this report. Responsibility cannot be accepted for such site conditions not revealed by the assessment.

This report has been prepared for the sole use and reliance of the Client, Joe Battye. No other third party may rely upon or reproduce the contents of this report without the written permission of Brownfield Solutions Ltd (BSL); a charge may be levied against such approval. If any unauthorised third party comes into possession of this report, then they rely on it at their own risk and BSL do not owe them any Duty of Care. This report may not be relied upon by the client or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full.

Any recommendations made in this report should be confirmed with the Regulatory Authorities prior to implementation to ensure compliance.

This assessment has been based on the proposed planning layouts provided. Any subsequent change to the planning layout may have an impact on the validity of recommendations made within this report. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

The site plans enclosed in this report should not be scaled off. Any site boundary line depicted on plans does not imply legal ownership of land.

Notwithstanding site observations concerning the presence or otherwise of archaeological issues, asbestos-containing materials (ACM) or invasive weeds (e.g. Japanese knotweed), this report does not constitute a formal survey of these potential issues and specialist advice should be sought.

2.0 THE SITE

2.1 Location

The site is located off Bradford Road, Batley, WF17 6HU, centred on National Grid Reference 424780, 423377 as shown on the Site Location Plan, Drawing No. C4575/01.

2.2 Site Description

A site reconnaissance survey was carried out at the site on 17th July 2025. The main site features and potential issues identified during this survey are detailed below. A selection of photographs from the site walkover are presented to the rear of this report.

Feature	Description
Site Area	Approximately 0.04 hectares.
Site Access	Access to the site is gained off Bradford Road to the west.
Site Overview Imagery	 Orientated North Update from Google: All images: Imagery Google©2023, Imagery ©2023 Airbus, CNES / Airbus, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The Geoinformation Group, Map data ©2023.
Current Land Use and Site Features	The site comprises an existing vehicle parking area to the rear of an active gym. Overhead or buried services were not identified during the walkover survey. However, possible scarring on the hardstanding may be related to resurfacing where services are present. The site area was surfaced with bound macadam at the time of the walkover. The macadam was in general was cracked and in a moderate condition with some patchwork repairs noted. No access constraints were identified.
Potential Sources of Gross Contamination	None observed.
Vegetation / Ecology	None observed.
Topography	The site is generally flat.
Site Boundaries	The north and west boundaries were marked by a gym building. The east and south boundaries were not clearly defined, with the area an open continuation of the larger car parking area.
Surrounding Area	The site is set within a mixed commercial and residential area, bordered a garage, shops and restaurants to the north. To the east an indoor playground with a railway line beyond. To the south vehicle parking and open land. To the west Bradford Road with restaurants and residential dwellings beyond.

3.0 GEO-ENVIRONMENTAL SETTING

3.1 Historical Setting

A review of the available historical Ordnance Survey Maps and satellite imagery has been conducted, with the pertinent issues that may have affected the site, or its environs, summarised below. The Historical Maps are presented in Appendix B. A review of the historical industrial data within the geo-environmental data report has also been undertaken below, the report is presented in Appendix C.

Notable features on site, and potentially contaminative or geotechnically relevant features within 100m of the site boundary have been presented. Features that have potentially been infilled will be considered up to 250m from the site boundary.

Feature	Distance (m) & Direction	Years Mapped	Description
Sewage Works	Onsite and offsite surround the site	1905 - 1992	Sewage works were present on site from 1905 and were no longer mapped on the 1969-1974 map. The sewage works reduce in size after these dates but were still present immediately south until 1992. For much of the duration the sewage works was present the site was shown to be located within the bacteria bed area.
Redevelopment	Onsite and offsite immediately west	1969/1974-present	The 1969-1974 mapping shows redevelopment on the site and area immediately west. The sewage works are no longer present on site. Immediately west a building has been constructed and labelled as 'Batley Variety Club'. At the time of writing the structure immediately west is a gym.
Tanks	4m SW	1933-1938	Humus Tank were present between 1933 and 1938 to the southwest associated with the sewage works.
	5m SE	1955-1966	Unspecified Tanks were present between 1955 and 1966 to the southeast.
	20m NE	1933-1938	Humus Tanks were present between 1933 and 1938 to the northeast.
	20m SW	1922-1988	Septic Tanks and Settling Tanks were present between 1922 and 1988.
	70m NE	1922-1938	Unspecified Tanks were present between 1922 and 1938 to the northeast.
	90m NE	1907-1938	Unspecified Tanks were present between 1907 and 1938 to the northeast.
Garage	From 65m N	1974 - Present	A garage was present to the north of the site from 1974 until is still mapped to the more recent mapping.
Wool, Oil and Waste, and Shoddy and Rags Mills	From 75m W and NE	1907-1995	Various mills were present to the west and northeast of the site from 1907. These were mapped until the 1995 map records.
Laundry	From 85m SW	1922-1966	Laundry building mapped from 85m south-west of the site.

In summary, the map evidence indicates that the site was open ground in the earliest mapping record dated 1890. From 1905 the site was shown to be part of the Batley Sewage Works, generally positioned within the bacteria beds that form part of the sewage works. The sewage works surrounded the site in all directions with various associated features including humus tanks, septic and settling tanks. From the 1969 mapping record the sewage works were no longer recorded on site where Batley Variety Club was mapped immediately offsite, with the site likely an area of open land/parking to the east of this building. The site remained open land since this record with buildings being constructed around it.

The surrounding site has predominantly been industrial. As mentioned above, the sewage works dominated the immediate offsite areas, with other industrial features such as mills and a laundry mapped

from 1907 to the northeast and west from 75m. These mills included wool, oil and waste, and shoddy and rags mills. The mills were mapped until the 1995 record, with the laundry mapped until 1966.

A garage was mapped 65m north of the site from 1974 and was still present on the most recent mapping.

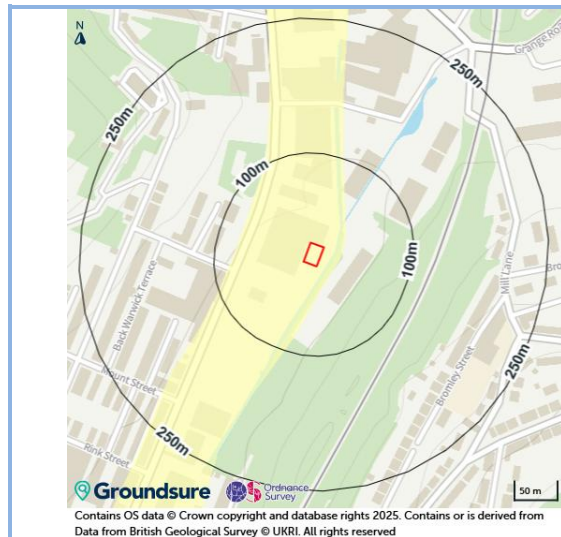
3.2 Published Geology

The following publications of the British Geological Survey (BGS) were examined in respect of the geology underlying the site:

- British Geological Survey (BGS) 1:50,000 Scale Geological Map Sheet 77, Huddersfield, Solid and Drift Edition.
- BGS GeoIndex Onshore.
- Mining Remediation Authority Interactive Map.
- Geo-Environmental Data Report (Groundsure GeoInsight).

Extracts of the 1:10,000 geological mapping from the Geo-Environmental Data Report are presented below for reference:

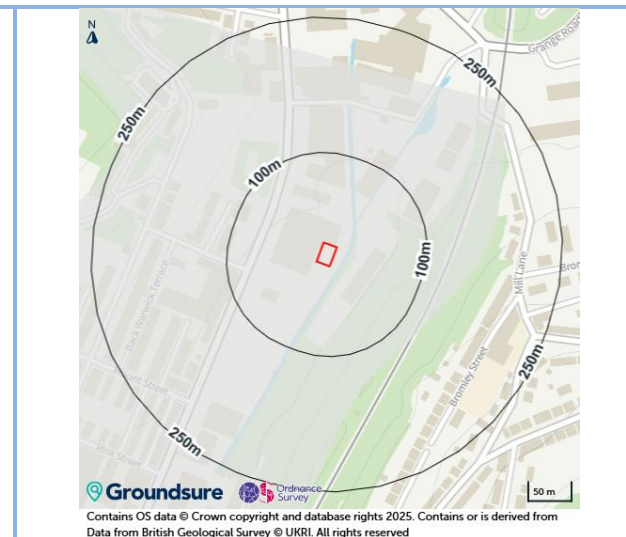
BGS 1:10 000 Superficial Geology



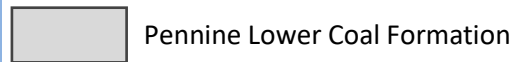
Key:



BGS 1:10 000 Solid Geology



Key:



Made Ground

BGS mapping does not record Made Ground deposits onsite, however based on the historical mapping and the development that has taken place, made ground deposits are considered likely to be present.

Superficial Deposits

The site is indicated to be underlain by Alluvium deposits. This stratum typically comprises clay, silt, sand and gravel.

Solid Geology

The deeper solid geology is indicated to be part of the Pennine Lower Coal Measures Formation which typically comprises mudstone, siltstone and sandstone.

Geological faults are not mapped on or within an influencing distance of the site.

3.3 BGS Exploratory Hole Records

There are 2 BGS exploratory hole records within a relevant distance of the site (assumed as an approximate 50m radius).

A summary of the ground conditions is presented in the table below.

Reference	Distance from Site (m) and Direction	Depth Range - Made Ground (m)	Depth Range - Superficial Deposits (m)	Depth Range - Solid Geology (m)
SE22SW508	49m SW	Ground Level – 1.30 brick	1.30 – 4.80 sandy and silty clays	>4.80 weathered mudstone
SE22SW521	49m W	Ground Level – 2.90 ash, silty clay	2.90 – 6.60 very sandy silty clay	>6.60 weathered siltstone

The BGS Borehole Logs are presented in Appendix D.

Previous investigations undertaken by BSL and others have included a single borehole within the current site boundary (JPG BH01) and one in very close proximity to the eastern boundary (JPG WS04). A summary of these borehole logs is included below and are presented in Appendix D.

BH01

Made Ground was recorded from ground level, comprising surfacing of tarmacadam, underlain by a gravel subbase comprising brick, shale, clinker, slate, mudstone, and sandstone. A layer of sandstone boulders was then recorded below the subbase between depths of 0.50m bgl to 0.80m bgl.

Underlying this was another later of Made Ground comprising similar material to that in the subbase layer, to a depth of 2.70m bgl. This was then underlain by a gravelly layer with occasional cobbles which mostly comprised slag, brick, and burnt red shale to a depth of 3.50m bgl.

Underlying the Made Ground were natural units recorded as Alluvium, comprising very soft to soft slightly sand silty clay to a depth of 4.9m bgl. Underlying this was a lens of sandstone gravel to a depth of 5.3m bgl. This was underlain by a stiff grey occasionally very thinly laminated silty clay with a trace of lithorelics of mudstone. This unit was proven to the base of the borehole at 7.46m bgl.

Groundwater was struck during drilling within the Alluvium at a depth of 4.35m bgl, rising to 4.20m bgl.

WS04

Made Ground was recorded from ground level to the base of the borehole at 2.9m bgl. The surface material comprised tarmacadam. This was underlain by a thin layer of limestone subbase to a depth of 0.25m bgl. Underlying this was similar units of Made Ground as described in BH01, however, a thin layer of gravel sized asbestos sheet, and glass was recorded between 1.4-1.65m bgl.

The deepest unit of Made Ground was recorded to comprise a soft brown clay with cobbles of sandstone.

Groundwater was not recorded within this borehole; however, it was recorded to become damp at 1.65m bgl.

3.4 Mining and Mineral Extraction

Coal Mining

The site lies in an area where the Law Society and Coal Authority recommend a mining search be undertaken as the site could be affected by past or current coal mining.

Therefore, a mining search was carried out, which is presented in Appendix E, the main findings of which are presented below.

Highlighted Evidence	Issue	Details
Past Underground Mining	Yes	The property lies within the potential zone of influence of recorded workings in 2 seam(s) of coal. The most recent underground working in the area was in 1959. These workings lie between 90m and 265m. Any ground movement due to this coal mining activity should have stopped. The property is indicated to lie in an area where coal deposits have been worked at moderate depth in the past but for which no plan exists. A further 14 underground workings have been identified between 754m and 940m from the site with most described as collieries and tunnels (assumed to be associated with underground coal mining).
Present Underground Mining	No	
Future Underground Mining	No	
Mine Entries	No	
Past, present, and future opencast coal mining	No	
Coal mining subsidence	No	
Mine gas	No	
Withdrawal of support	No	
Information from the Cheshire Brine Subsidence Compensation Board	No	

Non-Coal Mining

There are three records of BritPits (British Pits) within 500m of the site; however, all three were surface mineral workings and therefore only extractions that have occurred within 250m of the site have been considered (one BritPit). This BritPit, located 175m E of the site at Union Mill, quarried sandstone from a surface mineral working and ceased operation at an unknown date.

3.5 Hydrogeology

Based on the inferred geology, a summary of the Environment Agency aquifer designations is presented in the table below:

Stratum	Coverage	Aquifer Designation
Superficial Aquifer - Alluvium	Full Site	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.
Bedrock Aquifer – Lower Pennine Coal Formation	Full Site	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.

A summary of the pertinent hydrogeological features within the Geo-Environmental Data Report are provided below:

Feature	Distance (m) & Direction	Details
Nearest Active Groundwater Abstraction	-	None recorded within 2000m.
Nearest Active Potable Groundwater Abstraction	-	None recorded within 2000m.
Source Protection Zones	-	None recorded within 500m.

3.6 Hydrology

A summary of the pertinent hydrological aspects within the Geo-Environmental Data Report are provided below:

Feature	Distance (m) & Direction	Details
Nearest Watercourse	10m SE	Batley Beck. N to S flow.
Nearest Active Surface Water Abstraction	-	None within 2000m.
Closest Active Licenced Discharge Consent	198m SW	Effluent Type: SEWAGE DISCHARGES – SEWER STORM OVERFLOW – WATER COMPANY Permit Number: WRA8819 Receiving Water: BATLEY BECK Issue Date: 08/11/2017

Information obtained from the Environment Agency (EA) Risk of Flooding from Rivers and the Sea (RoFRaS) database indicates that the risk of flooding across the site is low (greater than 1 in 1000 but less than 1 in 100 chance of flooding in any given year).

The site is indicated to lie within an EA designated Zone 2 flood plain. The closest EA designated Zone 3 flood plain is located 6m to the southeast.

The British Geological Survey indicate there is a potential for groundwater flooding at the subject site, with a low-risk rating.

No further consideration of flood risk is undertaken in this report. Specialist flood risk advice should be sought with regards to drainage and flooding.

3.7 Landfill and Waste Management Sites

No active landfills are recorded within 500m based on the data available.

There are three recorded historic landfills within 500m, the nearest is recorded 372m northeast at Batley Holder Station registered to British Gas Plc North Eastern, stated to accept Inert and Commercial wastes between 1987 and 1992.

There is one historical waste management site recorded as a Metal Recycling Site (vehicle dismantler), located 112 to the north of the site and effective from 18/03/1992. The status is listed as surrendered with no surrendered date available.

3.8 Environmental Regulatory Data

A summary of the relevant environmental aspects, both on site and within 250m of the site contained in the Geo-Environmental Data Report, is presented in the table below:

Entry	On-site	0 – 50m	50 – 250m	Details
Recent Industrial Land Uses	-	-	13	The closest record relates to a garage located 56m north of the site.
Current or Recent Fuel Stations	-	-	-	
Licensed Industrial Activities (Part A(1))	-	-	-	
Licensed Pollutant Release (Part A(2)/B)	-	-	-	
Radioactive Substances	-	-	-	
Pollution Incidents (EA/NRW)	-	-	4	The closest record was in 2003 and was 120m northeast, recorded as firefighting run-off with a minor impact to water and air, and no impact to land.

In regard to the entries identified above, based on the uses listed, alongside distances and ages, none are considered to be of significant relevance to be carried forward to the preliminary CSM and have not been considered further.

3.9 Radon

Information from the environmental database report indicates the property is in an area where <1% of properties are above the Action Level for radon, and therefore radon protective measures are not required in accordance with BRE Report 211 'Radon – Guidance on protective measures for new dwellings'.

3.10 UXO Risk

In accordance with CIRIA Report C681, BSL have reviewed non-specialist UXO data for the site using the online Zetica Bomb Risk Mapping data.

The map indicates the site to be in an area where the bomb risk is low.

However, when reviewing historic maps there are various ruins noted around the site in the first post war World War 2 mapping (1955). Ruins are mapped 25m south, 75-100m northeast and 290m southwest of the site. Further research undertaken online identified anecdotal evidence from first hand accounts of bombing in Batley^{1,2}, which indicates the Batley Sewage Works had been in an area bombed during World War 2. Furthermore, a review of post-war RAF aerial photography identified the ruined buildings present nearby indicated on historic mapping, as well as several surface features which could be bomb craters within the sewage works.

Therefore, although the Zetica mapping indicates the site lies within a low-risk area, the mapping and evidence of bombing would suggest the risk is higher. Therefore, further assessment of the UXO risk is required, through a detailed desk-based assessment.

¹ <https://www.dewsburyreporter.co.uk/heritage-and-retro/heritage/nostalgia-with-margaret-watson-ronnie-elliss-memoirs-part-one-the-outbreak-of-world-war-ii-3968114>

² <https://pasttopresentgenealogy.co.uk/2022/06/10/batleys-first-air-raid-the-night-of-12-13-december-1940/>

A copy of the map is presented in Appendix F.

3.11 Summary of Previous Reports

A summary of the relevant points from the Geo-Environmental Ground Investigation Report completed by JPG (RM/GI/4575.v1) is presented below. It should be noted this investigation was for a much larger site area, with the current study site sitting centrally within the study site for the JPG report.

- Fieldwork comprised the drilling of 15 window sample boreholes and nine cable percussion boreholes. In-situ testing was carried out. Samples of soil and groundwater were obtained and submitted for chemical and geotechnical analysis.
- The exploratory boreholes undertaken during this investigation were generally located within the easter of the larger development area.
- Of the six window sample boreholes mentioned above that were located in the eastern parcel of the site, WS09 and WS12 had monitoring wells installed. These were subsequently monitored for groundwater and ground gas on six occasions.
- Groundwater was recorded between 1.22m and 2.06m bgl across the two installations.
- Methane was not detected in either of the installations in any of the six gas monitoring visits. Carbon dioxide was recorded at 5.1%v/v in WS09 on one occasion. The other 5 visits detected carbon dioxide below 5.0%v/v. The lowest oxygen concentration recorded was 15.8%v/v within WS09.
- Based on the gas monitoring results JPG recommended that gas protective measures, in accordance with Characteristic Situation 2 ground gas protection measures should be installed in the proposed development.
- Within the window sample boreholes in the eastern parcel, made ground was encountered to depths between 1.20m and 2.30mbgl. The made ground generally comprised gravel or clay with varying amounts of silt, sand, gravel, ash, and cobbles as minor constituents.
- All chemical test results were screened against the GAC for commercial end-use. No elevations of heavy metal determinants were recorded from samples tested from WS07 to WS12.
- After statistical analysis, WS09 (0.40m to 1.00m), WS10 (1.00m to 1.50m) and WS11 (0.20m to 1.00m) are potentially contaminated with respect to benzo(a)pyrene.
- Hydrocarbon fractions were not detected at concentrations above the LQM threshold concentrations which pose a potential risk to human health.
- A sample of very soft dark grey silty clay (WS10, 1.00m to 1.50m), possibly associated with the former sewage works, was submitted for pathogen analysis. Coliforms were not detected, and salmonella was absent.
- 19 samples were screened for asbestos. Chrysotile fibres were detected in a sample from WS03 (0.15m to 0.70m) and chrysotile in a cement sheet was identified in a sample from WS04 (1.40m to 1.65m). Asbestos was not detected in any of the samples tested from WS07 to WS12 in the eastern parcel of the site.
- No groundwater samples from WS09 or WS12 were obtained. The elevations against various criteria (EQS, UK Water Supply Regulations 2002 and Dutch intervention values) that were detected were in samples collected from installations located in the western parcel of the site.
- Elevated concentrations of PAHs were recorded in a groundwater sample from BH01 when screening against EQS and Dutch Intervention Values, sealed within the Made Ground. Minorly elevated concentrations of sulphate were also detected in groundwater samples from BH01 and BH02. BH02 was sealed within both the Alluvium and Lower Pennine Coal Formation
- Based on the thickness of the Made Ground and the calculated shear strengths of Alluvium JPG recommended that foundation loads are transferred to deeper natural strata of suitable bearing capacity, e.g., piles. Ground improvement techniques were another option that could be utilised.

A summary of the relevant points from the Desk Study completed by BSL (AH/C4575/9450) is presented below. This desk study, as with the JPG Report above, covers a much larger site area which includes the current study site.

- The site has largely been a sewage works that has expanded, and converted various processes to include stormwater & bacteria beds, septic, settling, humus & unspecified tanks, and sludge lagoons. Expansion of the sewage works reached its peak around 1966 with adjacent offsite works before gradual downsizing and subsequent demolition and construction of Batley Variety Club (and then J.D Batley Gym) with associated car parks.
- Offsite works have primarily been industrial with the nearby railway and mills which have gradually downsized whilst offsite garages, warehouses, electrical substations & transformer stations have been developed, renovated, and downsized over the years with current offsite use comprising of a mix of residential/commercial and industrial.
- The western parcel of the site is indicated to be underlain by alluvial clay, silt, sand, and gravel. These deposits formed up to 2 million years ago in the Quaternary Period. No superficial deposits are recorded to be present within the eastern parcel.
- The deeper solid geology (western and eastern parcels) is indicated to be part of the Pennine Lower Coal Measures Formation, which typically comprises mudstone, siltstone, and sandstone.
- A rock fault is shown 144m north of the site and runs in an east-west orientation. A further three rock faults are identifiable within 500m of the site.
- The Geo-Environmental Data Report identifies a coal seam onsite that is shown to traverse the eastern boundary of the site in a south-westerly to north-easterly direction. Another coal seam is shown 84m north-west of the site and runs in a general south-westerly to north-easterly direction. An additional six coal seams are identified within 500m of the site.
- The Coal Mining Assessment and The Coal Authority Interactive Map identifies several coal outcrops in parallel to the south-east of the site from 150m from the site running in a general north-easterly direction. The Coal Mining Assessment indicates that Probable shallow coal mine workings are present in this area. The interactive map however does not provide further details of the locations of the seams.
- The nearest watercourse to the site is the Batley Beck River, which is onsite and flow direction is indicated to be from north to south.
- The western parcel of the site is indicated to lie within an EA designated Zone 2 flood zone compared to the eastern parcel which is indicated to lie within a Zone 3 flood zone.
- The risk to human health is low to moderate/low.
- The risk from ground gas is moderate and the site is not located in an area requiring radon protection measures.
- The risk to controlled waters is low to moderate.
- The site is in the UXO low risk zone.
- Recommendations were for an appropriate Phase II ground investigation to be carried out to confirm the identified risks and obtain information for preliminary design.

A summary of the relevant points from the Geo-Environmental Assessment Report completed by BSL (MS/C4575/9676) Rev B is presented below. This report was undertaken for the larger site as per the BSL Desk Study above.

- The site was predominantly flat and being used for vehicle parking with a tarmacadam/concrete surfacing.
- Ground conditions comprised Made Ground from ground level up to 2.60m bgl within boreholes and up to 3.60m within trial pits excavated into a stockpile.
- Natural superficial deposits were encountered from 2.20m bgl to between 3.90m and 4.80m bgl. Solid geology encountered from 4.40m and 4.80m bgl.
- Groundwater recorded between 3.20m and 3.50m bgl.
- Elevated concentrations of determinands above commercial screening values for human health receptors were not identified from the soil samples tested and screened.
- Groundwater was not encountered within the Made Ground and the concentrations of determinands recorded within the Made Ground were considered to no represent a risk to groundwater via leaching.
- BSL undertook gas monitoring of three locations and in combination with CL:AIRE RB17, placed the site within Characteristic Situation 1 (CS1), and gas precaution measures would not be deemed necessary. As a precaution due to monitoring from the JPG monitoring programme, the site was classified as CS2 where gas protection measures would be required.
- Remediation measures were not considered necessary at the site to protect human health or controlled waters; however, gas protection measures in line with CS2 were recommended.
- The soils encountered during the investigation undertaken by BSL indicate soils are non-hazardous.
- A suspended floor slab was recommended at the site supported by piled foundations.
- The Made Ground was classified as DS-2 and ACEC Class AC-1s with regard to concrete classification. The natural soils were classified as DS-1 and ACEC Class AC-1s.
- Made Ground was assessed as being unsuitable with regard to highway design with an assumed CBR value of 2%.
- Drainage to soakaways was considered to be unsuitable due to the presence of variable made ground near the service and low permeability natural clays.
- The following further works were recommended to progress to the construction phase:
 - Detailed foundation design by a structural engineer
 - Production of Materials Management Plan (MMP) under the CL:AIRE DoWCoP, if required.

A summary of the relevant points from the Supplementary Ground Investigation at Zucchini's Restaurant completed by BSL (MS/C4575A/9825) is presented below. This report was specifically for an extension to the existing restaurant, located immediately southwest of the current study site.

- One cable percussive borehole was drilled to 2.80m bgl where it was terminated due to encountering a concrete slab.
- Visual and olfactory evidence of hydrocarbons was observed from 2.00m to 2.80m bgl.
- Ground conditions comprised bound macadam from ground level further underlain by Made Ground comprising a mixture of sands and gravels to a depth of 2.00m bgl. From 2.00m to 2.80m bgl the Made Ground comprised very soft black sandy gravelly clay with a strong hydrocarbon odour.
- Perched groundwater was encountered at 2.00m bgl which was also noted to have a hydrocarbon odour.
- Chemical laboratory testing did not indicate exceedances of determinand concentrations when compared to generic screening values for human health based on a Commercial end use.
- Made Ground was considered unsuitable for shallow foundations based on poor SPT N values decreasing from N=13 at 1.2m bgl to N=0 at 2m bgl.

4.0 PHASE 1 SUMMARY AND RISK ASSESSMENT

4.1 Introduction

The risk posed by any contaminants in soil or groundwater will depend on the nature and level of the source, the probability of exposure occurring, the potential pollution pathway and the likely 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 through which a receptor could be exposed to the contaminant.

The following sections discuss the identified potential on-site and off-site sources, and any pollution that could impact receptors via the pathways associated with the proposed development. Pollution linkages are assessed which may represent a risk to human health and/or controlled water receptors from the information gained from the Phase I Assessment searches. The assessment has been carried out on a qualitative basis and aims to produce a complete and comprehensive Preliminary Conceptual Site Model in accordance with LCRM (2023).

Three potential impacts exist for any given site and all three need to be considered in the qualitative risk assessment, these are:

-
- On-site impacts.
 - The site impacting its surroundings.
 - Off-site sources impacting the subject site.
-

4.2 Potential Contaminative Sources

Onsite

From the information obtained, the following sources have been identified which may affect the redevelopment of the site for commercial end use:

-
- Made Ground associated with the former sewage works.
-

Offsite

The following offsite sources have been identified which may affect the redevelopment of the site:

-
- Historical Tanks (closest 4m SW).
 - Made Ground (immediately offsite)
-

Discounted Sources of Contamination

Due to the distance from the site the mills, garages, and historic landfill is not considered to pose a potential risk to the subject site and therefore has not been considered further.

Associated Contaminants

The contaminants commonly associated with the potential sources of contamination identified are tabulated below:

Contaminative Sources	Department of the Environment Industry Profile or Other Source	Commonly Associated Contaminants
Onsite		
Made Ground	AGS Guides BS8485 and BS8576	Heavy metals, polycyclic aromatic hydrocarbons (PAHs), asbestos, ground gases (carbon dioxide and methane).
Offsite		
Tanks	N/A	PAHs, petroleum hydrocarbons (PHCs), pathogens, coliforms, heavy metals, nitrates, phenols.
Made Ground	AGS Guides BS8485 and BS8576	Heavy metals, PAHs, asbestos, ground gases (carbon dioxide and methane)

4.3 Pathways

A pathway is defined as a medium by which a contaminant comes into contact with, or otherwise impacts, a receptor.

At this stage the potential contaminants identified above are considered to present potential risks to site end users and controlled waters through the following pathways:

Potential Pathways	
Pathways in respect to Human Health	Inhalation of ground gases or vapours
Pathways in respect to Controlled Waters – Surface water	- Surface run-off /over land flow. - Drainage discharge. - Base flow from groundwater.
Pathways in respect to Controlled Waters – Groundwater	- Leaching of mobile contamination into groundwater via the unsaturated zone. - Migration of perched groundwater in any permeable soils or along existing or proposed service runs. - Migration into the saturated zone and flow through the aquifers underlying the site.
Pathways in respect to Property/structures/water pipes	- Direct contact with substances deleterious to building materials and potable water supply pipelines. - Migration of ground gases (methane) into confined spaces (explosion and damage to property).

4.4 Receptors

The identified receptors are listed below:

- Commercial end users (human health).
- Structures/Property/Potable water supply pipes.
- Nearest watercourse. Batley Beck (Controlled waters).
- Alluvium/Pennine Lower Coal Measures Formation – Secondary A Aquifers (Controlled waters).

Under current UK health and safety legislation, employers are required to carry out their own appropriate site-specific risk assessments and mitigation to protect employees. It has been assumed that any future construction works onsite will be undertaken in compliance with these requirements. Therefore, construction workers have not been specifically considered as part of this assessment.

4.5 Preliminary Conceptual Site Model (CSM)

The information obtained in the previous sections has been used to compile a Preliminary CSM. The identified potential contaminants and receptors have been assessed in the table below as to whether a plausible source-pathway-receptor pollutant linkage for the proposed end use of the site exists. The risk classification has been estimated in accordance with information in the BSL Guidance and Methodology in Appendix A.

The Preliminary CSM's are presented in the tables overleaf, any assessed risk above moderate will possibly require further action:

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
Human Health						
On site Made ground PHCs, PAHs	Inhalation of ground gases or vapours	End-users	Low Likelihood	Medium	Moderate / Low	The presence of Made Ground and the findings of previous investigations has indicated some hydrocarbon odours. There is a risk that hydrocarbon contamination within these soils could pose a risk to the development through a vapour pathway. Further investigation into potential vapour risk is recommended.
Off site Tanks PAHs, TPHs		End-users	Unlikely	Medium	Low	A number of potential contaminative land uses have been identified off site, however their distance from the site and the relatively impermeable geology, any lateral migration is likely to be limited. Should contamination migrate, the underlying ground conditions makes it likely that contaminants will significantly attenuated/degraded and it considered unlikely that significant contamination would migrate to site, if contamination did arrive at the site consequence is considered medium due to the potential risk of inhalation of vapours. Risks are therefore considered to be low. Furthermore, extensive testing to date across a larger area surrounding the site has identified isolated areas of hydrocarbons contamination within the soils and groundwater which may pose a risk to this development area.
Controlled Waters						
Made Ground PAHs, Metals	Overland flow / migration through saturated zone	River Batley Beck (Surface water)	Unlikely	Medium	Low	The proposed development will likely remain as hardstanding across the site, which would be expected to reduce the potential for leaching into the Secondary A Aquifer beneath the site.
	Migration through saturated zone	Secondary A Aquifer (Groundwater)	Unlikely	Medium	Low	The previous investigations on site have identified groundwater situated within both the Made Ground and Alluvium that is potentially in hydraulic connectivity with the river to the east of the site named the Batley Beck. However, investigation has not identified gross contamination in all locations, and groundwater sampling and analysis has not indicated gross contamination of this water body. Although there is a potential risk to the Secondary A Aquifers and the Batley Beck, the potential of contamination is unlikely. The area is, and has been for over 100 years, predominantly industrial land use and it is unlikely the study site is the source of any significant contaminated that poses a risk to controlled waters.

Human Health Risk – Soils Contamination Summary

Based on the preliminary CSM and the current use of the site, the overall risk from land contamination at the site is considered to be **low/moderate** for a the proposed development. The pathway that is considered to pose the greatest risk is vapours arising from potentially high volumes of PHCs. This source and pathway will need to be investigated further.

Human Health Risk – Ground Gas Summary

Previous investigations have given the site a Characteristic Situation 2 (CS2) rating with basic ground protection measures recommended. This is seen as being very conservative. Carbon Dioxide levels recorded by JPG were marginally above 5.0%v/v on one occasion. A maximum flow of 2.5l/hr was recorded on one occasion with all other flows recorded as less than limit of detection (<0.1l/hr) or negative, the flow of 2.5l/hr is likely an anomalous result.

However, the presence of alluvium, which in CL:AIRE RB17 is indicated to be a potential source of methane, means that assessment of the risk to development from ground gasses is considered necessary. Therefore the risk to the site from ground gasses is considered to be **moderate**.

Controlled Waters Risk - Summary

Based on the preliminary CSM, BSL believes the overall risks to controlled waters at the site is **low**. This is due to the nature of the soils being often impermeable, the lack of gross contamination across much of the site and the proposed development placing the entire footprint of the site below a structure which will prevent future infiltration of rainwater and decrease the potential for contaminants to migrate into the groundwater.

5.0 PRELIMINARY GEOTECHNICAL ASSESSMENT

5.1 Hazard Identification

A preliminary geotechnical hazard identification exercise has been undertaken in general accordance with the Highways England document CD 622, 'Managing geotechnical risk'. Potential geotechnical hazards based on the expected ground conditions are listed below:

- Made ground of unknown nature; if placed in a non-engineered manner may cause excessive settlement of foundations, highways and infrastructure.
- Low strength, compressible ground (peat and soft organic clays); may cause excessive settlement of foundations, highways and infrastructure.
- Attack of buried concrete by aggressive ground conditions; the site will likely be underlain by made ground and potentially sulphate bearing soils. The coal measures are known to be high in naturally occurring sulphates.
- Shallow groundwater/groundwater rise causing resulting in difficulties with excavations due to trench collapse.
- Possible UXO risk associated with World War 2 bombing.

Whilst the site lies within a Mining Remediation Authority reporting area, based on the available information, the risk from mining induced instability is considered to be low and needs no further consideration.

5.2 Foundation and Geotechnical Design

The proposed development will comprise a commercial unit/office alongside the existing gym building. The type of foundation solution should be informed by an onsite intrusive investigation to confirm ground conditions and obtain geotechnical parameters for preliminary foundation and floor slab design.

5.3 Drainage

Given the site is underlain by low permeability clays, it is unlikely that drainage to SuDS such as traditional soakaways will be suitable.

5.4 Recommendations

The site has been included in various phases of previous intrusive investigations. At this time further geotechnical investigation is not considered necessary.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Geo-Environmental Summary

The site was a sewage works, the sewage works reduced in size between 1969-1974 with 'Batley Variety Club' constructed immediately west.

The risk from off-site sources of contamination is considered to be moderate / low.

The risk from permanent ground gases and vapours is considered to be **moderate**.

Radon is not considered to pose a risk.

The overall risk to controlled waters is considered to be low.

6.2 Geotechnical Summary

Intrusive investigations will be required to confirm the most suitable foundation solution and to obtain parameters for concrete classification, floor slab and highways design.

Whilst the site lies within a Mining Remediation Authority Reporting Area, mining related instability is not considered to pose a risk to the site.

Drainage to SuDS is unlikely to be a viable option for the site / is potentially viable, subject to intrusive investigation and testing.

6.3 Further Work

The site has been included in various phases of previous intrusive investigations. However, given the risk to the proposed development from ground gases and vapours, further investigation within the footprint of the structure comprising boreholes to allow the installation of monitoring wells, groundwater sampling, ground gas monitoring, vapour monitoring, and potentially vapour sampling, should be undertaken.

A Detailed UXO Risk Assessment is recommended to be carried out based on the mapped and photographed bomb damage in the vicinity of the site, and anecdotal accounts of bombs hitting the sewage works.