PRELIMINARY RISK ASSESSMENT
(Phase 1 Desk Study)

GMSF Allocation: Land North of Irlam Station
Irlam
M28 0AZ

Date: 14th September 2020

Job Ref: UV/0088926-01-0010

Client:

Salford City Council

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PRELIMINARY RISK ASSESSMENT
LAND NORTH OF IRLAM STATION

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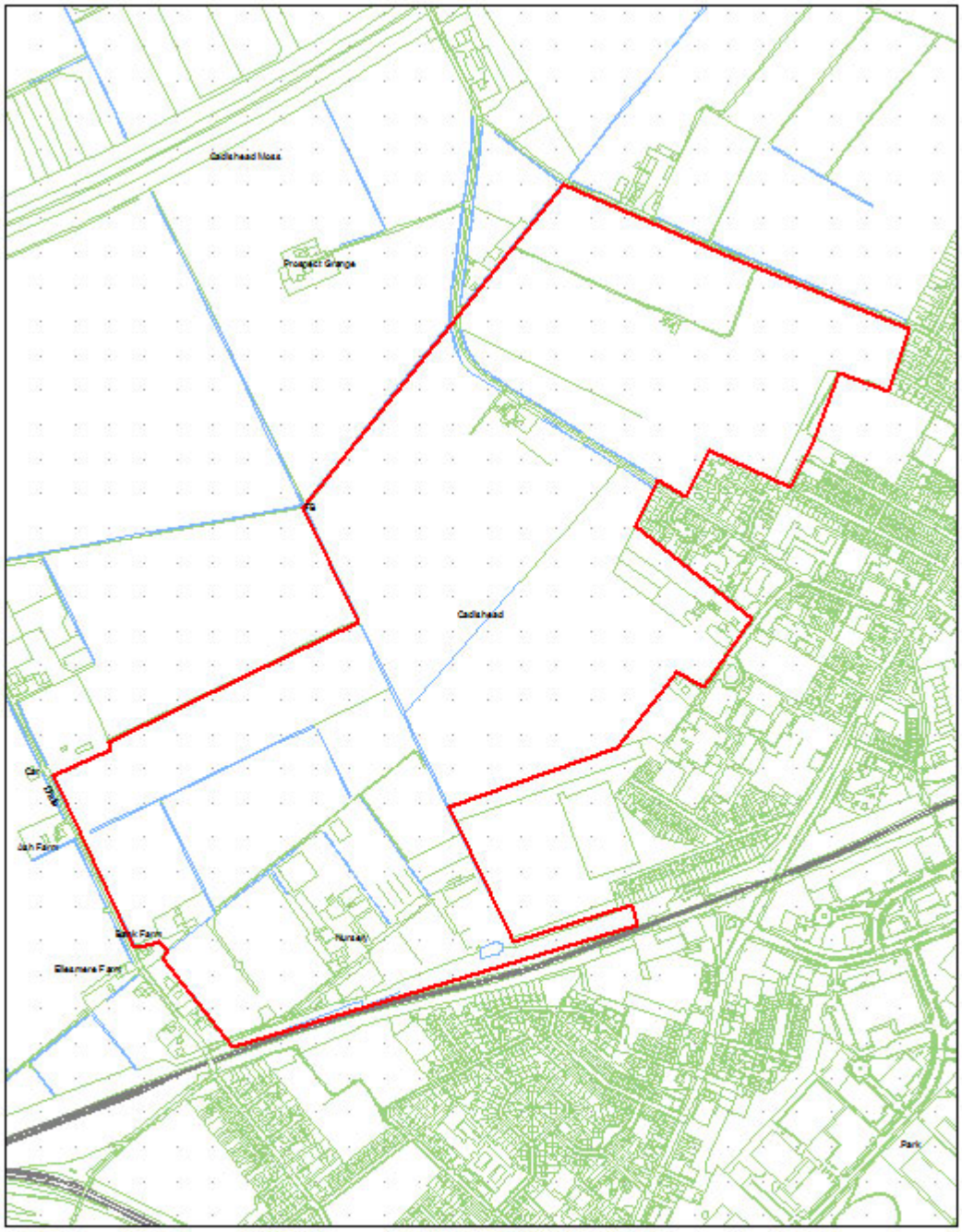
Site Plan



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PRELIMINARY RISK ASSESSMENT
H3/4 IRLAM / CADISHEAD PROPOSAL

EXECUTIVE SUMMARY

Site Address	H3/4 Irlam / Cadishead Land North of Irlam Station Irlam Manchester M44 5JT (Indicative Postcode)	
Grid Reference	Approximate Site Centre E 371062 N 393637	
Site Area	66.65 Ha	
Current Use	Nurseries, agricultural farmland.	
Proposed Development	The development potential at this time is unconfirmed. For the purposes of this assessment the end use is assumed to be residential with private gardens.	
Environmental Setting	**Drift Geology**	Peat Till, Devensian – Diamicton Glaciofluvial Sheet Deposits, Devensian (Sand and Gravel)
	Bedrock	Wilmslow Sandstone
	Hydrogeology	**Superficial:** Secondary (A), Secondary (Undifferentiated), Unproductive
		Bedrock: Principal Aquifer
	Flood Risk	Low
	Ecology	Existing trees may support protected species such as bats. A habitat survey may be required to support any future planning application.
	Compressible Ground and Substance Hazards	High – Very significant potential for compressible deposits. See section XX below
Site History	Predominantly farmland. A tramway extended South to North with an eastern siding from approximately 1848 to 1951. A number of potentially contaminative uses have existed in close proximity to the site including Irlam Steel and Iron Works and a Match Factory.	
Utilities	Unknown and not surveyed	
Landfill Sites and Ground Gasses	There are no recorded landfill sites on site. There are areas of potentially filled ground (cuttings associated with the railway and tramway) and a pond on site. Peat has the potential, under some circumstances, to generate ground gasses.	
Invasive Plant Species	None observed however it would be prudent to conduct a habitat survey given the nature of the site.	
Radon	No protection measures required.	
Coal Mining / Land Stability	No known historic underground workings within 1km of the site. The site is located within the specified search distance of an identified mining area, and a coal authority search will be required to confirm / eliminate any risk associated with mining. Non-Coal Mining extraction (most likely peat) is indicated in close proximity to the site.	
Railway Projects	The site is within 5KM of the route of the High Speed 2 Rail Project	

Geotechnical Risk

Peat on the site is highly compressible and movement due to variable water conditions. Construction may not be possible in all areas at economic cost.

Contaminated Land Risk Assessment

Human Health

The risk from surface and near surface contamination to future site users is considered **moderate** due to the potential for contamination to exist from current and historic activities.

Controlled Waters

The risk to surface waters is considered **moderate** due to the large number of open drains on site, and potential for perched shallow groundwater to be in continuity with surface water features. The risk to the underlying principal aquifer is considered **low** due to the depth of intervening, clayey strata.

Ground Gas

The risks from ground gasses are considered **high** due to nearby historic landfill sites and on site peat deposits.

Recommendations

Further site investigation is required to quantify and delineate the anticipated risks on site. This will be required prior to undertaking any development.

At this stage as there are no details of the proposed end uses it is considered prudent to postpone this work to ensure any future investigation can be targeted and undertaken economically.

A main aim of the investigation is to determine the geotechnical risks present on site due to the peat deposits, and as such a limited intrusive investigation is recommended to further understand the geotechnical risks, gather further information about peat thickness and lateral extent and provide additional information to inform the preliminary contamination risk assessment.

It is recommended a Coal Authority report is obtained to determine or eliminate any risks from historic coal mining in the area.

1.0 Introduction

Urban Vision Partnership Ltd have been appointed to carry out a Preliminary Risk Assessment with site reconnaissance for a site located to the North of Irlam Station known internally as H3/4 Irlam / Cadishead. The risk assessment has been prepared in support of a site appraisal being undertaken by Salford City Council.

This risk assessment includes a review of the site history, geology, hydrogeology, hydrology and a search to identify landfill and mineral sites within 250 metres of the site. The principal aim of the report is to inform the potential for housing led development on site, and gain a greater understanding of contamination risks, geotechnical constraints and assess future land value. Observations recorded during a recent site reconnaissance (undertaken on 7th November 2018) have been provided.

A Groundsure Enviro-Insight Report (Ref: GS-5545540), Geo-Insight (Ref: GS-5545541) together with OS historic mapping have been reviewed. The full reports and copies of the OS maps are contained in appendices C, D and E. The information has been used to develop a preliminary conceptual site model for the site which identifies potential sources of contamination, pathways and possible receptors. Where there is considered a potential source, a viable pathway and a likely receptor a potential pollutant linkage is created.

2.0 Limitations

The Preliminary Risk Assessment has been undertaken using information obtained from a number of sources referenced within the report. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. Urban Vision Partnership Ltd has assumed the information reviewed is correct.

There may be other conditions on site which are either outside the scope of work or are unknown at this time and as such have not been accounted for in this report. No responsibility or liability can be accepted for such conditions not revealed by the assessment.

The site walkover included areas of the site accessible or made accessible, not including areas that were barricaded, blocked or overgrown. No access was made to areas considered to be unsafe or present a risk to health.

The author of the report is not a trained ecologist, and any reference to invasive species is indicative only. A full ecological survey is required to confirm any findings.

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3.0 Sources of Information

Background information has been obtained from the following sources;

- Groundsure Enviro-insight report (presented in appendix C)
- Groundsure Geo-Insight report (presented in appendix D)
- Ordnance Survey Historical Maps (presented in appendix E)
- Greater Manchester Archaeology Advisory Service report
- BGS Public Borehole Records
- Site Reconnaissance Visit (photographs presented in appendix F)
- British Geological Survey (BGS) sheet 85 Manchester Bedrock and Superficial Editions 1:10,000, 1:50,000 and 1:63,500
- Groundwater Vulnerability Maps (available from Magic Map online repository[1])
- Salford City Council online planning Portal

4.0 Previous Studies & Planning History

RELEVANT PLANNING HISTORY

There are 10 No. planning applications dating from 2003 to 2017 within the study site boundary. Figure 4.1 below shows the locations / boundaries and Table 4.2 describes the applications.

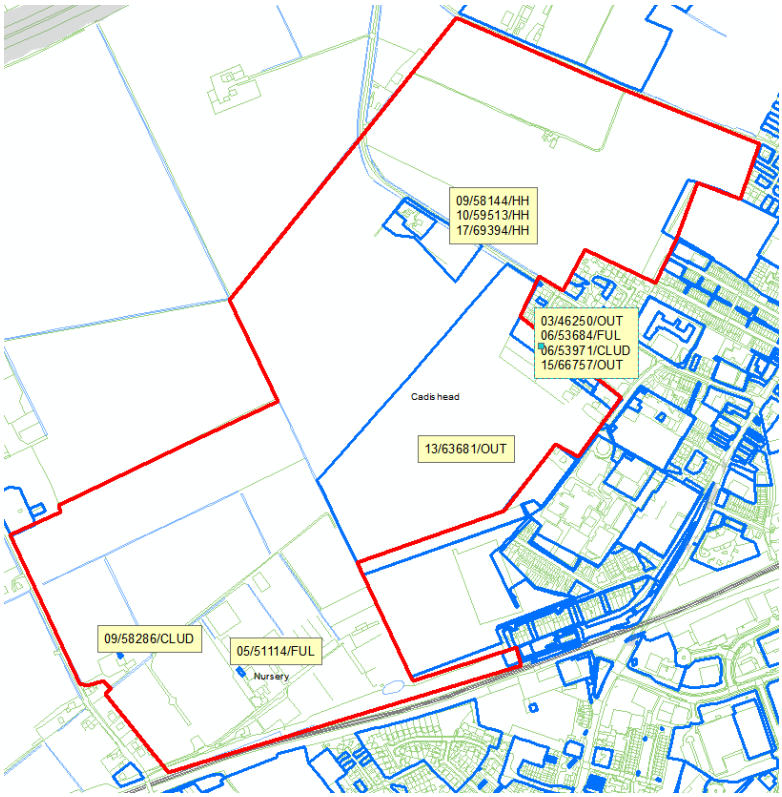


FIGURE 4.1: PLANNING HISTORY

[1] DEFRA Magic Map Online Repository, available from https://magic.defra.gov.uk/

TABLE 4.2: PLANNING HISTORY

APPLICATION	DETAIL	STATUS
09/58286/CLUD	Certificate of existing lawful use as a dwelling	REFUSED
05/51114/FUL	Installation of a 17m high timber clad monopole with three antennas, a radio equipment cabinet, 1.8m high close boarded fence and ancillary development	APPROVED
13/63681/OUT	Outline planning permission for the access with all other matters reserved for the erection of up to 285 dwellings together with car parking and landscaping, six sports pitches, three tennis courts and two associated pavilions, community facilities including a cafe and multi-functional facility, vehicular access and overspill car parking	REFUSED
03/46250/OUT	Certificate of lawfulness for the use of boarding kennels	Unknown
06/53684/FUL	Erection of 3 metre high noise barrier fence	APPROVED
06/53971/CLUD	Application for Certificate of Lawfulness for use as dog boarding kennels	APPROVED
15/66757/OUT	Outline planning application, with all matters to be considered except for landscaping, for the demolition of the existing dwelling and commercial buildings and erection of nine dwellings with associated works	APPROVED
09/58144/HH	Erection of a part single part two storey side and rear extension together with a raised terraced area and porch	REFUSED
10/59513/HH	Erection of part single part two storey side and rear extension	APPROVED

PREVIOUS STUDIES

In support of applications 13/63681/OUT and 15/66757/OUT a preliminary risk assessment was submitted with respect to land contamination.[2] A synopsis of the assessment is provided below.

Officers from Urban Vision attended an internal meeting with a developer concerning a plot of land 500m to the north of the site. A phase 1 preliminary risk assessment and a phase 2 intrusive investigation draft report were made available to the Council.

Whilst this report does not cover the study site it is considered relevant as the land is similar in character and nature to the study site.

As the report was draft, and has not been formally submitted as part of a planning application it is not possible to publish the report, or to place any reliance on the report. However a synopsis is provided below.

PHASE 1 PRELIMINARY RISK ASSESSMENT FOR 13/63681/OUT (SUMMARY).

[2] Phase 1 Geo-Environmental Site assessment, April 2013, Ref: 44883p1r0, REC Available from Planning Public Portal http://publicaccess.salford.gov.uk/publicaccess/simpleSearchResults.do?action=firstPage

The application site is located in the centre of the study site, and is some 10.98 Ha in area, covering approximately 16% of the total study site.

The underlying geology was confirmed as peat deposits overlying Wilmslow Sandstone. A Tramway ran into the centre of the site, and Salford CC Records indicate the site may have been used to dispose of "night soil" together with power station ash and waste from the Irlam Iron and Steel Works via the tramway.

Base steel slag was widely deposited across the Cadishead area, and there is potential for this to expand through hydration of lime and magnesium within the material. A network of drainage ditches across the site may also be a source of contamination within sediments from off-site sources.

The presence of heavy metals, sulphates, polycyclic aromatic hydrocarbons (PAH) and organic / inorganic contaminants was anticipated. The report references testing by the Environment Agency of farmland for heavy metals which showed elevated levels of the above determinants, above limits for sludge disposal.

5.0 Site Description

The site is located to the North West of Irlam town centre, 400 m to the South of the M62 motorway, and immediately to the North of the Manchester to Warrington railway on the South-western edge of Chat Moss. The eastern edge of the site is bounded by Moss Lane, with the Western Edge bounded by Roscoe Road. Astley Road runs through the northern part of the site.

The study site is predominantly agricultural land (arable) with a series of land drains forming boundaries to fields. A nursery (Brentwood Moss Nurseries) occupies the south-western corner of the site.

A further detailed description of the site can be seen in the site reconnaissance section (Section 8).

TABLE 5.2: SITE DESCRIPTION

Site location	H3/4 Irlam / Cadishead Land North of Irlam Station Irlam Manchester M44 5JT (Indicative Postcode)
National Grid Reference	Approximate Site Centre E 371062 N 393637
Site area	66.65 Ha
Current land use	Nursery, agriculture

6.0 Site History

The site is located in an area of Chat Moss, a predominantly agricultural area. Table 6.1 below summarises the historical industrial uses on and in the vicinity of the site;

TABLE 6.1: HISTORICAL INDUSTRIAL USES

Feature	On Site	0-50m	51-250m	251-500m
Potentially Contaminative Uses (1:10,000 scale mapping)	48	68	93	84
Historical Tank Database	0	7	21	30
Historical Energy Features Database	0	0	9	35
Historical Petrol and Fuel Site Database	0	0	0	0
Historical Garage and Motor Vehicle Repair Database	0	0	5	10
Historical Military Sites	0	0	0	0
Potentially Infilled Land	20	14	46	44

Table 6.2 below summarises potentially contaminative features identified on site from the historic mapping. Copies of the maps are presented in Appendix E.

TABLE 6.2: ON SITE HISTORY

Mapping date	Scale	Features / Changes
1848	1:10,560	Northern / centre of Site **Irlam Cottage** and **Rose Farm** depicted along Astley Road. (Not shown from 1904 Mapping)
1848	1:10,560	**Tramway** shown to South of site North of Irlam Station running through site to North (Not shown from 1951-52 mapping).
1848	1:10,560	**Unnamed features** (probably land drains) shown to the Southwest of the site
1848	1:10,560	**Unnamed building** South of site (possibly **Farm**)
1848-1849	1:10,560	No significant changes
1876	1:2,500	Fields shown as **Marshland.** Rose Farm shown with a **Nursery.**
1890	1:2,500	No significant changes
1891-1894	1:10,560	**Marshland** shown to North of NE section of site (Not shown from 1929 mapping)
1897	1:10,560	Not mapped
1904-1905	1:10,560	**Irlam Cottage and Rose Farm** no longer shown (shown again on 1929 mapping)
1904-1908	1:10,560	No significant changes
1908	1:2,500	No significant changes
1928	1:2,500	No significant changes
1929	1:10,560	**Irlam Cottage and Rose Farm** shown along Astley Road. **Marshland** no longer shown.
1937	1:2,500	No significant changes
1951-1952	1:10,560	**Buildings** in South of Site annotated as **Railway View Farm. Tramway** no longer shown.
1949-1952	1:10,560	No significant changes
1954	1:10,560	No significant changes
1965-1966	1:10,560	No significant changes
1981-1985	1:10,000	**Tracks** shown across site. **Railway View Farm** annotated as **Nursery**, **Drains** feature across site. **Irlam Cottage** no longer shown. **Unnamed Buildings** in North of site towards Roscoe Road.
1990-1995	1:10,000	**Nursery** expanded in south of site.
2002	1:10,000	**Pond** shown South of site adjacent to Railway Cutting.
2010	1:10,000	No significant changes
2014	1:10,000	No significant changes

SURROUNDING AREA (<500M FROM THE SITE)

Table 6.3 below describes significant historic features outside the site from the 1:10,000 and 1:10,560 historic mapping (a full list is contained in the Groundsure Enviro-Insight report shown in appendix C)

TABLE 6.3: OFF-SITE HISTORY

Mapping date	Scale	Description (New Features from previous mapping)	Direction and Approximate Distance from Site
1848-1849	1:10,560	Pond (Not shown from 1904)	E 500m
		River Mersey (Diverted from 1929)	S 450-500m
		Brick Field (Not shown from 1891)	SE 250m
		Brick Field (Not shown from 1929)	S 400m
		Pond (Not shown from 1904)	S 350m
1891-1894	1:10,560	Pond (Not shown from 1904)	E 300m
		Smithy (Not shown from 1929)	SE 250m
		Railway (Cheshire Line)	S 0m
		Irlam Station	S 10m
		Railway (Glazebrook and Godley)	S 400-500m
1904-1905	1:10,560	Tramway (Not shown from 1954)	N 300-500m
		Nursery	N 0m
		Rope works	SE 200m
		Match Works (Not shown from 2002)	S 40m
		Engineering Works (Not shown from 2002)	S 40m
		Brick works (Not shown from 1929)	S 250M
		Smithy (Not shown from 1929)	S 800m
		Saw Mill (Not shown from 1929)	S 800m
1904-1908	1:10,560	No significant changes	
1929	1:10,560	Graveyard	NE 900m
		Soap and Candle Works	E 500m
		Tanks	SE 400-510m
		Partington Steel and Iron Works (Main works no longer shown from 1981)	SE 500m
		Wall Paper Works (Not shown from 1938)	S 40m
		Allotment Gardens (not shown from 2010)	S 15m
1938	1:10,560	No significant changes	
1949-1952	1:10,560	No significant changes	
1954	1:10,560	No significant changes	
1965-1966	1:10,560	No significant changes	
1981-1985	1:10,000	Nursery alongside Astley Road	SE 10m
		M62 Motorway	N 400-500m
1990-1995	1:10,000	Northbank Industrial Park	SE 500m
		Depot	S 750m
2002	1:10,000	No significant changes	
2014	1:10,000	No significant changes	

ANECDOTAL SITE HISTORY

There is anecdotal evidence from several sources that areas of Chat Moss were disposal sites for "Night Soil" (human faeces) from Manchester, used to fertilise the peat soils to develop agriculture. The tramline identified as running across the site (see section 6 above) were developed in the early 19th century to transport clay and marl as a soil improver, and were also used to transport and deposit night soils, and steel slag from the Iron and Steel Works south of the site.

There is also suggestion[3] parts of Chat Moss were used during World War 2 to light decoy fires (Starfish Sites) designed to simulate burning cities and divert German bombers from nearby Manchester.

7.0 Contemporary Potentially Contaminative Uses

A search has been undertaken of contemporary potentially contaminative uses on the site and within 500m of the site. Table 7.1 below details the results of the search;

TABLE 7.1: ENVIRONMENTAL PERMITS, INCIDENTS AND REGISTERS

Feature	No. Within 500m of Site
Historic IPC Authorisations	0
Part A(1) and IPPC Permitted Activities	0
Red List Discharge Consents (Potentially Harmful Substances)	0
List 1 / List 2 Dangerous Substance Sites	0
Part A(2) / Part B Activities	6
Category 3 or 4 Radioactive Substance Authorisations	0
Licenced Discharge Consents	3
Water Industry Referrals	0
Planning Hazardous Substance Consents	0
COMAH / NIHHS sites	0
Recorded Pollution Incidents	13
Current Landfill Sites	0
Historic Landfill Sites	14
Local Authority Historic Landfills	7
Waste Treatment / Transfer Sites	11
Current Industrial Uses (<250m)	29

There are 6 No. Part B Activities (regulated by the Local Authority under the Pollution Prevention and Control Act) consisting of 1 No. Coating Material Manufacturer, 3 No, Mineral Processes, 1 No. Petrol Vapour Recovery and 1 No. Vehicle Respraying Process. All are considered to be sufficient distance from the site to have no influence.

There are 3 No. Licenced discharge consents within 500m of the site boundary from 2 No. sites relating to sewage discharges to the Manchester Ship Canal.

[3] Smith, PJC (2003), *Luftwaffe Over Manchester: The Blitz Years 1940-1944*, Neil Richardson

There are 13 No. recorded pollution incidents (Environment Agency National Incidents (List 2) within 500m of the study site. Of these 1 No. is shown as on-site dating from January 2002 at the nursery, listed as having no water or air impact, and minor land impact.

These incidents are unlikely to have influenced the study site.

There are 14 No. historic landfill sites within 1500m of the site, the closest being North Bank Industrial Estate located 152m to the South-east.

There are 7 No. historic landfills shown on Local Authority Records within 1500m of the study site. The closest are 439m to the South-east of the site and not considered to be within influencing distance of the site with respect to ground gasses.

8.0 Site Reconnaissance

Guidance within BS10175:2011 + A2:2017[4] has been followed to undertake a comprehensive site reconnaissance. A visit was undertaken on 6th November 2018. The weather at the time of the site visit was dry and overcast.

Photographs are presented in appendix F.

OVERVIEW

Observations were made from publicly accessible roads, footpaths and tracks, with no access made onto private land during the survey.

The site is bounded on the East by Moss Road. The road is separated from the site by a drainage ditch running along the eastern boundary of the site. The fields are noticeably lower than the road (most likely due to fill material used to create a firm foundation for the road surface on the peat).

The main feature in this area of the site is the Nursery occupying the southwest corner of the site, accessed by a private driveway. The remaining land consists of agricultural fields separated by drainage ditches.

A Public Footpath runs eastwards from a point on moss lane some 330m North of the site, and intersects the northern boundary of the site 500m to the East then following the northern boundary of the site to Astley Road.

Astley Road itself transects the site in a north-westerly direction. At the point where Astley Road enters the site there is significant subsidence of the road surface (see photograph 4 in appendix F). Astley Road is bounded on both sides by drainage ditches. No significant features within the site were observed.

The North-eastern boundary of the site is bounded by Roscoe Road. No significant features were observed across the site.

The information obtained from the visit is summarised in Table 8.2 below;

TABLE 8.2: SITE RECONNAISSANCE SUMMARY

Feature	Observation
Current use of Land	Agricultural (arable) and Nursery
Context	The site is located to the North or Irlam, and on the eastern edge of Chat Moss.
Surfaces	Predominantly fields separated by open drainage ditches.
Topography	The site is predominantly flat.
Access	There are various points where vehicles can access the site. A public Footpath runs along part of the northern boundary.

[4] BS10175:2011 + A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice, BSI

Feature		Observation
Services		There are no high voltage national grid underground cables. There are no high-pressure gas transmission lines.[5]
Boundary	**North**	Agricultural fields (in similar setting) and farms running to the M62 Motorway approximately 320m from the site.
	East	Residential housing (Irlam)
	South	Railway line, Irlam Station. Industrial uses at Northbank Industrial Park.
	West	Agricultural land (similar setting) running to Glaze Brook approximately 900m to the West.
Material Storage		None observed however likely to be materials stored on the nursery site.
Waste Disposal		None observed
Potential contamination sources observed		Nursery use in south-western corner of the site (pesticides, herbicides, fuel oils etc). No further obvious sources observed.
Ecology*		No invasive species were observed. Mature trees and wet marshy areas may support protected species.

**Ecology comments are for initial assessment only and based on observations of a person with no formal ecology training.*

[5] Information obtained from Groundsure Report (Appendix C) and subject to the limitations contained in that report.

9.0 Environmental Setting

In compiling the following sections reference has been made to the Groundsure Geo-Insight report Ref GS-5545541 (appendix D). The geological succession is outlined below;

ARTIFICIAL GROUND

The BGS 1:10,000 scale mapping shows **Worked Ground (Undivided)** on site associated with the railway cutting to the South of the site boundary. Other areas of worked / made ground outside the site boundary are shown on figure 9.1 below with full details available in the geo-insight report (appendix D);

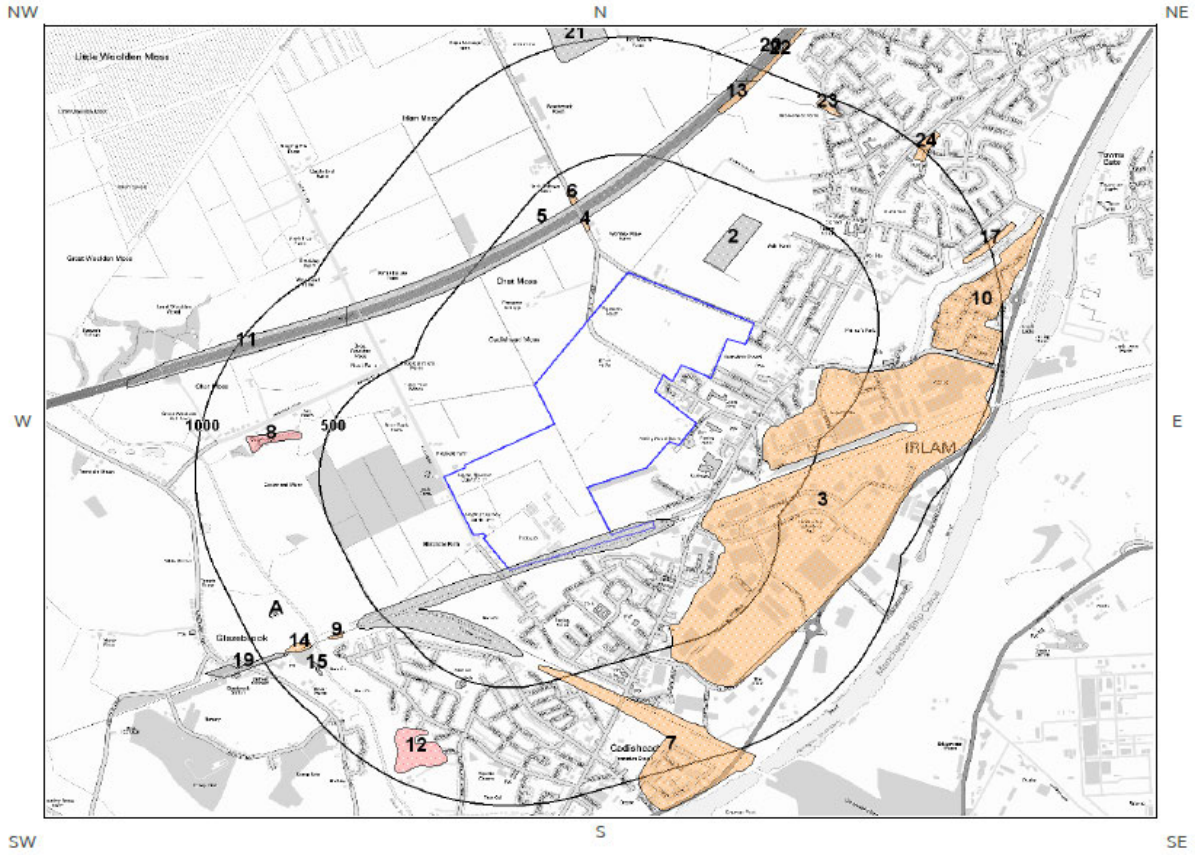


FIGURE 9.1: MADE GROUND WITHIN 1000M OF SITE

SUPERFICIAL GEOLOGY

British Geological Survey (BGS) 1:10,000 mapping shows superficial deposits of peat across the majority of the site. Small areas of the site at the southern boundary with the railway consist of Till (Devensian) and a very small area at the far eastern boundary closest to Irlam Station superficial deposits are indicated as Glaciofluvial Sheet Deposits (Devensian Sand and Gravel).

SOLID GEOLOGY

British Geological Survey 1:10,000 mapping (BGS) indicates the underlying solid geology as Wilmslow Sandstone Formation. An inferred fault is shown as extending into the southern section of the site (see figure 9.2 below). It is noted the fault does not intersect with the historic landfill to the South of the site reducing the chances of creating a preferential pathway for any ground gas;

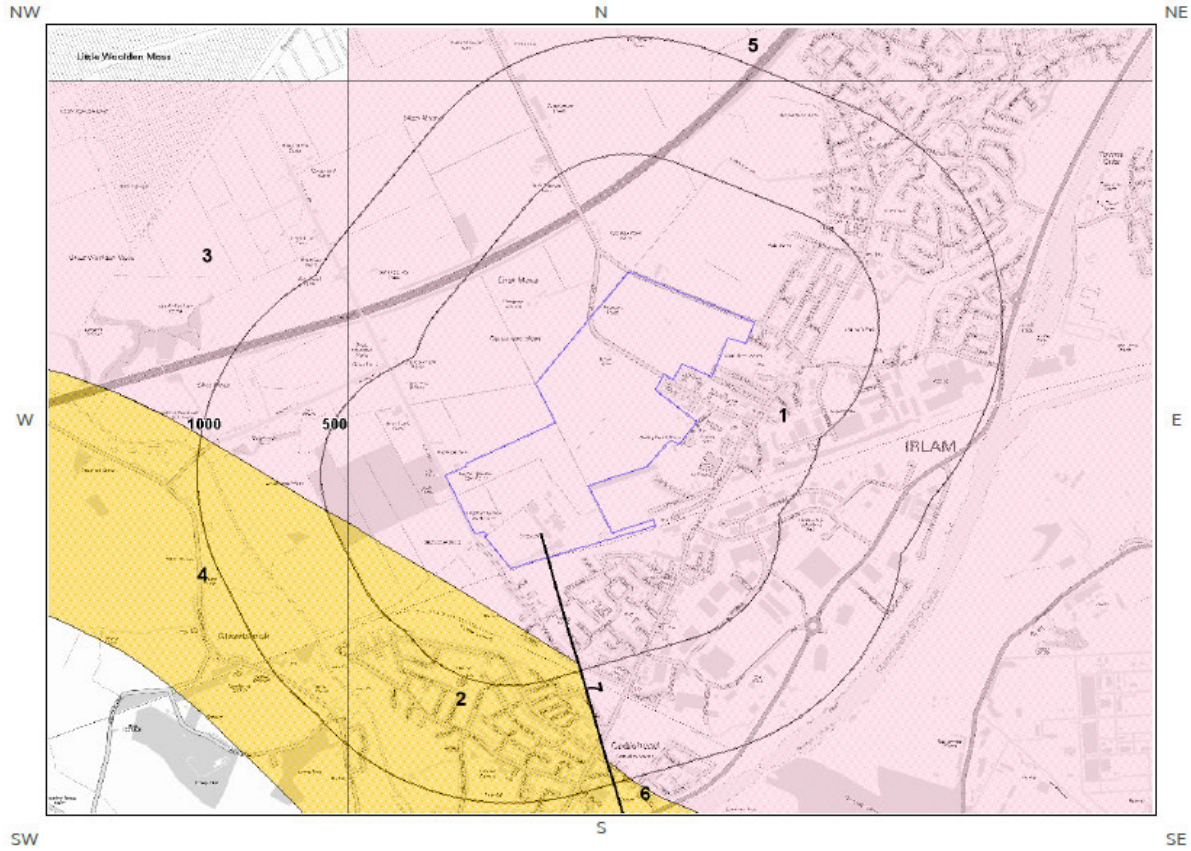


FIGURE 9.2: SOLID GEOLOGY AND FAULT LINES

NATURAL GROUND SUBSIDENCE

Table 9.3 below shows the estimated natural ground subsidence risk for the site;

TABLE 9.3: NATURAL GROUND RISKS SUMMARY

Feature	Risk
Shrink-Swell Clay	Very Low
Landslides	Very Low
Ground Dissolution of Soluble Rocks	Negligible
Compressible Deposits	High
Collapsible Deposits	Very Low
Running Sand	Very Low

RADON

The HPA defines radon affected areas as those with 1% chance or more of a house having a radon concentration at or above the Action Level of 200 Bq m^{-}3. The property is not within a radon affected areas as less than 1% of homes are above the action level, no further action is required with respect to radon and protective measures are not necessary.

GROUND WORKINGS

There are a number of historic surface ground workings adjoining or in close proximity to the site, predominantly associated with the development of the railway and a brickworks shown on figure 9.4 below;

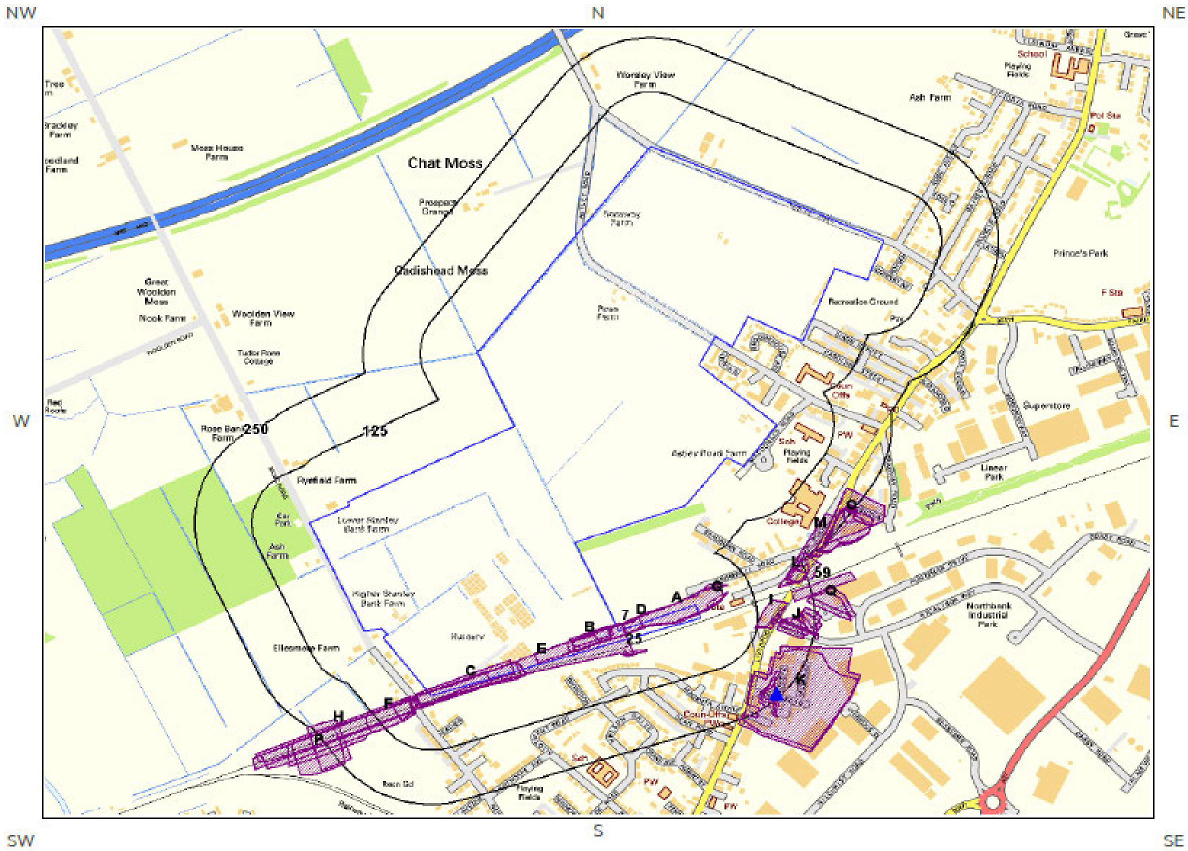


FIGURE 9.4: HISTORIC GROUND WORKINGS

BGS BOREHOLE RECORDS

There are 3 No. Historic Borehole Records within the site boundary, and a further 6 No. within close proximity of the site boundary. Historic borehole logs can be used to gain insight into the ground conditions likely to be encountered on site.

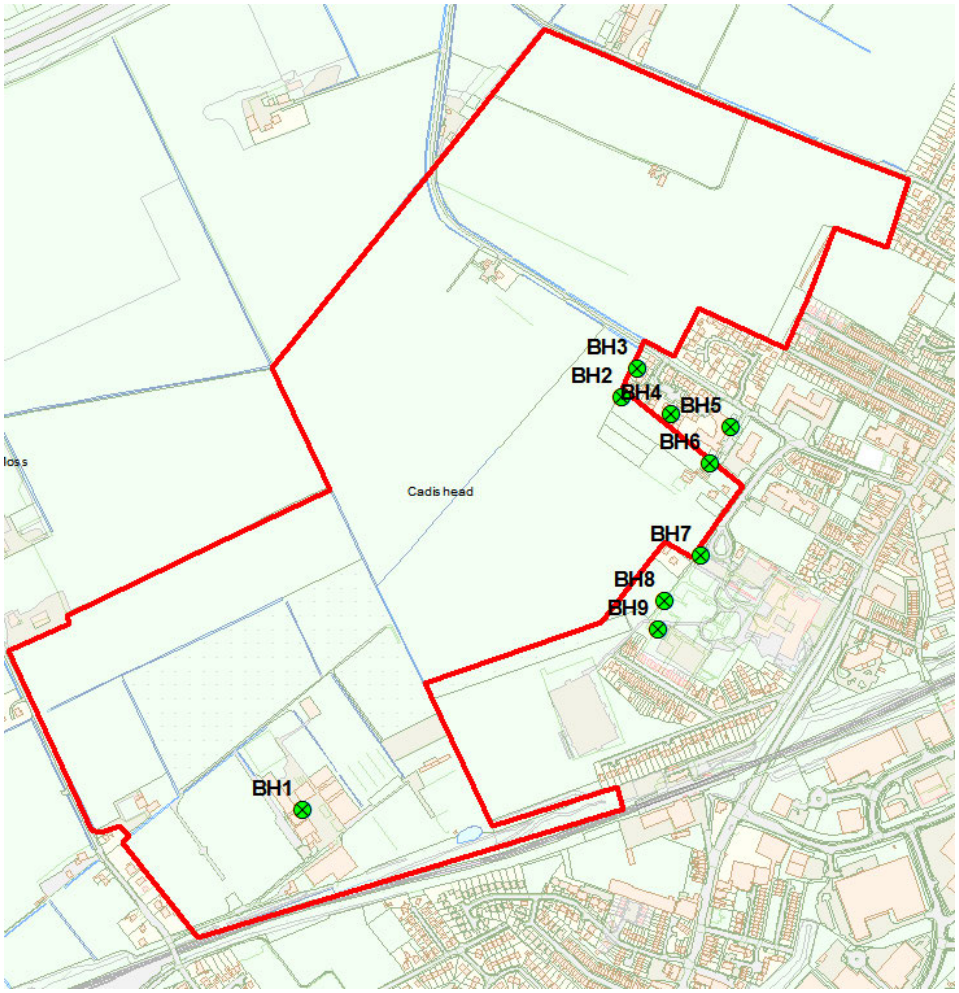


FIGURE 9.5: BGS HISTORIC BOREHOLE LOCATIONS

A summary of the public records is shown in table 9.6 below. In general peat is shown at depths varying between 0.9m bgl and 3.7m bgl on site, with offsite shallow peat deposits confirmed between 0.76m bgl and 1.98m bgl. Underlying the peat tends to be clayey deposits to approximately 6.5m bgl (varying and unproven). The clayey deposits in BH1 extend to significant depth (91.5m bgl) to bedrock.

TABLE 9.6: BGS BOREHOLE RECORDS SUMMARY

Borehole ID	NGR	Year	Distance from Site	Summary of Record
BH1 SJ79SW374	370800 393100	1985	0m at Brentwood Nursery	(Record of Well Installation) Peat to 3.7m bgl Coarse Sand to 4.3m bgl Sandy Clay to 17.7m bgl Fine Gravel to 18.3m bgl Red Sandstone + Grey Zones to 91.5m bgl *NB Not Geological Lithography*
BH2 SJ79SW290	371240 393670	1976	0m Astley Road	Clayey PEAT and sandy silty CLAY to 0.91m bgl Silty CLAY to 1.37m bgl Firm silty CLAY with pebbles and siltstone to 3.2m bgl Compact clayey SAND to 6.55m bgl BOREHOLE COMPLETE 6.55m bgl Dry
BH6 SJ79SW292	371360 393580	1976	0m Astley Road	Clayey PEAT with traces of sand to 1.37m bgl Silty sandy CLAY with traces of sand to 2.28m bgl Firm silty CLAY occasional pebbles and siltstone to 6.35 m bgl BOREHOLE COMPLETE 6.35m bgl Dry
BH4 SJ79SW288	371310 393650	1976	10m Astley Road	Peaty clay with cinders FILL to 0.76m bgl Organic silty CLAY with fine sand/silt inclusions to 1.98m bgl Firm silty CLAY to 5.18m BGL Still silty very sandy CLAY with occasional pebbles to 6.25m bgl BOREHOLE COMPLETE 6.25m bgl Dry

Borehole ID	NGR	Year	Distance from Site	Summary of Record
BH5 SJ79SW293	371390 393630	1976	5m Astley Road	Soft clayey PEAT and peaty SAND to 1.83m bgl Silty CLAY with occasional pebbles and siltstone to 4.88m bgl Firm very sandy CLAY with occasional pebbles to 6.1m bgl BOREHOLE COMPLETE 6.1m bgl Dry
BH3 SJ79SW291	371260 393710	1976	5m Astley Road	Clayey PEAT to 1.98m bgl Soft sandy CLAY to 4.11m bgl Firm silty CLAY to 6.25m bgl BOREHOLE COMPLETE 6.25m bgl Dry
BH9 SJ79SW317	371290 393350	1967	40m Secondary School	*Measurements converted from Imperial* PEAT to 1.14m bgl Clayey SAND to 1.5m bgl Soft to firm sandy CLAY to 2.74m bgl Firm/stiff silty and sandy CLAY to 5.49m bgl Stiff very sandy CLAY to 6.4m bgl BOREHOLE COMPLETE 6.4m bgl Dry
BH8 SJ79SW318	371300 393390	1967	35m Secondary School	*Measurements converted from Imperial* PEAT to 1.09m bgl Clayey SAND and peat zones to 1.52m bgl Very sandy organic CLAY to 1.98m bgl Firm silty and sandy CLAY to 3.50m bgl Stiff silty sandy CLAY to 6.55m bgl BOREHOLE COMPLETE 6.55m bgl Dry

Borehole ID	NGR	Year	Distance from Site	Summary of Record
BH7 SJ79SW319	371350 393450	1967	5m Secondary School	*Measurements converted from Imperial* Soft and firm PEAT to 1.5m bgl Firm very sandy CLAY to 1.6m bgl Loose silty SAND with fibre organics to 2.29m bgl Soft to firm silty sandy CLAY to 3.04m bgl Stiff sandy CLAY with sand pockets to 5.18m bgl Stiff silty laminated CLAY to 7.39m bgl Stiff sandy CLAY to 7.62m bgl Dense SAND and GRAVEL to 11.43m bgl Stiff to very stiff silty CLAY to 12.8m bgl BOREHOLE COMPLETE 12.8m bgl Water at 2.28m bgl, 2.90m bgl and 7.62m bgl standing at 5.79m bgl

HYDROGEOLOGY

The online database "Magic Map"[6] combined with the Groundsure Enviro-Insight (appendix C) has been consulted to determine the hydrogeology and groundwater vulnerability status of the site. These maps contain data previously held by the Environment Agency in a central, searchable repository.

SUPERFICIAL AQUIFER CLASSIFICATION

The Environment Agency aquifer designation map shows an unproductive aquifer. These are rock layers or superficial deposits with low permeability that have negligible significance for water supply or river base flow. Peat deposits are likely to contain localised perched groundwater.

BEDROCK / SOLID AQUIFER CLASSIFICATION

The Environment Agency aquifer designation map shows a **Principal** aquifer (formerly major). The Environment Agency classify this type of aquifer as *"layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer."*

[6] Magic Map can be accessed at https://magic.defra.gov.uk/MagicMap.aspx, managed by Natural England and the Environment Agency

GROUNDWATER VULNERABILITY & SOIL LEACHING POTENTIAL

Magic Map[6] identifies the site as within a zone shown as **Major Aquifer Intermediate** vulnerability area. The Environment Agency classifies these as areas able to offer some groundwater protection (between high and low).

The on-site soil vulnerability classification (I2) is described as *"soils which can possibly transmit non – or weakly adsorbed pollutants and liquid discharges but are unlikely to transmit adsorbed pollutants"*.

Actual site conditions may vary, and it is noted the borehole records nearby indicate clayey soils underlying the peat deposits which is likely to inhibit vertical migration of groundwater and any mobile pollutants. Further the deepest borehole for a well installation (at the nursery) extended to 91.5m bgl indicating the underlying bedrock containing the principal aquifer lies at significant depth beneath the site.

GROUNDWATER ABSTRACTIONS

There is 1 No. groundwater abstraction within the site, located at the nursery for irrigation purposes. There are 4 No. further groundwater abstraction licences within 1KM of the site for industrial or irrigation purposes, the closest being 804m E of the site. It is assumed as part of any development the on-site abstraction would be ceased.

SOURCE PROTECTION ZONES

No Source Protection Zones or potable water abstraction licences have been identified within 500m of the site.

SURFACE WATER ABSTRACTION LICENCES

There is 1 No. Surface water abstraction licence granted 1118m to the South-east of the site. A General Use at Saica Paper. This is considered to be sufficiently remote from the site and is not considered further. A further 16 No. surface water abstraction licences have been identified within 2KM of the study site.

There are no potable water abstraction licences within 2KM of the study site.

SURFACE WATER

The closest major surface water feature is Glaze Brook, located some 750m West of the site, and the Manchester ship Canal located 1.2km South of the site. There are a significant number of inland rivers within 500m of the site boundary shown on figure 9.7 below extracted from the Groundsure Enviro-Insight report (appendix C).

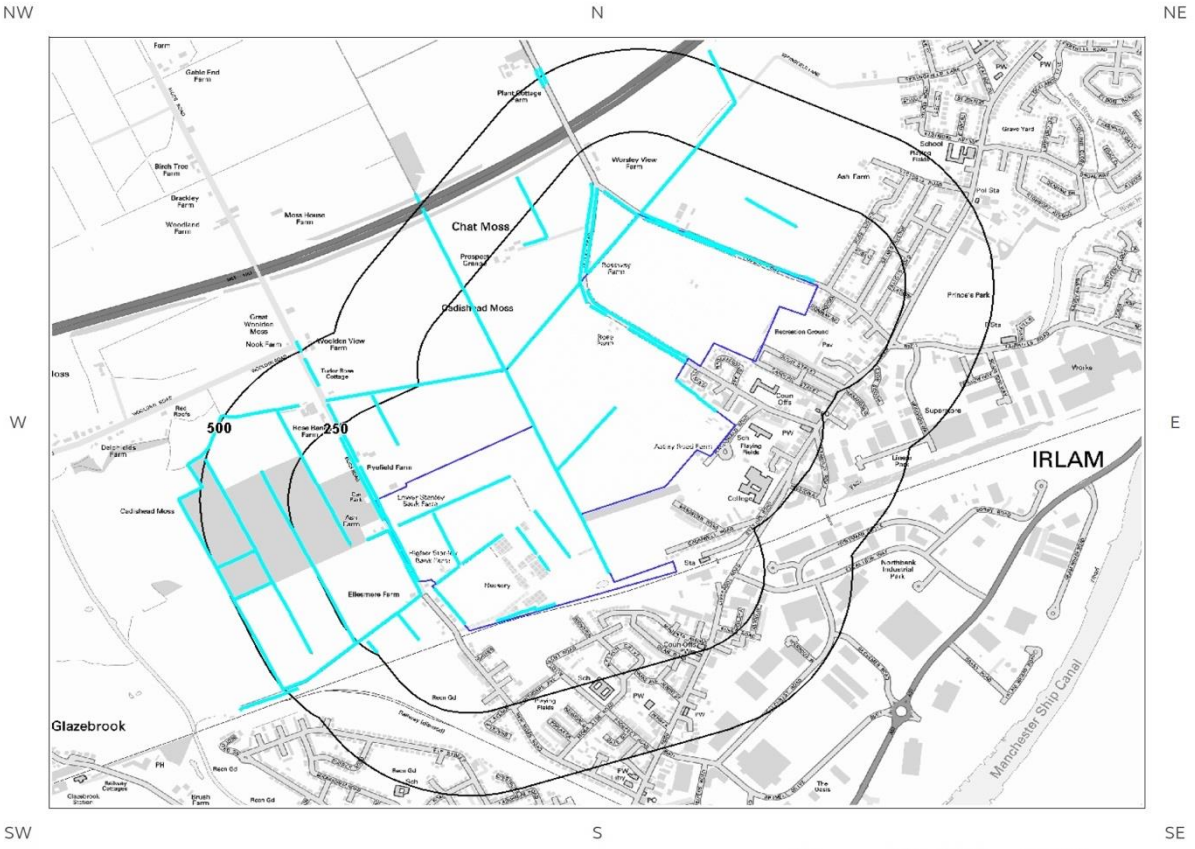


FIGURE 9.6: SURFACE WATER FEATURES

The inland rivers are part of a wider drainage system for the peat bog, allowing agricultural use, and a part of a much wider network covering much of the Chat Moss area, thought to originate from early 1800's as attempts were made to bring Chat Moss back into agricultural use. The system consists of networks of enclosed drains under the fields running to open ditches at the edge of fields.

These features have potential to transport pollutants and deposit within silts on the site. Most features are in continuity with off-site surface water features of a similar nature.

There are no major rivers or controlled surface waters within 500m of the site.

POLLUTION INCIDENTS

There are 4 No. recorded pollution incidents recorded within 500m of the site boundary. Incidents of minor fly tipping taking place in 2001 and 2002 at 4 No. separate locations. All are considered minor or no impact and are not considered further.

Full details can be obtained from the Groundsure Report in appendix C.

DISCHARGE CONSENTS

There are 3 No. Environment Agency Discharge Consents within 500m of the site related to sewage discharge consents.

FLOOD ZONES

The site is within Flood Zone 1. Flood Zone 1 is defined as areas having a 0.1% (1 in 1000 year) chance of flooding. There are no flood zones within 250m of the site.

A review of the Flood Warning Data held by the Environment Agency[7] shows that small parts of the site are at **LOW, MEDIUM or HIGH** risk from surface water flooding (shown on Figure 9.7 below).

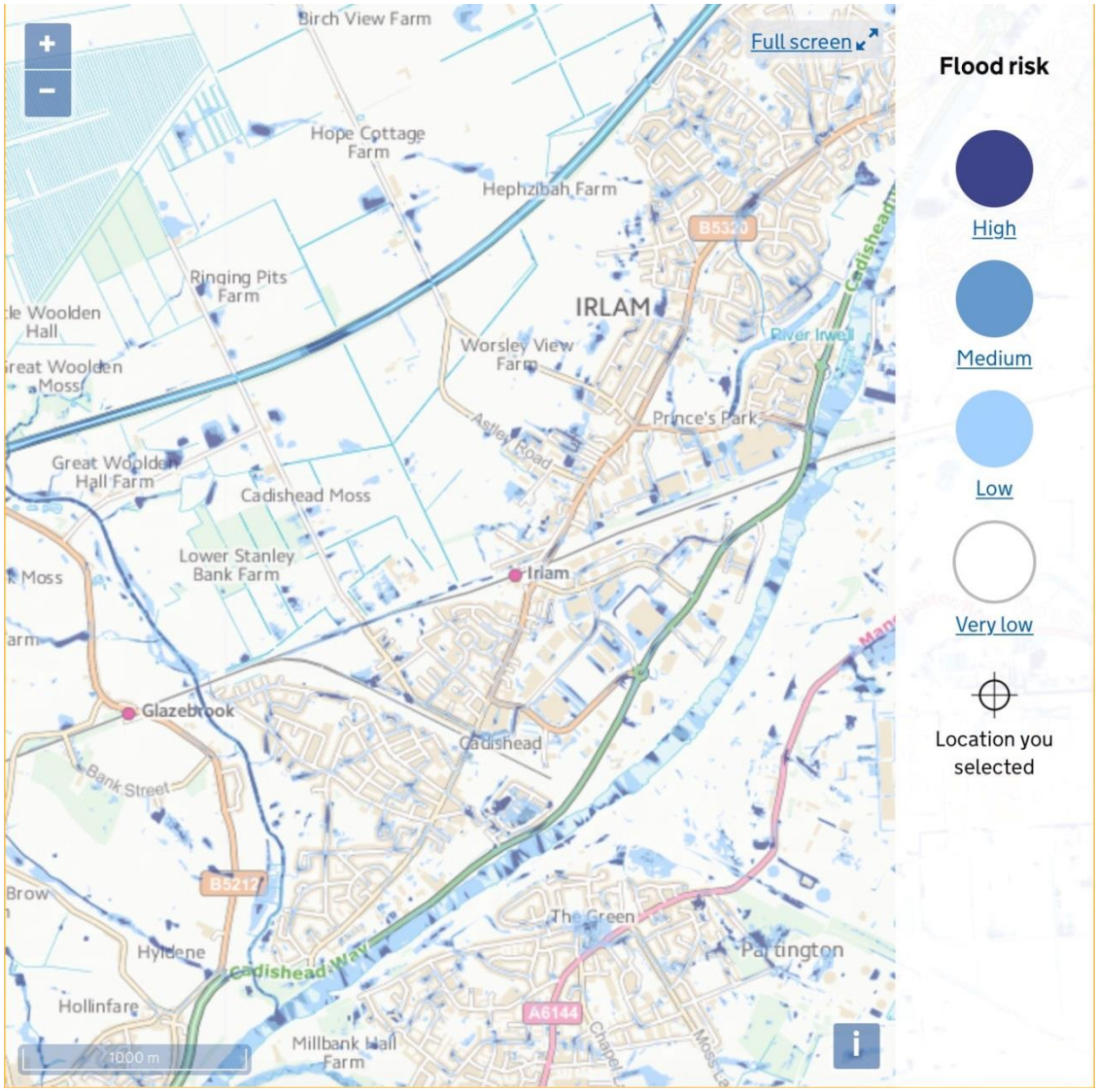


FIGURE 9.7: EA SURFACE WATER FLOODING RISK

[7] EA Surface Water Flood Risk Data accessed from https://flood-warning-information.service.gov.uk/long-term-flood-risk/map.

A British Geological Survey groundwater flooding susceptibility area is located within 50m from the centre of the site[8]. Clearwater flooding is associated with groundwater coming to the surface in superficial deposits after heavy rainfall.

DESIGNATED SITES

There is 1 No. Site of Special Scientific Interest (SSSI) and 1 No. Special Area of conservation within 2KM of the study site (Holcroft Moss and Manchester Mosses respectively) located 1594m West of the site.

The site is contained within designated Green Belt, and the southwestern corner of the site is shown as a Nitrate Vulnerable Zone.

[8] See Groundsure Enviro-Insight Report in Appendix C

10.0 Minerals Mining and Peat

SURFACE MINERAL WORKINGS

There are no areas of coal or mineral workings within 1KM of the site. The site is not within the Coal Authority Reporting Area (see figure 10.1 below);

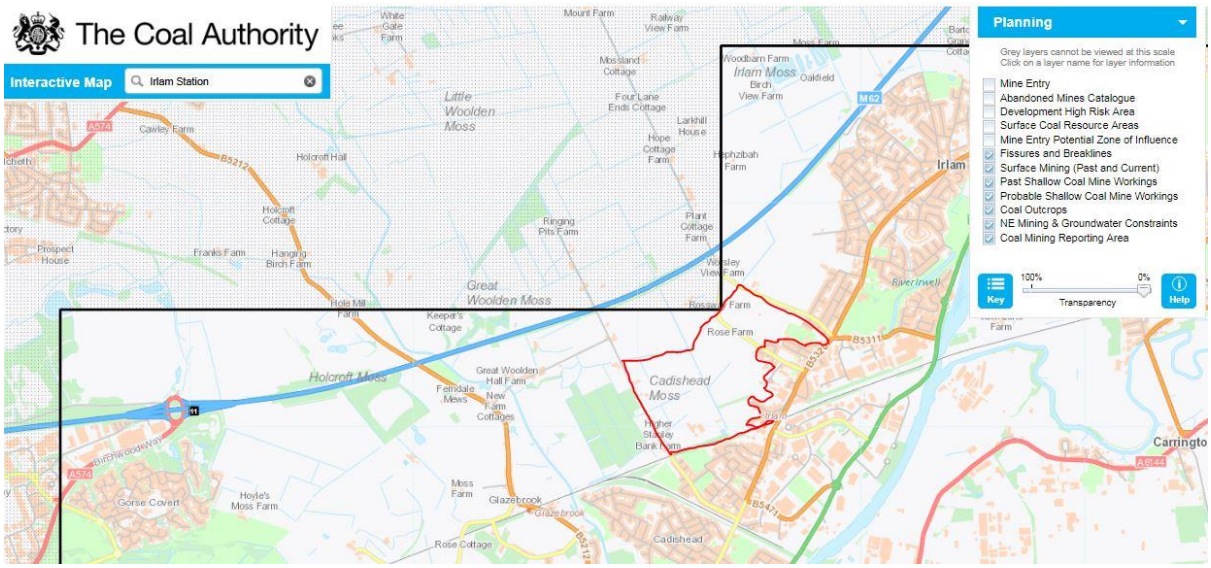


FIGURE 10.1: COAL MINING REPORTING AREA

PEAT

The BGS Geological Maps show the site underlain by peat. Various borehole records show the depth varying between 0.9 m bgl and 5.9 m bgl within and in close proximity to the site.

A report provided by the Greater Manchester Archaeological Advisory Service (GMAAS)[9]covering a wider area than the study site identified a number of sources showing information concerning the depth of peat.

Sampling identified within the GMAAS report showed peat depths up to 7m bgl in areas to the north of the wider site. A further analysis of various studies including boreholes created for the construction of the M62 (to the North of the site) and across Chat Moss was included in the report.

With respect to the wider site (covered by the GMAAS study), peat depths are expected to rise from 3m bgl on the west of the site (near Glaze Brook and Wooden Hall Farm, to over 6m bgl in areas to the East of Roscoe Road. The depths also seem to rise in the eastern area of the site (from North to South) with greatest depths at Moss Brow Farm;

Figure 10.2 below shows the depths of peat recorded at the boreholes analysed within the report with the current study site overlaid (Red);

[9] GMAAS, *Salford Potential Site Allocations for The Greater Manchester Spatial Framework And Local Plan*, University of Salford.

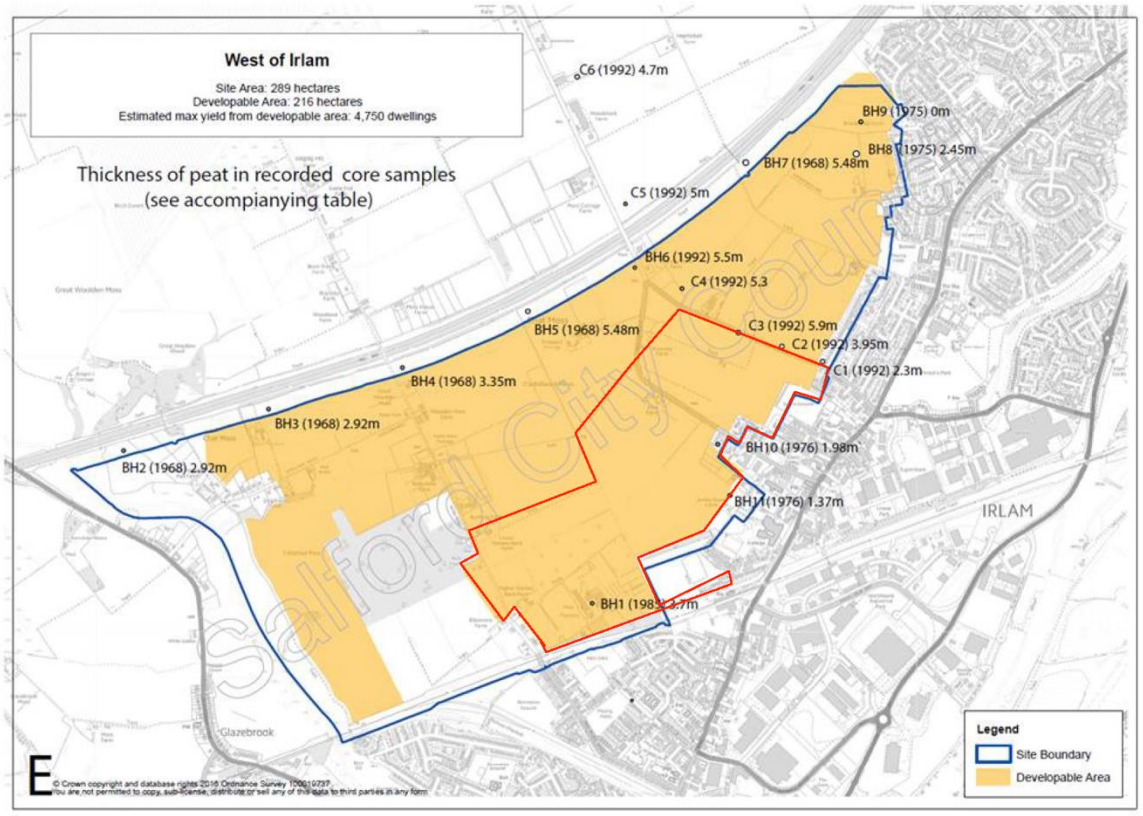


FIGURE 10.2: PEAT THICKNESS FROM BGS BOREHOLE RECORDS AND NORTH WEST WETLANDS SURVEY

Table 10.3 below shows the data above in relation the current study site showing peat thicknesses expected on site (combined with the data from the borehole summary in section 9 above – ID shown in parenthesis);

TABLE 10.3: PEAT THICKNESS DATA

ID	Year	Distance from Site	Peat Thickness Recorded
BH1 (BH1)	1985	0m	3.7m bgl
BH11 (BH6)	1976	0m	1.37m bgl
BH10 (BH3)	1976	0m	1.98m bgl
C1	1992	5m	2.3m bgl
C2	1992	5m	3.95m bgl
C3	1992	5m	5.9m bgl
C4	1992	40m	5.3m bgl
(BH2)	1976	0m	0.91m bgl
(BH4)	1976	10m	0.76m bgl
(BH5)	1976	25m	1.83m bgl
(BH9)	1967	40m	1.14m bgl
(BH8)	1967	35m	1.09m bgl
(BH7)	1967	5m	1.5m bgl

SUMMARY OF PEAT THICKNESS DATA

In the Eastern half of the site (towards Astley Road) all borehole and survey data show a rising depth of peat from north to south across the site. Whilst there are insufficient data points to provide an accurate profile it is reasonable to assume peat in this area ranges from 2.3m BGL along the south of the site through to 5.9m bgl in the centre section reducing slightly towards the North.

The Western section of the site is less clear as there are fewer data points. BH1 taken from the nursery recorded 3.7m thickness of peat, whereas boreholes towards the M62 (North of the site) show peat thickness ranging from 3.35m BGL to the west to 5.5m BGL to the East.

The GMAAS report suggests there is a basin in the superficial geology to the East of the site around Roscoe Road, with a ridge in the geology moving west (corresponding with the shallower peat deposits), dipping again towards the western boundary.

A plot of all the available peat thickness points on a map gives a representation of available data spatially (figure 10.4 below);

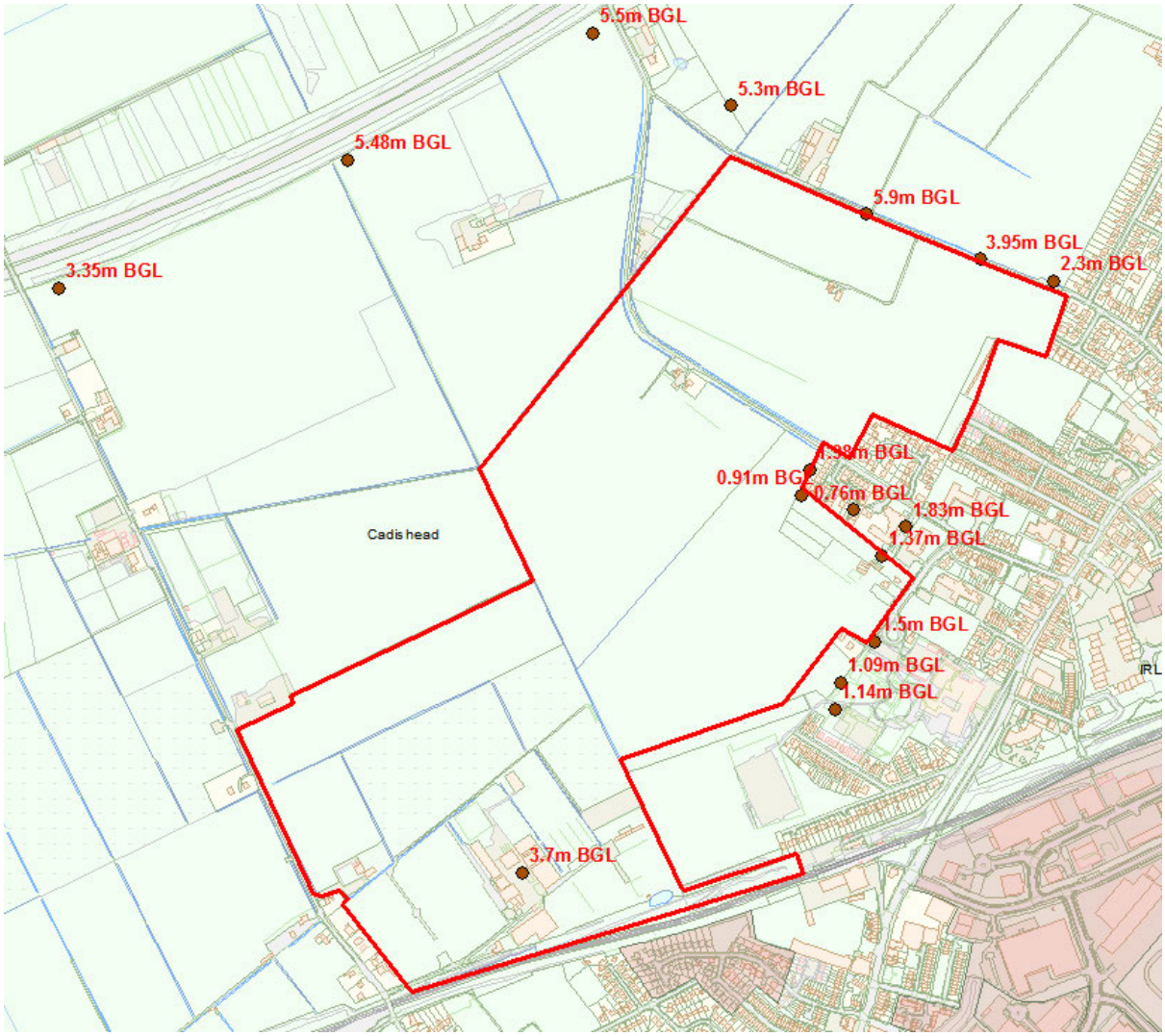


FIGURE 10.4: PLOT OF AVAILABLE PEAT THICKNESS DATA

PEAT EXTRACTION

Peat is known to have been extracted from various areas of Chat Moss, including sites close to the study site. There are no records of peat extraction taking place (in recent history) within the study site.

A 2006 report[10] undertaken by the BGS and Office of the Deputy Prime Minister recorded peat extraction across three sites on Chat Moss (see figure 10.5 below);

> Peat is being extracted from three sites on Chat Moss to the west and north west of Irlam on the Wigan/Salford boundary. The peat deposits cover an area of 2587 ha of raised bogs up to 9 m thick on a flat underlying topography. Planning permission for peat extraction covers 305 ha, both in the Wigan and Salford districts. Smaller lowland peat deposits such as Carrington Moss and Ashton Moss cover approximately 2 km^2 each, but are not worked.
>
> Many of the peat deposits have been worked extensively in the past and today a large percentage of these areas have been 'reclaimed' to agricultural land. Due to the unavailability of up-to-date linework defining the extent of the reclamation, the entire resource as mapped is shown on the map face.

FIGURE 10.5: EXTRACT FROM 2006 REPORT

A search of Salford Council's Public Planning Portal[11] shows four records relating to peat extraction, two are Article 16 consultations from neighbouring Wigan MBC area. The two records within the boundary of Salford relate to a pre-1990 permission for a site North of Twelve Yards Road, Irlam some 2.5KM North of the study site.

It is understood peat extraction has ceased in the area around 2011.

[10] D J Minchin et. Al., (2006), *Mineral Resource Information in support of National Regional and Local Planning: Greater Manchester (Comprising Cities of Manchester and Salford and Metropolitan Boroughs of Bolton, Bury, Oldham, Rochdale, Stockport, Tameside, Trafford and Wigan)*, British Geological Society

[11] Available from http://publicaccess.salford.gov.uk/publicaccess/

11.0 Landfill Search

KNOWN LANDFILL SITES

There are no operational landfill sites within 500m of the site. There are 3 No. historic landfill sits listed within 500m of the site boundary located within Northbank Industrial Park approximately 151m to the southeast.

Historic planning records are held with respect to two planning applications relating to the Northbank Industrial Park Landfill Site;

The first is an application from British Steel Corporation dated 1986 for the tipping of domestic, commercial and industrial waste. The records indicate this application was withdrawn however the area is shown on the EA database of historic landfill sites.

The second is an application for a smaller area from Trafford Park Development Group dated 1992 was approved for the excavation of contaminated material, disposal on site tip and replacement of contaminated material with imported fill.

POTENTIAL LANDFILL SITES

A search has been undertaken of Local Authority held records for historic landfill sites and there are no other suspected areas of landfilling within 250m of the site boundary.

A number of areas of potentially filled ground exist under and in the vicinity of the site (see section 9 above).

12.0 Unexploded Ordinance (UXO)

In general accordance with CIRIA report C681[12] a non-specialist UXO screening exercise has been undertaken for the site. There is no indication of former military usage on the site or within influencing distance of the site.

A search has been undertaken of the Zetica UXO database[13] which indicates the site is in a **LOW RISK** area for unexploded ordinance. These maps provide a high-level assessment of regional WWII bombing densities. A copy of the map is presented in appendix H.

Since the available records of aerial bombing are interpreted by Zetica as low bomb risk this suggests no further consideration of UXO is required at this level however it is considered prudent to obtain further confirmation in the form of a Pre Desk-Study Assessment before commencing intrusive investigations.

[12] CIRIA (2009), *C681 - Unexploded Ordinance (UXO) a Guide for the Construction Industry*, CIRIA London
[13] https://zeticauxo.com/downloads-and-resources/risk-maps/

13.0 Preliminary Conceptual Site Model

A conceptual site model (CSM), which supports the identification and assessment of contaminant-pathway-receptor pollutant linkages, is integral to the overall process of risk assessment. A preliminary CSM provides a foundation for hazard identification and risk estimation, for later refinement using intrusive investigation techniques.

Risk estimation in this investigation has been based on consideration of magnitude, probability, and consequence of a contaminant-pathway-receptor linkage occurring, using a matrix recommended by Defra. The rationale behind the estimation of risk in this investigation is presented in Appendix G. This is in line with best practice and guidance described in CLR11[14].

POTENTIAL SOURCES OF CONTAMINATION

The site is agricultural land recovered from peat bogs in the 1800's. An extensive network of underground and open drainage ditches exists and could serve to transport contamination into the site, off site and also deposit into sediments.

The nursery located to the south-west of the site is a potential source of contamination due to the use of organic and inorganic chemicals (pesticides, herbicides and fertilisers) together with ash in shallow soils.

Made ground (imported soils and marls) are likely to be found across the site. Depending on the source of the made ground metals, metalloids, hydrocarbons, PAH, organic and inorganic contaminants may be present. There is potential for asbestos containing materials to be present in shallow soils on site, especially in areas around the tramway or where buildings have previously been demolished.

The nearby historic landfill and infilled ponds are a potential source of ground gas. In addition superficial deposits of peat and marshland exist at varying depths across the site and have the potential to be a source of ground gasses.

Historic tramways within the site (possibly used to transport waste from the former Irlam Ironworks) are a potential source of heavy metal contamination, organic and inorganic contamination together with asbestos, petroleum hydrocarbons and polycyclic aromatic hydrocarbons (PAH). It is suspected the site may have been subject to disposal of 'night soil' together with industrial waste from the nearby ironworks. The presence of biological contamination is discounted due to the time period that has elapsed.

A number of tanks are shown on records within 50m of the site. Depending on their use there may be fuel / oil leakage which may impact areas of the site.

[14] Department for Environment, Food and Rural Affairs and the Environment Agency (2004). *Model procedures for the management of land contamination. R&D Publication CLR 11*. DEFRA

To the south of the site, heavy industry was present including Irlam Iron Works, a wallpaper factory and a match factory which have potential to impact the site through atmospheric deposition and / or unknown waste disposal.

POTENTIAL PATHWAYS

There are a number of 'pathways' by which human receptors could be exposed to the potential contaminants identified at this site. These include;

- Ingestion of soil and indoor dust
- Ingestion of contaminated vegetables and attached soil
- Dermal contact with soil and indoor dust
- Inhalation of indoor and outdoor dust
- Inhalation of indoor and outdoor vapours (including carbon dioxide)
- Explosive gasses (Methane)
- Migration / leaching of contamination into underlying groundwater

Surface water and groundwater represent one of the principal mechanisms by which contaminants can move through and leave the site.

- Rainwater infiltrating through contaminated soils and introducing them to groundwater or the underlying aquifer.
- Groundwater flowing at depth through contaminated soils / strata, or contaminated by rainwater, flowing through or off site and discharging into an aquifer or as groundwater springs.

The peat deposits will contain water, and it is likely varying depths of perched groundwater will lie across the site, impeded by the clayey deposits beneath. It is likely water within peat deposits and perched groundwater may be in continuity with the drainage ditch network. There is potential for mobile contaminants to migrate through shallow groundwaters.

It is anticipated the principal aquifer lies at significant depth beneath the peat, and it is considered the intervening thickness of clayey deposits, together with natural attenuation will serve to protect the underlying principal aquifer.

POTENTIAL RECEPTORS

The following are potential receptors to the contaminants identified:

- Future site users
- Construction workers
- Buildings
- Water pipes
- Surface water
- Controlled waters
- Principal aquifer

14.0 Preliminary Qualitative Risk Assessment (Tier 1)

The rationale behind the estimation of risk in this investigation is presented in Appendix H. Where more than one risk is present, the overall risk assessment will consider the highest risk associated with that feature.

- Made ground is anticipated on site, however the nature and constituents of the made ground are unknown. There is evidence of deposition of materials likely to contain contamination (Night Soils and Industrial Waste). Due to uncertainty regarding the made ground and the likelihood that contaminants are present in significant quantities, the risk to end users from organic and inorganic contamination is estimated to be **moderate**. The risk from potential asbestos (until proven otherwise) is considered **high** requiring further investigation.

- The boundary of the nearest historic landfill site is 151m to the south east of the site, which is potentially within influencing distance together with a number of in filled ponds. Underlying peat deposits on site also have potential to generate ground gasses under certain circumstances. Due to the consequence being severe, the risk from ground gas is deemed to be **high** requiring further investigation.

- Levels of contaminants likely to affect building structures are unknown but likely to be present in made ground on the site, and the consequence is considered minor as such the risk is considered to be **low**.

- If water supply pipes are present or will be present beneath the site, they will also come into contact with any contamination within made ground on site. The risk is estimated to be **moderate / low**.

- Shallow groundwater within the peat and perched above the clayey soil deposits are potentially in continuity with controlled waters (Glaze Brook). Any mobile contaminants may therefore migrate off site to controlled waters. The risk is considered **moderate / low** and requires further investigation.

- The principal aquifer in the bedrock is considered to lie at considerable depth beneath the peat and an intervening layer of clayey soils with sands, pebbles and gravel. This layer is indicated as being intermediately permeable, however given the expected thickness, processes such as dilution, attenuation and biodegradation are also likely to significantly reduce the concentration of potential contaminants. The preliminary risk to the principal aquifer is assessed as **Low** requiring further consideration and possible investigation.

SUMMARY

The conceptual model is summarised below. The rationale behind the estimation of risk in this investigation is presented in Appendix H.

TABLE 14.1: PRELIMINARY CONCEPTUAL SITE MODEL (CSM)

TYPE OF CONTAMINATION	POTENTIAL SOURCES	POTENTIAL PATHWAY	POTENTIAL RECEPTORS	POLLUTION LINKAGE	COMMENT	RISK RATING
Ground Gas	Made ground on site. Presence of peat of varying depths Nearby historic Landfill <250m	Inhalation of Vapours	Construction / Maintenance Workers	Potentially ACTIVE	Peat has the potential to generate methane (CH_4) carbon dioxide (CO_2) depending on depth, climatic conditions and pH values. The potential for ground gasses is considered **LIKELY.** The consequences from ground gasses are **SEVERE.**	**HIGH**
		Vapours Penetrating Buildings	Future Site Users	Potentially ACTIVE		
Surface and Near Surface Contaminants within Soils	Made ground on the site. Tipping of night soils and industrial wastes Former buildings demolished. Historic heavy industry in immediate surrounding area Asbestos PAH, TPH,VOC, SVCO Metals, Metalloids, Inorganics.	Ingestion, Inhalation, Dermal Contact	Current Site Users	Considered ACTIVE	The site is predominantly agricultural land, and presently worked as arable farmland. Contact with soils is possible, including trackback to residential buildings, although the presence of grass / crop coverings will reduce this likelihood. It is therefore considered **LOW LIKELIHOOD** exists of this pathway, the consequences are considered **MEDIUM**	**MODERATE / LOW**
			Construction Workers	Potentially ACTIVE	Ground disturbance is inevitable during construction. With the use of standard PPE and safe working practices, dermal contact and inhalation are considered **UNLIKELY**, and the consequences would be **MEDIUM.**	**LOW**
			Future Site Users	Potentially ACTIVE	Without remediation future site users are **LIKELY** to come into contact with soils, inhale dust and trackback soils. The consequences from exposure to potential contamination is considered MEDIUM which would result in a MODERATE risk rating, however due to the potential for asbestos containing materials within shallow soils the consequences are considered **SEVERE.**	**HIGH**
			Adjacent Land Users	Potentially ACTIVE	It is considered **UNLIKELY** site soils will be spread off site during construction (wind-blown). The consequences would be **MEDIUM** due to potential asbestos within the site soils.	**LOW**
		Direct Contact	Structures	Potentially ACTIVE	In the absence of evidence to the contrary it is considered **LIKELY** contaminant may exist which attach structures such as concrete. The consequences are considered **MINOR**	**LOW**
		Absorption in Root Zone	Plants	Potentially ACTIVE	The proposed end use is considered to be housing with gardens which may include cultivation of root vegetables and crops. It is considered **LIKELY** contaminants exist which may be absorbed into plants. The consequences are considered **MEDIUM**	**MODERATE**

Type of contamination	Potential Sources	Potential Pathway	Potential Receptors	Pollution Linkage	Comment	Risk Rating
Mobile Contaminants, Leachable e.g. from pollution sources Adjacent to Site / On Site	Made ground on the site. Former buildings developed in the 1950's and 60's, and demolition remains. Boilers associated with buildings. A former undesignated tank. Hydrocarbons, Leachable metals / metalloids.	Leaching into Shallow Groundwater	Shallow Groundwater	Potentially ACTIVE	The peat deposits are classed as an unproductive aquifer however will contain groundwater. Underlying clayey soils can lead to perched groundwater and mobile contaminants may impact the groundwater. It is considered **LIKELY** contaminants may reach shallow groundwaters, the consequence would be **MILD**	**MODERATE / LOW**
		Off-site Migration in Groundwater	Deep Groundwater	Considered INACTIVE	There is one groundwater abstraction (non-potable) on site and 4 No. abstractions within 1KM of the site (non-potable). The depth of the principal aquifer is suspected to be significant with intervening clayey soils between shallow groundwater and the aquifer. It is considered **UNLIKELY** contaminants may impact the principal aquifer and the consequence would be **MILD**	**VERY LOW**
			Controlled Waters	Potentially ACTIVE	The nearest surface watercourses are considered to be small ditches / drains potentially in continuity with controlled waters. It is considered there is a **LOW LIKELIHOOD** of contaminants migrating to controlled waters, and the consequence would be **MILD**	**LOW**
Organic and Inorganic Contaminants Within Soils / Groundwater	Made ground on site.	Potable Water Supply Pipes	Utilities Workers	Considered INACTIVE	Utilities workers with industry standard PPE and working practices are **UNLIKELY** to be exposed to contaminants. The consequences are considered **MODERATE**	**LOW**
			Future Site Users	Potentially ACTIVE	In the absence of evidence to the contrary there remains a **LOW LIKELIHOOD** soil contaminants exist that may affect potable water supply pipes. The consequences are considered **MEDIUM.**	**MODERATE / LOW**

15.0 Conclusions

The Preliminary Risk Assessment is intended to provide information on likely contamination on the site north of Irlam Station. The purpose of the investigation is to provide information on the suitability of the site for development in a housing led scheme. In particular to gauge the impact of the peat deposits may have on geo-technical requirements with such a development.

The report identifies potential contamination associated with made ground deposits resulting from the historic use of land, and from historical activities on the site. The report has identified potential pathways and receptors for contamination and as such the possibility of viable pollutant linkages exists.

The peat deposits themselves have potential to generate ground gas under certain circumstances depending on depth, pH and other factors. The risk has been identified as high and ground gas monitoring will be required before any development takes place. If required, the installation of ground gas monitoring wells is recommended together with a periodic monitoring regime to provide data on gas production in accordance with latest CIRIA guidance (Report C665)[15] and BS8485:2013[15].

Gas monitoring is likely to require a minimum of 12 No. visits over 6 months, including visits under worst case meteorological conditions (pressure falling rapidly). Analysis of the ground gas may be required to profile future generation potential. It may be possible to estimate the gas profile of the site based on the first 4 to 6 monitoring visits (depending on atmospheric conditions) however the monitoring will require completion.

In areas with a significant thickness of peat, some types of development may not be feasible or economically viable.

Due to the size of the site and lack of indication as to land uses across the area, a full Phase II Site Investigation (SI) would be considered uneconomical and unnecessary at this time. The sampling rate for a site of 66.5Ha in accordance with BS 10175:2011[16] and BS 8576:2013[17] would require somewhere in the region of 400 – 500 sampling points.

The requirements for SI on (for example) public open space differ than those required for housing with gardens etc. As such it is considered prudent to undertake a full SI at an appropriate time in the future. This may be undertaken at the master planning stage, or at the time of individual application submission when more is known about the future intention of land uses and the site can be more accurately zoned for investigation.

In order to satisfy the main objective of understanding the geotechnical risks associated with the site and gather a limited amount of information to refine the preliminary risk assessment it is considered a site investigation in the form of a series of boreholes / trial pits is undertaken. This assessment will not provide sufficient information for future planning purposes, however will inform future investigations and provide greater certainty.

[15] Construction Industry Research and Information Association (2007) Assessing risks posed by hazardous ground gases to buildings. *CIRIA Report C665*.
[16] BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice
[17] BS 8576:2013 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).

Urban Vision Partnership Ltd has taken all reasonable precautions to ensure the information contained in this report is correct. However, contamination may exist from a source for which there are no records, or which records consulted are inaccurate.

16.0 Recommended Further Investigations

It is recommended the following are the key outcomes of a future site investigation;

1. Confirmation of peat thickness and lateral extent to provide a profile for the site and inform geotechnical design.

2. Investigation of shallow soil contamination in a general grid spaced at 150m^2.

3. Investigation of any soil contamination in the vicinity of the former tramway.

4. Investigation of shallow groundwater and surface water for contamination.

5. Characterisation of the gas regime.

In order to achieve this, and subject to final specification the following is an example of a survey to achieve the above objectives;

No.	Method	Target Depth	Rationale	Sampling
18	Trial Pits	2.5m bgl	Shallow soils / made ground sampling, geotechnical	Full Sampling Suite[18], SPT, CPT, CBR, Geotechnical Samples
10	Window Samples	5 – 7 m bgl	Shallow soils / made ground sampling, peat depth profiling, Groundwater and gas monitoring[19], geotechnical	Full Sampling Suite[18], Sulphates, SPT, CPT, Geotechnical Samples
8	Rotary or Cable Percussive	Bedrock or 90m bgl	Determine ground characteristics beneath peat	Geotechnical samples / testing (SPT, CPT)

Figure 16.1 below shows a draft sampling plan;

[18] Asbestos Screen, As, B, Ba, Be, Cd, Cr (III and VI), Cu, Pb, Hg, Ni, Se, V, Zn, Sulphate, Total Free and Complex Cyanide, pH, SOM, Total Phenols, PAH, TPH (selected leachability testing), (VOC and SVOC, BTEX where required)
[19] Gas response zones to be confirmed

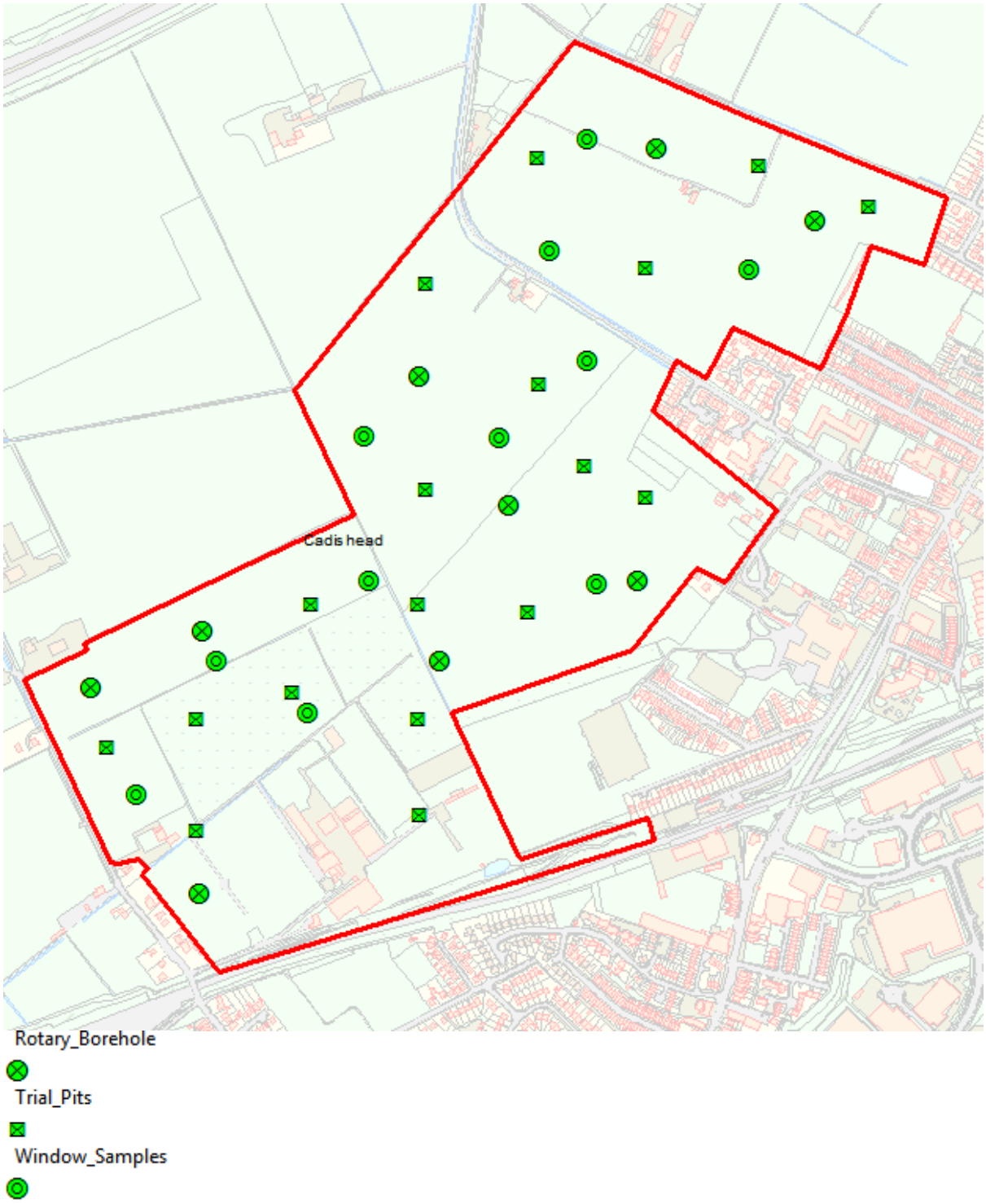
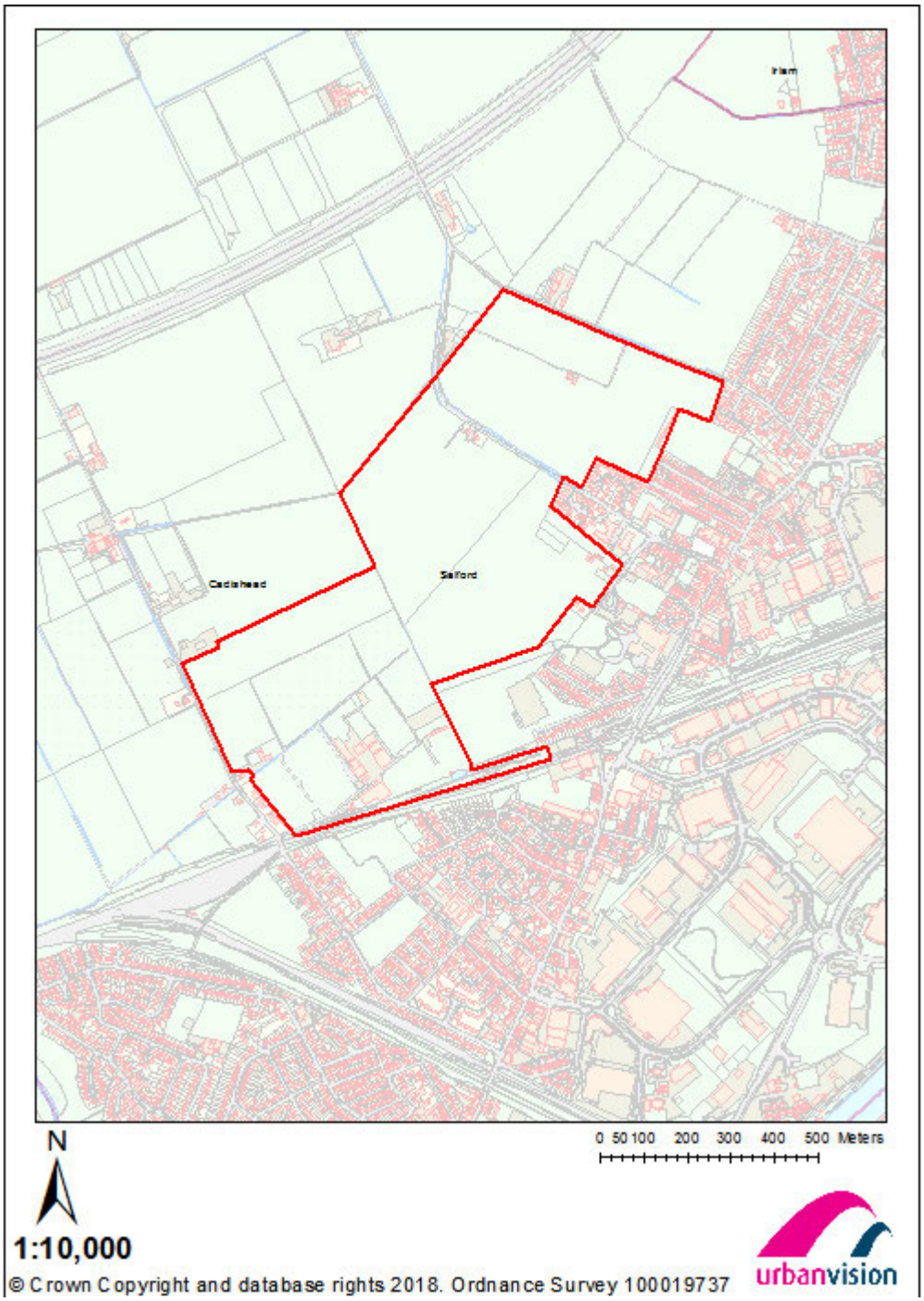


FIGURE 16.1: EXAMPLE SAMPLING PLAN

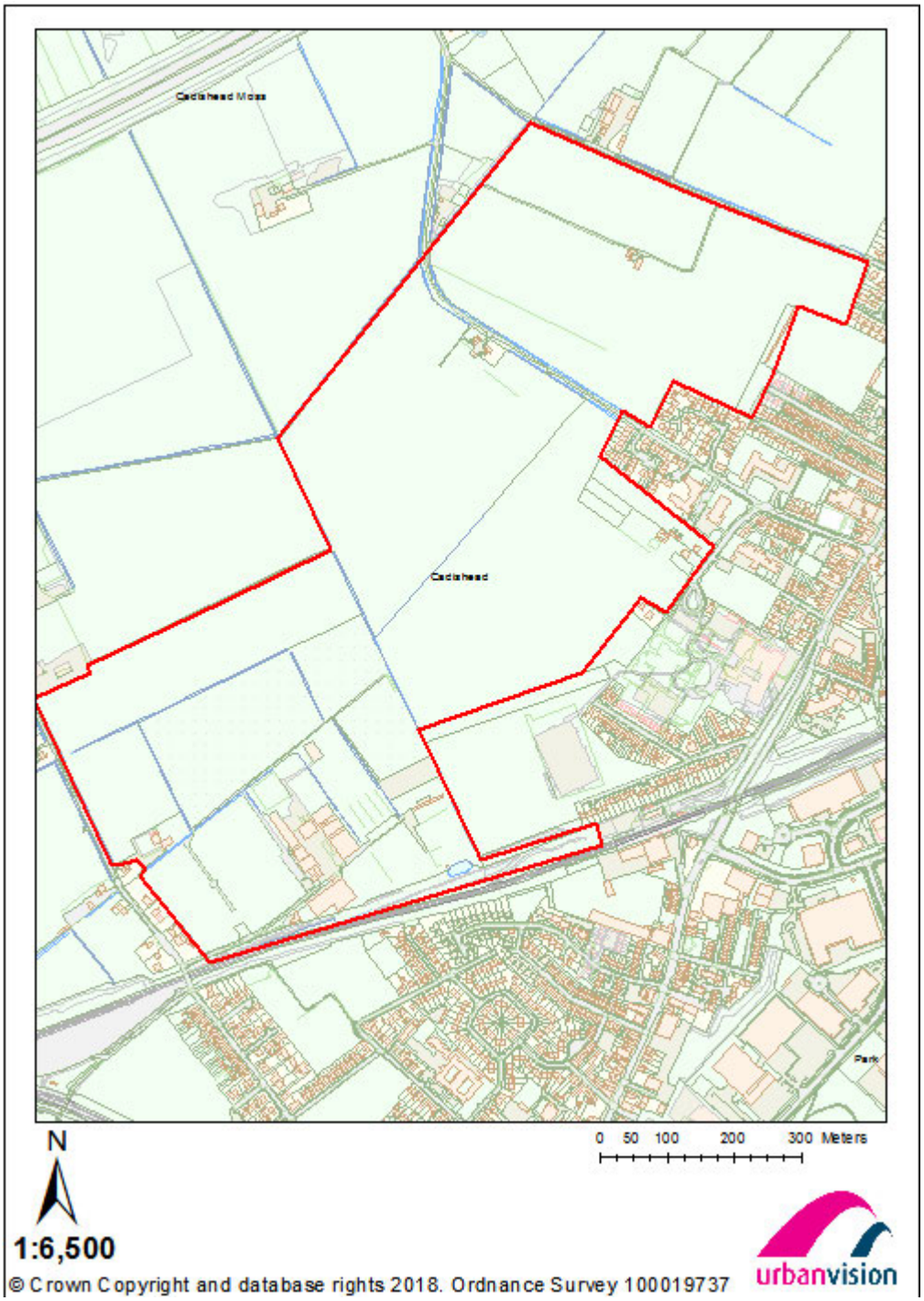
Sampling to be undertaken in accordance with BS ISO 18400-102:2017 and an MCERTS / UKAS accredited laboratory should be appointed. It should be noted that ground conditions, access restrictions and other factors may influence the exact position of intrusive investigations. A services survey including with CAT and Genny should be undertaken.

Appendices

Appendix A: Site Location Plan 1:10,000



Appendix B: Site Plan 1:6,500



Appendix C: Groundsure Enviro-Insight

Provided separately due to file size

Appendix D: Groundsure Geo-Insight

Provided separately due to file size

Appendix E: OS Historic Maps 1:10,560 1:10,000 and 1:2,500

Provided separately due to file size

Appendix F: Site Reconnaissance Photographs

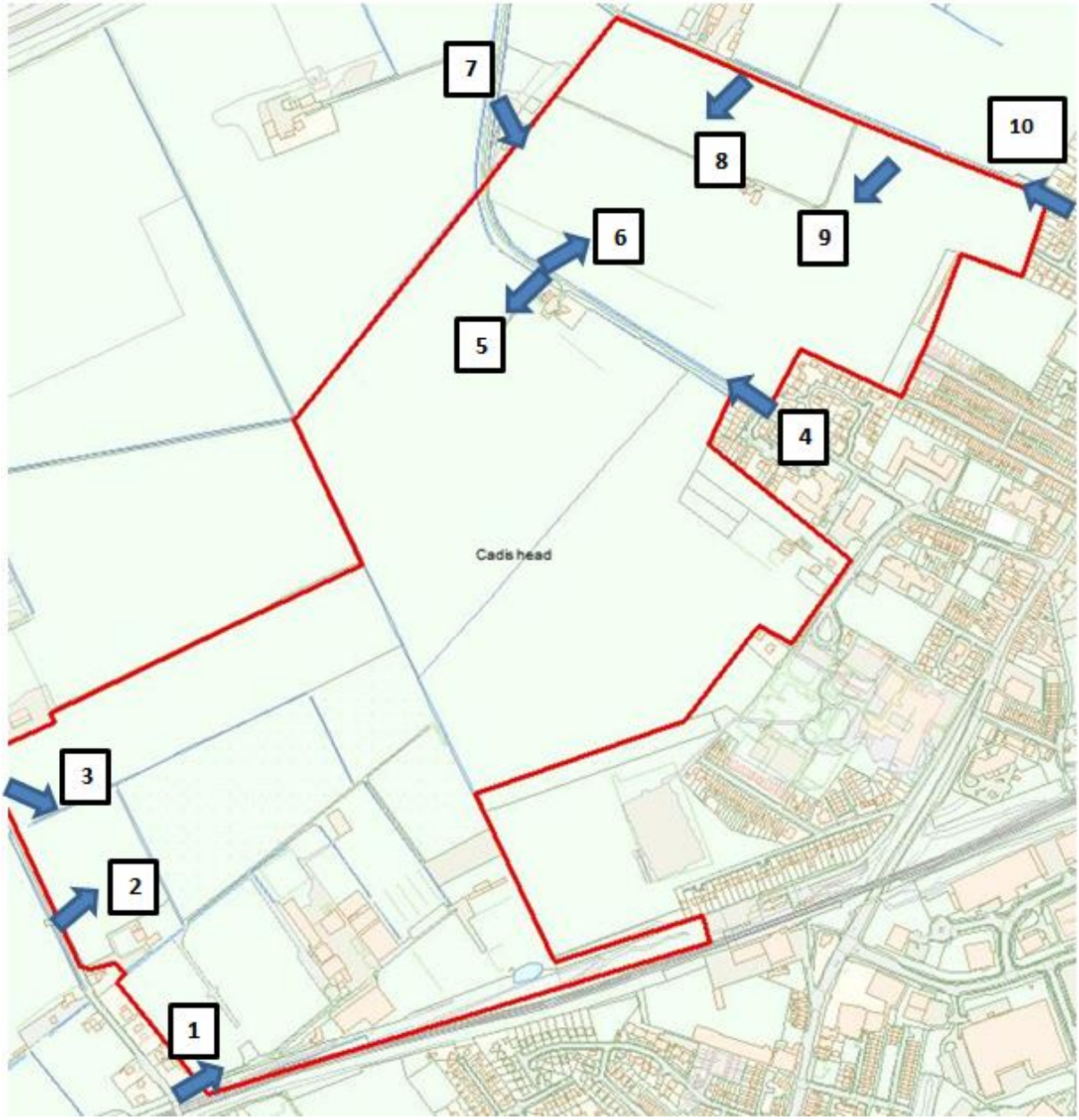


FIGURE AF.1: VIEWPOINTS FOR PHOTOGRAPHS

PHOTO 1: ENTRANCE TO NURSERY FROM MOSS LANE.

PHOTO 2: VIEW NE FROM MOSS LANE – DRAINAGE DITCH IN FOREGROUND

PHOTO 3: VIEW SE FROM MOSS LANE – BAND OF TREES AND NURSERY (TREES) BEYOND

PHOTO 4: VIEW N ALONG ASTLEY ROAD INTO THE SITE (SEVERE SUBSIDENCE OBSERVED)

PHOTO 5: VIEW NW INTO SITE FROM ASTLEY LANE

PHOTO 6: VIEW E FROM ASTLEY LANE TOWARDS ROSCOE ROAD (DRAINAGE DITCH IN FOREGROUND)

PHOTO 7:VIEW S FROM ASTLEY LANE INTO NORTH-EASTERN SECTION OF SITE.

PHOTO 8: VIEW SW FROM ROSCOE ROAD

PHOTO 9: VIEW SW FROM ROSCOE ROAD

PHOTO 10: VIEW NW UP ROSCOE ROAD – END OF FIELD DRAIN ENTERING CULVERT

PHOTO 11: VIEW FROM NE CORNER OF SITE (END OF ROSCOE ROAD) LOOKING NW INTO THE SITE

Appendix G:Current Legislation, Guidance and Risk Assessment Methodology

LEGISLATIVE GUIDANCE

This report includes hazard identification and risk assessment in line with the risk-based methods referred to in relevant UK legislation and guidance. Government environmental policy is based upon a "suitable for use approach". When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment given the current use and circumstances of the land.

Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:
"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:

(a) Significant harm is being caused or there is a significant possibility of such harm being caused; or
(b) Pollution of controlled waters is being, or is likely to be, caused."

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as: "the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter". In order to assist in establishing if there is a "significant possibility of significant harm" there must be a "significant pollutant linkage" for potential harm to exist. That means there must be a source(s) of contamination, sensitive receptors present and
a connection or pathway between the two.

This combination of source-pathway-receptor is termed a "pollutant linkage or SPR linkage." Part IIA of The Environmental Protection Act 1990 is supported by a substantial quantity of guidance and other Regulations, especially DEFRA Circular 01/2006 Contaminated Land

Part IIA defines the duties of Local Authorities in dealing with it. With the exception of situations of very high pollution risk, Part IIA places contaminated land responsibility on thee planning and redevelopment process. In situations where there is very high pollution risk direct action from the Local Authority is usually necessary.

PLANNING POLICY & GUIDANCE

The National Planning Policy Framework (NPPF) was redrafted in 2018. The policy provisions for land affected by contamination remain largely unchanged and are outlined below;

Paragraph 178 states;

> Planning policies and decisions should ensure that:
>
> a) 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);
>
> b) 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

> c) Adequate site investigation information, prepared by a competent person, is available to inform these assessments.

Paragraph 179 states;

> Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

RISK ASSESSMENT PROCESS (TIER 1)

Contaminated Land Risk Assessment is a technique that identifies and considers the associated risk, determines whether the risks are significant and whether action needs to be taken. The four main stages of risk assessment are:

Hazard Identification > Hazard Assessment > Risk Estimation > Risk Evaluation

CLR11 outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. The starting point of the risk assessment is to identify the context of the problem and the objectives of the process. Under CLR11, three tiers of risk assessment exist - Preliminary, Generic Quantitative and Detailed Quantitative.

Formulating and developing a conceptual model for the site is an important requirement of risk assessment, this supports the identification and assessment of pollutant linkages. Development of the conceptual model forms the main part of preliminary risk assessment, and the model is subsequently refined or revised as more information and understanding is obtained through the risk assessment process.

Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk.

The risk assessment process needs to take into account the degree of confidence required in decisions. Identification of uncertainties is an essential step in risk assessment. The likelihood of an event is classified on a four-point system using the following terms and definitions from CIRIA C552:

- **High likelihood**: There is a pollution linkage and an event appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution;

- **Likely**: There is a pollution linkage and all the elements are present and in the right place, which means it is probable that an event will occur. Circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term;

- **Low likelihood**: There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain even over a longer period such event would take place, and is less likely in the short term;

- **Unlikely**: There is a pollution linkage but circumstances are such that it is improbable the event would occur even in the long term.

The severity is also classified using a system based on CIRIA C552. The terms and definitions are:

- **Severe**: Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property.

  A short-term risk to a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);

  Examples – High concentrations of contaminant on surface of recreation area, major spillage of contaminants from site into controlled waters, explosion causing building to collapse;

- **Medium**: Chronic damage to human health ('significant harm' as defined in DETR 2000). Pollution of sensitive water resources. A significant change in a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);

  Examples - Concentrations of contaminants exceed the generic assessment criteria, leaching of contaminants from a site to a Principal or Secondary Aquifer, death of species within a designated nature reserve;

- **Mild**: Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures, services or the environment;

  Examples – Pollution of non-classified groundwater or damage to buildings rendering it unsafe to occupy.

- **Minor**: harm, not necessarily significant harm, which may result in financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by use of personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.

  Examples – Presence of contaminants at such concentrations PPE is required during site work, loss of plants in landscaping scheme or discolouration of concrete.

Once the likelihood and severity have been determined, a risk category can be assigned, based on the table below (CIRIA C552, 2001);

		CONSEQUENCES			
		SEVERE	MEDIUM	MILD	MINOR
PROBABILITY	HIGHLY LIKELY	VERY HIGH	HIGH	MODERATE	MODERATE / LOW
	LIKELY	HIGH	MODERATE	MODERATE / LOW	LOW
	LOW LIKELIHOOD	MODERATE	MODERATE / LOW	LOW	VERY LOW
	UNLIKELY	MODERATE / LOW	LOW	VERY LOW	VERY LOW

Definitions of the risk categories obtained from the above table are as follows together with an assessment of the further work that might be required:

- **Very high**: 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 is currently happening. This risk, if realised, could result in substantial liability. Urgent investigation and remediation are likely to be required;

- **High**: 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 is required and remedial works may be necessary in the short term and are likely over the longer term;

- **Moderate**: 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 would be more likely to be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term;

- **Low**: 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**: 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.

GROUND GAS GUIDANCE

Redevelopment on brownfield sites is an ever increasing occurrence, including those sites where a potential ground gas issue is present.

CIRIA C665 is the current guidance which gives up-to-date advice on all aspects of ground gas. It outlines good practice in investigation, the collection of relevant data and monitoring programmes in a risk-based approach to gas contaminated land. Two semi-quantitative methods are set out for the assessment of risk:

1. For low rise housing with a ventilated under floor void at minimum 150 mm (Boyle and Witherington);

2. For all other development types (Wilson and Card).

Both methods use the concept of Gas Screening Values (GSVs) to identify levels of risk. The mitigation and management of potentially unacceptable risk is described with reference to both passive and active systems of gas. Source removal is also discussed as an option. CIRIA C665 and the advice it contains has been prepared to be generally consistent with

CLR11 Model Procedures for the management of land contamination (Defra and Environment Agency, 2004a). The aim of CIRIA C665 is a consistent approach to decision making, particularly relating to the scope of protective design measures on a site specific basis.

Legislative Framework

CIRIA C665 provides technical guidance however also recognises the context into which the guidance has to be employed. Government policy is based upon a “suitable for use approach”, which is relevant to both the current and proposed future use of land. When considering the current use of land, Part IIA of the Environment Protection Act 1990 provides the regulatory regime.

The presence of hazardous ground gases could provide the "source" in a "pollutant linkage" which could lead the regulator to determine that considerable harm or there is a significant possibility of such harm being caused. Under such circumstances, the regulator would determine the land to be "contaminated land" under the provisions of the Act, setting out the process of remediation as described in the DETR Circular 02/2000 Statutory guidance on contaminated land (DETR, 2000a).

Frequency and Duration of Monitoring

The monitoring period for a specific site covers the "worst case" scenario. A "worst case" scenario will occur during falling atmospheric pressure and, in particular, weather conditions such as rainfall, frost and dry weather.

The benefits of the additional information and whether it is likely to change the scope of gas protection should be considered, as are the consequences of failing to characterise adequately pollutant linkages. Investigations concerned with soil gas are required to provide monitoring data sufficient to allow prediction of worst case conditions enabling the confident assessment of risk and subsequent design of appropriate gas protection schemes. Monitoring programmes should not be an academic exercise in data collection.

Below are matrices that will aid in determining an appropriate number of gas monitoring visits and the length of monitoring period.

Typical Periods of Monitoring & No. of Visits required

		Generation Potential of Source				
		Very Low	Low	Moderate	High	Very high
Sensitivity of Development	Low (Commercial)	1 Month 4 Visits	2 Months 6 Visits	3 Months 6 Visits	6 Months 12 Visits	12 Months 12 Visits
	Moderate (Flats)	2 Months 6 Visits	3 Months 6 Visits	6 Months 9 Visits	12 Months 12 Visits	24 Months + 24 visits +
	High (Residential with Gardens)	3 Months 6 Visits	6 Months 9 Visits	6 Months 12 Visits	12 Months 24 Visits	24 Months + 24 visits +

Note
1 NHBC guidance also recommends this period of monitoring (Boyle and Witherington, 2007).
2 There is no industry consent over "high", "medium" or "low" generation potential of source.
3 At least two sets of readings should be at low and falling atmospheric pressure (but not restricted to periods below <1000 mb) known as worst case conditions. Historical data can be used as part of the data set (Table 5.5b).
4 Recently released CL:AIR Technical Briefing (TB17) should be consulted (Ground Gas Monitoring and 'Worst-Case' Conditions) August 2018

It is recommended that newly installed monitoring wells are left for 24 hours to allow the soil gas to reach equilibrium. It should be recognised, however, that some soil gas regimes could take considerably longer (up to seven days). Interpretation of any initial readings should take this equilibrium process into account.

Appendix H: UXO Risk Map