



**Gaerwen Industrial Estate, Anglesey**  
Phase 1 Geo-environmental Assessment  
Desk Top Study  
A109869

Amber REI Holdings Ltd




March 2019

Prepared on behalf of WYG Environment Planning Transport Limited



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## EXECUTIVE SUMMARY

<b>The Site</b>	The site covers 12.72 hectares and is located on the outskirts of Gaerwen Industrial Estate on Anglesey, accessed via Lon Groes Road. The proposed development consists of twelve warehouse style commercial units with associated hardstanding and soft landscaping.
<b>Site History</b>	The site has historically been used as an abattoir. The earliest maps available (1888) show that the site remained undeveloped fields until between 1979 and 1985. During this period, various buildings and tanks were constructed in line with the current development. The site has remained in this configuration until the present day and was in use as an abattoir until 2013. From 1979, the area to the west of the site was also developed as various commercial units and industries forming the wider Gaerwen Industrial Estate.
<b>Geology</b>	The majority of the site is underlain by Dictamicton Till, with no recorded deposits in the central site area. The superficial deposits are underlain by bedrock from the Anglesey shear zone which is indicated by nearby boreholes to be at shallow depth in the area. Significant thickness of Made Ground deposits are not anticipated to be present.
<b>Hydrogeology and Hydrology</b>	The superficial deposits are classified as a Secondary Undifferentiated Aquifer and the bedrock is designated as a Secondary B Aquifer. The nearest watercourse is located 115m south of the site. There are no surface water or groundwater abstractions near to the site and the site is not located within a source protection zone. One minor pollution incident was recorded in 1998, 180m from the site and downstream of the abattoir.
<b>Radon</b>	The Envirocheck Report confirms that the site is in a high probability radon area as 5-10% of homes are above the action level.
<b>Unexploded Ordnance</b>	The site is located within a Low Risk Area with regards to Unexploded Ordnance (UXO).
<b>Environmental database search</b>	There are five recorded opencast mineral sites within 1km of the site, the nearest of which is located 145m north. One Integrated Pollution Prevention and Control measure is registered at the site under Welsh Country Foods, relating to its use as an abattoir. There are three Licensed Waste Management Facilities in the vicinity, the nearest of which is located 50m west.
<b>Preliminary geotechnical assessment</b>	The previous on-site development indicates the potential for inground obstructions in the near surface materials. Bedrock as encountered at shallow depths (<2m) in the two investigation locations summarised below.
<b>Preliminary ground contamination assessment</b>	Due to the nature of the previous development on the site potential risks to human health (future site users and construction workers) have been identified associated with the use of the site as an abattoir and the potential presence of asbestos containing materials at the ground surface and entrained within the near surface soils. Risks to the wider environment (groundwater, surface water) and adjacent properties have also been identified. Ground gas generation associated with infilled ground in adjacent properties and Made Ground on site is also considered possible.
<b>Conclusions and Recommendations</b>	Intrusive investigation will be required on the site to confirm ground conditions and to assess the presence of contamination in the near surface soils including potentially mobile contamination within these materials which may impact shallow perched groundwater or deeper water bodies within the underlying bedrock. Geotechnical investigation will also be required to provide information to aid foundation and pavement design for the proposed development. Any future ground investigation will also need to include ground gas monitoring to facilitate a CIRIA 665 compliant risk assessment for the site.



## 1.0 INTRODUCTION

### 1.1 Instruction

WYG Environment Planning Transport Ltd (WYG) was commissioned by Amber REI Holdings Ltd to undertake a Geo-Environmental Desk Top Study for a site known as Gaerwen Industrial Estate, Anglesey (known hereafter as “the site”).

The location of the site is shown on Figure 1.

### 1.2 Brief

The brief was to provide a Phase 1 Geo-environmental Desk Study assessment report including a preliminary qualitative geotechnical and contamination risk assessment and initial soil infiltration testing to support a planning application for development of the site for commercial end use.

### 1.3 Proposed Development

It is understood that the proposed development will involve construction of 14 no. commercial units, associated car parking and soft landscaping.

### 1.4 Report Scope

This report includes the following key elements:

- A record of a site visit and visual inspection walkover;
- A discussion of the current site status and key associated environmental influences observable by general visual inspection around the site;
- An historical site and area review, primarily referring to past editions of Ordnance Survey Maps;
- A discussion of the general expected ground and groundwater conditions within the topographical and area context referring to our own geological and hydrogeological maps library;
- Details of an Environmental database search (Envirocheck™ report) of key relevant agencies, including Local and Statutory Authorities such as the Natural Resources Wales;



- A geotechnical and ground contamination assessment discussing the results of the research above not only concerning potential on-site conditions/constraints and contamination but also an overview of the potential for migration onto or off-site with respect to the surrounding neighbouring sites;
- A baseline UXO risk assessment using on-line databases to classify the site with regards to UXO risk;
- Development of a preliminary conceptual site model;
- Preliminary geotechnical hazard assessment;
- Qualitative ground contamination risk assessment (compliant with CIRIA 552 (CIRIA, 2001) methodology);
- Records of the soil infiltration testing undertaken in two locations on the site including trial pit logs and soil infiltration calculations.
- An executive summary of the report to allow a rapid, layman's overview.

## 1.5 Limitations

The recommendations and opinions expressed in this report are based on information obtained as part of the desk study or provided by others. Information provided from other sources is taken in good faith and WYG cannot guarantee its accuracy.

This report is subject to the report conditions presented in Appendix A.

The information contained in this report is intended for the use of Amber REI Holdings Ltd and WYG can take no responsibility for the use of this information by any third party or for uses other than that described in this report or detailed within the terms of our engagement.



## 2.0 SITE INFORMATION

### 2.1 Location

The site is located on the outskirts of Gaerwen Industrial Estate, near Gaerwen, Anglesey. The site is approximately 12.72ha in area and is centred on National Grid Reference (NGR) 247820, 371420. The approximate postcode of the site is LL60 6HR.

A site location plan is presented in Figure 1.

### 2.2 General Area Context

**Table 1 - Surrounding land uses**

	Description
North	Commercial units to the north-west, a school and residential buildings to the north-east.
East	Fields and residential/commercial buildings beyond.
South	Undeveloped land consisting of a mixture of agricultural and arable farming fields.
West	Commercial units forming Gaerwen Industrial Estate.

### 2.3 Site Description

A site walkover inspection was undertaken by WYG on 7<sup>th</sup> February 2019. A series of photographs are presented in photo plates at the end of this report and are cross referenced in the following section. The general site layout and photograph locations are shown in Figure 2.

#### 2.3.1 Current Site Usage

The site is occupied by a disused abattoir surrounded by agricultural fields separated with fences. The site is not currently in use although full-time security is present.

#### 2.3.2 Access and Boundaries

The site can be accessed via the entrance gate to the north leading from Lon Groes Road. The access road (Photo 1) leads around the former abattoir buildings to a loading area to the south. The surrounding fields are separated from the road with tall metal fencing and can be accessed through metal gates. The site is bounded by hedgerows to the east, west and south and by Lon Groes Road to the north.

#### 2.3.3 Topography

The site slopes gently downwards to the southeast, with the building area relatively flat and level. Along the south-east boundary, the ground slopes steeply downwards towards the

boundary hedge.

#### **2.3.4 Ground Cover and Vegetation**

The fields consist of grass cover with longer grass and boggy ground in the eastern corner. The building area consists of concrete and asphalt hardstanding with asphalt car park area to the east of the road.

#### **2.3.5 Drainage**

Due to the topography of the site and the presence of a stagnant stream/drainage ditch along the eastern boundary, it is assumed drainage direction is towards the east or south-east.

#### **2.3.6 Services**

Service drawings obtained from utility providers indicate that underground electricity cables are present on site leading from a substation at the western boundary, adjacent to the road into the abattoir buildings. Another electricity cable is shown adjacent to the building along the south of the site. Openreach telecommunication cables are shown along the road connecting to the buildings.

Overhead cables cross the southern part of the site, to the south of the former abattoir buildings.

#### **2.3.7 On-Site Structures and Fuel Tanks**

There are several disused buildings on site relating to the site's historical use as an abattoir. The gated private road dissecting the site leads to three single-storey office buildings near the abattoir entrance and security office. Behind these, to the south, there are several large warehouse style buildings surrounded by loading yards. These buildings are in poor repair and parts of the roof have fallen onto the hardstanding.

A disused waste water treatment system is located in the southern corner of the site consisting of four circular settlement tanks and associated infrastructure. It was not possible to assess the content of the tanks during the site inspection. To the south-west of the buildings are several gas storage canisters located within a secure storage area surrounded by steel security fencing (Photo 6) and empty water storage containers. Towards the eastern boundary of the site are two large circular water tanks (Photo 5). Across the road to the south there are two large tanks assumed to be for the bulk storage of fuel (Photo 8) these are located within a concrete bund and securely fenced to prevent access and marked as highly flammable. A smaller domestic style oil tank is also recorded adjacent to the northernmost buildings. There are two smaller water storage tanks located adjacent to the western office building and eastern office building respectively.



### **2.3.8 Electrical Substations**

An electricity substation is located at the western edge of the central field. There are multiple transformers and electrical infrastructure adjacent to the buildings in the centre of the site.

### **2.3.9 Asbestos Containing Materials**

Fragments of potential asbestos containing material (ACM) were identified on the hardstanding to the east and south of the buildings. It is suspected this has fallen from the roof of the adjacent buildings. It was advised by the security personnel on site that the roof is in an unstable condition.

### **2.3.10 Signs of Contamination**

No visible evidence of contamination (with the exception of asbestos) was observed on site.

## **2.4 Previous Investigations**

No previous geo-environmental assessment reports relating to the site have been provided to WYG for review as part of this desk-based study.

## 3.0 GEOLOGY, HYDROGEOLOGY, HYDROLOGY AND RADON

### 3.1 Geology

Details of the geology underlying the site have been obtained from the following sources:

- British Geological Survey (BGS) Sheet No. 73 (Anglesey, South of Holyhead Island, Beaumaris) Solid Edition (Old Series) 1:63,000 scale;
- BGS website (British Geological Survey, 2018);
- Environmental database (Envirocheck™) presented in Appendix B;
- BR211 Indicative Radon Mapping (Scivyer, 2015);
- Coal Authority Interactive Mapper (The Coal Authority, 2018);

#### 3.1.1 Made Ground

According to the BGS map, Made Ground deposits are not present on site, however, given the previous development on the site, it is anticipated that localised areas of Made Ground may be present on the site, especially within the vicinity of the former abattoir buildings.

#### 3.1.2 Superficial Geology

The majority of the site, with the exception of the central part of the site (site of the former abattoir) is underlain by Dictamicton Till. There are no recorded deposits in the central site area.

Further information of the Dictamicton Till is not provided by the BGS, however, it is anticipated to be predominantly cohesive in nature with varying levels of granular content.

#### 3.1.3 Solid Geology

The superficial deposits are underlain by deposits from the Central Anglesey Shear Zone and are recorded as consisting of schist and mica. Historical boreholes in the vicinity of the site (adjacent to the A5, circa 200m north of the site) indicate bedrock to be approximately 5-6m bgl.

#### 3.1.4 Historical Borehole Logs

British Geological Survey (BGS) logs have been referred to for information only. A summary of reported ground conditions is presented in the table below with copies of the borehole logs presented in Appendix C.

**Table 2 – Summary of BGS Borehole Logs**

Reference Number	Hole Type and Depth	Distance and Direction from Site	Details	
			Depth (m)	Stratum
SH47SE2/A	Exploratory borehole to a depth of 5.86m	205m north	0.00 – 0.90	Silty Topsoil
			0.90 – 4.00	Sandy silty Clay, increasing in stiffness
			4.00 – 4.80	Silty Sand with mudstone and metamorphic rock fragments
			4.80 – 5.86	Mudstone and metamorphic rock fragments
SH47SE2/B	Exploratory borehole to a depth of 6.28m	205m north	0.00 – 0.65	Clayey Topsoil
			0.65 – 1.95	Sandy silty Clay, increasing in stiffness
			1.95 – 2.90	Soft sandy gravelly Clay
			2.90 – 4.10	Stiff sandy silty Clay
			4.10 – 5.10	Silty Sand with mudstone and metamorphic rock fragments
5.10 – 6.28	Mudstone and metamorphic rock fragments			

### 3.1.5 BGS Soil Chemistry

The Envirocheck Report also provides Urban Soil Chemistry Averages for the site (source: Urban Soil and Soil Chemistry data provided by the British Geological Survey). The information is summarised in the table below.

**Table 3 – Urban Soil Chemistry Averages**

Determinand	Soil Concentration Range	
	Minimum (mg/kg)	Max (mg.kg)
Arsenic	<15	
Cadmium	<1.8	
Chromium	60	90
Lead	<100	
Nickel	15	30

## 3.2 Hydrogeology

### 3.2.1 Aquifer Classification

The bedrock of the Anglesey Shear Zone is designated as a Secondary B Aquifer. These are predominantly lower permeability layers which may store and 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 former non-aquifers.

The Superficial Deposits (where present) are classified as a Secondary Undifferentiated Aquifer. This has been assigned in cases where it has not been possible to attribute either a Secondary A or B aquifer to the soil type due to the variable characteristics. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

### 3.2.2 Groundwater Vulnerability

Guidance released by the EA (Environment Agency, March 2017) states that activities that have the potential to affect the quality or quantity of groundwater must prevent groundwater pollution. All groundwater is vulnerable to pollution, and some geological formations are more vulnerable than others. The risks of groundwater pollution from any given activity depend in part on:

- The physical, chemical and biological properties of the underlying soil and rocks;
- Depth and quality of soil;
- The presence of glacial sediment and other materials – known as 'drift' deposits; and,
- Depth of the unsaturated zone.

All of the above affect how groundwater is more or less vulnerable to pollution, with type of vulnerability generally one of the following:

- Intrinsic vulnerability – this relates to the physical characteristics, it includes soil type, presence of superficial soils, or rock type; and,
- Specific vulnerability – this relates to the effect of the proposed activity including any contaminant and consequent risk to groundwater.

A review of the Groundwater Vulnerability Maps for Wales has revealed that the Superficial Deposits are categorised as a non-aquifer. Non-aquifers are defined as being "*negligibly permeable*".

### 3.2.3 Groundwater Source Protection Zones

The EA defines groundwater Source Protection Zones (SPZs) around identified abstractions to aid the assessment of risk to groundwater or abstraction sources from development. SPZs have three subdivisions and bespoke SPZs are defined for all major abstraction sources intended for

human consumption or food use, e.g. boreholes and springs. These sub-divisions are defined as follows:

- SPZ1 – Inner protection zone - defined as the 50-day travel time from any point below the water table to the abstraction source. This zone has a minimum radius of 50 metres;
- SPZ2 – Outer protection zone - defined by a 400-day travel time from a point below the water table. This zone has a minimum radius of 250 or 500 metres around the abstraction source, depending on the size of the abstraction;
- SPZ3 – Source catchment protection zone - defined as the area around an abstraction source within which all groundwater recharge is presumed to be discharged at the abstraction source.

The site is not shown to be situated within an EA defined groundwater SPZ, nor are there any source protection zones within 1km of the site.

#### **3.2.4 Depth to Groundwater and Anticipated Groundwater Flow Direction**

Groundwater was not encountered in any nearby historical boreholes. The nearest water feature is to the south of the site, therefore, it is assumed (taking in account topography) that groundwater flow will be in a south to south-easterly direction.

#### **3.2.5 Groundwater Abstractions**

There are no groundwater abstractions recorded within 250m of the site in the Environmental Database report (Envirocheck™).

### **3.3 Hydrology**

Details of the hydrology of the area have been obtained from the following sources:

- MAGIC interactive mapping website (DEFRA, 2018); and,
- Environmental database (Envirocheck™).

#### **3.3.1 Watercourses**

The nearest watercourse is located 115m south of the site, an inland river in the catchment of Braint Cadnant Lleiniog.

### 3.3.2 Surface Water Abstractions

There are no surface water abstractions within 250m of the site boundary.

### 3.3.3 Discharge Consents

There are no active surface water discharge consents recorded within 250m of the site.

### 3.3.4 Pollution Incidents and Prosecutions

A summary of recorded Pollution Incidents and Prosecutions are presented in the table below.

**Table 4 – Summary of Pollution Incidents and Prosecutions within 250m of the site.**

Location	Details
180m south	Downstream of abattoir, cause unknown (1998). Category 3 – Minor Incident.

## 3.4 Radon

The BRE document 211 (Scivyer, 2015) mapping coverage for the site area was consulted and indicates that the site is located within an area where basic radon protection measures may be required for new developments on the site. This statement is supported by the Envirocheck Report (Appendix B) which confirms that the site is in a high probability radon area as 5-10% of homes are above the action level.

## 3.5 Historical Mining

According to the Coal Authority Interactive Viewer (The Coal Authority, 2018) the site is not located within a Coal Mining Reporting Area.

## 3.6 BGS Recorded Mineral Sites

With reference to the Environmental Database (Envirocheck™) and the BGS Geoindex database the following BGS recorded mineral site are recorded within 1km of the site.



**Table 5 – Summary of BGS Recorded Mineral Sites within 1km of the site.**

Site Name	Reference and Status	Type	Geology	Commodity	Distance and Direction from Site
Moelfryn	24866 Ceased	Opencast	Central Anglesey Shear Zone, Berw Shear Zone	Igneous and Metamorphic rock	145m north
Bron-Heulog	24864 Ceased	Opencast	Unnamed Dyke	Igneous and Metamorphic rock	310m north-west
Gaerwen	24863 Ceased	Opencast	Central Anglesey Shear Zone, Berw Shear Zone	Igneous and Metamorphic rock	360m north
Parc Y Coed	24862 Ceased	Opencast	Unnamed Igneous Intrusion	Igneous and Metamorphic rock	570m north
Nant-Graig	24865 Ceased	Opencast	Central Anglesey Shear Zone, Berw Shear Zone	Igneous and Metamorphic rock	940m west



## 4.0 UNEXPLODED ORDNANCE

Based on freely available mapping data from Zetica UXO (Zetica UXO, 2008), the site is located within a Low Risk Area with regards to Unexploded Ordnance (UXO). A 'Low Risk' area is defined by Zetica as:

*'Low risk regions are those with a bomb density of up to 10 bombs per 1000 acres. These areas are considered to have a significant but low UXB risk. In general, further action to mitigate the risk is considered prudent, although not essential. Care is required when assessing the risk for specific sites where the risk may be higher because of local wartime activity.'*

## 5.0 SITE HISTORY

### 5.1 Introduction

The historical development of the site and surrounding area has been assessed using information available from historical Ordnance Survey (OS) maps within the Envirocheck Report for the site which is presented in Appendix B of this report.

In the context of the summary of historical development of the surrounding area, the descriptions are limited to within approximately 500m of the site boundary, unless specified in the following section.

### 5.2 Site History

#### 5.2.1 Detailed Analysis of Site History

The table below provides a detailed account of the review of available OS mapping coverage and historical aerial imagery for the site and general area dating back to 1888.

**Table 6 – Summary of Historical Data**

Map Date & Map Scale	Within Site Boundary	Surrounding Area
1888 (1:10,560) 1889 (1:2,500)	The site is shown as agricultural land with a footpath crossing it east to west across the central part of the site. An access track is marked running north to south towards a farm (Garey Wian) immediately to the south of the site.	The surrounding area is predominantly agricultural in nature, with a farm (Garey Wian) immediately to the south of the site. The settlement of Gaerwen is shown approximately 350m to the north.
1900 (1:2,500) 1901 (1:10,560)	There are no significant changes in land use recorded on site.	There are no significant changes in land use in the surrounding area. The farm to the south is now recorded as Carey Wian.
1920 (1:2,500) 1926 (1:10,560)	There are no significant changes in land use recorded on site.	There are no significant changes in land use in the surrounding area.
1953 (1:10,560)	There are no significant changes in land use recorded on site.	There are no significant changes in land use in the surrounding area.
1963 (1:10,000)	There are no significant changes in land use recorded on site.	Further residential development is recorded within Gaerwen 200m to the north of the site.
1969-1970 (1:2,500)	Overhead electricity cables are	There are no significant changes in

Map Date & Map Scale	Within Site Boundary	Surrounding Area
1972 (1:10,000)	recorded crossing the southern part of the site.	land use in the surrounding area.
1979-1985 (1:2,500)	A number of buildings and tanks are recorded as an abattoir on the site along with four circular tanks in a layout which is consistent with the current site.	Gaerwen Industrial Estate is now marked approximately 100m west of the site boundary, sites include a brick works and timber yard.
1991 (1:10,000) 1994 (1:2,500)	There are no significant changes in land use recorded on site.	There are no significant changes in land use in the surrounding area.
2000 (1:10,000)	There are no significant changes in land use recorded on site.	There are no significant changes in land use in the surrounding area.
2006 (1:10,000)	There are no significant changes in land use recorded on site.	There are no significant changes in land use in the surrounding area.
2019 (1:10,000)	There are no significant changes in land use recorded on site.	There are no significant changes in land use in the surrounding area.

### 5.2.2 Summary of Site History

The earliest available mapping (1888) indicates the site remained undeveloped fields (potentially farmland) until between 1979 and 1985. During this period, various buildings and tanks were constructed relating to the abattoir. The site has remained in this configuration until the present day. An internet search and review of news extracts has indicated that the site was in use as an abattoir to process lambs until April 2013 when it was closed by operators Welsh Country Foods. From 1979, the area to the west of the site was also developed as various commercial units and industries forming the wider Gaerwen Industrial Estate.



## 6.0 ENVIRONMENTAL DATABASE SEARCH

### 6.1 Introduction

Regulatory authority information relevant to the site and its surroundings has been obtained from the undertaking of an environmental database search (Envirocheck™). The information is summarised below, and the environmental database records are enclosed in Appendix B. Distances stated are approximate and are taken from the boundary of the site to the database recorded entries.

The following summary is generally limited to locations within 250m of the site boundaries unless it is considered that installations or activities beyond that range could potentially have an impact on the site or be affected by the redevelopment of the site.

### 6.2 Pollution Controls

The Envirocheck report identifies the following Pollution Controls within 250m of the site:

**Table 7 – Summary of Pollution Controls within 250m of the Site**

Type	Details
Integrated Pollution Prevention and Controls	Farmer's Choice (Anglesey) Ltd, Gaerwen Industrial Estate – on site, dated 23 <sup>rd</sup> November 2015. Wales & West England Ltd, Welsh Country Foods – on site, dated 26 <sup>th</sup> March 2013, associated with the disposal of >50 T/day non-hazardous waste involving biological treatment (slaughtering animals)
Local Authority Pollution Prevention and Controls	Waste Hygenics Ltd, - on site. Local Authority air Quality Control associated with clinical waste incineration <1T/hr. (Revoked). Mona Precast (Anglesey) Ltd – Gaerwen Works, Gaerwen Industrial Estate – 140m west, associated with blending, packing and use of bulk cement.

### 6.3 Waste

A summary of records pertaining to waste disposal, management and transfer facilities are presented in the table below.

**Table 8- Summary of Waste Facilities within 250m of the Site**

Facility Type	Location	Details
Licensed Waste Management Facility	50m west	Green Skips Environmental Ltd Gaerwen Industrial Estate
	60m north-west	Phoenix Metals and Colin Davies Non-ferrous Metals Gaerwen
	65m north-west and 80m west	Cymru Lan Gaerwen Industrial Estate
Registered Waste Treatment or Disposal Sites	5m north	Phoenix Metals and Colin Davies Non-ferrous
Active Registered Waste Transfer Stations	95m west	Green Skips Environmental Ltd Gaerwen Industrial Estate

## 6.4 Hazardous Substances

The following table outlines records relating to the storage and use of Hazardous Substances within 250m of the site boundary.

**Table 9 – Summary of Hazardous Substances within 250m of the Site**

Type	Details
Control of Major Hazards Sites (COMAH)	Cambrian Gas Ltd, Gaerwen Industrial Estate – 85m north-west

## 6.5 Environmentally Sensitive Areas

**Table 10 – Summary of Environmentally Sensitive Areas**

Designation	Location and Name	Details
Environmentally Sensitive Area	Ynys Mon	On site – decommissioned

## 6.6 Flooding

The absence or presence of flooding potential at the site is summarised in the table below.

**Table 11 - Summary of Flooding Potential**

Designation	On Site	Detail
Flooding at Surface (from Groundwater)	Yes	Potential for groundwater flooding to occur at surface
Flooding below Ground Level (from Groundwater)	Yes	Potential for groundwater flooding of property situated below ground level
Flooding from Surface Waters	No	-

## 6.7 Industrial Land Use

The following section outlines the surrounding industrial land use within 250m and considered to be relevant to the site and the proposed development.

**Table 12 - Summary of Industrial Land Use**

Land Use	Detail	Location
Contemporary Trade Directory Entries	Welsh Country Foods Ltd, Gaerwen Industrial Estate Meat Product Manufacturers & Wholesalers – no longer active	On site
Active Contemporary Trade Directory Entries (surrounding area)	Anglesey Commercial Spares, Gaerwen Industrial Estate Commercial Vehicle Servicing, Repairs, Parts & Accessories	30m north
	N R Evans, Gaerwen Industrial Estate Road Haulage Services	40m north-west
	C Davies Non Ferrous Metals Scrap Metal Merchants	40m north-west
	Phoenix Metals & Demolition Ltd, Gaerwen Industrial Estate Scrap Metal Merchants	40m north-west
	Green Skips Environmental Ltd, Gaerwen Industrial Estate Chemical Recycling & Disposal Services	85m north
	Cam Gas, Gaerwen Industrial Estate Gas Suppliers	85m north-west
	Cymru Lan Ltd, Gaerwen Industrial Estate Reclaiming – Waste Products	85m west
	Eric Lloyd Commercials, Gaerwen Industrial Estate Commercial Vehicle Screening, Repairs, Parts & Accessories	85m north-west
	HCS, Gaerwen Industrial Estate Central Heating Supplies & Equipment	95m north
	Laserpack, Gaerwen Industrial Estate Boxes & Cartons	100m north
	Mona Precast Anglesey Ltd, Gaerwen Industrial Estate Concrete Products	140m west
	Huws Gray, Gaerwen Industrial Estate Builder's Merchants	145m north
	Sbarion, Gaerwen Industrial Estate Hydraulic Equipment & Accessories – Sales & Service	150 north
	Plas Farm, Gaerwen Industrial Estate Ice Cream Manufacturers	150m north-west
	C C Paints, Gaerwen Industrial Estate Car Paint & Lacquer Manufacturers & Suppliers	155m north-west
	Menai Cleaning Services Ltd, Gaerwen Industrial Estate Commercial Cleaning Services	185m north-west
	Joloda, Gaerwen Industrial Estate Materials Handling Equipment	190m north
Biffa, Gaerwen Industrial Estate Waste Disposal Services	210m north-west	
Cybi Building Plastics Ltd, Gaerwen Industrial Estate Cladding Suppliers & Installers	215m north	
G D Jones, Gaerwen Industrial Estate Oil Fuel Distributors	220m north	

Land Use	Detail	Location
	A & R Tyres, Gaerwen Industrial Estate Tyre Dealers	220m north
	Blue Garage, Gaerwen Industrial Estate Garage Services	230m north
	Pearsons Farm Supplies Ltd, Gaerwen Industrial Estate Printers	220m north-west
	Emyr Evans, Gaerwen Industrial Estate Agricultural Machinery – Sales & Service	250m north-west

## 6.8 Summary of Environmental Setting

There are no recorded pollution incidents, no landfills within 250m and no fuel station entries within 250m of the site. There are a number of contemporary trade entries relating to the nearby industrial estate.

Other than the potential for groundwater flooding, there are no significant nearby activities impacting the site.



## 7.0 SOIL INFILTRATION TESTING

### 7.1 Scope of Works

Two soil infiltration tests were undertaken within machine excavated inspection pits to assess the feasibility of the use of soakaway drainage within future development. The site works were undertaken by WYG on the 11<sup>th</sup> February 2019. A summary of ground conditions encountered is presented below, with the soakaway test data and trial pit logs presented in Appendix D.

### 7.2 Ground Conditions Encountered

Ground conditions encountered in the two trial pits are summarised in the following table with trial pit logs presented in Appendix D.

**Table 13 – Summary of Ground Conditions Encountered**

Location	Topsoil (m bgl)	Superficial Deposits (m bgl)	Bedrock (m bgl)
SA1	GL – 0.59	0.59 – 1.66	1.66
SA2	GL – 0.39	0.39 – 1.75	1.75

#### 7.2.1 Topsoil

Topsoil was encountered in both locations to a maximum thickness of 0.59m. It was described as dark brown soft silty topsoil with low boulder content.

#### 7.2.2 Superficial Deposits / Weathered Bedrock

Superficial deposits, or possible weathered bedrock were encountered in both locations and were described as light brown very gravelly clayey sand. Gravel is fine to coarse angular to sub-angular limestone, sandstone, shale and flint. A high cobble and boulder content was also noted described as limestone, shale and mudstone.

Within SA2, a layer of light brown, sandy gravel was encountered. The sand is described as coarse and gravel as fine to coarse angular to sub-angular limestone, sandstone, shale and flint.



### 7.3 Test Results

**Table 14 – Summary of Soakaway Test Results**

Location	Test Number	Hydraulic Conductivity (m/sec)
SA01	1	$2.5 \times 10^{-5}$ m/s*
SA02	1	$4.04 \times 10^{-7}$ m/s*

\* Test did not reach 25% effective depth. Infiltration rate calculated from linear extrapolation.

## 8.0 PRELIMINARY GEOTECHNICAL ASSESSMENT

Based on the information identified in the preceding sections, the table below summarises the anticipated ground conditions and associated geotechnical assessment for the site, including highlighting the potential constraints for future development. Actual ground conditions will need to be confirmed through ground investigation in due course.

### 8.1 Anticipated Ground Conditions

The following ground conditions are anticipated underlying the site:

- Localised Made Ground
- Diamicton Till
- Anglesey Shear Zone Deposits

#### 8.1.1 Shrinking and Swelling Clay

Given the anticipated ground conditions, the potential for clays with a high swelling potential is considered to be limited.

#### 8.1.2 Running Sands

Given the anticipated ground conditions, the potential for running sands is considered as low.

#### 8.1.3 Dissolution Features

Given the anticipated ground conditions, the ground dissolution potential is classified as limited on the site.

#### 8.1.4 Compressible Ground

Given the anticipated ground conditions, the potential for compressible ground is classified as low.

### 8.2 Slope Stability

The site was noted to be predominantly flat during the site walkover and as such no issues in relation to slope stability are anticipated.

### 8.3 Enabling Works

### **8.3.1 Anticipated Cut and Fill**

The site is predominantly flat and as such significant cut and fill is considered unlikely to be required to facilitate the proposed development.

### **8.3.2 Ground Improvement**

Given the anticipated ground conditions, significant ground improvement works are not anticipated.

## **8.4 Anticipated Foundation Requirements**

### **8.4.1 Foundations**

Given the anticipated ground conditions it is considered likely that traditional shallow foundations may be suitable within the context of the proposed development. Suitable founding strata are likely to be identified within the glacial till, where present and/or underlying bedrock.

### **8.4.2 Pavements**

Based on the assumed ground conditions, ground improvement may be required prior to the construction of pavements, especially within any areas of significant Made Ground.

## **8.5 Temporary Works**

### **8.5.1 Excavations**

Due to the anticipated ground conditions, excavations may exhibit some degree of instability and may require battering or site protection to facilitate the proposed development.

### **8.5.2 Groundwater**

Shallow groundwater is not anticipated on the site.

### **8.5.3 Inground Obstructions**

Due to the previous developments on the site, inground obstructions are anticipated in the area of the site occupied by the abattoir buildings and will require excavation prior to development.

## **8.6 Drainage**

The shallow soils underlying the site exhibited low permeability during soakaway testing. In addition, areas of boggy ground were noted across the western area of the site during the site walkover and standing water was present in the adjacent field south of the site boundary.



## 8.7 Potential Constraints

Within the context of this geotechnical assessment and based on the information above, the following potential constraints have been identified with respect to the proposed development.

- Potential for inground obstructions – hardstanding and various buildings present;
- Shallow bedrock;
- Variable drainage rates across the site.

It should, however, be noted that the actual ground conditions will need to be confirmed through intrusive investigation and laboratory testing in due course to inform foundation design.

## 9.0 SITE CONCEPTUAL MODEL AND PRELIMINARY GROUND CONTAMINATION RISK ASSESSMENT

### 9.1 Overview

The information presented in the previous sections of this report have been collated and evaluated to establish an initial qualitative risk assessment for the site. A conceptual model of the site has been generated based on information derived from this Phase 1 Geo-environmental Assessment, supplemented by information attained during the WYG site walkover.

The site has been considered with regard to current UK legislation and guidance, namely Part 2A of the Environmental Protection Act 1990 and the Contaminated Land (England) Regulations 2000 and in accordance with current UK good practice guidelines (for example BS10175:2011).

In general, ground contamination can occur through several causes, particularly from historical operations and activities. Contamination can result from either on-site sources or from on-site migration from off-site sources, leading to long term liabilities under recent legislation for any site owner.

For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

- Source, i.e. a substance that is capable of causing pollution or harm;
- Pathway, i.e. a route by which the contaminant can reach a target; and
- Receptor (target), i.e. something which could be adversely affected by the contaminant.

If one of these elements is absent there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

### 9.2 Current Site Usage and Proposed Development

The site is currently not in use, however historically it has been used as a commercial abattoir. The proposed development consists of 14 no. commercial units with associated yards, soft landscaping and access roads.

### 9.3 Conceptual Site Model

The key source, pathways and receptor model is outlined below within the context of potential development of the site.

As the proposed development is for a commercial and purpose, the following risk assessment is undertaken in the context of a commercial end use scenario.

#### 9.3.1 Potential Sources of Contamination

The main potential sources of contamination on the site are associated with existing features as well as historical land uses on the site as summarised below.

**Table 15 -- Potential Sources of Contamination**

Potential Hazard	Associated Contaminants	Does hazard form a plausible pollutant linkage?
Contaminants associated with former use as abattoir.	Heavy metals, hydrocarbons, PAHs, disinfectants, solvents, (biological waste), biocides, pathogens.	Yes – long term use as abattoir. s.
	Asbestos containing materials	Yes – possibility for ACM to be present associated with development, including entrained with Made Ground. Loose material suspected of containing asbestos (cement bound sheeting) was noted at the surface during the site inspection.
Bulk storage of fuel	Hydrocarbons	Yes – although tanks are located within concrete bunds, no information has been provided regarding the ongoing maintenance of the tanks.
Electrical substation	PCBs	No – age of ESS is unknown, however it is located within a secure compound and unlikely to be disturbed during the development process. Immobility of PCBs indicate that contamination is likely to be localised.
Waste water tanks	Heavy metals, hydrocarbons, PAHs	Yes – unknown if still containing waste. Previous pollution incident.
Infilled Land, including former brick works (off site).	Ground gas	Yes – albeit limited scale, the potential for land gas generation cannot be discounted.
Potentially mobile contamination associated with adjacent industrial estate.	Heavy metals, hydrocarbons, PAH, solvents, VOCs	Yes – long-term use of adjoining site within the context of an industrial estate, including timber yard, former brick works, light industry, vehicle servicing and scrap



Potential Hazard	Associated Contaminants	Does hazard form a plausible pollutant linkage?
		merchants.
Radon	Radon	Yes – site is situated in an area where between 5% and 10% of buildings are above the action level.

### 9.3.2 Potential Contaminant Pathways

The following contaminant pathways are considered to potentially be active based on the current site use and proposed development:

#### Human Exposure Pathways

- Direct dermal contact or ingestion of soils, or inhalation of dust and/or vapours (i.e. human interaction with surface and sub-surface materials).

#### Environmental Pathways

- Lateral and vertical migration of groundwater through permeable sub-surface materials and/ or preferential pathways;
- Leaching to surface water run-off/drainage;
- The migration and accumulation of gases or vapours through permeable sub-surface materials and/ or preferential pathways.

### 9.3.3 Potential Receptors at Risk

The following potential receptors have been identified:

#### Human Health

- Future site users (commercial);
- Site workers during the redevelopment of the site; and,
- Adjacent site users (residential/commercial).

#### Wider Environment

- Secondary Undifferentiated Aquifer within superficial deposits;
- Secondary B Aquifer within bedrock;
- Surface waters – nearby stream to the south, within Braint Cadnant Lleiniog catchment;





- Building infrastructure and supply pipes; and,
- Adjacent land users and properties.

#### **9.4 Ground Conditions Risk Assessment**

The source, pathway, receptor linkages identified in the previous section are outlined and a qualitative risk assessment shown in the following tables.

The risk assessment considers the site within an area context and assesses potential risks to identified receptors in relation to the existing site setting and the proposed development. CIRIA C552 has been used to define the risk rating presented in the Qualitative Risk Assessment matrix, the methodology for which is presented in Appendix E.



**Table 16- CIRIA C552 Qualitative Risk Assessment**

Source	Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Potential risk management requirements
Contaminants associated with abattoir, /waste water tanks	Ingestion/dermal contact, inhalation of dust/vapours	Future site users (commercial)	Medium	Likely	<b>Moderate Risk</b>	<p>Due to the historical use of the site as an abattoir and the bulk storage of abattoir waste, and waste water on the site, ground investigation will be required to confirm ground conditions and to assess the potential presence of contamination on the site.</p> <p>The scope of the ground investigation should include an assessment of risks to future site users (within a commercial / industrial context) and also consider the presence of potentially mobile contamination which may impact underlying groundwater bodies, surface water features and neighbouring properties.</p> <p>The risk of pathogens being present on land associated with animal processing generally diminishes with time, however, spore forming bacteria such as tetanus and anthrax may remain viable in soils for many years. Given the age of the plant it is considered unlikely that these bacteria would be present, however screening for the presence of pathogens should be considered.</p>
		Construction workers	Medium	Likely	<b>Moderate Risk</b>	
	Leaching and lateral / vertical migration	Groundwater (Secondary B/Undifferentiated aquifers)	Mild	Likely	<b>Moderate / Low Risk</b>	
		Surface water	Mild	Likely	<b>Moderate / Low Risk</b>	
	Leaching and lateral migration	Building infrastructure and supply pipes	Mild	Low Likelihood	<b>Low Risk</b>	
		Adjacent land users and properties	Mild	Low Likelihood	<b>Low Risk</b>	



Bulk storage of fuel	Ingestion/dermal contact, inhalation of dust/vapours	Future site users (commercial)	Medium	Likely	<b>Moderate Risk</b>	<p>Whilst the on site tanks appear to be in good condition and the two largest tanks are located within a concrete bund no maintenance or spill records have been provided regarding their presence on site.</p> <p>Ground investigation will be required in these locations in due course to confirm ground conditions.</p>
		Construction workers	Medium	Likely	<b>Moderate Risk</b>	
	Leaching and lateral / vertical migration	Groundwater (Secondary B/Undifferentiated aquifers)	Mild	Likely	<b>Moderate / Low Risk</b>	
		Surface water	Mild	Likely	<b>Moderate / Low Risk</b>	
	Leaching and lateral migration	Building infrastructure and supply pipes	Mild	Low Likelihood	<b>Low Risk</b>	
		Adjacent land users and properties	Mild	Low Likelihood	<b>Low Risk</b>	
Asbestos	Inhalation	Future site users (commercial)	Medium	Likely	<b>Moderate Risk</b>	<p>Asbestos containing materials were identified at the ground surface during the site inspection and given the nature and age of the current development asbestos containing materials are anticipated within the building fabric and potentially within near surface made ground deposits. Any future ground investigation should include the screening of near surface soils for asbestos.</p>
		Construction workers	Medium	Likely	<b>Moderate Risk</b>	
Landgas generated from off-site infilled land	Migration and accumulation in enclosed spaces	Future site users (commercial)	Medium	Low likelihood	<b>Moderate / Low Risk</b>	<p>The infilled ground associated with the adjacent industrial estate poses a potential source of ground gas, as such ground gas monitoring will be required as part of any future site investigation in line with the recommendations of CIRIA 665.</p>



Potentially mobile contamination associated with adjacent industrial estate	Lateral migration	Groundwater (Secondary B/Undifferentiated aquifers)	Mild	Low Likelihood	<b>Low Risk</b>	Shallow groundwater was not encountered during the site investigation and given the limited extent of superficial deposits across the site, persistent perched groundwater is not anticipated. Any future ground investigation should consider contamination testing of any groundwater encountered on site.
Radon	Migration and accumulation in enclosed spaces	Future site users (commercial)	Medium	Likely	<b>Moderate Risk</b>	The site is located in an area where between 55 and 10% of buildings are above the action level. As such basic radon protection measures are required within new developments on the site.

## 10.0 CONCLUSIONS AND RECOMMENDATIONS

### 10.1 Conclusions

#### 10.1.1 Ground Contamination

Due to the historical use of the site as an abattoir and the bulk storage of fuel and waste water on the site, ground investigation will be required to confirm ground conditions and to assess the potential presence of contamination associated with the former land use.

Asbestos containing materials were noted on the ground surface during the site inspection. This material is anticipated to be derived from the fabric of the current building and will need to be removed from the site during the demolition process. The possibility of asbestos containing materials having become entrained within the near surface soils cannot be discounted, either as a result of the current on-site structures, or due to the presence of Made Ground on the site. As such assessment of the near surface soils will be required to identify the presence of asbestos containing materials during any future site investigation.

Risks to groundwater and surface water bodies have been identified linked to the historical on-site uses and also associated with the presence of the neighbouring industrial estate. Consideration will need to be given to the potential mobility of any identified contamination within the context of shallow, perched groundwater (anticipated to be of limited extent) and deeper groundwater within the underlying bedrock.

The potential for ground gas generation on the site is anticipated associated with Made Ground deposits on site and infilled land on neighbouring properties. As such any ground investigation should include ground gas monitoring to enable a CIRIA 665 compliant risk assessment.

The site is located within an area where between 5% and 10% of homes are above the action level for radon, as such radon protection measures will be required for new developments on the site.

#### 10.1.2 Geotechnical

Inground obstructions are anticipated to be present associated with former foundations, drainage runs and other infrastructure.

The infiltration testing undertaken on site indicated the presence of shallow bedrock in the two locations investigated, further confirmation of ground conditions, including depth to bedrock should be undertaken through a future ground investigation on the site. This should be

designed to provide information to support foundation and pavement design process.

An initial assessment of soil infiltration rates presented in this report indicate variable permeabilities of the superficial deposits ranging from  $2.5 \times 10^{-5}$  m/s to  $4.04 \times 10^{-7}$  m/s. Further assessment will be required during development of drainage design.

## 10.2 Recommendations

Prior to development proceeding, ground investigation will be required to facilitate the following:

- Investigation, logging and sampling of general ground conditions (superficial deposits and made ground soils) to assess the variability of soils and assess the depth to competent strata and/ or bedrock;
- Installation of land gas and groundwater monitoring wells;
- Geotechnical testing of soils (in situ and laboratory);
- Chemical laboratory testing of soils, soil derived leachate and groundwater chemistry for a range of contaminants including heavy metals, polycyclic aromatic hydrocarbons (PAHs), speciated hydrocarbons and PCBs.
- Return visits to monitor land gas (in line with CIRIA 665 guidance) and groundwater;
- An interpretive land quality assessment including development of a refined conceptual site model (based on site specific data) and a qualitative risk assessment (compliant with UK CLR guidance and CIRIA 552 methodology) within the context of a commercial land use scenario;
- An interpretive geotechnical assessment of ground properties with respect to the proposed development of the site, including assessment of likely solutions for foundations, floor slabs and hard surface areas, feasibility of soakaway drainage, sulphate chemical attack and other salient matters such as potential requirements for ground stabilisation.

Ground conditions may be assessed prior to the demolition of the site, however further confirmatory assessment may be required following the removal of the current infrastructure.

## 11.0 GLOSSARY

AOD	above Ordnance Datum
bgl	below ground level
BGS	British Geological Survey
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
C4SL	Category 4 Screening Levels
CIEH	Chartered Institute of Environmental Health
CLEA	Contaminated Land Exposure Assessment
CoC	Constituent of Concern
CSM	Conceptual Site Model
DEFRA	Department of Environment, food and Rural Affairs
DQRA	Detailed Quantitative Risk Assessment
DTS	Desktop Study
DRO	Diesel Range Organics
DWS	Drinking Water Standard
EA	Environment Agency (England)
EPH	Extractable Petroleum Hydrocarbons
EQS	Environmental Quality Standards
FOC	Fraction Organic Carbon
GPR	Ground Penetrating Radar
LOD	Limit of detection
LQM	Land Quality Management
NRW	Natural Resources Wales
OS	Ordnance Survey
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PPE	Personal Protection Equipment
ppm	parts per million
PRO	Petroleum Range Organics
SGV	Soil Guideline Values
SOM	Soil Organic Matter
SVOC	Semi-volatile organic compounds
TPH	Total Petroleum Hydrocarbon
TSV	Tier 1 Screening Values
VOC	Volatile Organic Carbon
VPH	Volatile Petroleum Hydrocarbons



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## FIGURES

Phase 1 Geo-environmental Assessment  
Gaerwen Industrial Estate, Anglesey



**Figure 1 – Site Location Plan**



Figure 1 – Site Location Plan

**Quay West at MediaCityUK,  
Trafford Wharf Road,  
Trafford Park,  
Manchester M17 1HH**

**Tel: 0161 872 3223  
Fax: 0161 872 3192  
E-mail enquiries @wyg.com**



**Environmental Consultancy  
Ground Technologies & Investigation**

**Project:** Gaerwen Industrial Estate, Anglesey

**Client:** Amber REI Holdings Ltd

**Figure 1 – Site Location Plan**

**Project No.:** A109869

**Date:** February 2019



**Figure 2 – Photograph Locations**

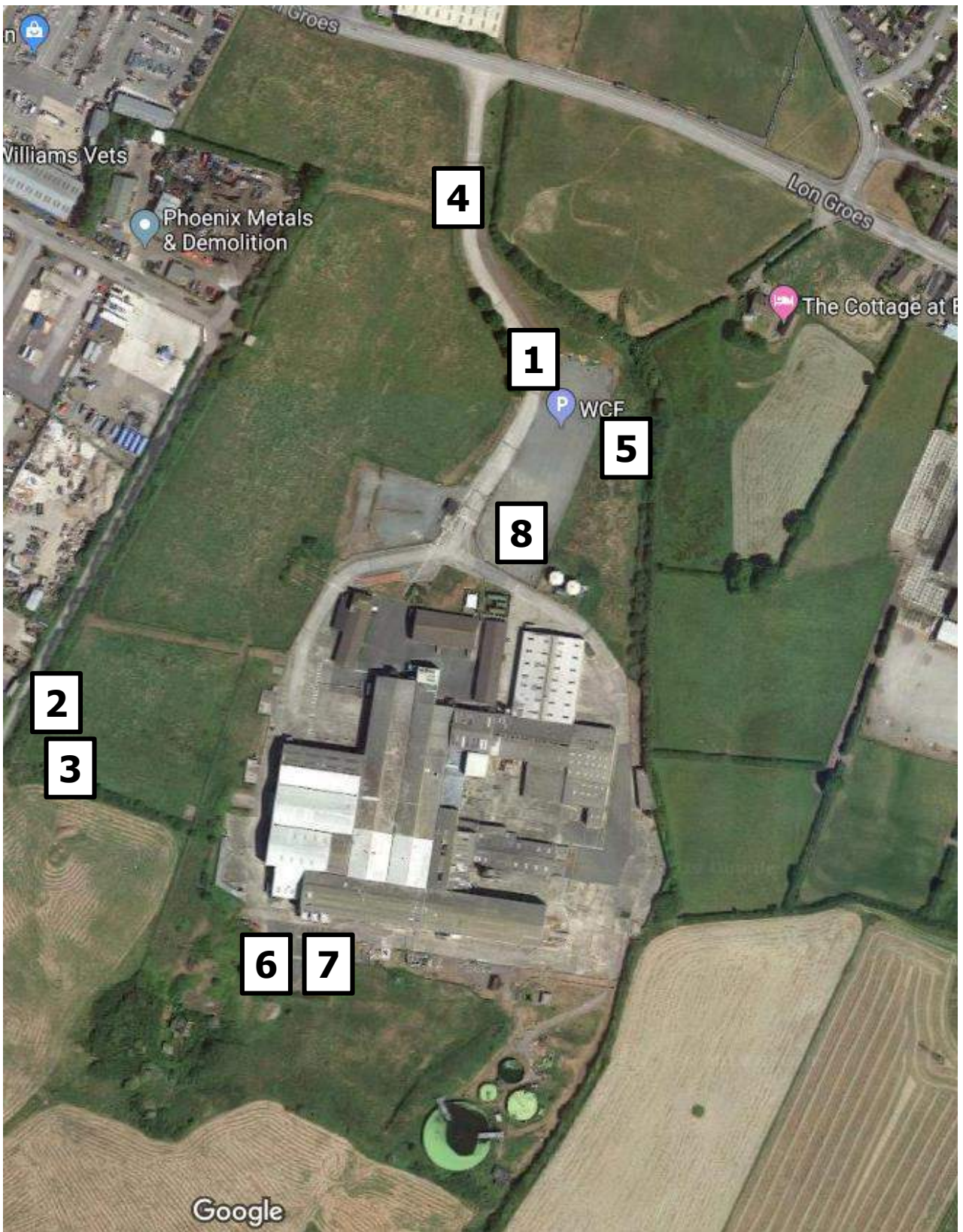


Figure 2 – Photograph Locations

**Quay West at MediaCityUK,  
Trafford Wharf Road,  
Trafford Park,  
Manchester M17 1HH**

**Tel: 0161 872 3223  
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E-mail enquiries @wyg.com**



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**Figure 2 – Photograph Locations**

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**Date:** February 2019