



**Castledine
Environmental**

LAND CONTAMINATION SURVEYS

Phase 1 Land Contamination Risk Assessment

for

Proposed Residential Development Comprising a Pair of Semi-Detached, Four- Bedroomed Dwellings with Associated Parking

on the site of

Land Adjacent to No 3, Slaithwaite Drive, Manchester M11 4BA

Status:

Date: July 2023

Final Report

Reference:

3569D P1 Casey - Manchester

Date:

17/07/2023

Tel: 01509 880399 Email: info@castledineenvironmental.co.uk

4 Wymeswold Road, Hoton, Loughborough, Leicestershire, LE12 5SN

EXECUTIVE SUMMARY

Site is currently occupied by the former garden plot of an associated dwelling, located directly south of site and comprising exterior areas, a garage and adjoined workshop. Both the structures and the exterior areas were noted to be occupied by a large amount of storage, debris and refuse.

The historical usage of the site and the potential sources outlined in Section 7.1 have the potential to have impacted site (with various contaminants listed in Section 7.1.2.) via potential pathways listed in Section 7.2 and potentially impacting the receptors outlined in Section 7.3.

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **MODERATE** level of risk with respect to the site development proposals.

It is recommended that further investigation inline with Section 16.0 is planned and carried out on site along with remediation inline with Section 17.0.

This report should be submitted to your Local Planning Authority for agreement to allow the Phase 2 intrusive testing to be undertaken and a subsequent Phase 3 Remediation Strategy and Verification Plan to be produced.

CONTENTS

<u>1.0</u>	<u>QUALITY ASSURANCE</u>	<u>1</u>
<u>2.0</u>	<u>LIMITATIONS</u>	<u>1</u>
<u>3.0</u>	<u>INTRODUCTION AND SITE PROPOSALS</u>	<u>2</u>
<u>4.0</u>	<u>SCOPE</u>	<u>2</u>
<u>5.0</u>	<u>SITE DESCRIPTION</u>	<u>3</u>
<u>6.0</u>	<u>REGULATORY AUTHORITY AND OTHER ENVIRONMENTAL DATA</u>	<u>4</u>
6.1	HYDROLOGICAL	5
6.1.1	AQUIFER	5
6.1.2	ABSTRACTIONS AND PRIVATE WATER SUPPLIES	6
6.1.3	SOURCE PROTECTION ZONE	6
6.1.4	GROUNDWATER VULNERABILITY AND SOIL LEACHING POTENTIAL	6
6.1.5	POTENTIAL SURFACE WATER	7
6.1.6	DISCHARGE CONSENTS	7
6.2	PERMITTED PROCESSES	7
6.3	POLLUTION INCIDENTS	7
6.4	RADIOACTIVE SUBSTANCES REGISTRATIONS	7
6.5	WASTE	7
6.5.1	LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS)	7
6.5.2	LANDFILL SITES	7
6.6	HAZARDOUS SUBSTANCES	8
6.7	ECOLOGICAL RECEPTORS	8
6.8	SOILS AND GEOLOGY	8
6.8.1	SUPERFICIAL DEPOSITS	8
6.8.2	SUPERFICIAL DEPOSITS PERMEABILITY	8
6.8.3	BEDROCK DEPOSITS	9
6.8.4	BEDROCK PERMEABILITY	9
6.8.5	ARTIFICIAL GROUND	9
6.8.6	COAL MINING	9
6.8.7	NON-COAL MINING	10
6.8.8	SURFACE WORKINGS	10
6.8.9	RADON	11
6.9	AERIAL PHOTOGRAPHY	11
6.9.1	GOOGLE MAPS	11
6.9.2	GOOGLE EARTH	11
6.10	GOOGLE STREET VIEW	13
6.11	HISTORIC MAPPING	13
6.12	CURRENT LAND USE DATA	16
6.13	PETROL AND FUEL SITES	16
6.14	HISTORICAL PETROL AND FUEL SITE DATABASE	16
6.15	POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING	16

6.16	HISTORICAL TANK DATABASE	16
6.17	HISTORICAL ENERGY FACILITIES	16
6.18	HISTORICAL GARAGE DATABASE	17
<u>7.0</u>	<u>PRELIMINARY CONCEPTUAL SITE MODEL</u>	<u>17</u>
7.1	SOURCES	18
7.1.1	ONSITE	18
7.1.2	OFFSITE	18
7.2	PATHWAYS	20
7.3	RECEPTORS	21
<u>8.0</u>	<u>CONCEPTUAL SITE MODEL</u>	<u>21</u>
8.1	PRELIMINARY CONCEPTUAL SITE MODEL	22
8.1.1	SOIL CONTAMINATION	22
8.1.2	HAZARDOUS GROUND GAS AND VAPOURS	22
<u>9.0</u>	<u>ENVIRONMENTAL RISK ASSESSMENT</u>	<u>25</u>
<u>10.0</u>	<u>SUMMARY OF RISKS</u>	<u>26</u>
<u>11.0</u>	<u>HUMAN HEALTH</u>	<u>26</u>
11.1.1	RESIDENTS / END-USERS	26
11.1.2	SITE WORKERS	26
<u>12.0</u>	<u>CONTROLLED WATERS</u>	<u>26</u>
<u>13.0</u>	<u>STRUCTURES</u>	<u>27</u>
13.1.1	GROUND GASES	27
13.1.2	HAZARDOUS VAPOURS	27
13.1.3	POTABLE WATER SUPPLY PIPING	27
<u>14.0</u>	<u>OFFSITE RECEPTORS</u>	<u>28</u>
<u>15.0</u>	<u>WASTE CLASSIFICATION</u>	<u>28</u>
<u>16.0</u>	<u>RECOMMENDATIONS</u>	<u>28</u>
<u>17.0</u>	<u>REMEDIATION</u>	<u>29</u>
<u>18.0</u>	<u>REFERENCES</u>	<u>30</u>
18.1	LEGISLATION AND REGULATIONS	30
18.1.1	ACTS	30
18.1.2	PLANNING REGULATIONS	30
18.1.3	CONTAMINATED LAND REGULATIONS	30
18.2	STATUTORY GUIDANCE	30
18.3	BRITISH STANDARDS	31
18.4	NON STATUTORY TECHNICAL GUIDANCE	31
18.4.1	ENVIRONMENT AGENCY	31
18.4.2	CIRIA PUBLICATIONS	31
18.4.3	CL:AIRE	31
<u>19.0</u>	<u>APPENDICES</u>	<u>32</u>

LIST OF APPENDICES

APPENDIX A	ENVIRONMENTAL SEARCH	32
APPENDIX B	HISTORICAL MAPPING	32
APPENDIX C	PROPOSED AND CURRENT SITE PLANS	33
APPENDIX D	SITE PHOTOS AND LOCATIONS	34
APPENDIX E	WATCHING BRIEF	41
APPENDIX F	DISCOVERY STRATEGY	43

LIST OF TABLES

TABLE 1.	SUMMARY OF SIGNIFICANT POLLUTION LINKAGES	23
TABLE 2.	RISK CLASSIFICATION MATRIX	24
TABLE 3.	CLASSIFICATION OF RISK	25

1.0 QUALITY ASSURANCE

Castledine Environmental confirm that all reasonable efforts have been made to ensure that the information outlined within this report is accurate.

Castledine Environmental would further confirm that due care, attention and technical skill were used in the creation of this report.

For and on behalf of Castledine Environmental

Kevin Castledine

(Director)

2.0 LIMITATIONS

The conclusions and recommendations made in this report are limited to those based on the findings of the investigation. Where comments are made based on information obtained from third parties, Castledine Environmental assumes that all third-party information is true and correct. No independent action has been undertaken to validate the findings of third parties. The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at the time.

This survey has not included asbestos within existing structures, invasive plant species, geotechnical considerations or any elements unconnected with potential ground contamination at the site. If required, such surveys should be undertaken by suitably accredited organisations.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

3.0 INTRODUCTION AND SITE PROPOSALS

Castledine Environmental have been appointed by Mr. J.P. Casey to undertake a Phase 1 Desk study on a site at No.7/9 Slaithwaite Drive, Manchester M11 4BA.

The site proposals consist of a proposed residential development comprising a pair of semi-detached, four-bedroomed dwellings with associated off-road parking.

4.0 SCOPE

Castledine Environmental have prepared this report for the sole use and reliance of Mr. J.P. Casey and associated appointees for the purpose of ensuring compliance with:

- Paragraph(s) 174, 179, 183 & 184 of the National Planning Policy Framework 2021
- Part C1 of the building regulations
- Support of a Planning Application

This report may not be used or relied upon by any unauthorised third party, or for any other proposed use than that specified above, without the explicit written agreement of Castledine Environmental

This report is to be regarded as a Preliminary Risk Assessment in accordance with the Environment Agency's Land Contamination Risk Management (LCRM – 2021), which replaces *CLR11 "Model Procedures for the Management of Land Contamination"*, carried out in accordance with BS 10175:2011+A2:2017, *"Investigation of Potentially Contaminated Land - Code of Practice"* and relevant sections of BS5930:2015+A1:2020, *"Code of Practice for Ground Investigations"*.

The objectives of the report are:-

- To assess historical activities at the site with respect to their potential impact on the site environment;

- To assess historical and current surrounding land use in relation to known or potential off-site contamination issues that may impact on the subject site;
- Review of geological, hydrological and hydrological conditions at the site, pertaining to land contamination issues;
- To characterise the environmental setting of the site, identify migration pathways and vulnerable receptors for contamination originating at the site, focusing on potential soil and groundwater liabilities;
- To develop a preliminary conceptual site model (CSM).

5.0 SITE DESCRIPTION

The site is located in Manchester at National Grid Reference: 388149,398936 and is approximately 0.05ha in area.

The site is irregular in shape and is orientated east to west. The site is located in a predominantly residential area and is directly bounded by neighbouring dwellings and their associated garden spaces to the north, east and west with Slaithwaite Drive located directly south east of site.

The site interior comprises a former garden plot of an associated dwelling, located directly south of site, presently in use as a yard and workshop area.

Access to site was provided via the south eastern boundary through herras fencing, located between timber garden fencing on this boundary. Directly inside and north of the access lies a garage unit with an adjoined workshop. The garage unit was seen to be constructed of concrete slabs, concrete flooring and a mixture of timber and concrete cladding and corrugated metal roofing. The adjoined workshop, located on the western face of the garage was seen to be constructed of corrugated cladding, timber structuring and further concrete flooring. The interiors of both the garage unit and the workshop were seen to be heavily congested with numerous items such as furniture, construction materials such as boarding, plaster, timber, window frames, metal spars along with tyres,

miscellaneous tools, tool and component boxes, ladders, bins, batteries and other associated workshop and vehicle maintenance items. The area outside the southern face of the buildings and to the east and north, between site boundaries was also noted to be occupied by heaped debris and refuse including chicken wire, bricks and stone, vehicle components and scrap metals including radiators, bin-bags, scaffolding, timber and further tyres.

The remainder of site is then occupied by largely bare, recently scraped soils with evidence of rubbles and debris seen across the site. The far western extent of site was seen to be occupied by a small excavator, a heaped pile of timber and vegetation cuttings and some small heaps of soil and further scaffolding associated tools and materials. A skip with further refuse and debris, similar to that noted elsewhere on site, was then noted to be located centrally on the southern boundary.

Potential sources of contamination noted on the site walkover include both the garage and workshop unit, the scattered debris noted both within and without the buildings, along with the scattered debris and refuse noted across the remainder of site. Topographically, the site is level as are surrounding areas.

Photos of the site are present in Appendix D

6.0 REGULATORY AUTHORITY AND OTHER ENVIRONMENTAL DATA

An environmental search listing historical and environmental factors likely to affect the property has been reviewed.

The most pertinent information is summarised in the following sections.

A copy is presented in Appendix A.

Additional geological and hydrological data was obtained from the British Geological Survey.

6.1 HYDROLOGICAL**6.1.1 AQUIFER****6.1.1.1 SUPERFICIAL GEOLOGY**

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary (Undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
2	22	NW	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.1.1.2 BEDROCK GEOLOGY

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
2	142	SW	Secondary B	Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers

6.1.2 ABSTRACTIONS AND PRIVATE WATER SUPPLIES

The Groundsure report records no abstraction licences held within 250m of site and no potable abstraction license located within 1000m of site.

6.1.3 SOURCE PROTECTION ZONE

Site is not in a source protection zone.

6.1.4 GROUNDWATER VULNERABILITY AND SOIL LEACHING POTENTIAL

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one-kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

ID	Location	Summary	Soil / Surface	Superficial geology	Bedrock geology
1	On site	Summary Classification: Secondary superficial aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: <40% Dilution value: 300- 550mm/year	Vulnerability: Low Aquifer type: Secondary Thickness: >10m Patchiness value: >90% Recharge potential: High	Vulnerability: Low Aquifer type: Principal Flow mechanism: Well connected fractures
2	21m NW	Summary Classification: Secondary superficial aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: <40% Dilution value: 300- 550mm/year	Vulnerability: Low Aquifer type: Secondary Thickness: >10m Patchiness value: >90% Recharge potential: High	Vulnerability: Low Aquifer type: Principal Flow mechanism: Well connected fractures

6.1.5 POTENTIAL SURFACE WATER

The Groundsure report records no hydrological features located within 250m of site; however, the River Medlock is located approximately 422m north west of site.

Information identified from historical mapping showed a possible former watercourse, possibly being infilled or culverted formerly located directly north west of site and extending north west in a delph (infilled by circa.1922).

6.1.6 DISCHARGE CONSENTS

None recorded within 250m of site.

6.2 PERMITTED PROCESSES

None recorded within 250m of site.

6.3 POLLUTION INCIDENTS

The Groundsure report records no pollution incidents located within 250m of site and no significant impact incidents located with 500m of site.

6.4 RADIOACTIVE SUBSTANCES REGISTRATIONS

None recorded within 250m of site.

6.5 WASTE**6.5.1 LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS)**

None recorded within 250m of site.

6.5.2 LANDFILL SITES

The Groundsure report records a historical landfill formerly located 217m north of site which handled inert, industrial, commercial, household, special and liquid sludge waste types between the dates of circa.1965-68. The Groundsure also records an area 294m north east of site at a refuse tip with the same date. A second historical landfill is then recorded 478m north of site which handled inert and industrial waste types, being dated circa.1901 with no end date held.

6.6 HAZARDOUS SUBSTANCES

None recorded within 250m of site.

6.7 ECOLOGICAL RECEPTORS

The Groundsure report records the Clayton Vale Local Nature Reserve (LNR) located 206m north west of site and the Merseyside and Greater Manchester Greenbelt (as operated by Manchester) located 214m north of site.

No further sensitive land usages are recorded within 1000m of site.

6.8 SOILS AND GEOLOGY

"Contains British Geological Survey materials © NERC 2023" obtained from <http://www.bgs.ac.uk/data/mapViewers/home.html> under the [Open Government Licence](#)

6.8.1 SUPERFICIAL DEPOSITS

Both BGS geological mapping and the Groundsure report record superficial geological deposits of Glacial Till on site, comprising a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape.

Records of Glaciofluvial Deposits (arising from the action of glacial meltwater streams) are then located 15m north west and comprise mostly coarse-grained sediments (i.e. sand and gravel) with some finer-grained layers (i.e. clay and silt) with local lenses of silt, clay or organic material.

6.8.2 SUPERFICIAL DEPOSITS PERMEABILITY

The Groundsure report records the site as being within an area where the maximum permeability of superficial deposits is recorded as 'high' and the minimum permeability as 'low' and facilitated by mixed flow mechanisms. A 'very high' to 'high' permeability is recorded 15m north west and facilitated by intragranular flow mechanisms.

6.8.3 BEDROCK DEPOSITS

Both BGS geological mapping Groundsure report record bedrock geology of the Collyhurst Sandstone Formation underlying site, comprising a soft red sandstone with abundant beds of "millet seed" sand grains alternating with beds of fine-grained sharp sand with some interbedded grey sandstones locally.

Records of the Manchester Marls Formation, comprising a red marl (calcareous mudstone and siltstone) with thin beds of fossiliferous marine limestone and dolomite are then located 135m south west of site.

6.8.4 BEDROCK PERMEABILITY

The Groundsure report records the site as being within an area where the maximum permeability of bedrock geology is recorded as 'high' and the minimum permeability as 'high' and facilitated by fracture flow mechanisms.

This is a qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

6.8.5 ARTIFICIAL GROUND

BGS geological mapping records the site as being entirely located atop an area of infilled ground with further records of infilled ground being located 140m north and made ground (undivided) located 231m north of site (correlating with the historical landfill outlined in Section 6.5.2 above).

6.8.6 COAL MINING

The site is located in a coal mining reporting area. According to National Coal Authority interactive mapping the site is not located within an area of development high risk, area of shallow known or probable coal workings, area of surface mining (past, present or planned) nor is the site in proximity to any coal mining entrances or outcrops.

6.8.7 NON-COAL MINING

The Groundsure report records no non-coal mining operations located within 250m of site.

6.8.8 SURFACE WORKINGS

ID	Distance [m]	Direction	Land Usage	Year of Mapping
A	0	On site	Brick works	1923
A	0	On site	Unspecified pit	1923
A	0	On site	Unspecified ground workings	1921
A	0	On site	Brick works	1921
A	0	On site	Brick works	1906
A	10	W	Unspecified pit	1933
A	37	S	Unspecified ground workings	1906
A	37	W	Pond	1933
A	76	SW	Pond	1851
A	85	SW	Unspecified pit	1891
A	108	SW	Pond	1906
B	131	N	Pond	1906
B	131	N	Pond	1923
B	132	N	Pond	1921
B	132	N	Pond	1891
C	142	N	Unspecified pit	1891
C	155	E	Pond	1906
1	217	E	Unspecified ground workings	1906
D	217	N	Unspecified ground workings	1921
E	217	N	Unspecified heap	1938
D	219	N	Unspecified ground workings	1923
E	219	N	Unspecified heap	1933
F	233	N	Refuse heap	1921
F	239	N	Refuse heap	1923
G	244	E	Pond	1906
G	246	E	Refuse heap	1891

ID	Distance [m]	Direction	Land Usage	Year of Mapping
H	247	SE	Ponds	1851
2	248	S	Ponds	1851
E	248	N	Unspecified pit	1985
E	248	N	Unspecified pit	1991

6.8.9 RADON

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level. No radon protective measures are necessary as described in publication BR211:2015 by the Building Research Establishment.

6.9 AERIAL PHOTOGRAPHY

Aerial photography shows the following:

6.9.1 GOOGLE MAPS

The site is shown as located within a wider, predominantly residential area and as directly bounded by neighbouring residential dwellings and their associated garden spaces to the north, east and west, an associated dwelling south and the roadside south east. The site itself is shown as occupied by the garage unit and adjoined workshop in the north east of site with the exterior areas remaining occupied by scattered debris, refuse and storages (as seen on the site walkover) with an additional 2 No. vehicles parked on site. The far west of site is obscured by foliage of trees at this time, noted to be felled and heaped in the west of site on the site walkover.

6.9.2 GOOGLE EARTH

16 No. images are held in the historic imagery dataset, as follows:

Date	Description
December 2000	The site is shown as a bare, unoccupied plot of scrubland occupied by rough vegetation, located directly NW of the turning circle / termination of Slaithwaite Drive. The associated dwelling, seen directly south of site in the present-day is not present at this time.
April 2003	Imagery is indistinct; however, the site appears unchanged. A building formerly located approx.42m NW of site has been demolished and the area left bare and unoccupied concrete.
August 2003	No major change on site, site remains unchanged. Formerly unoccupied concrete area to the NW of site has now been developed with large building (housing association in present-day).
October 2005	Imagery is indistinct; however, the dwelling seen directly south of site in the present-day has been erected and the site is likely within the garden boundary of the dwelling.
December 2005	Site now clearly shown as occupied by debris and construction materials associated with the development the associated dwelling directly south of site.
June 2009	Site now occupied by the garage unit, construction materials and a number of vehicles, adjoined workshop not present at this time. Associated dwelling now fully constructed.
April 2013	Imagery is indistinct; however, there appears no change on site.
September 2016	Imagery is indistinct; however, there appears no change on site.
March 2017	Workshop adjoined to the western face of the garage at this time. Amount of storage on site has increased and what appears to be a camper van is now parked on site.
April 2018	No discernible change on site nor site relevant change to the surrounding areas.
May 2019	No discernible change on site other than minor vehicle and storage movements nor site relevant change to the surrounding areas.
April 2020	No discernible change on site other than minor vehicle and storage movements nor site relevant change to the surrounding areas.

Date	Description
March 2021	No discernible change on site other than minor vehicle and storage movements. Area directly east of the site formerly occupied by vegetation and trees now cleared and left unoccupied.
April 2021	No discernible change on site other than minor vehicle and storage movements and no site relevant change to the surrounding areas.
January 2022	No discernible change on site other than minor vehicle and storage movements and no site relevant change to the surrounding areas.
June 2023	Far western extent of site now cleared of vegetation and foliage, as seen on the site walkover. Site has now been scraped clear of vegetation and is wholly occupied by bare soil, storage of building footprint.

6.10 GOOGLE STREET VIEW

Google Street View imagery is dated July of 2019 with the site viewed from the termination / turning circle of Slaithwaite Drive and facing north west. The site is largely obscured by roadside vehicles and site boundaries; however, what can be seen remains occupied by the garage and workshop unit with a large van parked on site.

6.11 HISTORIC MAPPING

The following historic maps have been reviewed as part of this assessment, found in the appendices.

Map	Onsite	Offsite
OS County Series: 1848, 1:10,560	The site is shown as largely unoccupied field with the northern extent of site located within woodland named 'Clayton Dingle'.	The areas directly north, NE and NW of site are occupied by woodland and the areas directly south, SW and SE of site occupied by open field. Notable features include an unspecified pit approx.108m SW, a pond approx.132m north and a large, old marl pit approx.142m NE of site with a large pond just beyond this.
OS County Series: 1890-1892, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.

Map	Onsite	Offsite
OS County Series: 1893, 1:2,500	No discernible change on site.	Housing has been erected along North Street approx.250m south of site.
OS County Series: 1905-1906, 1:10,560	No discernible change on site.	A brick works is now marked approx.50m SW of site with a large brick pit approx.50m S of site, incorporating the unspecified pit formerly located approx.108m SW of site. Marl pit to the NE of site now partially water filled. Further housing erected along North Street south of site and approx.250m SW and SE of site.
OS County Series: 1908, 1:2,500	Woodland area on the northern extent of site now shown as a depression or river channel.	Brick pit south of site extended northwards slightly. Area approx.250m north now shown as a very large, marsh filled pit or depression. Area approx.100m SE of site now a cricket ground.
OS County Series: 1922, 1:2,500	The river channel or depression underlying the northern extent of site is no longer marked and is assumed infilled. The southern extent of site is now marked as within the brick pit, which has been extended further northwards from its previous location.	The river channel or depression extending NW from site is no longer marked and assumed infield. Refuse heap is marked within the large pit approx.250m north of site. Further terraced development to the south of site along North Street and to rear of streetside housing.
OS County Series: 1923, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1932, 1:2,500	Site now no longer atop the brick-pit, which is now located directly west of site – it is likely the site has been infilled and levelled at this time.	Brick works buildings removed save for chimney, pit moved west and south westwards. New housing development approx.100m east and large pit to the north of site now reduced in size, a football ground occupying the former western extent of the pit.
OS County Series: 1933-1938, 1:10,560	No discernible change on site.	Brick pit directly W/SW of site now partially water-filled.

Map	Onsite	Offsite
National Grid: 1949-1950, 1:1,250	Site now occupied by 2 No. dwellings with their gardens extending to the western boundary.	Surrounding areas in all compass directions now occupied by housing. Brick pit directly W/SW of site removed as part of housing development.
National Grid: 1951, 1:1,250	No discernible change on site.	Surrounding areas see little site relevant change.
Provisional: 1956, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
Provisional: 1966-1968, 1:10,560	No discernible change on site.	Areas approx.250m N and NE of site are marked as landfill. Surrounding areas see further residential development and infill.
National Grid: 1972-1975, 1:1,250	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1980-1981, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1985, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1984-1986, 1:1,250	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1988-1991, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1987-1992, 1:1,250	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 2001, 1:10,000	No discernible change on site.	Landfilled areas to the N and NE of site appear to have been landscaped.
Landline: 2003, 1:1,250	The site has now been cleared of structures – likely due to poor structural stability due to former brick-works pit (client information also indicates this along with dilapidated area regeneration).	2 No. dwellings formerly located directly south of site have been demolished, likely due to poor structural stability (client information also indicates this along with dilapidated area regeneration).
National Grid: 2010, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 2023, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.

6.12 CURRENT LAND USE DATA

ID	Distance [m]	Direction	Company	Activity	Category
1	37	W	Electricity substation	Electrical features	Infrastructure and facilities
2	227	NE	Advance Wall & Floor Tiling	Construction completion services	Construction services

6.13 PETROL AND FUEL SITES

None recorded within 250m of site.

6.14 HISTORICAL PETROL AND FUEL SITE DATABASE

None recorded within 250m of site.

6.15 POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING

ID	Distance [m]	Direction	Use	Date
A	0	On site	Unspecified ground workings	1921
A	0	On site	Unspecified pit	1923
A	0	On site	Brick works	1921-1923
A	0	On site	Brick works	1906
A	10	W	Unspecified pit	1933
A	37	S	Unspecified ground workings	1906
A	85	SW	Unspecified pit	1891
1	142	NE	Unspecified pit	1891
2	217	N	Unspecified ground workings	1906
C	217	N	Unspecified ground workings	1921
3	217	N	Unspecified heap	1933-1938
C	219	N	Unspecified ground workings	1923
4	233	N	Refuse heap	1921-1923
5	248	N	Unspecified pit	1985-1991

6.16 HISTORICAL TANK DATABASE

None recorded within 250m of site.

6.17 HISTORICAL ENERGY FACILITIES

ID	Distance(m)	Direction	Use	Date
B	16	W	Electricity substation	1985-1991
B	17	W	Electricity substation	1972

6.18 HISTORICAL GARAGE DATABASE

None recorded within 250m of site.

7.0 PRELIMINARY CONCEPTUAL SITE MODEL

The risk posed by any contaminants in soil or groundwater will depend on the nature of the hazard, the probability of exposure, the pathway by which exposure occurs, and the likely effects on the receptors. A contaminant is defined as a substance in, on or under land (or within groundwaters) that has the potential to cause harm, while a risk is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance. The following sections discuss all the identified potential on and off-site sources, pathways and receptors in the context of the proposed development and plausible pollutant linkages which may represent a risk to identified receptors from the data gained from the desk study. At this stage the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

Source	A contaminant or pollutant that is in, on or under land that has the potential for cause harm or pollution to a receptor.
Pathway	The physical route by which a receptor is or could be affected by a contaminant or pollutant
Receptor	Something or someone that could be adversely affected by a contaminant, i.e. people, controlled waters, ecological systems, buildings, crops, livestock

By considering each of the three elements above, an assessment of actual and potential hazards to receptors can be carried out, taking into account the significance and degree of risk of each. The three elements above can exist separately; however, they only create a risk where they are linked together, thus creating a contaminant linkage. During the Preliminary Risk Assessment Stage the linkages are referred to as 'Potential Contaminant Linkages', until they are confirmed via intrusive sampling, thus becoming 'Relevant Contaminant Linkages'.

A tabled, diagrammatic or matrix of pollutant linkages is considered to be a Conceptual Site Model (CSM), the source-pathway-receptor linkages are reviewed and displayed, apportioning a risk-rating and mitigation suggestion after each summary.

Three impact potentials exist for any given site, these are:

- The site impacting upon itself;
- The site impacting on its surroundings; and
- The surroundings impacting on the site.

All three impacts need to be considered in a risk assessment.

7.1 SOURCES

The following potential sources of contamination have been identified.

7.1.1 ONSITE

- Infilled former watercourse (infilled circa.1922, north of site)
- Usage of site as brick pit (circa.1922, south of site – infilled by circa.1932)
- Erection of dwellings on site (circa.1950, demolished by circa.2003 – likely due to poor stability and regeneration of the area, client information reinforces this)
- Disused nature of the site following demolition (circa.2003-2009)
- Subsequent erection of dwelling with associated garage unit (circa.2009 to present-day)
- Adjoined workshop on garage (circa.2017 onwards)
- Storage of vehicles on site along with scattered debris and refuse within buildings and across site including vehicle components, containers, refuse and debris (likely circa.2009/2017 to present-day)
- Noted made ground underfoot across site (noted on site walkover)

7.1.2 OFFSITE

- Infilled former watercourse (circa.1922, north of site and extending NW)
- Brick works & pit (on site and directly S/SW, circa.1905/06, water-filled by circa.1933/38 and removed and infilled by circa.1950)
- Numerous historical ponds in local area (infilled by circa.1950)
- Large pit marked with marshland (approx.250m)
- Subsequent large landfill in pit (approx.217m north, handling inert, industrial, commercial, household, special and liquid sludge waste types between the dates of circa.1965-68)

Potential Sources and Associated Contaminants Identified (on site)	
Source	Potential Contaminants
Infilled former watercourse (infilled circa.1922, north of site)	Ground gases (CO ₂ , CH ₄ , CO)
Usage of site as brick pit (circa.1922, south of site – infilled by circa.1932)	Ground gases (CO ₂ , CH ₄ , CO), Leachate (heavy metals)
Erection of dwellings on site (circa.1950, demolished by circa.2003 – likely due to poor stability and regeneration of the area, client information reinforces this)	Heavy metals, polycyclic aromatic hydrocarbons (PAHs), asbestos Possible stability issues
Disused nature of the site following demolition (circa.2003-2009)	Heavy metals, polycyclic aromatic hydrocarbons (PAHs), asbestos
Subsequent erection of dwelling with associated garage unit (circa.2009 to present-day) and adjoined workshop (circa.2017)	Hydrocarbons TPH CWG, PAH's, heavy metals, VOC's & SVOC's
Storage of vehicles on site along with scattered debris and refuse within buildings and across site including vehicle components, containers, refuse and debris (likely circa.2009/2017 to present-day)	Hydrocarbons TPH CWG, PAH's, heavy metals, VOC's & SVOC's

Potential Sources and Associated Contaminants Identified (offsite)	
Source	Potential Contaminants
Infilled former watercourse (circa.1922, north of site and extending NW)	Ground gases (CO ₂ , CH ₄ , CO)
Brick works & pit (on site and directly S/SW, circa.1905/06, water-filled by circa.1933/38 and removed and infilled by circa.1950)	Hydrocarbons TPH CWG, PAH's, heavy metals, VOC's & SVOC's
Numerous historical ponds in local area (infilled by circa.1950)	Ground gases (CO ₂ , CH ₄ , CO)
Large pit marked with marshland (approx.250m)	Ground gases (CO ₂ , CH ₄ , CO)
Subsequent large landfill in pit (approx.217m north, handling inert, industrial, commercial, household, special and liquid sludge waste types between the dates of circa.1965-68)	Ground gases (CO ₂ , CH ₄ , CO), Leachate (heavy metals)

7.2 PATHWAYS

A pathway is defined as a mechanism or route by which a contaminant comes into contact with, or otherwise affects a receptor. Pathways by which the identified receptors may be impacted upon in the context of the proposed development are identified as follows:

- Ingestion (direct and indirect via crop uptake);
- Dermal contact;
- Inhalation;
- Plant uptake,
- Direct contact by buried structures (i.e. pipe degradation and leaching, pH & Sulphate attack on concrete);
- Leaching of soluble contamination into groundwater;
- Airbourne dusts

Potential Source	Credible Pathways	Potential Receptors
Made Ground (infilled ground on site both former river and brick-pit)	Dermal contact and direct & indirect ingestion of soils & Inhalation of dust or vapours	Current Site Users
		Future Site Users (residential)
		Site workers
Made Ground (erection and demolition of dwellings on site)	Ingress of contaminants i.e. PAH's into piping, drinking water or services	Services or their users
Made Ground (subsequent workshop and vehicle storage & maintenance on site)		Buried structures
Numerous infilled watercourses, ponds, marshland within pits and pits (circa.1922-1950)	Inhalation of dust or vapours	Structures on or adjacent to site and persons or, adjacent or above the site
	Migration of gases or vapours via geology or below-ground services	
Large landfill (accepting inert, industrial, commercial, household, special and liquid sludge waste types between the dates of circa.1965-68)		

7.3 RECEPTORS

Receptors are defined as people, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by contaminant(s).

- Human Health
 - Current users of the site;
 - Future users of the site;
 - Users of neighbouring sites;
 - Construction workers; and
 - Services personnel working in trenches.
 - Construction Materials
- Buried concrete, which may be affected by high concentrations of sulphate and/or low pH, in the soils and groundwater underlying the site; and
- Buried water pipes.
- Controlled Waters
- Ecological Receptors
- Flora and fauna using the proposed development

The site proposals are understood to be residential. As such, the likely receptors are: residents / tenants, children, visitors and pets and any service personnel, along with adjacent flora and fauna and any controlled waters (however there are no potable abstraction sites within 1000m of site).

8.0 CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) is a hypothesis of the nature and sources of contamination, potential receptors that may be the recipient of contamination arising from those sources and any pathways that may exist. It creates a plausible source-pathway-receptor pollutant linkage (hazard), set within the context of the ground and proposed end use of the site.

8.1 PRELIMINARY CONCEPTUAL SITE MODEL**8.1.1 SOIL CONTAMINATION**

Site is currently occupied by the former gardened plot of an associated dwelling, located directly south of site and comprising exterior areas, a garage and adjoined workshop. Both the structures and the exterior areas were noted to be occupied by a large amount of storage, debris and refuse.

The historical usage of the site and the potential sources outlined in Section 7.1 have the potential to have impacted site (with various contaminants listed above in Section 7.1.2.) via potential pathways listed in Section 7.2 and potentially impacting the receptors outlined in Section 7.3.

8.1.2 HAZARDOUS GROUND GAS AND VAPOURS

A number of potentially significant sources of ground gas have been identified both on site, in immediate proximity to site and more distal. Both superficial and bedrock geologies are recorded as predominantly high and as such, may offer migration pathways to site.

Additionally, a number of potential sources of hazardous vapours have been identified on site.

TABLE 1. SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Probability of Pollutant Linkage	Conseq.	Risk	Possible Mitigation
Contaminated Soils (<i>erection and demolition of dwellings on site, noted made ground deposits, garage & workshop with vehicle maintenance and storage, scattered debris and refuse</i>)	Direct Ingestion & Direct Contact	Site Workers (<i>during site works, excavations, eating and drinking</i>)	Li	Md	M	Site workers to wear appropriate PPE for health and safety reasons, considered usage and adherence to relevant HSE guidance during site works sufficient to mitigate risks to low – following confirmation via intrusive Phase II Site Investigation.
Contaminated Soils (<i>erection and demolition of dwellings on site, noted made ground deposits, garage & workshop with vehicle maintenance and storage, scattered debris and refuse</i>)	Inhalation of Dust, Dry Arisings	Site Workers (<i>during site works, excavations, eating and drinking</i>)	Li	Md	M	
Contaminated Soils (<i>erection and demolition of dwellings on site, noted made ground deposits, garage & workshop with vehicle maintenance and storage, scattered debris and refuse</i>)	Crop Uptake & Direct Ingestion, Direct Contact	End Users (<i>residents / tenants, children, visitors, service personnel</i>)	Li	Md	M	Potentially significant sources of soil contamination identified on site including unknown infill material following brick-pit usage, the erection and demolition of dwellings on site, noted made ground deposits, subsequent garage and workshop usage with vehicle maintenance and storage, scattered refuse and debris across site.
Contaminated Soils (<i>erection and demolition of dwellings on site, noted made ground deposits, garage & workshop with vehicle maintenance and storage, scattered debris and refuse</i>)	Inhalation of Dust, Dry Arisings	End Users (<i>residents / tenants, children, visitors, service personnel</i>)	Li	Md	M	
Contaminated Soils (<i>erection and demolition of dwellings on site, noted made ground deposits, garage & workshop with vehicle maintenance and storage, scattered debris and refuse</i>)	Crop Uptake & Direct Ingestion, Direct Contact	Flora and Fauna (<i>on and offsite</i>)	Lw	Md	M/L	Due to the sensitive proposed usage of the site, it is recommended that an intrusive Phase II Site Investigation is planned and carried out on site. Trial pit formation will allow assessment of ground conditions on site (i.e. natural, reworked natural or made ground deposits, their nature, depth and extent) along with the taking of environmental samples for laboratory analysis (metals, metalloids, PAH's, TPH CWG, asbestos, phenol, MTBE and BTEX).
Contaminated Soils (<i>erection and demolition of dwellings on site, noted made ground deposits, garage & workshop with vehicle maintenance and storage, scattered debris and refuse</i>)	Vertical and lateral migration (<i>bedrock & superficial geology pathways</i>)	Controlled Waters (<i>Principal Bedrock Aquifer</i>)	Lw	Md	M/L	
Contaminated Soils (<i>garage and workshop usage with vehicle storage & maintenance, associated debris</i>)	Direct contact (<i>pipe degradation and leaching</i>)	Services (<i>impacted new potable supply piping</i>)	Li	Md	M	
Ground Gases (Methane and CO ₂) (<i>onsite infilled brick pit and gully, proximate infilled ponds and pits by circa.1950</i>)	Vertical and lateral migration (<i>both bedrock and superficial geologies high in permeability</i>)	Site Workers & Excavations, End Users & Building Envelope (<i>ingress and build-up</i>)	Lw	Sv	M	On site and proximate potential sources of ground gas identified considered hazard to site proposals – recommend installation of ground gas protection measures to CS3 standards inline with BS8485:2015+A1-2019. Risk assessment is a representation of severity of outcome as opposed to likelihood.
Ground Gases (Methane and CO ₂) (<i>landfill approx.217m N, multiple waste types</i>)	Vertical and lateral migration (<i>both bedrock and superficial geologies high in permeability</i>)	Site Workers & Excavations, End Users & Building Envelope (<i>ingress and build-up</i>)	Lw	Sv	M	More distal landfill considered a hazard to site due to highly permeable geology in local area, multitude of waste types and age of landfill (circa.1960's) - recommend installation of ground gas protection measures to CS3 standards inline with BS8485:2015+A1-2019. Risk assessment is a representation of severity of outcome as opposed to likelihood.
Volatile and Semi-volatile Organic Compounds (<i>garage and workshop usage with vehicle storage & maintenance, associated debris</i>)	Vertical and lateral migration (<i>sources on site</i>)	Site Workers & Excavations, End Users & Building Envelope (<i>ingress and build-up</i>)	Li	Md	M	Sites usage with garage and workshop, maintenance and storage of vehicles along with scattered, associated debris considered potential sources of hazardous vapours that should be investigated further via environmental sampling and PID usage.
Radon	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	Site is not located in a Radon Affected Area.

KEY: Probability of pollutant linkage Hi = Highly likely, Li = Likely, Lw = Low Likelihood, UI = Unlikely
Consequence Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor,
Overall Risk VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low

Based on the preliminary CSM for the site, an environmental risk assessment has been undertaken. A simple matrix can provide a consistent basis for decision making. It should be used with caution, recognising the over-simplification that it will normally represent. The probability and consequences are defined according to parameters relevant to the situation; the boundaries of risk acceptability (and tolerability, where relevant) indicated on the matrix provided in Table 2, can be tailored to the factors influencing the significance of the risk. Individual situations are mapped onto the matrix to provide a ready and consistent indication of their acceptability or tolerability.

TABLE 2. RISK CLASSIFICATION MATRIX

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High (Hi)	Very high risk	High risk	Moderate Risk	Moderate/Low Risk
	Likely (Li)	High risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood (Lw)	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely (UI)	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

These attributes are evaluated qualitatively against individual hazard assessments to determine the likelihood of a given hazard occurring. The risk evaluations for each plausible pollutant linkage are given in the last three columns of Table 1.

TABLE 3. CLASSIFICATION OF RISK

Very high risk (Vh)	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High risk (Hi)	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer term.
Moderate risk (Md)	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk (Lw)	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk (VI)	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

9.0 ENVIRONMENTAL RISK ASSESSMENT

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **MODERATE** level of risk with respect to the site development proposals.

It is recommended that further investigation inline with Section 16.0 is planned and carried out on site along with remediation inline with Section 17.0.

This report should be submitted to your Local Planning Authority for agreement to allow the Phase 2 intrusive testing to be undertaken and a subsequent Phase 3 Remediation Strategy and Verification Plan to be produced.

10.0 SUMMARY OF RISKS**11.0 HUMAN HEALTH****11.1.1 RESIDENTS / END-USERS**

The risks to end-users of the site are considered to be moderate when assessed against the residential end-usage of the site. The site is proposed to contain areas of soft-landscaping, as such should onsite soils be used to form these areas, there exists credible pathways for contamination to impact end-users (inhalation of dusts, direct contact with soils, direct and indirect ingestion). Furthermore, vapour and ground gas hazards to end-users via the building envelope are considered significant and high, due to the proximate and potentially significant sources identified during the course of this report. Additionally, the potential for hydrocarbon impact to new potable water supply piping is considered a hazard to end-users of the site via impacted potable supplies.

11.1.2 SITE WORKERS

The risks to site workers during site works are considered to be moderate, due to the potential for asbestos contamination along with a significant depth of made ground arising from the brick-pit usage (infill material unknown, ash, clinker and other wastes historically prevalent at the time of infill). The potential for the inhalation of asbestos fibres, direct contact with contaminated made ground or the build-up of vapours / ground gases in excavations are considered risks to site workers. The provision for considered usage of PPE and adherence to relevant HSE guidance would be sufficient to mitigate the risks to low, following confirmation of both soil and ground gas / vapour hazards on site via an intrusive Phase II Site Investigation.

12.0 CONTROLLED WATERS

The risks to controlled waters are considered to be low to moderate, due to the largely low vulnerability of both superficial and bedrock aquifers in the area (Section 6.1.4); however, there exists a potential risk to the bedrock Principal Aquifer from onsite potential sources such as made ground deposits and vehicle maintenance, storage and associated debris and the highly permeable nature of both superficial and bedrock geologies.

13.0 STRUCTURES**13.1.1 GROUND GASES**

A number of potentially significant sources of ground gas generation have been identified both on site, in proximity to site and more distant. On site potential sources include the potential infilling of a river gully by circa.1922 (potential for organics or peat both below the infill and within the infill material) and the infill material of the brick-pit (circa.1932 - infill material unknown, ash, clinker and other wastes historically prevalent at the time of infill). Proximate sources include a number of pits and ponds (or ponds within pits, subsequently infilled) in the local area, infilled by circa.1950 (within gas generational window); and, more distant, a historical landfill located approximately 217m north of site and accepting inert, industrial, commercial, household, special and liquid sludge waste types between the dates of circa.1965-68). Due to the sites location in an area where both superficial and bedrock geologies are recorded as highly permeable, these features are considered hazards to the proposed end-usage of the site and as such, ground gas protection measures to CS3 standards should be installed within the proposed development inline with BS8485:2015+A1-2019.

13.1.2 HAZARDOUS VAPOURS

The sites historical usage as a brick-pit and brick works industry (with the pit being subsequently infilled) is considered a potential source of hazardous vapours, as the nature of the infill material is unknown (with the potential to include industrial wastes or demolition debris from the removed brick-works). Additionally, the subsequent erection and usage of the site with a garage and workshop, vehicle maintenance and storage with associated debris and refuse across site is also considered a potential source of hazardous vapours, should significant spillages or hydrocarbon releases have occurred.

13.1.3 POTABLE WATER SUPPLY PIPING

Due to the potential for both PAH contamination and hydrocarbon contamination on site, there exists the potential for new potable water piping to be impacted by residual site soils. PAH and Hydrocarbon degradation and

leaching can impact potable supply piping and thus impact potable supplies themselves, offering a potential risk to end-users via impacted water supplies.

14.0 OFFSITE RECEPTORS

The site is located adjacent to a dwelling and in a predominantly residential area. Should significant contamination exist on site, there exists the credible potential for impact to offsite receptors from onsite features such as the scattered refuse and debris, potentially significant made ground deposits and vehicle, machinery and likely fuel and chemical storages. As such, there exists a limited potential for surface-water run-off, groundwater migration and the release of dusts from excavations and dry arisings.

15.0 WASTE CLASSIFICATION

Due to the potential for impacted made ground deposits, industrial and demolition rubbles and infill and the potential for asbestos presence, any arisings from site works, excavations or remediation should be WAC (waste acceptance classification) tested, to ascertain the suitability of the material for disposal at an accredited waste facility.

- Any waste generated during site works will need to be disposed of at a suitable and accredited landfill and in accordance with current waste regulations.
- Results of any WAC testing should be given to relevant waste/landfill site so they can be reviewed by a qualified waste assessor.

16.0 RECOMMENDATIONS

It is recommended that further investigation is planned and carried out on site to allow further updates to the Conceptual Site Model. The site works should involve the formation of trial pits on site, to facilitate the assessment of ground conditions on site (i.e. made ground, natural or reworked natural deposits or infill material, its nature, extent and depth), the taking of environmental samples for laboratory analysis, this will allow for confirmation and updating to the CSM.

The CSM is an iterative process that will need reviewing and reappraising following further investigative works:

- Confirm the ground conditions;
- Test for general contaminants in the ground and groundwater to refine the CSM, allow a quantitative contamination risk assessment to be undertaken, and allow categorization for waste disposal purposes of any soils that are to be taken off site.
- Targeted testing at possible point sources of contamination. With Contamination testing to inform a materials management plan if required
- Characterisation of the ground gas and groundwater regime to assess risk to future users and for foundation design, by way of installation of monitoring wells across the site and a programme of post site works monitoring.
- Waste Acceptance Criteria (WAC) testing of soil could also be considered to be provided to any potential landfill operators so they can determine whether or not to accept any soils removed from site for disposal

A watching brief (as outlined in Appendix E) should be carried out by the site supervisor during the course of demolition, site clearance and construction works for any obvious contamination (e.g. oil spillage in ground, buried waste, possible asbestos containing material). Should previously unreported or undiscovered contamination be identified, then development should stop and Castledine Environmental should be contacted to determine if further assessment or changes to the remediation scheme are required.

17.0 REMEDIATION

The client has opted to forego ground gas monitoring in favour of a 'belt and braces' approach to ground gas hazard remediation. Therefore, ground gas protection measures to CS3 standards are to be installed within the proposed development, inline with BS8485:2015+A1-2019.

18.0 REFERENCES**18.1 LEGISLATION AND REGULATIONS****18.1.1 ACTS**

- [1] Environmental Protection Act 1990, Part IIA: inserted by Environment Act 1995, Section 57. See Environment Act 1995 for text of Part IIA.

18.1.2 PLANNING REGULATIONS

- [2] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 SI1999/No.293
- [3] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) (Amendment) Regulations 2000 SI2000/No.2867

18.1.3 CONTAMINATED LAND REGULATIONS

- [4] The Contaminated Land (England) Regulations 2000. SI2000/No.227
- [5] The Contaminated Land (England) (Amendment) Regulations 2001 SI2001/No.663
- [6] The Contaminated Land (England) Regulations 2006 SI2006/No.1380

18.2 STATUTORY GUIDANCE

- [7] Department of Environment, Food and Rural Affairs. 2012. *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*. Department of Environment, Food and Rural Affairs
- [8] Communities and local Government, 2018: National Planning Policy Framework.

18.3 BRITISH STANDARDS

- [9] BS 5930:2015 Code of practice for site investigations
- [10] BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of practice
- [11] BS 8485:2015+A1:2019 BS 8485 - 2015 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- [12] BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

18.4 NON STATUTORY TECHNICAL GUIDANCE**18.4.1 ENVIRONMENT AGENCY**

- [13] Cassella Stranger, 2002. Model Procedures for the Management of Contaminated Land, Contaminated Land Report (CLR) 11, Department for Environment, Food, and Rural Affairs.

18.4.2 CIRIA PUBLICATIONS

- [14] Wilson, S., Oliver, S., Mallett, H., Hutchings, H., and Card, G.. 2007, *C 665 Assessing risks posed by hazardous ground gases to buildings* London: Construction Industry Research and Information Association
- [15] Mallett, H., Cox, L., Wilson, S. and ,Corban M... 2014, *C 735 Good practice on the testing and verification of protection systems for buildings against hazardous ground gases* London: Construction Industry Research and Information Association

18.4.3 CL:AIRE

- [16] Card G, Wilson S, Mortimer S. 2012. *A Pragmatic Approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17.* CL:AIRE, London, UK. ISSN 2047- 6450 (Online)

19.0 APPENDICES

APPENDIX A ENVIRONMENTAL SEARCH

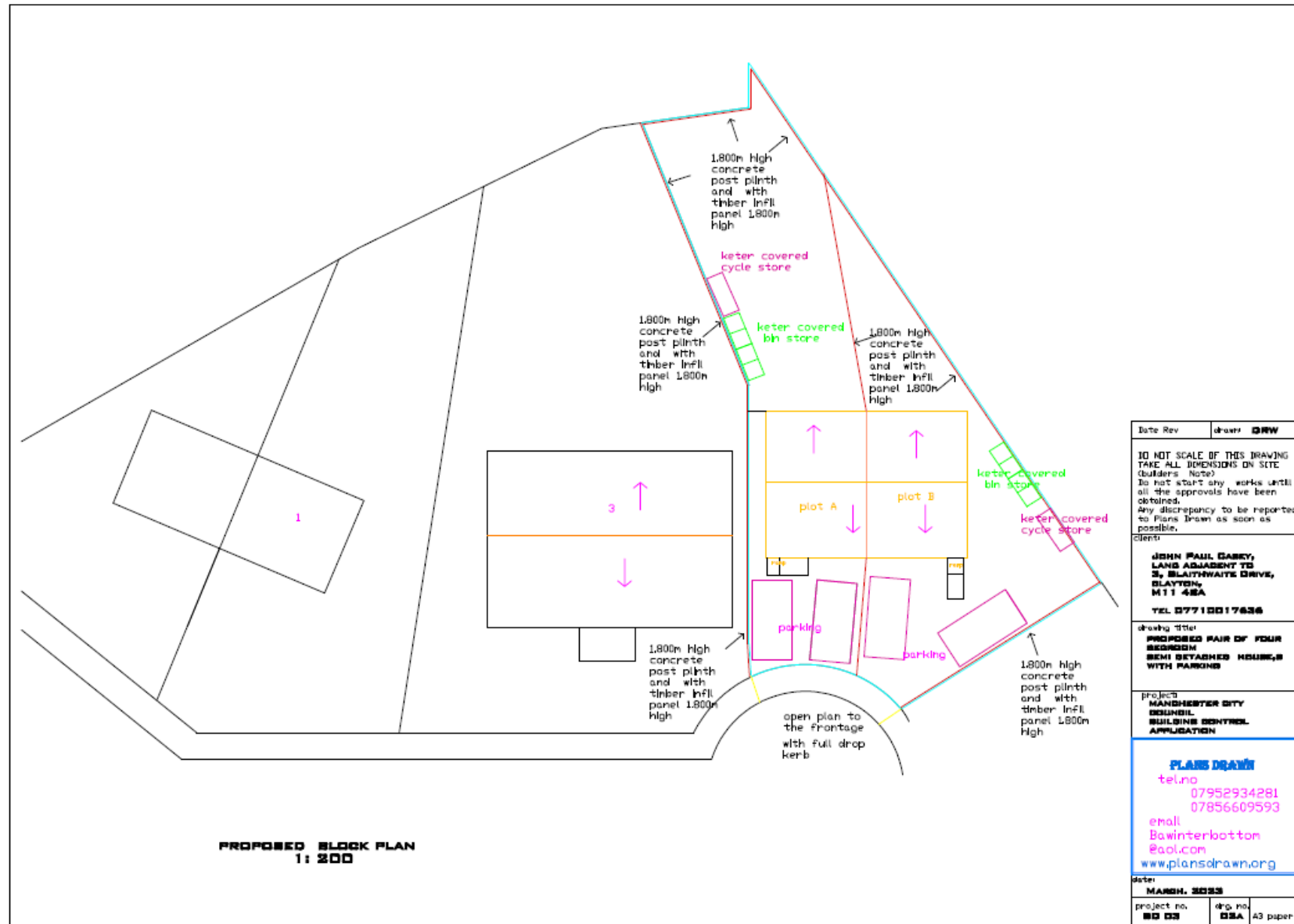
Separate Groundsure Report

APPENDIX B HISTORICAL MAPPING

Separate Map Packs (2 No. files)

APPENDIX C

PROPOSED AND CURRENT SITE PLANS



APPENDIX D

SITE PHOTOS AND LOCATIONS



Site Walkover Photos

Address: No.7/9 Slaithwaite Drive, Manchester
Client: Mr. J.P. Casey

Photo No.1: Facing NW from the turning circle of Slaithwaite Drive showing the site access



Photo No.2: Facing slightly NW from the site access





Site Walkover Photos

Photo No.3: Facing SW from the site entrance showing heaped debris and offsite, adjacent and associated dwelling



Address: No.7/9 Slaithwaite Drive, Manchester
Client: Mr. J.P. Casey

Photo No.4: Facing north from the site access





Site Walkover Photos

Photo No.5: Facing north showing the southern face of the workshop, adjoined to the garage (right of photo)



Address: No.7/9 Slaithwaite Drive, Manchester
Client: Mr. J.P. Casey

Photo No.6: Facing NW from the SE corner of the garage





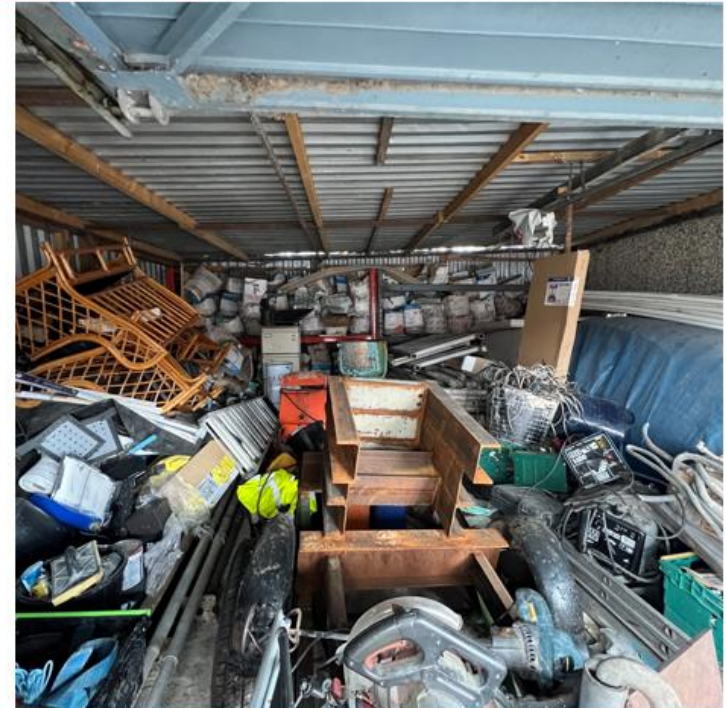
Site Walkover Photos

Photo No.7: Showing heaped debris outside garage and workshop



Address: No.7/9 Slaithwaite Drive, Manchester
Client: Mr. J.P. Casey

Photo No.8: Showing heaped debris inside garage





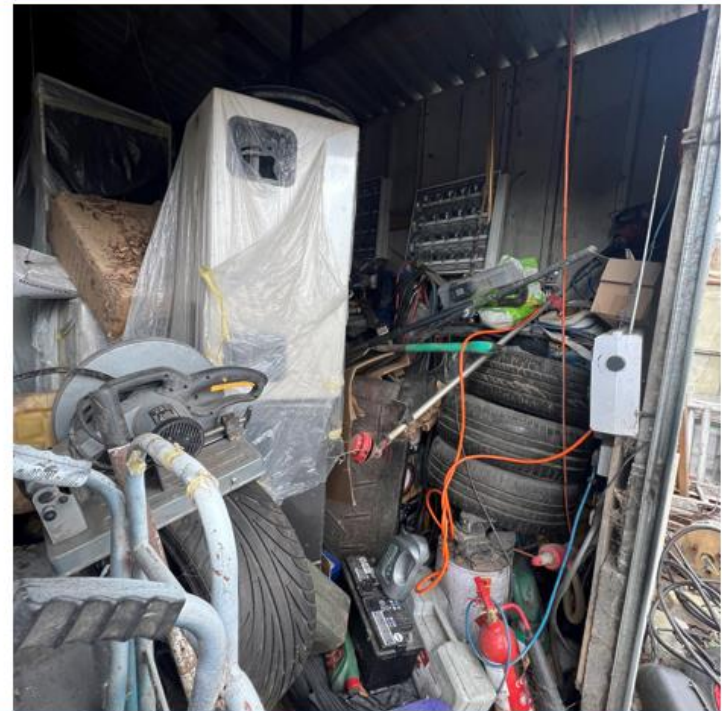
Site Walkover Photos

Photo No.9: Showing heaped debris inside workshop



Address: No.7/9 Slaithwaite Drive, Manchester
Client: Mr. J.P. Casey

Photo No.10: Showing heaped debris inside workshop





Site Walkover Photos

Photo No.11: Facing slightly NW along the southern boundary of site towards the western extent and showing skip



Address: No.7/9 Slaithwaite Drive, Manchester
Client: Mr. J.P. Casey

Photo No.12: Facing east along the northern boundary of site





Site Walkover Photos

Photo No.13: Facing west in the western extent of site showing heaped scaffolding items and vegetation cuttings



Address: No.7/9 Slaithwaite Drive, Manchester
Client: Mr. J.P. Casey

Photo No.14: Facing east from the far west of site



APPENDIX E**WATCHING BRIEF**

It remains possible that previously unexpected soil conditions may be encountered during the construction process. Examples may include oily pockets within the soil, potential for asbestos containing materials, black ashy materials, soils exhibiting strong odours, brightly coloured materials, and former demolition materials.

Should previously undiscovered contamination be encountered during the demolition/construction of the new buildings the following course of action should be adhered to:

1. The ground workers should report any suspected contamination immediately to the Client's site supervisor. The supervisor should contact the Client or their appointed agent who will in turn contact Castledine Environmental to request an engineer to visit the site to assess the extent of the 'contamination'.
2. Castledine Environmental shall make records of their inspection, and pass details of these to the Local Authority.
3. Where the conditions revealed differ from those previously anticipated, the Castledine Environmental shall take samples as deemed appropriate to be dispatched for appropriate chemical testing.
4. Depending on the results of the testing either:
 - a. no further work will be required;
 - b. a further detailed risk assessment will be required; and/or
 - c. Localised specific remedial measures will be necessary.Appraisal criteria will vary depending on the nature of the assessment.
5. The results of any such testing will be sent to the Local Authority Pollution Control Section, Local Authority development control section, and the appointed building inspector. If remediation is required, the LA/Building inspector will be informed of the date and time of the proposed works.

6. Remediation will be undertaken in accordance with a method statement submitted for approval. The works shall be supervised where necessary by Castledine Environmental who shall provide a Verification Report for the Local Authorities.
7. A copy of the discovery strategy should be lodged on site and provisions made to ensure that all workers are made aware of their responsibility to observe, report and act on any potentially suspicious or contaminated materials they may encounter.

APPENDIX F

DISCOVERY STRATEGY

