3818-05/AS

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Bellway Homes Ltd. (Manchester)
304 Bridgewater Place
Birchwood,
Warrington,
Cheshire,
WA3 6XG

Office 16
Bartle House
Oxford Court
Manchester
M2 3WQ

Tel: 0161 914 9171
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk

PHASE 1 GEO-ENVIRONMENTAL INVESTIGATION FOR LINNEY LANE MOTORS, SHAW

INTRODUCTION

This Phase 1 Geo-Environmental Investigation report has been prepared at the request of Bellway Homes Ltd. (Manchester). Instructions to proceed were received in January 2024.

This report pertains to a c. 0.11 Ha site located to the south of Linney Lane, Shaw, c. 15km northeast of Manchester city centre, at the approximate postcode OL2 8HB. The National Ordnance Survey Grid Reference for the centre of the site is 394390E, 409439N.

The site currently comprises an active vehicle repair shop (Linney Lane Motors) with an adjacent car parking space, storage areas and access track. Access to the site is off Linney Lane in the northern site section. An aerial photo of the site is included below. A site location plan is contained in Appendix 2.

Figure 1: Aerial image of the site dated April 2022.

This Phase 1 Geo-Environmental Investigation is to be used for submission to the Local Authority as part of a planning application. It is the Client's intention to include the site into the wider adjacent Bellway Homes Ltd. development at the former Shaw Distribution Centre, with additional 4 No. detached dwellings with associated garages and private gardens proposed to be built on this site. The wider site has been subject to demolition and is currently subject to enabling works / remedial activities.

A proposed development plan is included in Appendix 3 and as Figure 2 below.

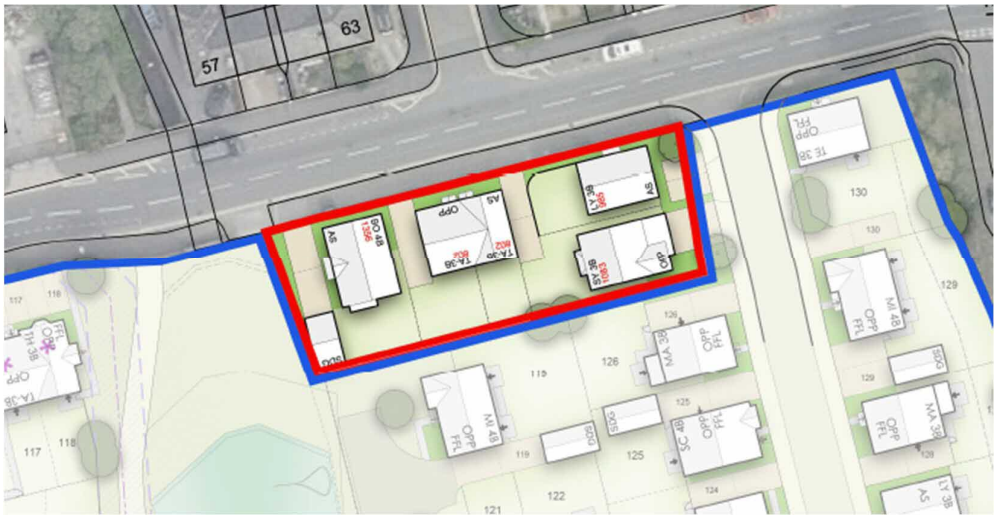

Figure 2: Proposed Development Plan, taken from Urban Design Group, Planning Layout, APD/BHM257/PL01 Rev. T, dated 20.10.2023.

Brief

The brief was to carry out a Phase 1 Geo-Environmental Investigation for the site based upon the proposed development outlined in Section 1.0. The site area is shown on the site location plan contained in Appendix 2. The investigation was to include the following:

a) Assess the probable ground conditions and contaminated land conditions on and below the site based on existing and historical site uses and relevant off-site activities, including a site walkover.
b) Identify sources of contamination that may be present at the site using current contaminated land guidance and develop a conceptual site model for potential human health, ground gas and controlled waters receptors.
c) Undertake a Preliminary Risk Assessment which will determine the requirement for further environmental (contaminated land) investigation and assessment.
d) Design, on the basis of the anticipated ground conditions, appropriate ground investigation works and discuss potential development issues (i.e. sub-surface features – obstructions, infilling, compressible ground, faulting, mineral extraction, mining and land instability).

A report was to be provided to summarise findings and to provide recommendations. The limitations of this investigation work and report are included in Appendix 1.

Third Parties

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SCOPE OF INVESTIGATION WORKS

Previous Geo-Environmental Investigation

As the site in question is located abutting the Shaw Distribution Centre site for which the following reports have been undertaken and utilised to inform this assessment:

- CCG '*Geotechnical & Geo-Environmental Site Investigation at Shaw Distribution Centre, Shaw, Oldham*' (ref: CCG-C-20-11693.REV1, November 2020).
- IGE Consulting Ltd. '*Phase 2 Geo-Environmental Ground Investigation Report*' Revision B (ref: 3818-02/B, dated: August 2023).
- IGE Consulting 'Remedial Strategy Report' (Ref: 3818-03/C, dated January 2024).

FINDINGS

Walkover Survey

The majority of the site comprises an active vehicle repair shop called Linney Lane Motors. The footprint of the building spans the majority of the central and western site sections.

Figure 3: The site as seen from Linney Lane, looking south-east (left) and the south-western site corner with a locked access gate into the Shaw Distribution Centre and the off-site River Beal located on the opposite side of the boundary fence (right).

An adjacent car park was noted in the eastern site section. The area along the southern site boundary was noted to be very densely overgrown and inaccessible.

Storage drums and discarded tyres were noted along the southern site boundary adjacent to the building.

Figure 4: The Linney Lane Motors car park (left) and the southern site boundary with dense vegetation along the back of the garage building (right).

Numerous manholes were recorded across the site, notably in the vicinity of the north-eastern and the north-western corners of the garage building. A BT overhead cable pole is located adjacent to the north-western site corner.

The River Beal, contained within a concrete channel, is located site-adjacent along the western boundary.

With the exception of the above, the off-site surroundings are summarised up to a 250m radius around the site:

- The former Shaw Distribution centre is located adjacent to the southern and eastern site boundaries. Based on the CCG Geotechnical and Geo-Environmental Site Investigation Report (2020) it is known that numerous tanks, chemical storage areas, chimneys and electric sub-stations were recorded within the site.
- Residential buildings were recorded to the north of the site, across Linney Lane.
- A Metrolink tram line (East Didsbury – Rochdale) is located within 194m west of the site, situated adjacent to the western boundary of the former Shaw Distribution Centre.
- Additional industrial land use was recorded within 250m of the site, including a metal fabricator, sign shop, paint and decoration shop, and a window installation shop.

Site History

The site development history has been researched by reference to historical maps, street plans and aerial photographs. The historical maps are included in Appendix 4 to this report and the principal observations, which are divided into on-site history and off-site history, are summarised below:

On-Site History

Date	Site Feature
1851 – 1893	On the earliest historical map, the site is recorded as a field off Linney Lane with no structures or buildings recorded. The River Beal is recorded to the west of the site.
1893 – 1956	The majority of the site is unchanged. Elm Mill is recorded site-adjacent to the south by 1893, more mills, including Rutland Mill and Lilly Mills are also recorded in the vicinity of the site to the west and south-west by 1909.
1956 – 2024	An unspecified building is recorded on site from 1956. No other changes are recorded until present day. The site is currently used as a vehicle repair shop (Linney Lane Motors).

Off-Site History

Numerous mills, works, foundries, chimneys and railway infrastructures were recorded within 250m of the site, given the industrial nature of the area.

Geology

BGS Geological Map

The BGS Solid and Drift Geological Maps of the area (BGS 1:50,000 map sheet number: 85, dated: 2011) indicates that the site is underlain by Made Ground, underlain by superficial deposits comprising Alluvium and Glaciofluvial Sheet Deposits. The eastern half of the site is recorded to be underlain by Glaciofluvial Sheet Deposits, which typically comprise sand and gravel. The western half of the site is expected to be underlain by Alluvium, typically comprising clay, silt and gravel.

The site is underlain in turn by bedrock of the Milnrow Sandstone, which comprises sandstone.

BGS Borehole Logs

There were. No available BGS borehole on-site. An additional 1 No. available BGS boreholes was recorded in the vicinity of the site and within a comparable geological setting. The pertinent information from the borehole logs is outlined below:

BGS Borehole Reference: SD90NW10

This borehole (Ref. name: Rutland Mills Co.) is located in the northern site section, constructed in 1920 and terminated at 214.12m bgl. The following pertinent information was recorded:

- No record to a depth of 3.66m bgl, underlain by;
- BOULDERS, STONE (COBBLES) and GRAVEL to a depth of 5.18m bgl, underlain by;
- Running SAND and GRAVEL to a depth of 9.75m bgl, underlain by;
- BOULDERS and STONES (COBBLES) to a depth of 10.97m bgl, underlain by;
- BEDROCK, comprising SANDSTONE, fractured SHALE and occasional GRITSTONE and MUDSTONE beds to 214.12m bgl.

Groundwater strike was recorded at 121.00m bgl, with the resting level recorded at 3.35m.

BGS Borehole Reference: SD90NW11

This borehole (Ref. name: The Lily Mill Co.) is located in the northern site section, constructed in 1917 and terminated at 141.12m bgl. The following pertinent information was recorded:

- No record to a depth of 3.35m bgl, underlain by;
- Stoney (cobbly), gravelly CLAY to a depth of 15.85m bgl, underlain by;
- GRAVEL to a depth of 17.07m bgl, underlain by;
- SHALE, shaly SANDSTONE and blue SHALE to a depth of 122.22m bgl, underlain by;
- COAL (Upper Foot Mine Seam) to a depth of 122.68m bgl, underlain by;
- Dark grey SHALE to a depth of 141.12m bgl.

Groundwater was recorded to overflow the borehole.

BGS Borehole Reference: SD90NW13

This borehole (Ref. name: Crompton Spinning Co. Vale Mills) is located in the northern site section, constructed in 1920 and terminated at 141.43m bgl. The following pertinent information was recorded:

- CLAY to a depth of 4.88m bgl, underlain by;
- CLAY and SAND to a depth of 9.14m bgl, underlain by;
- MARL to a depth of 11.28m bgl, underlain by;
- MARL and SAND to a depth of 13.72m bgl, underlain by;
- SAND and GRAVEL to a depth of 15.54m bgl, underlain by;
- BEDROCK, comprising blue and grey SHALE, SANDSTONE and BIND to a depth of 141.43m bgl.

Groundwater was recorded to overflow the borehole.

BGS Borehole Reference: SD90NW12 (off-site)

This borehole (Ref. name: Bank House Pit, near Dee Mill) is located within 48m to the east of the site and terminated at 114.50m bgl. The following pertinent information was recorded:

- SOIL and CLAY to a depth of 4.67m bgl, underlain by;
- BEDROCK, comprising FLAG ROCK to a depth of 12.90m bgl, underlain by;
- BEDROCK, comprising BLACK STONE to a depth of 36.70m bgl, underlain by;
- COAL (40 Yards Mine or Upper Mountain Mine) to a depth of 36.80m bgl, underlain by;
- BEDROCK, comprising BLACK STONE and GREY ROCK to a depth of 96.01m bgl, underlain by;
- COAL (Upper Foot Mine) to a depth of 96.32m bgl, underlain by;
- BEDROCK, comprising BLACK ROCK, FOOT MINE ROCK and BLACK STONE to a depth of 114.00m bgl, underlain by;
- COAL (Upper Foot Mine) to a depth of 114.50m bgl.

No information regarding groundwater levels was available.

BGS Estimated Soil Chemistry

The BGS have estimated that the superficial deposits across the site to naturally comprise of the following determinands:

- Arsenic: 15mg/kg – 35mg/kg
- Cadmium: 3.0mg/kg – 6.0mg/kg
- Chromium: 120mg/kg – 180mg/kg
- Nickel: 15mg/kg – 30mg/kg
- Lead: 300mg/kg – 60mg/kg

Mining

The site lies within the Coal Authority Coal Mining Reporting Area, however, it is not located within a Development High Risk Area. The site was recorded to lie within an area of underground workings with 3 No. mine shafts recorded to the south-east of the site. The following information was recorded:

- Mine Shaft Ref.: 394409-011 to a depth of 114.00m bgl, assumed diameter of 2.50m;
- Mine Shaft Ref.: 394409-012, depth unknown of unrecorded depth, assumed diameter 2.50m;
- Mine Shaft Ref.: 394409-015, depth unknown, assumed diameter 2.5m.

The above recorded mine shafts are likely associated with the Bank House Colliery and none of the 3 No. shafts were recorded as treated. It is crucial to note that a departure (positional error of the shafts) of a c.10m radius may occur. Further unrecorded mine entries may be present in the area. Based on the Phase 1 report it is anticipated that any potentially worked seams were located at +100.00m bgl. A shallower recorded coal seam was recorded at 36.80m bgl (i.e. the 40 Yards Mine), however, it was unlikely to have been worked, as its thickness was recorded as 0.10m.

No historic surface excavations have been recorded on-site. However, unrecorded surface excavations cannot be discounted.

Hydrology and Hydrogeology

Environmental data relevant to the site and its immediately surrounding area has been obtained from sources in the public domain and the Integra Consulting 2014 Geo-Env report. The principal observations in relation to waters and flooding can be summarised as follows:

Data Type	Details
Flooding	➢ With respect to rivers and seas, the north-western site corner lies within Flood Zone 3, a small area of land in the central site section lies within Flood Zone 2, with the south-eastern site section lies within Flood Zone 1. The flooding risk on site is deemed to be Low. ➢ With respect to surface water, the risk of flooding to site is deemed to be Low.

Surface Water Features	➢ The River Beal is located adjacent to the site along the western site boundary.
Surface Water Abstractions	➢ There are no licensed surface water abstractions located on-site or within 2000m of the site.
Superficial Aquifer	➢ The site is underlain by superficial deposits classified as a Secondary A Aquifer - *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	➢ The underlying bedrock is classified as a Secondary A Aquifer - *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.*
Groundwater Abstractions	➢ There are no recorded groundwater abstraction licenses located on-site. ➢ There is a single active groundwater abstraction license located within 1207m to the south west of the Shaw Distribution Centre and relates to the abstraction of groundwater from a borehole at J&B Fitton Ltd for general use. ➢ There is a single historical potable water abstraction license located within 1233m to the south west of the Shaw Distribution Centre. The license has been revoked in 2006.
Source Protection Zones	➢ The site lies within a Source Protection Zone 2 (Outer Catchment Area).
Nitrate Vulnerable Zones	➢ There are no Nitrate Vulnerable Zones recorded on-site or within 500m of the site.
Licensed Discharge Consents	➢ There are no recorded licensed discharge consents to controlled waters located on-site. ➢ There are 4 No. recorded licensed discharge consents to controlled waters located within 500m of the site. 3 No. have been revoked. The consents include miscellaneous discharges, treated sewage and cooling water discharges to the River Beal.
Pollution Incidents to Controlled Waters	➢ There are no recorded pollution incidents to controlled waters located on-site. ➢ There is a single pollution incident recorded at the adjacent Shaw Distribution Centre and involve an incident in May 2002 involving Diesel, recorded as a Category 4 (No Impact) incident to controlled waters. ➢ There are an additional 3 No. pollution incidents recorded within 250m of the site. The nearest is located 26m north of the site and involves an incidents in September 2001 involving tyre waste, recorded as a Category 4 (No Impact) incident to controlled waters. ➢ There are 2 No. pollutant releases to public sewers located within 500m of the site. The nearest is located within 97m to the west of the site and involves release of pollutants at ESC (Shaw) Ltd, Chandros Street.

For further details see the CCG Geotechnical and Geo-Environmental Site Investigation Report (2020).

Hazardous Installations, Landfill and Waste

The following information relating to hazardous installations, landfill and waste obtained from the CCG Geotechnical and Geo-Environmental Site Investigation Report (2020):

Data Type	Details
Environment Agency Recorded Active Landfill Sites	➢ There are no Environment Agency recorded landfill sites located on-site or within 500m of the site.
Environment Agency Recorded Historic Landfill Sites	➢ There are no Environment Agency recorded historical landfill sites located on-site. ➢ There are 5 No. Environment Agency recorded historical landfill sites located at the adjacent Shaw Distribution Centre, including Rutalnd Mill, Lilly Mills, Dee Mill, Vale Mills and Newby Mills. The landfills are potentially associated with infilling of reservoirs and former alignment of River Beal. Newby Mills were noted to be infilled between 1980 and 1982, are now known to be inert and have been used to contain commercial waste.

	➢ A further 10 No. Environmental Agency recorded historical landfill sites within 500m of the site. The nearest is located 14m north of the Shaw Distribution Centre site off Linney Lane, Shaw and comprises a landfill infilled in 1989, known to be inert.
BGS Recorded Historic Landfill Sites	➢ There is a single BGS recorded landfill site called Twingates Tip located within 152m to the south-west of the Shaw Distribution Centre site, located at Sumner Street, Shaw, Oldham.
Local Authority Recorded Landfill Sites	➢ There are no Local Authority recorded historical landfill sites located on-site. ➢ There are 2 No. Local Authority recorded historical landfill sites within 500m of the site. The nearest is located 61m north of the Shaw Distribution Centre site. The second is located 310m south-east of the Shaw Distribution Centre. Both pertain to refuse tips and gravel pits. No information pertaining to the landfill operation dates or type of waste is available for either landfill.
Local Authority Pollution Prevention and Control (Part A(2) and Part B Activities and Enforcements)	➢ There are no Local Authority Part A2 or Part B Activities or Enforcements located on-site or within 500m of the site.
Registered Radioactive Substances	➢ There are no Registered Radioactive Substances recorded on-site or within 500m of the site. ➢ There is a single radioactive substance authorisation recorded within 433m to the south-west of the Shaw Distribution Centre and involves disposal of radioactive waste at Osram Ltd, Shaw Factory.
Registered Waste Treatment, Transfer or Disposal Sites	➢ There are no waste treatment, transfer or disposal sites located on-site. ➢ There are 4 No. historical Local Authority waste sites recorded within 500m of the site, the nearest is a refuse destruction located within 6m to the north of the Shaw Distribution Centre, recorded in 1930. ➢ There are a further 4 No. licensed waste sites recorded within 500m of the site, the nearest is located 80m to the north-west of the Shaw Distribution Centre and comprises the Beal Hey Civic Amenity site, utilised as a commercial and industrial waste transfer station. ➢ There is a single licensed pollutant release record located within 266m to the west of the Shaw Distribution Centre, which included the release of dry cleaning waste at Tyro Cleaners Ltd. No enforcement was recorded.
Industrial Land Use	➢ The site is currently utilised as a vehicle repair shop called Linney Lane Motors. ➢ There are 9 No. recent industrial uses recorded within 250m of the Shaw Distribution Centre site, including an electricity sub-station, gas governor, unspecified works, industrial engineers and various other industrial land uses located more than 50m away from Shaw Distribution Centre. ➢ There is a single historical licensed industrial activity (IPC) recorded within 433m to the south-west of the Shaw Distribution Centre involving inorganic chemical processes at Osram Ltd, Refuge Street.
Dangerous Substances	➢ There are no recorded discharges of dangerous substances on-site or within 500m of the site.
Hazardous Building Materials	➢ Hazardous building materials may be present on-site due to the current site uses.

It must also be noted that the Shaw Distribution Centre is located 0m – 150m north east and southeast of the site, however the site will be included within the boundaries of the Shaw Distribution Centre site, therefore the above assessment is deemed accurate for the site in question.

For further details see the CCG Geotechnical and Geo-Environmental Site Investigation Report (2020).

Radon

Based on the CCG Phase 1 report, it is noted that the site is not in a Radon Affected Area. Radon protection measures are not required for new properties.

Previous Site Investigations

As part of the 2022 CCG investigation, 9 No. cable percussive boreholes (BH01 – BH09, inclusive), 28 No. dynamic sampling boreholes (WS01 – WS28) were undertaken across the Shaw Distribution Centre Site. 4 No. boreholes (WS02 and WS15 – WS17, inclusive) were constructed in the vicinity of the Linney Lane Motors site.

8 No. ground gas and groundwater monitoring well were installed. Details of the monitoring well installs are included in the following table.

Exploratory Hole	Ground Level (m AOD)	Stratum	Response Zone
BH01	175.2	Made Ground	1.00 – 5.00
BH03	174.5	Made Ground and Alluvium	1.00 – 7.00
BH04	174.2	Made Ground and Alluvium	1.00 – 3.00
BH06	173.3	Made Ground	0.50 – 3.00
BH09	173.7	Made Ground	1.00 – 3.00
WS01	173.2	Alluvium (organic clay, sand and gravel)	1.00 – 4.00
WS03	174.1	Made Ground	0.50 – 2.50
WS09A	174.7	Made Ground	1.00 – 3.00

Ground Conditions

The typical ground conditions encountered within the CCG 2020 exploratory holes located near the site (WS02 and WS15 – WS17, inclusive) are:

- **Made Ground** comprising tarmac, cobbles, loose, dark brown, mottled reddish brown and brown, gravelly, sandy, silty sand and very soft, dark grey, slightly sandy, silty clay to a depth of between 1.00m and 2.50m bgl (171.07m – 174.05m AOD), underlain by;
- Suspected **Alluvium** comprising soft to firm, becoming stiff, dark grey and greenish grey, gravelly, sandy, silty clay and medium dense, brown, mottled dark grey, very gravelly, slity, fine to medium sand to a depth of at least 5.00m bgl (168.64m – 168.90m AOD).

Notable exceptions

In WS17 the Made Ground is underlain by suspected Alluvial deposits comprising very soft, becoming soft to firm, dark brown, slightly sandy, silty, organic clay with inclusions of pseudo-fibrous peat to a depth of 5.00m bgl (168.57m AOD).

Chemical Contamination

4 No. exploratory holes were located in close proximity to the site, and samples from these were included within the chemical testing undertaken in 2020, including samples of the made ground and

natural strata. GAC exceedances were recorded within 2 No. of the exploratory holes located closes to the site. These are summarised in the table below.

Exploratory Hole	Depth (m bgl)	Contaminant of concern	Maximum Concentration On-Site (mg/kg)	GAC (mg/kg)
WS15	0.40	Arsenic	131	37
		Beryllium	2.4	1.7
WS16	0.50	Lead	307	200
	2.80	Benzo(a)pyrene	23.5	2.2
		Dibenzo(a,h)anthracene	4.9	0.24

Asbestos in the form of Asbestos Insulation Board fragments was also recorded within WS16 in a sample taken at 0.50m bgl. The concentrations detected included <0.001% free fibre and 0.001% ACM.

For full chemical testing results please see the CCG Geotechnical and Geo-Environmental Site Investigation Report (2020).

Ground Gas Monitoring Results

4 No. ground gas monitoring visits were undertaken. The results are summarised below:

Stratum	Methane (%)	Carbon dioxide (%)	Steady flow rate (l/hr)
Made Ground	<0.1	<0.1 – 1.9	<0.1
Made Ground and Alluvium	<0.1	0.4 – 2.9	<0.1
Organic clay, sand and gravel (Alluvium)	<0.1	<0.1 – 0.7	<0.1

Full ground gas and groundwater depth monitoring results can be found in the CCG Geotechnical and Geo-Environmental Site Investigation Report (2020).

CONCLUSIONS

General

The site comprises Linney Lane Motors, an active vehicle repair shop, where potentially contaminative activities may take place. The River Beal is located site-adjacent, along the western site boundary. The site is located adjacent to the former Shaw Distribution Centre, which is situated to the south and east of the site.

The anticipated typical ground conditions across the site are as follows:

- **Made Ground** of an unknown composition, anticipated to comprise sands and gravels to an unknown depth, underlain by:
- **Alluvium**, comprising clay, silt and gravel;
  OR
- **Glaciofluvial Sheet Deposits**, comprising sand and gravel to a depth of between c.5.00m and c.17.00m bgl;
- **Milnrow Sandstone** comprising sandstone.

Sources of Contamination and Probable Contaminants

Based on the desk study information and the CCG Geotechnical and Geo-Environmental Site Investigation Report (2020), the following potentially contaminative sources have been identified:

Potentially Contaminative Source	Associated Determinands	Remarks
On-Site Made Ground (including Linney Lane Motors)	Unknown, anticipated to be metals, semi-metals, PAHs, TPH, asbestos. Ground Gas – carbon dioxide, methane, hydrogen sulfide, VOCs	Made Ground has been recorded site-adjacent during the CCG ground investigation of the Shaw Distribution Centre with asbestos and elevated concentrations of arsenic, lead and PAHs recorded within the stratum. It is expected to be present across the site and may be present to significant depths (c. 2.50m bgl). The Made Ground located below the former Shaw Distribution Centre may pose a ground gas migration risk to the Linney Lane Motors site, as ground gas monitoring results at Shaw Distribution Centre included elevated carbon dioxide concentrations within the Made Ground.
Off-Site Shaw Distribution Centre		
On-Site Possible Organic Clay	Ground Gas – carbon dioxide, methane, hydrogen sulfide, VOCs	Soft, organic clays have been recorded to depths of 5.00m bgl in the vicinity of the site during the CCG ground investigation, indicating the presence of suspected organic-rich Alluvial deposits. Although no significantly elevated concentrations of ground gas were recorded in the area during CCG ground gas monitoring, a possible ground gas source exists due to the organic clays recorded.
Coal Seam (below former Shaw Distribution Centre)	Ground Gas – carbon dioxide, methane	Coal seams may be present below the Linney Lane Motors site based on the records from the adjacent Shaw Distribution Centre and the CCG Geotechnical and Geo-Environmental Site Investigation Report (2020), which identified the Upper Foot Mine and Upper Mountain (40 Yards Mine) coal seams below the former Shaw Distribution Centre.

It should be noted that potentially contaminative unrecorded historical activities may have occurred (e.g. the use or deposition of Made Ground from off-site during historical on-site developments) and in this event, further contaminative sources may be present.

Identified Pathways of Contamination

Human Health		Controlled Waters		Ground Gas	
A	Ingestion of dust and soil	A	Vertical migration through coarse Made Ground and coarse soils	A	Migration through fractures and fissures in bedrock
B	Dermal contact with dust and soil	B	Lateral migration along low permeability natural soils & pooling at relative low points	B	Preferential migration along foundations & service ducts
C	Inhalation (dust)	C	Vertical migration along future foundations and pooling at base	C	Migration within groundwater
D	Inhalation (vapours)	D	Migration through porous bedrock	D	Ingress through cavity walls & floors
E	Consumption of homegrown produce	E	Overland flow	E	Inhalation
F	Inhalation and oral backgrounds			F	Lateral migration along historical drainage

Conceptual Site Model

Conceptual Model for Human Health Risk Assessment

A site conceptual model in the form of a linkage table for the purposes of a preliminary risk assessment for the human health of site occupants has been produced as a result of the probable contaminants, pathways and receptors identified above.

Conceptual Model for Human Health Assessment					
Sources of Contamination	**Pathway**	**Receptor**	**Hazard (severity)**	**Likelihood**	**Risk**
On-Site and Off-Site Made Ground (Linney Lane Motors, former Shaw Distribution Centre)	A B C D E F	End users General public	Effect on human health **(Medium)**	**Likely:** Deep Made Ground has been recorded site-adjacent during the CCG ground investigation of the Shaw Distribution Centre with asbestos and elevated concentrations of arsenic, lead and PAHs recorded within the stratum. It is expected to be present across the site and may be present to significant depths (c. 2.50m bgl). Ingestion, dermal and inhalation pathways will be reduced across the majority of the site given the presence of hardstanding i.e. roads and buildings. Private gardens and areas of soft landscaping will be at increased risk.	**Moderate**
		Construction workers		**Low Likelihood:** Construction workers will be at increased risk due to their acute interaction with soils. However, the appropriate use of PPE, Good Practice and Health and Safety Measures will significantly reduce the risk.	**Low to Moderate**
	D	End users and general public		**Likely:** Given existing site use as a garage, risk of fuel and engine oil (hydrocarbon) spill / leak is high, as such investigation through the existing floor slab will be required post demolition.	**Moderate**
		Construction workers		**Unlikely:** Construction workers at increased risk if any disturbance of soil occurs as this may generate a temporary increase in the release of soil vapours, however risk remains low given the lack of a sources and detected concentrations of VOCs.	**Low**

Conceptual Model for Ground Gas Risk Assessment

A conceptual model in the form of a linkage table for the purposes of a preliminary risk assessment for ground gas has been produced as a result of the probable contaminants, pathways and targets identified above as follows:

Conceptual Model for Ground Gas Risk Assessment					
Source	**Pathway**	**Receptor**	**Hazard (severity)**	**Likelihood**	**Risk**
On-Site and Off-Site Made Ground (Linney Lane Motors, former Shaw Distribution Centre)	B D E	Human occupants Site Workers	Effect on human health **(Mild to Severe*)**	**Unlikely:** Significant Made Ground deposits were recorded by CCG in 2929 during their site investigation of the site-adjacent area of the former Shaw Distribution Centre. It is possible, that significant Made Ground deposits are present below the Linney Lane Motors site. Based on the CCG site investigation it is possible that the Made Ground may contain organic-rich or putrescible material, as the ground gas ground gas monitoring results at Shaw Distribution Centre included elevated carbon dioxide concentrations within the Made Ground. Risk posed by fuel range hydrocarbons a s a by product of its use as a vehicle garage is low – moderate, however the main driver to in terms of risk will be human health for contaminants of this nature.	**Low to Moderate**
		Building and Structures	Damage to building **(Mild)**		
On-Site Possible Organic Clay		Human occupants Site Workers	Effect on human health **(Mild to Severe*)**	Organic-rich clays were recorded in the vicinity of the site during the CCG 2020 site investigation to depths of at least 2.50m bgl. CCG ground gas monitoring recorded concentrations of 0.7% carbon dioxide. Given the vicinity to site it is possible that migration of ground gas from the organic-rich deposits occurs below site.	**Low to Moderate**
		Building and Structures	Damage to building **(Mild)**		
Coal Seam (below former Shaw Distribution Centre)		Human occupants Site Workers	Effect on human health **(Mild to Severe*)**	Coal seams may be present below the Linney Lane Motors site based on the records from the adjacent Shaw Distribution Centre and the CCG Geotechnical and Geo-Environmental Site Investigation Report (2020), which identified the Upper Foot Mine and Upper Mountain (40 Yards Mine) coal seams below the former Shaw Distribution Centre.	**Low**
		Building and Structures	Damage to building **(Mild)**		

*Due to the risk of explosion.

Mine Gas Risk Assessment

Although coal outcrops have been recorded in close proximity to the site, they are unlikely to have been worked at shallow depth (<30m bgl) as the potentially workable seams are locate at depths greater than 100m bgl. A shallow seam was recorded near the site at c.36m bgl, however it was recorded to measure 0.10m in thickness, therefore it is unlikely that it has been worked. The ground gas risk associated with coal measures are mine gas emissions from unflooded workings.

It is unknown whether the recorded seams at depth were worked, however 3 No. mine entries were recorded at the adjacent former Shaw Distribution Centre site, therefore it is possible that the deep seams have been worked. No mine entries were recorded on-site. However, given that any workings are likely present below 100m bgl, as well as the recorded presence of groundwater overflowing the BGS boreholes summarised in the CCG Geotechnical and Geo-Environmental Site Investigation Report (2020), and due to the lack of vertical migration pathways on-site (i.e. faults and mine shafts) the likelihood of vertical migration of mine gas from the seams at greater than 100m is considered low.

Based on the above conceptual site model and the CL:AIRE Good practice for Risk Assessment for Coal Mine gas Emissions (October 2021), the risk posed by mine gas emissions is deemed low.

Conceptual Model for Controlled Waters Risk Assessment

A site conceptual model in the form of a linkage table for the purposes of a preliminary risk assessment for pollution of waters has been produced as a result of the probable contaminants, pathways and targets identified above as follows:

Conceptual Model for Controlled Waters Risk Assessment					
Source	**Pathway**	**Receptor**	**Hazard (severity)**	**Likelihood of Occurrence**	**Risk**
Possible Made Ground **Agricultural Use**	A C D	Groundwater within the Secondary A Aquifers	Effects to controlled waters (**Mild)**	**Pre-Development Site** **Likely**: Elevated concentrations of arsenic, lead, petroleum hydrocarbons and PAHs recorded within the Made Ground. As groundwater is present at shallow depths, there is a feasible contaminative pathway to identified sensitive receptors within the on-site Secondary A aquifers.	**Low to Moderate**
				Post Development Site **Low Likelihood:** Following development there will be a significant increase in hardstanding (i.e. buildings and roads) across the site therefore vertical migration will be significantly reduced.	**Low**
	B E F	Surface water courses (River Beal – western site boundary)	Effects to controlled waters: (**Mild**)	**Pre-Development Site:** **Likely**: Lateral migration of contaminants is considered likely given the presence of potentially contaminative sources and feasible contaminative pathways through mostly cohesive suspected Alluvial deposits at shallow depths. Shallow groundwater is anticipated across site, therefore lateral migration is considered likely.	**Low to Moderate**
				Post Development Site: **Low Likelihood**: The potential for lateral migration of contaminants will be reduced following development given the increased presence of hardstanding significantly reducing infiltration of water into the underlying ground.	**Low**
	E	Surface water courses (On-Site Pond and Unnamed Stream Along Eastern Boundary)	Effects to controlled waters: (**Mild)**	**Pre-Development Site** **Low Likelihood**: Although a surface water feature is located adjacent to the eastern boundary of the site, overland flow is considered unlikely as no hardstanding is currently present on-site to facilitate overland flow, the existing granular Made Ground will facilitate vertical migration rather than lateral migration to the surface water receptors. Lateral migration may occur in places where cohesive suspected Alluvial deposits are present at shallow depths.	**Low**
				Post Development Site: **Low Likelihood**: Although the presence of hardstanding is likely to increase significantly following development, the risk remains very low as any contamination is likely to be beneath hardstanding or beneath areas of soft landscaping / private gardens which will facilitate vertical migration rather than lateral migration to the surface water receptors.	**Low**

Preliminary Risk Assessment Summary

Human Health

Based on the human heath conceptual model the risk to human health is deemed low to moderate to end users and construction workers. Elevated concentrations of arsenic, lead and PAHs have been recorded in localised areas and contaminative linkages have been identified. Although the risk to construction workers is increased due to their acute interaction with site soils, it is envisaged that with appropriate PPE and site management, risks to construction workers can be mitigated therefore the risk is deemed to be low.

Ground Gas

Ground gas sources have been identified on-site and elevated concentrations of carbon dioxide were recorded during the CCG ground gas monitoring, therefore, the risk is deemed low to moderate. If any organic rich Made Ground deposits are identified or if previously unrecorded potential ground gas sources are recorded during the ground investigation works, then ground gas monitoring may be required. The length and frequency of the ground gas monitoring regime and the sampling method, initial results and alterations to the conceptual model are subject to the findings of the ground investigation works and development constraints (i.e. development timescales and liaison with the local authority).

Controlled Waters

Sensitive receptors have been identified on-site (Secondary A Aquifers and The River Beal), as well as feasible contaminative linkages, therefore the risk to controlled waters is deemed low to moderate. If unrecorded contaminative sources are noted, the above conceptual models may require re-assessment.

RECOMMENDATIONS

1. A Phase 2 Intrusive Site Investigation for the purposes of assessing environmental risk is recommended, undertaken as part of the Shaw Distribution Centre Remedial Works. Due to site access currently being severely restricted by the existing buildings (Linney Lane Motors vehicle repair shop) and dense vegetation, this is to be completed after demolition works on the site. This Phase 2 work will confirm whether the Remedial Strategy compiled for the wider site is appropriate or any variation is required. The IGE Consulting Remedial Strategy has been revised to accommodate this 'extra' area.

2. Due to geotechnical requirements, site investigation works should be undertaken in order to determine the ground conditions with a greater degree of certainty and allow design of the proposed development, drainage, services and immediate external areas to be undertaken. It is therefore recommended that exploratory holes are constructed where access is permitted across the site during or after demolition of the site.

3. Remedial works to be undertaken on-site in line with the remedial requirements agreed for the adjacent Shaw Demolition Centre site.

4. It should be noted that, if any visual or olfactory evidence of contamination is encountered during construction work, then the Local Authority Environmental Health Officer and Environment Agency should be contacted immediately in order to agree any necessary remediation measures.

If any additional information is needed, do not hesitate to ask.

Yours sincerely,

Aga Stefanowicz MEarthSci FGS
Geo-Environmental Engineer

Enc.
Appendix 1 – Limitations of Investigation Work and Report & Contaminated Land Legislative Framework
Appendix 2 – Site Location Plan & Site Features Plan
Appendix 3 – Proposed Development Plan

LIMITATIONS OF REPORT

This consultancy report was compiled and carried out by IGE Consulting Limited ('IGE') for the client, as defined in the main report (the 'client'), on the basis of a defined programme and scope of works and the terms of a contract between IGE and the client. IGE undertook this with all reasonable skill and care, taking into account the limits of the scope of works required by the client, the prevailing site conditions, the time scale involved and the resources, including financial and manpower resources, agreed between IGE and the client. IGE cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices. This report may not be relied upon, or transferred to, by any other party without the written agreement of its author. If a third party relies on this report, it does so wholly at its own and sole risk and IGE disclaims any liability to such parties.

It is IGE's understanding that this report is to be used for the purpose described in the 'Brief' section of this report. That purpose was a significant factor in determining the scope and the services to be provided. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without IGE's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of IGE.

This report is a function of the date it was written and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of IGE. In the absence of such written advice of IGE, reliance on the report in the future shall be at the client's own and sole risk. Should IGE be requested to review the report in the future, IGE shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between IGE and the client.

The observations and conclusions described in this report are based solely upon the scope of works agreed between the client and IGE. IGE has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. IGE is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the agreed scope of works. For the avoidance of doubt, this report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species (e.g. Japanese Knotweed). It is recommended that the client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the suspected presence asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace full and proper surveys.

Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation and these two main aspects are inter-related. The geo-environmental sections are written in broad agreement with BS 10175:2011+A2 2017.

LIMITATIONS OF INVESTIGATION WORK

Desk Study References

This report is based upon IGE's observations of existing physical conditions at the site gained from a walkover survey of the site together with IGE's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. Reliance has been placed on this publicly available data obtained from the sources identified in the main report. When using the information, it has been assumed that it is correct. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst IGE have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. IGE did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services. IGE is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to IGE and including the doing of any independent investigation of the information provided to IGE except when otherwise provided in the terms of the contract between the client and IGE.

Historical Mapping

Historical Ordnance Survey maps do not provide a comprehensive description of a site history. They provide details of the site from a date prior to the publication of the map (i.e. a snapshot in time). The period between map editions can be substantial (i.e. several decades). Not all map series are available for every date range in many areas of the UK and therefore there will be gaps in this mapped record for some sites. Potentially contaminative land uses could have been present and removed during such periods and may therefore not form a part of this particular record. In addition, there will be potentially contaminative land uses which are not identified on the map records such as small scale storage / use of hazardous materials, illegal / unlicensed waste disposal activities etc. Different map series identify different features utilising different symbols which can result in features that remain on-site being removed from maps. Some features are also not mapped for security reasons (e.g. airfields and other military installations). These areas are mostly shown as blank areas on historical maps.

Site Walkover

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 be made known or accessible.

Flooding

Flooding in this report is defined as flooding caused by the sea, ditches, rivers, streams, ponds, lakes, reservoirs and the like. It does not extend to flooding caused by surcharged piped drainage systems and investigations into flooding of this nature are excluded from this report.

Extent of Contamination Studies

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. The 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 reporting in full. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Intrusive Investigation

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations, the potential exists for ground conditions to be encountered which are different to those considered in this report. The explored extent of the site area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters, based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Exploratory Holes

Where exploratory holes have been carried out as part of this investigation, the spacing has been determined to provide a reasonable indication of the general ground conditions across the site, but the number has ultimately been limited by commercial constraints. The findings of the exploratory holes relate specifically to the exploratory hole locations and are no absolute guarantee of the ground conditions between such locations. Due allowance should be made for the possibility of variation in conditions between exploratory hole locations.

Extent of Contamination Testing

The extent of contaminated land testing carried out on samples obtained from the site has been determined in accordance with the latest legal guidance issued by the government to provide, with reasonable certainty, the probable general levels of contamination present on site that could pose a significant hazard to human health or waters. The extent of site investigation works including chemical testing has also been limited by reasonable commercial constraints. Although extensive testing of samples has been carried out, the volume of samples taken for testing are a minute fraction of the total volume of soils and groundwater present on site. Therefore, there is a residual risk that undetected pockets of contamination may be present on site, situated between testing locations.

When investigating or developing potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and temporally. The absence of certain ground, ground gas, contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. 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. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Extent of Geo-Environmental Studies

This report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species e.g. Japanese Knotweed. It is recommended that the Client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the identification asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace a full and proper survey. If an Unexploded Ordnance (UXO) report has been obtained within the report, it has been so on the basis of Health and Safety concerns and no assessment has been made other than transcribing the recommendations of the sub-contractor contained within the report. In terms of a potential contaminative source, unless ordnance has been manufactured / stored on site, UXOs will only be determined as a contaminative source following a positive identification on site.

PLANNING CONTEXT

The National Planning Policy Framework (NPPF, 2023) states that the purpose of the planning system is to contribute to the achievement of sustainable development. In order to do this the planning system has three overarching objectives, one of which directly relates to the potential for pollution and contaminated land:

- *'**environmental objective** - to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy'.*

In accordance with this environmental objective, Paragraph 118 clarifies that 'making effective use of land' includes to:

- *'give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land'*.

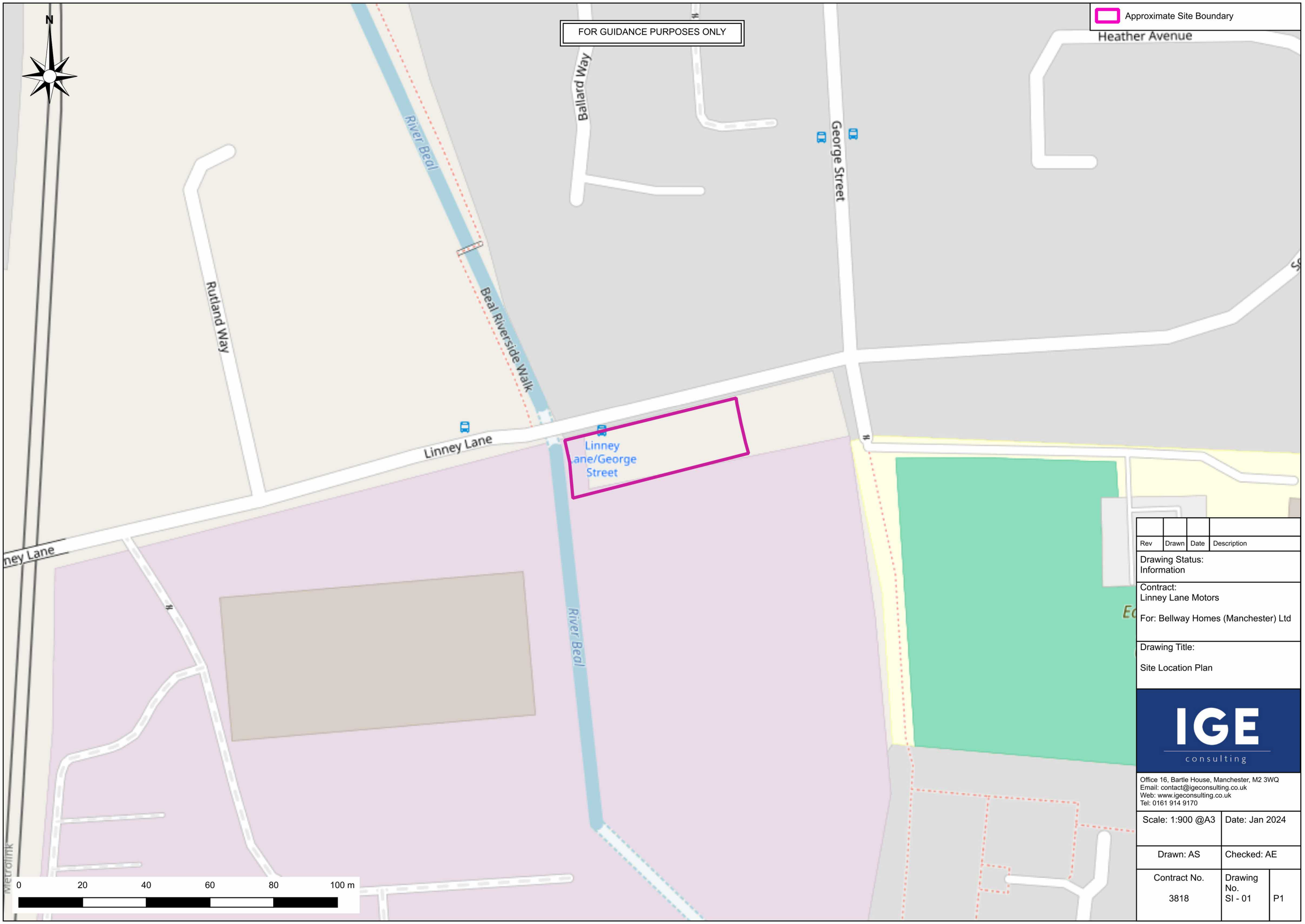
In accordance with this environmental objective, Paragraph 170 clarifies that' conserving and enhancing the natural environment includes:

- *'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability*'; and
- *'remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate'.*

Paragraph 189 of the NPPF states that planning policies and decisions for developments should also ensure that:

- *'a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation)*';
  and,
- '*after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990'*; and
- '*adequate site investigation information, prepared by a competent person, is available to inform these assessments'*.

This report has been prepared and authorised by staff that are competent as defined in the NPPF.



Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:
Linney Lane Motors

For: Bellway Homes (Manchester) Ltd

Drawing Title:

Site Location Plan

IGE consulting

Office 16, Bartle House, Manchester, M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:900 @A3	Date: Jan 2024	
Drawn: AS	Checked: AE	
Contract No. 3818	Drawing No. SI - 01	P1

FOR GUIDANCE PURPOSES ONLY

N

Rutland Way

Linney Lane

Linney Lane

Linney Lane George Street

River Beal

East Crompton St George's CofE School

P

Cuniffe Drive

0 20 40 60 80 100 m

Approximate Site Boundary BP1
Linney Lane Motors Garage Building
Shaw Distribution Centre Mill Buildings
Tanks (1950s - 2022)
Historical Infilled Reservoirs (Landfills)

Former Path of River Beal
1891
1952

Present Day River Beal
Culverted
Open

Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:
Linney Lane Motors, Shaw

For: Bellway Homes (Manchester) Ltd

Drawing Title:

Site Features Plan

IGE consulting

Office 16, Bartle House, Manchester, M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:900 @A3	Date: Jan 2024	
Drawn: AS	Checked: AE	
Contract No. 3818	Drawing No. SI-02	P1

Linney Lane, Shaw, Oldham

www.astlepd.co.uk

ACCOMMODATION SCHEDULE
GARAGE SITE

Name	Ref	Bed	Storey	Unit No's	Unit ft²	ft² Total
Open Market Dwellings (112no. @ 80%)						
Bowyer	BO-4B	4 Bed	2	1	1356	1356
Sawyer	SY-3B	3 Bed	2	1	1083	1083
Lymner	LY-3B	3 Bed	2	1	985	985
Tailor	TA-3B	3 Bed	2	2	802	1604
Total:				**5 Units**		**5028 ft²**

Planning Layout

Feasibility Study

Drawing Number - APD/BHM257/PL01
Revision - T (INFILL)
Date - 25/10/23
Scale/Sheet Size - 1:500/A3

1:500 0 5 10 15 25m

URBAN DESIGN GROUP REGISTERED PRACTICE

Bellway