



Report type	Phase 1 Preliminary Risk Assessment
Date	31 August 2021
Client	PAG Developments Limited
Site address	Judy Cross Barn, Water Gate, Quadring, Spalding, PE11 4PY
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Supervised by	Mr Joseph Turner

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1. Introduction

The following document is a Phase 1 Preliminary Risk Assessment carried out by Oakshire Environmental commissioned by PAG Developments Limited. It includes a description of the site location and site history as well as the ground composition and environmental setting of the site. This information has been used to develop an initial conceptual site model of potential sources, pathways and receptors of contamination. A brief overview of the proposed development is also included below.

1.1 Project Overview

The client's proposed project involves the conversion of a barn into residential dwelling and associated works at Judy Cross Barn, Water Gate, Quadring, Spalding, PE11 4PY. A desk-top study has been requested by South Holland District Council, through attachment of conditions on planning application H15-0100-21. Oakshire Environmental have carried out a Phase 1 Preliminary Risk Assessment, as described below.

1.2 Purpose of Investigation

The objectives of the Phase 1 Preliminary Risk Assessment were:

- Develop a detailed assessment of the site.
- Identify potential contamination sources, receptors and pathways at the site.
- Assess the level of potential contamination risk.
- Assess the requirement or scope of further investigations, based on the identified level of potential contamination risk.

1.3 Scope of Work

- To develop a detailed assessment of the site, desk studies have been carried out to collate information on relevant planning history, site history, ground conditions and environmental setting.
- This information has been used to identify and assess potential contamination sources, receptors and pathways, as part of a Conceptual Site Model.
- To assess the level of potential contamination risk and the requirement for further investigations, the Conceptual Site Model categorises the severity of consequence and probability of identified potential contaminant linkages.
- Supporting appendix include site photographs and historical and geological maps of the site.
- Desk studies have been carried out by professional Environmental Consultants, with BSc (Hons) in Environmental Science or above, in accordance with the Environment Agency's Land Contamination: Risk Management (LCRM) guidelines as updated from Environment Agency's Model Procedures for the Management of Land Contamination (CLR11) framework.

1.4 Limitations

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This report excludes consideration of potential hazards arising from any activities at the site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities. Oakshire Environmental does not warrant or guarantee that the site is free of hazardous or potentially hazardous materials or conditions. It should be noted that this report has been produced for environmental purposes only.

2. Site

The following section describes the site using information obtained from the client and publicly available sources.

2.1 Site Description and Location

The site is located on the corner of Water Gate and Green Lane to the north east of the village of Quadring in South Holland and is approximately 1,350m². There is a brick barn building at the south of the site with a pile of crushed limestone to the west of this building and a concrete base with some wooden pallets to the north. The barn building is unused and contains some old wood and metal products, broken concrete and brick rubble. Adjacent to the building is a water tank and some concrete blocks. The remainder of the site is covered by grass and shrubs.

The site is bordered by an agricultural field to the north and east, Water Gate to the south and Green Lane to the west. A land drain curtails the south and west boundaries of the site. The surrounding area is predominantly agricultural with some residential dwellings in the vicinity, including just south of Water Gate and 150m east of the site. There are no woodlands, ancient monuments or archaeological sites within 500m of the site.

National Grid Reference: 523345 333676

2.2 Relevant Planning History

A search of the Local Authority's planning website identified one application near the site with associated contaminated land conditions or assessments.

Table 1: Previous planning applications on and near the site

Application No.	Year	Address	Proposal	Decision	Details
H15-0582-19	2019	62 Water Gate, Quadring	Erection of 4 dwellings to be used as holiday lets and associated works including roadway and accessible play park	Approved	Contamination condition applied. Phase 1 and 2 assessments carried out that identified no elevated levels of any contaminants or ground gas. Groundwater was identified at 1.11m to 1.15m bgl.

2.3 Site History

A detailed assessment of historical Ordnance Survey maps and associated data has highlighted the below on-site and off-site, current and historical land uses.

Table 2: Description of the site and surrounding area over time, according to historical maps

Year	Site Description	Surrounding Area
1888	Corn Mill (Judycross Mill) on the site with a circular mill in the centre, an adjacent engine house to the west and a small square building at the north east of the site	The surrounding area is predominantly agricultural with very little development Land drains curtailing the east, south and west boundaries of the site Two buildings 30m south of the site Buildings 300m north west and 380m north east
1904 - 1905	Another building believed to be a granary now shown at the south of the site that appears to be the existing brick barn	Unchanged
1972	Circular mill building replaced by a rectangular building and the engine house is no longer shown Lincolnshire windmill records show that the mill was no longer present in 1953	Land drain along the east boundary no longer shown Building to the south is labelled as 'Mill House' suggesting it is residential Buildings to the north west no longer shown Detached residential dwellings 180m east and 230m north east
1995	Unchanged	Unchanged
2003	Unchanged	Unchanged
2010	Rectangular building in the centre of the site has been demolished and there are some remnants of the base	Unchanged

3. Environmental Setting

The following section provides information on the environmental setting of the site based on data from the British Geological Survey (BGS), the Department for Environment, Food and Rural Affairs (DEFRA), the Coal Authority and Public Health England (PHE).

Table 3: Summary of the site's environmental setting

Environmental Factor		Details	
Hydrogeology	Aquifer Designation	Superficial	Unproductive
		Bedrock	Unproductive
	Groundwater Vulnerability	Superficial	Low
		Bedrock	Low
	Source Protection Zones and Abstractions		Site does not lie within a Source Protection Zone
Hydrology	Water Network		Land drains bordering the site to the south and west as well as along most roads in the area No Main Rivers within 1km of the site
Geology	Artificial Ground		None within 500m of the site
	Superficial Deposits		Tidal Flat Deposits - Clay and Silt
	Bedrock Geology		Oxford Clay Formation - Mudstone
	Superficial Permeability		Low to High
	Bedrock Permeability		Low
	Borehole Records		No borehole records within 500m of the site
Workings	Mining and Ground Workings		Cuttings and embankments for the creation of land drains in the area
Radon	PHE UKradon		<1% probability of being above action level
Waste and Landfill	Historical Landfill		None within 500m of the site
	Permitted Waste Sites		None within 500m of the site

4. Initial Conceptual Site Model

The following section outlines potential contamination sources, pathways and receptors based on the information gathered in the previous sections to develop an initial conceptual site model.

4.1 Potential Contamination Sources

Historical map data and information obtained from a review of current and historical land uses on and near the site identified the following potential sources of contamination.

Historical Corn Mill

A corn mill was situated on the site from the early 19th century to around 1952. This may have contaminated underlying soils through the use and storage of hydrocarbons. Hydrocarbon use is not likely to have been significant, given the age and nature of the mill, so high levels of contamination of underlying soils with hydrocarbons is not likely.

Made ground is also likely to be present and this may contain demolition rubble from previous developments on the site. Made ground deposits often contain elevated concentrations of contaminants such as heavy metals and hydrocarbons.

4.2 Potential Contamination Receptors

Given the proposed residential use of the site, the following receptors are considered:

- Residential end users
- Controlled waters

4.3 Potential Contamination Pathways

Based on the expected on-site receptors, relevant pathways for the above receptors include:

- Ingestion/inhalation of contaminated soil dust
- Dermal contact with contaminated soil
- Inhalation of soil vapours
- Ingestion of homegrown produce
- Permeation into drinking water pipes
- Ground gas permeation into buildings
- Leaching through soil
- Surface runoff

Pathways between off-site sources and off-site receptors is beyond the scope of this assessment.

4.4 Risk Assessment Methodology

The potential level of risk posed by a particular source is determined by assessing the potential severity of the impact of the contaminant linkage on the receptor, if it is assumed to be present, and the probability of the contaminant linkage being present.

Severities are categorised from Minor to Severe and probabilities are categorised from Unlikely to High Likelihood to give a potential level of risk output.

Table 4: Risk Matrix

Probability	Severity of Consequence			
	Severe	Medium	Mild	Minor
High Likelihood	Very High Risk	High Risk	Moderate Risk	Low / Moderate Risk
Likely	High Risk	Moderate Risk	Low / Moderate Risk	Low Risk
Low Likelihood	Moderate Risk	Low / Moderate Risk	Low Risk	Very Low Risk
Unlikely	Low / Moderate Risk	Low Risk	Very Low Risk	Very Low Risk

Very High Risk

There is a high probability that severe harm could arise to a designated receptor from an identified source; or there is evidence that severe harm to a designated receptor is currently happening.

High Risk

Harm is likely to arise to a designated receptor from an identified source.

Moderate Risk

It is possible that harm could arise to a designated receptor from an identified source. It is relatively unlikely that any such harm would be severe or if any harm were to occur it is more likely that the harm would be relatively mild.

Low Risk

It is possible that harm could arise to a designated receptor from an identified source, however, it is likely that this harm, if realised, would normally be mild.

Very Low Risk

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.

4.5 Conceptual Site Model

The information in this section has been compiled to produce an initial conceptual site model outlining the potential sources, pathways and receptors to consider at the site. The level of risk was categorised by considering the severity and probability, as outlined in the previous section.

Table 5: Conceptual site model

Sources	Pathways	Receptors	Severity	Probability	Potential Level of Risk	
Historical Corn Mill	Ingestion/inhalation of contaminated soil dust Dermal contact with contaminated soil Inhalation of soil vapours Ingestion of homegrown produce Permeation into drinking water pipes	Residential end users	Medium	Low Likelihood	Low / Moderate	The historical use and storage of hydrocarbons and made ground deposits on the site may have resulted in elevated concentrations of heavy metals and hydrocarbons. Volatile hydrocarbon fractions are not likely to be present, due to the time elapsed since the corn mill was in use, so the main contaminants of concern are likely to be heavy metals and low volatility PAHs.
	Leaching through soil Surface runoff	Controlled waters	Mild	Low Likelihood	Low	The contaminants that may be present as a result of the historical corn mill at the site are not likely to be mobile or leachable through soil. The unproductive aquifers underlying the site will also further limit the impact on groundwater. It is possible that some surface water runoff from the site may be contaminated due to elevated concentrations on contaminants in the soil. However, soil contamination is not likely to be significant and the surface waters near the site are land drains that are not considered to be particularly sensitive receptors due to the lack of any surface water abstractions.

5. Conclusions

5.1 Risk Evaluation

The initial conceptual site model identified the following potential pollutant linkages present at the site and the following conclusions have been drawn:

- There is a **low to moderate risk** to residential end users from the ingestion/inhalation of contaminated soil dust, dermal contact with contaminated soil, inhalation of soil vapours, ingestion of homegrown produce and permeation into drinking water pipes from the historical corn mill on the site.
- There is a **low risk** to controlled waters from the leaching and surface runoff of contaminants from the historical corn mill on the site.

Based on the findings of this Phase 1 Preliminary Risk Assessment, the risk to residential end users is considered to be low to moderate and the risk to controlled waters is considered to be low. It can be assumed that the risk to crops, woodland, archaeological sites and ancient monuments is negligible.

5.2 Further Investigation

Based on the above conclusions, further investigation is recommended in the form of a Phase 2 Intrusive Site Investigation. This should include sampling of shallow soil at the site to be tested for a suite of contaminants including heavy metals and hydrocarbons.

6. References

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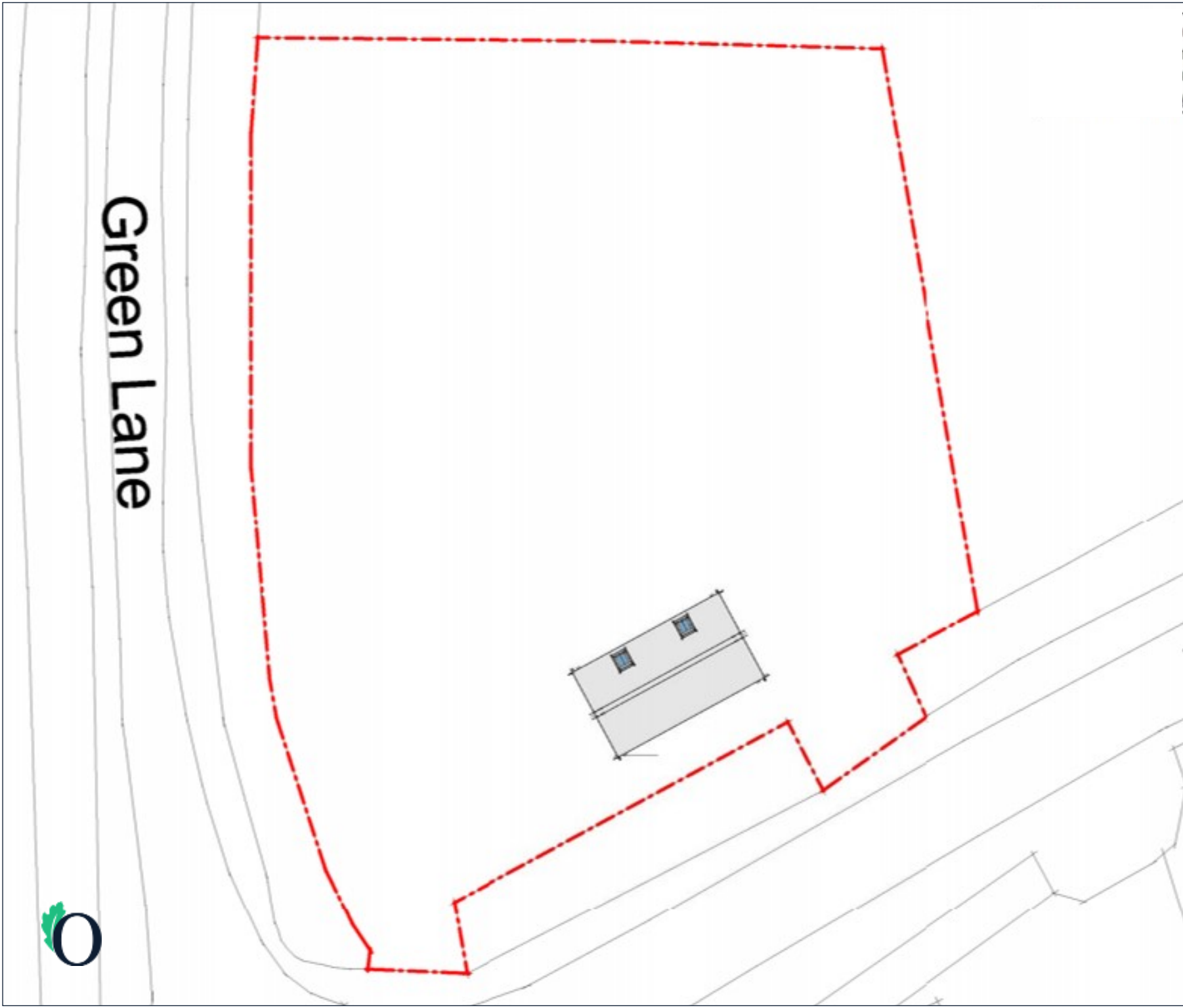
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Appendix A - Site Maps & Plans	
Description	
Existing block plan	
Sources	
Remway Design Ltd	
Key	
	Site boundary
	
	
	
	
	
	
	
	
Name	Figure 1





Appendix A - Site Maps & Plans

Description	
Proposed block plan	
Sources	
Remway Design Ltd	
Key	
	Site boundary

Name	Figure 2
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Appendix B - Site Photos		
Description		
Photo of disused barn building and tank at the south of the site, facing south		
Sources		
Key		
Name		Figure 3



Appendix B - Site Photos

Description

Photo of disused barn building and tank at the south of the site, facing south west

Sources

Key

Name

Figure 4



Appendix B - Site Photos

Description

Photo of showing concrete base to the north of the disused barn building

Sources

Key

Name

Figure 5



Appendix B - Site Photos

Description

Photo of south boundary of the site, facing west

Sources

Key

Name

Figure 6



Appendix B - Site Photos		
Description		
Photo of crushed limestone at the south west of the site, facing east		
Sources		
Key		
Name		Figure 7



Appendix B - Site Photos

Description

Photo of demolition rubble in the centre of the site, facing east

Sources

Key

Name

Figure 8



Appendix B - Site Photos

Description

Photo of vegetation at the north of the site, facing north east

Sources

Key

Name

Figure 9



Appendix B - Site Photos		
Description		
Photo of grass area at the north of the site, facing north		
Sources		
Key		
Name		Figure 10



Appendix B - Site Photos

Description

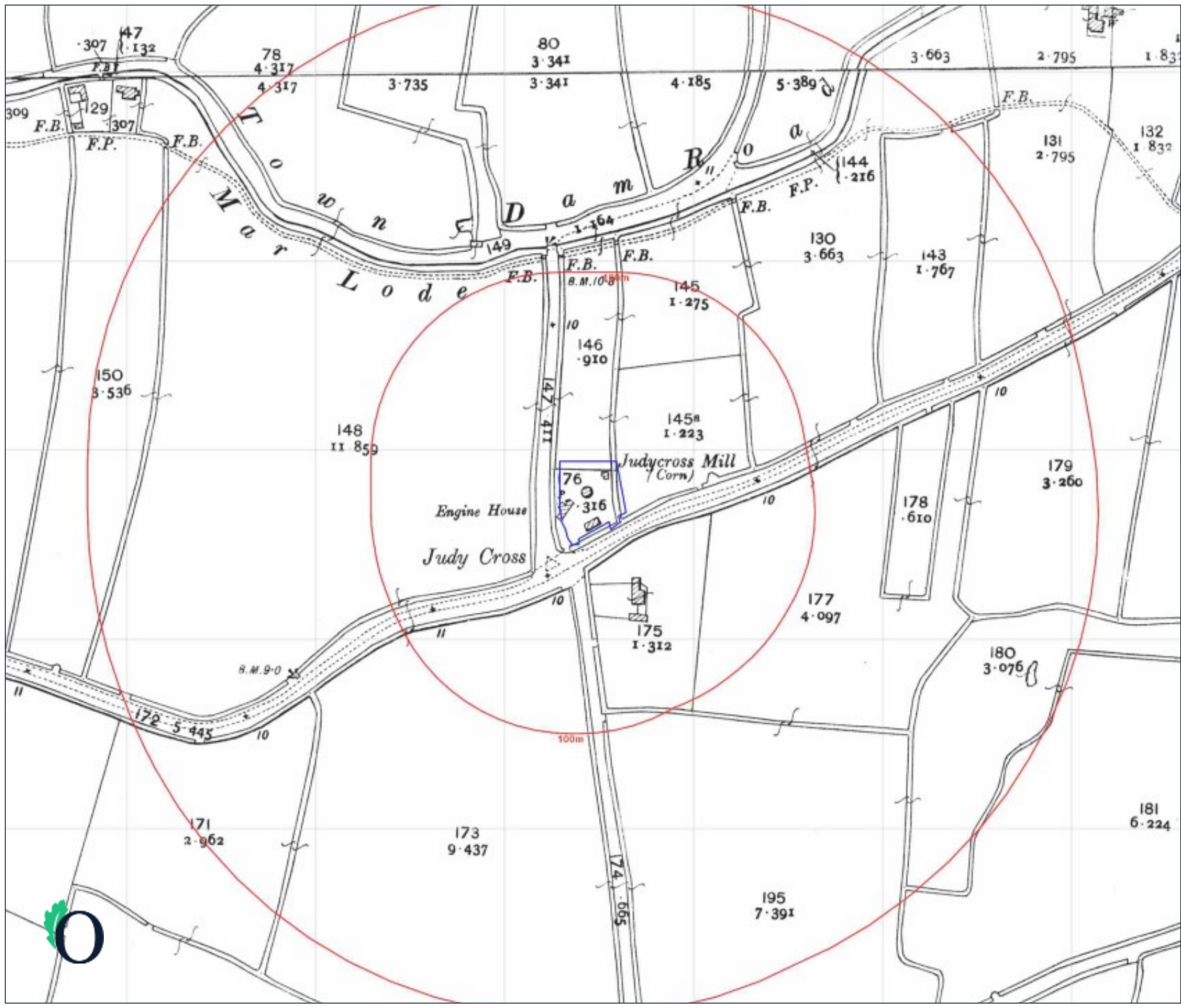
Photo of interior of the barn building at the south of the site, prior to repair work

Sources

Key

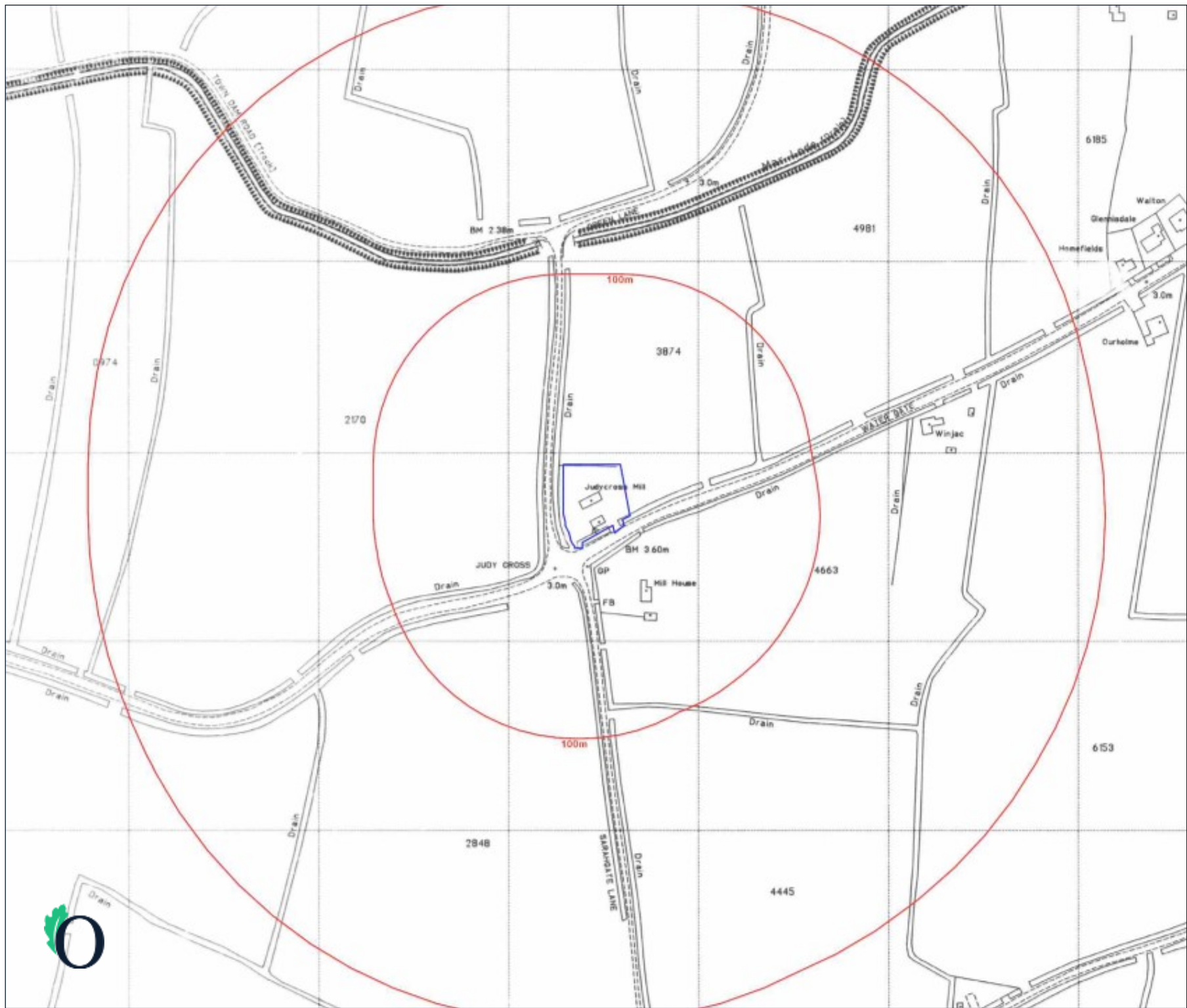
Name

Figure 11



Appendix C - Historical Maps	
Description	
Historical map dated 1904 - 1905	
Map scale: 1:2,500	
Sources	
© Crown copyright and database rights 2018 Ordnance Survey 100035207	
Key	
	Site boundary
Name	Figure 13





Appendix C - Historical Maps	
Description	
Historical map dated 1995	
Map scale: 1:2,500	
Sources	
© Crown copyright and database rights 2018 Ordnance Survey 100035207	
Key	
	Site boundary

Name	Figure 15
------	-----------





Appendix C - Historical Maps

Description

Historical map dated 2003

Map scale: 1:2,500

Sources

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Key

Site boundary

Name

Figure 16





Appendix C - Historical Maps

Description

Aerial photograph dated 2010

Sources

© 2021 Getmapping PLC

Key

Site boundary

Name

Figure 17





Appendix D - Geological Maps

Description	
BGS map showing superficial hydrogeology on site	
Sources	
DEFRA Magic Map British Geological Society (2021)	
Key	
	Site location
	Principle
	Secondary A
	Secondary B
	Secondary Undifferentiated
	Unproductive
Name	Figure 18





Appendix D - Geological Maps

Description

BGS map showing bedrock hydrogeology on site

Sources

DEFRA Magic Map

British Geological Society (2021)

Key

Site location

Principle

Secondary A

Secondary B

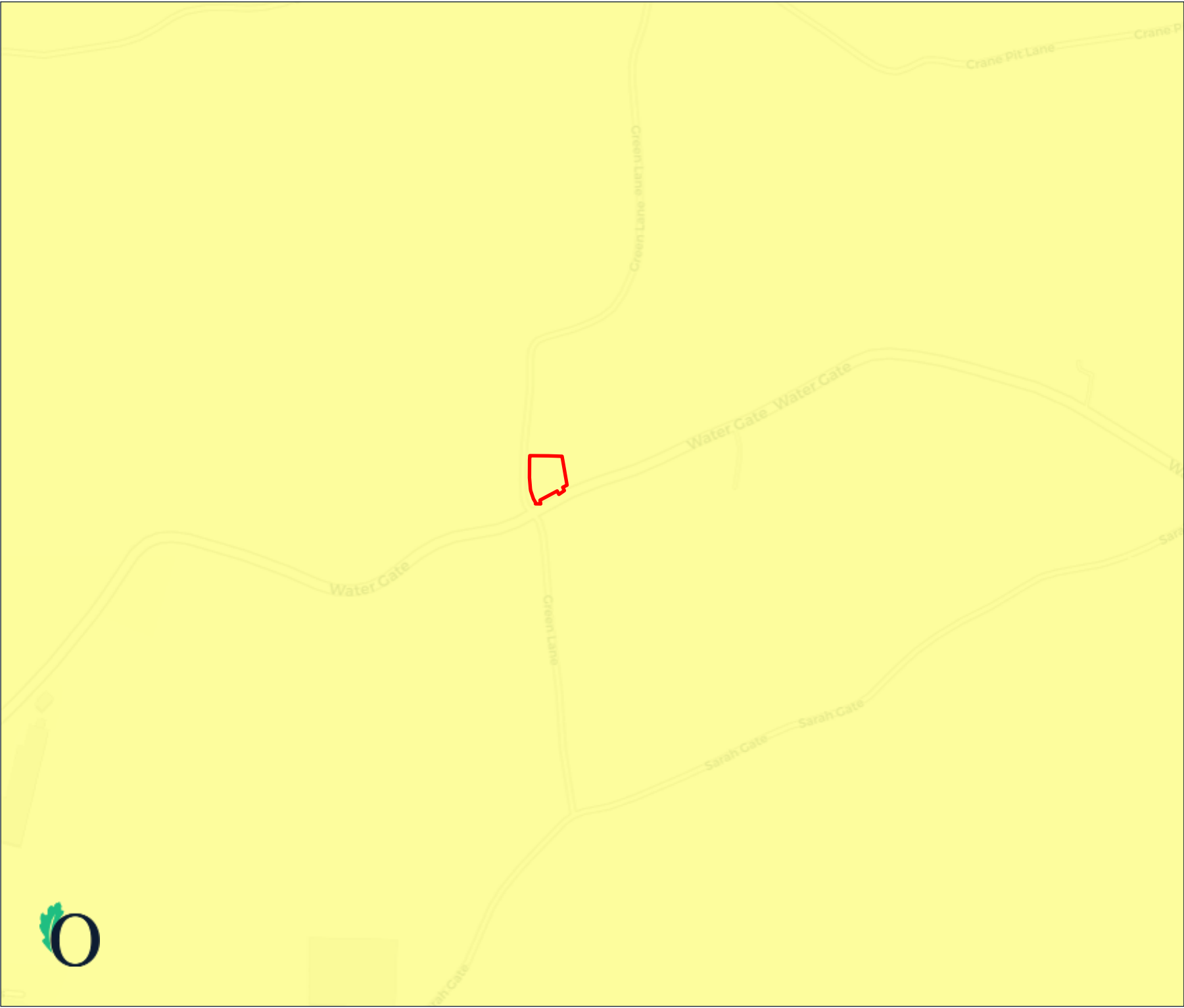
Secondary Undifferentiated

Unproductive

Name

Figure 19





Appendix D - Geological Maps

Description

BGS map showing superficial deposits on site

Sources

British Geological Society (2021)

Key

Site boundary

Tidal Flat Deposits

Name

Figure 20





Appendix D - Geological Maps	
Description	
BGS map showing bedrock geology on site	
Sources	
British Geological Society (2021)	
Key	
	Site boundary
	Oxford Clay Formation
Name	Figure 21

