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# SITE INVESTIGATION REPORT

## 22 BACKGATE
## COWBIT
## SPALDING
## LINCOLNSHIRE

**Report Reference C15144**

**On behalf of:-**

**A. C. Building Limited**
**Glenholme**
**Springfield**
**Fletton**
**Peterborough**
**PE2 8BU**

**October 2020**

**A. C. BUILDING LIMITED**

# SITE INVESTIGATION REPORT

# FOR

# PROPOSED RESIDENTIAL DEVELOPMENT

# AT

# 22 BACKGATE

# COWBIT

# SPALDING

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## INTRODUCTION

The client, A. C. Building Limited, proposes to build a new residential development of five two-storey detached houses at 22 Backgate, Cowbit, near Spalding in Lincolnshire.

Ground Engineering Limited was commissioned by the client to carry out a site investigation to determine the nature and geotechnical properties of the underlying soils, and provide information for the design and construction of the foundations. A desk study checking past uses and a contamination assessment were also included within the scope of this report.

## LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE

The site of the proposed development is located at No.22 Backgate, on the eastern side of the road, and on the eastern side of Cowbit, near Spalding in Lincolnshire. The village of Cowbit is approximately 5km south-south-east of Spalding. The National Grid Reference for the centre of the site is TF 2664 1777 and its location is shown on plans following this report text.

The approximately 0.21 hectare, rectangular shaped site is approximately 55m long fronting Backgate, and extends 23m east. The site contains a centrally located detached bungalow (No.22), and outbuildings in the south-western part fronting Backgate. A lawned garden is present to the north of the bungalow. An overgrown vegetable garden including Apple and Elder trees and a wooden shed are present to the south of the bungalow. The site is bounded by Backgate to the west; by dwellings fronting Backgate to the north and south; and a cultivated field to the east. A drain with trees beside it was also present along the southern boundary of the site with the neighbouring property. Trees were present along the western boundary with Backgate, however these have been removed since the site work. A beech hedge was also present along the northern boundary with the neighbouring property.

The relatively level site stands at an elevation of between 2.37mOD in the southern part, and 2.99mOD in the northern part, in an area of Fenland.

The geological map for the area, sheet 144 at 1:50,000 scale, shows the site to be underlain by a thick succession of Tidal Flat Deposits (consisting of near surface Terrington Beds and Barroway Drove Beds). These initially silt and fine sand soils merge into organic and peaty clays, and are indicated to rest on the solid geology of the Oxford Clay Formation at depth. The site is 250m to the south of New Fen Dyke (1186-89), a drainage and reclamation feature.

## HISTORY OF THE SITE

Research into the site history involved reference to historical Ordnance Survey (OS) maps, photographs and information obtained from the internet. The map extracts and photographs studied are presented in the desk study map section, Appendix 1, and are described below. Distances are approximate.

| *OS Map Extract* | *Description* |
|---|---|
| **1887**<br>Lincolnshire<br>Sheets 142SW & 142SE<br>Scale 1:10,560<br>**Figure A** | The site is undeveloped within the south-western corner of a field on the east side of Back Gate. A drain is present along the southern boundary of the site, and along the northern margin of the field. A railway line is shown 50m north-east of the site. Cowbit Windmill is 100m to the north of the site, and Cowbit Station 200m north. |
| **1888**<br>Lincolnshire<br>Sheets 142.10, 142.11, 142.14 & 142.15<br>Scale 1:2500<br>**Figure B** | The site and immediate surrounding area appear unchanged. |
| **1904**<br>Lincolnshire<br>Sheets 142.10, 142.11, 142.14 & 142.15<br>Scale 1:2500<br>**Figure C** | The site and immediate surrounding area appear generally unchanged. An outbuilding has been demolished 50m north-west of the site. |
| **1951**<br>Lincolnshire<br>Sheets 142SW & 142SE<br>Scale 1:10,560<br>**Figure D** | A building is shown in the south-western part of the site fronting the road. A new house is shown on the adjacent land to the north of the site, and another new house on the other side of the road to the south-west. A new building is shown adjoining the windmill to the north of the site. |
| **1976**<br>Sheet TF2617<br>Scale 1:2500<br>**Figure E** | The site has a centrally located dwelling (No.22), and an outbuilding in the south-western corner. The property to the north of the site is named The Orchards, which has outbuildings to the rear (east), and new houses have been built further north. A new property is also shown to the south of the site on the adjoining land. A nursery with glasshouses is shown 50m west of the site on the other side of the road. A sewage pumping station is shown 50m south-east of the site, and another nursery 130m south of the site. Cowbit station to the north of the site is denoted as disused. |
| **1979**<br>Sheet TF21NE<br>Scale 1:10,000<br>**Figure F** | The site and immediate surrounding area appear unchanged. |

| *OS Map Extract* | *Description* |
|---|---|
| **1989**<br>Sheet TF21NE<br>Scale 1:10,000<br>**Figure G** | The site and immediate surrounding area appear generally unchanged. The railway line to the east is denoted as dismantled. |
| **1995**<br>Sheet TF2617 & TF2618<br>Scale 1:2500<br>**Figure H** | The site area appears unchanged. A new house has been built on the opposite side of Backgate, and new houses have also been built to the south-west and south of the site. A new road named Orchard Way and houses are shown 150m north-west of the site. A gas governor is shown 160m south-west of the site. |
| **1999-2015**<br>GroundSure<br>Aerial Photographs of Site (Pages 9-12, Appendix 2) | The site contains the centrally located property with a driveway to Backgate on its western side. Outbuildings are evident in the south-western corner of the site, with a planted garden area including a large tree in the southern part of the site. The northern part of the site has a lawn, and two mature trees are evident on the western boundary adjacent Backgate. Trees are also present in the adjacent properties to the north and south of the site. Cultivated land is evident to the rear (east) of the property. New roads are shown (1999) to the south-west of the site. |
| **2001**<br>Sheet TF21NE<br>Scale 1:10,000<br>**Figure I** | The site and immediate surrounding area appear unchanged. The new road to the south-west is named Curlew Drive. A rectangular building is shown on the line of the old railway 160m south-east of the site. |
| **2003**<br>Sheets TF2617NW & TF2617NE<br>Scale 1:1250<br>**Figure J** | The site area appears unchanged. A rectangular outbuilding is shown to the north-east on the line of the old railway to the rear of The Orchards. A new house is shown 40m south of the site, and new housing 100m south-west off Meadow Walk (an extension from Curlew Drive). A track is shown to the south of the site which provides access to the rectangular building to the south-east. |
| **2010**<br>Sheet TF21NE<br>Scale 1:10,000<br>**Figure K** | The site and immediate surrounding area appear generally unchanged. New housing estates are evident to the north-west and south-east of the site. |
| **2018**<br>GroundSure<br>Aerial Photograph of Site (Page 8, Appendix 2) | The site remained generally unchanged, however a new tree is evident to the rear of the outbuildings. A new road (Willow Court) and housing are shown under construction to the west of the site. |
| **2020**<br>Sheet TF21NE<br>Scale 1:10,000<br>**Figure L** | The site area appears unchanged. Willow Court is shown to the west of the site, and the A16 Crowland Bypass has been constructed to the east of the site. |
| **2020**<br>Sheet TF2617<br>(BT plan)<br>Not to scale<br>**Figure M** | The site and immediate surrounding area appear unchanged. Two new houses are shown on the opposite side of the road. |

**Summary of Historical Information**

The Ordnance Survey map of 1887 showed that the site was undeveloped within a rural area to the east of Cowbit. The site had been developed with an outbuilding by 1951, and a dwelling by 1976, and the site has remained in this configuration to the present day.

The area around the site was initially fields to the east of Back Gate, with a railway line 50m to the north-east. Housing had been constructed to the north of the site by 1951 and to south by 1976. Nurseries had also been built 50m west, and 130m south of the site by 1976, as well as a sewage pumping station to the south-east. Cowbit Station was disused by 1976, and the railway line had been dismantled by 1989. New roads and housing were built to the north-west, south-west, and west of the site in the 1990s, 2000s and 2010s respectively.

## SUMMARY OF ENVIRONMENTAL DATA

Appendix 2 contains information derived from Environmental Databases for a radius of up to 2,000m from the site. The information covers datasets held by Groundsure with contributors including the local authority, the Environment Agency (EA), British Geological Survey, Ordnance Survey and the Coal Authority and the results, within a radius of 250m, are summarised below:

| **1-2. Historical Industrial Sites** | **On-Site** | **0 - 250m** |
|---|---|---|
| Potentially Contaminative Uses (1:10,000 mapping) | 0 | 19 |
| Historical Tank Database | 0 | 1 |
| Historical Energy Features Database | 0 | 1 |
| Historical Petrol & Fuel Site Database | 0 | 0 |
| Historical Garage & Motor Vehicle Repair Database | 0 | 0 |
| **3. Landfill and Other Waste Sites** | **On-Site** | **0 - 250m** |
| Landfill Sites | 0 | 0 |
| Historical Landfill and Other Waste Sites | 0 | 0 |
| Waste Exemptions | 0 | 37 |
| **4. Current Land Use** | **On-Site** | **0 - 250m** |
| Current Industrial Sites Data | 0 | 4 |
| Records of Petrol and Fuel Sites | 0 | 0 |
| Underground Electricity, High Pressure Oil and Gas Pipelines | 0 | 0 |
| Sites Determined as Contaminated Land under Part IIA EPA 1990 | 0 | 0 |
| Records of COMAH and NIHHS Sites | 0 | 0 |
| Environmental permits/pollution incidents/registers | 0 | 6 |
| **5-6. Hydrogeology and Hydrology** | **On-Site** | **0 - 250m** |
| Productive strata within superficial geology beneath the site | No | |
| Productive strata within solid geology | No | |
| Groundwater Abstraction Licences | 0 | 0 |
| Surface Water Abstraction Licences | 0 | 0 |
| Potable Water Abstraction Licences | 0 | 0 |
| Source Protection Zones | 0 | 0 |
| Water Network Entries | 0 | 24 |
| Surface Water Features | 0 | 8 |

| **7-9. Flooding** | | |
|---|---|---|
| Risk of flooding from rivers & the sea (RoFRaS) rating | Low | |
| Historical flood events | 0 | 0 |
| Flood defences within 250m of site | No | |
| Any areas benefitting from flood defences within 250m of site | No | |
| Flood storage areas within 250m of site | No | |
| Environment Agency indicative Zone 2 floodplains within 50m of site | Yes | |
| Environment Agency indicative Zone 3 floodplains within 50m of site | No | |
| Surface water flooding on site | 1 in 30 year (0.30m to 1.00m) | |
| Groundwater flooding on site | Negligible | |
| **10-13. Designated Environmentally Sensitive Sites** | **On Site** | **0 - 250m** |
| Environmentally sensitive sites | 1 | 0 |
| **14-16. Geology** | | |
| Artificial Ground or Made Ground records | 0 | 0 |
| Superficial Ground and Drift Geology records beneath the site | Yes | |

**17. Natural Hazards (on site)**

| Hazard | Negligible | Very Low | Low | Moderate | High |
|---|---|---|---|---|---|
| Shrinking or Swelling Clay | - | - | On-site | - | - |
| Running Sand | - | - | - | On-site | - |
| Compressible Ground | - | - | - | On-site | - |
| Collapsible Rocks | On-site | - | - | - | - |
| Landslides | - | On-site | - | - | - |
| Soluble rocks | On-site | - | - | - | - |

| **18. Mining** | | |
|---|---|---|
| Surface ground workings | 0 | 2 |
| Underground workings | 0 | 0 |
| Non coal-mining areas within 50m of site | 0 | 0 |
| Mining cavities | 0 | 0 |
| Brine affected areas on study site | No | |

**19. Radon**

The property is not in a Radon Affected Area, as less than 1% of properties are above the action level.
No Radon Protective Measures are required for new properties or extensions.

## Database Summary

No historical land uses are identified on the site. A corn windmill is recognised 93m north of the site; an unspecified tank 100m north (misinterpretation of the windmill); railway station 137m north; and a nursery 149m south of the site. No garages, petrol or fuel stations are recorded within 250m of the site. No historic landfills are recorded on, or within 250m of the site. Waste exemptions are recorded at farms and other places around the site, and include burning of waste in the open; aerobic composting; spreading of plant matter; and dredging of waste from inland waterways.

Recent industrial land uses around the site include the sewage pumping station 51m south-east; gas governor station 160m south-west; electricity sub-station 213m south-west; and telecommunications mast 238m to the south-east. Discharge consents are recorded for the sewage pumping station to the south of the site.

Superficial Tidal Flat Deposits are shown beneath the site, which are classified by the EA as an ôUnproductiveô stratum. The solid geology Oxford Clay Formation underlying the site is also classified by the EA as an ôUnproductiveô stratum. There are no groundwater abstractions within 250m of the site. The site is not within a source protection zone.

The nearest surface water feature is the drain along the southern boundary of the property. The site is within a Zone 2 floodplain, and has a low risk of flooding. The site is within an SSSI impact zone, an environmentally sensitive area.

There is a moderate hazard from compressible ground and running sand; a low hazard from shrinking and swelling clay; a very low hazard from landslides; and a negligible hazard from soluble rocks and collapsible rocks. The site is not in an area affected by mining.

The site is not in a radon affected area, and no radon protection measures are required for new properties on the site.

## PRELIMINARY RISK ASSESSMENT

Potential sources of contamination present on or beneath the site would relate primarily to; the historical use of the site; the presence of contaminated soil; and the potential presence of hazardous or ground gas beneath the site.

In order to assess the risks associated with the presence of ground contamination the linkages between the sources and potential receptors to contamination need to be established and evaluated. This is in accordance with the Environmental Protection Act 1990, which provides a statutory definition of Contaminated Land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that;

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Pollution of controlled waters is being, or is likely to be, caused.*

There are three principal factors that are assessed whilst undertaking a qualitative risk assessment for any site. These are the presence of a contamination source, the existence of migration pathways and the presence of a sensitive target(s). It should be noted that it is necessary for each element of source, pathway and target to be present in order for exposure of a human or environmental receptor to occur.

UK Government guidance on the assessment of contaminated land, requires risk to human health and the environment to be reviewed using source ï pathway ï target relationships. If each of these elements is present, the linkage provides a potential risk to the identified targets.

***Contaminants*** or ***potential pollutants*** identified as ***sources*** in relation to the identified previous uses are listed overleaf in Table 1.

**Table 1: Identified Potential Contaminant Sources**

| *Contaminant Source* | *Comments* |
|---|---|
| Drainage/ Buildings | Effluent from existing drains could provide a contaminant source. The bungalow and outbuildings may include asbestos containing materials (ACM). |
| Soil Beneath Site | Contamination may be present within any made ground on the site. |
| Soil Gas | Potential soil gas generated from made ground or naturally deposited organic soils. |
| Ground Contamination Outside Site Boundary | Ground contamination migrating from adjoining sites. |

A ***Pathway*** is defined as one or more routes through which a receptor is being, or could be, exposed to, or affected by, a given contaminant.

Potential ***Targets or Receptors*** fall within the categories of Human Health, Water Environment, Flora and Fauna, and Building Materials.

There are a number of possible pathways for the contaminants identified on the site to impact human and/or environmental receptors and these are summarised in Tables 2 and 3.

**Table 2: Human Receptors and Pathways**

| *Human Receptor-Mechanism* | *Typical Exposure Pathway* |
|---|---|
| Human Inhalation | Breathing Dust and Fumes<br>Breathing Gas emissions |
| Human Ingestion | Eating<br>-contaminated soil, for example by small children<br>-produce grown on contaminated soil<br>Ingesting dust or soil on vegetables<br>Drinking contaminated water |
| Human Contact | Direct skin contact with contamination<br>Direct skin contact with contaminated liquids |

**Table 3: Water Receptors and Pathways**

| *Receptor-Water Environment* | *Typical Exposure Pathway* |
|---|---|
| **Groundwater**<br>The superficial Tidal Flat Deposits and solid geology Oxford Clay are indicated to be ôUnproductiveõ strata.<br>The site is not within a Source Protection Zone. | Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and migrate to underlying groundwater.<br>Contamination leads to restriction/prevention of use as a resource, for example, drinking water, and can have secondary impacts on other resources, which depend on it. |
| **Surface Water/Watercourses**<br>The nearest surface water feature is a drainage ditch immediately south of the site. | Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and laterally migrate.<br>Contamination leads to a restriction/prevention of use:<br>-as drinking water resource<br>-for amenity use<br>Effects on aquatic life. |

## Preliminary Conceptual Model

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research documented in the preceding sections of this report.

A generalised preliminary conceptual model is presented below in Table 4.

**Table 4: Preliminary Conceptual Model Relative to Residential Development**

| Receptors | Pathway | Estimated Potential for Linkage with Contaminant Sources | | | |
|---|---|---|---|---|---|
| | | **Drainage/ Buildings** | **Soil Beneath Site** | **Soil Gas** | **Ground Contamination Outside Site Boundary** |
| Human Health ï ground or construction workers | Ingestion and Inhalation of contaminated Soil, Dust and Vapour | Low likelihood/ Likely | Low likelihood | Low likelihood | Low likelihood |
| Human Health ï end users | Ingestion and Inhalation of contaminated Soil, Dust and Vapour | N/A | Low likelihood | Low likelihood | Low likelihood |
| Water Environment | Migration through ground into surface water or surrounding groundwater | Low likelihood | Low likelihood | Unlikely | Low likelihood |
| Flora | Vegetation on site growing on contaminated soil | Low likelihood | Low likelihood | Low likelihood | Unlikely |
| Building Materials | Contact with contaminated soil | Low likelihood | Low likelihood | Low likelihood | Low likelihood |

| **Key to Table 4**<br>**Estimated Potential for Linkage with Contaminant Source** | **Definition** |
|---|---|
| **High likelihood** | There is a pollution linkage and an event that either 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 that it is probable that an event will occur.<br>Circumstances are such that an 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.<br>However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term. |
| **Unlikely** | There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term. |
| **N/A** | Not Applicable. |

## SITE WORK

The site work conducted on 4th and 9th September 2020 comprised a cable percussion borehole (BH1), and four augered boreholes (HA1 to HA4). The positions are shown on the exploratory hole location plan following this report text.

Public utility service drawings were sourced and consulted prior to determining the exploratory hole positions. Prior to excavation, a service scan was made at each position using a CAT (Cable Avoidance Tool) to check for the absence of detectable buried services that may otherwise have been damaged by the investigation.

The exploratory hole records, presented following the plans, give the descriptions and depths of the various strata encountered, details of all samples taken, in-situ tests and the groundwater conditions observed during and on completion of boring and subsequent monitoring.

### Cable Percussion Borehole

The borehole BH1 was undertaken by a standard cable percussive boring rig, using claycutter and shell boring tools within 150mm diameter casing installed to a maximum 12.00m depth. The borehole was sunk to a depth of 20.00m below ground level.

Representative small disturbed and bulk samples of soil were taken from the boring tools at regular intervals throughout the depth of the borehole. A water sample was also taken once sufficient water had entered the borehole.

Undisturbed samples 100mm in diameter were taken within clay soils, the ends of the samples were capped to maintain them in as representative condition as possible during transit to the laboratory.

Standard penetration tests (SPT) were undertaken in order to give an indication of the in-situ density of the soils. The tests were made by driving a split spoon (S) attachment into the soil at the base of the borehole by means of an automatic trip hammer weighing 63.50kg falling freely through 760mm. The penetration resistance was determined as the number of blows ôNõ required to drive the tool the final 300mm of a total penetration of 450mm into the soil

ahead of the borehole. The SPT test is fully described in BS EN22476:3:2005, the results of these tests are presented on the borehole record and have been plotted against depth on the soil profile Figure 2.

On completion of borehole BH1, a 50mm diameter gas and groundwater monitoring standpipe was installed to 11.00m depth. The annulus around the standpipe was backfilled with pea gravel with a bentonite seal placed around the top of the installation within 1.00m of ground level. A gas tap was installed in the top of the standpipe and a protective stopcock cover was concreted into the ground flush with the surface. The borehole beneath the installation was backfilled with clean arisings.

**Hand Augered Boreholes**

Boreholes HA1 to HA4 were augered using hand tools to depths of between 1.20m and 2.13m.

Representative disturbed samples were taken at regular intervals throughout the depth of the boreholes.

A Mackintosh Probe (MP) was used to provide an indication of the density of the soils at regular depth intervals within the holes. The 25mm diameter solid cone point of the probe was screwed onto the rods and driven into the ground by repeated blows of a 4.5kg slide hammer with a fall of 0.30m. The number of blows required to drive the probe 0.30m into the ground was recorded and is presented on the borehole records.

On completion, the holes were backfilled with arisings and the surfaces reinstated.

**Gas and Groundwater Monitoring**

Three return gas monitoring visits were undertaken in September 2020 in order to monitor methane, carbon dioxide and oxygen gas levels in the borehole standpipe (BH1). The ambient pressure and flow rate were also recorded together with the depth to groundwater. The gas/groundwater results are tabulated following the exploratory hole records.

## LABORATORY WORK

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the borehole records. The soil descriptions have been made in accordance with BS5930:2015+A1:2020. The geotechnical test results, undertaken in accordance with BS1377:1990 & 2016, are presented following the exploratory hole records. The chemical test results follow the geotechnical test results.

The moisture content and index properties of selected soil samples were determined as a guide to soil classification and behaviour. The liquid limit was determined by a cone penetrometer.

The particle size distribution of a selected sample of silt and sand was determined by sieve analysis. The particle size distribution passing the 63μm sieve was obtained by pipette sedimentation. The results of these tests have been combined and are presented as a particle size distribution curve at the end of this report.

A California Bearing Ratio (CBR) test was performed on a selected recompacted near surface sample in accordance with Lincolnshire County Councilôs specification. The sample was recompacted using a 2.5kg rammer (BS light) or vibrating hammer, and the test consisted of jacking into the soil a cylindrical plunger with a cross sectional area of 1935mm$^2$. A force of 50N was applied initially to seat the plunger on the soil surface and then the plunger was made to penetrate the soil at a uniform rate of 1mm/min. Readings of force were taken at intervals of penetration of 0.25mm to a penetration not exceeding 7.50mm. The CBR value is the ratio of the force required to achieve 2.5mm or 5.0mm penetration to standard forces expressed as a percentage.

Test specimens were prepared at full diameter from selected undisturbed samples. Immediate undrained triaxial compression tests were performed under single-stage confining cell pressures. The moisture content and bulk density of each specimen were also determined. The triaxial test results are plotted against depth in Figure 1.

Selected samples of soil and groundwater were analysed to determine the concentration of soluble sulphates. The pH values were also determined.

Chemical analysis of soil samples recovered from the exploratory holes was undertaken, by an independent laboratory, primarily for characterisation purposes. The samples were tested for a suite encompassing a wide range of potential contaminants outlined by the Environment Agency (EA) and National House Building Council (NHBC) document R&D 66; 2008 ‘Guidance for the Safe Development of Housing on Land Affected by Contamination’.

## GROUND CONDITIONS

The ground conditions have been plotted as a soil profile in Figure 2. The ground conditions comprised a surface layer of made ground or topsoil to between 0.30m and 0.60m depth, underlain by superficial Tidal Flat Deposits initially comprising very sandy silt varying to silty sand, overlying soft slightly organic clay at 1.10m to 2.40m depth. Groundwater was recorded between 1.45m and 2.30m depth during the investigation.

### Made Ground/Topsoil

Made ground was encountered to between 0.35m and 0.60m depth. The made ground generally comprised dark and brown, slightly gravelly, sandy silt. The gravel fraction comprised angular to sub-rounded brick and shell fragments.

The topsoil in BH1 comprised brown, silty sand.

### Tidal Flat Deposits

Beneath the surface made ground and topsoil at between 0.30m and 0.60m depth, loose to medium dense, orange brown, light brown and light grey, slightly clayey, silty sand, varying to clayey, very sandy silt was encountered. These soils were considered to represent a ‘roddon’ within the anticipated superficial Tidal Flat Deposits and were encountered to depths of between 1.05m (HA3) and 2.40m (BH1).

Below 1.05m and 1.10m depth in HA3 and HA4 in the southern part of the site, and below 1.45m to 2.40m depth in the central to northern parts of the site, initially firm (HA3), soft and very soft, dark brown, grey and orange brown, slightly sandy to sandy, silty, locally organic (HA1) clay was encountered. The clay contained pockets of peat below 4.00m depth. In BH1 at 8.70m to 10.50m depth, soft, brown and grey, slightly gravelly, slightly organic clay was encountered, which had a gravel fraction of sub-angular and sub-rounded flint. These soils were considered to represent the Crowland Bed marking the base of the Tidal Flat Deposits.

**Abbey Gravel**

At 10.50m to 11.30m depth in BH1, medium dense, brown, very clayey sand and gravel was encountered. The gravel fraction was fine and medium grained, sub-angular flint, and these soils were considered to represent superficial Abbey Gravel.

**Till (Boulder Clay)**

At a depth of 11.30m in BH1, brown and grey, slightly sandy, slightly gravelly, silty clay was encountered to at least the base of the borehole at a depth of 20.00m, a thickness of at least 8.70m. The gravel fraction comprised angular to rounded chalk and flint. These clay soils were initially stiff, becoming very stiff below 15.00m depth, and were considered to represent superficial glacial Till.

**Groundwater**

Groundwater was recorded during hand excavation in HA1 at 1.45m depth and in HA3 at 1.65m depth. Groundwater was also recorded at 10.50m depth in BH1 within Abbey Gravel soils, which rose to 5.10m depth, and was sealed off by the casing at 12.00m depth. During monitoring of the standpipe installed in BH1, water was recorded at 2.30m depth initially and rose to 2.25m during the monitoring period in September 2020.

**Observations**

Live roots were observed in all of the boreholes and to a maximum depth of 1.20m in BH1.

**Evidence of Contamination**

The made ground encountered during this investigation was not noted to have olfactory or visual evidence of fuel contamination. The made ground contained occasional fragments of brick. No asbestos containing materials were noted in the soils during this investigation, or during testing.

## COMMENTS ON THE GROUND CONDITIONS IN RELATION TO FOUNDATION DESIGN AND CONSTRUCTION

This investigation found made ground and topsoil to depths of between 0.30m and 0.60m, covering superficial loose to medium dense silty sand Tidal Flat Deposits, and in turn generally soft, locally slightly organic clay below 1.05m to 2.40m depth. Groundwater was met as shallow as 1.45m depth during the investigation. The superficial deposits (clay, silt and sand) could offer support for lightly to modest loaded traditional foundations for the proposed housing development.

The slightly clayey, silty sand varying to sandy silt of the Tidal Flat Deposits were generally medium dense and could be used to support the proposed houses on traditional foundations cast within the shallow soils, as long as the structures are lightly loaded and could tolerate potentially large total and differential consolidation movements.

Foundations should extend through any made ground and topsoil into the underlying very silty to silty Marine Sand 0.60m below ground level, which offers modest support for traditional foundations.

Floor slabs could be ground bearing in areas where they are well away from the influence of trees, or where sand forms the sub-grade, although differential movements are likely to occur.

### Traditional Shallow Foundations

Large scale processes of natural sedimentation allow a certain degree of confidence to be placed in the absence of important variation of the engineering properties of natural soils across sites. The made ground and topsoil had variable bearing properties and were found to a maximum depth of 0.60m, and both soils should be avoided as bearing strata.

The silty sand soils would be classed as non-shrinkable and where present could enable foundations to be cast at a minimum foundation depth of 0.60m.

Samples of the near surface soils had modified plasticity indices of 10%, and the sandy silt varying to slightly clayey, silty sand, is rated as a ósiltô soil to a marginal clay/silt soil having a low volume change potential based on NHBC Standards Chapter 4.2 óBuilding near treesô (2020). A minimum foundation depth of 0.75m in the naturally deposited slightly clayey, silty sand soils beneath this site, where remote from trees, would be considered appropriate in order to penetrate the zone affected by seasonal moisture content and volume change.

In summary, foundations for the new buildings will need to be a minimum of 0.60m deep, and preferably extended through any clayey soils into non-shrinkable silty sand soils encountered at 0.75m below ground level. Deepened foundations will encounter the organic clay and are likely to be below the groundwater table, in which case piled foundations would be recommended. Piled foundations may provide an economic alternative to support the proposed dwellings, particularly as deepened foundations are likely to have unacceptably high total and differential settlements.

The non-shrinkable, orange brown and brown, silty sand, found beneath the surface made ground soils at 0.60m depth, offers a maximum safe bearing pressure of 80kN/$m^2$ for foundations up to 1.20m width, where present above the groundwater table. The above bearing pressure is limited by the strength of the underlying soft clays, and should ensure that settlement beneath such foundations would be within 25mm. Settlement within the underlying sand should occur as the loads are applied. Deeper foundations would have a lower maximum safe bearing capacity. Similarly, the Tidal Flat Deposits beneath a nominal 12m by 7m raft foundation would have a maximum safe bearing capacity of 15kN/$m^2$ with the same factor of safety of 3.0 incorporated. Estimated consolidation settlement beneath such a raft is likely to be in excess of 50mm.

Structures founded within the Tidal Flat Deposits would have to tolerate potentially large total and differential settlements, which may be exaggerated where the foundations cross any natural variation different soil types. Differential settlements are likely to occur across individual building plots where foundations partially bear within the clay, due to variation in thickness and compressibility of the underlying soils. Further differential

movements will occur if and where foundation pressures locally increase along foundation runs. Movements could be further exacerbated by effects of desiccation, which could also locally generate upward heave movements. New foundations should incorporate reinforcement in order to minimise differential movements along or between them.

**Excavations**

The made ground together with the underlying soils should be easily removed within excavations for the proposed buildings, although the existing bungalow foundations may be more difficult to remove and require the use of a breaker. The sides of excavations within any silty fine sand are likely to be unstable and should not be relied upon to stand unsupported.

Excavations could be expected to encounter groundwater at depths between 1.45m and 2.30m, which is likely to reflect the water level in nearby drains. The groundwater levels may fluctuate seasonally and such inflows would locally be accompanied by órunning sandô conditions and resulting instability. Care should be taken not to excavate below the water table in the absence of suitable groundwater control and side support, such as dewatering via screened sumps or well points and interlocking sheeting. The clays, and silty sands are prone to softening, deterioration and loosening in the presence of water, with loss of their modest bearing properties. Care should be taken to keep the excavations dry.

Attention should be given where personnel are to enter deep excavations, when sides should either be safely battered back, or close side support provided, in order to comply with statutory safety requirements and prevent sidewall collapse.

**Piled Foundations**

Piled foundations may be used to support the proposed dwellings, particularly where higher loads are required. The underlying glacial Till would provide a suitable pile bearing stratum. The advice of a specialist piling contractor should be sought with regard to suitable methods of pile installation. The very soft, organic clay and silty sand of the Tidal Flat Deposits will require use of casing for bored piles and attention should be made to the possibility

of ónecking' of concrete within such soils. Driven, bored or Continuous Flight Augered (CFA) piles could be used, however vibrations from driven piles could be transmitted through organic soils and affect nearby properties on shallow foundations.

Preliminary working loads for a single bored pile may be estimated for preliminary cost and design purposes using the pile bearing coefficients given over page, which are based on the following assumptions;

1. The ultimate load on a pile would be the sum of the adhesion in clay, and friction in sand, acting on the shaft of the pile together with the end bearing load.
2. The adhesion acting on the shaft of a pile is a function of the values of apparent cohesion within the clay, presented on the laboratory test results and plotted against depth in Figure 1. The adhesion assumes that the very soft organic clay soil would not be surcharged by surface or floor loadings. If these soils are surcharged then negative shaft adhesion would need to be considered.
3. The friction acting on the shaft of a pile is a function of the density of sand, taken from the SPT 'N' values presented on the borehole records, plotted against depth on the soil profile Figure 2, and the effective overburden pressure.
4. The end bearing load would be a function (9.0) of the average cohesion of the clay at the level of the pile base.
5. A factor of safety of at least 2.0 would be used to assess the working load and if test loading of selected piles were not practical, the factor of safety (F) would be increased to at least 2.5.
6. Where piles are installed in groups it will be necessary to position them at least 3.0 diameters apart, centre-to-centre, otherwise a reduction in individual working load will need to be taken into account.

| Item | Ultimate Pile Bearing Value ($kN/m^2$) |
|---|---|
| Adhesion in made ground or root affected clay | Ignored |
| Adhesion/friction in very soft & organic clay to 10.50m | 5 |
| Friction in Abbey Gravel, 10.50m to 11.30m depth | 15 |
| Adhesion in stiff Till, 11.30m to 15.00m | 60 |
| Adhesion in very stiff Till, 15.00 to 20.00m | 100 |
| End bearing in stiff Till, 12.00 to 15.00m | 1100 |
| End bearing in very stiff Till, below 15.00m depth | 1800 |

Based on these coefficients at the centrally located BH1, it is estimated that a single 450mm diameter bored pile installed to 12m depth within the stiff Till, would have a working load of 125kN (F=2.5). A single 450mm diameter pile extended to 15m depth within the very stiff Till, would have a working load of 340kN (F=2.5).

Larger diameter piles would have increased working loads. For example, the same 12m and 15m length piles at 600mm diameter would have a working load of 200kN (F=2.5) and 500kN (F=2.5) respectively.

These values assume that negative skin friction resulting from surcharging of the compressible and organic Tidal Flat Deposits is not generated. If surcharge loads are to be applied to the ground around the piles, for example by ground bearing floor slabs, it would be necessary to reduce the estimated working loads of the piles by the drag down force ($-5kN/m^2$) within the made ground and very soft organic clays around the pile shaft.

The advice of a specialist piling contractor should be sought prior to design.

**Floor Slabs**

Ground bearing floor slabs could be adopted for the new properties, even within influencing distance of neighbouring trees, and the naturally deposited clay/silt and non-shrinkable silty sand soils are present at shallow depth. If any root infested clays are present, they should be removed and replaced with suitable well-graded coarse-grained fill. Damaging

differential heave movements could occur across such slabs, particularly where they cover any clay affected by recently severed tree roots. Suspended floor slabs will be required to avoid the anticipated large total and differential consolidation settlements, any negative skin friction, together with any volume change movements within root affected clays, providing that the sub-floor gaps recommended in Table 7 of the NHBC Standards Chapter 4.2 (2020), are adopted.

**Hardstanding**

Naturally deposited, medium dense, clayey, very sandy silt, varying to slightly clayey, silty sand was encountered at sub-grade level across this site. Any old foundations should be removed and replaced with suitable well-graded coarse grained fill to avoid hard spots beneath the hardstanding.

Based on IAN 73/06, Table 5.1 recommends a design CBR value of 1% for silt, 3.0% for sandy clay with a plasticity index of 10%, and 20% for a poorly graded sand.

Laboratory CBR tests yielded CBR values of 1.1% and 1.2%. A design CBR value of 1.0% for the naturally deposited sandy silt/silty sand, should be adopted for hardstanding design on this site, although the pavement construction will need to be at least 450mm thick since the silty soils are considered to be potentially frost susceptible in accordance with Road Note 29, Appendix 1.

The sub-grade should be suitably compacted and inspected, with any topsoil, very soft, organic or desiccated clays, being removed and replaced with suitable well-graded coarse-grained fill. Care should be taken not to allow exposed silt/clay soils at sub-grade level to become exposed to inclement weather conditions, since they are prone to rapid softening and deterioration. A permeable geotextile should be incorporated in order to prevent both loss of any sub-base material into the sub-grade and migration of sub-grade soils into the overlying sub-base.

**Sulphate Conditions**

Sulphate analysis of selected samples of soil and groundwater yielded soluble sulphate concentrations within Design Sulphate Class DS-1, of the BRE Special Digest 1, Table

C1 (2001), presented in Appendix 3. The pH results of the samples ranged between 7.4 and 8.4 indicating alkaline conditions.

These results indicate an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-1 for buried concrete. This ACEC Class should be considered when specifying a Design Chemical Class (DC Class) for buried concrete on this site, as detailed in the above cited BRE document.

## COMMENTS ON THE SOIL CHEMICAL TEST RESULTS

The results of the laboratory chemical testing on near surface soil samples have primarily been compared to soil screening values (SSVs) produced by Land Quality Management Limited (LQM) and the Chartered Institute for Environmental Health (CIEH) presented in their document ôThe LQM/CIEH S4ULs for Human Health Risk Assessment: 2015 (Publication Number S4UL3608)ô. The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and are transparently-derived and cautious ótrigger valuesô above which further assessment of the risks or remedial action may be needed. The S4ULs (Suitable for Use Levels) have been derived, in accordance with UK legislation and Environment Agency policy, using a modified version of the Environment Agency CLEA 1.06 software.

Reference has also been given to ATRISKsoil soil screening values produced by Atkins Limited and provided under licence to Ground Engineering Limited. Atkins SSVs have been derived in line with the Environment Agency 2009 guidance using the CLEA 1.071 software. With the absence of a S4UL for cyanide the ATRISKsoil SSV has been used as the soil screening criteria within this report.

In 2014 the Department for Environment Food and Rural Affairs (DEFRA) published, in their document SP1010, Category 4 Screening Levels (C4SL) for several contaminants including lead. The C4SL represent screening levels below which the land could be considered suitable for a specified use and definitely not contaminated land in respect of those determinands. With the absence of S4UL for lead the C4SL has been used as the soil screening criteria within this report.

For each contaminant the adopted soil screening criteria have been calculated for the following land uses:

- Residential use with home grown produce
- Residential use without home grown produce
- Commercial and industrial usage

The intended purpose of the SSVs are as ñintervention valuesò in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards, but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users.

Table 5 compares the test results for the made ground with the SSVs in relation to the specified uses. The number of test results, which exceed these values, are also provided.

## Table 5: Comparison of Chemical Test Results with SSVs for Near Surface Soils

| Determinand | Number of Samples | Min Value mg/kg | Max Value mg/kg | Number of Samples Exceeding SSV for | | | Measured 95th Percentile mg/kg | Assessment Method | Soil Screening Criteria 2.5% SOM | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Residential with home grown produce | Residential without home grown produce | Commercial/ Industrial | | | Residential with home grown produce mg/kg | Residential without home grown produce mg/kg | Commercial/ Industrial mg/kg |
| **Organic Matter** | 5 | 3.0% | 4.5% | - | - | - | - | - | - | - | - |
| **Arsenic** | 5 | 6.8 | 11 | 0 | 0 | 0 | 10.53 | S4UL | 37 | 40 | 640 |
| **Cadmium** | 5 | <0.20 | <0.20 | 0 | 0 | 0 | <0.20 | S4UL | 11 | 85 | 190 |
| **Chromium (III)** | 5 | 16 | 19 | 0 | 0 | 0 | 18.04 | S4UL | 910 | 910 | 8600 |
| **Chromium (VI)** | 5 | <4.0 | <4.0 | 0 | 0 | 0 | <4.0 | S4UL | 6 | 6 | 33 |
| **Lead** | 5 | 26 | 91 | 0 | 0 | 0 | 67.51 | C4SL | 200 | 310 | 2330 |
| **Mercury** | 5 | <0.3 | <0.3 | 0 | 0 | 0 | <0.3 | S4UL | 11 | 15 | 320 |
| **Selenium** | 5 | <1.0 | <1.0 | 0 | 0 | 0 | <1.0 | S4UL | 250 | 430 | 12,000 |
| **Nickel** | 5 | 12 | 14 | 0 | 0 | 0 | 13.67 | S4UL | 130 | 180 | 980 |
| **Phenols** | 5 | <1.0 | <1.0 | 0 | 0 | 0 | <1.0 | S4UL | 200 | 690 | 690 |
| **Benzo[a]pyrene** | 5 | <0.05 | 0.99 | 1 | 0 | 0 | 0.64 | S4UL | 0.98 | 1.2 | 15 |
| **Copper** | 5 | 15 | 28 | 0 | 0 | 0 | 23.82 | S4UL | 2400 | 7100 | 68,000 |
| **Zinc** | 5 | 53 | 140 | 0 | 0 | 0 | 121.41 | S4UL | 3700 | 40,000 | 730,000 |
| **Free Cyanide** | 5 | <1 | <1 | 0 | 0 | 0 | <1 | ATRISK | 34 | 34 | 34 |

Notes
S4UL and C4SL for metals were derived using 6% SOM. These values are not sensitive to SOM and would also be applicable for 1% SOM and 2.5% SOM.
LQM/CIEH S4ULs ©Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3608. All rights reserved©
ATRISKsoil SSVs produced by Atkins Limited and provided under licence to Ground Engineering Limited.

**Discussion of Soil Results**

Apart from a marginally elevated benzo[a]pyrene concentration of 0.99mg/kg (HA3 at 0.10m depth), levels of all elements and compounds in the samples tested were within the associated soil screening values for both residential end uses and for commercial/industrial end use.

Statistical analysis, using the mean value test, indicates that none of the US95 values exceeded the screening values for the most sensitive end uses of residential with home grown produce and residential without home grown produce, nor the screening values for a commercial or industrial usage.

The made ground encountered during this investigation was not noted to have olfactory or visual evidence of fuel contamination.

No asbestos containing materials (ACM) were observed within the made ground soils during site work or testing in the laboratory.

In conclusion, the near surface soils would be suitable for use in the proposed gardens and landscaped areas of the residential development, and also beneath buildings and areas of permanent hardstanding if geotechnically suitable.

## SOIL GAS MONITORING RESULTS

The monitoring of soil gasses (methane, carbon dioxide and oxygen) within the standpipe installed within BH1 was undertaken during three visits in September 2020. The results of the monitoring are summarised in Table 6 below.

**Table 6: Summary of Gas Monitoring Data**

| Hole Location | No. Visits | Methane (% v/v) | Carbon Dioxide (% v/v) | Oxygen (% v/v) | Flow (l/hr) | Water Level (mbgl) | Atmospheric Pressure (mb) |
|---|---|---|---|---|---|---|---|
| BH1 | 3 | 27.5-32.3 | 3.9-4.4 | 11.6-12.0 | <0.1 | 2.25-2.30 | 995-1025 |

The results of the soil gas monitoring of the installation indicated between 27.5% to 32.3% by volume methane. The soil gas monitoring indicated between 3.9% to 4.5% by volume carbon dioxide, recorded during the monitoring visits. The in-situ measurements recorded gas emission rates of less than 0.1l/hr.

Using a flow rate of 0.1l/hr, the detection limit of the equipment used, these in-situ measurements indicate a Gas Screening Value (GSV) of 0.0323l/hr for methane and 0.00441/hr for carbon dioxide. These results fall into Characteristic Situation 2 as defined by BS8485:2015+A1 2019 ócode of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildingsô. Based on these levels, gas protection measures are required for proposed buildings on this site.

In order to achieve a Gas Protection Score of 3.5 beneath a suspended reinforced floor slab, precautionary measures would either need to include a gas membrane or comprise a passive sub-floor dispersal layer with very good performance, or an active dispersal layer.

## UPDATED CONCEPTUAL MODEL

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research and the intrusive ground investigation documented in the preceding sections of this report.

A generalised conceptual model relative to the existing site and proposed residential use of the site is presented in Table 7 below.

**Table 7: General Conceptual Model Relative to Future Residential Development**

| Receptors | Pathway | Estimated Potential for Linkage with Contaminant Sources | | | |
|---|---|---|---|---|---|
| | | Drainage/ Buildings | Soil | Soil Gas | Off-Site Sources |
| Human Health ï ground workers | Ingestion and Inhalation of contaminated Soil, Dust and Vapour | Moderate | Low | High | Very Low |
| Human Health ï users of completed development | Ingestion and Inhalation of contaminated Soil, Dust and Vapour | N/A | Very Low | Moderate | Very Low |
| Water Environment | Migration through ground into surface water or groundwater | Low | Very Low | Very Low | Low |
| Flora | Vegetation on site growing on contaminated soil | Very Low | Very Low | Very Low | Very Low |
| Building Materials | Contact with contaminated soil | Very Low | Very Low | Very Low | Very Low |

| Key to Table 7 Risk | Definition |
|---|---|
| **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 to a designated receptor is currently happening.<br>The risk, if realised, is likely to result in a substantial liability.<br>Urgent investigation (if not undertaken already) and remediation are likely to be required. |
| **High** | Harm is likely to arise to a designated receptor from an identified hazard.<br>Realisation of the risk is likely to present a substantial liability.<br>Urgent investigation (if not undertaken already) and remedial works may be necessary in the short term and likely over the long 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 is more likely that the harm would be relatively mild. |
| **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. |
| **N/A** | Not Applicable because the proposed development will remove the source. |

## COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED DEVELOPMENT

Anticipated exposure scenarios relating to the existing site, the site history and proposed residential end use of the site, in the context of the conceptual model, are discussed as follows.

This investigation may not have revealed the full extent of contamination on the site and appropriate professional advice should be sought if subsequent site work reveals materials that may appear to be contaminated.

### Contaminated Soil

On the basis of the ground investigation, the site is underlain by between 0.30m and 0.60m of made ground and topsoil. The chemical testing has identified no significant elevated concentrations in the soils tested in respect to the proposed gardens or soft landscaping in the residential development, and would be suitable beneath buildings or areas of permanent hardstanding. The absence of contaminants in the made ground indicates that there is a low risk of contaminants affecting groundworkers during any construction works, and there will be a very low risk of affecting future end users of the site.

The underlying naturally deposited soils encountered beneath the site would be considered suitable for retention and re-use within the development if required.

### Existing Drainage

Redundant drain runs, where encountered, should be removed from beneath the site and precautions should ensure that any remaining effluent is directly disposed off-site. The integrity of existing drainage should be checked, and if they are to be retained any damaged sections should be replaced prior to development. The latter measures should minimise any future risk to human health and the water environment.

**Buildings**

The existing bungalow and outbuildings within the site may have asbestos containing materials within them and an asbestos survey should be undertaken prior to demolition for the proposed redevelopment. Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos containing materials, during the site clearance and redevelopment phases.

There is a very low risk of contamination affecting the existing and proposed structures, and their foundations.

**Soil Gas**

According to the environmental database there are no landfills recorded within 250m of the site. The site is generally underlain by a thin layer of made ground and topsoil, covering variable becoming organic Tidal Flat Deposits and in turn Abbey Gravel at depth.

Gas monitoring recorded up to 32.3% by volume methane, and also recorded up to 4.5% by volume carbon dioxide.

There is a high risk that hazardous gases would affect groundworkers during the construction phase and a moderate risk of hazardous gases affecting future users of the site.

Consideration should be given to gas monitoring within deep or confined spaces, particularly where thick made ground and organic soils are present, to ensure safety of personnel entering them, since methane and carbon dioxide could accumulate within any excavations, service chambers or sub-structures.

The site is not in a radon affected area, and no radon protection measures are required for new properties on the site.

**Human Health - Construction Workers**

Based on the chemical test results, no special precautions would be required during the development of the site by workers who may come into contact with the soil during

groundworks, providing standard precautions are adopted which should generally include the procedures given by the Health and Safety Executive (The Blue Book) HS(G)66.

For the protection of workers during groundworks the following is recommended:

a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.

b) Washing facilities should be made available to groundworkers, so as to minimise the potential for inadvertent ingestion of soil.

c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

d) Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos containing material, during the site clearance phase.

e) Consideration should be given to gas monitoring within deep or confined spaces, particularly where thick made ground and organic soils are present, to ensure safety of personnel entering them, since methane and carbon dioxide could accumulate within any excavations, service chambers or sub-structures.

**Human Health - Users of Completed Development**

The results of the chemical analysis undertaken would indicate that the made ground and near surface soils should be considered suitable for re-use at the surface in any new garden, landscaped or planted areas.

The made ground could be considered for re-use beneath proposed buildings and permanent hardstanding, if suitable for engineering purposes, where it is unlikely to affect future users of the site, however these soils could affect buried services.

Any soil imported to site must be certified as "suitable for use".

Based on the recorded elevated methane and carbon dioxide gas levels, gas protection measures are required for the proposed buildings on this site. Additional

precautionary measures including signage and monitoring will also be required if any below ground sub-structures or inspection chambers are included in the development, in order to ensure the safety of personnel or end users entering such confined spaces.

**Water Environment**

The site is underlain by superficial Tidal Flat Deposits and glacial Till at depth, which are indicated by the EA to be ôUnproductiveô strata. The Abbey Gravel at depth beneath the site would be anticipated to be a ôSecondary (A) Aquiferô. The nearest surface water feature is the drain along the southern boundary of the site. The site does not lie within a source protection zone.

Groundwater was recorded as shallow as 1.45m below ground level during the investigation.

The risk to the water environment from soil contaminants is considered very low as it is unlikely that the proposed development and contaminants within the made ground soils would impact the quality of the water environment.

**Effects on Building Materials and Buried Services**

The sulphate requirements for buried concrete have been discussed in the previous section of this report.

The local water supply company should be consulted if new buried plastic water pipes are to be installed within the made ground soils on this site.

**Off-Site Disposal of Soil Arisings**

The results of chemical analysis are provided following the exploratory hole records and can be used within the information necessary for basic characterisation of the soil destined for landfill. The Environment Agency publication Hazardous Waste, Technical Guidance WM3 outlines the methodology for classifying wastes and should be referenced for guidance. The test results (total metals, hydrocarbons and cyanide) should be compared to the

relevant thresholds to determine whether they fall into the primary categories of non-hazardous or hazardous waste and will help indicate the likely European Waste Catalogue (EWC) code which is determined by the waste type. Asbestos containing materials would be considered hazardous and should be appropriately disposed of.

Excavated material and excess spoil should always be classified prior to removal from site as required by 'Duty of Care' (Environmental Protection Act, 1990) legislation. This means that material has to be given a proper description and waste classification prior to removal. Basic characterisation is the responsibility of the waste producer, whilst compliance checking and on-site verification are generally the responsibility of the landfill operator. The landfill operator will need to liaise with the waste producer, as the approach relies on the information from basic characterisation.

It is expected that arisings of natural soils from the excavations across this site would fall into the inert category under the European Waste Catalogue description 'Soil and Stones', EWC code 17 05 04 with restrictions excluding topsoil and peat.

**GROUND ENGINEERING LIMITED**

S Weatherley

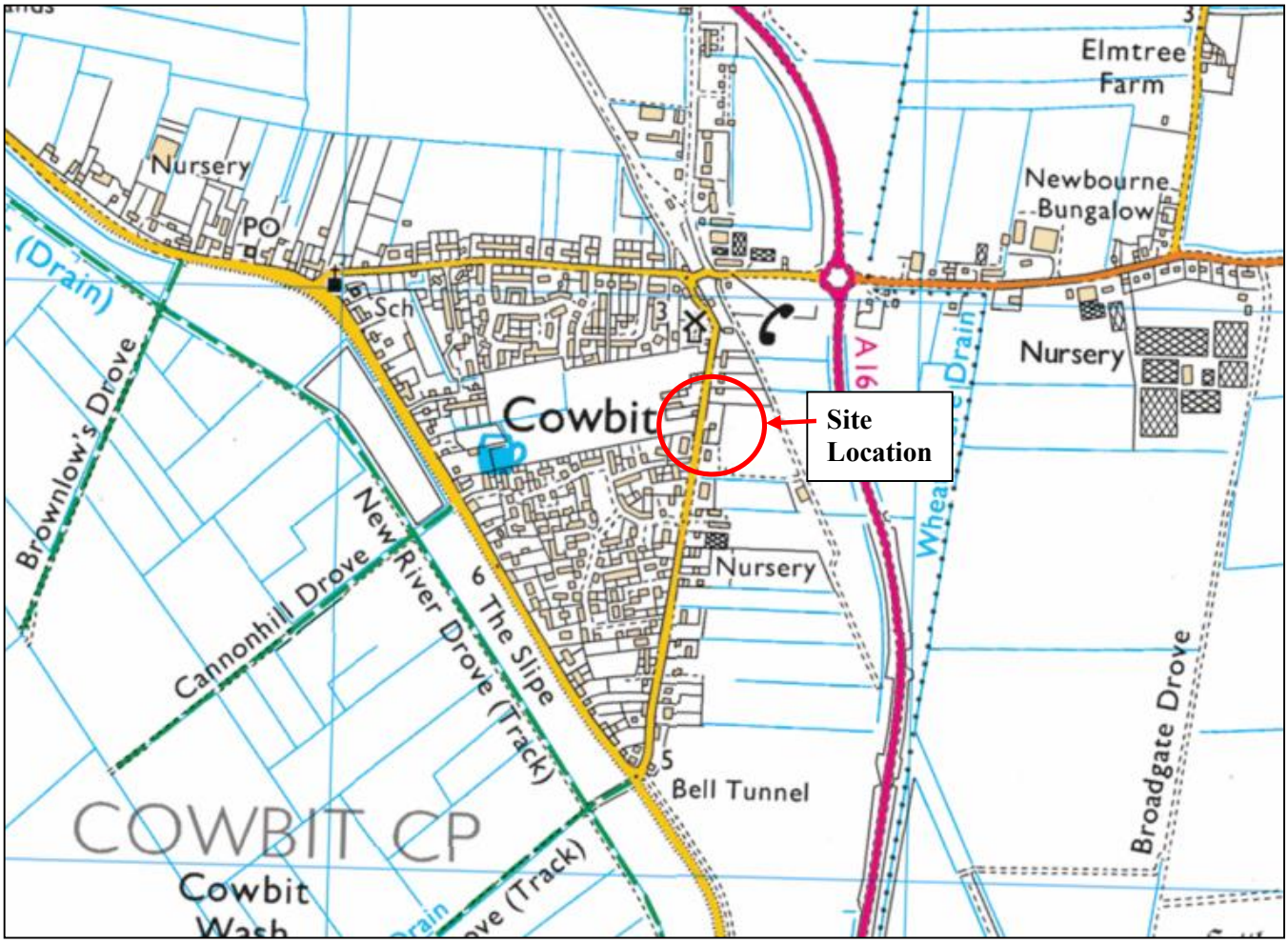
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**C.Geol., F.G.S.**
**Senior Geo-Environmental Engineer**

pp

**C. M. J. EBELING**
**M.Sc.(Eng.), M.A.E.G.,**
**C.Geol., F.G.S.**
**Director**

# Site Location Plan

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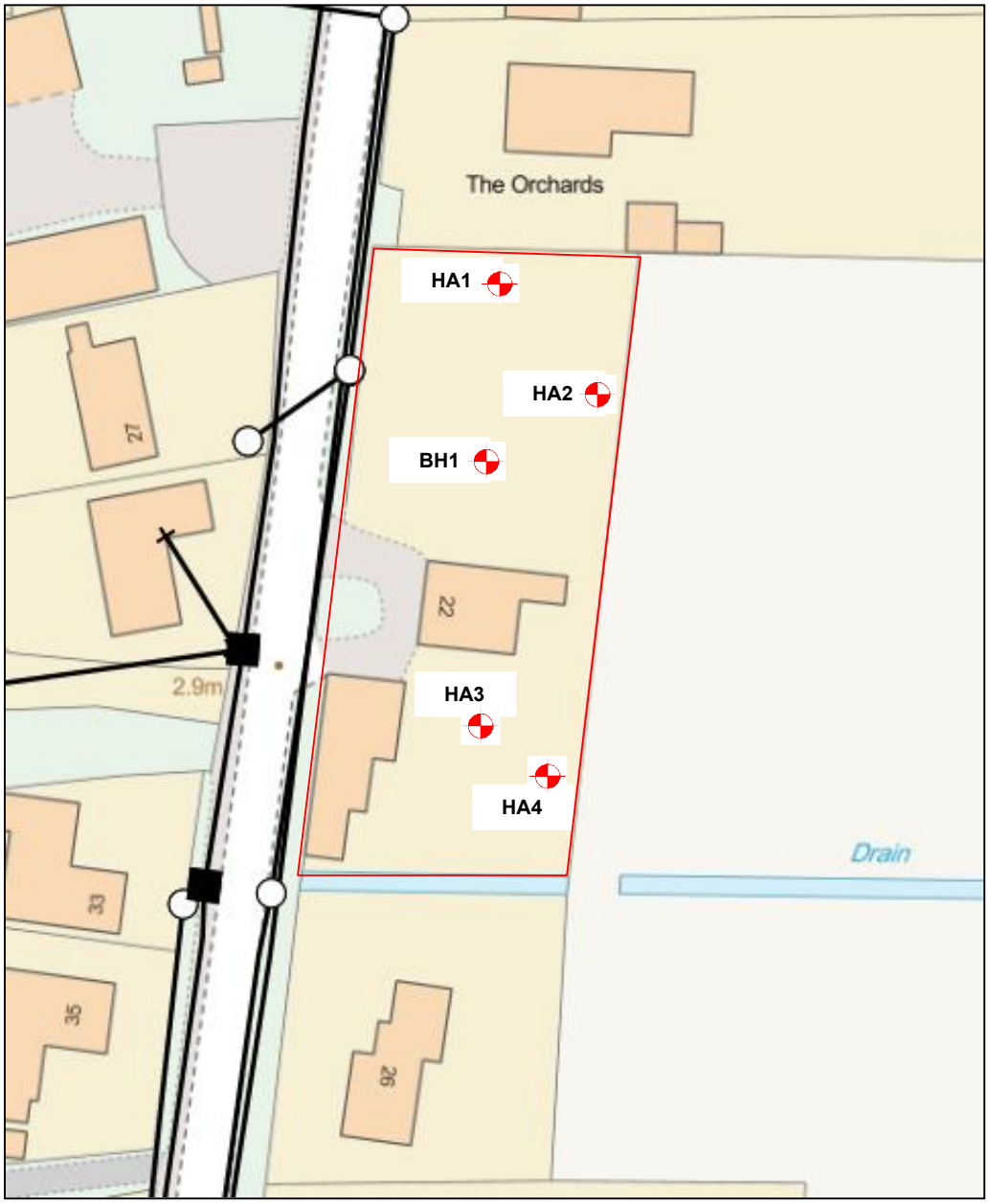

**Not To Scale**

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|---|---|---|
| **Project : 22 Backgate, Cowbit, Spalding, Lincolnshire**<br><br>**Client : A. C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br>**C15144** |

# Exploratory Hole Location Plan

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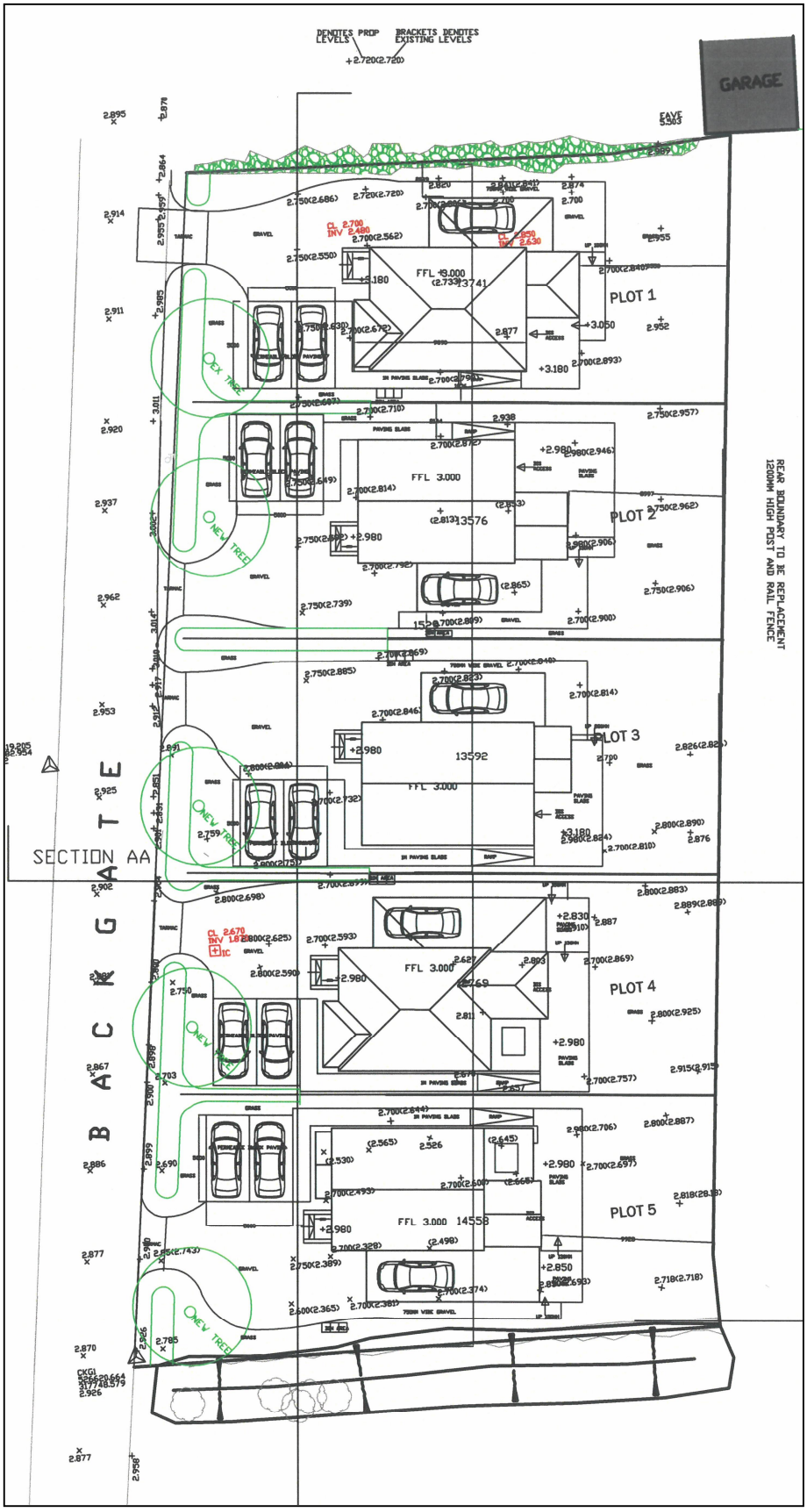



**Not To Scale**

| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit, Spalding, Lincolnshire**<br><br>**Client : A. C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No. C15144** |

# Proposed Development Plan

Based on plan provided by client




**Not To Scale**

| | | |
|---|---|---|
| **Project:** 22 Backgate, Cowbit, Spalding, Lincolnshire<br><br>**Client:** A. C. Building Limited | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No. C15144** |

**GROUND ENGINEERING LIMITED**

Tel: 01733-566566
www.groundengineering.co.uk

Site: 22 BACKGATE, COWBIT

BOREHOLE BH1

Date: 04/09/20 to 04/09/20

Hole Size: 150mm dia to 20.00m

Ground Level:

| Samples and in-situ Tests | | | (Date) Casing | Inst. | Description of Strata | Legend | Depth m | O.D. Level m |
|---|---|---|---|---|---|---|---|---|
| Depth m | Type | Blows | | | | | | |
| 0.00-0.30 | B1 | | | | TOPSOIL - Brown, silty SAND. | | 0.30 | |
| 0.30-0.80 | B2 | | | | Loose, brown, slightly clayey, silty SAND. | | | |
| 1.20-1.70 | B3 | | | | | | | |
| 1.35-1.65 | S | N7 | | | | | | |
| 1.65 | D1 | | | | | | | |
| 2.00-2.40 | B4 | | | | .... Becoming very loose below 2.00m depth. (TIDAL FLAT DEPOSIT) | | | |
| 2.15-2.45 | S | N2 | 1.50 | | | | 2.40 | |
| 2.30 | W1 | | | | | | | |
| 2.40-3.00 | B5 | | | | | | | |
| 2.45 | D2 | | | | Very soft, brown and grey, slightly sandy, slightly organic CLAY. | | | |
| 3.00-3.50 | B6 | | | | | | | |
| 3.00-3.00 | S | N1 | 3.00 | | | | | |
| 3.45 | D3 | | | | | | | |
| 4.00-4.50 | B7 | | | | .... with pockets of peat below 4.00m depth. | | | |
| 4.15-4.45 | S | N1 | 4.00 | | | | | |
| 4.45 | D4 | | | | | | | |
| 4.45 | D5 | | | | | | | |
| 5.00-5.45 | U1 | 8 | 4.50 | | (TIDAL FLAT DEPOSIT) | | | |
| 5.45 | D6 | | | | | | | |
| 5.80-6.25 | U2 | 10 | 5.50 | | | | | |
| 6.25 | D7 | | | | | | | |
| 6.70-7.20 | B8 | | | | | | | |
| 7.50-8.00 | B9 | | | | | | | |
| 7.65-7.95 | S | N1 | 7.50 | | | | | |
| 7.95 | D8 | | | | | | | |
| 8.70-9.00 | B10 | | | | | | 8.70 | |
| 9.00-9.45 | U3 | 11 | 9.00 | | Soft, brown and grey, slightly gravelly, slightly organic CLAY. Gravel is sub-angular and sub-rounded chalk. | | | |
| 9.45 | D9 | | | | | | | |
| 9.50-10.00 | B11 | | | | (TIDAL FLAT DEPOSIT) | | | |
| 10.00-10.50 | B12 | | | | | | 10.00 | |

REMARKS
1. Excavating a pit from 0.00m to 1.20m for 1 hour
2. Live roots observed to 1.20m depth
3. Borehole cased to 12.00m depth
4. Gas monitoring standpipe installed to 11.00m depth

Project No 15144

Scale 1:50

Page 1/2

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
▽ Water Strike
▼ Water Rise
N/* - SPT Blows for 0.3m or given penetration
ES - Environmental Sample
V - Vane Shear Test Cohesion ( ) kPa
▼c Level on completion
c▼w Level casing withdrawn
▼s Standpipe Level

**Groundwater Strikes**

| No | Depth m Struck | Rose to | Rate | Cased | Sealed |
|---|---|---|---|---|---|
| 1 | 10.50 | 5.10 | steady/fast | 10.00 | 12.00 |

**Groundwater Observations**

| Date | Depth m Hole | Casing | Water |
|---|---|---|---|
| 04/09/20 | 10.50 | 12.00 | dry |
| 04/09/20 | 20.00 | 12.00 | dry |
| 04/09/20 | 20.00 | 0.00 | dry |
| 14/09/20 | 11.00 | 1.00 | 2.30 |
| 21/09/20 | 11.00 | 1.00 | 2.25 |

**GROUND ENGINEERING LIMITED**

Tel: 01733-566566
www.groundengineering.co.uk

Site: 22 BACKGATE, COWBIT

BOREHOLE BH1

Date: 04/09/20 to 04/09/20

Hole Size: 150mm dia to 20.00m

Ground Level:

| Samples and in-situ Tests | | | (Date) Casing | Inst. | Description of Strata | Legend | Depth m | O.D. Level m |
|---|---|---|---|---|---|---|---|---|
| Depth m | Type | Blows | | | | | | |
| | | | | | Soft, brown and grey, slightly gravelly, slightly organic CLAY. Gravel is sub-angular and sub-rounded chalk. (TIDAL FLAT DEPOSIT) | | 10.00 | |
| 10.50-11.00 | B13 | | | 1 | | | | |
| 10.50 | W2 | | | | Medium dense, brown, very clayey SAND AND GRAVEL. Gravel is fine and medium, sub-angular flint. | | 10.50 | |
| 10.65-10.95 | S | N14 | 10.50 | | | | | |
| | | | | | (ABBEY GRAVEL) | | | |
| 11.30-11.80 | B14 | | | BENEATH INSTALLATION | | | 11.30 | |
| | | | | BENEATH INSTALLATION | Stiff, brown and grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to rounded chalk and flint. | | | |
| 11.80-12.25 | U4 | 50 | 11.80 | BENEATH INSTALLATION | | | | |
| 12.25 | D10 | | | BENEATH INSTALLATION | | | | |
| 13.00 | D11 | | | BENEATH INSTALLATION | | | | |
| 13.50-13.95 | U5 | 70 | 12.00 | BENEATH INSTALLATION | | | | |
| 13.95 | D12 | | | BENEATH INSTALLATION | | | | |
| 14.50 | D13 | | | BENEATH INSTALLATION | | | | |
| 15.00-15.45 | U6 | 70 | 12.00 | BENEATH INSTALLATION | .... Becoming very stiff below 15.00m depth. | | | |
| 15.45 | D14 | | | BENEATH INSTALLATION | | | | |
| 16.00 | D15 | | | BENEATH INSTALLATION | (TILL) | | | |
| 16.50-16.90 | U7 | 70 | 12.00 | BENEATH INSTALLATION | | | | |
| 16.90 | D16 | | | BENEATH INSTALLATION | | | | |
| 17.50-18.00 | B15 | | | BENEATH INSTALLATION | | | | |
| 18.00-18.40 | U8 | 70 | 12.00 | BENEATH INSTALLATION | | | | |
| 18.40 | D17 | | | BENEATH INSTALLATION | | | | |
| 19.00 | D18 | | | BENEATH INSTALLATION | | | | |
| 19.60-20.00 | U9 | 90 | 12.00 | BENEATH INSTALLATION | | | | |
| 20.00 | D19 | | | | | | 20.00 | |

REMARKS

Borehole completed at 20.00m depth

Project No 15144

Scale 1:50

Page 2/2

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
▽ Water Strike
▼ Water Rise
N/* - SPT Blows for 0.3m or given penetration
ES - Environmental Sample
V - Vane Shear Test Cohesion ( ) kPa
▽c Level on completion
c▽w Level casing withdrawn
▼s Standpipe Level

Groundwater Strikes

| No | Depth m Struck | Rose to | Rate | Cased | Sealed |
|---|---|---|---|---|---|
| | | | | | |

Groundwater Observations

| Date | Depth m Hole | Casing | Water |
|---|---|---|---|
| 24/09/20 | 11.00 | 1.00 | 2.25 |

**GROUND ENGINEERING LIMITED**

Tel: 01733-566566
www.groundengineering.co.uk

Site: 22 BACKGATE, COWBIT

HAND AUGER
HA1

Date: 09/09/20

Hole Size: 80mm dia to 2.13m

Ground Level:

| Samples and in-situ Tests | | | (Date) Water | Description of Strata | Legend | Depth m | O.D. Level m |
|---|---|---|---|---|---|---|---|
| Depth m | Type | Result | | | | | |
| 0.05 | D1 | | | MADE GROUND - Dark brown, slightly gravelly, sandy SILT. Gravel is sub-angular and sub-rounded brick fragments. | | | |
| 0.05 | ES1 | | | | | | |
| 0.30 | D2 | | | | | 0.35 | |
| 0.30 | ES2 | | | | | | |
| 0.40 | D3 | | | Medium dense, light brown, clayey, very sandy SILT. (TIDAL FLAT DEPOSIT) | | | |
| 0.40 | ES3 | | | | | | |
| 0.50-0.60 | B1 | | | | | | |
| 0.60-0.90 | MP1 | 79 | | | | 0.80 | |
| 0.90 | D4 | | | Medium dense, brown, grey and orange brown, sandy SILT. (TIDAL FLAT DEPOSIT) | | | |
| 0.90-1.20 | MP2 | 61 | | | | 1.05 | |
| 1.10 | D5 | | | Medium dense, grey and light brown, silty SAND. (TIDAL FLAT DEPOSIT) | | | |
| 1.20-1.50 | MP3 | 66 | | | | | |
| 1.30 | D6 | | 1 ▽ ▼c | | | 1.45 | |
| 1.60 | D7 | | | Soft, light grey and orange brown, sandy CLAY. (TIDAL FLAT DEPOSIT) | | 1.90 | |
| | | | | Soft, blue grey and brown, very silty, slightly organic CLAY. (TIDAL FLAT DEPOSIT) | | 2.13 | |
| 2.13 | D8 | | | Hole completed at 2.13m depth. | | | |

REMARKS 1. Live roots observed to 0.50m depth

Project No 15144

Scale 1:25

Page 1/1

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
R - Root Sample
▽ Water Strike
▼c Level on completion
MP - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
ES - Environmental Sample
▼ Water Rise
▼s Standpipe Level

Groundwater Strikes

| No | Depth m Struck | Rose to | Rate | Cased | Sealed |
|---|---|---|---|---|---|
| 1 | 1.45 | | | | |

Groundwater Observations

| Date | Depth m Hole | Casing | Water |
|---|---|---|---|
| 09/09/20 | 2.13 | | 1.50 |

**GROUND ENGINEERING LIMITED**
Tel: 01733-566566
www.groundengineering.co.uk

Site: 22 BACKGATE, COWBIT

HAND AUGER
HA2

Date: 09/09/20

Hole Size: 80mm dia to 1.25m

Ground Level:

| Samples and in-situ Tests | | | (Date) Water | Description of Strata | Legend | Depth m | O.D. Level m |
|---|---|---|---|---|---|---|---|
| Depth m | Type | Result | | | | | |
| 0.10 | D1 | | | MADE GROUND - Brown and dark brown, slightly gravelly, sandy SILT. Gravel is angular brick fragments. | | | |
| 0.10 | ES1 | | | | | 0.30 | |
| 0.40 | D2 | | | MADE GROUND - Dark brown, slightly gravelly, silty SAND. Gravel is angular brick fragments. | | | |
| 0.40 | ES2 | | | | | | |
| 0.50-0.60 | B1 | | | | | 0.60 | |
| 0.60 | D3 | | | | | | |
| 0.60-0.90 | MP1 | 63 | | Medium dense, light brown, slightly clayey, silty SAND. (TIDAL FLAT DEPOSIT) | | 0.75 | |
| 0.80 | D4 | | | Medium dense, light brown, slightly clayey, very silty SAND. Sand is fine grained. | | | |
| 0.90-1.20 | MP2 | 115 | | (TIDAL FLAT DEPOSIT) | | 1.10 | |
| 1.15 | D5 | | | Light brown and orange brown, slightly silty SAND. | | | |
| 1.25 | D6 | | | (TIDAL FLAT DEPOSIT) | | 1.25 | |
| | | | | Hole completed at 1.25m depth. | | | |

REMARKS 1. Live roots observed to 0.60m depth

Project No 15144

Scale 1:25

Page 1/1

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
R - Root Sample
▽ Water Strike
▼c Level on completion
MP - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
ES - Environmental Sample
▼ Water Rise
▼s Standpipe Level

| Groundwater Strikes | | | | | | Groundwater Observations | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth m | | | | | | | Depth m | | |
| No | Struck | Rose to | Rate | Cased | Sealed | Date | Hole | Casing | Water |
| | | | | | | 09/09/20 | 1.25 | | dry |

**GROUND ENGINEERING LIMITED**

Tel: 01733-566566
www.groundengineering.co.uk

Site: 22 BACKGATE, COWBIT

HAND AUGER
HA3

Date: 09/09/20

Hole Size: 80mm dia to 2.05m

Ground Level:

| Samples and in-situ Tests | | | (Date) Water | Description of Strata | Legend | Depth m | O.D. Level m |
|---|---|---|---|---|---|---|---|
| Depth m | Type | Result | | | | | |
| 0.10 | D1 | | | MADE GROUND - Dark brown, slightly gravelly, sandy SILT. Gravel is sub-angular and sub-rounded brick and shell fragments. | | | |
| 0.10 | ES1 | | | | | | |
| | | | | | | 0.45 | |
| 0.50 | D2 | | | Medium dense, light brown, light grey and orange brown, slightly clayey, silty SAND. (TIDAL FLAT DEPOSIT) | | | |
| 0.50 | ES2 | | | | | | |
| 0.60-0.90 | MP1 | 84 | | | | | |
| 0.85 | D3 | | | | | | |
| 0.90-1.20 | MP2 | 59 | | | | | |
| | | | | | | 1.05 | |
| 1.10 | D4 | | | Firm, grey, brown and orange brown, slightly sandy, silty CLAY. (TIDAL FLAT DEPOSIT) | | | |
| 1.20-1.50 | MP3 | 38 | | | | 1.25 | |
| 1.30 | D5 | | | Soft, dark brown, grey and orange brown, slightly sandy SILT/CLAY. (TIDAL FLAT DEPOSIT) | | | |
| 1.50 | D6 | | 1 ▽ | | | | |
| 1.80 | D7 | | ▼c | | | | |
| 2.05 | D8 | | | | | 2.05 | |
| | | | | Hole completed at 2.05m depth. | | | |

REMARKS 1. Live roots observed to 0.60m depth

Project No 15144

Scale 1:25

Page 1/1

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
R - Root Sample
▽ Water Strike
▼c Level on completion
MP - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
ES - Environmental Sample
▼ Water Rise
▼s Standpipe Level

| Groundwater Strikes | | | | | | Groundwater Observations | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Depth m | | | | | | Depth m | | |
| No | Struck | Rose to | Rate | Cased | Sealed | Date | Hole | Casing | Water |
| 1 | 1.65 | | | | | 09/09/20 | 2.05 | | 1.90 |

**GROUND ENGINEERING LIMITED**

Tel: 01733-566566
www.groundengineering.co.uk

Site: 22 BACKGATE, COWBIT

HAND AUGER
HA4

Date: 09/09/20

Hole Size: 80mm dia to 1.20m

Ground Level:

| Samples and in-situ Tests | | | (Date) Water | Description of Strata | Legend | Depth m | O.D. Level m |
|---|---|---|---|---|---|---|---|
| Depth m | Type | Result | | | | | |
| 0.10 | D1 | | | MADE GROUND - Dark brown, slightly gravelly, SILT/SAND. Gravel is angular brick fragments. | | | |
| 0.10 | ES1 | | | | | 0.35 | |
| 0.40 | D2 | | | MADE GROUND - Brown, slightly gravelly, sandy SILT. Gravel is angular to sub-rounded brick fragments. | | | |
| 0.40 | ES2 | | | | | | |
| 0.50-0.60 | B1 | | | | | 0.60 | |
| 0.60-0.70 | B2 | | | Medium dense, light brown and orange brown, slightly clayey, silty SAND. | | | |
| 0.60-0.90 | MP1 | 152 | | | | | |
| 0.65 | D3 | | | | | | |
| 0.80 | D4 | | | | | | |
| 0.90-1.20 | MP2 | 60 | | (TIDAL FLAT DEPOSIT) | | | |
| 1.05 | D5 | | | | | 1.10 | |
| 1.20 | D6 | | | Soft, light brown and grey, silty CLAY.(TIDAL FLAT DEPOSIT) | | 1.20 | |
| | | | | Hole completed at 1.20m depth. | | | |

REMARKS 1. Live roots observed to 0.60m depth

Project No 15144

Scale 1:25

Page 1/1

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
R - Root Sample
▽ Water Strike
▼c Level on completion
MP - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
ES - Environmental Sample
▼ Water Rise
▼s Standpipe Level

| Groundwater Strikes | | | | | | Groundwater Observations | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Depth m | | | | | | Depth m | | |
| No | Struck | Rose to | Rate | Cased | Sealed | Date | Hole | Casing | Water |
| | | | | | | 09/09/20 | 1.20 | | dry |

**Groundwater & Gas Monitoring Record**

Site **22 Backgate, Cowbit**

Report Ref: **C15144**

| Date | Borehole No. | Methane (% v/v) | | Carbon Dioxide (% v/v) | | Oxygen (% v/v) | | Flow Rate (l/hr) | Atmosph. Pressure (mb) | Depth of Well (mbgl) | Depth to Groundwater (mbgl) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Peak | Steady | Peak | Steady | Min. | Max. | | | | | |
| 14/9/20 | BH1 | 27.5 | 27.5 | 3.9 | 3.9 | 11.9 | 20.0 | <0.1 | 1025 | 11 | 2.30 | Water sampled |
| | | | | | | | | | | | | |
| 21/9/20 | BH1 | 28.0 | 28.0 | 4.5 | 4.5 | 11.6 | 20.5 | <0.1 | 1020 | 11 | 2.25 | |
| | | | | | | | | | | | | |
| 24/9/20 | BH1 | 32.3 | 32.3 | 4.4 | 4.4 | 12.0 | 21.8 | <0.1 | 995 | 11 | 2.25 | |
| | | | | | | | | | | | | |

LEL – Lower Explosive Limit

# LABORATORY TEST RESULTS

CONTRACT 22 BACKGATE, COWBIT

| Bore-hole | Sample | Depth m | Classification | | | | Density | | Triaxial Compression | | | | | Sulphates ($SO_4$) | | | | C.B.R. | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Liquid Limit % | Plastic Limit % | Plasticity Index % | Moisture Content % | Bulk $Mg/m^3$ | Dry $Mg/m^3$ | Type | Principal Stress Difference kPa | Cell Pressure kPa | Shear Strength kPa | Angle of Shear Resistance degrees | Soil Total % Dry Wt. | Soil Aqueous Extract mg/l | Water mg/l | pH | Top % | Base % | |
| BH1 | B2 | 0.30 - 0.80 | | | | 23 | 1.94 | 1.57 | | | | | | | | | | 1.2 | 1.1 | 0% retained on 20mm sieve |
| | W1 | 2.30 | | | | | | | | | | | | | | 305 | 7.4 | | | |
| | U1 | 5.00 - 5.45 | | | | 77 | 1.41 | 0.80 | Q | 29 | 95 | 15 | 0 | | | | | | | |
| | U2 | 5.80 - 6.25 | | | | 62 | 1.51 | 0.93 | Q | 38 | 110 | 19 | 0 | | | | | | | |
| | U3 | 9.00 - 9.45 | | | | 79 | 1.59 | 0.89 | Q | 50 | 165 | 25 | 0 | | | | | | | |
| | U4 | 11.80 - 12.25 | | | | 17 | 2.20 | 1.87 | Q | 225 | 210 | 112 | 0 | | | | | | | |
| | U5 | 13.50 - 13.95 | | | | 18 | 2.18 | 1.86 | Q | 240 | 245 | 120 | 0 | | | | | | | |
| | U6 | 15.00 - 15.45 | | | | 14 | 2.27 | 1.99 | Q | 686 | 275 | 343 | 0 | | | | | | | |
| | U7 | 16.50 - 16.90 | | | | 14 | 2.24 | 1.97 | Q | 824 | 305 | 412 | 0 | | | | | | | |
| | U8 | 18.00 - 18.40 | | | | 19 | 2.15 | 1.80 | Q | 555 | 325 | 278 | 0 | | | | | | | |
| | U9 | 19.60 - 20.00 | | | | 18 | 2.15 | 1.82 | Q | 788 | 360 | 394 | 0 | | | | | | | |

U - UNDISTURBED SAMPLE
D - DISTURBED SAMPLE
B - BULK SAMPLE
W - WATER SAMPLE

C.U. - CONSOLIDATED UNDRAINED
C.D. - CONSOLIDATED DRAINED
Q. - IMMEDIATE UNDRAINED
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

C.B.R. - CALIFORNIA BEARING RATIO

15144

GROUND ENGINEERING LIMITED
Tel: 01733-566566
www.groundengineering.co.uk

# LABORATORY TEST RESULTS

CONTRACT 22 BACKGATE, COWBIT

| Bore-hole | Sample | Depth m | Classification | | | | Density | | Triaxial Compression | | | | | Sulphates ($SO_4$) | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Liquid Limit % | Plastic Limit % | Plasticity Index % | Moisture Content % | Bulk $Mg/m^3$ | Dry $Mg/m^3$ | Type | Principal Stress Difference kPa | Cell Pressure kPa | Shear Strength kPa | Angle of Shear Resistance degrees | Soil: Total % Dry Wt. | Soil: Aqueous Extract mg/l | Water mg/l | pH | |
| HA1 | B1 | 0.50 - 0.60 | | | | | | | | | | | | | 123 | | 7.6 | |
| | D4 | 0.90 | 36 | 26 | 10 | 23 | | | | | | | | | | | | SOIL CLASSIFICATION = MI<br>0% retained on 425μm sieve |
| HA2 | D3 | 0.60 | | | | | | | | | | | | | 156 | | 7.9 | |
| HA3 | D3 | 0.85 | 33 | 23 | 10 | 18 | | | | | | | | | | | | SOIL CLASSIFICATION = CL/ML<br>0% retained on 425μm sieve |
| | D4 | 1.10 | | | | | | | | | | | | | 132 | | 8.2 | |
| HA4 | D3 | 0.65 | 34 | 24 | 10 | 12 | | | | | | | | | | | | SOIL CLASSIFICATION = ML<br>0% retained on 425μm sieve |
| | D4 | 0.80 | | | | | | | | | | | | | 165 | | 8.4 | |

U – UNDISTURBED SAMPLE
D – DISTURBED SAMPLE
B – BULK SAMPLE
W – WATER SAMPLE

C.U. – CONSOLIDATED UNDRAINED
C.D. – CONSOLIDATED DRAINED
Q. – IMMEDIATE UNDRAINED
Q.M. – IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

1544

GROUND ENGINEERING LIMITED
Tel: 01733-566566
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GROUND ENGINEERING

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

UKAS TESTING
8180

# TEST CERTIFICATE

## Determination of Particle Size Distribution

Tested in Accordance with BS 1377-2: 1990: Clause 9.2 & 9.4
Wet Sieving Method and Sedimentation by Pipette

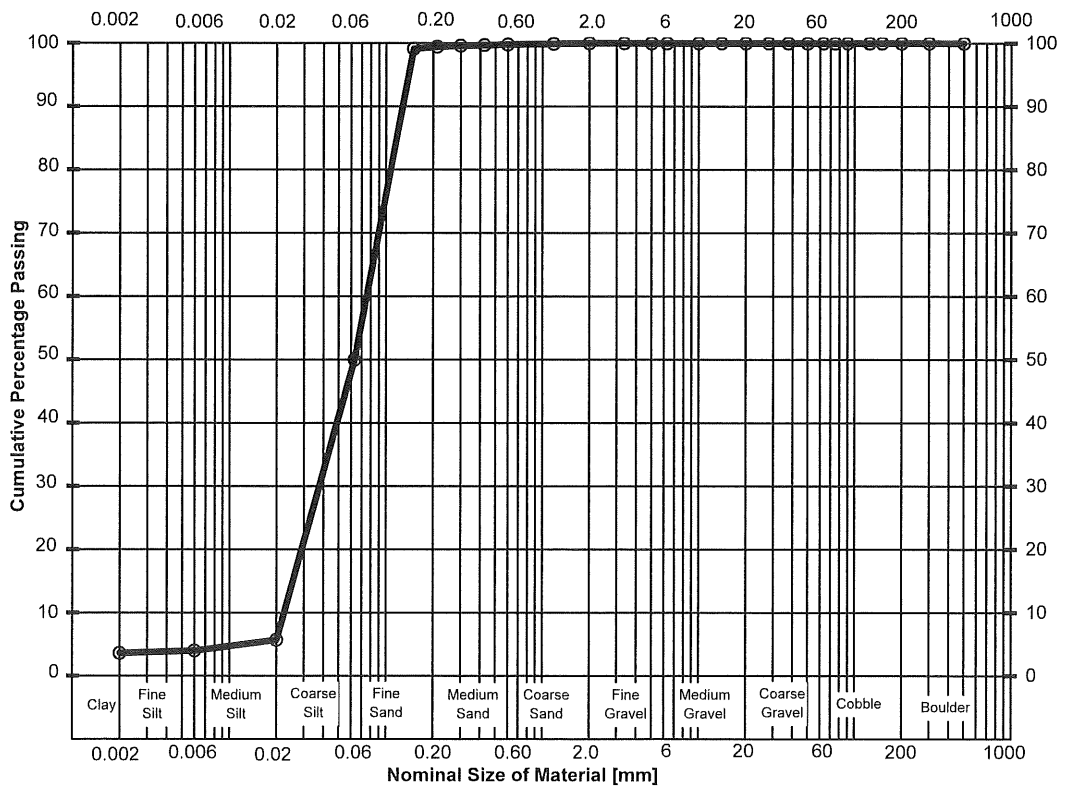
| | | | |
|---|---|---|---|
| Client: | Ground Engineering Ltd | Certificate Number: | PL7178-1/4/710-2 |
| Client Address: | Newark Road | Client Reference: | C15144 |
| | Peterborough | Lab Job Number: | PL7178-1 |
| | PE1 5UA | Date Sampled: | Unknown |
| | | Date Received: | 11.09.2020 |
| Contact: | Simon Weatherley | Date Tested: | 23.09.2020 |
| | | Certificate of Sampling: | N/A |
| Site Name: | 22 Backgate | Sampling Certificate No.: | N/A |
| Site Address: | Cowbit | Sampled By: | Client |

**TEST RESULTS**

**Laboratory Reference:** PL7178-1/4
**Client Reference:** D4
**Pre-treatment for organic material:** No

**Sample Description:** Brown orange-brown slightly clayey SILT/SAND.

**Material Specification:** Not Required
**Location:** HA2
**Source:**
**Depth:** 0.80m
**Supplier:**




**Sieve Analysis**

| Sieve mm | %Passing |
|---|---|
| 125 | 100 |
| 90 | 100 |
| 75 | 100 |
| 63 | 100 |
| 50 | 100 |
| 37.5 | 100 |
| 28 | 100 |
| 20 | 100 |
| 14 | 100 |
| 10 | 100 |
| 6.3 | 100 |
| 5.0 | 100 |
| 3.35 | 100 |
| 2.00 | 100 |
| 1.18 | 100 |
| 0.600 | 100 |
| 0.425 | 100 |
| 0.300 | 100 |
| 0.212 | 99 |
| 0.150 | 99 |
| 0.063 | 50 |
| **0.020** | **6** |
| **0.006** | **4** |
| **0.002** | **4** |

Comments: Data relevant to material below 63 microns is outside the current scope of UKAS accreditation

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

**for and on behalf of Ground Engineering Ltd**

Date Reported: 05.10.2020 Page 1 of 1
Form Number: GELab/C/709-2 Version 54

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4041

Environmental Science

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**e:** reception@i2analytical.com

# Analytical Report Number : 20-30022

| | | | |
|---|---|---|---|
| **Project / Site name:** | 22 Backgate, Cowbit | **Samples received on:** | 14/09/2020 |
| **Your job number:** | SW1C15144 | **Samples instructed on/ Analysis started on:** | 14/09/2020 |
| **Your order number:** | | **Analysis completed by:** | 21/09/2020 |
| **Report Issue Number:** | 1 | **Report issued on:** | 21/09/2020 |
| **Samples Analysed:** | 5 soil samples | | |

**Signed:** Karolina Marek

Karolina Marek
PL Head of Reporting Team
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 20-30022**
**Project / Site name: 22 Backgate, Cowbit**

| **Lab Sample Number** | | | | 1620099 | 1620100 | 1620101 | 1620102 |
|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | BH1 | HA1 | HA2 | HA3 |
| **Sample Number** | | | | 1 | 2 | 1 | 1 |
| **Depth (m)** | | | | 0.00-0.30 | 0.30 | 0.10 | 0.10 |
| **Date Sampled** | | | | 04/09/2020 | 09/09/2020 | 09/09/2020 | 09/09/2020 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | |
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Moisture Content | % | N/A | NONE | 14 | 12 | 10 | 11 |
| Total mass of sample received | kg | 0.001 | NONE | 0.3 | 0.3 | 0.3 | 0.3 |
| **General Inorganics** | | | | | | | |
| pH - Automated | pH Units | N/A | MCERTS | 7.9 | 8.1 | 8 | 7.8 |
| Total Cyanide | mg/kg | 1 | MCERTS | < 1 | < 1 | < 1 | < 1 |
| Free Cyanide | mg/kg | 1 | MCERTS | < 1 | < 1 | < 1 | < 1 |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | 26 | 24 | 20 | 26 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | 0.013 | 0.012 | 0.01 | 0.013 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | 12.9 | 12.1 | 10 | 12.8 |
| Organic Matter | % | 0.1 | MCERTS | 4.5 | 3.5 | 3.9 | 3 |
| **Total Phenols** | | | | | | | |
| Total Phenols (monohydric) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| **Speciated PAHs** | | | | | | | |
| Naphthalene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Fluorene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Phenanthrene | mg/kg | 0.05 | MCERTS | 0.27 | < 0.05 | < 0.05 | 0.4 |
| Anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Fluoranthene | mg/kg | 0.05 | MCERTS | 0.48 | < 0.05 | < 0.05 | 0.9 |
| Pyrene | mg/kg | 0.05 | MCERTS | 0.52 | < 0.05 | < 0.05 | 1.2 |
| Benzo(a)anthracene | mg/kg | 0.05 | MCERTS | 0.26 | < 0.05 | < 0.05 | 0.68 |
| Chrysene | mg/kg | 0.05 | MCERTS | 0.31 | < 0.05 | < 0.05 | 0.62 |
| Benzo(b)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 1.1 |
| Benzo(k)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.62 |
| Benzo(a)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.99 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.48 |
| Dibenz(a,h)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(ghi)perylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.56 |
| **Total PAH** | | | | | | | |
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | 1.84 | < 0.80 | < 0.80 | 7.54 |

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The results included within the report relate only to the sample(s) submitted for testing.

**Analytical Report Number: 20-30022**
**Project / Site name: 22 Backgate, Cowbit**

| **Lab Sample Number** | | | | 1620099 | 1620100 | 1620101 | 1620102 |
|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | BH1 | HA1 | HA2 | HA3 |
| **Sample Number** | | | | 1 | 2 | 1 | 1 |
| **Depth (m)** | | | | 0.00-0.30 | 0.30 | 0.10 | 0.10 |
| **Date Sampled** | | | | 04/09/2020 | 09/09/2020 | 09/09/2020 | 09/09/2020 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | |
| **Heavy Metals / Metalloids** | | | | | | | |
| Arsenic (aqua regia extractable) | mg/kg | 1 | MCERTS | 10 | 8.6 | 6.8 | 11 |
| Boron (water soluble) | mg/kg | 0.2 | MCERTS | 1.2 | 1 | 0.5 | 1.9 |
| Cadmium (aqua regia extractable) | mg/kg | 0.2 | MCERTS | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| Chromium (hexavalent) | mg/kg | 4 | MCERTS | < 4.0 | < 4.0 | < 4.0 | < 4.0 |
| Chromium (III) | mg/kg | 1 | NONE | 17 | 13 | 16 | 14 |
| Chromium (aqua regia extractable) | mg/kg | 1 | MCERTS | 17 | 16 | 16 | 16 |
| Copper (aqua regia extractable) | mg/kg | 1 | MCERTS | 18 | 17 | 16 | 15 |
| Lead (aqua regia extractable) | mg/kg | 1 | MCERTS | 32 | 26 | 29 | 53 |
| Mercury (aqua regia extractable) | mg/kg | 0.3 | MCERTS | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nickel (aqua regia extractable) | mg/kg | 1 | MCERTS | 13 | 12 | 13 | 13 |
| Selenium (aqua regia extractable) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Zinc (aqua regia extractable) | mg/kg | 1 | MCERTS | 64 | 53 | 57 | 110 |

U/S = Unsuitable Sample  I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

**Analytical Report Number: 20-30022**
**Project / Site name: 22 Backgate, Cowbit**

| | | | | |
|---|---|---|---|---|
| **Lab Sample Number** | | | | 1620103 |
| **Sample Reference** | | | | HA4 |
| **Sample Number** | | | | 1 |
| **Depth (m)** | | | | 0.10 |
| **Date Sampled** | | | | 09/09/2020 |
| **Time Taken** | | | | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | |
| Stone Content | % | 0.1 | NONE | < 0.1 |
| Moisture Content | % | N/A | NONE | 12 |
| Total mass of sample received | kg | 0.001 | NONE | 0.3 |
| **General Inorganics** | | | | |
| pH - Automated | pH Units | N/A | MCERTS | 7.9 |
| Total Cyanide | mg/kg | 1 | MCERTS | < 1 |
| Free Cyanide | mg/kg | 1 | MCERTS | < 1 |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | 43 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | 0.021 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | 21.3 |
| Organic Matter | % | 0.1 | MCERTS | 3.7 |
| **Total Phenols** | | | | |
| Total Phenols (monohydric) | mg/kg | 1 | MCERTS | < 1.0 |
| **Speciated PAHs** | | | | |
| Naphthalene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Acenaphthylene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Acenaphthene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Fluorene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Phenanthrene | mg/kg | 0.05 | MCERTS | 0.3 |
| Anthracene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Fluoranthene | mg/kg | 0.05 | MCERTS | 0.4 |
| Pyrene | mg/kg | 0.05 | MCERTS | 0.43 |
| Benzo(a)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Chrysene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Benzo(b)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Benzo(k)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Benzo(a)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Dibenz(a,h)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 |
| Benzo(ghi)perylene | mg/kg | 0.05 | MCERTS | < 0.05 |
| **Total PAH** | | | | |
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | 1.13 |

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The results included within the report relate only to the sample(s) submitted for testing.

**Analytical Report Number: 20-30022**
**Project / Site name: 22 Backgate, Cowbit**

| **Lab Sample Number** | | | | 1620103 |
|---|---|---|---|---|
| **Sample Reference** | | | | HA4 |
| **Sample Number** | | | | 1 |
| **Depth (m)** | | | | 0.10 |
| **Date Sampled** | | | | 09/09/2020 |
| **Time Taken** | | | | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | |
| **Heavy Metals / Metalloids** | | | | |
| Arsenic (aqua regia extractable) | mg/kg | 1 | MCERTS | 8.7 |
| Boron (water soluble) | mg/kg | 0.2 | MCERTS | 2.5 |
| Cadmium (aqua regia extractable) | mg/kg | 0.2 | MCERTS | < 0.2 |
| Chromium (hexavalent) | mg/kg | 4 | MCERTS | < 4.0 |
| Chromium (III) | mg/kg | 1 | NONE | 19 |
| Chromium (aqua regia extractable) | mg/kg | 1 | MCERTS | 19 |
| Copper (aqua regia extractable) | mg/kg | 1 | MCERTS | 28 |
| Lead (aqua regia extractable) | mg/kg | 1 | MCERTS | 91 |
| Mercury (aqua regia extractable) | mg/kg | 0.3 | MCERTS | < 0.3 |
| Nickel (aqua regia extractable) | mg/kg | 1 | MCERTS | 14 |
| Selenium (aqua regia extractable) | mg/kg | 1 | MCERTS | < 1.0 |
| Zinc (aqua regia extractable) | mg/kg | 1 | MCERTS | 140 |

U/S = Unsuitable Sample  I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

**Analytical Report Number : 20-30022**
**Project / Site name: 22 Backgate, Cowbit**

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

| Lab Sample Number | Sample Reference | Sample Number | Depth (m) | Sample Description * |
|---|---|---|---|---|
| 1620099 | BH1 | 1 | 0.00-0.30 | Brown loam and sand with gravel and vegetation. |
| 1620100 | HA1 | 2 | 0.3 | Brown loam and sand with gravel and vegetation. |
| 1620101 | HA2 | 1 | 0.1 | Brown loam and sand with gravel and vegetation. |
| 1620102 | HA3 | 1 | 0.1 | Brown loam and sand with gravel and vegetation. |
| 1620103 | HA4 | 1 | 0.1 | Brown loam and sand with gravel and vegetation. |

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The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number : 20-30022**
**Project / Site name: 22 Backgate, Cowbit**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Metals in soil by ICP-OES | Determination of metals in soil by aqua-regia digestion followed by ICP-OES. | In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil. | L038-PL | D | MCERTS |
| Sulphate, water soluble, in soil (16hr extraction) | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In house method. | L038-PL | D | MCERTS |
| Boron, water soluble, in soil | Determination of water soluble boron in soil by hot water extract followed by ICP-OES. | In-house method based on Second Site Properties version 3 | L038-PL | D | MCERTS |
| Hexavalent chromium in soil | Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry. | In-house method | L080-PL | W | MCERTS |
| Free cyanide in soil | Determination of free cyanide by distillation followed by colorimetry. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar) | L080-PL | W | MCERTS |
| Moisture Content | Moisture content, determined gravimetrically. (30 oC) | In house method. | L019-UK/PL | W | NONE |
| Monohydric phenols in soil | Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar) | L080-PL | W | MCERTS |
| Organic matter (Automated) in soil | Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate. | In house method. | L009-PL | D | MCERTS |
| Speciated EPA-16 PAHs in soil | Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards. | In-house method based on USEPA 8270 | L064-PL | D | MCERTS |
| pH in soil (automated) | Determination of pH in soil by addition of water followed by automated electrometric measurement. | In house method. | L099-PL | D | MCERTS |
| Stones content of soil | Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight. | In-house method based on British Standard Methods and MCERTS requirements. | L019-UK/PL | D | NONE |
| Total cyanide in soil | Determination of total cyanide by distillation followed by colorimetry. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar) | L080-PL | W | MCERTS |
| Cr (III) in soil | In-house method by calculation from total Cr and Cr VI. | In-house method by calculation | L080-PL | W | NONE |
| Sulphate, water soluble, in soil | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In house method. | L038-PL | D | MCERTS |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

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The results included within the report are representative of the samples submitted for analysis.

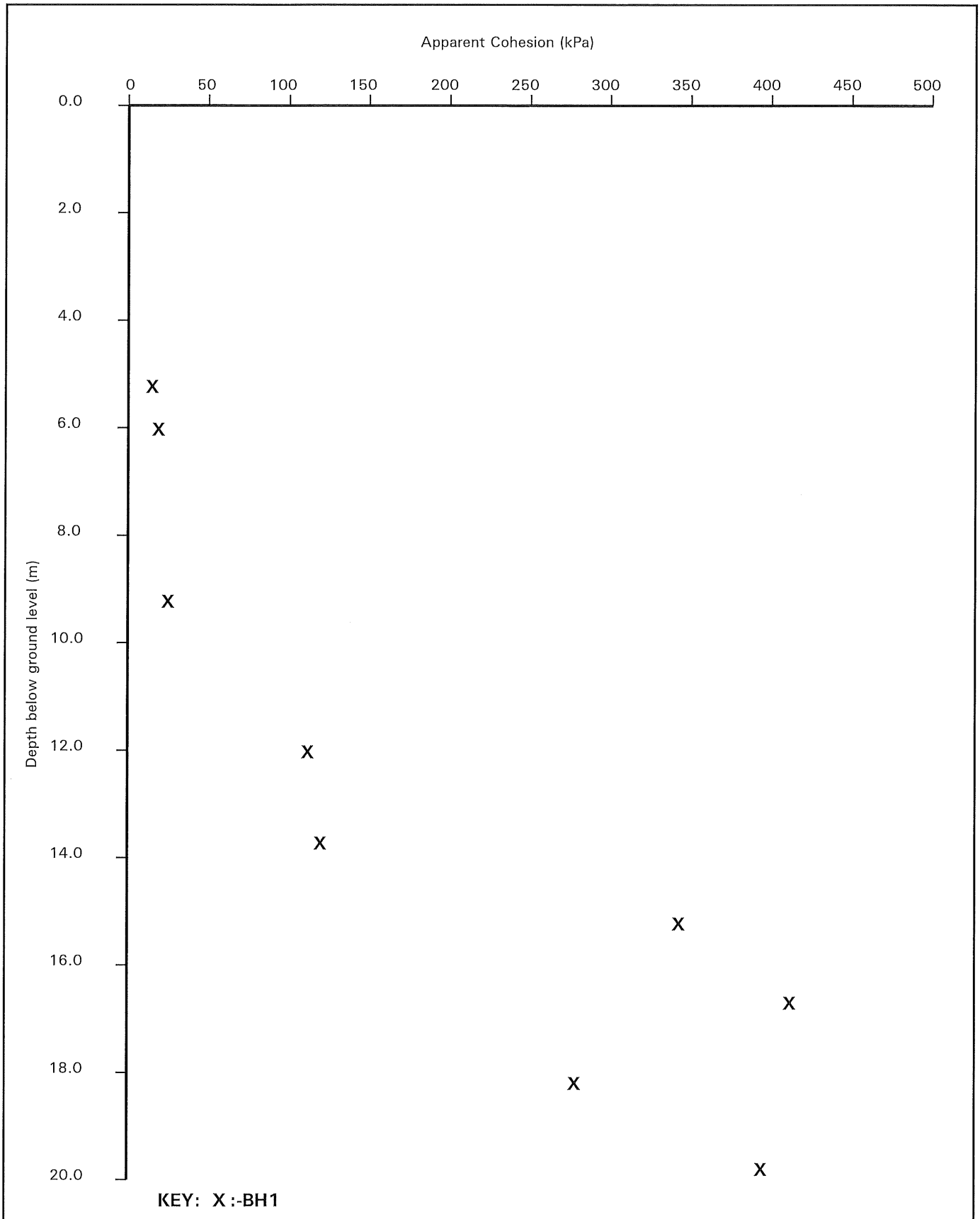
## Sample Deviation Report

Environmental Science

**Analytical Report Number : 20-30022**
**Project / Site name: 22 Backgate, Cowbit**

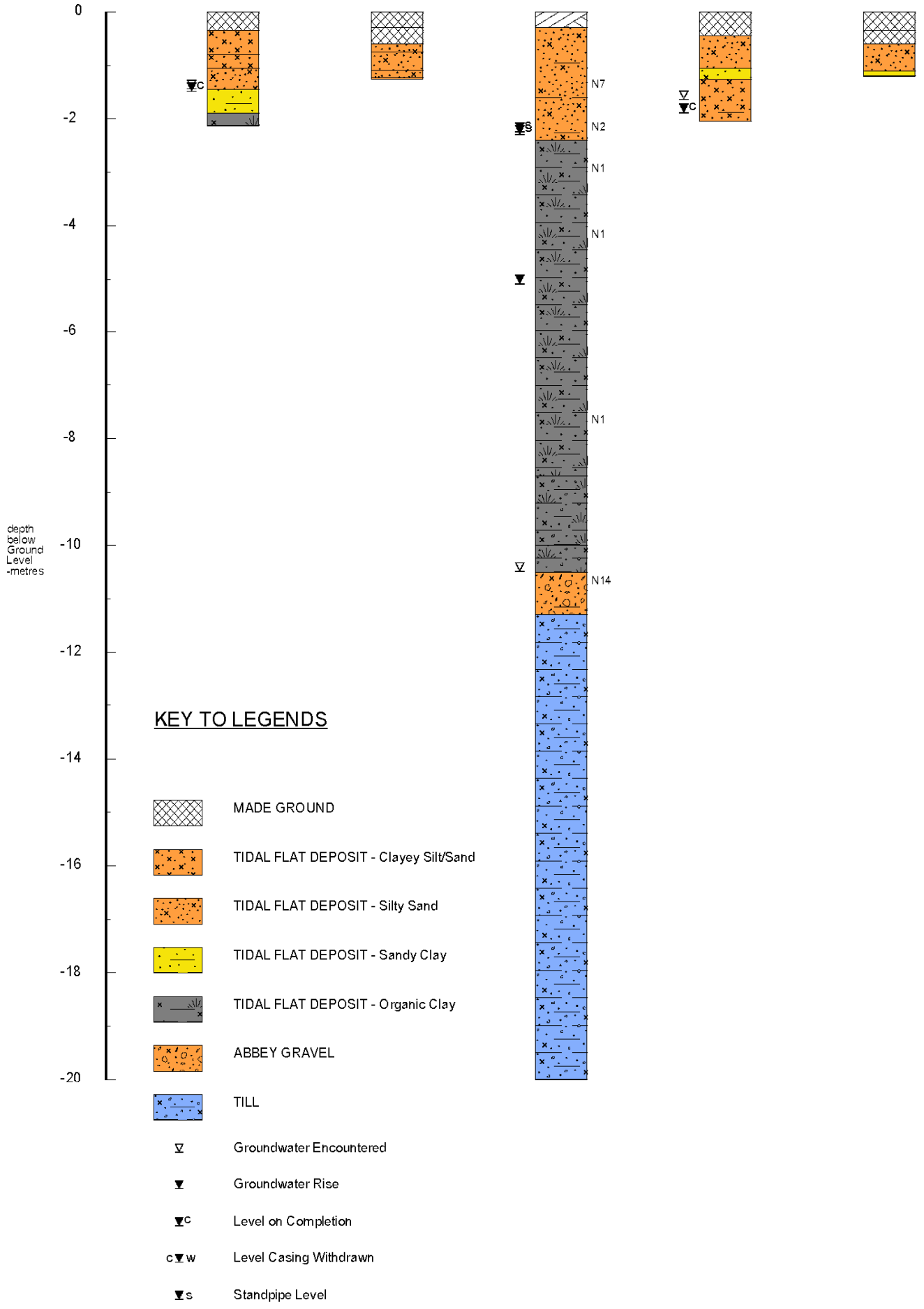
| Sample ID | Other ID | Sample Type | Lab Sample Number | Sample Deviation | Test Name | Test Ref | Test Deviation |
|---|---|---|---|---|---|---|---|
| BH1 | 1 | S | 1620099 | c | Free cyanide in soil | L080-PL | c |
| BH1 | 1 | S | 1620099 | c | Total cyanide in soil | L080-PL | c |

Key: **a** - No sampling date **b** - Incorrect container
**c** - Holding time **d** - Headspace **e** - Temperature




Apparent Cohesion (kPa) vs Depth below ground level (m).

| | | |
|---|---|---|
| SITE | 22 BACKGATE, COWBIT | |
| CLIENT | A.C. BUILDING LTD | Contract Number 15144 |
| GROUND ENGINEERING LIMITED Tel: 01733-566566 www.groundengineering.co.uk | Date 08/10/20 | Figure 1 |




| | | | |
|---|---|---|---|
| SITE | 22 BACKGATE, COWBIT | | Contract No. 15144 |
| CLIENT | A.C. BUILDING LTD | Soil Profile | Vertical Scale 1:100 |
| © 1993 GROUND ENGINEERING, NEWARK ROAD, PETERBOROUGH. Tel (01733) 566566 | | Date 08/10/20 | Fig. No 2 |

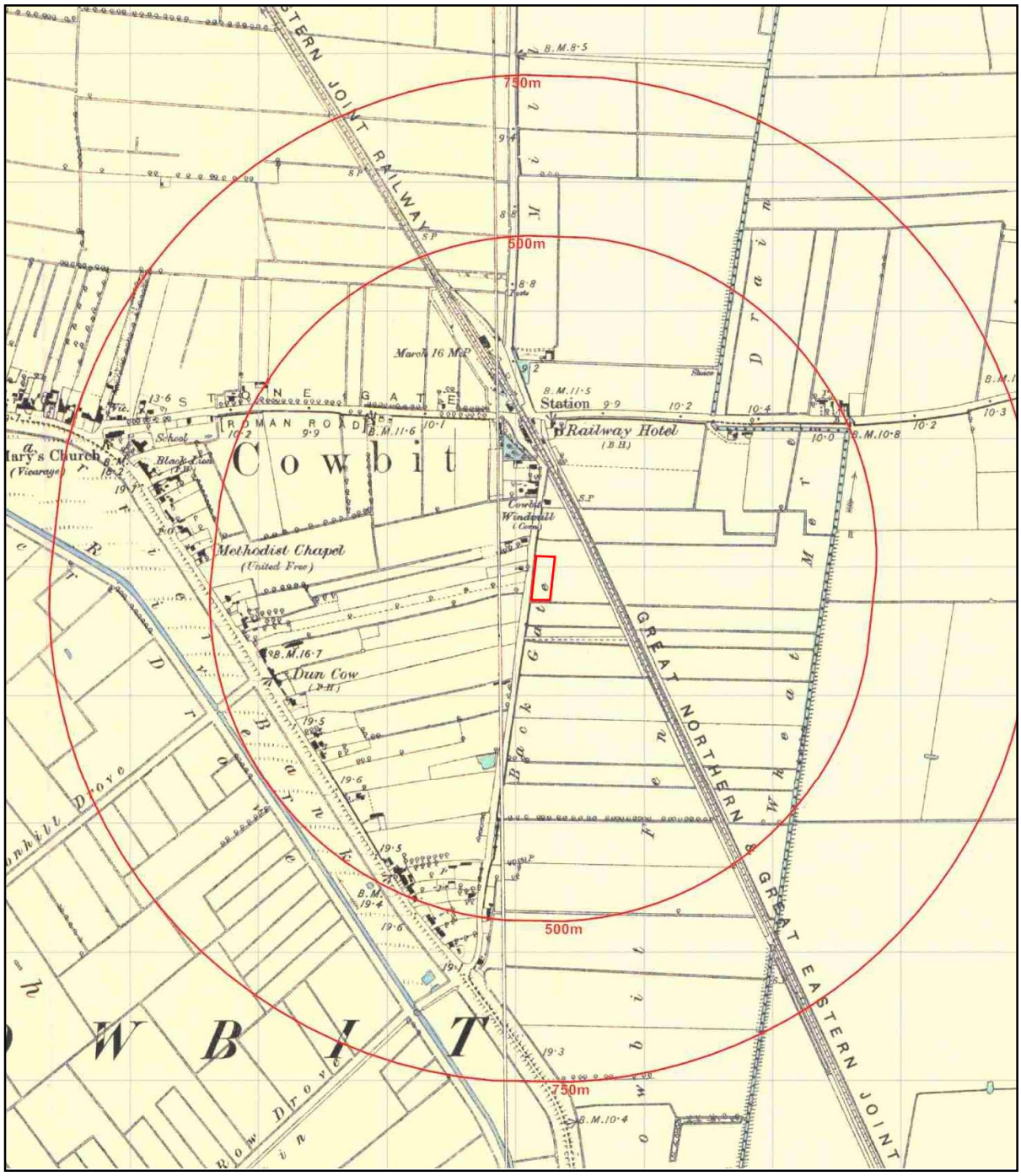
# APPENDIX 1

## HISTORICAL MAP EXTRACTS

# Site History

**Figure A**

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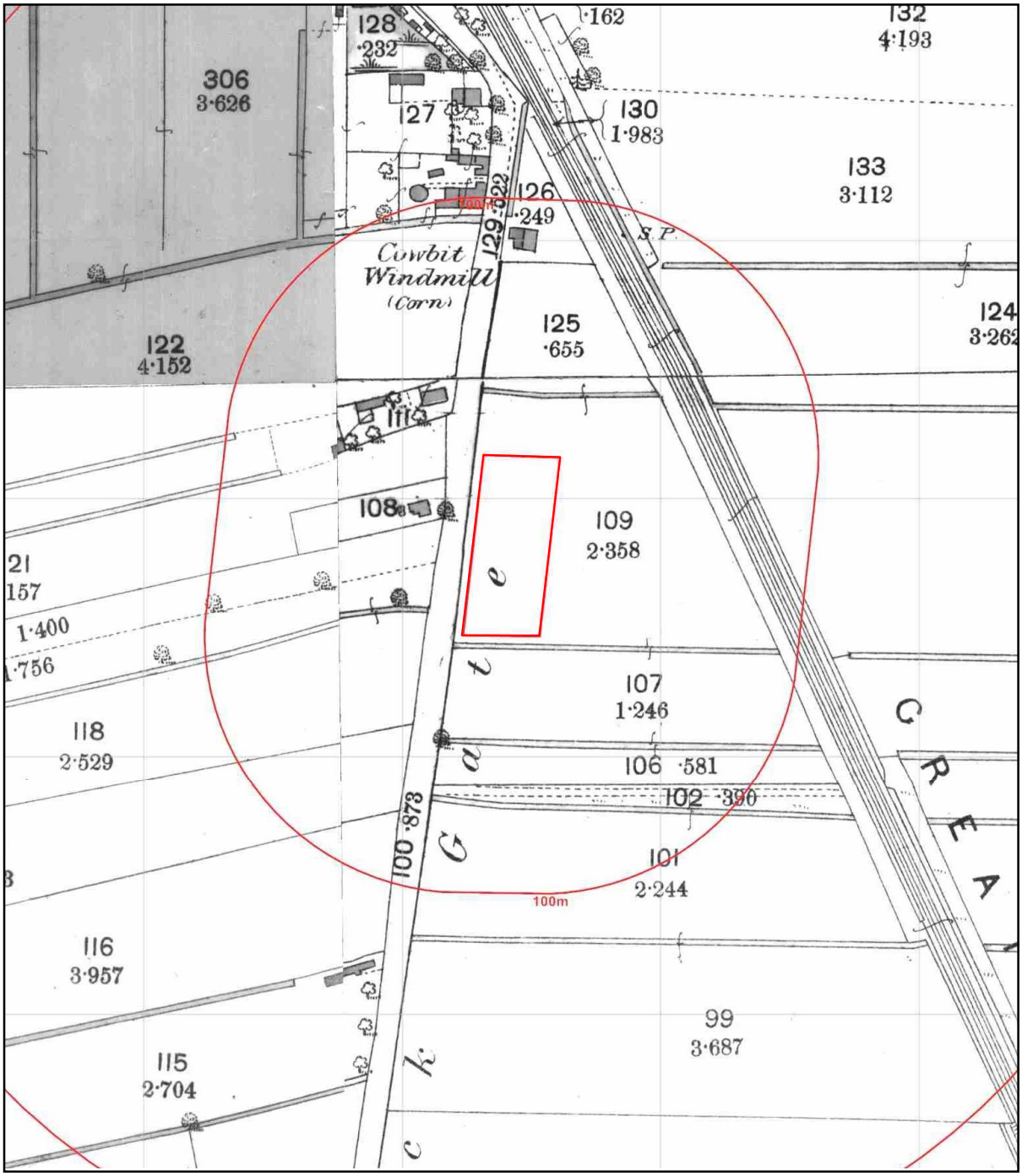



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br>**C15144** |

# Site History

**Figure B**

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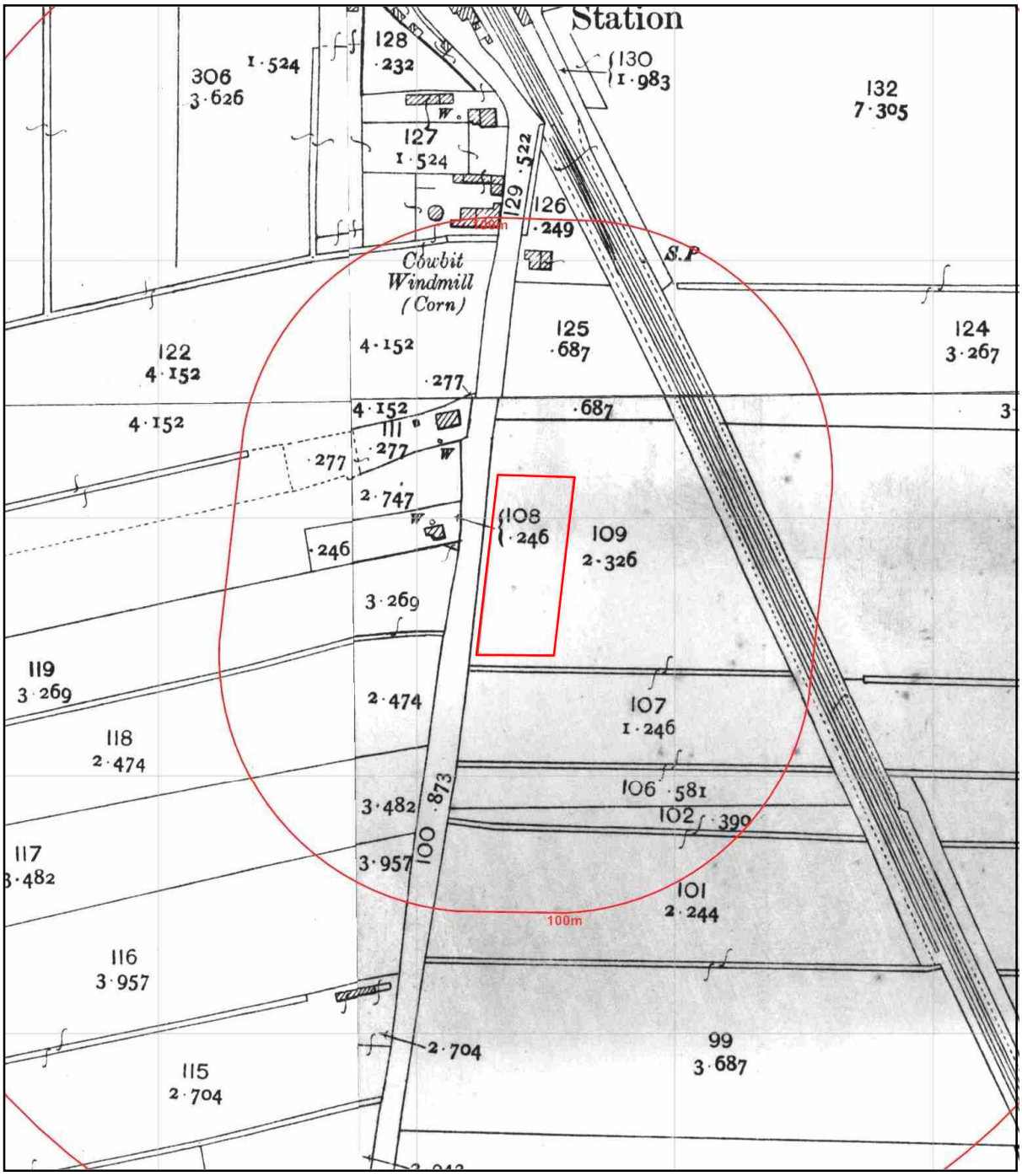



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br><br>**C15144** |

# Site History

**Figure C**

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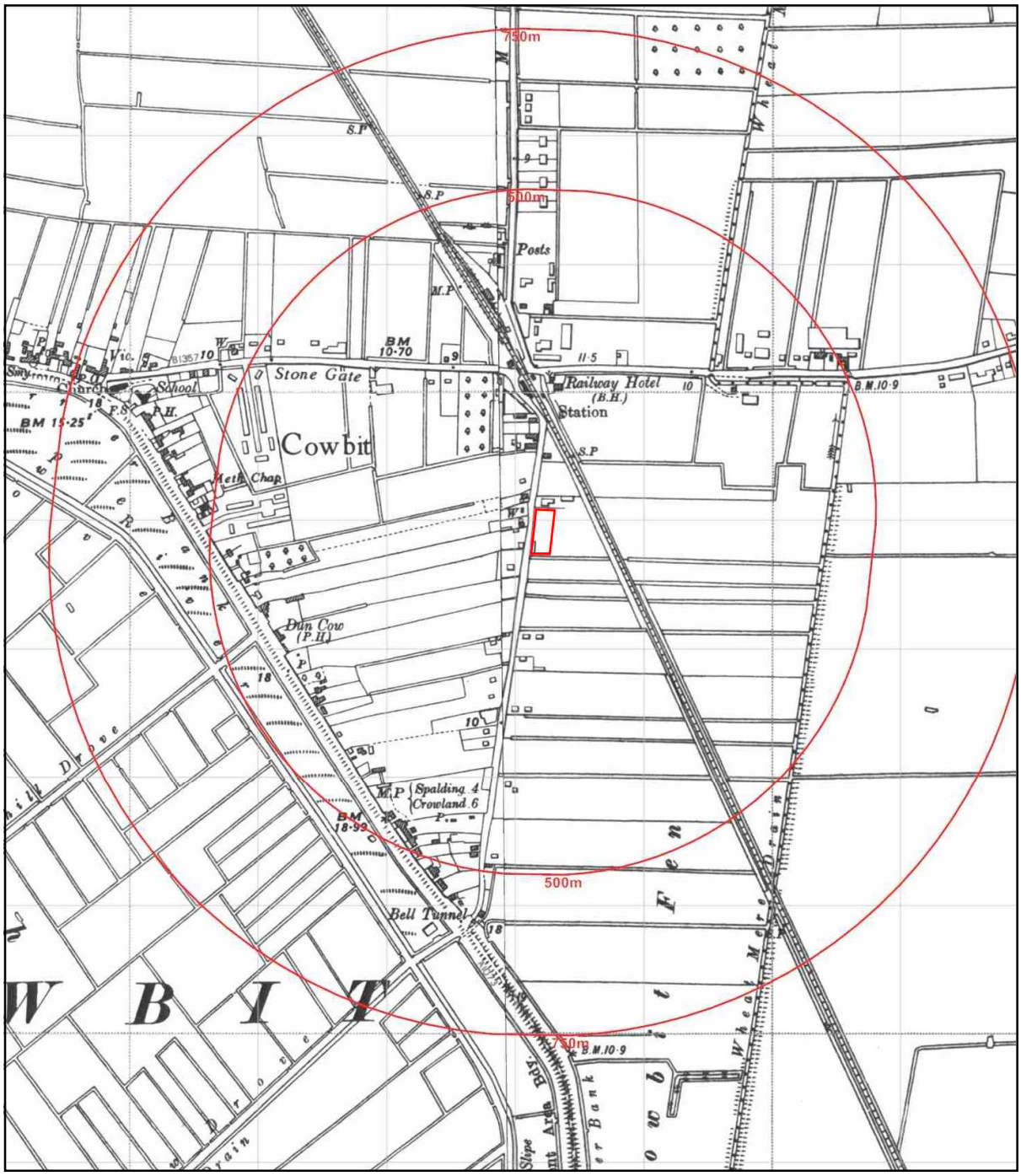



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br>**C15144** |

# Site History

**Figure D**

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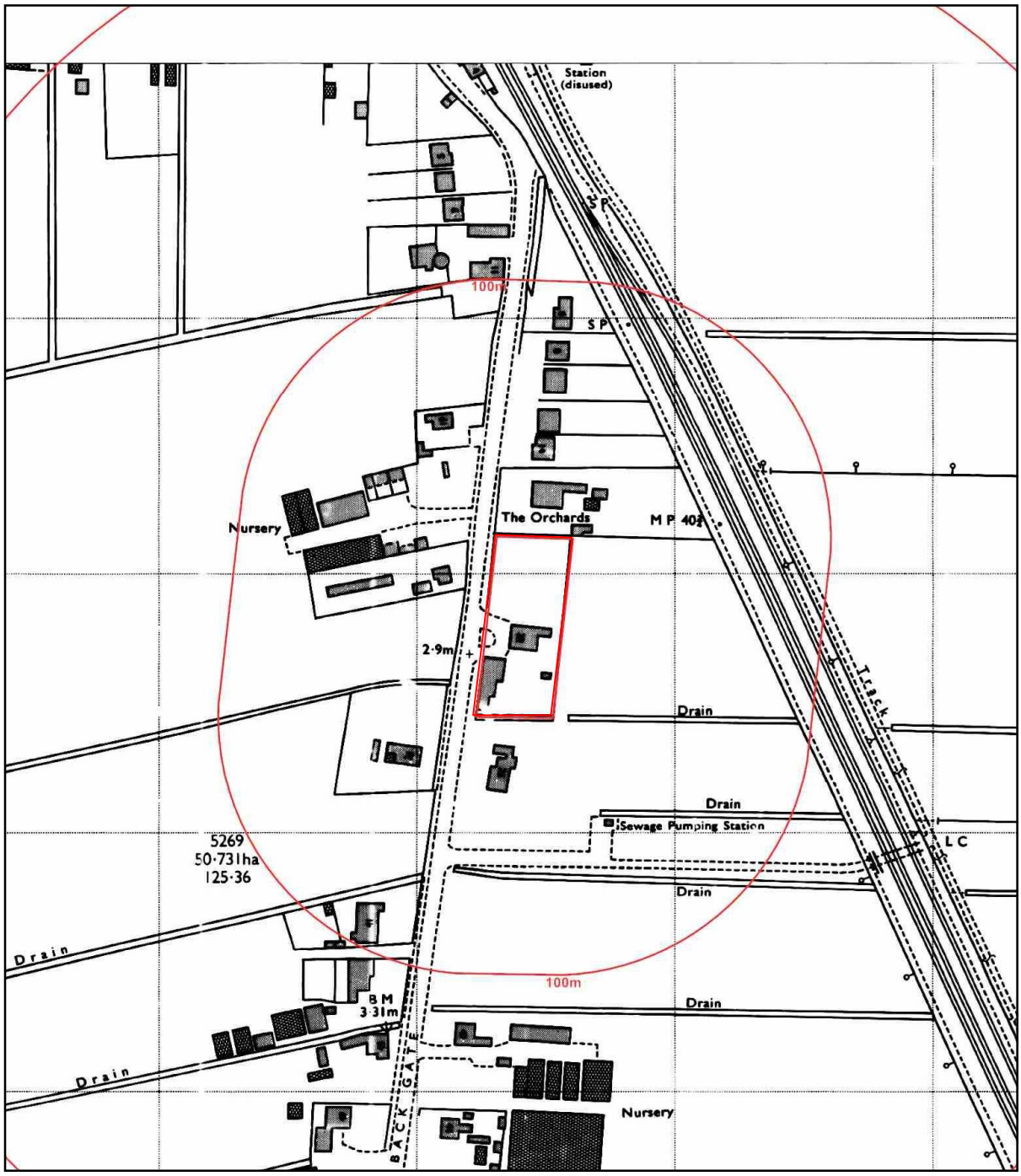



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br><br>**C15144** |

# Site History

**Figure E**

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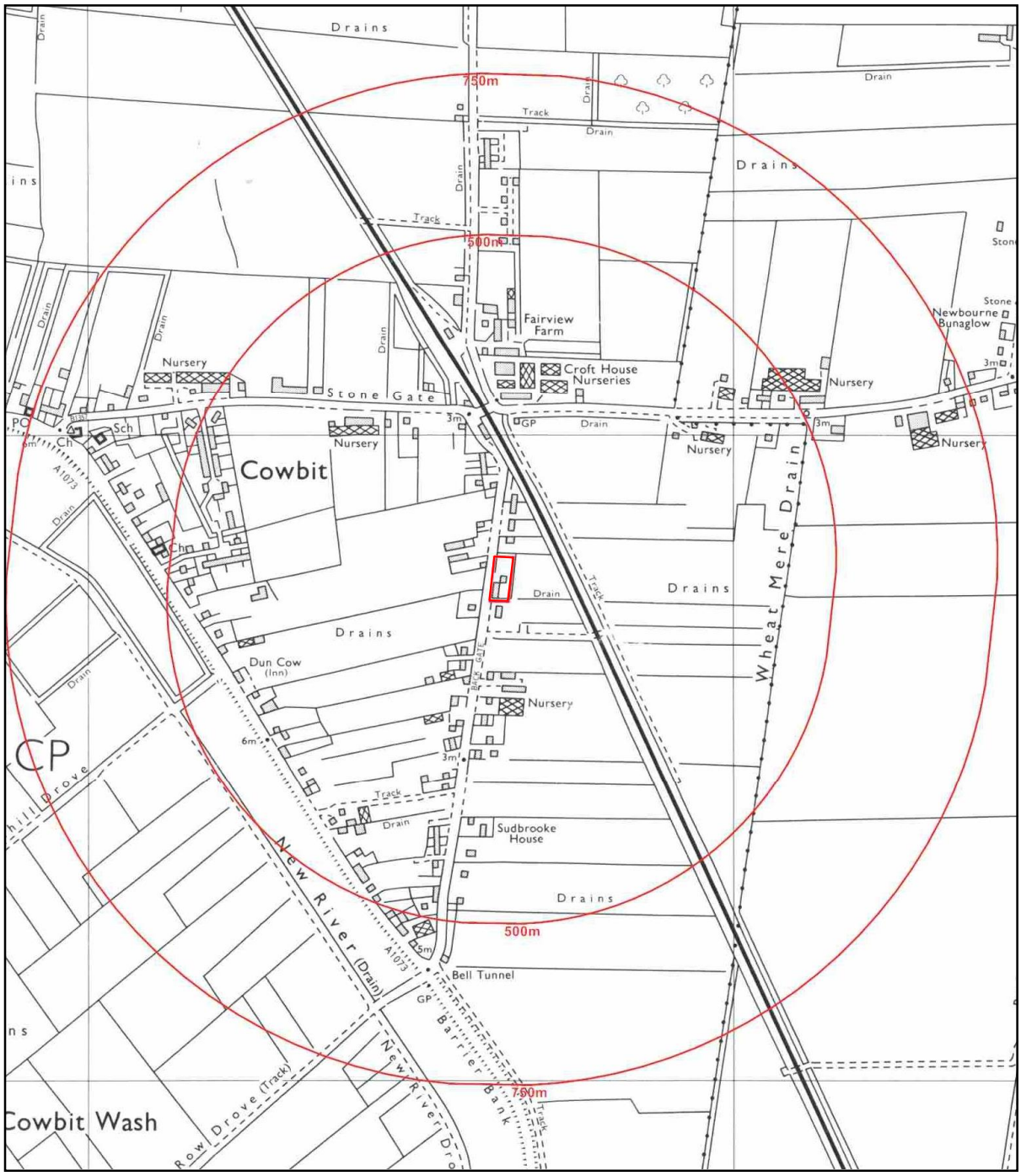



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br>**C15144** |

# Site History

**Figure F**

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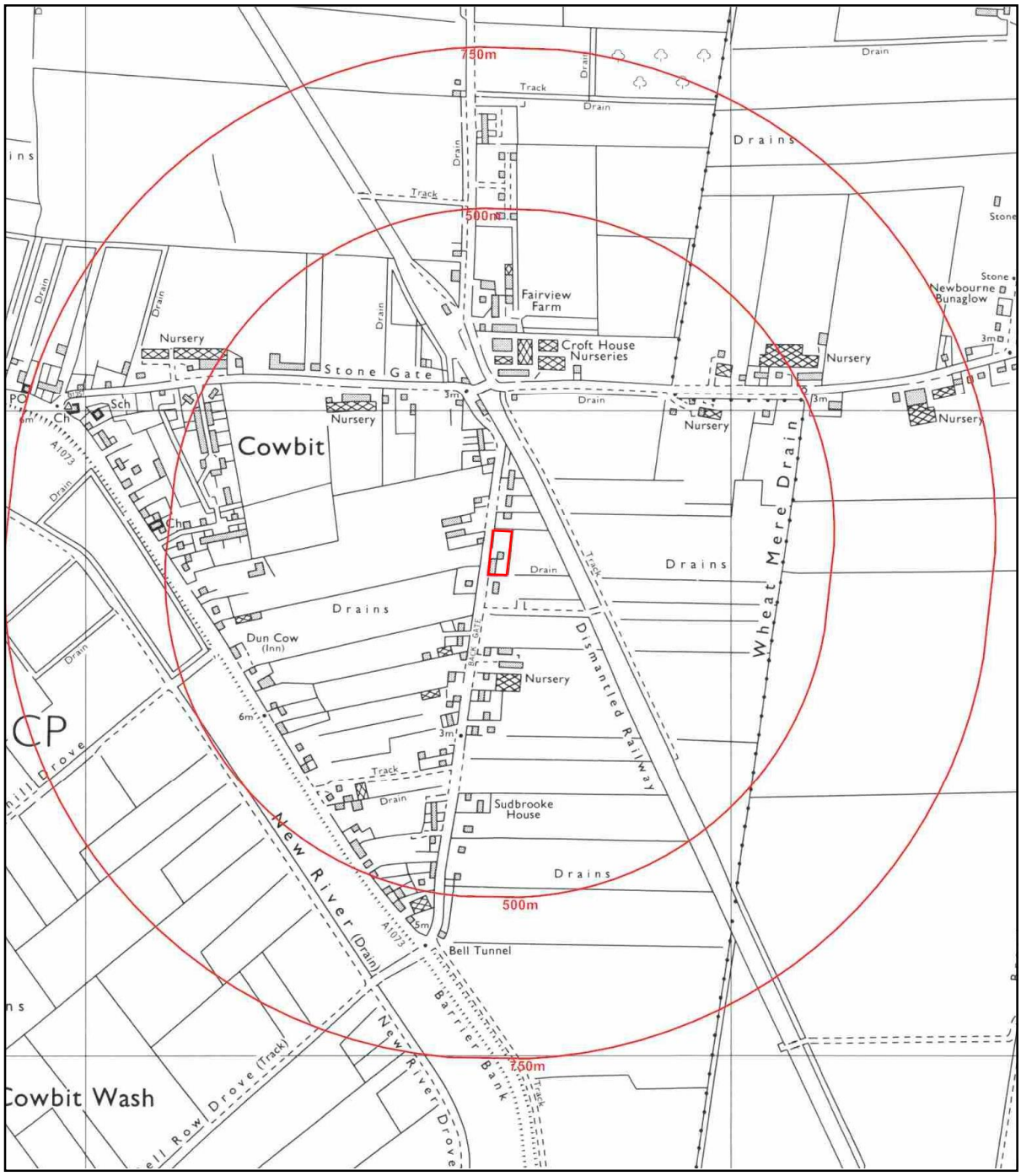



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br><br>**C15144** |

# Site History

**Figure G**

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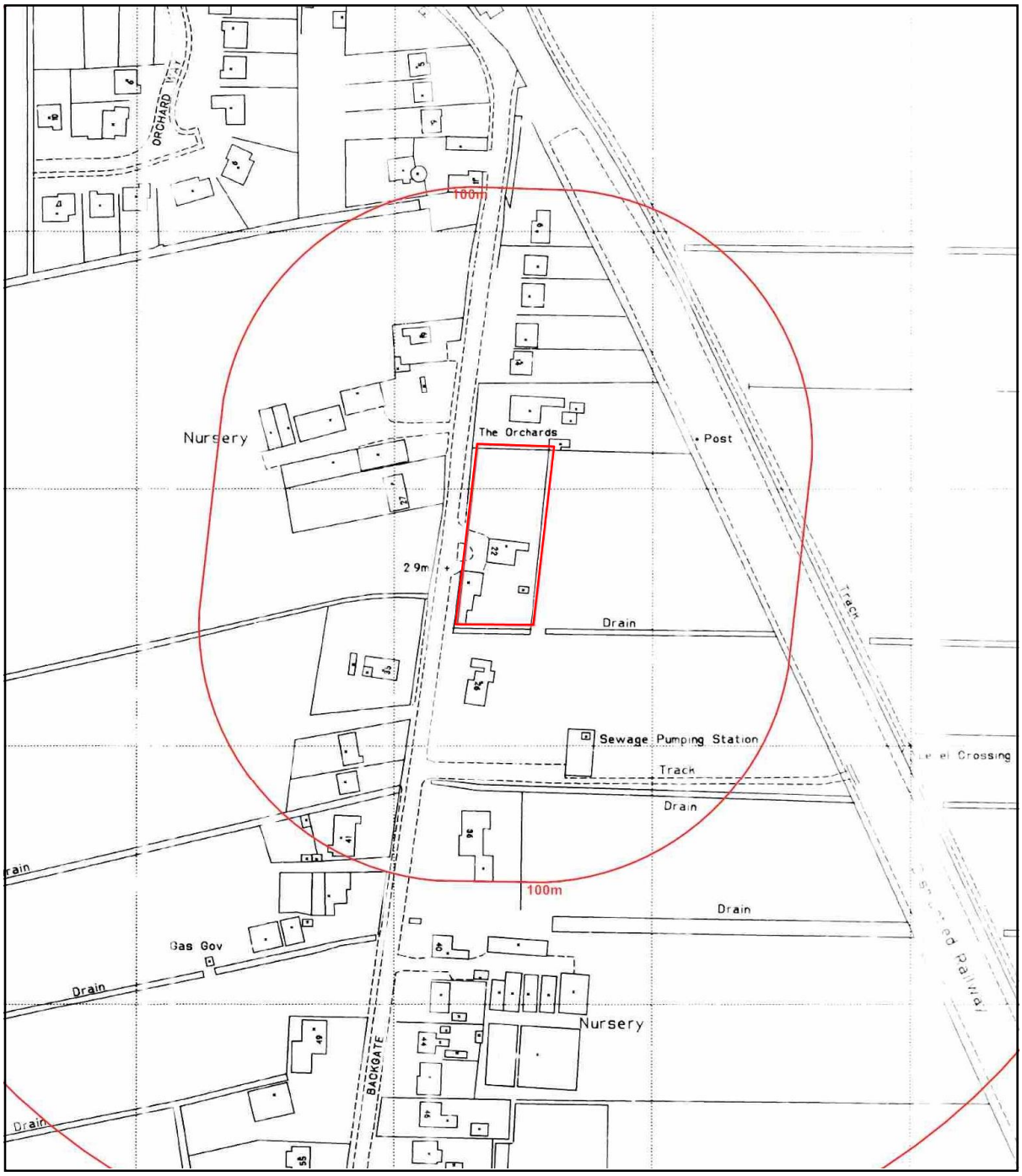



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br><br>**C15144** |

# Site History

**Figure H**

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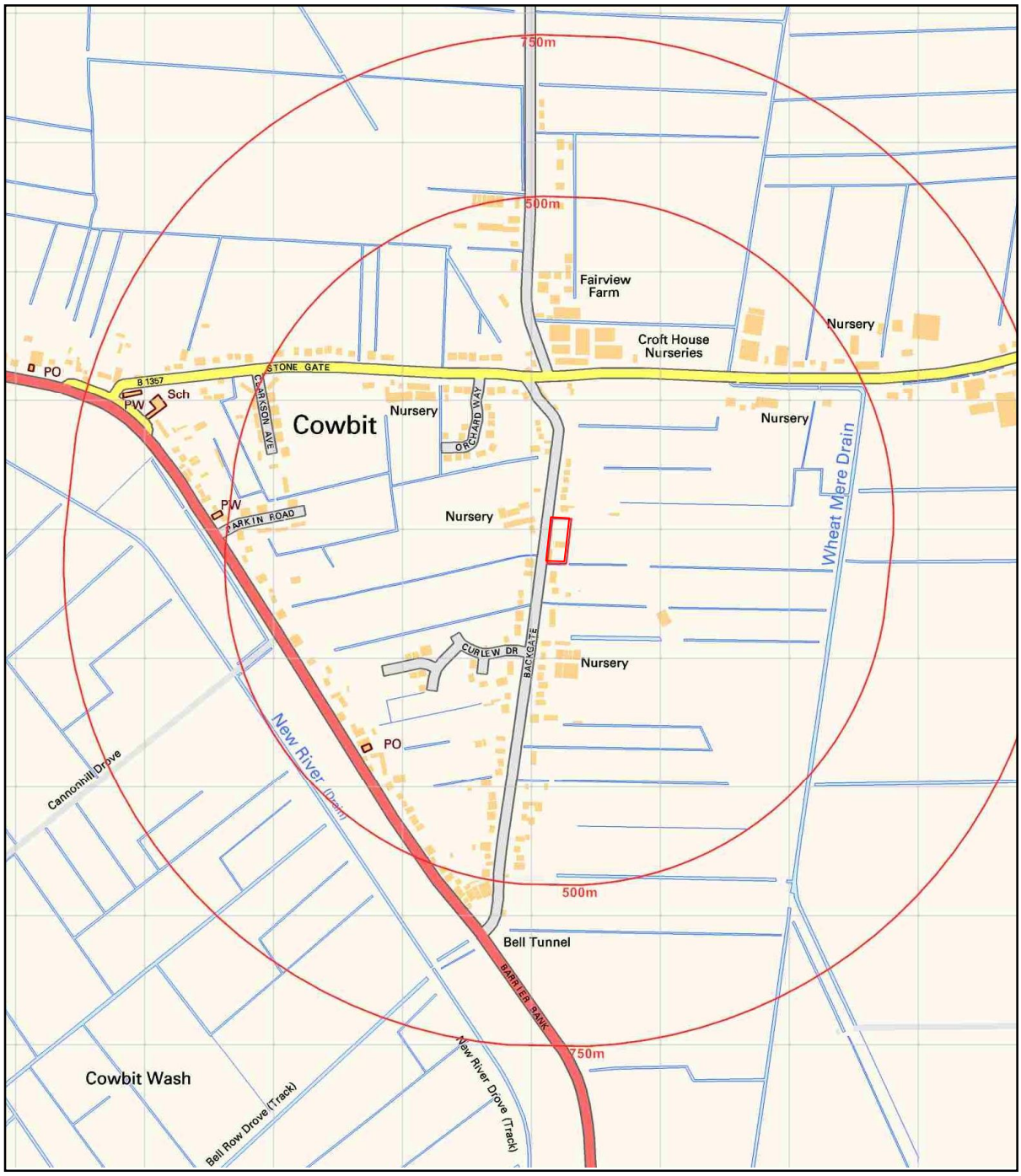



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br>**C15144** |

# Site History

**Figure I**

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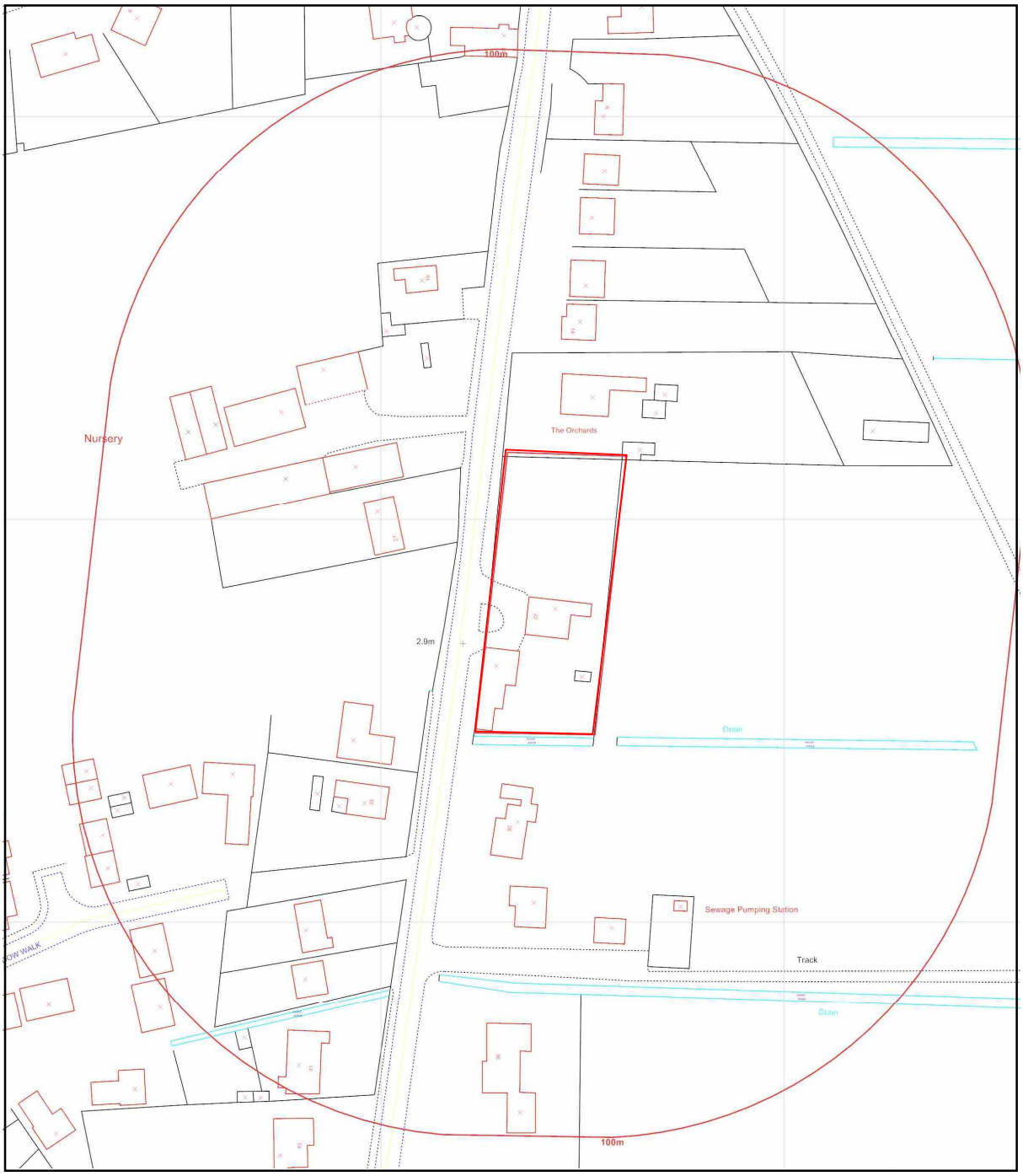



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br>**C15144** |

# Site History

**Figure J**

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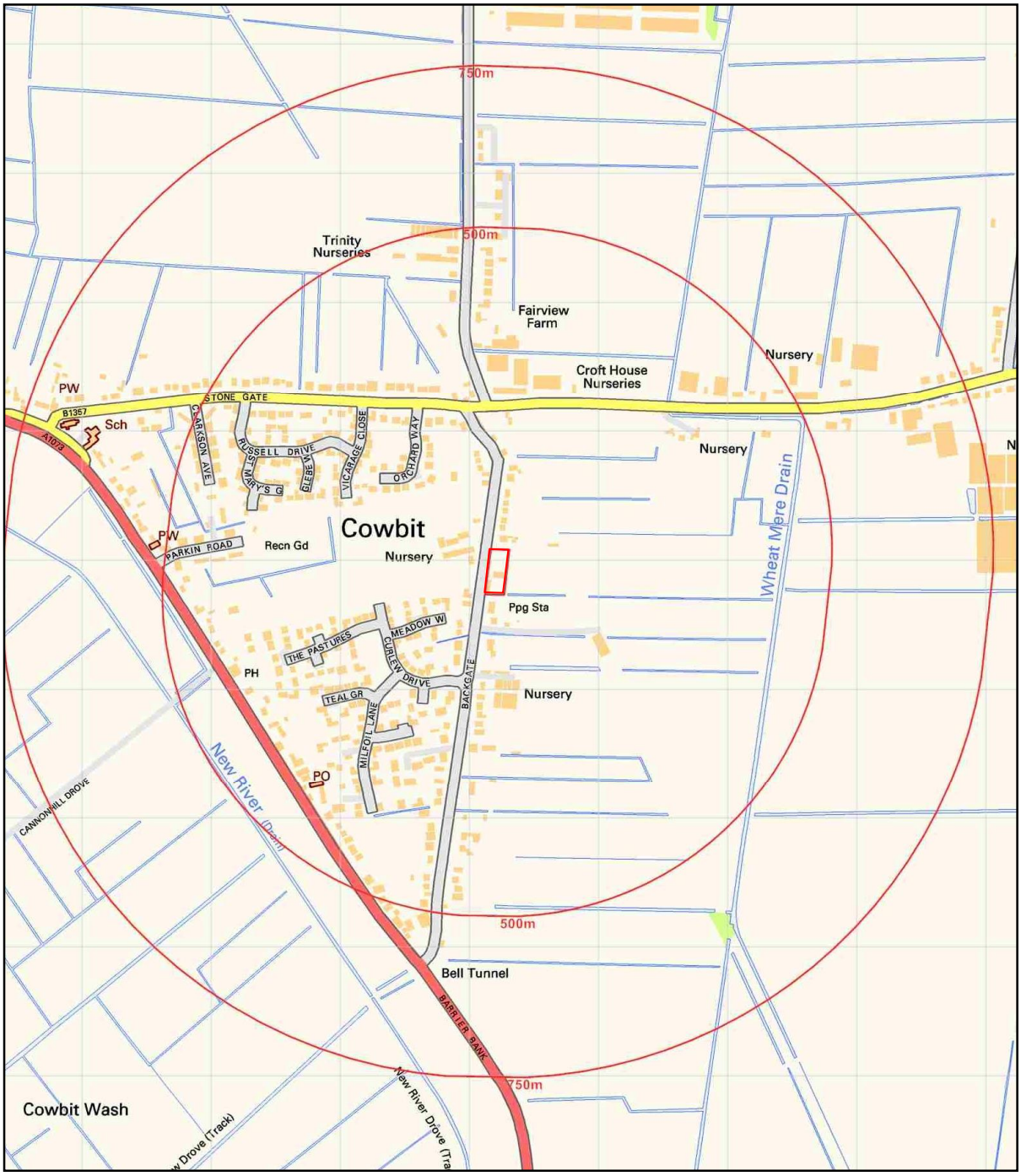



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br>**C15144** |

# Site History

**Figure K**

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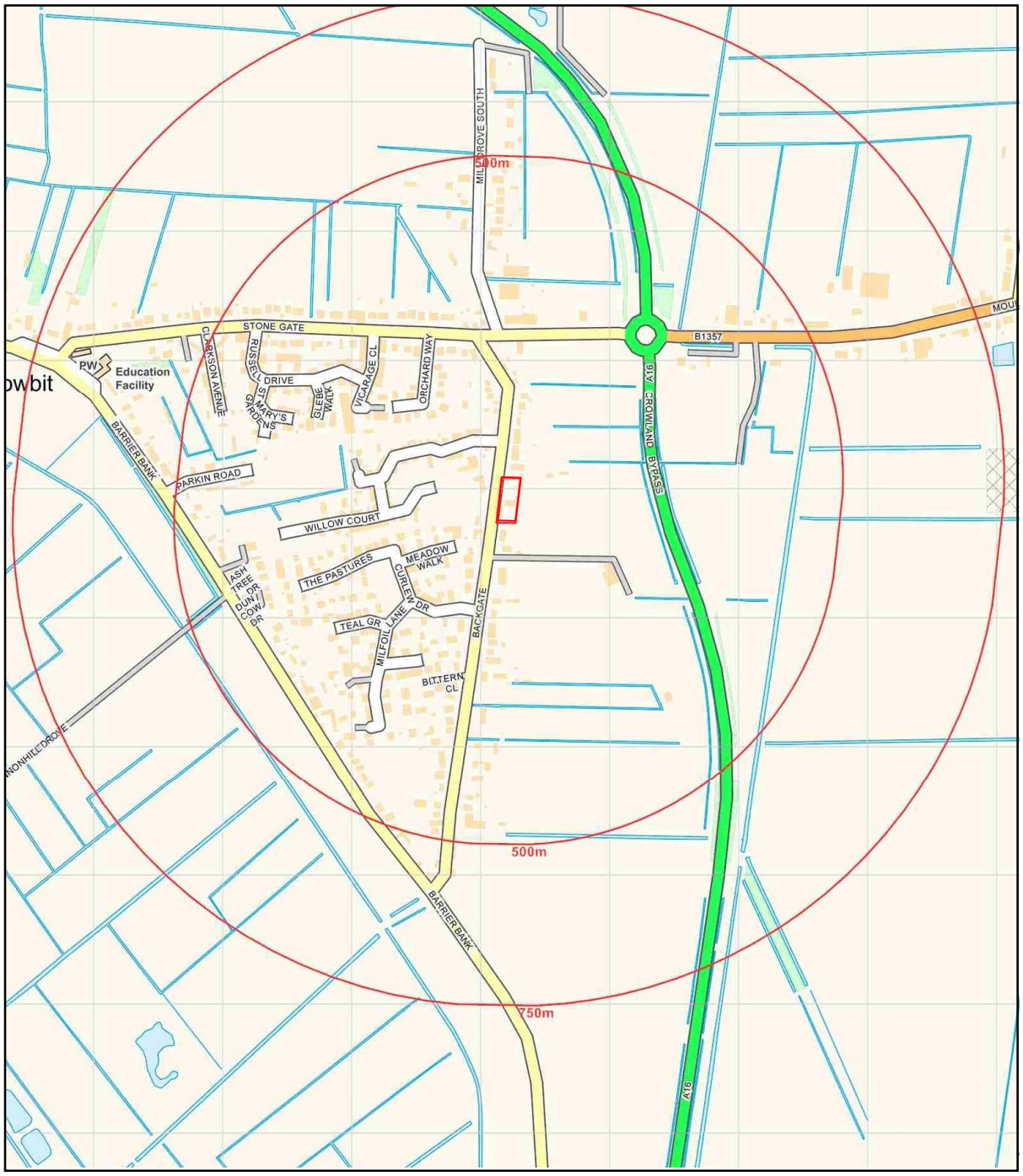



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br><br>**C15144** |

# Site History

**Figure L**

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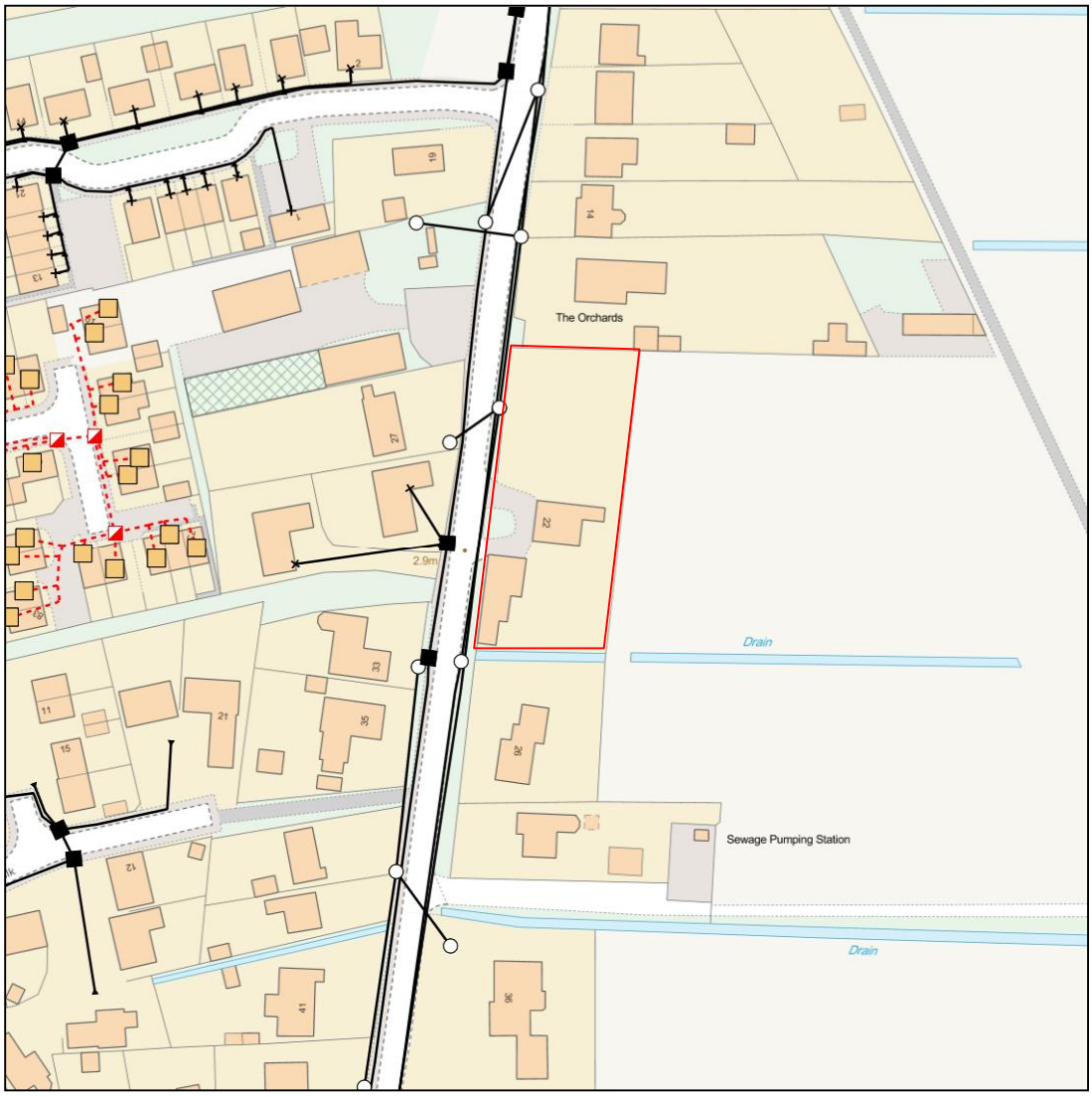



| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br>**C15144** |

# Site History

**Figure M**

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| | | |
|---|---|---|
| **Project : 22 Backgate, Cowbit**<br><br>**Client : A.C. Building Limited** | **GROUND ENGINEERING LIMITED**<br>Peterborough Tel : 01733 566566 | **Project No.**<br>**C15144** |

# APPENDIX 2

## ENVIRONMENTAL DATABASE SEARCH

Groundsure LOCATION INTELLIGENCE

# Enviro+Geo Insight

## 22, BACKGATE, COWBIT, SPALDING, PE12 6AP

## Order Details

**Date:** 08/09/2020

**Your ref:** SWC15144

**Our Ref:** GS-7032635

**Client:** Ground Engineering Limited

## Site Details

**Location:** 526642 317775

**Area:** 0.21 ha

**Authority:** South Holland District Council




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**Summary of findings** p. 2

**OS MasterMap site plan** p.13

**Aerial image** p. 8

groundsure.com/insightuserguide

Contact us with any questions at:
info@groundsure.com
08444 159 000

# Summary of findings

| Page | Section | Past land use | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
|---|---|---|---|---|---|---|---|
| 14 | 1.1 | Historical industrial land uses | 0 | 0 | 19 | 19 | - |
| 16 | 1.2 | Historical tanks | 0 | 0 | 1 | 0 | - |
| 16 | 1.3 | Historical energy features | 0 | 0 | 1 | 0 | - |
| 17 | 1.4 | Historical petrol stations | 0 | 0 | 0 | 1 | - |
| 17 | 1.5 | Historical garages | 0 | 0 | 0 | 1 | - |
| 18 | 1.6 | Historical military land | 0 | 0 | 0 | 0 | - |
| Page | Section | Past land use - un-grouped | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| 19 | 2.1 | Historical industrial land uses | 0 | 0 | 22 | 23 | - |
| 21 | 2.2 | Historical tanks | 0 | 0 | 1 | 0 | - |
| 22 | 2.3 | Historical energy features | 0 | 0 | 1 | 0 | - |
| 22 | 2.4 | Historical petrol stations | 0 | 0 | 0 | 1 | - |
| 22 | 2.5 | Historical garages | 0 | 0 | 0 | 1 | - |
| Page | Section | Waste and landfill | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| 23 | 3.1 | Active or recent landfill | 0 | 0 | 0 | 0 | - |
| 23 | 3.2 | Historical landfill (BGS records) | 0 | 0 | 0 | 0 | - |
| 24 | 3.3 | Historical landfill (LA/mapping records) | 0 | 0 | 0 | 0 | - |
| 24 | 3.4 | Historical landfill (EA/NRW records) | 0 | 0 | 0 | 0 | - |
| 24 | 3.5 | Historical waste sites | 0 | 0 | 0 | 0 | - |
| 24 | 3.6 | Licensed waste sites | 0 | 0 | 0 | 0 | - |
| 24 | 3.7 | Waste exemptions | 0 | 0 | 37 | 5 | - |
| Page | Section | Current industrial land use | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| 28 | 4.1 | Recent industrial land uses | 0 | 0 | 4 | - | - |
| 29 | 4.2 | Current or recent petrol stations | 0 | 0 | 0 | 1 | - |
| 29 | 4.3 | Electricity cables | 0 | 0 | 0 | 0 | - |
| 29 | 4.4 | Gas pipelines | 0 | 0 | 0 | 0 | - |
| 30 | 4.5 | Sites determined as Contaminated Land | 0 | 0 | 0 | 0 | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 30 | 4.6 | Control of Major Accident Hazards (COMAH) | 0 | 0 | 0 | 0 | - |
| 30 | 4.7 | Regulated explosive sites | 0 | 0 | 0 | 0 | - |
| 30 | 4.8 | Hazardous substance storage/usage | 0 | 0 | 0 | 0 | - |
| 30 | 4.9 | Historical licensed industrial activities (IPC) | 0 | 0 | 0 | 0 | - |
| 31 | 4.10 | Licensed industrial activities (Part A(1)) | 0 | 0 | 0 | 0 | - |
| 31 | 4.11 | Licensed pollutant release (Part A(2)/B) | 0 | 0 | 0 | 0 | - |
| 31 | 4.12 | Radioactive Substance Authorisations | 0 | 0 | 0 | 0 | - |
| **31** | **4.13** | **Licensed Discharges to controlled waters** | 0 | 0 | 6 | 0 | - |
| 32 | 4.14 | Pollutant release to surface waters (Red List) | 0 | 0 | 0 | 0 | - |
| 33 | 4.15 | Pollutant release to public sewer | 0 | 0 | 0 | 0 | - |
| 33 | 4.16 | List 1 Dangerous Substances | 0 | 0 | 0 | 0 | - |
| 33 | 4.17 | List 2 Dangerous Substances | 0 | 0 | 0 | 0 | - |
| 33 | 4.18 | Pollution Incidents (EA/NRW) | 0 | 0 | 0 | 0 | - |
| 33 | 4.19 | Pollution inventory substances | 0 | 0 | 0 | 0 | - |
| 34 | 4.20 | Pollution inventory waste transfers | 0 | 0 | 0 | 0 | - |
| 34 | 4.21 | Pollution inventory radioactive waste | 0 | 0 | 0 | 0 | - |

| Page | Section | Hydrogeology | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
|---|---|---|---|---|---|---|---|
| **35** | **5.1** | **Superficial aquifer** | Identified (within 500m) | | | | |
| **36** | **5.2** | **Bedrock aquifer** | Identified (within 500m) | | | | |
| **37** | **5.3** | **Groundwater vulnerability** | Identified (within 50m) | | | | |
| 38 | 5.4 | Groundwater vulnerability- soluble rock risk | None (within 0m) | | | | |
| 38 | 5.5 | Groundwater vulnerability- local information | None (within 0m) | | | | |
| 39 | 5.6 | Groundwater abstractions | 0 | 0 | 0 | 0 | 0 |
| **40** | **5.7** | **Surface water abstractions** | 0 | 0 | 0 | 0 | 8 |
| 41 | 5.8 | Potable abstractions | 0 | 0 | 0 | 0 | 0 |
| 42 | 5.9 | Source Protection Zones | 0 | 0 | 0 | 0 | - |
| 42 | 5.10 | Source Protection Zones (confined aquifer) | 0 | 0 | 0 | 0 | - |

| Page | Section | Hydrology | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
|---|---|---|---|---|---|---|---|
| **43** | **6.1** | **Water Network (OS MasterMap)** | 0 | 2 | 22 | - | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 45 | 6.2 | Surface water features | 0 | 0 | 8 | - | - |
| 46 | 6.3 | WFD Surface water body catchments | 1 | - | - | - | - |
| 46 | 6.4 | WFD Surface water bodies | 0 | 0 | 0 | - | - |
| 47 | 6.5 | WFD Groundwater bodies | 0 | - | - | - | - |
| Page | Section | River and coastal flooding | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| 48 | 7.1 | Risk of Flooding from Rivers and Sea (RoFRaS) | Low (within 50m) | | | | |
| 49 | 7.2 | Historical Flood Events | 0 | 0 | 0 | - | - |
| 49 | 7.3 | Flood Defences | 0 | 0 | 0 | - | - |
| 49 | 7.4 | Areas Benefiting from Flood Defences | 0 | 0 | 0 | - | - |
| 49 | 7.5 | Flood Storage Areas | 0 | 0 | 0 | - | - |
| 50 | 7.6 | Flood Zone 2 | Identified (within 50m) | | | | |
| 51 | 7.7 | Flood Zone 3 | None (within 50m) | | | | |
| Page | Section | Surface water flooding | | | | | |
| 52 | 8.1 | Surface water flooding | 1 in 30 year, 0.3m - 1.0m (within 50m) | | | | |
| Page | Section | Groundwater flooding | | | | | |
| 54 | 9.1 | Groundwater flooding | Negligible (within 50m) | | | | |
| Page | Section | Environmental designations | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| 55 | 10.1 | Sites of Special Scientific Interest (SSSI) | 0 | 0 | 0 | 0 | 0 |
| 55 | 10.2 | Conserved wetland sites (Ramsar sites) | 0 | 0 | 0 | 0 | 0 |
| 55 | 10.3 | Special Areas of Conservation (SAC) | 0 | 0 | 0 | 0 | 0 |
| 55 | 10.4 | Special Protection Areas (SPA) | 0 | 0 | 0 | 0 | 0 |
| 56 | 10.5 | National Nature Reserves (NNR) | 0 | 0 | 0 | 0 | 0 |
| 56 | 10.6 | Local Nature Reserves (LNR) | 0 | 0 | 0 | 0 | 0 |
| 56 | 10.7 | Designated Ancient Woodland | 0 | 0 | 0 | 0 | 0 |
| 56 | 10.8 | Biosphere Reserves | 0 | 0 | 0 | 0 | 0 |
| 57 | 10.9 | Forest Parks | 0 | 0 | 0 | 0 | 0 |
| 57 | 10.10 | Marine Conservation Zones | 0 | 0 | 0 | 0 | 0 |
| 57 | 10.11 | Green Belt | 0 | 0 | 0 | 0 | 0 |
| 57 | 10.12 | Proposed Ramsar sites | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 57 | 10.13 | Possible Special Areas of Conservation (pSAC) | 0 | 0 | 0 | 0 | 0 |
| 58 | 10.14 | Potential Special Protection Areas (pSPA) | 0 | 0 | 0 | 0 | 0 |
| 58 | 10.15 | Nitrate Sensitive Areas | 0 | 0 | 0 | 0 | 0 |
| **58** | **10.16** | **Nitrate Vulnerable Zones** | 0 | 0 | 0 | 1 | 3 |
| **59** | **10.17** | **SSSI Impact Risk Zones** | 1 | - | - | - | - |
| 60 | 10.18 | SSSI Units | 0 | 0 | 0 | 0 | 0 |
| Page | Section | Visual and cultural designations | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| 61 | 11.1 | World Heritage Sites | 0 | 0 | 0 | - | - |
| 62 | 11.2 | Area of Outstanding Natural Beauty | 0 | 0 | 0 | - | - |
| 62 | 11.3 | National Parks | 0 | 0 | 0 | - | - |
| **62** | **11.4** | **Listed Buildings** | 0 | 0 | 1 | - | - |
| 63 | 11.5 | Conservation Areas | 0 | 0 | 0 | - | - |
| 63 | 11.6 | Scheduled Ancient Monuments | 0 | 0 | 0 | - | - |
| 63 | 11.7 | Registered Parks and Gardens | 0 | 0 | 0 | - | - |
| Page | Section | Agricultural designations | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| **64** | **12.1** | **Agricultural Land Classification** | Grade 1 (within 250m) | | | | |
| 65 | 12.2 | Open Access Land | 0 | 0 | 0 | - | - |
| 65 | 12.3 | Tree Felling Licences | 0 | 0 | 0 | - | - |
| 65 | 12.4 | Environmental Stewardship Schemes | 0 | 0 | 0 | - | - |
| 65 | 12.5 | Countryside Stewardship Schemes | 0 | 0 | 0 | - | - |
| Page | Section | Habitat designations | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| 66 | 13.1 | Priority Habitat Inventory | 0 | 0 | 0 | - | - |
| 66 | 13.2 | Habitat Networks | 0 | 0 | 0 | - | - |
| 66 | 13.3 | Open Mosaic Habitat | 0 | 0 | 0 | - | - |
| 66 | 13.4 | Limestone Pavement Orders | 0 | 0 | 0 | - | - |
| Page | Section | Geology 1:10,000 scale | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| **67** | **14.1** | **10k Availability** | Identified (within 500m) | | | | |
| 68 | 14.2 | Artificial and made ground (10k) | 0 | 0 | 0 | 0 | - |
| **69** | **14.3** | **Superficial geology (10k)** | 1 | 0 | 0 | 0 | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 70 | 14.4 | Landslip (10k) | 0 | 0 | 0 | 0 | - |
| **71** | **14.5** | **Bedrock geology (10k)** | 1 | 0 | 0 | 0 | - |
| 72 | 14.6 | Bedrock faults and other linear features (10k) | 0 | 0 | 0 | 0 | - |
| Page | Section | Geology 1:50,000 scale | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| **73** | **15.1** | **50k Availability** | Identified (within 500m) | | | | |
| 74 | 15.2 | Artificial and made ground (50k) | 0 | 0 | 0 | 0 | - |
| 74 | 15.3 | Artificial ground permeability (50k) | 0 | 0 | - | - | - |
| **75** | **15.4** | **Superficial geology (50k)** | 1 | 0 | 0 | 0 | - |
| **76** | **15.5** | **Superficial permeability (50k)** | Identified (within 50m) | | | | |
| 76 | 15.6 | Landslip (50k) | 0 | 0 | 0 | 0 | - |
| 76 | 15.7 | Landslip permeability (50k) | None (within 50m) | | | | |
| **77** | **15.8** | **Bedrock geology (50k)** | 1 | 0 | 0 | 0 | - |
| **78** | **15.9** | **Bedrock permeability (50k)** | Identified (within 50m) | | | | |
| 78 | 15.10 | Bedrock faults and other linear features (50k) | 0 | 0 | 0 | 0 | - |
| Page | Section | Boreholes | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| **79** | **16.1** | **BGS Boreholes** | 0 | 0 | 4 | - | - |
| Page | Section | Natural ground subsidence | | | | | |
| **81** | **17.1** | **Shrink swell clays** | Low (within 50m) | | | | |
| **82** | **17.2** | **Running sands** | Moderate (within 50m) | | | | |
| **83** | **17.3** | **Compressible deposits** | Moderate (within 50m) | | | | |
| **84** | **17.4** | **Collapsible deposits** | Negligible (within 50m) | | | | |
| **85** | **17.5** | **Landslides** | Very low (within 50m) | | | | |
| **86** | **17.6** | **Ground dissolution of soluble rocks** | Negligible (within 50m) | | | | |
| Page | Section | Mining, ground workings and natural cavities | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
| 87 | 18.1 | Natural cavities | 0 | 0 | 0 | 0 | - |
| 88 | 18.2 | BritPits | 0 | 0 | 0 | 0 | - |
| **88** | **18.3** | **Surface ground workings** | 0 | 0 | 2 | - | - |
| **88** | **18.4** | **Underground workings** | 0 | 0 | 0 | 0 | 4 |
| 89 | 18.5 | Historical Mineral Planning Areas | 0 | 0 | 0 | 0 | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 89 | 18.6 | Non-coal mining | 0 | 0 | 0 | 0 | 0 |
| 89 | 18.7 | Mining cavities | 0 | 0 | 0 | 0 | 0 |
| 89 | 18.8 | JPB mining areas | None (within 0m) | | | | |
| 89 | 18.9 | Coal mining | None (within 0m) | | | | |
| 90 | 18.10 | Brine areas | None (within 0m) | | | | |
| 90 | 18.11 | Gypsum areas | None (within 0m) | | | | |
| 90 | 18.12 | Tin mining | None (within 0m) | | | | |
| 90 | 18.13 | Clay mining | None (within 0m) | | | | |

| Page | Section | Radon | |
|---|---|---|---|
| **91** | **19.1** | **Radon** | Less than 1% (within 0m) |

| Page | Section | Soil chemistry | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
|---|---|---|---|---|---|---|---|
| **92** | **20.1** | **BGS Estimated Background Soil Chemistry** | 1 | 0 | - | - | - |
| 92 | 20.2 | BGS Estimated Urban Soil Chemistry | 0 | 0 | - | - | - |
| 92 | 20.3 | BGS Measured Urban Soil Chemistry | 0 | 0 | - | - | - |

| Page | Section | Railway infrastructure and projects | On site | 0-50m | 50-250m | 250-500m | 500-2000m |
|---|---|---|---|---|---|---|---|
| 93 | 21.1 | Underground railways (London) | 0 | 0 | 0 | - | - |
| 93 | 21.2 | Underground railways (Non-London) | 0 | 0 | 0 | - | - |
| 94 | 21.3 | Railway tunnels | 0 | 0 | 0 | - | - |
| **94** | **21.4** | **Historical railway and tunnel features** | 0 | 0 | 3 | - | - |
| 94 | 21.5 | Royal Mail tunnels | 0 | 0 | 0 | - | - |
| **94** | **21.6** | **Historical railways** | 0 | 1 | 0 | - | - |
| 95 | 21.7 | Railways | 0 | 0 | 0 | - | - |
| 95 | 21.8 | Crossrail 1 | 0 | 0 | 0 | 0 | - |
| 95 | 21.9 | Crossrail 2 | 0 | 0 | 0 | 0 | - |
| 95 | 21.10 | HS2 | 0 | 0 | 0 | 0 | - |

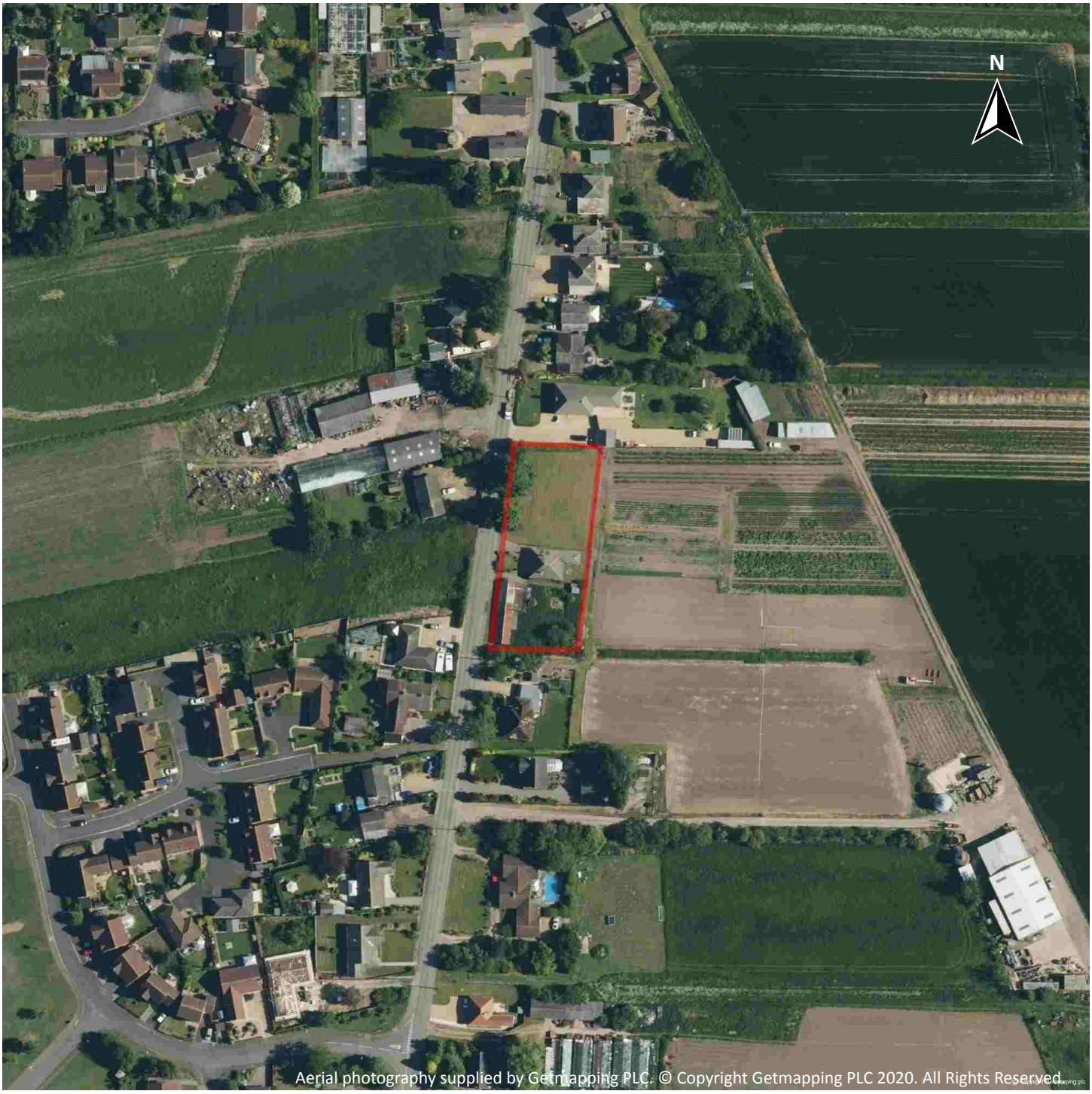
## Recent aerial photograph




Capture Date: 20/04/2018

Site Area: 0.21ha

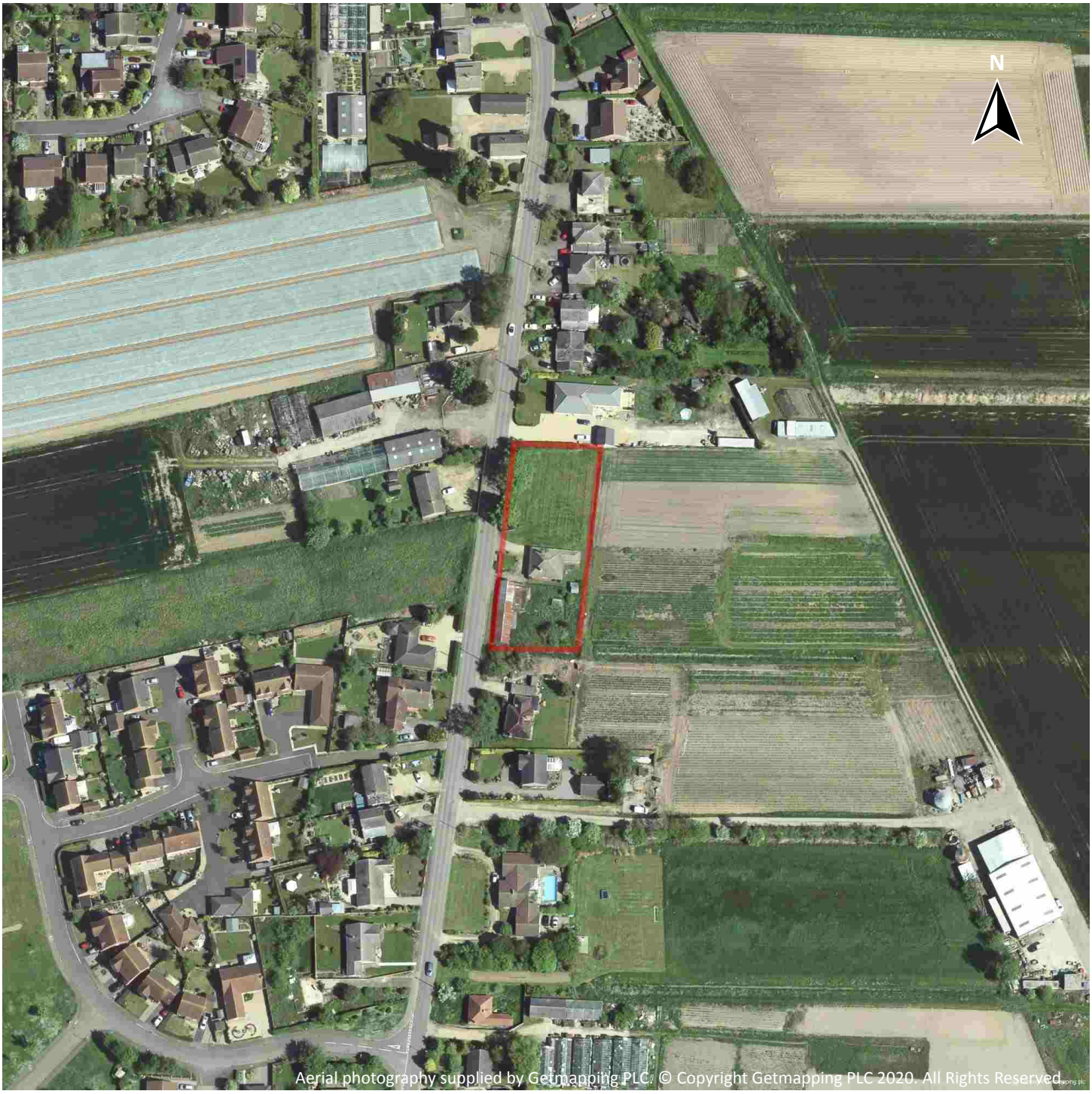
# Recent site history - 2015 aerial photograph




Capture Date: 06/04/2015

Site Area: 0.21ha

# Recent site history - 2013 aerial photograph




Capture Date: 27/05/2013

Site Area: 0.21ha

# Recent site history - 2007 aerial photograph




Capture Date: 19/04/2007

Site Area: 0.21ha

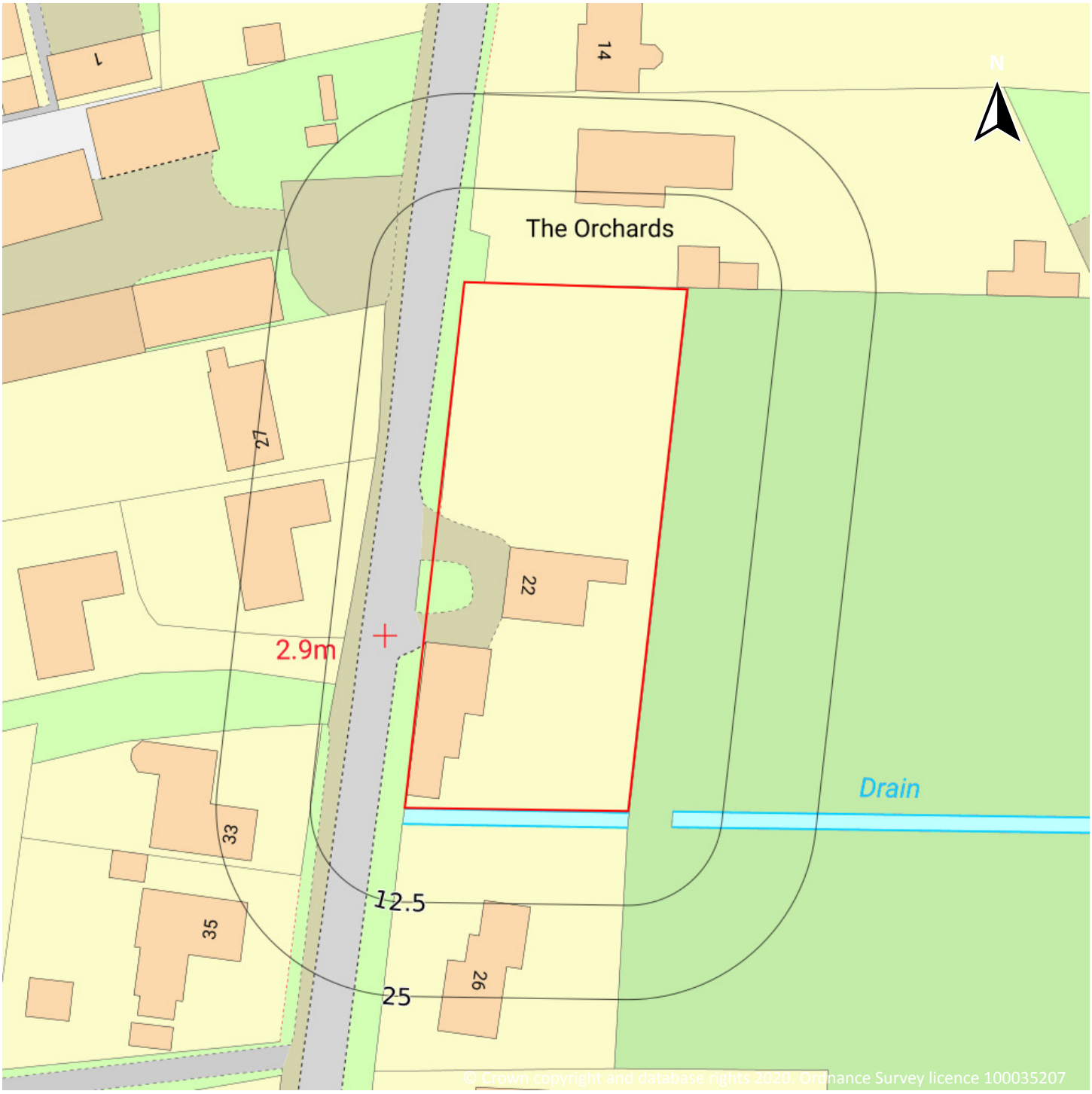
# Recent site history - 1999 aerial photograph




Capture Date: 18/06/1999

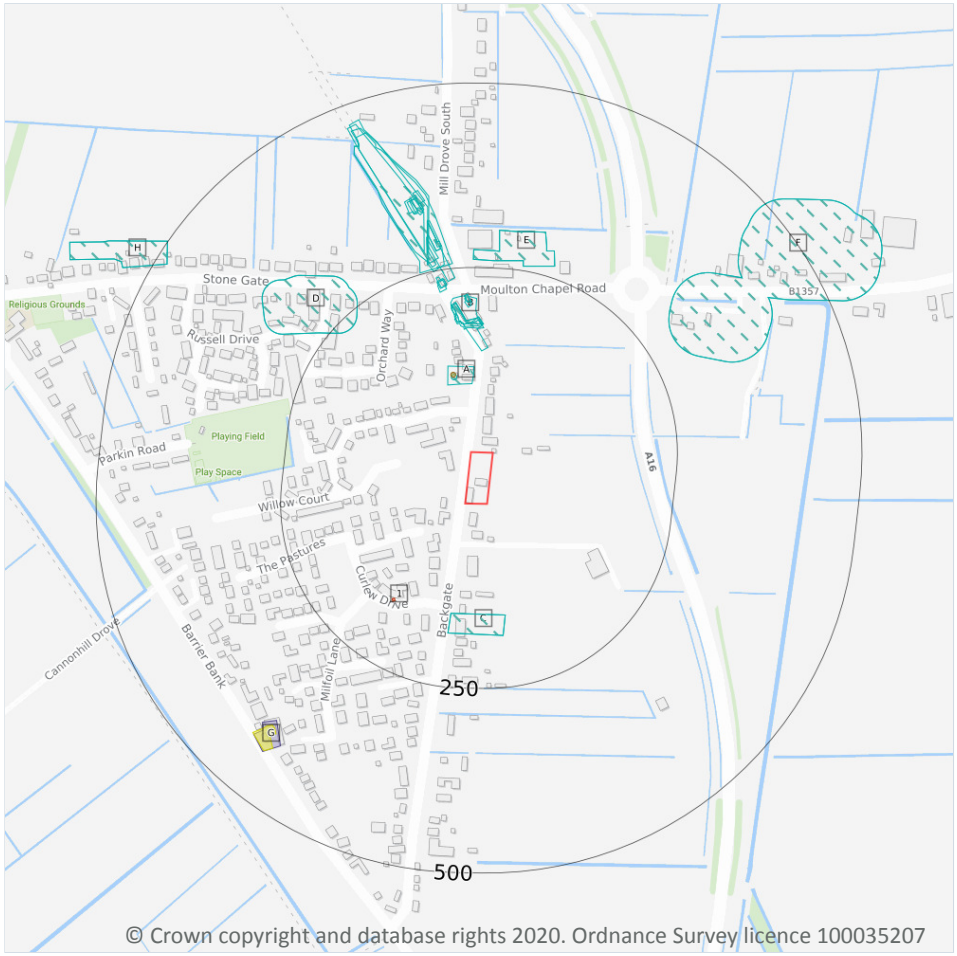
Site Area: 0.21ha

## OS MasterMap site plan




Site Area: 0.21ha

# 1 Past land use




Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

Historical petrol stations

Historical garages

## 1.1 Historical industrial land uses

| Records within 500m | 38 |
|---|---|

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14**

| ID | Location | Land use | Dates present | Group ID |
|---|---|---|---|---|
| A | 93m N | Corn Windmill | 1887 | 2006851 |

| ID | Location | Land use | Dates present | Group ID |
|---|---|---|---|---|
| A | 100m N | Unspecified Tank | 1938 | 2004269 |
| B | 137m N | Railway Station | 1903 | 2025881 |
| C | 149m S | Nursery | 1989 | 2023682 |
| C | 149m S | Nursery | 1977 | 2037929 |
| B | 167m N | Railway Station | 1951 | 2028169 |
| B | 170m N | Railway Station | 1950 | 2026008 |
| B | 174m N | Railway Station | 1887 | 2012539 |
| B | 174m N | Railway Station | 1938 | 2014919 |
| B | 196m N | Railway Building | 1950 - 1951 | 2030735 |
| B | 203m N | Railway Building | 1887 | 2029151 |
| B | 203m N | Railway Building | 1938 | 2029489 |
| B | 221m N | Railway Building | 1950 - 1951 | 2039433 |
| B | 225m N | Railway Building | 1938 | 2016103 |
| B | 226m N | Railway Building | 1887 | 2033362 |
| B | 233m N | Railway Sidings | 1887 | 2031399 |
| D | 233m NW | Nursery | 1989 | 2012498 |
| D | 233m NW | Nursery | 1977 | 2022068 |
| B | 250m N | Railway Sidings | 1950 | 2039320 |
| B | 252m N | Railway Sidings | 1951 | 2028099 |
| B | 256m N | Railway Sidings | 1903 - 1906 | 2034356 |
| E | 256m N | Nurseries | 1977 | 2027419 |
| E | 256m N | Nurseries | 1989 | 2029378 |
| B | 261m N | Railway Sidings | 1938 | 2012328 |
| B | 263m N | Railway Sidings | 1951 | 2029616 |
| B | 277m N | Railway Sidings | 1903 | 2014195 |
| B | 277m N | Railway Sidings | 1903 | 2031766 |
| B | 278m N | Railway Sidings | 1887 | 2023076 |
| B | 281m N | Railway Building | 1938 | 2007573 |

| ID | Location | Land use | Dates present | Group ID |
|---|---|---|---|---|
| F | 290m NE | Nursery | 1977 | 2025271 |
| F | 290m NE | Nursery | 1989 | 2036945 |
| B | 329m N | Railway Building | 1951 | 2031009 |
| B | 331m N | Railway Building | 1887 | 2021875 |
| B | 332m N | Railway Building | 1951 | 2027857 |
| B | 336m N | Railway Building | 1906 | 2031682 |
| B | 343m N | Railway Building | 1977 | 2018524 |
| H | 484m NW | Nursery | 1989 | 2019207 |
| H | 484m NW | Nursery | 1977 | 2026890 |

*This data is sourced from Ordnance Survey / Groundsure.*

## 1.2 Historical tanks

| **Records within 500m** | **1** |
|---|---|

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14**

| ID | Location | Land use | Dates present | Group ID |
|---|---|---|---|---|
| A | 104m N | Unspecified Tank | 1992 | 337795 |

*This data is sourced from Ordnance Survey / Groundsure.*

## 1.3 Historical energy features

| **Records within 500m** | **1** |
|---|---|

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14**

| ID | Location | Land use | Dates present | Group ID |
|---|---|---|---|---|
| 1 | 160m SW | Gas Governor | 1992 | 221452 |

*This data is sourced from Ordnance Survey / Groundsure.*

## 1.4 Historical petrol stations

| Records within 500m | 1 |
|---|---|

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14**

| ID | Location | Land use | Dates present | Group ID |
|---|---|---|---|---|
| G | 398m SW | Filling Station | 1974 | 3696 |

*This data is sourced from Ordnance Survey / Groundsure.*

## 1.5 Historical garages

| Records within 500m | 1 |
|---|---|

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14**

| ID | Location | Land use | Dates present | Group ID |
|---|---|---|---|---|
| G | 389m SW | Garage | 1992 | 67883 |

*This data is sourced from Ordnance Survey / Groundsure.*

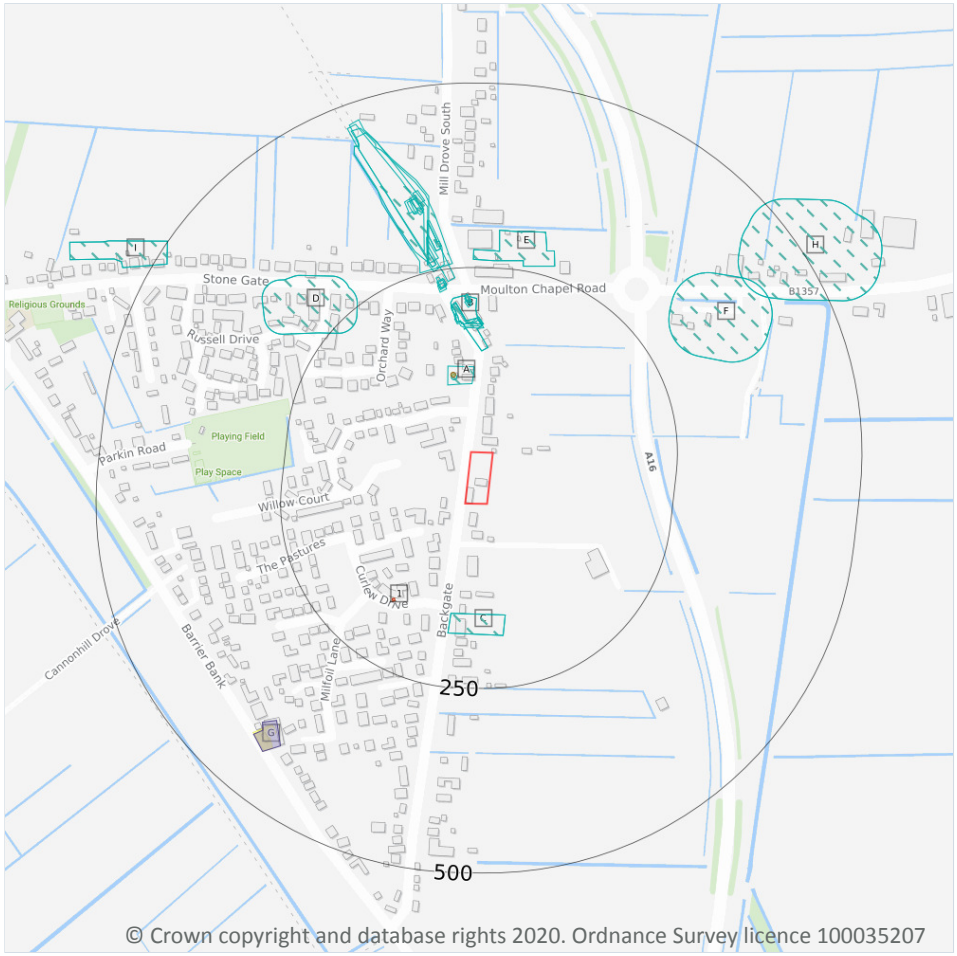
## 1.6 Historical military land

| Records within 500m | 0 |
|---|---|

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

*This data is sourced from Ordnance Survey / Groundsure / other sources.*

# 2 Past land use - un-grouped




Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

Historical petrol stations

Historical garages

## 2.1 Historical industrial land uses

| Records within 500m | 45 |
|---|---|

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 19**

| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| A | 93m N | Corn Windmill | 1887 | 2006851 |
| A | 100m N | Unspecified Tank | 1938 | 2004269 |
| B | 137m N | Railway Station | 1903 | 2025881 |

| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| B | 137m N | Railway Station | 1903 | 2025881 |
| C | 149m S | Nursery | 1989 | 2023682 |
| C | 149m S | Nursery | 1977 | 2037929 |
| B | 167m N | Railway Station | 1951 | 2028169 |
| B | 170m N | Railway Station | 1950 | 2026008 |
| B | 174m N | Railway Station | 1938 | 2014919 |
| B | 174m N | Railway Station | 1887 | 2012539 |
| B | 196m N | Railway Building | 1951 | 2030735 |
| B | 200m N | Railway Building | 1950 | 2030735 |
| B | 203m N | Railway Building | 1938 | 2029489 |
| B | 203m N | Railway Building | 1887 | 2029151 |
| B | 221m N | Railway Building | 1951 | 2039433 |
| B | 224m N | Railway Building | 1950 | 2039433 |
| B | 225m N | Railway Building | 1938 | 2016103 |
| B | 226m N | Railway Building | 1887 | 2033362 |
| B | 233m N | Railway Sidings | 1887 | 2031399 |
| D | 233m NW | Nursery | 1989 | 2012498 |
| D | 233m NW | Nursery | 1977 | 2022068 |
| B | 250m N | Railway Sidings | 1950 | 2039320 |
| B | 252m N | Railway Sidings | 1951 | 2028099 |
| B | 256m N | Railway Sidings | 1903 | 2034356 |
| B | 256m N | Railway Sidings | 1903 | 2034356 |
| E | 256m N | Nurseries | 1989 | 2029378 |
| E | 256m N | Nurseries | 1977 | 2027419 |
| B | 261m N | Railway Sidings | 1938 | 2012328 |
| B | 263m N | Railway Sidings | 1951 | 2029616 |
| B | 266m N | Railway Sidings | 1906 | 2034356 |
| B | 277m N | Railway Sidings | 1903 | 2014195 |

| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| B | 277m N | Railway Sidings | 1903 | 2031766 |
| B | 278m N | Railway Sidings | 1887 | 2023076 |
| B | 281m N | Railway Building | 1938 | 2007573 |
| F | 290m NE | Nursery | 1989 | 2036945 |
| F | 290m NE | Nursery | 1977 | 2025271 |
| B | 329m N | Railway Building | 1951 | 2031009 |
| B | 331m N | Railway Building | 1887 | 2021875 |
| B | 332m N | Railway Building | 1951 | 2027857 |
| B | 336m N | Railway Building | 1906 | 2031682 |
| B | 343m N | Railway Building | 1977 | 2018524 |
| H | 412m NE | Nursery | 1989 | 2036945 |
| H | 412m NE | Nursery | 1977 | 2025271 |
| I | 484m NW | Nursery | 1989 | 2019207 |
| I | 484m NW | Nursery | 1977 | 2026890 |

*This data is sourced from Ordnance Survey / Groundsure.*

## 2.2 Historical tanks

| **Records within 500m** | **1** |
|---|---|

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 19**

| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| A | 104m N | Unspecified Tank | 1992 | 337795 |

*This data is sourced from Ordnance Survey / Groundsure.*

## 2.3 Historical energy features

| Records within 500m | 1 |
|---|---|

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 19**

| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| 1 | 160m SW | Gas Governor | 1992 | 221452 |

*This data is sourced from Ordnance Survey / Groundsure.*

## 2.4 Historical petrol stations

| Records within 500m | 1 |
|---|---|

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 19**

| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| G | 398m SW | Filling Station | 1974 | 3696 |

*This data is sourced from Ordnance Survey / Groundsure.*

## 2.5 Historical garages

| Records within 500m | 1 |
|---|---|

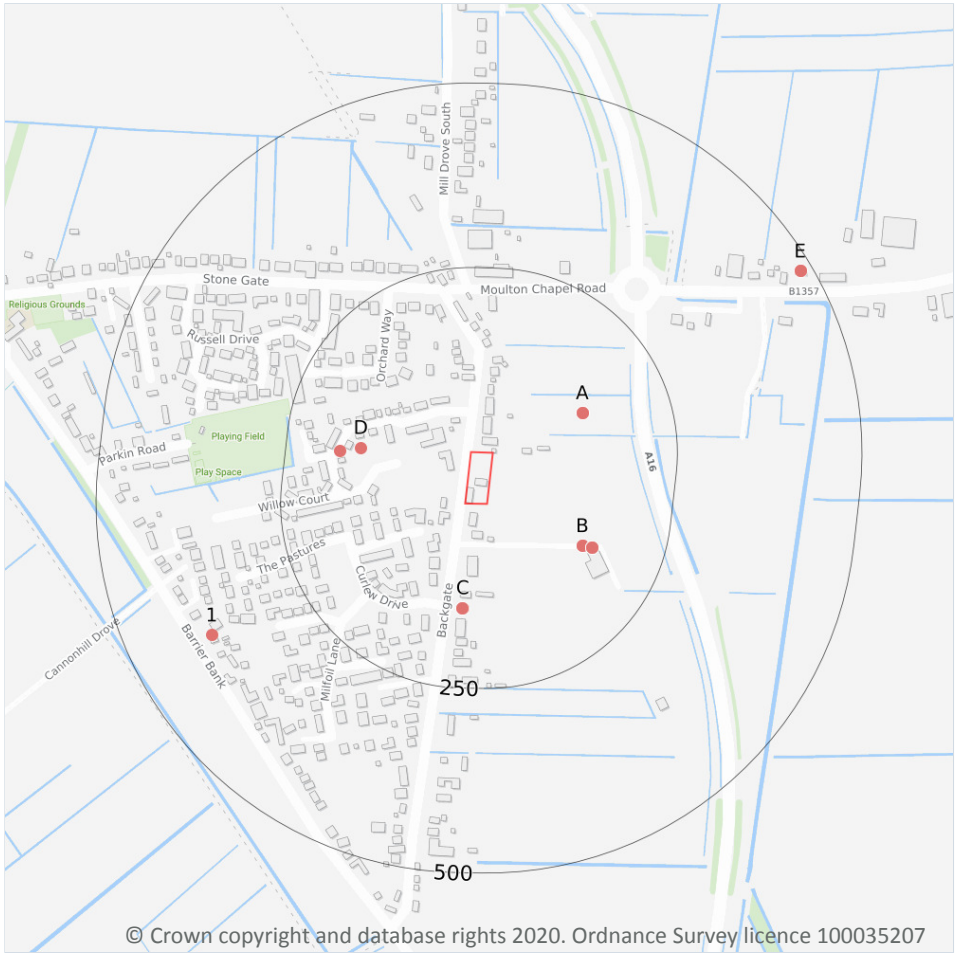
Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 19**

| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| G | 389m SW | Garage | 1992 | 67883 |

*This data is sourced from Ordnance Survey / Groundsure.*

# 3 Waste and landfill




## 3.1 Active or recent landfill

| Records within 500m | 0 |
|---|---|

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 3.2 Historical landfill (BGS records)

| Records within 500m | 0 |
|---|---|

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

*This data is sourced from the British Geological Survey.*

## 3.3 Historical landfill (LA/mapping records)

| Records within 500m | 0 |
|---|---|

Landfill sites identified from Local Authority records and high detail historical mapping.

*This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.*

## 3.4 Historical landfill (EA/NRW records)

| Records within 500m | 0 |
|---|---|

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 3.5 Historical waste sites

| Records within 500m | 0 |
|---|---|

Waste site records derived from Local Authority planning records and high detail historical mapping.

*This data is sourced from Ordnance Survey/Groundsure and Local Authority records.*

## 3.6 Licensed waste sites

| Records within 500m | 0 |
|---|---|

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 3.7 Waste exemptions

| Records within 500m | 42 |
|---|---|

Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 23**

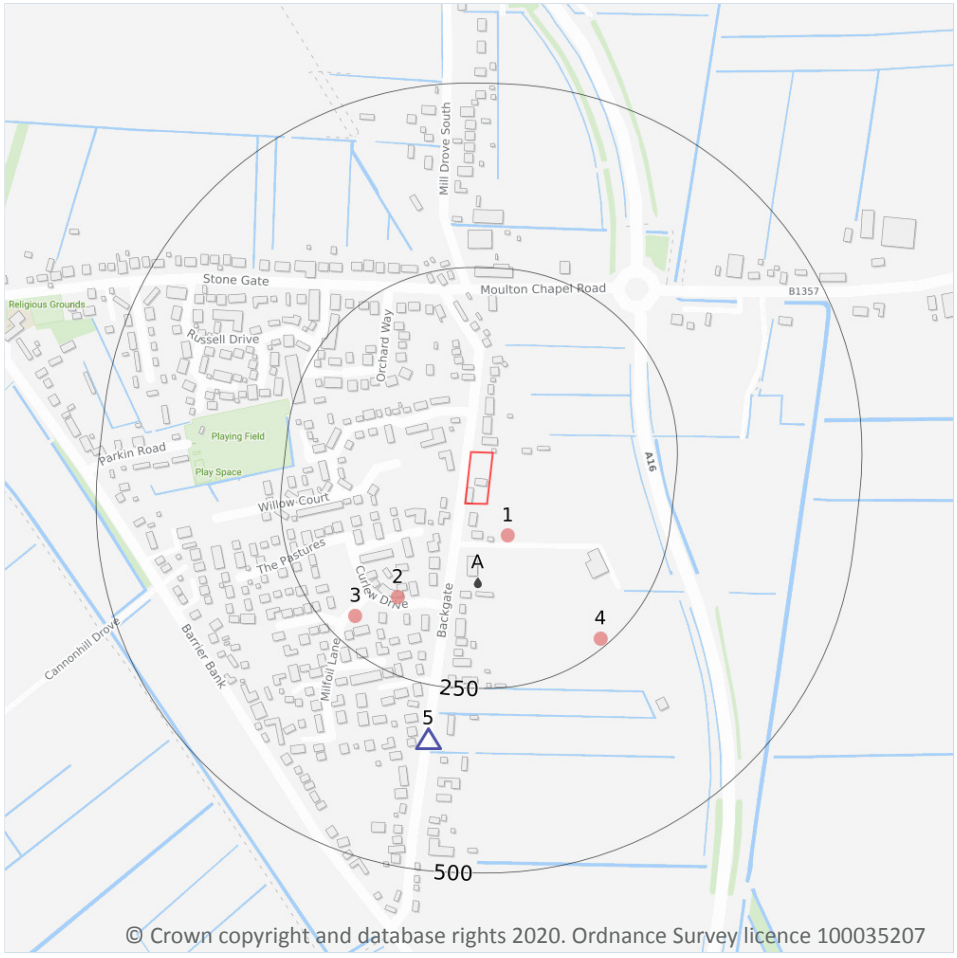
| ID | Location | Site | Reference | Category | Sub-Category | Description |
|---|---|---|---|---|---|---|
| A | 132m NE | - | WEX042310 | Disposing of waste exemption | On a farm | Deposit of waste from dredging of inland waters |
| A | 132m NE | - | WEX042310 | Disposing of waste exemption | On a farm | Deposit of waste from a portable sanitary convenience |
| A | 132m NE | - | WEX042310 | Disposing of waste exemption | On a farm | Burning waste in the open |
| A | 132m NE | - | WEX042310 | Storing waste exemption | On a farm | Storage of waste in secure containers |
| A | 132m NE | - | WEX042310 | Treating waste exemption | On a farm | Aerobic composting and associated prior treatment |
| A | 132m NE | - | WEX042310 | Using waste exemption | On a farm | Use of waste in construction |
| A | 132m NE | - | WEX042310 | Using waste exemption | On a farm | Spreading waste on agricultural land to confer benefit |
| A | 132m NE | - | WEX042310 | Using waste exemption | On a farm | Spreading of plant matter to confer benefit |
| A | 132m NE | - | WEX042310 | Using waste exemption | On a farm | Incorporation of ash into soil |
| A | 132m NE | - | WEX042310 | Using waste exemption | On a farm | Use of waste for a specified purpose |
| B | 141m SE | Farm buildings Backgate Lincolnshire PE12 6AP | EPR/RH0075VW/A001 | Disposing of waste exemption | Agricultural Waste Only | Deposit of waste from dredging of inland waters |
| B | 141m SE | Farm buildings Backgate Lincolnshire PE12 6AP | EPR/RH0075VW/A001 | Disposing of waste exemption | Agricultural Waste Only | Deposit of waste from a portable sanitary convenience |
| B | 141m SE | Farm buildings Backgate Lincolnshire PE12 6AP | EPR/RH0075VW/A001 | Disposing of waste exemption | Agricultural Waste Only | Burning waste in the open |
| B | 141m SE | Farm buildings Backgate Lincolnshire PE12 6AP | EPR/RH0075VW/A001 | Treating waste exemption | Agricultural Waste Only | Aerobic composting and associated prior treatment |
| B | 141m SE | Farm buildings Backgate Lincolnshire PE12 6AP | EPR/RH0075VW/A001 | Using waste exemption | Agricultural Waste Only | Use of waste in construction |
| B | 141m SE | Farm buildings Backgate Lincolnshire PE12 6AP | EPR/RH0075VW/A001 | Using waste exemption | Agricultural Waste Only | Spreading waste on agricultural land to confer benefit |

| ID | Location | Site | Reference | Category | Sub-Category | Description |
|---|---|---|---|---|---|---|
| B | 141m SE | Farm buildings Backgate Lincolnshire PE12 6AP | EPR/RH0075VW/A001 | Using waste exemption | Agricultural Waste Only | Spreading of plant matter to confer benefit |
| B | 141m SE | Farm buildings Backgate Lincolnshire PE12 6AP | EPR/RH0075VW/A001 | Using waste exemption | Agricultural Waste Only | Incorporation of ash into soil |
| B | 141m SE | Farm buildings Backgate Lincolnshire PE12 6AP | EPR/RH0075VW/A001 | Using waste exemption | Agricultural Waste Only | Use of waste for a specified purpose |
| C | 142m S | 42 Backgate PE12 6AP | EPR/WE5451DB/A001 | Disposing of waste exemption | Agricultural Waste Only | Deposit of agricultural waste consisting of plant tissue under a Plant Health notice |
| C | 142m S | 42 Backgate PE12 6AP | EPR/WE5451DB/A001 | Disposing of waste exemption | Agricultural Waste Only | Burning waste in the open |
| C | 143m S | 42, BACKGATE, COWBIT, SPALDING, PE12 6AP | WEX172322 | Disposing of waste exemption | Not on a farm | Deposit of agricultural waste consisting of plant tissue under a Plant Health notice |
| C | 143m S | 42, BACKGATE, COWBIT, SPALDING, PE12 6AP | WEX172322 | Disposing of waste exemption | Not on a farm | Burning waste in the open |
| C | 143m S | 42, BACKGATE, COWBIT, SPALDING, PE12 6AP | WEX013401 | Disposing of waste exemption | Not on a farm | Deposit of agricultural waste consisting of plant tissue under a Plant Health notice |
| C | 143m S | 42, BACKGATE, COWBIT, SPALDING, PE12 6AP | WEX013401 | Disposing of waste exemption | Not on a farm | Burning waste in the open |
| D | 149m W | - | WEX115808 | Using waste exemption | On a farm | Use of waste in construction |
| B | 154m SE | - | WEX190185 | Using waste exemption | On a Farm | Use of waste for a specified purpose |
| B | 154m SE | - | WEX190185 | Using waste exemption | On a Farm | Spreading waste on agricultural land to confer benefit |
| B | 154m SE | - | WEX190185 | Treating waste exemption | On a Farm | Aerobic composting and associated prior treatment |
| B | 154m SE | - | WEX190185 | Disposing of waste exemption | On a Farm | Burning waste in the open |
| B | 154m SE | - | WEX190185 | Storing waste exemption | On a Farm | Storage of waste in secure containers |

| ID | Location | Site | Reference | Category | Sub-Category | Description |
|---|---|---|---|---|---|---|
| B | 154m SE | - | WEX190185 | Using waste exemption | On a Farm | Use of waste in construction |
| B | 154m SE | - | WEX190185 | Using waste exemption | On a Farm | Spreading of plant matter to confer benefit |
| B | 154m SE | - | WEX190185 | Using waste exemption | On a Farm | Incorporation of ash into soil |
| B | 154m SE | - | WEX190185 | Disposing of waste exemption | On a Farm | Deposit of waste from dredging of inland waters |
| B | 154m SE | - | WEX190185 | Storing waste exemption | On a Farm | Storage of waste in a secure place |
| D | 177m W | - | WEX135968 | Using waste exemption | Not on a farm | Use of waste in construction |
| 1 | 387m SW | Cowbit St Mary's Primary School PE12 6AL | EPR/LF0605XN/A001 | Treating waste exemption | Non-Agricultural Waste Only | Crushing waste fluorescent tubes |
| E | 483m NE | 50, MOULTON CHAPEL ROAD, MOULTON CHAPEL, SPALDING, PE12 0XD | WEX022768 | Disposing of waste exemption | On a farm | Deposit of waste from dredging of inland waters |
| E | 483m NE | 50, MOULTON CHAPEL ROAD, MOULTON CHAPEL, SPALDING, PE12 0XD | WEX022768 | Using waste exemption | On a farm | Spreading waste on agricultural land to confer benefit |
| E | 483m NE | 50, MOULTON CHAPEL ROAD, MOULTON CHAPEL, SPALDING, PE12 0XD | WEX022768 | Using waste exemption | On a farm | Spreading of plant matter to confer benefit |
| E | 483m NE | 50, MOULTON CHAPEL ROAD, MOULTON CHAPEL, SPALDING, PE12 0XD | WEX022768 | Using waste exemption | On a farm | Incorporation of ash into soil |

*This data is sourced from the Environment Agency and Natural Resources Wales.*

# 4 Current industrial land use




Site Outline

Search buffers in metres (m)

Recent industrial land uses

Current or recent petrol stations

Licensed Discharges to controlled waters

## 4.1 Recent industrial land uses

| Records within 250m | 4 |
|---|---|

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 28**

| ID | Location | Company | Address | Activity | Category |
|---|---|---|---|---|---|
| 1 | 51m SE | Sewage Pumping Station | Lincolnshire, PE12 | Waste Storage, Processing and Disposal | Infrastructure and Facilities |
| 2 | 156m SW | Gas Governor Station | Lincolnshire, PE12 | Gas Features | Infrastructure and Facilities |

| ID | Location | Company | Address | Activity | Category |
|---|---|---|---|---|---|
| 3 | 213m SW | Electricity Sub Station | Lincolnshire, PE12 | Electrical Features | Infrastructure and Facilities |
| 4 | 238m SE | Mast (Telecommunication) | Lincolnshire, PE12 | Telecommunications Features | Infrastructure and Facilities |

*This data is sourced from Ordnance Survey.*

## 4.2 Current or recent petrol stations

| **Records within 500m** | **1** |
|---|---|

Open, closed, under development and obsolete petrol stations.

Features are displayed on the Current industrial land use map on **page 28**

| ID | Location | Company | Address | LPG | Status |
|---|---|---|---|---|---|
| 5 | 322m S | OBSOLETE | Barrier Bank, Cowbit, Spalding, Lincolnshire, PE12 6A | Not Applicable | Obsolete |

*This data is sourced from Experian.*

## 4.3 Electricity cables

| **Records within 500m** | **0** |
|---|---|

High voltage underground electricity transmission cables.

*This data is sourced from National Grid.*

## 4.4 Gas pipelines

| **Records within 500m** | **0** |
|---|---|

High pressure underground gas transmission pipelines.

*This data is sourced from National Grid.*

## 4.5 Sites determined as Contaminated Land

| Records within 500m | 0 |
|---|---|

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

*This data is sourced from Local Authority records.*

## 4.6 Control of Major Accident Hazards (COMAH)

| Records within 500m | 0 |
|---|---|

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

*This data is sourced from the Health and Safety Executive.*

## 4.7 Regulated explosive sites

| Records within 500m | 0 |
|---|---|

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

*This data is sourced from the Health and Safety Executive.*

## 4.8 Hazardous substance storage/usage

| Records within 500m | 0 |
|---|---|

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

*This data is sourced from Local Authority records.*

## 4.9 Historical licensed industrial activities (IPC)

| Records within 500m | 0 |
|---|---|

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.10 Licensed industrial activities (Part A(1))

| Records within 500m | 0 |
|---|---|

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.11 Licensed pollutant release (Part A(2)/B)

| Records within 500m | 0 |
|---|---|

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

*This data is sourced from Local Authority records.*

## 4.12 Radioactive Substance Authorisations

| Records within 500m | 0 |
|---|---|

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.13 Licensed Discharges to controlled waters

| Records within 500m | 6 |
|---|---|

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

Features are displayed on the Current industrial land use map on **page 28**

| ID | Location | Address | Details | |
|---|---|---|---|---|
| A | 106m S | COWBIT STW | Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY<br>Permit Number: AW5NF807<br>Permit Version: 1<br>Receiving Water: Moulton Mere Drn River Nene N | Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY)<br>Issue date: 22/03/1988<br>Effective Date: 22/03/1988<br>Revocation Date: 17/09/1989 |

| ID | Location | Address | Details | |
|---|---|---|---|---|
| A | 106m S | COWBIT STW | Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY<br>Permit Number: AW5NF807<br>Permit Version: 2<br>Receiving Water: Moulton Mere Drn River Nene N | Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2)<br>Issue date: 18/09/1989<br>Effective Date: 18/09/1989<br>Revocation Date: 31/12/2009 |
| A | 106m S | COWBIT STW | Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY<br>Permit Number: AW5NF807<br>Permit Version: 3<br>Receiving Water: Moulton Mere Drn River Nene N | Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2)<br>Issue date: 24/09/2009<br>Effective Date: 01/01/2010<br>Revocation Date: 30/03/2010 |
| A | 106m S | COWBIT STW | Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY<br>Permit Number: AW5NF807<br>Permit Version: 4<br>Receiving Water: Moulton Mere Drn River Nene N | Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2)<br>Issue date: 31/03/2010<br>Effective Date: 31/03/2010<br>Revocation Date: 31/12/2010 |
| A | 106m S | COWBIT STW | Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY<br>Permit Number: AW5NF807<br>Permit Version: 5<br>Receiving Water: Moulton Mere Drn River Nene N | Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2)<br>Issue date: 31/03/2010<br>Effective Date: 01/01/2011<br>Revocation Date: 20/09/2015 |
| A | 106m S | COWBIT STW | Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY<br>Permit Number: AW5NF807<br>Permit Version: 6<br>Receiving Water: Moulton Mere Drn River Nene N | Status: VARIED UNDER EPR 2010<br>Issue date: 21/09/2015<br>Effective Date: 21/09/2015<br>Revocation Date: - |

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.14 Pollutant release to surface waters (Red List)

| **Records within 500m** | **0** |
|---|---|

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.15 Pollutant release to public sewer

| Records within 500m | 0 |
|---|---|

Discharges of Special Category Effluents to the public sewer.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.16 List 1 Dangerous Substances

| Records within 500m | 0 |
|---|---|

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.17 List 2 Dangerous Substances

| Records within 500m | 0 |
|---|---|

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.18 Pollution Incidents (EA/NRW)

| Records within 500m | 0 |
|---|---|

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.19 Pollution inventory substances

| Records within 500m | 0 |
|---|---|

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

*This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.*

## 4.20 Pollution inventory waste transfers

| Records within 500m | 0 |
|---|---|

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

*This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.*

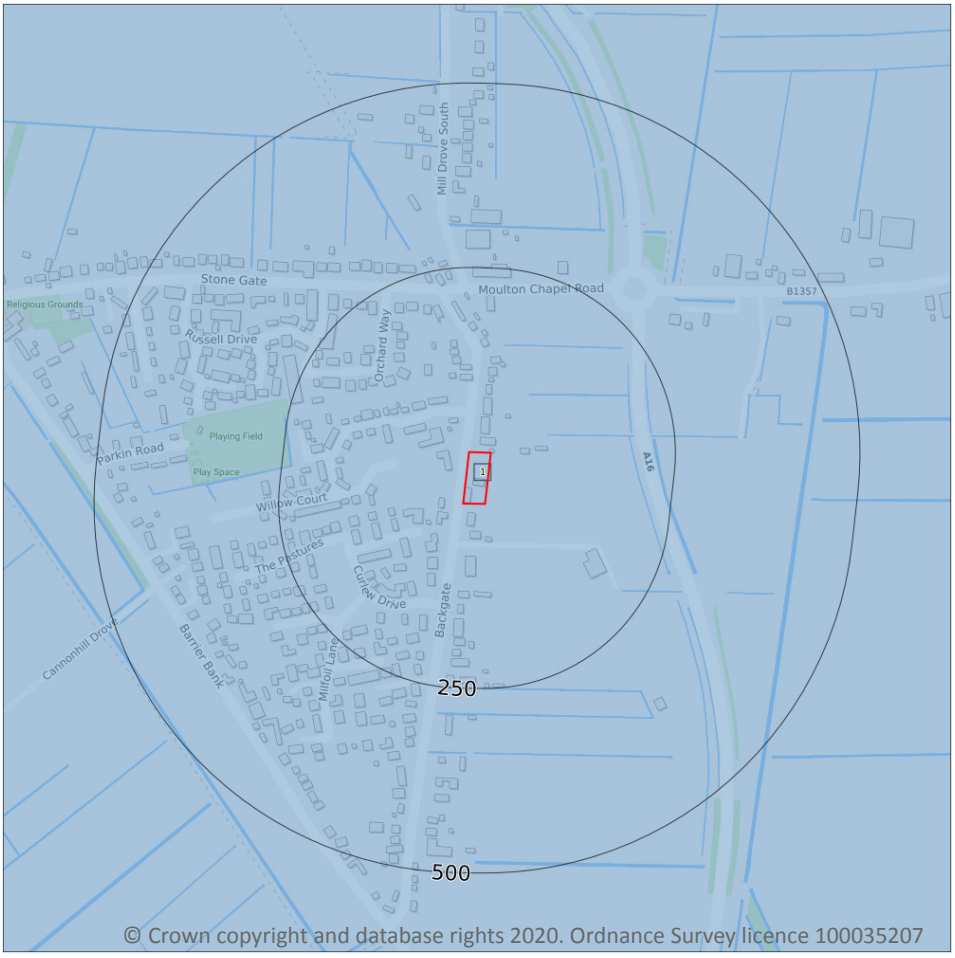
## 4.21 Pollution inventory radioactive waste

| Records within 500m | 0 |
|---|---|

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

*This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.*

# 5 Hydrogeology - Superficial aquifer




## 5.1 Superficial aquifer

| Records within 500m | 1 |
|---|---|

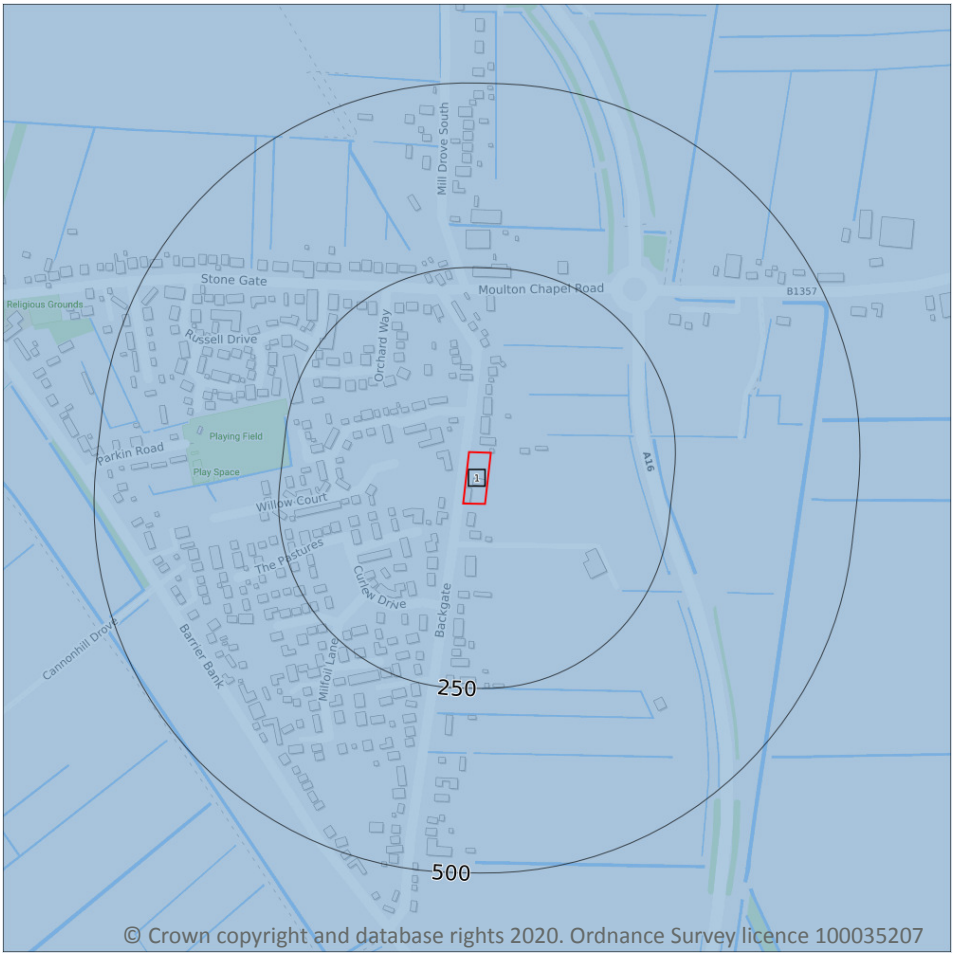
Aquifer status of groundwater held within superficial geology.

Features are displayed on the Hydrogeology map on **page 35**

| ID | Location | Designation | Description |
|---|---|---|---|
| **1** | **On site** | **Unproductive** | **These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow** |

*This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.*

# Bedrock aquifer




## 5.2 Bedrock aquifer

| Records within 500m | 1 |
|---|---|

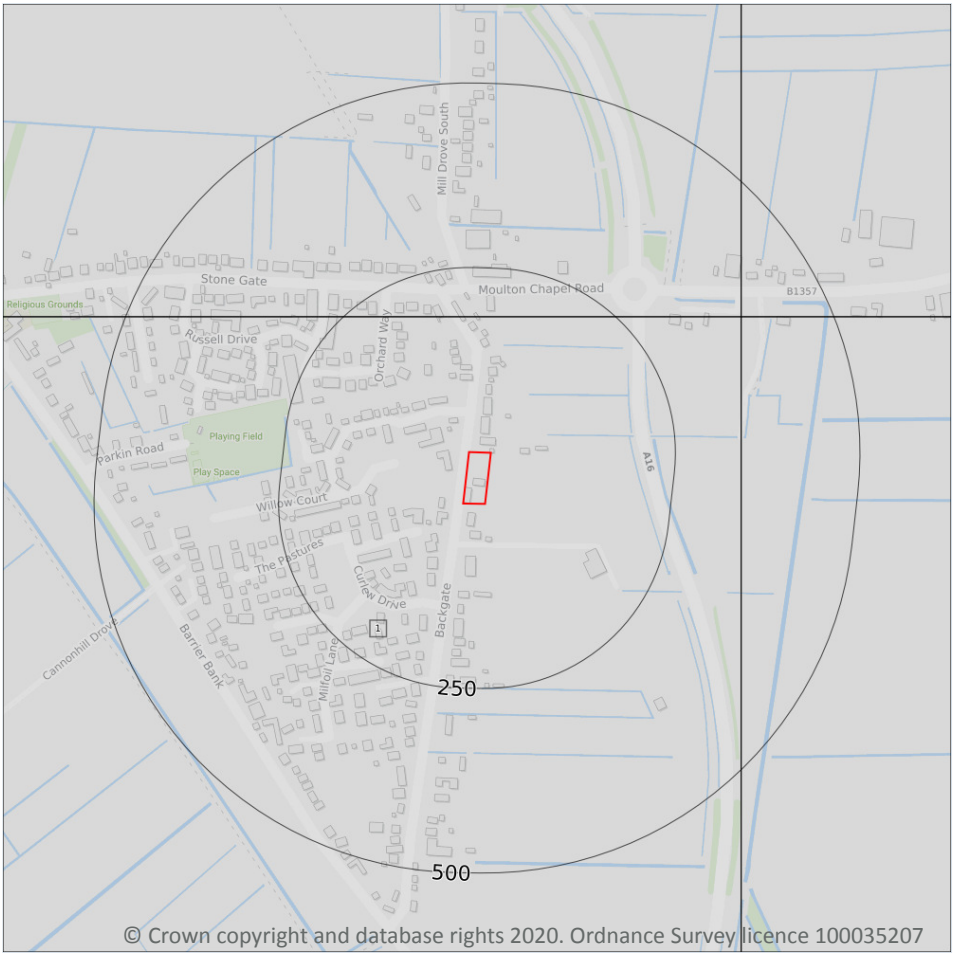
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 36**

| ID | Location | Designation | Description |
|---|---|---|---|
| **1** | **On site** | **Unproductive** | **These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow** |

*This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.*

# Groundwater vulnerability




Site Outline

Search buffers in metres (m)

Superficial vulnerability

- Principal superficial aquifer, high vulnerability
- Secondary superficial aquifer, high vulnerability
- Principal superficial aquifer, medium vulnerability
- Secondary superficial aquifer, medium vulnerability
- Principal superficial aquifer, low vulnerability
- Secondary superficial aquifer, low vulnerability

Bedrock vulnerability

- Principal bedrock aquifer, high vulnerability
- Secondary bedrock aquifer, high vulnerability
- Principal bedrock aquifer, medium vulnerability
- Secondary bedrock aquifer, medium vulnerability
- Principal bedrock aquifer, low vulnerability
- Secondary bedrock aquifer, low vulnerability

Other information

- Unproductive aquifer
- Soluble rock risk
- Local information

## 5.3 Groundwater vulnerability

| Records within 50m | 1 |
|---|---|

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

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

Features are displayed on the Groundwater vulnerability map on **page 37**

| ID | Location | Summary | Soil / surface | Superficial geology | Bedrock geology |
|---|---|---|---|---|---|
| 1 | On site | **Summary Classification: Unproductive aquifer (may have productive aquifer beneath) Combined classification: Unproductive Bedrock Aquifer, Unproductive Superficial Aquifer** | **Leaching class: High Infiltration value: >70% Dilution value: <300mm/year** | **Vulnerability: Unproductive Aquifer type: Unproductive Thickness: >10m Patchiness value: >90% Recharge potential: Low** | **Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Well connected fractures** |

*This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.*

## 5.4 Groundwater vulnerability- soluble rock risk

| Records on site | 0 |
|---|---|

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

*This data is sourced from the British Geological Survey and the Environment Agency.*

## 5.5 Groundwater vulnerability- local information

| Records on site | 0 |
|---|---|

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on enquiries@environment-agency.gov.uk.

*This data is sourced from the British Geological Survey and the Environment Agency.*

# Abstractions and Source Protection Zones




Site Outline

Search buffers in metres (m)

- Source Protection Zone 1 — Inner catchment
- Source Protection Zone 2 — Outer catchment
- Source Protection Zone 3 — Total catchment
- Source Protection Zone 4 — Zone of Special Interest
- Source Protection Zone 1c — Inner catchment - confined aquifer
- Source Protection Zone 2c — Outer catchment - confined aquifer
- Source Protection Zone 3c — Total catchment - confined aquifer
- Drinking water abstraction licences
- Drinking water abstraction licences — Polygon features
- Drinking water abstraction licences — Linear features
- Groundwater abstraction licence (point)
- Groundwater abstraction licence (area)
- Groundwater abstraction licence (linear)
- Surface Water Abstractions (point)
- Surface Water Abstractions (area)
- Surface Water Abstractions (linear)

## 5.6 Groundwater abstractions

| Records within 2000m | 0 |
|---|---|

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 5.7 Surface water abstractions

| **Records within 2000m** | **8** |
|---|---|

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 39**

| ID | Location | Details | |
|---|---|---|---|
| 1 | 638m SE | Status: Historical<br>Licence No: 5/31/14/*S/0263<br>Details: Spray Irrigation - Direct<br>Direct Source: SURFACE WATER SOURCE OF SUPPLY<br>Point: WHEATMERE DRAIN<br>Data Type: Line<br>Name: J W E BANKS LTD<br>Easting: 527000<br>Northing: 317210 | Annual Volume ($m^3$): 4546<br>Max Daily Volume ($m^3$): 545.5<br>Original Application No: -<br>Original Start Date: 28/02/2005<br>Expiry Date: 31/08/2013<br>Issue No: 1<br>Version Start Date: 28/02/2005<br>Version End Date: - |
| - | 1138m E | Status: Historical<br>Licence No: 5/32/11/*S/0052C<br>Details: Spray Irrigation - Direct<br>Direct Source: SURFACE WATER SOURCE OF SUPPLY<br>Point: MOULTON MERE DRAIN<br>Data Type: Line<br>Name: A H CLARK FARMS LTD<br>Easting: 527700<br>Northing: 316000 | Annual Volume ($m^3$): 4000<br>Max Daily Volume ($m^3$): 818.3<br>Original Application No: -<br>Original Start Date: 01/04/1966<br>Expiry Date: -<br>Issue No: 100<br>Version Start Date: 02/04/1966<br>Version End Date: - |
| - | 1311m SW | Status: Historical<br>Licence No: 5/31/14/*S/0185<br>Details: Spray Irrigation - Direct<br>Direct Source: SURFACE WATER SOURCE OF SUPPLY<br>Point: THE NEW RIVER AT COWBIT<br>Data Type: Line<br>Name: BOOR<br>Easting: 524170<br>Northing: 319130 | Annual Volume ($m^3$): 10000<br>Max Daily Volume ($m^3$): 2000<br>Original Application No: -<br>Original Start Date: 01/06/1986<br>Expiry Date: -<br>Issue No: 101<br>Version Start Date: 23/02/2005<br>Version End Date: - |
| - | 1313m SW | Status: Active<br>Licence No: 5/31/14/*S/0185<br>Details: Spray Irrigation - Direct<br>Direct Source: SURFACE WATER SOURCE OF SUPPLY<br>Point: THE NEW RIVER AT COWBIT<br>Data Type: Line<br>Name: BOOR<br>Easting: 524184<br>Northing: 319104 | Annual Volume ($m^3$): 10,000<br>Max Daily Volume ($m^3$): 2,000<br>Original Application No: -<br>Original Start Date: 01/06/1986<br>Expiry Date: -<br>Issue No: 102<br>Version Start Date: 18/09/2013<br>Version End Date: - |

| ID | Location | Details | |
|---|---|---|---|
| - | 1505m SW | Status: Active<br>Licence No: 5/31/14/*S/0185<br>Details: Spray Irrigation - Direct<br>Direct Source: SURFACE WATER SOURCE OF SUPPLY<br>Point: THE SOKE DYKE AT COWBIT<br>Data Type: Line<br>Name: BOOR<br>Easting: 525346<br>Northing: 316951 | Annual Volume ($m^3$): 10,000<br>Max Daily Volume ($m^3$): 2,000<br>Original Application No: -<br>Original Start Date: 01/06/1986<br>Expiry Date: -<br>Issue No: 102<br>Version Start Date: 18/09/2013<br>Version End Date: - |
| - | 1507m SW | Status: Historical<br>Licence No: 5/31/14/*S/0185<br>Details: Spray Irrigation - Direct<br>Direct Source: SURFACE WATER SOURCE OF SUPPLY<br>Point: THE SOKE DYKE AT COWBIT<br>Data Type: Line<br>Name: BOOR<br>Easting: 525340<br>Northing: 316950 | Annual Volume ($m^3$): 10000<br>Max Daily Volume ($m^3$): 2000<br>Original Application No: -<br>Original Start Date: 01/06/1986<br>Expiry Date: -<br>Issue No: 101<br>Version Start Date: 23/02/2005<br>Version End Date: - |
| - | 1533m SW | Status: Historical<br>Licence No: 5/31/14/*S/0185<br>Details: Spray Irrigation - Direct<br>Direct Source: SURFACE WATER SOURCE OF SUPPLY<br>Point: RIVER WELLAND AT COWBIT<br>Data Type: Line<br>Name: BOOR<br>Easting: 525320<br>Northing: 316940 | Annual Volume ($m^3$): 10000<br>Max Daily Volume ($m^3$): 2000<br>Original Application No: -<br>Original Start Date: 01/06/1986<br>Expiry Date: -<br>Issue No: 101<br>Version Start Date: 23/02/2005<br>Version End Date: - |
| - | 1548m SW | Status: Active<br>Licence No: 5/31/14/*S/0185<br>Details: Spray Irrigation - Direct<br>Direct Source: SURFACE WATER SOURCE OF SUPPLY<br>Point: RIVER WELLAND AT COWBIT<br>Data Type: Line<br>Name: BOOR<br>Easting: 525305<br>Northing: 316934 | Annual Volume ($m^3$): 10,000<br>Max Daily Volume ($m^3$): 2,000<br>Original Application No: -<br>Original Start Date: 01/06/1986<br>Expiry Date: -<br>Issue No: 102<br>Version Start Date: 18/09/2013<br>Version End Date: - |

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 5.8 Potable abstractions

| Records within 2000m | 0 |
|---|---|

Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 5.9 Source Protection Zones

| Records within 500m | 0 |
|---|---|

Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

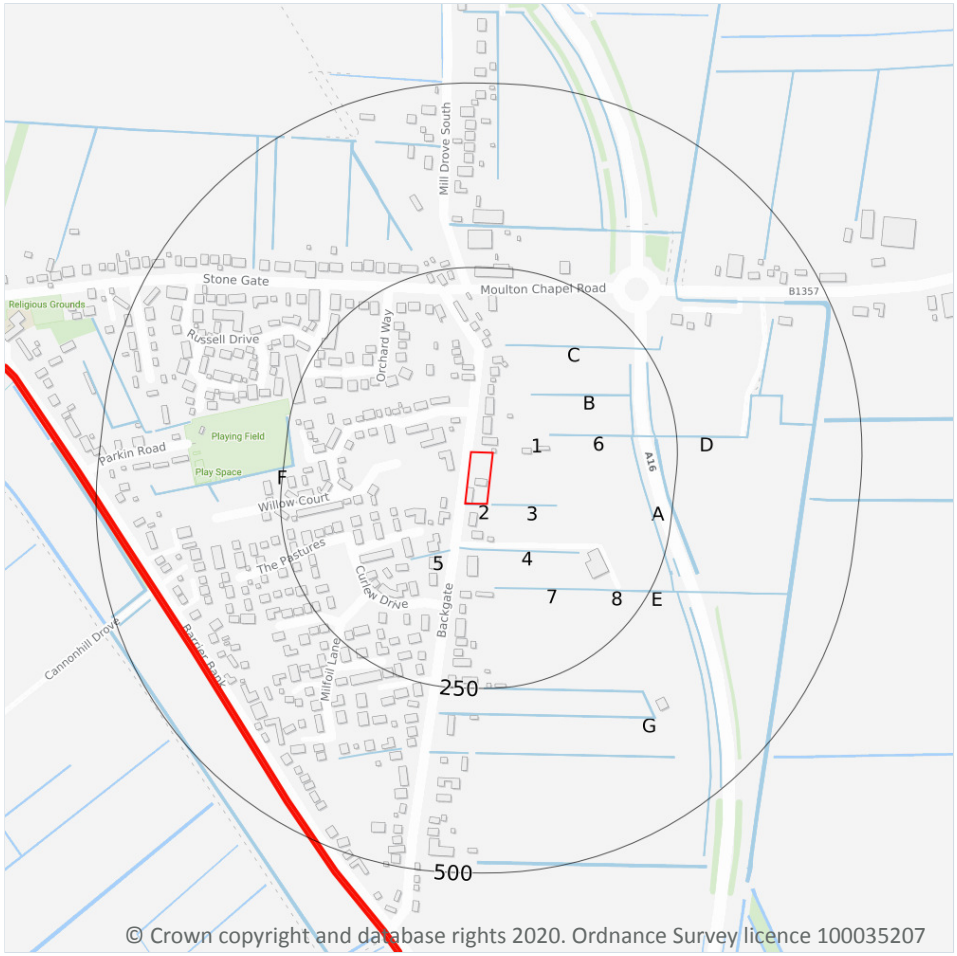
## 5.10 Source Protection Zones (confined aquifer)

| Records within 500m | 0 |
|---|---|

Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

# 6 Hydrology




Site Outline

Search buffers in metres (m)

Water Network (OS MasterMap)

Surface water features (wider than 5m)

Surface water features (narrower than 5m)

WFD River, canal and surface water transfer water bodies

WFD Lake water bodies

WFD Transitional and coastal water bodies

WFD Surface water body catchments boundaries

WFD Groundwater body boundaries

## 6.1 Water Network (OS MasterMap)

| **Records within 250m** | **24** |
|---|---|

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

Features are displayed on the Hydrology map on **page 43**

| ID | Location | Type of water feature | Ground level | Permanence | Name |
|---|---|---|---|---|---|
| 2 | 1m S | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |

| ID | Location | Type of water feature | Ground level | Permanence | Name |
|---|---|---|---|---|---|
| 3 | 5m E | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| 4 | 60m S | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| 5 | 66m S | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| 6 | 80m E | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| B | 94m NE | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| 7 | 114m S | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| C | 146m N | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| 8 | 185m SE | Inland river not influenced by normal tidal action. | Underground | Watercourse contains water year round (in normal circumstances) | - |
| A | 189m E | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| B | 190m E | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| B | 190m E | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| B | 195m E | Inland river not influenced by normal tidal action. | Underground | Watercourse contains water year round (in normal circumstances) | - |
| B | 202m NE | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |

| ID | Location | Type of water feature | Ground level | Permanence | Name |
|---|---|---|---|---|---|
| B | 217m E | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| B | 218m E | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| B | 219m E | Inland river not influenced by normal tidal action. | Underground | Watercourse contains water year round (in normal circumstances) | - |
| E | 220m SE | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| A | 220m E | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| B | 220m E | Inland river not influenced by normal tidal action. | Underground | Watercourse contains water year round (in normal circumstances) | - |
| D | 221m E | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| B | 228m NE | Inland river not influenced by normal tidal action. | Underground | Watercourse contains water year round (in normal circumstances) | - |
| F | 237m W | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |
| G | 249m S | Inland river not influenced by normal tidal action. | On ground surface | Watercourse contains water year round (in normal circumstances) | - |

*This data is sourced from the Ordnance Survey.*

## 6.2 Surface water features

| **Records within 250m** | **8** |
|---|---|

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

Features are displayed on the Hydrology map on **page 43**

*This data is sourced from the Ordnance Survey.*

## 6.3 WFD Surface water body catchments

| Records on site | 1 |
|---|---|

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.

Features are displayed on the Hydrology map on **page 43**

| ID | Location | Type | Water body catchment | Water body ID | Operational catchment | Management catchment |
|---|---|---|---|---|---|---|
| **1** | **On site** | **River WB catchment** | **South Holland Main Drain** | **GB205032050405** | **Lower Nene** | **Nene** |

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 6.4 WFD Surface water bodies

| Records identified | 1 |
|---|---|

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each water body listed.

Features are displayed on the Hydrology map on **page 43**

| ID | Location | Type | Name | Water body ID | Overall rating | Chemical rating | Ecological rating | Year |
|---|---|---|---|---|---|---|---|---|
| - | 1849m S | River | South Holland Main Drain | GB205032050405 | Moderate | Good | Moderate | 2016 |

*This data is sourced from the Environment Agency and Natural Resources Wales.*

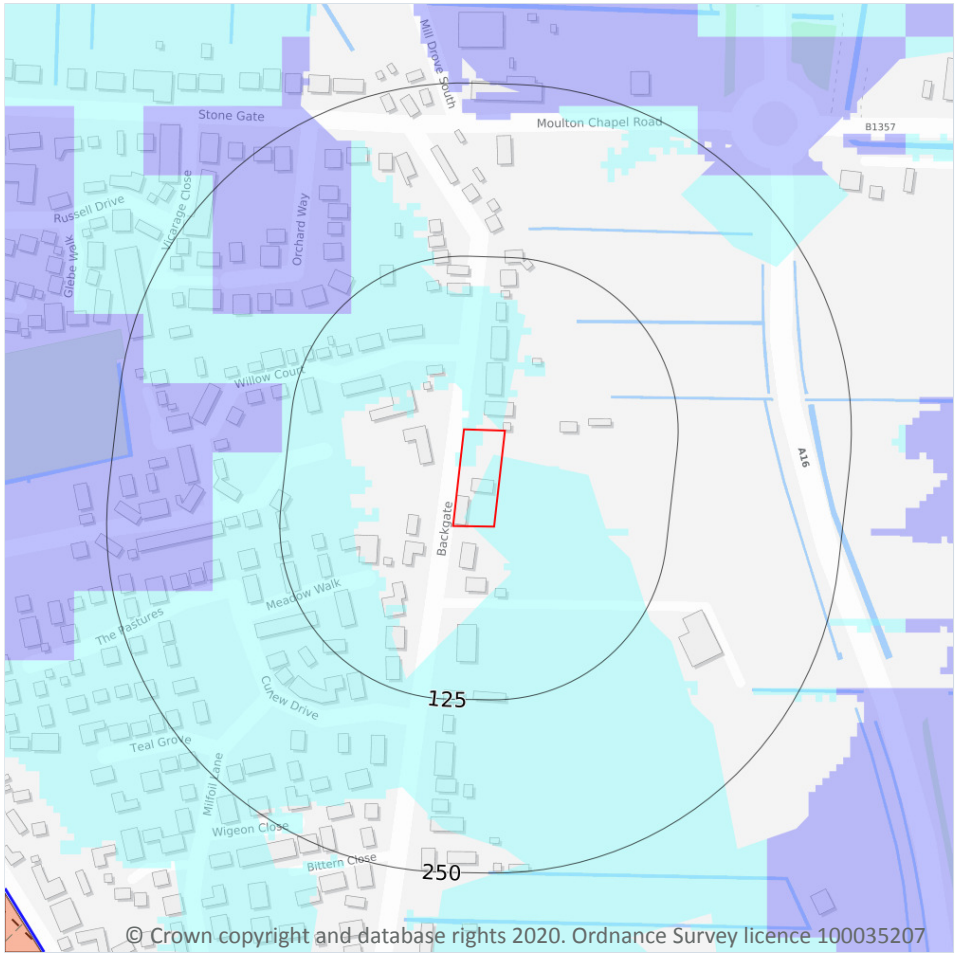
## 6.5 WFD Groundwater bodies

| Records on site | 0 |
|---|---|

Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

# 7 River and coastal flooding




Site Outline

Search buffers in metres (m)

Environment Agency river and coastal flooding:

- High
- Medium
- Low
- Very Low
- Historical Flood Events
- Areas Used for Flood Storage
- Areas Benefiting from Flood Defences
- Flood Defences

## 7.1 Risk of Flooding from Rivers and Sea (RoFRaS)

| Records within 50m | 1 |
|---|---|

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance).

Features are displayed on the River and coastal flooding map on **page 48**

| Distance | RoFRaS flood risk |
|---|---|
| **On site** | **Low** |
| 0 - 50m | Low |

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 7.2 Historical Flood Events

| Records within 250m | 0 |
|---|---|

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 7.3 Flood Defences

| Records within 250m | 0 |
|---|---|

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 7.4 Areas Benefiting from Flood Defences

| Records within 250m | 0 |
|---|---|

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

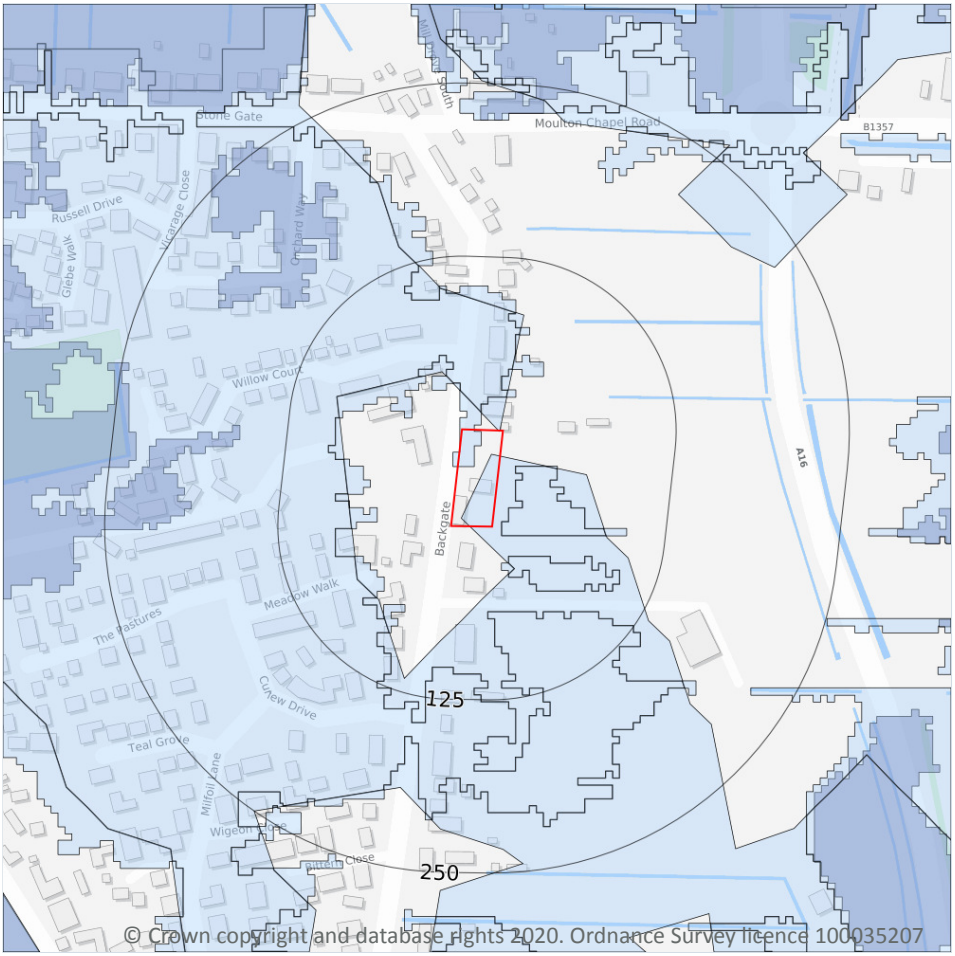
## 7.5 Flood Storage Areas

| Records within 250m | 0 |
|---|---|

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

# River and coastal flooding - Flood Zones




## 7.6 Flood Zone 2

| Records within 50m | 1 |
|---|---|

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

Features are displayed on the River and coastal flooding map on **page 48**

| Location | Type |
|---|---|
| **On site** | **Zone 2 - (Fluvial /Tidal Models)** |

*This data is sourced from the Environment Agency and Natural Resources Wales.*

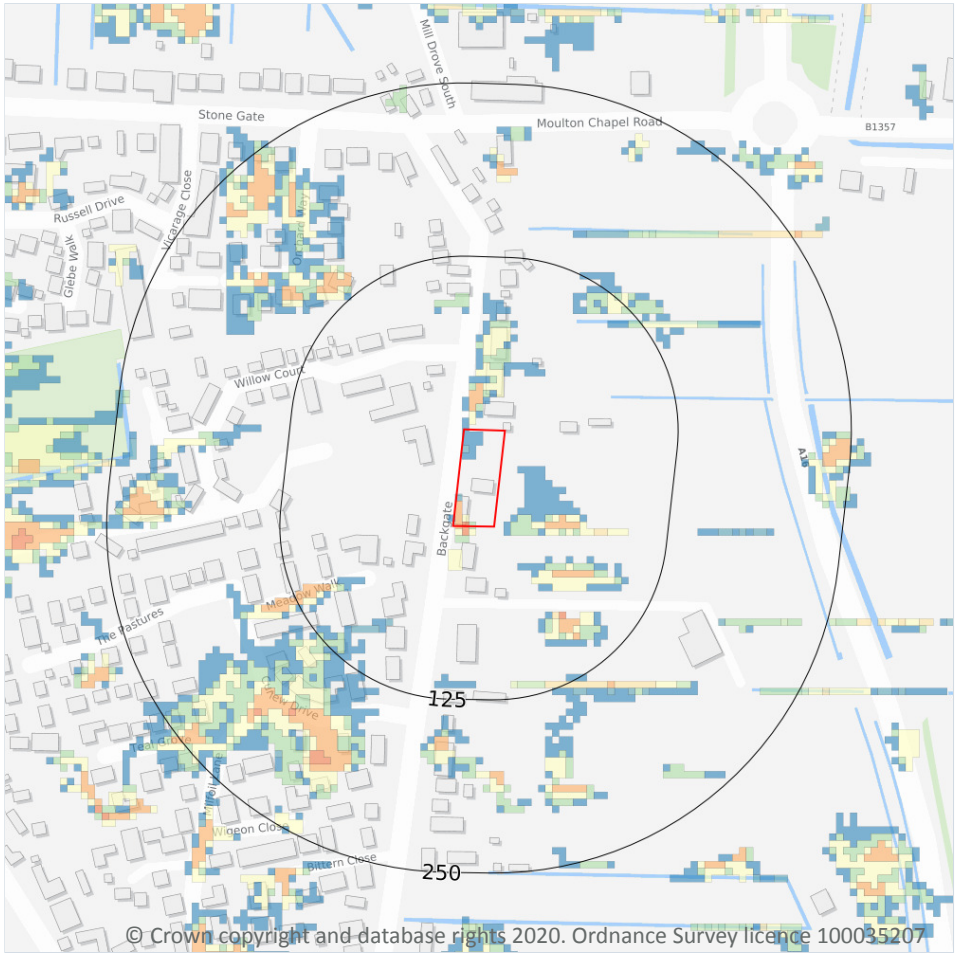
## 7.7 Flood Zone 3

| Records within 50m | 0 |
|---|---|

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

# 8 Surface water flooding




Site Outline

Search buffers in metres (m)

1 in 1000 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 250 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 100 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 30 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

## 8.1 Surface water flooding

| | |
|---|---|
| **Highest risk on site** | **1 in 30 year, 0.3m - 1.0m** |
| **Highest risk within 50m** | **1 in 30 year, 0.3m - 1.0m** |

Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Features are displayed on the Surface water flooding map on **page 52**

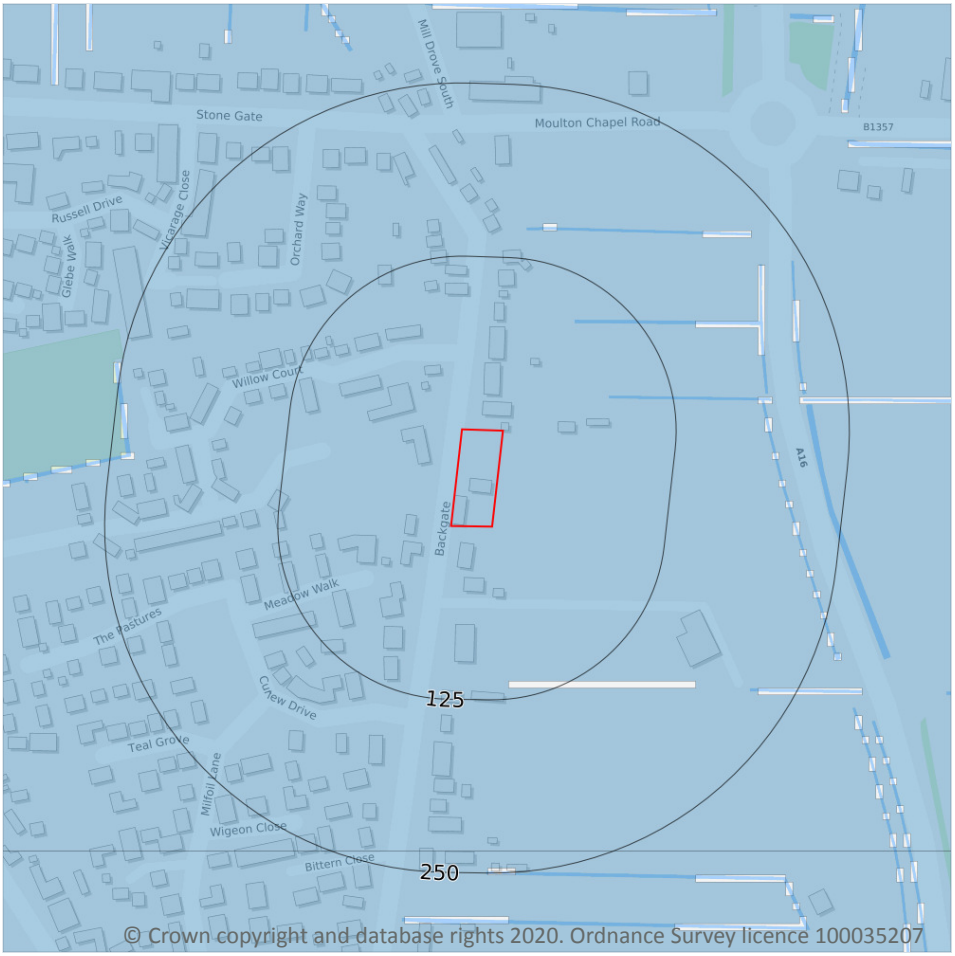
The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

The table below shows the maximum flood depths for a range of return periods for the site.

| Return period | Maximum modelled depth |
|---|---|
| 1 in 1000 year | Between 0.3m and 1.0m |
| 1 in 250 year | Between 0.3m and 1.0m |
| 1 in 100 year | Between 0.3m and 1.0m |
| 1 in 30 year | Between 0.3m and 1.0m |

*This data is sourced from Ambiental Risk Analytics.*

# 9 Groundwater flooding




Site Outline

Search buffers in metres (m)

High

Moderate - High

Moderate

Low

Negligible

## 9.1 Groundwater flooding

| | |
|---|---|
| **Highest risk on site** | **Negligible** |
| **Highest risk within 50m** | **Negligible** |

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on **page 54**

*This data is sourced from Ambiental Risk Analytics.*

# 10 Environmental designations

## 10.1 Sites of Special Scientific Interest (SSSI)

| Records within 2000m | 0 |
|---|---|

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.2 Conserved wetland sites (Ramsar sites)

| Records within 2000m | 0 |
|---|---|

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.3 Special Areas of Conservation (SAC)

| Records within 2000m | 0 |
|---|---|

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.4 Special Protection Areas (SPA)

| Records within 2000m | 0 |
|---|---|

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.5 National Nature Reserves (NNR)

| Records within 2000m | 0 |
|---|---|

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.6 Local Nature Reserves (LNR)

| Records within 2000m | 0 |
|---|---|

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.7 Designated Ancient Woodland

| Records within 2000m | 0 |
|---|---|

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.8 Biosphere Reserves

| Records within 2000m | 0 |
|---|---|

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.9 Forest Parks

| Records within 2000m | 0 |
|---|---|

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

*This data is sourced from the Forestry Commission.*

## 10.10 Marine Conservation Zones

| Records within 2000m | 0 |
|---|---|

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.11 Green Belt

| Records within 2000m | 0 |
|---|---|

Areas designated to prevent urban sprawl by keeping land permanently open.

*This data is sourced from the Ministry of Housing, Communities and Local Government.*

## 10.12 Proposed Ramsar sites

| Records within 2000m | 0 |
|---|---|

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

*This data is sourced from Natural England.*

## 10.13 Possible Special Areas of Conservation (pSAC)

| Records within 2000m | 0 |
|---|---|

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

*This data is sourced from Natural England and Natural Resources Wales.*

## 10.14 Potential Special Protection Areas (pSPA)

| Records within 2000m | 0 |
|---|---|

Special Protection Areas (SPAs) are areas designated (or 'classified') under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

*This data is sourced from Natural England.*

## 10.15 Nitrate Sensitive Areas

| Records within 2000m | 0 |
|---|---|

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

*This data is sourced from Natural England.*

## 10.16 Nitrate Vulnerable Zones

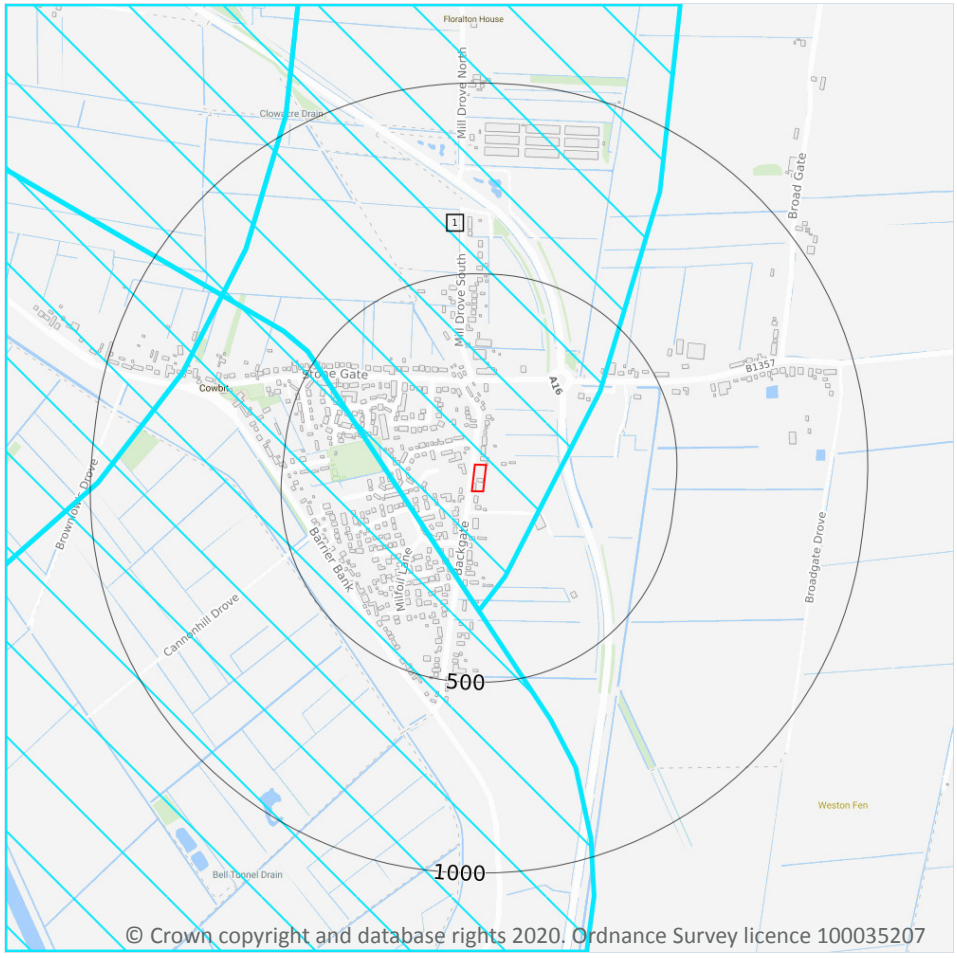
| Records within 2000m | 4 |
|---|---|

Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

| Location | Name | Type | NVZ ID | Status |
|---|---|---|---|---|
| 413m NW | River Welland NVZ | Surface Water | S832 | Existing |
| 1554m NW | Vernatt's Drain NVZ | Surface Water | S379 | Existing |
| 1776m S | River Welland NVZ | Surface Water | S832 | Existing |
| 1982m SW | Vernatt's Drain NVZ | Surface Water | S379 | Existing |

*This data is sourced from Natural England and Natural Resources Wales.*

# SSSI Impact Zones and Units




Site Outline

Search buffers in metres (m)

SSSI Impact Risk Zones

SSSI Units

- Not recorded
- Favourable
- Unfavourable - Recovering
- Unfavourable - No change
- Unfavourable - Declining
- Partially destroyed
- Destroyed

## 10.17 SSSI Impact Risk Zones

| Records on site | 1 |
|---|---|

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Features are displayed on the SSSI Impact Zones and Units map on **page 59**

| ID | Location | Type of developments requiring consultation |
|---|---|---|
| 1 | **On site** | **Minerals, Oil and Gas - Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc. Oil & gas exploration/extraction.** |

*This data is sourced from Natural England.*

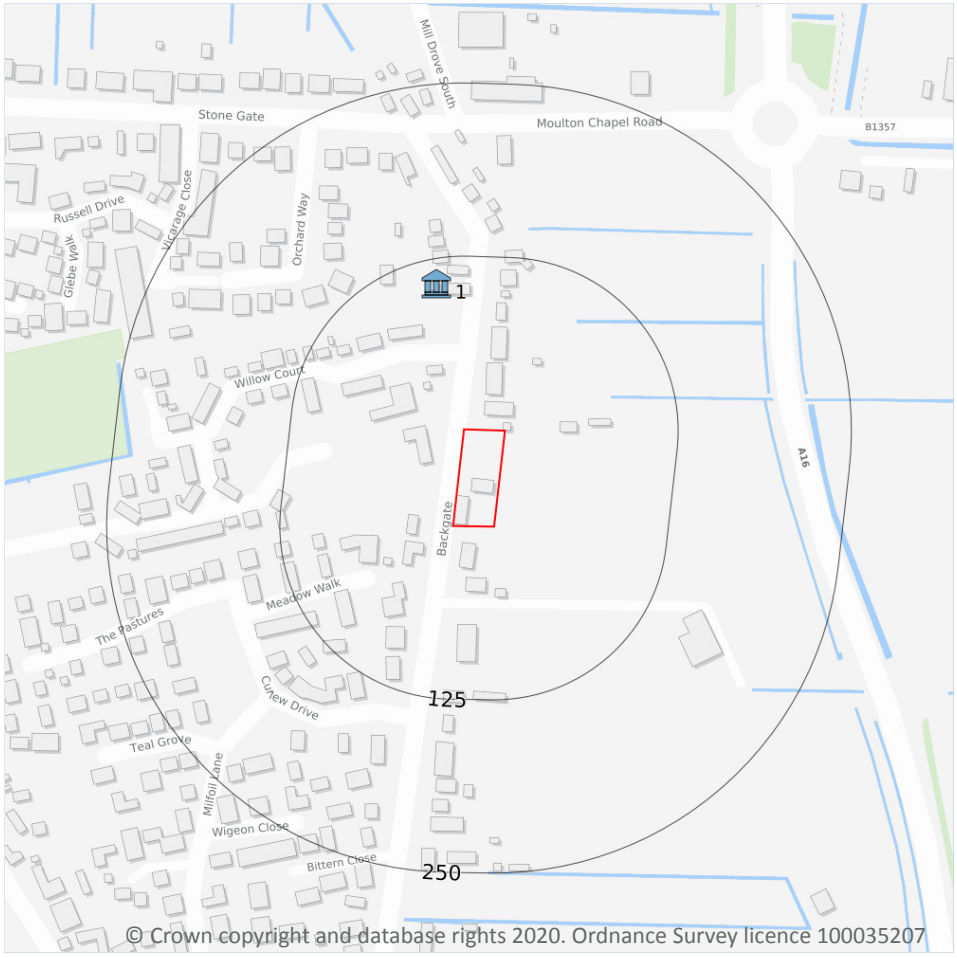
## 10.18 SSSI Units

| Records within 2000m | 0 |
|---|---|

Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

*This data is sourced from Natural England and Natural Resources Wales.*

# 11 Visual and cultural designations




Site Outline

Search buffers in metres (m)

Listed buildings

Conservation areas

Conservation areas - no data

National Parks

Areas of Outstanding Natural Beauty

Registered parks and gardens

Scheduled Monuments

World Heritage Sites

## 11.1 World Heritage Sites

| Records within 250m | 0 |
|---|---|

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

*This data is sourced from Historic England, Cadw and Historic Environment Scotland.*

## 11.2 Area of Outstanding Natural Beauty

| Records within 250m | 0 |
|---|---|

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 11.3 National Parks

| Records within 250m | 0 |
|---|---|

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

*This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.*

## 11.4 Listed Buildings

| Records within 250m | 1 |
|---|---|

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.

Features are displayed on the Visual and cultural designations map on **page 61**

| ID | Location | Name | Grade | Reference Number | Listed date |
|---|---|---|---|---|---|
| 1 | 107m N | Mill, Cowbit, South Holland, Lincolnshire, PE12 | II | 1359258 | 13/01/1988 |

*This data is sourced from English Heritage, Cadw and Historic Environment Scotland.*

## 11.5 Conservation Areas

| Records within 250m | 0 |
|---|---|

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

*This data is sourced from English Heritage, Cadw and Historic Environment Scotland.*

## 11.6 Scheduled Ancient Monuments

| Records within 250m | 0 |
|---|---|

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

*This data is sourced from English Heritage, Cadw and Historic Environment Scotland.*

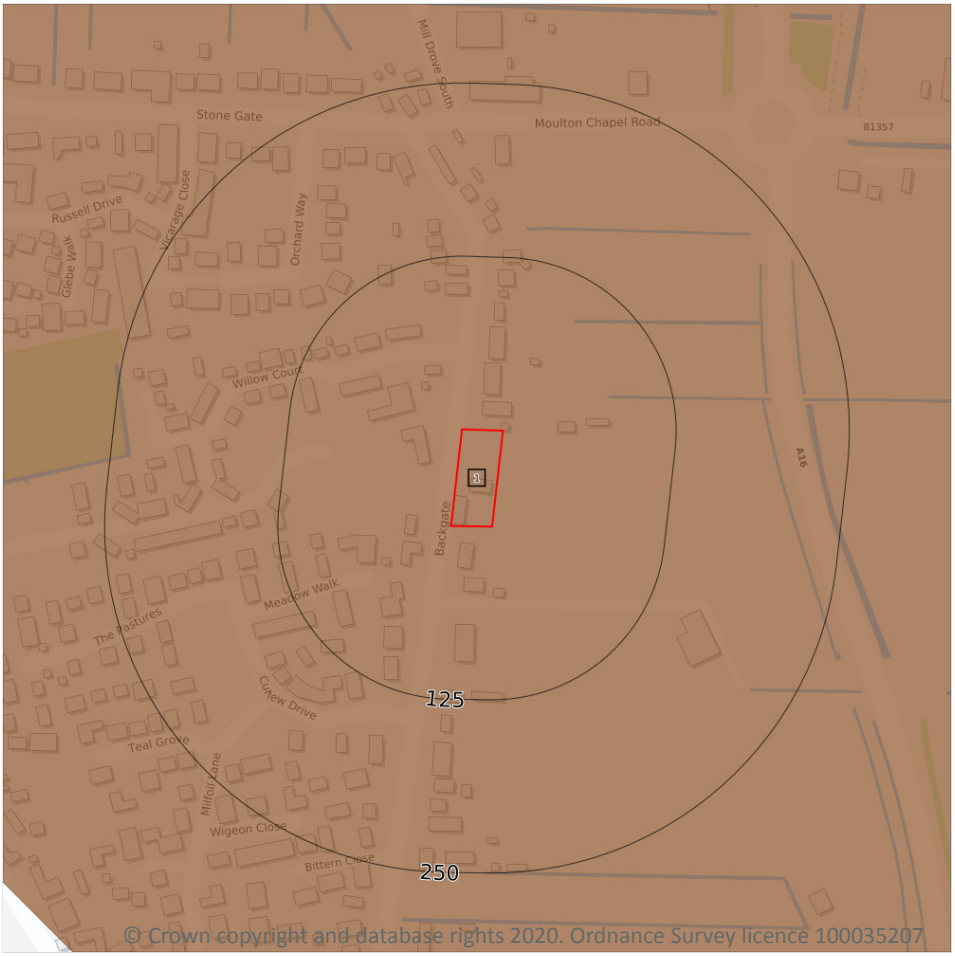
## 11.7 Registered Parks and Gardens

| Records within 250m | 0 |
|---|---|

Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

*This data is sourced from English Heritage, Cadw and Historic Environment Scotland.*

# 12 Agricultural designations




Site Outline

Search buffers in metres (m)

- Grade 1 - excellent quality
- Grade 2 - very good quality
- Grade 3 - good to moderate quality
- Grade 3a - good quality
- Grade 3b - moderate quality
- Grade 4 - poor quality
- Grade 5 - very poor quality
- Non-agricultural land
- Urban land
- Exclusion land
- Tree felling licences
- Open Access land

## 12.1 Agricultural Land Classification

| Records within 250m | 1 |
|---|---|

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on **page 64**

| ID | Location | Classification | Description |
|---|---|---|---|
| 1 | On site | Grade 1 | **Excellent quality agricultural land. Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly includes top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.** |

*This data is sourced from Natural England.*

## 12.2 Open Access Land

| Records within 250m | 0 |
|---|---|

The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

*This data is sourced from Natural England and Natural Resources Wales.*

## 12.3 Tree Felling Licences

| Records within 250m | 0 |
|---|---|

Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

*This data is sourced from the Forestry Commission.*

## 12.4 Environmental Stewardship Schemes

| Records within 250m | 0 |
|---|---|

Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment.

*This data is sourced from Natural England.*

## 12.5 Countryside Stewardship Schemes

| Records within 250m | 0 |
|---|---|

Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

*This data is sourced from Natural England.*

# 13 Habitat designations

## 13.1 Priority Habitat Inventory

| Records within 250m | 0 |
|---|---|

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

*This data is sourced from Natural England.*

## 13.2 Habitat Networks

| Records within 250m | 0 |
|---|---|

Habitat networks for 18 priority habitat networks (based primarily, but not exclusively, on the priority habitat inventory) and areas suitable for the expansion of networks through restoration and habitat creation.

*This data is sourced from Natural England.*

## 13.3 Open Mosaic Habitat

| Records within 250m | 0 |
|---|---|

Sites verified as Open Mosaic Habitat. Mosaic habitats are brownfield sites that are identified under the UK Biodiversity Action Plan as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates.

*This data is sourced from Natural England.*

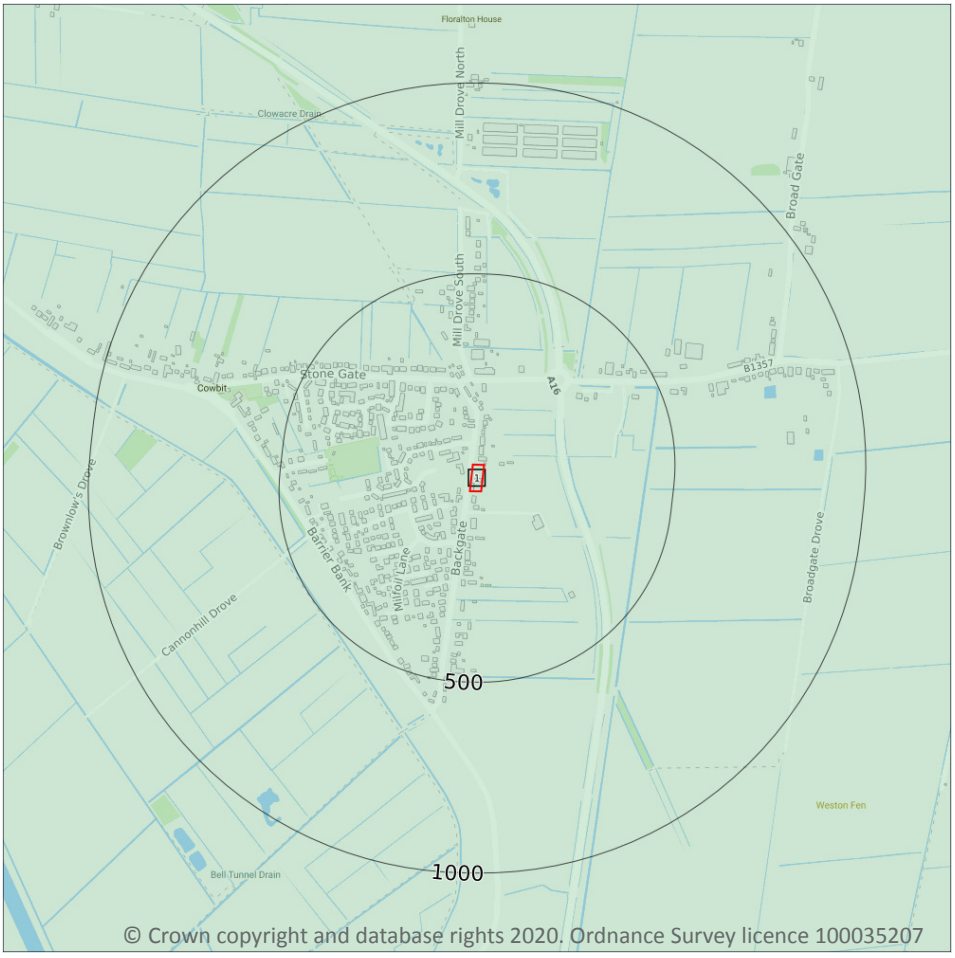
## 13.4 Limestone Pavement Orders

| Records within 250m | 0 |
|---|---|

Limestone pavements are outcrops of limestone where the surface has been worn away by natural means over millennia. These rocks have the appearance of paving blocks, hence their name. Not only do they have geological interest, they also provide valuable habitats for wildlife. These habitats are threatened due to their removal for use in gardens and water features. Many limestone pavements have been designated as SSSIs which affords them some protection. In addition, Section 34 of the Wildlife and Countryside Act 1981 gave them additional protection via the creation of Limestone Pavement Orders, which made it a criminal offence to remove any part of the outcrop. The associated Limestone Pavement Priority Habitat is part of the UK Biodiversity Action Plan priority habitat in England.

*This data is sourced from Natural England.*

# 14 Geology 1:10,000 scale - Availability




Site Outline

Search buffers in metres (m)

Full coverage

Partial coverage

No coverage

## 14.1 10k Availability

| Records within 500m | 1 |
|---|---|

An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 67**

| ID | Location | Artificial | Superficial | Bedrock | Mass movement | Sheet No. |
|---|---|---|---|---|---|---|
| **1** | **On site** | **No coverage** | **Full** | **Full** | **No coverage** | **TF21NE** |

*This data is sourced from the British Geological Survey.*

# Geology 1:10,000 scale - Artificial and made ground

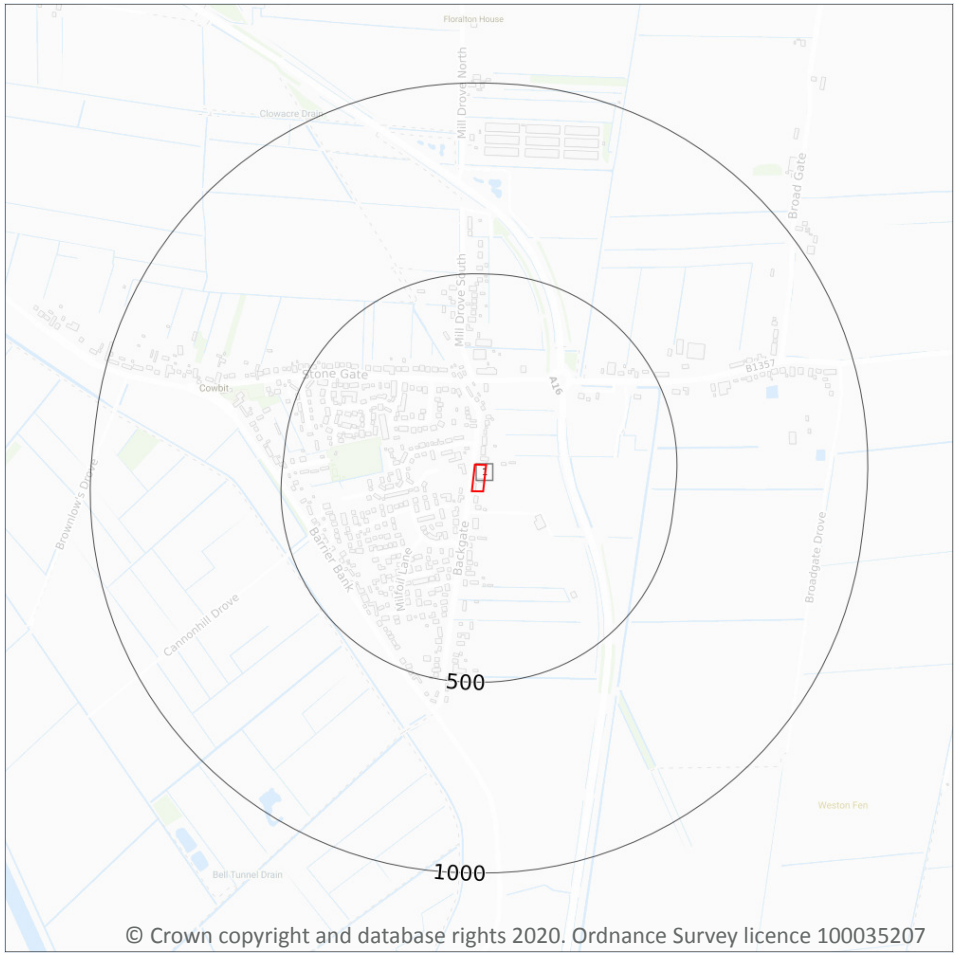
## 14.2 Artificial and made ground (10k)

| Records within 500m | 0 |
|---|---|

Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

*This data is sourced from the British Geological Survey.*

# Geology 1:10,000 scale - Superficial




Site Outline

Search buffers in metres (m)

Landslip (10k)

Superficial geology (10k)
Please see table for more details.

## 14.3 Superficial geology (10k)

**Records within 500m** **1**

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:10,000 scale - Superficial map on **page 69**

| ID | Location | LEX Code | Description | Rock description |
|---|---|---|---|---|
| **1** | **On site** | **SUPNM-UKNOWN** | **Superficial Theme Not Mapped [for Digital Map Use Only] - Unknown/unclassified Entry** | **Unknown/unclassified Entry** |

*This data is sourced from the British Geological Survey.*

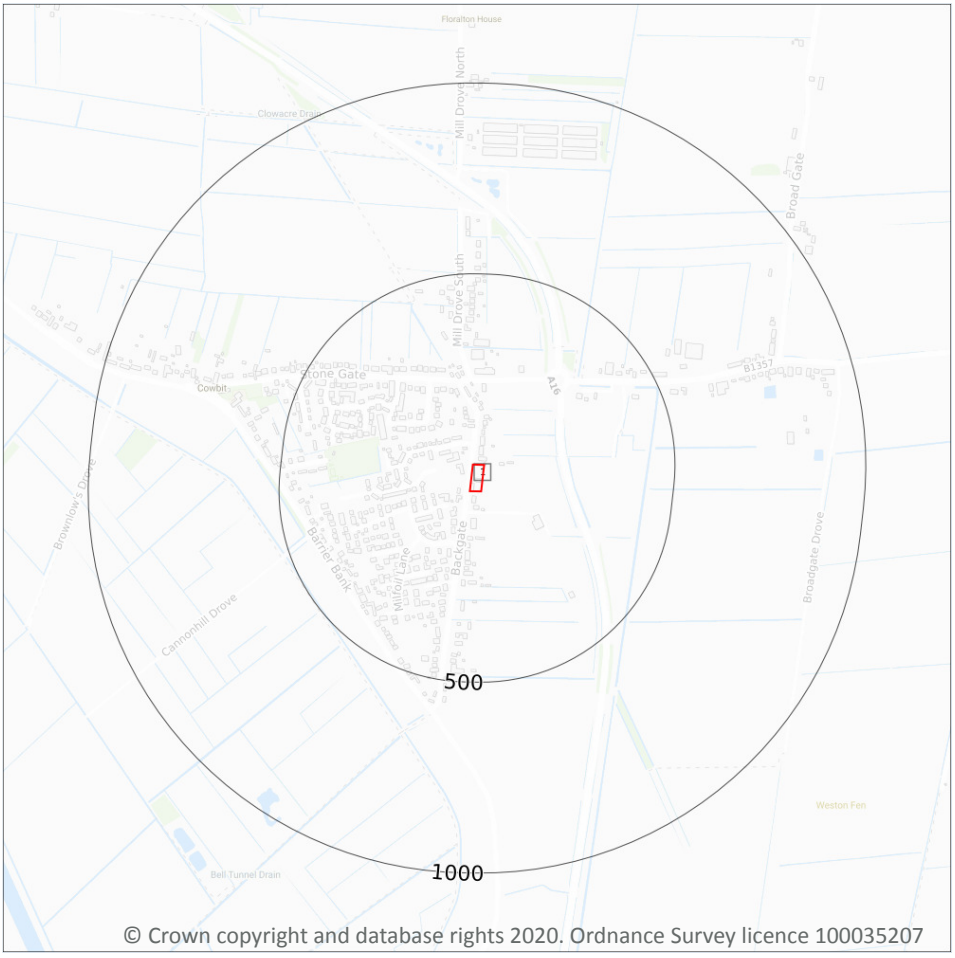
## 14.4 Landslip (10k)

| Records within 500m | 0 |
|---|---|

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

*This data is sourced from the British Geological Survey.*

# Geology 1:10,000 scale - Bedrock




Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (10k)

Bedrock geology (10k)
Please see table for more details.

## 14.5 Bedrock geology (10k)

| Records within 500m | 1 |
|---|---|

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 71**

| ID | Location | LEX Code | Description | Rock age |
|---|---|---|---|---|
| **1** | **On site** | **BEDNM-UKNOWN** | **Bedrock Theme Not Mapped [for Digital Map Use Only] - Unknown/unclassified Entry** | **No Details** |

*This data is sourced from the British Geological Survey.*

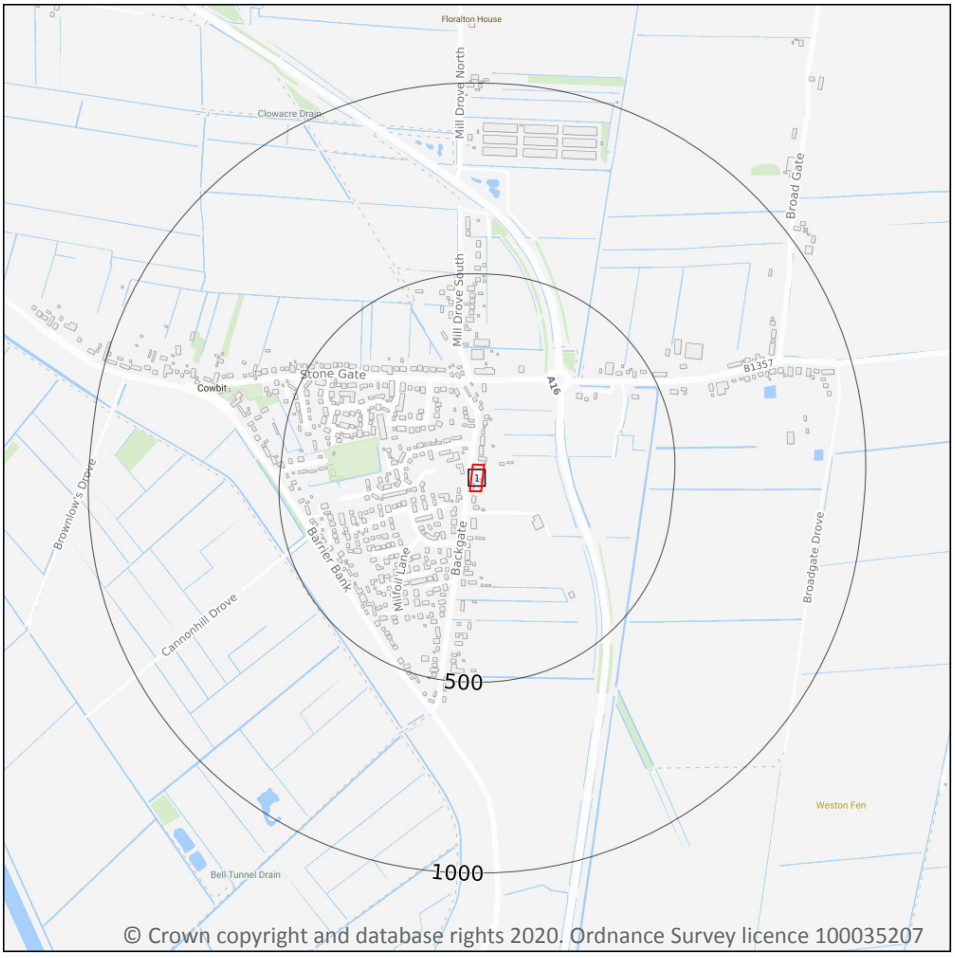
## 14.6 Bedrock faults and other linear features (10k)

| Records within 500m | 0 |
|---|---|

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

*This data is sourced from the British Geological Survey.*

# 15 Geology 1:50,000 scale - Availability




Site Outline

Search buffers in metres (m)

Geological map tile

## 15.1 50k Availability

| Records within 500m | 1 |
|---|---|

An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 73**

| ID | Location | Artificial | Superficial | Bedrock | Mass movement | Sheet No. |
|---|---|---|---|---|---|---|
| **1** | **On site** | **Full** | **Full** | **Full** | **No coverage** | **EW144_spalding_v4** |

*This data is sourced from the British Geological Survey.*

# Geology 1:50,000 scale - Artificial and made ground

## 15.2 Artificial and made ground (50k)

| Records within 500m | 0 |
|---|---|

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

*This data is sourced from the British Geological Survey.*

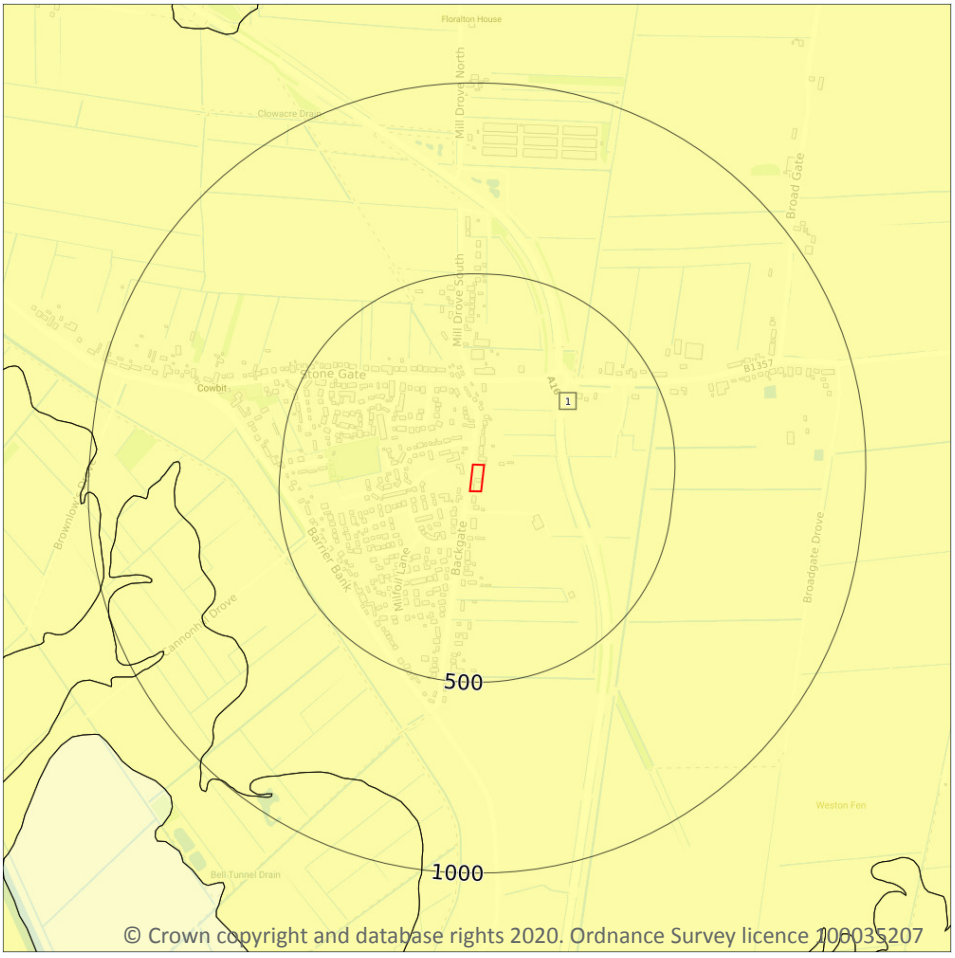
## 15.3 Artificial ground permeability (50k)

| Records within 50m | 0 |
|---|---|

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

*This data is sourced from the British Geological Survey.*

# Geology 1:50,000 scale - Superficial




Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

## 15.4 Superficial geology (50k)

| Records within 500m | 1 |
|---|---|

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 75**

| ID | Location | LEX Code | Description | Rock description |
|---|---|---|---|---|
| **1** | **On site** | **TFD-XCZ** | **TIDAL FLAT DEPOSITS** | **CLAY AND SILT** |

*This data is sourced from the British Geological Survey.*

## 15.5 Superficial permeability (50k)

| Records within 50m | 1 |
|---|---|

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

| Location | Flow type | Maximum permeability | Minimum permeability |
|---|---|---|---|
| **On site** | **Intergranular** | **Low** | **Very Low** |

*This data is sourced from the British Geological Survey.*

## 15.6 Landslip (50k)

| Records within 500m | 0 |
|---|---|

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

*This data is sourced from the British Geological Survey.*

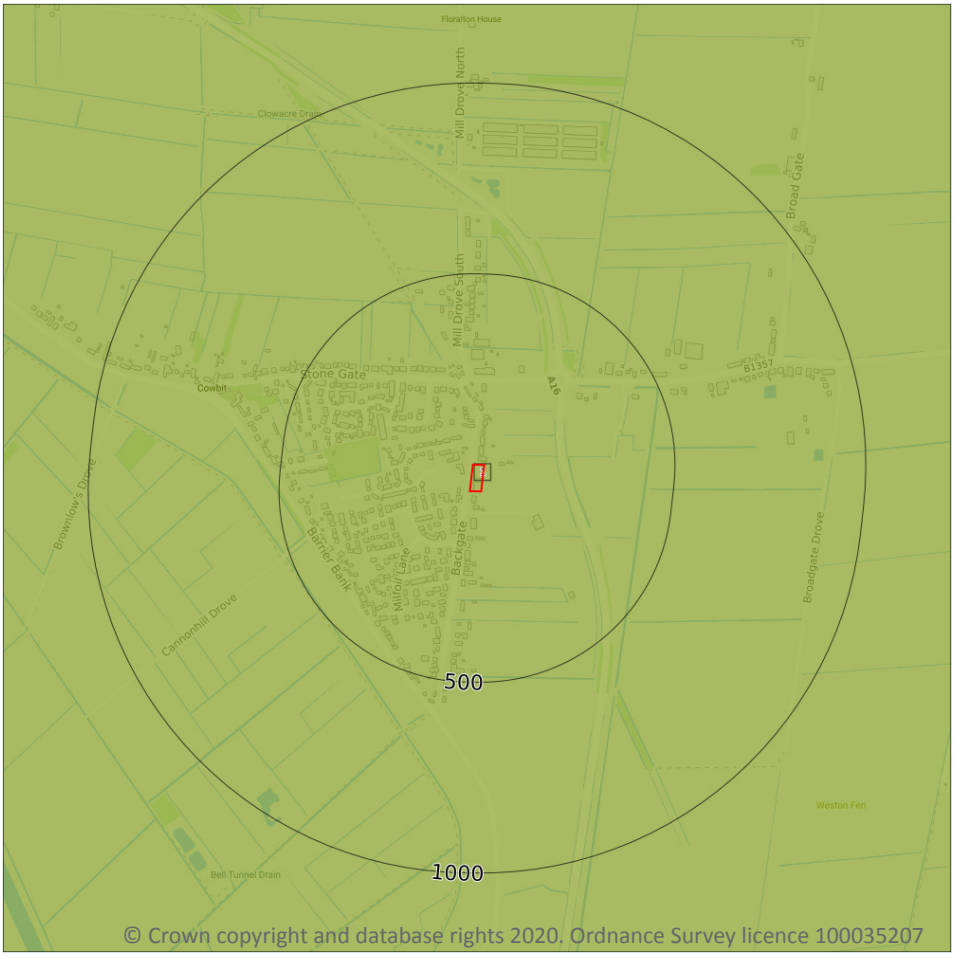
## 15.7 Landslip permeability (50k)

| Records within 50m | 0 |
|---|---|

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

*This data is sourced from the British Geological Survey.*

# Geology 1:50,000 scale - Bedrock




Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (50k)

Bedrock geology (50k)
Please see table for more details.

## 15.8 Bedrock geology (50k)

| Records within 500m | 1 |
|---|---|

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 77**

| ID | Location | LEX Code | Description | Rock age |
|---|---|---|---|---|
| **1** | **On site** | **OXC-MDST** | **OXFORD CLAY FORMATION - MUDSTONE** | **CALLOVIAN** |

*This data is sourced from the British Geological Survey.*

## 15.9 Bedrock permeability (50k)

| Records within 50m | 1 |
|---|---|

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

| Location | Flow type | Maximum permeability | Minimum permeability |
|---|---|---|---|
| **On site** | **Fracture** | **Low** | **Very Low** |

*This data is sourced from the British Geological Survey.*

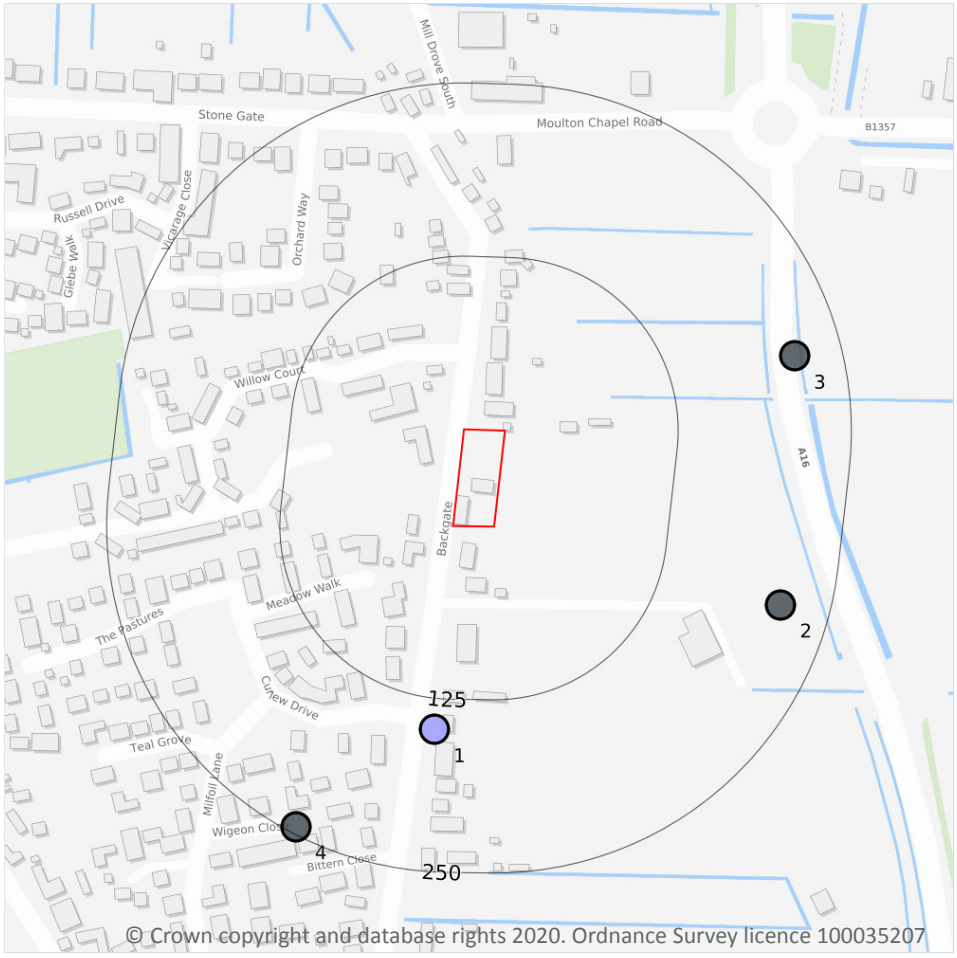
## 15.10 Bedrock faults and other linear features (50k)

| Records within 500m | 0 |
|---|---|

Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

*This data is sourced from the British Geological Survey.*

# 16 Boreholes




Site Outline

Search buffers in metres (m)

Confidential

0 - 10m

10 - 30m

30m+

Unknown

## 16.1 BGS Boreholes

| Records within 250m | 4 |
|---|---|

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

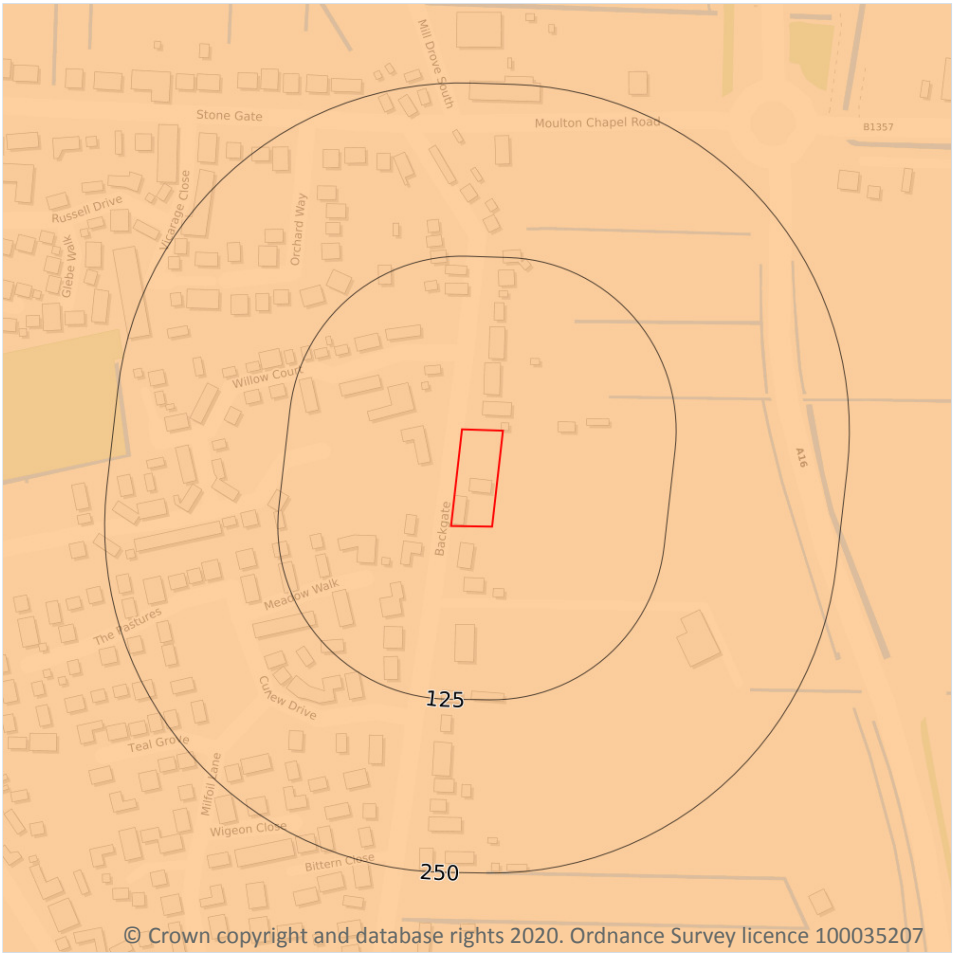
Features are displayed on the Boreholes map on **page 79**

| ID | Location | Grid reference | Name | Length | Confidential | Web link |
|---|---|---|---|---|---|---|
| 1 | 148m S | 526610 317600 | C4 COWBIT | 7.0 | N | 473365 |
| 2 | 215m E | 526860 317690 | A1073 LINE 5 RE-ALIGNMENT 52 | - | Y | N/A |
| 3 | 216m E | 526870 317870 | A1073 LINE 5 RE-ALIGNMENT 49 | - | Y | N/A |

| ID | Location | Grid reference | Name | Length | Confidential | Web link |
|---|---|---|---|---|---|---|
| 4 | 245m SW | 526510 317530 | BACKGATE COWBIT TP 2 | - | Y | N/A |

*This data is sourced from the British Geological Survey.*

# 17 Natural ground subsidence - Shrink swell clays




Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

## 17.1 Shrink swell clays

| Records within 50m | 1 |
|---|---|

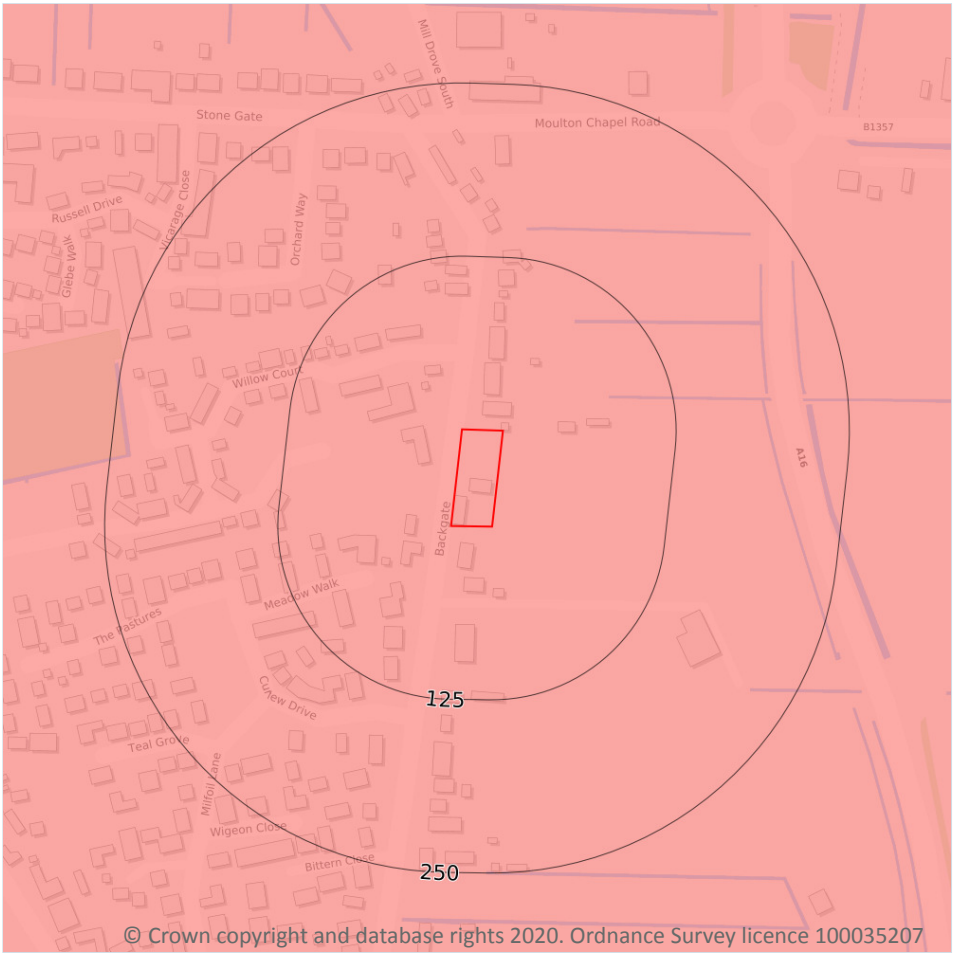
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 81**

| Location | Hazard rating | Details |
|---|---|---|
| **On site** | **Low** | **Ground conditions predominantly medium plasticity.** |

*This data is sourced from the British Geological Survey.*

# Natural ground subsidence - Running sands




Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

## 17.2 Running sands

| Records within 50m | 1 |
|---|---|

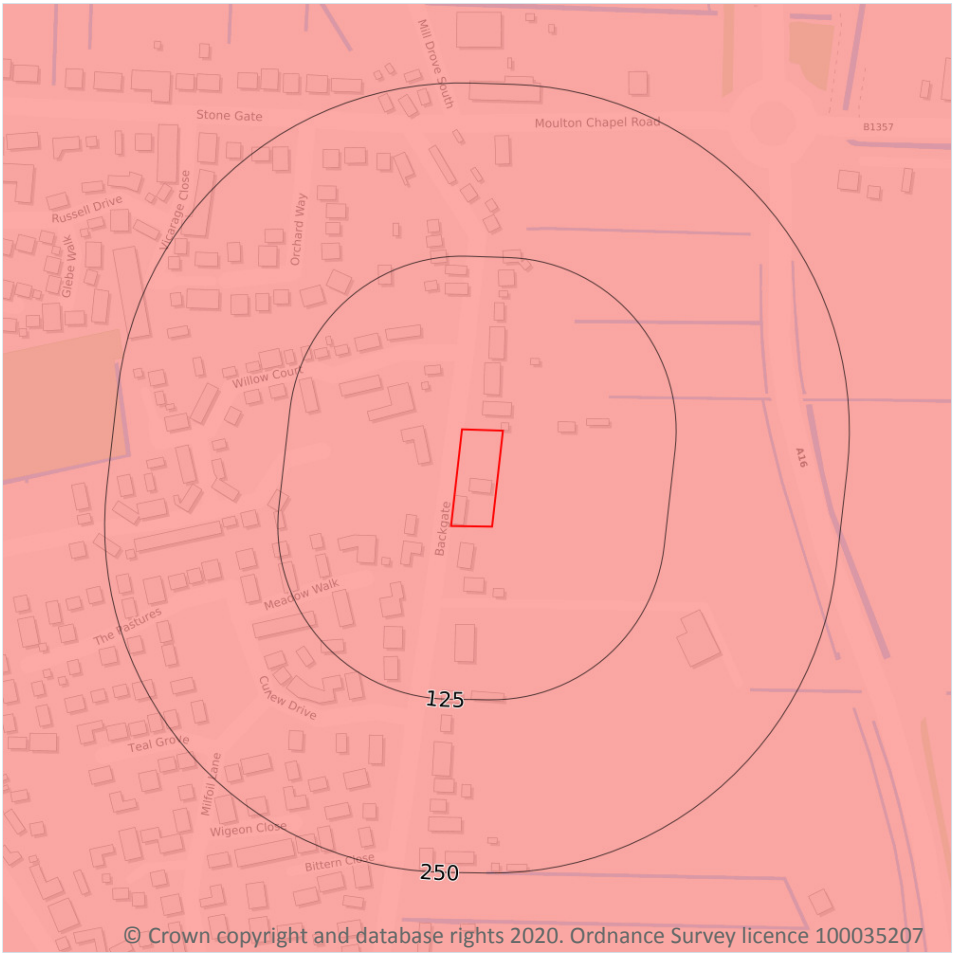
The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on **page 82**

| Location | Hazard rating | Details |
|---|---|---|
| **On site** | **Moderate** | **Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.** |

*This data is sourced from the British Geological Survey.*

# Natural ground subsidence - Compressible deposits




Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

## 17.3 Compressible deposits

| Records within 50m | 1 |
|---|---|

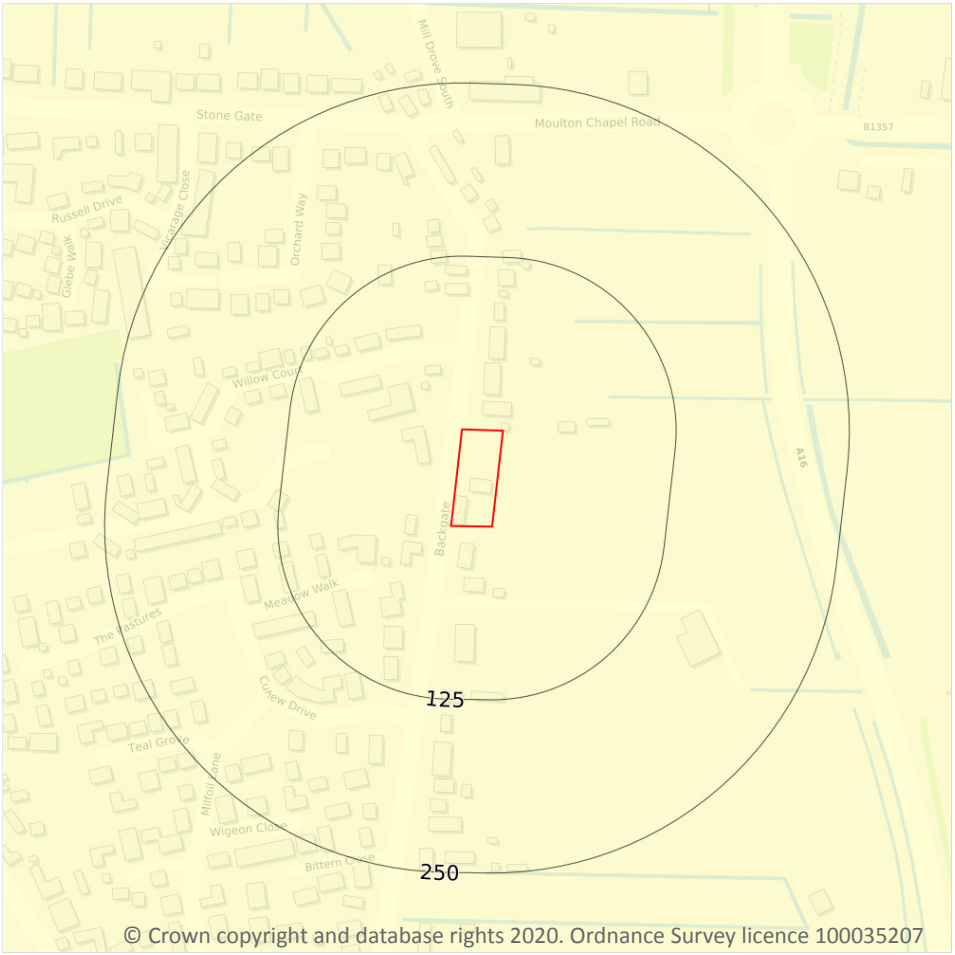
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 83**

| Location | Hazard rating | Details |
|---|---|---|
| **On site** | **Moderate** | **Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.** |

*This data is sourced from the British Geological Survey.*

# Natural ground subsidence - Collapsible deposits




Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

## 17.4 Collapsible deposits

| Records within 50m | 1 |
|---|---|

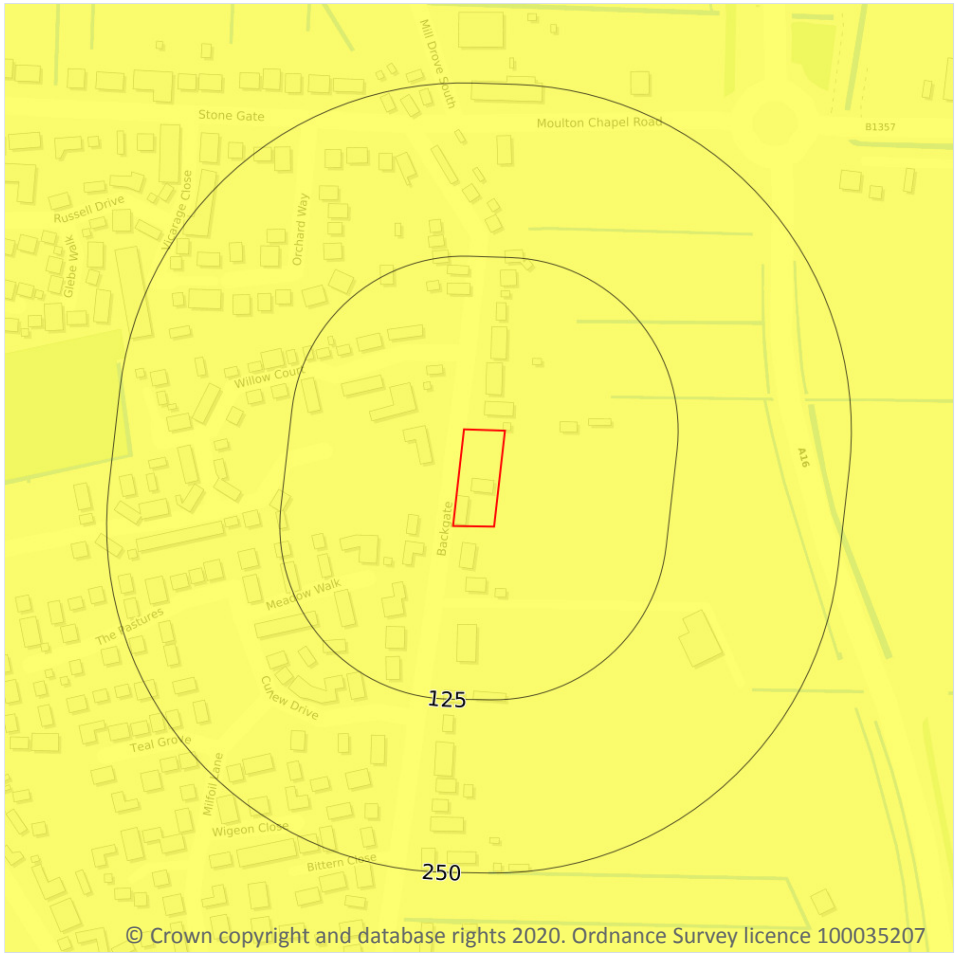
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 84**

| Location | Hazard rating | Details |
|---|---|---|
| **On site** | **Negligible** | **Deposits with potential to collapse when loaded and saturated are believed not to be present.** |

*This data is sourced from the British Geological Survey.*

# Natural ground subsidence - Landslides




Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

## 17.5 Landslides

| Records within 50m | 1 |
|---|---|

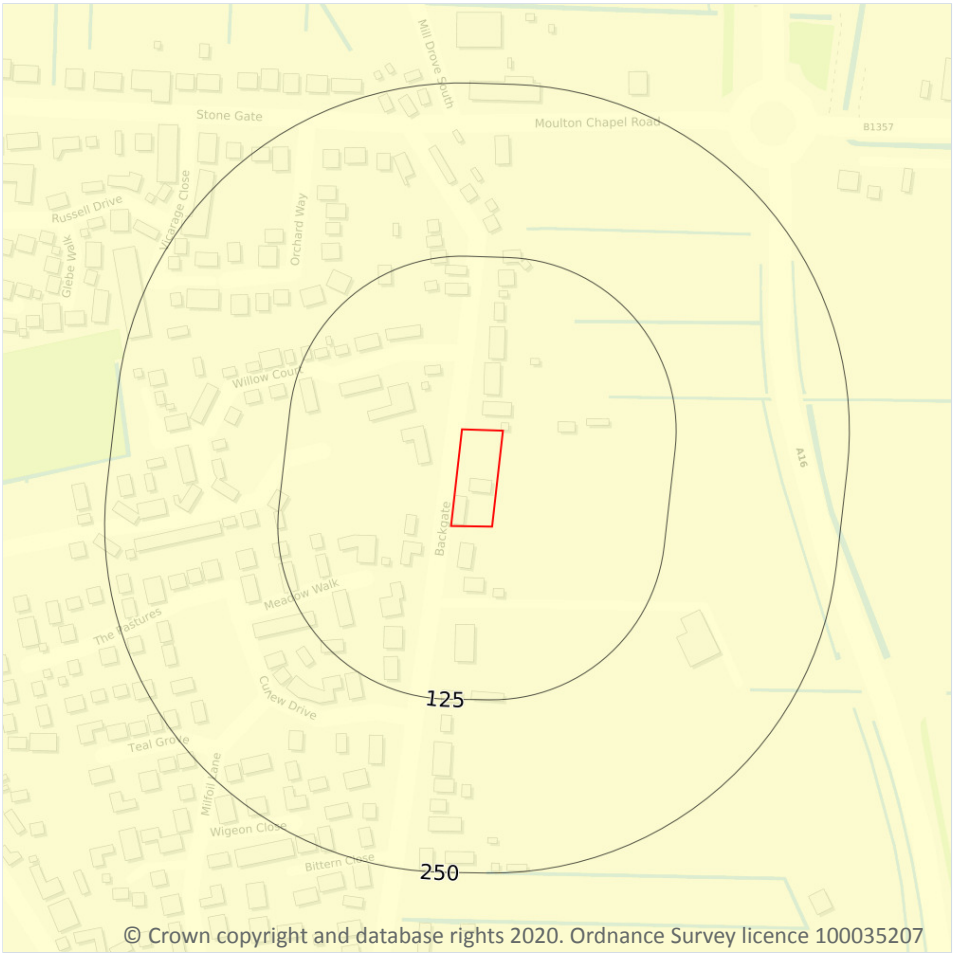
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 85**

| Location | Hazard rating | Details |
|---|---|---|
| **On site** | **Very low** | **Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.** |

*This data is sourced from the British Geological Survey.*

# Natural ground subsidence - Ground dissolution of soluble rocks




Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

## 17.6 Ground dissolution of soluble rocks

| Records within 50m | 1 |
|---|---|

The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 86**

| Location | Hazard rating | Details |
|---|---|---|
| **On site** | **Negligible** | **Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.** |

*This data is sourced from the British Geological Survey.*

# 18 Mining, ground workings and natural cavities




Site Outline

Search buffers in metres (m)

- Natural cavities (Area)
- Natural cavities (Point)
- BritPits
- Surface ground workings
- Underground workings
- Historical Mineral Planning Areas
- Mining Cavities

Non Coal Mining

- Sporadic underground mining of restricted extent possible
- Localised small scale underground mining possible
- Small scale mining possible
- Underground mining known or likely within or in close proximity
- Underground mining known within or in very close proximity

## 18.1 Natural cavities

| Records within 500m | 0 |
|---|---|

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

*This data is sourced from Peter Brett Associates (PBA).*

## 18.2 BritPits

| Records within 500m | 0 |
|---|---|

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

*This data is sourced from the British Geological Survey.*

## 18.3 Surface ground workings

| Records within 250m | 2 |
|---|---|

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining, ground workings and natural cavities map on **page 87**

| ID | Location | Land Use | Year of mapping | Mapping scale |
|---|---|---|---|---|
| 1 | 149m N | Pond | 1887 | 1:10560 |
| 2 | 226m N | Pond | 1887 | 1:10560 |

*This is data is sourced from Ordnance Survey/Groundsure.*

## 18.4 Underground workings

| Records within 1000m | 4 |
|---|---|

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

Features are displayed on the Mining, ground workings and natural cavities map on **page 87**

| ID | Location | Land Use | Year of mapping | Mapping scale |
|---|---|---|---|---|
| A | 563m S | Tunnel | 1989 | 1:10000 |
| A | 563m S | Tunnel | 1977 | 1:10000 |
| A | 581m S | Tunnel | 1951 | 1:10560 |
| A | 583m S | Tunnel | 1951 | 1:10560 |

*This is data is sourced from Ordnance Survey/Groundsure.*

## 18.5 Historical Mineral Planning Areas

| Records within 500m | 0 |
|---|---|

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

*This data is sourced from the British Geological Survey.*

## 18.6 Non-coal mining

| Records within 1000m | 0 |
|---|---|

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

*This data is sourced from the British Geological Survey.*

## 18.7 Mining cavities

| Records within 1000m | 0 |
|---|---|

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

*This data is sourced from Peter Brett Associates (PBA).*

## 18.8 JPB mining areas

| Records on site | 0 |
|---|---|

Areas which could be affected by former coal mining. This data includes some mine plans unavailable to the Coal Authority.

*This data is sourced from Johnson Poole and Bloomer.*

## 18.9 Coal mining

| Records on site | 0 |
|---|---|

Areas which could be affected by past, current or future coal mining.

*This data is sourced from the Coal Authority.*

## 18.10 Brine areas

| Records on site | 0 |
|---|---|

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

*This data is sourced from the Cheshire Brine Subsidence Compensation Board.*

## 18.11 Gypsum areas

| Records on site | 0 |
|---|---|

Generalised areas that may be affected by gypsum extraction.

*This data is sourced from British Gypsum.*

## 18.12 Tin mining

| Records on site | 0 |
|---|---|

Generalised areas that may be affected by historical tin mining.

*This data is sourced from Mining Searches UK.*

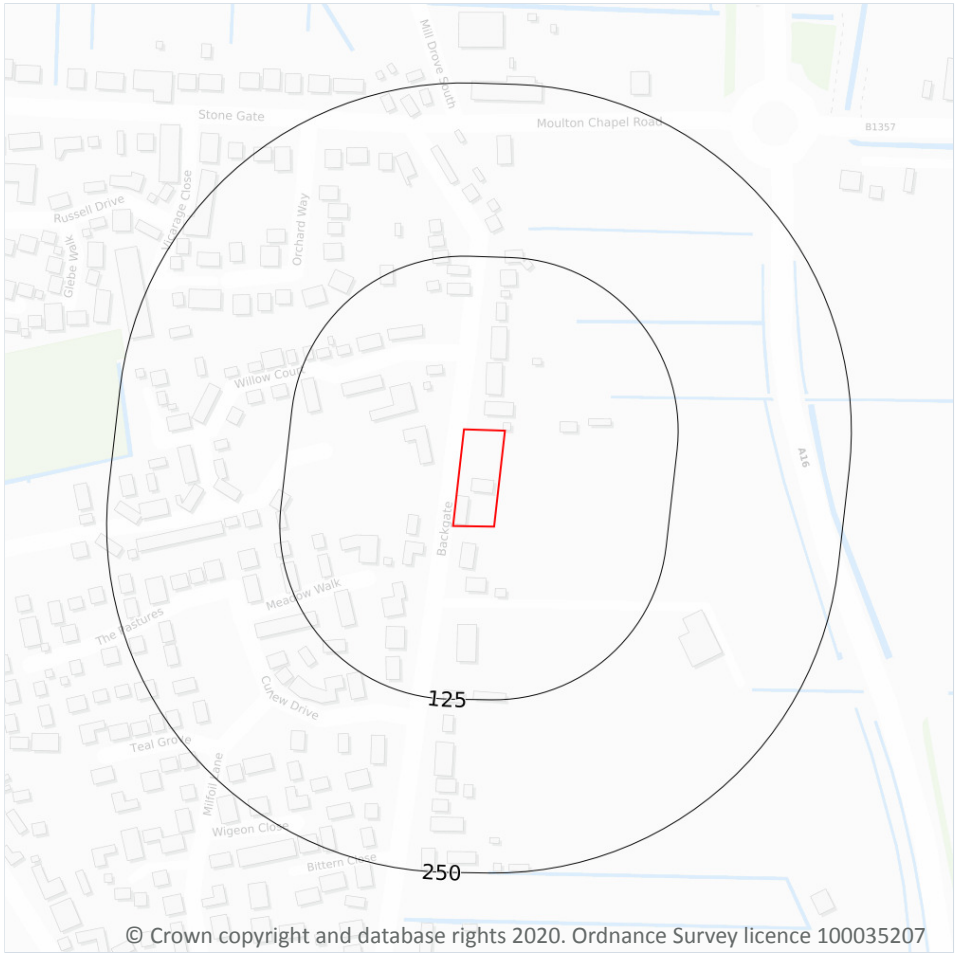
## 18.13 Clay mining

| Records on site | 0 |
|---|---|

Generalised areas that may be affected by kaolin and ball clay extraction.

*This data is sourced from the Kaolin and Ball Clay Association (UK).*

# 19 Radon




Site Outline

Search buffers in metres (m)

- Greater than 30%
- Between 10% and 30%
- Between 5% and 10%
- Between 3% and 5%
- Between 1% and 3%
- Less than 1%

## 19.1 Radon

| Records on site | 1 |
|---|---|

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 91**

| Location | Estimated properties affected | Radon Protection Measures required |
|---|---|---|
| **On site** | **Less than 1%** | **None**** |

*This data is sourced from the British Geological Survey and Public Health England.*

# 20 Soil chemistry

## 20.1 BGS Estimated Background Soil Chemistry

| Records within 50m | 1 |
|---|---|

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 $km^2$. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 $km^2$; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

| Location | Arsenic | Bioaccessible Arsenic | Lead | Bioaccessible Lead | Cadmium | Chromium | Nickel |
|---|---|---|---|---|---|---|---|
| **On site** | **15 - 25 mg/kg** | **No data** | **100 mg/kg** | **60 mg/kg** | **1.8 mg/kg** | **60 - 90 mg/kg** | **15 - 30 mg/kg** |

*This data is sourced from the British Geological Survey.*

## 20.2 BGS Estimated Urban Soil Chemistry

| Records within 50m | 0 |
|---|---|

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per $km^2$).

*This data is sourced from the British Geological Survey.*

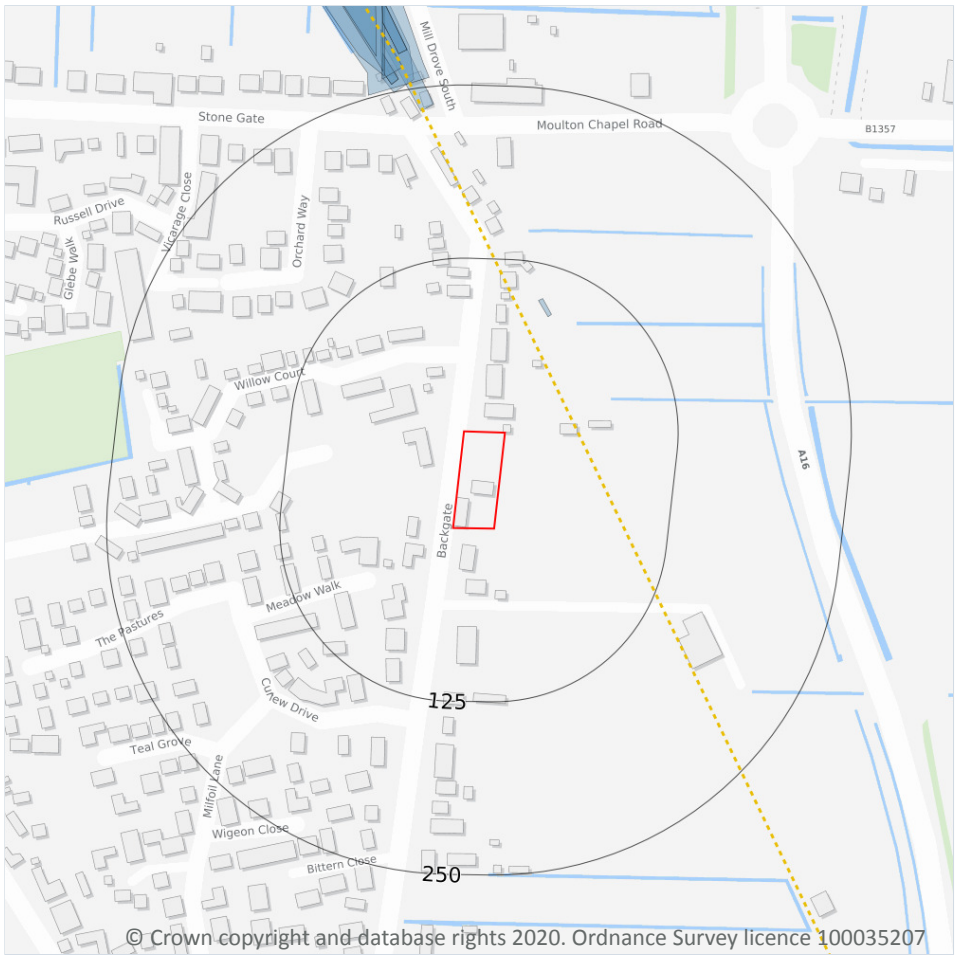
## 20.3 BGS Measured Urban Soil Chemistry

| Records within 50m | 0 |
|---|---|

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per $km^2$.

*This data is sourced from the British Geological Survey.*

# 21 Railway infrastructure and projects




Site Outline

Search buffers in metres (m)

- Crossrail 1 Stations
- Crossrail 1 Route
- Crossrail 1 Worksites
- Crossrail 2 Stations
- Crossrail 2 Route
- Crossrail 2 Worksites
- Crossrail 2 Safeguarding
- Crossrail 2 Headhouses
- Railway stations
- Active railways
- Active tunnels
- Abandoned railways
- Historic railways
- Historic tunnels
- Underground stations
- Underground Lines
- Royal Mail tunnels
- HS2 optimised route
- HS2 Stations
- HS2 Depots
- HS2 Surface Safeguarding
- HS2 Subsurface Safeguarding

## 21.1 Underground railways (London)

| Records within 250m | 0 |
|---|---|

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

*This data is sourced from publicly available information by Groundsure.*

## 21.2 Underground railways (Non-London)

| Records within 250m | 0 |
|---|---|

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

*This data is sourced from publicly available information by Groundsure.*

## 21.3 Railway tunnels

| Records within 250m | 0 |
|---|---|

Railway tunnels taken from contemporary Ordnance Survey mapping.

*This data is sourced from the Ordnance Survey.*

## 21.4 Historical railway and tunnel features

| Records within 250m | 3 |
|---|---|

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

Features are displayed on the Railway infrastructure and projects map on **page 93**

| Location | Land Use | Year of mapping | Mapping scale |
|---|---|---|---|
| 89m N | Railway Sidings | 1974 | 2500 |
| 233m N | Railway Sidings | 1887 | 10560 |
| 250m N | Railway Sidings | 1950 | 10560 |

*This data is sourced from Ordnance Survey/Groundsure.*

## 21.5 Royal Mail tunnels

| Records within 250m | 0 |
|---|---|

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

*This data is sourced from Groundsure/the Postal Museum.*

## 21.6 Historical railways

| Records within 250m | 1 |
|---|---|

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

Features are displayed on the Railway infrastructure and projects map on **page 93**

| Location | Description |
|---|---|
| 48m NE | Abandoned |

*This data is sourced from OpenStreetMap.*

## 21.7 Railways

| Records within 250m | 0 |
|---|---|

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

*This data is sourced from Ordnance Survey and OpenStreetMap.*

## 21.8 Crossrail 1

| Records within 500m | 0 |
|---|---|

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

*This data is sourced from publicly available information by Groundsure.*

## 21.9 Crossrail 2

| Records within 500m | 0 |
|---|---|

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

*This data is sourced from publicly available information by Groundsure.*

## 21.10 HS2

| Records within 500m | 0 |
|---|---|

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

*This data is sourced from HS2 ltd.*

## Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

## Terms and conditions

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# APPENDIX 3

## CLASSIFICATION OF AGGRESSIVE CHEMICAL ENVIRONMENT FOR BURIED CONCRETE

# TABLE C1 – AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) CLASSIFICATION FOR NATURAL GROUND LOCATIONS[a]

**Table C1 Aggressive Chemical Environment for Concrete (ACEC) classification for natural ground locations [a]**

| Sulfate | | | | Groundwater | | ACEC |
|---|---|---|---|---|---|---|
| Design Sulfate Class for location | 2:1 water/soil extract [b] | Groundwater | Total potential sulfate [c] | Static water | Mobile water | Class for location |
| 1 | 2 ($SO_4$ mg/l) | 3 ($SO_4$ mg/l) | 4 ($SO_4$ %) | 5 (pH) | 6 (pH) | 7 |
| DS-1 | < 500 | < 400 | < 0.24 | ≥ 2.5 | | AC-1s |
| | | | | | > 5.5 [d] | AC-1 [d] |
| | | | | | 2.5–5.5 | AC-2z |
| DS-2 | 500–1500 | 400–1400 | 0.24–0.6 | > 3.5 | | AC-1s |
| | | | | | > 5.5 | AC-2 |
| | | | | 2.5–3.5 | | AC-2s |
| | | | | | 2.5–5.5 | AC-3z |
| DS-3 | 1600–3000 | 1500–3000 | 0.7–1.2 | > 3.5 | | AC-2s |
| | | | | | > 5.5 | AC-3 |
| | | | | 2.5–3.5 | | AC-3s |
| | | | | | 2.5–5.5 | AC-4 |
| DS-4 | 3100–6000 | 3100–6000 | 1.3–2.4 | > 3.5 | | AC-3s |
| | | | | | > 5.5 | AC-4 |
| | | | | 2.5–3.5 | | AC-4s |
| | | | | | 2.5–5.5 | AC-5 |
| DS-5 | > 6000 | > 6000 | > 2.4 | > 3.5 | | AC-4s |
| | | | | 2.5–3.5 | ≥ 2.5 | AC-5 |

**Notes**

**a** Applies to locations on sites that comprise either undisturbed ground that is in its natural state (ie is not brownfield – Table C2) or clean fill derived from such ground.

**b** The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).

**c** Applies only to locations where concrete will be exposed to sulfate ions ($SO_4$) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).

**d** For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15 mg/l (Section C2.2.3), increase the ACEC Class to AC-2z.

**Explanation of suffix symbols to ACEC Class**

- Suffix 's' indicates that the water has been classified as static.
- Concrete placed in ACEC Classes that include the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.

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