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Little Crow
Solar Park

Little Crow Solar Park, Scunthorpe

ENVIRONMENTAL STATEMENT: TECHNICAL APPENDICES

APPENDIX 3.2

PHASE 1 GROUND CONDITIONS DESK STUDY

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On behalf of INRG Solar (Little Crow) Ltd

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Phase I Ground Conditions Desk Study
Little Crow Solar Park
Scunthorpe
Lincolnshire
DN20 0BG

Client: INRG Solar (Little Crow) Limited

Intégrale Report No. 1844, Version 9, November 2020, Submission

		Signature/Date
Project Co-ordinator & Report Preparation:	Dr Kay Boreland	
Report Approved by:	Gareth Thomas	
Final Check by:	Kay Boreland	

CONFIDENTIALITY STATEMENT

This report is addressed to and may be relied upon by the following:

INRG Solar (Little Crow) Limited, 14 Hyde Court, Golf Links Road, Roscommon, Ireland

Integrale Limited has prepared this report solely for the use of the client named above. Should any other parties wish to use or rely upon the contents of this report, written approval must be sought from Integrale Limited. An assignment fee may then be charged.

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EXECUTIVE SUMMARY

Little Crow Solar Park – Phase 1 Ground Conditions Desk Study
Report No. 1844, Version 9, November 2020, Submission

A Phase 1 Desk Study on ground conditions, geotechnical and contamination aspects for this proposed solar energy scheme has been completed.

This 225 hectare site comprises a higher eastern area of level or gently eastward sloping arable land, a central zone moderately sloping down to the west, and a lower western area of very gentle to level ground. Agricultural soils predominate, with small areas of woodland & vegetation. To the west of the site are opencast ironstone workings and steel works

Geological records indicate the lower slopes overlain by Blown Sand comprising up to 7m of fine-grained silty sand. The bedrock beneath forms a sequence of north-south outcrops. The higher eastern area comprises Jurassic limestones; the central area is underlain by Jurassic mudstones and locally limestones; the middle and lower slopes are blanketed in the Blown Sand, underlain by mudstones and marls, including the commercially important Pecten Ironstone. The complete site area is classified as freely draining slightly acid sandy soils.

There are potentially small-scale surface ironstone workings in the lower western area. Northeast of the site is the Broughton B1 conventional oil well trial, sunk to 1.9km depth in 1984. This Report includes additional information on the well site, subsequent to the scoping direction by the Planning Inspectorate.

Historically the majority of site has remained agricultural, with Gokewell Priory Farm in the north. Overhead power cable routes cross the site and mapping indicates periodic expansion of the ironstone workings and steel plant to the west. A former WWII anti-aircraft battery in the eastern area is reported removed.

In the higher area, the regional strata dip to the east directs surface water and moderate depth groundwater flow to the east, forming a Principal Aquifer. Midslope surface water and shallow groundwater flow within the Blown Sand is to the west, forming a Secondary A Aquifer, with a discontinuous springline midslope. Very shallow groundwater is anticipated in the lower western area where drainage ditches are frequent, with hummocky marshy areas.

Potential contaminant sources are considered limited to remnant metals in soils within any localised backfilled ironstone pits, and air-borne particulates from the industrial complex to the west, within topsoil.

Potential receptors comprise construction workers and maintenance staff. Drainage ditches and the groundwater within the Principal and Secondary A aquifers are controlled waters receptors. For the limited groundworks, risk to groundworkers is considered negligible with standard protection.

The shallow groundworks will have negligible potential to cause or increase leaching. Run-off during construction works will need to be controlled and managed, as standard practice. Future run-off is unlikely due to predominant topsoil cover and anticipated infiltration characteristics, but requires consideration.

Combined geotechnical and contaminated land assessment should concentrate on specific features from historical maps to confirm ground conditions within solar panel array zones, occurrence of small scale ironstone working, typical gas regime, infiltration and permeability of near surface soils and identify any specific areas of concern.

There is no current evidence of ground conditions that would preclude development.

1.0 INTRODUCTION

INRG Solar (Little Crow) Limited are considering the construction, operation, maintenance and decommissioning of a ground mounted solar park with an intended design capacity of over 50MWp (megawatts peak) with associated development. Their planning consultants are Pegasus Planning Group.

Integrale Limited are commissioned to undertake a Phase 1 Desk Study, concentrated on ground conditions, geotechnical and contamination aspects. The desk study is also to inform drainage considerations by Clive Onions Limited.

This desk study report describes the geological setting, mining risk and historical and environmental data reports. The ground and groundwater conditions are anticipated and used to establish a conceptual model of potential pollutant linkages. Implications for the development are discussed and recommendations for further investigation or potential remedial works or design measures given.

The desk study was originally undertaken in August 2017 and a Version 1 draft report prepared. As the project has progressed the desk study has been updated, and Version 4, July 2018 of the report was issued to North Lincolnshire Council Environmental Health section and the Environment Agency in September 2018. Their comments have been taken into account in the report, and in scoping subsequent intrusive investigations which are reported separately.

This Report also includes additional information on the off-site conventional oil well, at the request of the Planning Inspectorate in their Scoping Direction response. Consideration of the setting and history of the well and its potential for impact on the proposed solar development is included in the current report.

The original Version 1 desk study was completed without a site visit, and was therefore based on photographic and satellite imagery, mapping and data reports by others. Site visits were then completed during September and November 2018 to undertake intrusive investigation, and this Report has been updated where appropriate, based on those site visits.

2.0 THE SITE

2.1 Location and Description

As shown in Appendix A, the site is located to the east of Scunthorpe and north of Ravensthorpe. It has a central Ordnance Survey Grid Reference of 494000 410000 and postcode DN20 0BG. A slightly smaller site area initially considered has subsequently been extended to comprise the area shown in Appendix A. Where a red outline is given on drawings in the appendices, this is indicative of the study area and does not represent the Order Limits unless specifically annotated as such.

No site reconnaissance visit was completed by Integrale at the initial stage, and the typical photographs included in Appendix B have been provided by the client. The main features and pertinent aspects on the site and immediately adjacent land are summarised below:

Current Use	Predominantly arable agricultural land.
Site Area & Plan Shape	225 Hectares
Maximum Dimensions	1700m N-S by 1100-1500m E-W.
Ground Slopes & Topography	Higher eastern half at 60-67mAOD, level or with very gentle slopes down to east. Central quarter at 40-60mAOD, with moderate slopes (1:15 to 1:20) down to west. Western zone at 30-40mAOD, with moderate slope (1:12) down to west. Extreme western zone at 25-30m, with very gentle slope (1:50 to 1:60).
Buildings & Condition	None significant.
Surfacings & Condition Vegetation & Trees	Agricultural soils predominate, with small areas of woodland & vegetation. Three large plantations of trees (Gokewell Strip & Icehouse Strip in SE quadrant, and Little Crow Covert in northwest) do not form part of proposed development area.
Water Courses	Mapping shows numerous drainage ditches within western zone run down to west, feeding into north-south drains. Pond at site of former Gokewell Priory may feed into stream flowing northwest into a lower pond adjacent to Santon Wood.
Boundary Features	Agricultural fencing & hedges predominantly.
Contamination Issues	None noted from photographs. Beyond to west is area of opencast ironstone workings and steel works. Google Earth imagery shows substantial mound in SW from 2003 and centrally from 2008 (see below).

Geotechnical Issues	Former ironstone workings etc. – see below. Former Oil Well off-site to northeast – see historical maps and below.

2.2 Published Geology and Mining

2.2.1 British Geological Survey Mapping

BGS geological maps indicate the following strata beneath and adjacent to the site:

Map / Scale	Sheet 89 at 1:50,000 scale (Solid & Drift Sheets).
BGS On-Line Viewer	BGS Maps Portal Accessed 8th August 2017.
Artificial Ground	None mapped on site. Frodingham Ironstone Backfilled Opencast Workings immediately beyond western boundary.
Superficial Deposits	Lower slopes overlain by Sutton Sand (Devensian Blown Sand): up to 7m of fine grained silty sand. Further area of Blown Sand mapped at high level beyond eastern site boundary is likely to form a thin cover in parts of the eastern zone.
Solid Geology	Sequence of north-south outcrops from: 1. Kirton Cementstones of Lower Lincolnshire Limestone Formation (LLLS) of Middle Jurassic period forming higher eastern area, including Scawby Limestone and Santon Oolite, overlies; 2. Lower Estuarine Series and Northampton Sands (10-20m thickness), overlies; 3. Coleby Mudstones with Marlstone Rock of Lias Group of Lower Jurassic period on middle and lower slopes, including Pecten Ironstone.
Geological Features	None mapped other than superficial Blown Sand masking Jurassic bedrock. No dip arrows, however cross-section & more remote data indicates regional dip down to east at 1-3°.

Summary drawings of the geological formations and potential groundwater zones are included in Appendix C.

2.2.2 BGS Previous Investigation Records

Previous investigation records available on the BGS website under the Open Government Licence include 5 boreholes sunk across the northern area. These are also included in Appendix C and indicate:

- Higher Eastern half of site, at or above 55mAOD – Topsoil over Weathered oolitic limestone of Lincolnshire Limestone Formation;

- Central northern area between 40-50mAOD – Blown Sand to 2-4m depth, overlying Middle & Lower Lias mudstones and locally limestones;
- Lower northwestern area at 36mAOD – yellow and grey clays of Coleby Mudstones (with thin veneer of Blown Sand likely).

No details of groundwater levels are included in these records.

2.2.3 Soils Information

Data available on the LandIS Soilscapes Viewer and within a Soil Site Extended Report is included in Appendix C and indicates:

- The complete site area is classified as underlain by freely draining slightly acid sandy soils. These have typically low fertility arable land cover, and drain to groundwater.
- The complete site area is underlain by Newport 1 Type Soils. These are deep well drained sandy and coarse loamy soils. They are free draining and permeable in unconsolidated sands or gravels, which have a relatively high permeability and high storage capacity. They have a very low potential for ground movement (shrinkage or swelling).
- These soils will, by nature of their high permeability, readily transmit a wide range of pollutants because of the rapid drainage and low attenuation potential.
- The uppermost 300mm of the soil profile is sandy and ‘light’.
- Newport 1 Soils have typically an upper 250mm of dark brown slightly stony sandy loam or loamy sand, overlying brown slightly stony loamy sand or sand, with a weak fine subangular blocky structure. Below 500-550mm depth, these develop into yellowish red or brownish yellow slightly stony sand of single grain structure.

2.2.4 Past Mining

2.2.4.1 Historical Mapping Evidence

Historical maps are discussed in more detail below and are included in Appendix E. There is evidence for potential small scale near surface workings in the lower western area, where small pit features, some ponds and a hummocky area in the extreme southwest are shown.

A summary plan of such historical features has been included after those maps at the end of Appendix E. It is assumed that if these are evidence for surface working or mining, they represent ironstone extraction. It is noted that several such features align north-south, potentially reflecting the geological trend of ironstone outcrops. Google Earth imagery shows a substantial vegetated mound with approximate maximum dimensions of 70m by 45m in the southwest area between 20-26mAOD from 2003 onwards, which could relate to such workings. From 2008 a mound of material approximately 50m diameter appears centrally, south of the main access track to Gokewell Priory Farm, perhaps more likely to be agricultural in origin or related to the demolition of farm buildings.

The opencast workings to the west include a linear excavation, with steep side slopes and apparently extending well below 5mAOD, based on Google Earth spot heights.

2.2.4.2 Humberside Minerals Resources (2006)

The Humberside Minerals Resources plan obtained from the BGS website (an extract of which is included in Appendix C) indicates the complete site area as having "Underground planning permission (valid and expired)". This suggests that the Minerals Planning Authority had granted permission for (assumed) ironstone working by underground mining, presumably as an extension to the opencast area to the west, but that this has now expired. Whether any workings beneath the site area did in fact occur, remains undetermined to date.

2.2.4.3 TerraSearch Assess Report (August 2017)

A Terra Search Assess report was therefore obtained from TerraFirma Mine Searches Limited and is included in Appendix D. The report is based on the original slightly smaller site area (as shown on the maps) however, it includes information from a larger surrounding 'buffer zone' and therefore covers the complete Order Limits. This indicates:

- Negligible to low risk from past coal mining, evaporate working, brine extraction, or metalliferous mining for tin, lead etc.
- Moderate risk of past limestone or other stone extraction.
- Moderate risk of planned or future mineral extraction (of ironstone).

For ongoing current site use, TerraFirma therefore conclude:

- A Moderate risk from past ironstone extraction, due to a number of suspected extraction features (see hazard map within report).
- A Moderate risk due to a hydrocarbon well off-site to the northeast. TerraFirma have confirmed that DECC (Dept. of Energy & Climate Change) data indicates the hydrocarbon field area extends within the site boundary. "Therefore associated extraction features such as underground workings and shafts could be present and have the potential to impact ground stability in the area". See also Section 2.3.

For future development of the site, TerraFirma therefore conclude:

- "…prior to any site works or future development activity, it is considered prudent to commission a full Site Survey by a qualified mining geologist/engineer."

2.2.4.4 Conventional Oil Well

Immediately northeast of the site at Top Wood is the site of a conventional oil well, known as Broughton B1. This was sunk in 1984 by BP Petroleum

Development Limited. Details originally obtained from the UK Onshore Geophysical Library open-access resource are included in Appendix C.

This indicates:

- Well was sunk at 63.1mAOD and taken to 1920m depth, as a vertical boring;
- The well is cased to 1909m depth, casing decreasing from 340mm to 140mm down its length;
- The Upper, Middle and Lower Lias strata were proven from surface to 100m depth. The underlying Triassic, Penarth and Mercia Mudstone Groups, and Upper Permian strata occur to 800m. Beneath, the Lower Permian marl/shale and Rotliegendes Sandstone reservoir were found to 1120m, with Carboniferous strata below to the base of the well. It is tentatively assumed that the oil shales or sandstones being targeted are those below 800m depth.

On-line searches for details of this oil well found that Egdon Resources plc have stated: "The two prospects are located along an oil productive trend with the Crosby Warren producing oil field at one end and the Brigg oil discovery at the other. The Broughton-B1 well drilled by BP in 1984 flowed on test at up to 40 barrels of oil per day before being abandoned".

Subsequent consultation with the local authority and Environment Agency did not raise any points in regard to the off-site well. The Planning Inspectorate however have requested additional information on the well, specifically the current condition of the well site, any existing surface infrastructure and potential for hydrocarbon contamination.

Further enquiries have provided additional details, given in Appendix F of this report, which include:

a) Correspondence from Egdon Resources plc, who have held the current Petroleum Exploration and Development licence (PEDL 182) from July 2008. They confirmed that the well was drilled in 1984 and tested in 1985. The operator BP capped off and decommissioned the well prior to relinquishing the licence (PL 182) in 1991.
b) According to Egdon, "…the site has not been restored and remains in place having had various uses by the landowner in the intervening years…".
c) A drilling completion report provided by the client confirms this was purely an exploration well, aimed at the Namurian and Westphalian (Carboniferous age) strata below 1100m.
d) The drilling details give an elevation of 63mAOD. The test bore was taken to 46m at 445mm diameter, prior to being cemented to ground level. A 317mm bore was then cored through the cement seal to depth. There was a loss of drilling fluid at 23m, within the Coleby Mudstone (and limestone) Formation. A diagram of the well head indicates the test well

set into a 'cellar floor' ie excavated working area of the well head to 2m below ground level.

e) The test pumping recovered oil which was taken off-site by lorries, ie there is no infrastructure of pipelines, tanks or other storage plant.

Since the well site lies beyond the current site boundary, Lidar data has been used by Integrale to provide contour plots, and cross-sections included in Appendix F, to complement the historical map data. This confirms the well site lies on the east side of a north-south aligned topographic ridge between 60-65mAOD. The overall ground slope falls gently east northeastwards, ie away from the solar development site. This is in line with the overall regional dip of the Lias strata. The well site compound, approximately 100m by 80m in plan, has been levelled at 63-63.5mAOD, presumably as a working platform prior to well sinking in 1984. A heavily vegetated bund surrounds the former compound, with banks to typically 65-66m, increasing along the northern side to a wide bund at over 75mAOD.

Just north of centre is the remaining concrete slab, assumed to be the well capping. Historical Google Earth satellite imagery indicates that by 2003 the area was being used for agricultural storage (bales?), with more varied materials apparently by 2008-9, when ponding had occurred in the west central area. By 2017 the vegetation on the surrounding bunds had matured to shrubs and small trees.

In summary, this 300-500mm diameter exploration well sunk 35 years ago, has a cement seal placed to c.45m depth, and was used for test pumping, with the produced oil being tankered off-site. The well was decommissioned by 1991 and the former compound since used for temporary agricultural storage. The overall ground slope falls gently to the east or northeast, in line with the regional dip of the bedrock. The compound is level and bunded, with the only infrastructure remaining being the concrete slab centrally. Given the findings, potential future exploitation seems highly unlikely.

The potential for significant remnant hydrocarbon contamination dating from the well test pump phase appears minimal. The potential for current or future failure of the well sealing and decommissioning such that hydrocarbons could pollute the solar development site is considered negligible given the siting, bunding, topography and the dip direction of the Lias bedrock.

2.3 Outline History

Historical maps obtained from a Groundsure report are included in Appendix E, together with a summary plan of pertinent features. The Groundsure report is based on the original slightly smaller site area (as shown on the maps) however, it includes information from a larger surrounding 'buffer zone' and therefore covers the complete current boundaries. These indicate the following pertinent information:

Map Date	Site Features / Land Use	Adjacent Features (distance from site)
1885-1906	Majority of site agricultural fields with drainage ditches in lower area. Gokewell Priory Farm with pond in N area. Hummocky /marshy area in extreme lower SW with pond. Several small scale excavations or pits in lower W area may indicate surface diggings for ironstone (known locally as gullets).	Icehouse and Gokewell Strip woodlands present as existing. Redbourne Hill and Appleby Iron Works 2kms W and NW respectively. Small excavations (surface ironstone workings?) beyond SW corner near Gorse Covert. Larger ironstone quarries 1.5kms SW at Emmanuel Bridge.
1948-55	No significant changes apparent within site	Ironstone quarries extended to within 800m of W boundary. Iron & Steel Works extended to within 750m NW.
1968-80	Overhead powerlines constructed crossing SW to NE from substation within Iron & Steel Works to SW. Possible new drainage ditches (and small pond?) within hummocky area in extreme NW near Crow Covert. Clearance of Sodwall Plantation (possible ironstone workings?)	Iron & Steel Works expanded to within 500m W. Opencast Ironstone Workings mapped to within 500m NW. Emanuel Air Strip West and East within 500-750m SW of site. Drainage ditches apparently expanded just beyond site to SW, around Bottesford Beck. By 1979 Iron & Steel Works had expanded to SW site corner across former Air Strips and opencast ironstone workings typically to within 100m W. In extreme SW corner, opencast extended to site boundary, and two parallel drainage ditches constructed at cutting face.
1994-2002	Gokewell Priory Farm buildings demolished – exact date unclear from mapping. Opencast ironstone workings annotated in extreme SW site extension area.	Poultry Farm constructed beyond central E boundary near Heron Holt woodland.

2002-14	No significant changes apparent. Maximum elevation of drainage ditches / surface water courses on this mapping at 36mAOD in N, 43mAOD centrally, 35mAOD central southern, and 30mAOD in southern area.	Oil Well mapped at Top Wood c. 100m NE*. Opencast workings to W marked as Disused. Linear water feature c. 100-200m W of site reflects flooded workings (also shown on Google Earth imagery from 2003). Tree planting beyond SW corner on former opencast area.

* See 2.2.4.4 above.

A Built Heritage Assessment by Cotswold Archaeology [Document Ref 6.8 LC ES CH8] has identified a WWII Heavy Anti-Aircraft Battery in the upper eastern area (north of Gokewell Strip). They report it de-armed in 1942 and conclude that remains are unlikely to survive below ground.

2.4 Hydrogeology, Hydrology & Groundwater Vulnerability

BGS groundwater data available on-line indicates that a hydrometric area boundary runs north-south across the higher slopes of the eastern area. Upslope of the highest main extent of the Devensian Blown Sand (Sutton Sand) is approximately 45-55mAOD, the regional geological dip of the bedrock strata at 1-3° to the east directs both any surface water flows and groundwater flow direction eastwards. (The nearest surface water course to the higher eastern boundary is 600-800m remote). Downslope of 45-55mAOD, where the bedrock is overlain by the Blown Sand, both surface water and shallow groundwater flow within the Sand is to the west. The contours on the estimated minimum groundwater level or pressure surface within the Lincolnshire Limestone was also at c. 45mAOD (based on mid 1960’s data).

From the published geological strata and topographic maps showing surface water courses, the following can be anticipated at this site:

Shallow Soils Permeability	Permeable with intergranular flow in superficial deposits. High fracture/fissure permeability in limestone bedrock.
Anticipated Groundwater Table Depth	Very Shallow (<3m below ground level) in lowest western area. Shallow (3-5m below ground level) centrally. Moderate (5-10m below ground level) in higher eastern area.
Anticipated Groundwater Flow Direction	Extreme western boundary zone with opencast & ironworks, flow direction may be controlled by drainage ditches and likely low flow rate. Western zone and up to 45-55mAOD, flow direction to west. Eastern boundary and down to 45-55mAOD, down dip to east.

Surface Water Courses and Flow Direction	Unnamed drainage ditches (unnamed Tertiary Rivers) on site in western area, typically flow west and north-south. Springs & stream in Far Wood/ Heron Holt c. 600m east of site at c. 42mAOD flow east northeast.
Aquifer Type	Secondary A Permeable layers in superficial deposits. Bedrock strata from east to west: Principal Aquifer in higher limestones. Secondary Aquifer in lower Coleby Mudstones and Marlstone Rock. Unproductive Strata formed by upper Coleby Mudstones. (See page 33 of Groundsure Environmental Data for details).
Environment Agency Soils Classification	High leaching potential.
Hydraulic Continuity of Groundwater and Water Courses	Likely throughout site.

A summary plan has been included in Appendix C to indicate:

- Western area below 30mAOD has the likely shallowest groundwater table draining westwards;
- Likely hydraulic continuity with artificial drainage ditches also flowing north-south;
- There is a potential discontinuous springline at 40-43mAOD;
- The upper eastern area drains to east and water table is likely below 45-55mAOD;
- This causes spring issues at c. 40-45mAOD remote from the site to the east;
- Shallow depth soils in complete area are classed as being well drained.

2.5 Environmental Information

The following pertinent information on activities within 250m of the site has been extracted from the Groundsure report included in Appendix E.

2.5.1 Pollution Information and Licencing

	Number	Distance from Site
Surface Water Abstractions	0	
Groundwater Abstractions	0	
Contaminated Land Register Entry/ Enforcement / Prohibition	0	
Known Pollution to Controlled Waters	0	
Integrated Pollution Control	0	

Fuel Station Entry	0	
Registered Radioactive Substances	0	
Discharge Consent	1	Revoked (1997) effluent discharge Cokewell Priory
Known Landfills / Waste Management / Transfer Sites within 250m	2	190mW Crosby North Landfill Waste landfilling (excluding Inert) Current 144m W Scunthorpe Concast Surrendered Licence for Industrial, liquid, sludge, British Steel Corporation, last recorded 1992.
Source Protection Zones	None	
Floodplain Area / Flood Warning Status	None	Potential for groundwater flooding at surface locally

2.5.2 Geological Information

Hazard Type	**Hazard Rating**
Natural and Mining Cavities	Possible small scale mining within site boundaries for ironstones (see historical maps also)
Potential for Ground Dissolution Stability Hazard	Very Low
Potential for Landslide Ground Stability Hazard	**Moderate**
Potential for Shrinking/Swelling Clay Ground Stability Hazard	Low
Potential for Compressible Deposits Ground Stability Hazard	**Moderate**
Potential for Collapsible Deposits Ground Stability Hazard	Very Low
Potential for Running Sands Ground Stability Hazard	Low

2.5.3 Background Soils Chemistry

The Groundsure report includes BGS estimated background soil chemistry for 5 metals within shallow soils. This indicates that naturally occurring chromium marginally raised in this area. However interpretation suggests that at these levels, such metals would be unlikely to exceed generic assessment criteria for commercial use. Current National Planning Policy guidance does not consider naturally occurring metals as evidence of contamination.

2.5.4 Contemporary Trade Directories

Potentially Contaminative Activities on Site	No additional activities other than the overhead power supply pylons are given in the Groundsure data.
Potentially Contaminative Business Activities within 250-300m of Site	No additional significant activities other than the oil well detailed above and the steel works westwards are given in the Groundsure data.

2.5.5 Groundsure Radon Risk Information

The Groundsure report indicates that the specific site lies in a Radon Affected Area, requiring Full protection measures, for new buildings and dwellings.

2.6 Conceptual Exposure Model

This section draws together desk study information, outlines an initial conceptual exposure model, and provides a qualitative assessment of potential contamination via a source-pathway-receptor framework for the proposed redevelopment.

2.6.1 Proposed Redevelopment

Outline details of the proposed redevelopment are shown in Appendix A and can be summarised as:

Buildings	Small Control Room and Switchroom Buildings
Car Parking	Minimal
Access Roads	Main access from northeastern area to centre and former Gokewell Priory area. Smaller access roadways to each solar panel array area and inverter stations
Landscaping	Not considered substantial
Development Level	As existing
Drainage	Watercourses to be retained with 8m buffer zone alongside. Swales (c. 300mm depth by 3m width) to run N-S across central lower and extreme southwest areas to limit overland flows into watercourses.
Substation Building and Compound, and Battery Energy Storage System	Substation Building and Compound (Work No. 4; Battery Energy Storage System (Work No. 2 A with potential for alternative location Work No. 2B), Inverter & Transformer stations for each area of solar panel arrays

- The proposed arrays of solar panels are to be laid in rows approximately east – west across the field enclosures. Solar panels are typically mounted on a metal framework, fixed onto steel pins driven between 1-

2m depth into the ground, depending on the ground conditions. Alternatively, a system of installing small 'foot pads' for the arrays may be adopted. It is assumed that the east-west alignment across these gentle to moderate westerly facing slopes will require either very minor cutting into the slope, or more likely design of the metal frameworks to incorporate any more critical slope angles.

- In addition there will be a requirement for shallow depth cable trenches, assumed no deeper than 0.5m below existing ground level. Gravel filled drainage trenches of up to 0.5m depth are also assumed.
- The transformer and containerised battery units will be placed on a 300mm permeable gravel bed to allow attenuation and infiltration of rainfall and surface run-off into the underlying soil.
- Structures are limited to inverter and transformer stations, which typically site on reinforced concrete foundation slab, on sub-base aggregate, with a drain surrounding if required. Fencing and CCTV cameras are generally required around the boundary.
- The proposed layout shows the area of the former Gokewell Priory Farm, its associated pond and stream course remaining as existing. There are to be no solar panels within the overhead power cable and pylon corridor.
- The off-site former exploration well compound may be used as a temporary storage compound during the construction period.

2.6.2 Potential Sources of Contamination

The desk study has been used to identify the likely remnant contaminant sources and distribution. The potential current and historical on- and off-site sources and the contaminants associated with these, derived using CLR8 Potential Contaminants for the Assessment of Land, and through experience of industrial land use, are detailed below.

Potential Contaminants Associated with On-Site Sources			
Description	Metals, semi-metals, non-metals, inorganic chemicals and others	Organic chemicals	Ground Gases & Vapours
Localised small ironstone pits, if backfilled	Range of metals possible, given age	Unlikely given age of likely backfilling	Unlikely given age of likely backfilling
Recent Agricultural Use & Maintenance	Unlikely significant given usage and historical development		

Potential Relevant Contaminants Associated with Off-Site Sources			
Description	Metals, semi-metals, non-metals, inorganic chemicals and others	Organic chemicals	Ground Gases & Vapours
Opencast Ironstone Workings, if backfilled	Range of contaminants possible, although unlikely mobile in site direction	Range of contaminants possible, although unlikely mobile in site direction	Unlikely given distance, topography and ground conditions
Electricity Substation and overhead cables/pylons infrastructure	Unlikely to impact within site boundaries due to distance, topography and ground conditions		
Iron & Steel Works	Air borne dust & particulate contamination possible for range of metals	Unlikely given distance, topography and ground conditions	
Oil Well Infrastructure at Top Wood (95m remote)	Unlikely given land usage and ground conditions, depth of well seal, date of test pumping, and subsequent decommissioning. Geological and topographic conditions indicate no direct link to solar development site.		

The potential relevant contamination sources are therefore considered to be limited to remnant metals in soils within any localised backfilled ironstone pits, and air borne derived particulates from the extensive industrial complex to the west and southwest, remaining within shallow depth site topsoil. The Gokewell Priory Farm building area has been demolished since 1994-2002, and no specific development in that area is proposed. The hummocky areas west of this (near Crow and Little Crow Coverts) may relate to either this demolition or drainage works, or less likely to ironstone working.

2.6.3 Potential Receptors

A future solar park end use and known neighbouring agricultural land uses have been used to develop an understanding of the likely sensitive human receptors. In view of the very limited ground intrusion needed to install the panels, and the shallow depth of any service runs, or access track/roadways, it is envisaged that potential receptors to contamination (if present within the soils on-site, or via migration from adjacent sites) are limited to:

- Construction Workers during installation or maintenance. The most critical receptor would therefore be a female adult.

- Future maintenance staff or neighbouring workers.

Information gathered during the site research has been used to develop an understanding of the likely sensitive controlled waters receptors. These are considered to be the drainage ditches, streams and ponds on-site, and the groundwater within the Principal and Secondary A aquifers.

2.6.4 Potential Pathways

The presence of Blown Sand superficial deposits beneath both the site and adjacent areas creates a direct potential pathway for cross-migration of ground gases, leachate or mobile contaminants. The presence of drainage water courses indicates a potential pathway for leachate or other mobile contaminants within the site to locally impact on water receptors.

To develop further an understanding of the potential risks posed by the contaminants to human receptors, the pathways through which contaminants may impact sensitive receptors need to be identified. The CLEA model indicates potential exposure routes for assessing risks to human health for a solar panel array use to be limited to:

- Dermal exposure if contaminated soil exposed during groundworks;
- Inhalation of particulates if contaminated soil exposed during groundworks.

It is considered that the potential pathways with respect to controlled waters will be limited to:

- Lateral migration of perched groundwater or leachate to surface water (drainage ditches or ponds) during construction.
- Surface run-off to water courses if uncontrolled drainage allowed.

2.6.5 Conceptual Site Model with Respect to Human Health

The conceptual site model has been developed based upon the following potential source-pathway-receptor linkages:

SOURCE		PATHWAY		RECEPTOR
Contaminated soils	→	Dermal exposure (if exposed during groundworks).	→	On-site female adult construction worker.
Contaminated soils	→	Outdoor inhalation of soil dust/particulates.	→	On-site female adult construction worker.

The construction of foundations for the solar panel arrays typically comprises driving a short pre-formed steel pin into the ground, without production of spoil, or installation of a small diameter 'foot-pad' to support the steel legs. In view of the very limited groundworks required, and the minimal interaction with existing soils, it is considered that the actual risk to groundworkers, should contaminated soils be present within the topsoil and subsoil, is negligible.

2.6.6 Conceptual Site Model with Respect to Controlled Waters

The conceptual site model has been developed, based upon the following potential source-pathway-receptor linkages:

SOURCE		**PATHWAY**		**RECEPTOR**
Contaminated soils (if present within construction depth)	→	Leaching from soils or migration of liquid contaminants through the unsaturated zone by means of new man-made or natural pathways	→	Surface Water Courses & Groundwater
Contaminated soils (if present within construction depth)	→	Run-off from disturbed surface soils	→	Surface Water Courses

The very limited groundworks required to install the arrays of solar panels is considered to have negligible potential to cause or increase leaching, should any contaminated soils be present within the shallow depth of penetration. Run-off during construction works will need to be controlled and managed, as is standard practice. During future use, run-off is unlikely due to the predominant topsoil and turf cover and anticipated infiltration characteristics, but requires consideration.

3.0 ANTICIPATED GROUND & GROUNDWATER CONDITIONS

3.1 Anticipated Strata

In view of the above, the following ranges of ground conditions are anticipated:

Higher Eastern Area at or Above 60m AOD

Weathered Oolitic Limestones (Lincolnshire Limestone Formation of Inferior Oolite Group)

Depth (m)	Description
GL to 0.5/0.75	TOPSOIL and SUBSOIL (brashy/stony and sandy with limestone gravel)
0.5/0.75 to 1.0/3.0	Medium dense silty SAND with increasing gravel and sandy GRAVEL with a variable (loamy) silty binder, clayey in parts (WEATHERED INFERIOR OOLITE GROUP)
Below 1.0/3.0	Cream oolitic LIMESTONE, highly fractured with brown sandy SILT infilling (INFERIOR OOLITE GROUP)

Central Area between 50-60m AOD

Sandy Ironstone and Sandstones (Grantham Formation & Northampton Sand) or Coleby Mudstones)

Depth (m)	Description
GL to 0.5/0.75	TOPSOIL and SUBSOIL (slightly stony and very sandy)
0.5/0.75 to 1.0/2.0	Medium dense silty SAND and SILT (WEATHERED OOLITE OR LIAS GROUP)
1.0/2.0 to 2.0/4.0	Dense gravel becoming weathered bedrock of SILTSTONE, sandy IRONSTONE and SANDSTONE (NORTHAMPTON SAND) or Firm yellow or grey CLAY, highly weathered laminated MUDSTONE/ SILTSTONE OR SANDSTONE (LIAS GROUP)

Central & Western area between 30-50m AOD

Blown Sand overlying Lias mudstones and locally limestones

Depth (m)	Description
GL to 0.5/0.75	TOPSOIL and SUBSOIL (slightly stony and very sandy)
0.5/0.75 to 2.0/4.0	Loose or medium dense yellow brown silty SAND with some gravelly sand (SUTTON SAND / DEVENSIAN BLOWN SAND)

Below 2.0/4.0	Dense sandy IRONSTONE and SANDSTONE (NORTHAMPTON SAND) or Firm yellow or grey CLAY, highly weathered laminated MUDSTONE/ SILTSTONE OR SANDSTONE (LIAS GROUP)

<u>Lower Western area at or below 30m AOD</u>
Blown Sand overlying Lias Mudstones

<u>Depth (m)</u>	<u>Description</u>
GL to 0.5/0.75	TOPSOIL and SUBSOIL (slightly stony and clayey, very sandy)
0.5/0.75 to 2.0/4.0	Loose or medium dense yellow brown slightly clayey silty SAND with some gravelly sand (SUTTON SAND / DEVENSIAN BLOWN SAND)
Below 2.0/4.0	Firm dark grey CLAY, highly weathered laminated shaley MUDSTONE/ SILTSTONE (LIAS GROUP) (includes Pecten Ironstone)

3.2 Anticipated Groundwater and Leachate

It is anticipated that rainfall infiltration will rapidly move down through the free-draining topsoil and into the superficial granular deposits in the central and western area, and into the fissured predominant limestones in the higher eastern area. The potential groundwater conditions, springline and drainage directions are shown on an annotated plan included in Appendix C.

The groundwater table within the higher Lincolnshire Limestone Formation will be controlled by regional dip direction, which here is predominantly eastwards at 1-3°. The likely groundwater elevation is between 45-55mAOD, i.e. at least 5m below ground level in this higher area.

Below 50mAOD the occurrence of Blown Sand deposits appears to promote good drainage of the shallow depth soils, and the moderate slopes within the central area at 1 in 10 to 1 in 20, are likely to have an unconfined groundwater table within the basal layers of these sands.

Below 30mAOD on the lowest western area, the Blown Sands may well become more clayey or silty, and the underlying Coleby Mudstone of the Upper Lias, with a shallow surface slope of 1in 50 to 1 in 60 appears to promote a shallower water table. Spring issues are noted on the historical mapping at around 40-43mAOD and drainage ditches are prevalent below this elevation. Below 30mAOD the extreme western area may well have more poorly draining shallow soils, with frequent drainage ditches required. In addition, any backfilled ironstone workings could create localised poorly drained surface soils.

Nevertheless, the soils throughout the complete site area are classified as well drained or free draining.

3.3 Anticipated Ground Gas Regime

There is a substantial industrial area downslope to the west and major opencast ironstone workings, which may have been partially backfilled. It is not anticipated that an abnormal ground gas regime will be present beneath the majority of the site, in view of the topography, distance and apparent lack of continuity within the Blown Sand deposits.

However there remains a potential for abnormal ground gas development beneath the more level and closer western zone, and locally where small scale ironstone workings may have been backfilled.

4.0 CONTAMINATED LAND CONSIDERATIONS

4.1 General

The desk study has indicated that the current site has a prolonged history of agricultural usage. There is no specific evidence of significant large-scale ironstone extraction or landfilling within the boundaries proven to date, with the exception of the extreme southwestern zone, where opencast workings are annotated on the 1994 map. There appears also to have been small scale extraction via pits and near surface digging in the lower western area. Adjacent to the west and northwest boundaries, where there has been substantial ironstone working off-site, both opencast and underground mining areas may well be backfilled with unknown materials. There has been prolonged heavy industry immediately beyond the site boundaries.

4.2 Qualitative Risk Assessment

The currently proposed solar park is likely to involve construction activity within the uppermost 500-1500mm of ground level. The likelihood of solar panel array construction creating an adverse, or worsening impact on the contaminant exposure model given above, is therefore considered negligible for most of the site and low for potential backfilled features.

There is a negligible risk of a new controlled waters pollutant linkage being created due to the very shallow depth of construction activity, and the non-polluting nature of the development.

It is not currently anticipated that shallow depth soils will include significant remnant contamination, however this will need to be confirmed in view of the proximity of industrial sites and suggested small scale pit extraction in the extreme western boundary area, and recent 1990's opencast working in one small area. The majority of proposed construction however involves minimal ground intrusion, and it is considered that the pathway for exposure of groundworkers during construction is unlikely to create a significant contaminant linkage, with standard practice.

The overall ground gas regime beneath the site is likely to be normal or near normal. The proposed construction of solar panel arrays will not have any overall adverse impact on that ground gas regime. In the lower western area there is potential for an abnormal ground gas regime, due to any backfilled workings, and requires further consideration in view of the proposal for buried electrical plant and cabling.

4.3 Conclusions

In view of the above low levels of risk and proposed change of use, it is advisable that limited investigation/assessment be completed. It is concluded that for contaminated land assessment:

- Confirmatory intrusive contamination investigation is recommended, concentrated on the western boundary, targeted at specific features shown on historical maps. This will provide data on the occurrence and variation in shallow depth soils conditions (typically between ground level to 1m depth, and with deeper investigation at limited locations). The most technically appropriate method of investigation would be with shallow open-drive sampling boreholes.

- If these boreholes confirm the absence of significant extraction or landfilling in the western boundary zone, it seems unlikely to be necessary to undertake further investigation for this aspect across the remainder of the site. However where other geotechnical or drainage investigations are to be undertaken to provide data for design and construction, the opportunity to inspect and sample at those locations can be taken, to confirm deeper ground conditions and obtain additional soils samples for confirmatory analyses.

- Near surface and deeper gas monitoring should confirm the typical gas regime, particularly in the lower western area. This can be achieved by gas measurements within the borehole standpipes, which should have a variety of response zone depths. A sufficient programme of gas and groundwater monitoring would be 1- 2 visits initially during low or rapidly falling atmospheric pressure periods. That would identify whether any further monitoring is required.

- Assuming groundwater is proven within the standpipe installations, sampling can provide analyses of water quality and confirm any contaminant impact on controlled waters beneath the current site.

Following intrusive investigations the conceptual model can be updated and a quantitative risk assessment made. That will identify any specific areas of concern and the need for any further investigation, risk assessment or design measures.

5.0 GEOTECHNICAL CONSIDERATIONS

The anticipated ground conditions indicate predominantly granular superficial deposits or over-consolidated mudstones beneath the majority of the western and central area, and limestone derived soils in the higher eastern area. Under the anticipated minor loading changes due to solar panel array construction, these soils are unlikely to prove problematic.

If confirmation of shallow depth soils characteristics suggests it is merited, for instance in any shallow backfilled ironstone pits or backfilled workings, consideration could either be given to use of geogrid reinforcement in specific areas to increase soil stability and tensile strength, or shallow vibro compaction simply to produce a uniform formation and limit differential movement of solar panel arrays to within acceptable limits. The stability of the proposed anchoring / foundation system should provide adequate resistance to self-weight, wind and snow loadings.

The construction of the arrays should ensure that enhanced surface run-off, or erosion does not occur. Across the majority of the proposed array areas this is not considered likely, in view of the granular soils, described as being well-drained or free-draining. However where transformer and battery units are proposed, these should be sat on a permeable gravel bed to promote attenuation and infiltration to the underlying soils.

Intrusive geotechnical investigation will therefore be required to confirm the following aspects:

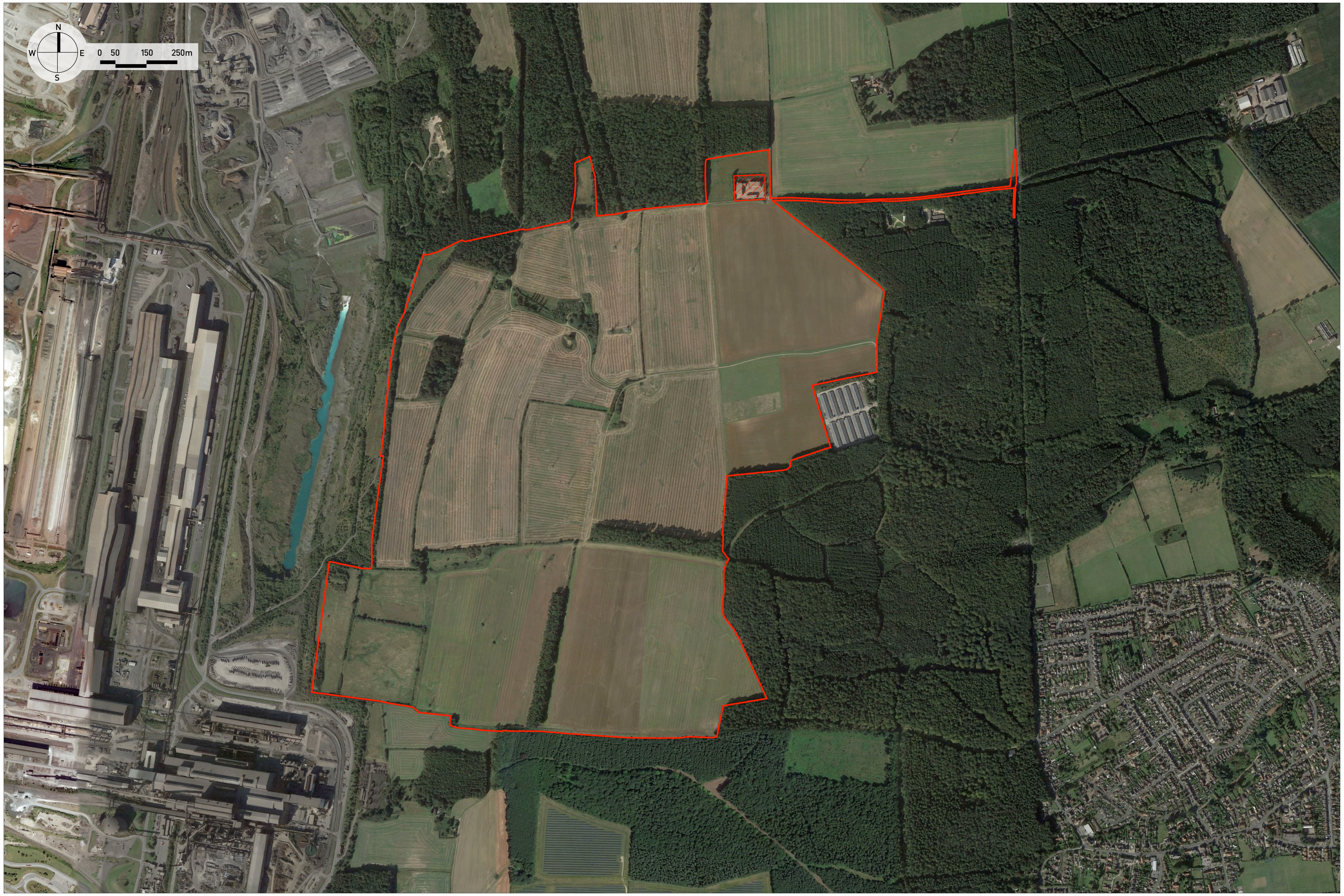
- The typical thickness of topsoil, subsoil and superficial deposits and their material, grading and strength properties;
- Description and classification of shallow depth soils, along with field infiltration trials via soakaway testing, to measure in situ permeability of near surface soils, and to compare against design permeability, drainage assumptions and design;
- Evidence for past shallow ironstone working or backfilling of such features, perhaps by ‘bell pit’ extraction or similar, in the lower western area, specifically investigating features indicated on historical mapping, where they occur within proposed solar panel array zones.

It would be prudent to take specialist advice on the need for Unexploded Ordnance supervision during any works close to the former WWII anti-aircraft battery identified by the heritage consultant in the eastern area.

The geotechnical investigation should be combined with contamination assessments discussed above. Machine excavated trial pitting will be the most appropriate technique for investigation and soakaway trials on this large area.

Appendix A

Site Location



KEY: ORDER LIMITS AERIAL PLAN

☐	ORDER LIMITS
▨	AREA NOT PART OF ORDER LIMITS

DOCUMENT REFERENCE NUMBER: 2.39 LC DRW

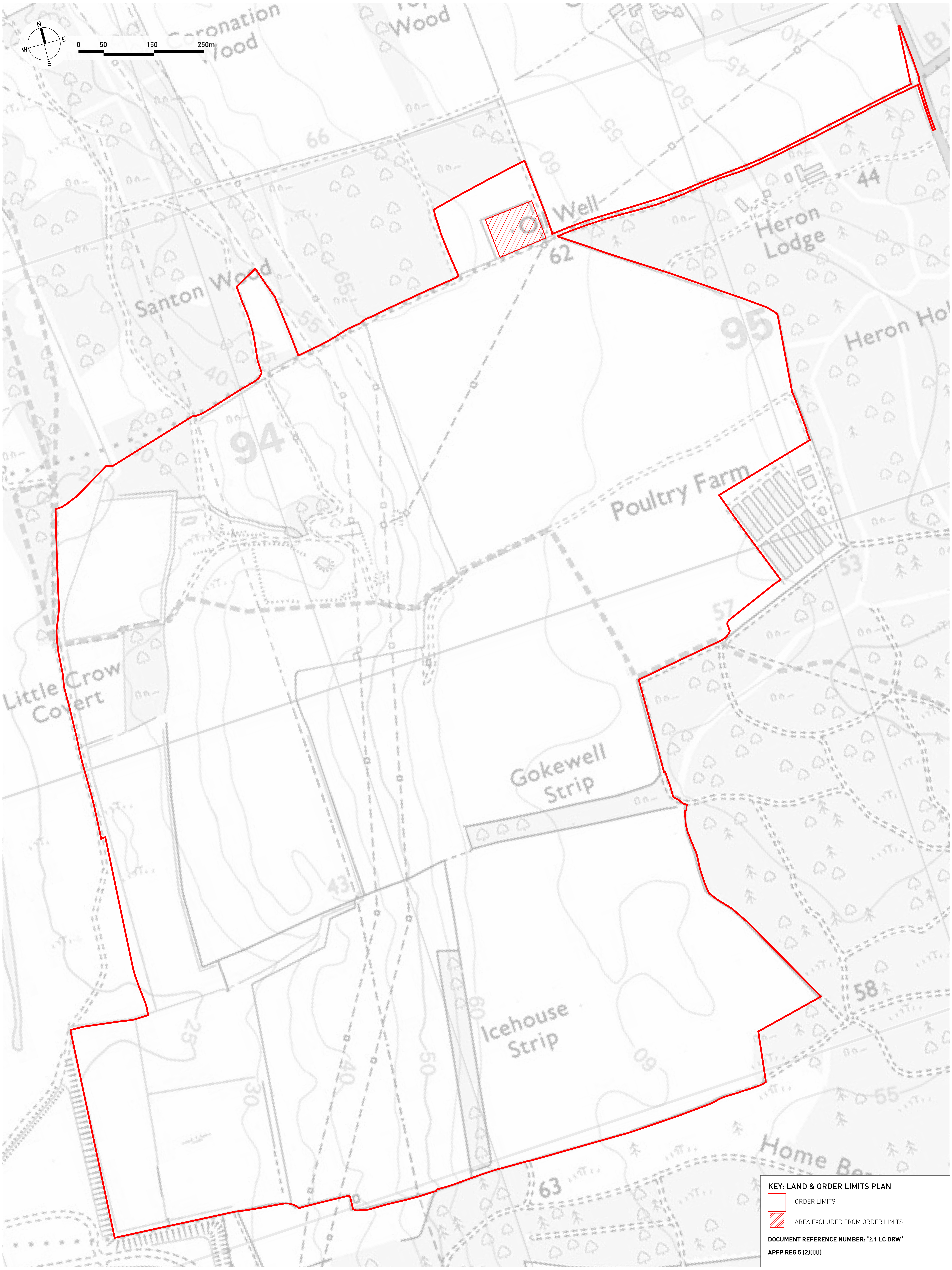
APFP REG: 5(2)(O)

INDICATIVE PLAN FOR INFORMATION ONLY

LITTLE CROW SOLAR PARK - **INDICATIVE AERIAL IMAGE OF ORDER LIMITS**

Pegasus
Design

PLANNING | DESIGN | ENVIRONMENT | ECONOMICS | www.pegasusgroup.co.uk | TEAM/DRAWN BY: RIT | APPROVED BY: GR | DATE: 15/10/2020 | SCALE: 1:5000 @ A0 | DRWG: **P17-0718**_31 SHEET NO: __ REV: E | CLIENT: **INRG SOLAR (LITTLE CROW) LTD.** |



KEY: LAND & ORDER LIMITS PLAN

🟥 ORDER LIMITS

▨ AREA EXCLUDED FROM ORDER LIMITS

DOCUMENT REFERENCE NUMBER: ˚2.1 LC DRW˚

APFP REG 5 (2)(i)(i)

LITTLE CROW SOLAR PARK - **LAND PLAN INCLUDING ORDER LIMITS**

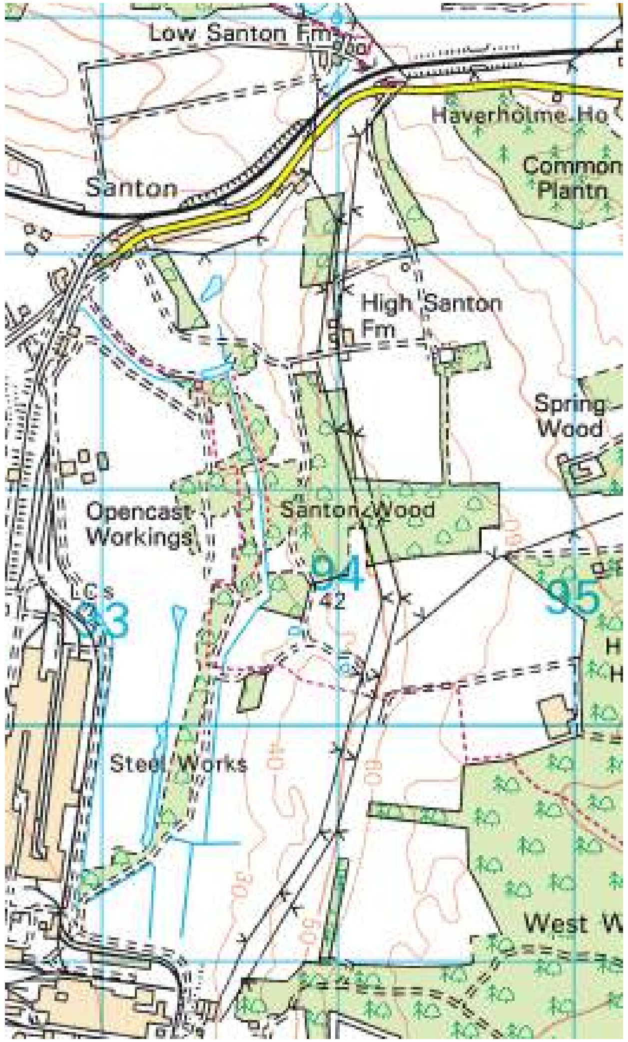
PLANNING | DESIGN | ENVIRONMENT | ECONOMICS | www.pegasusgroup.co.uk | TEAM/DRAWN BY: RIT | APPROVED BY: GR | DATE: 30/10/2020 | SCALE: 1:2500 @ A0 | DRWG: **P17-0718_29** SHEET NO: __ REV: E | CLIENT: **INRG SOLAR (LITTLE CROW) LTD.** |

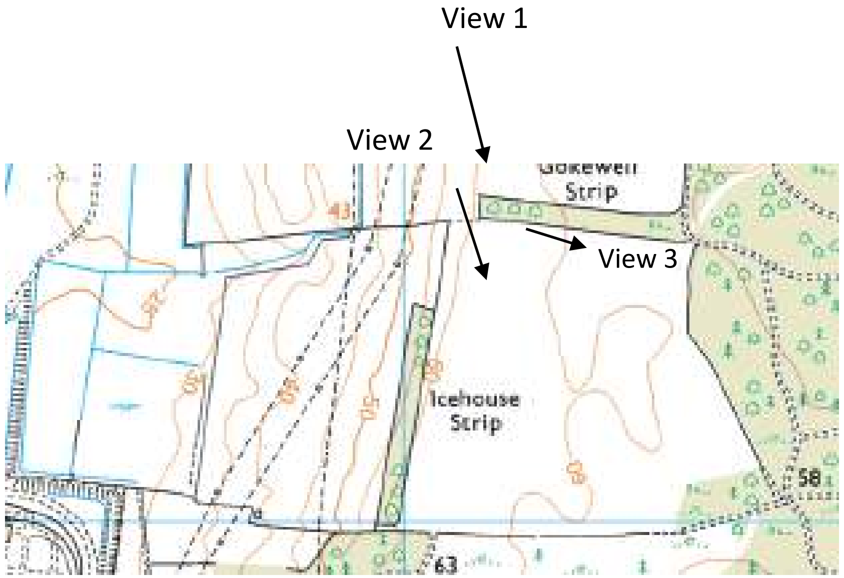
Pegasus
Design

Appendix B

Site Description/Photographs

Santon
Solar/Battery
Site survey photos





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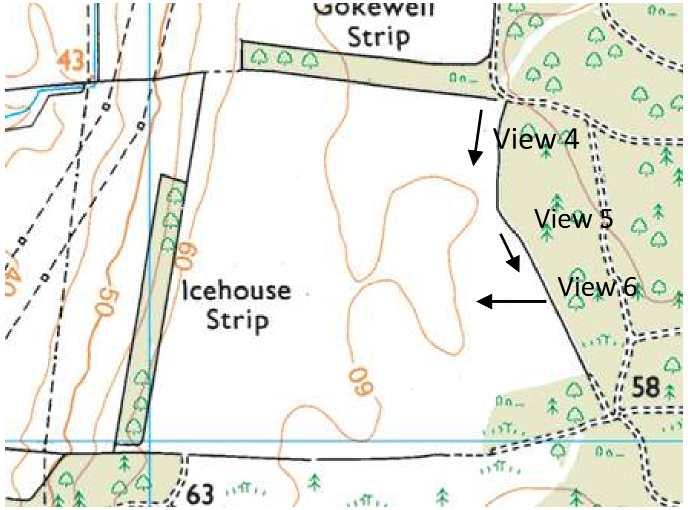
View 3



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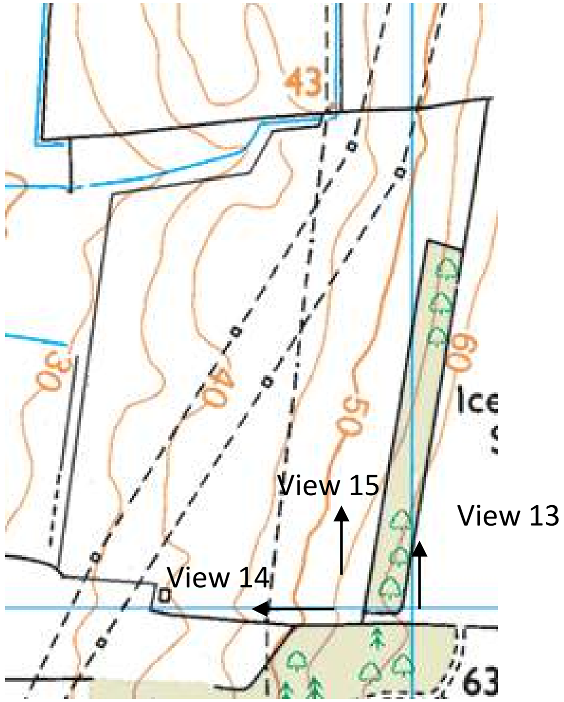

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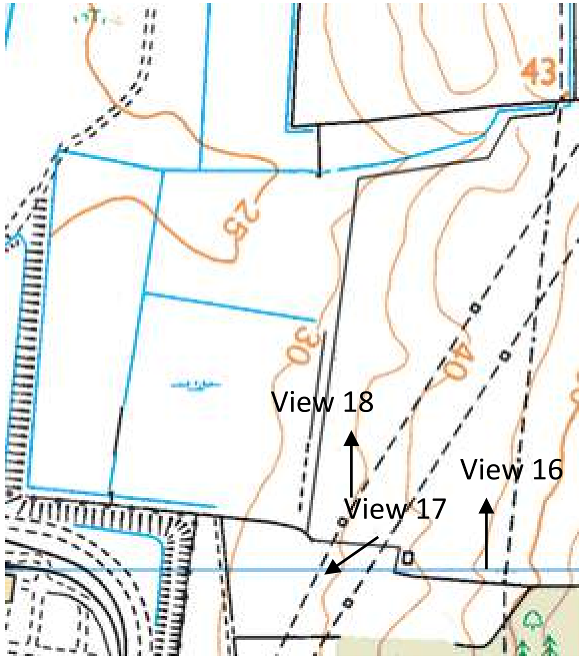
View 15



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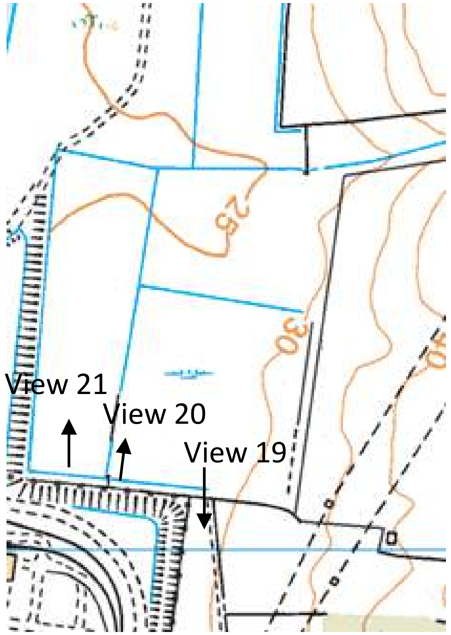
View 17 Sub

View 18



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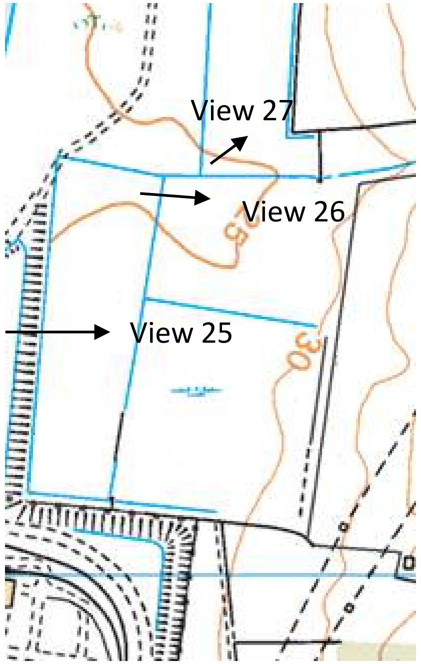

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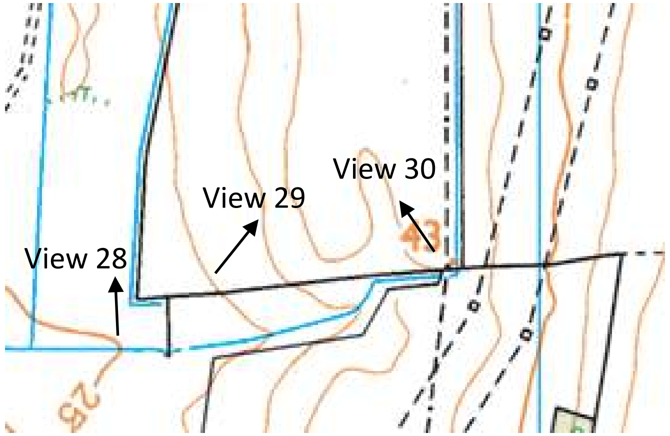

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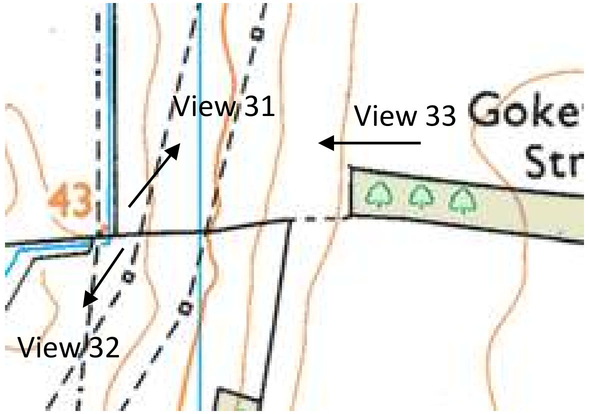

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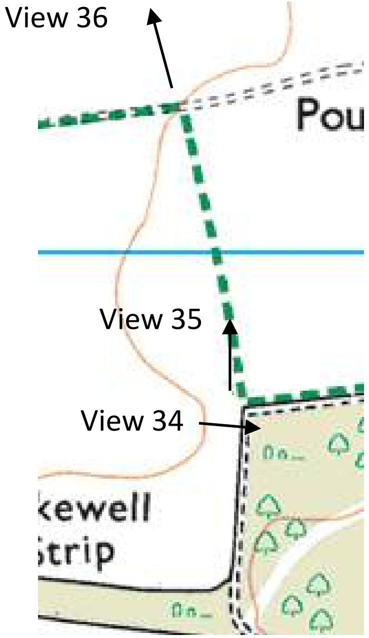

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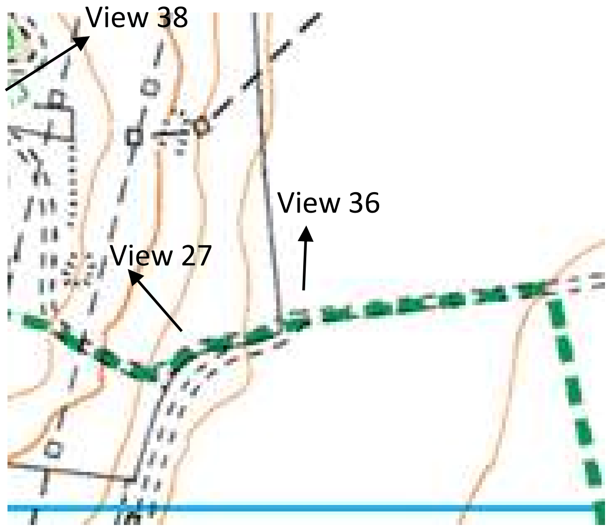

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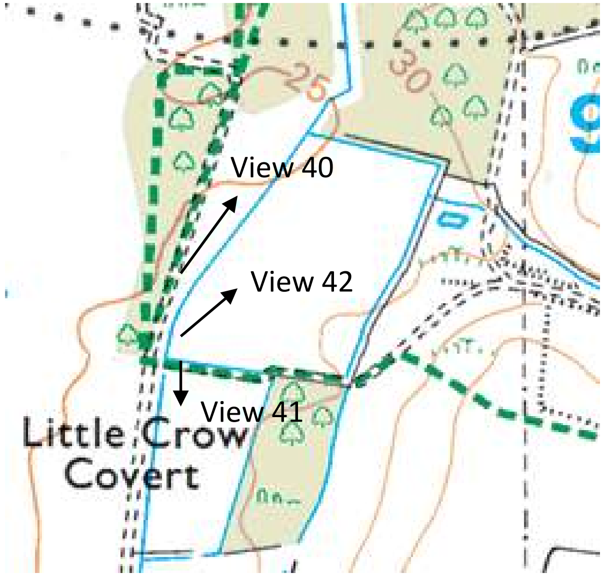

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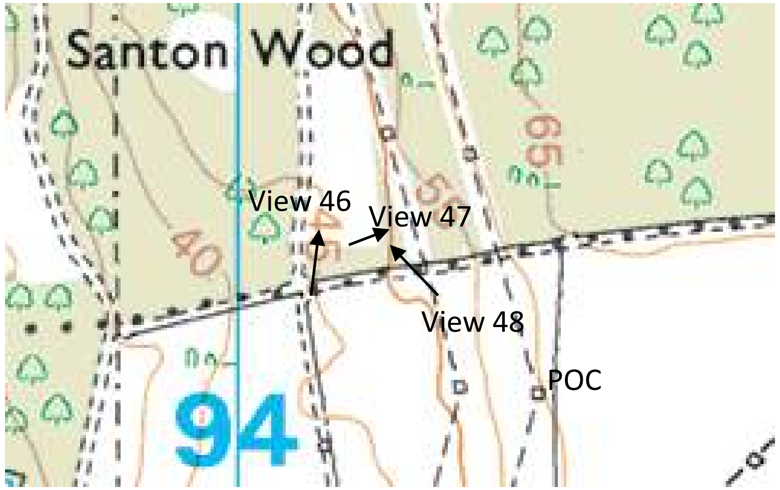

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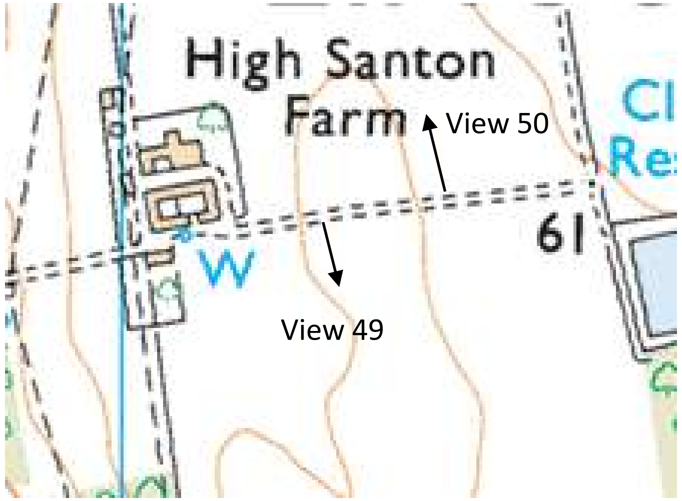

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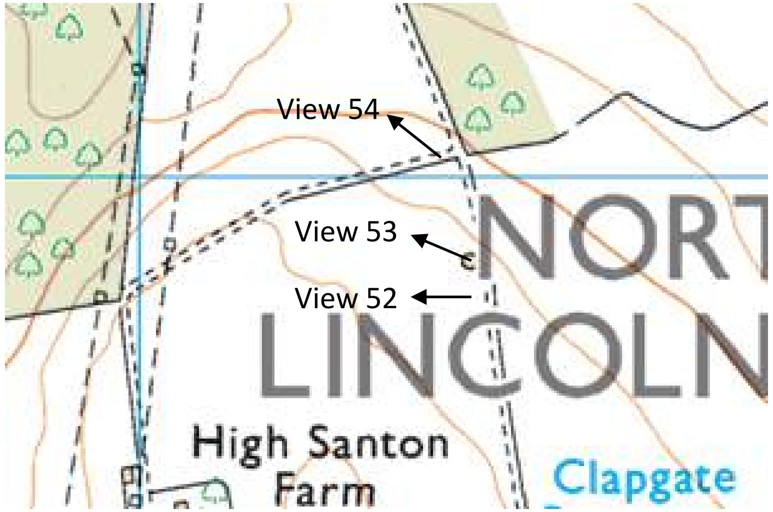

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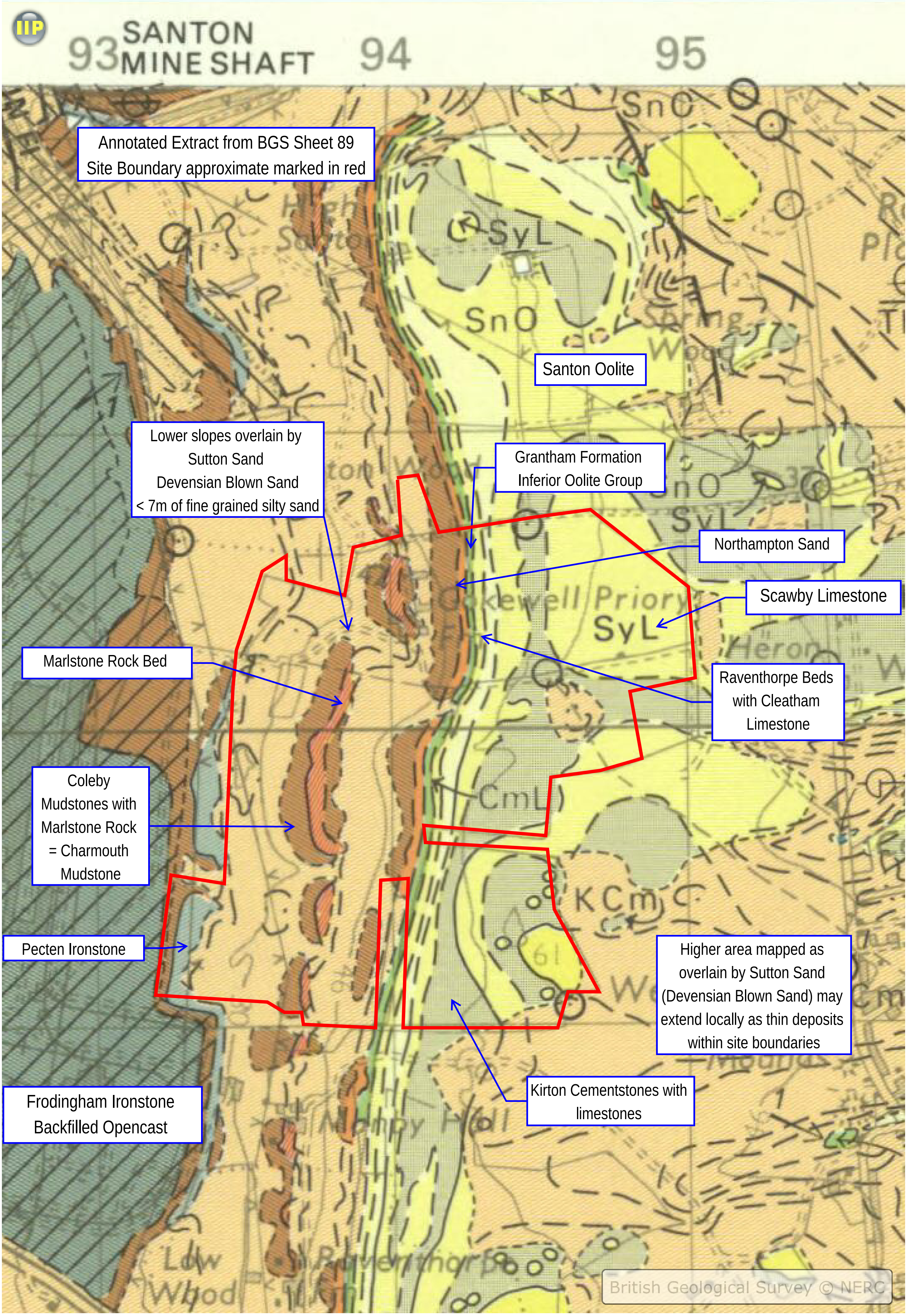
View 54

Appendix C

Geological Information



Annotated Extract from BGS Sheet 89
Site Boundary approximate marked in red

Santon Oolite

Lower slopes overlain by
Sutton Sand
Devensian Blown Sand
< 7m of fine grained silty sand

Grantham Formation
Inferior Oolite Group

Northampton Sand

Scawby Limestone

Marlstone Rock Bed

Raventhorpe Beds
with Cleatham
Limestone

Coleby
Mudstones with
Marlstone Rock
= Charmouth
Mudstone

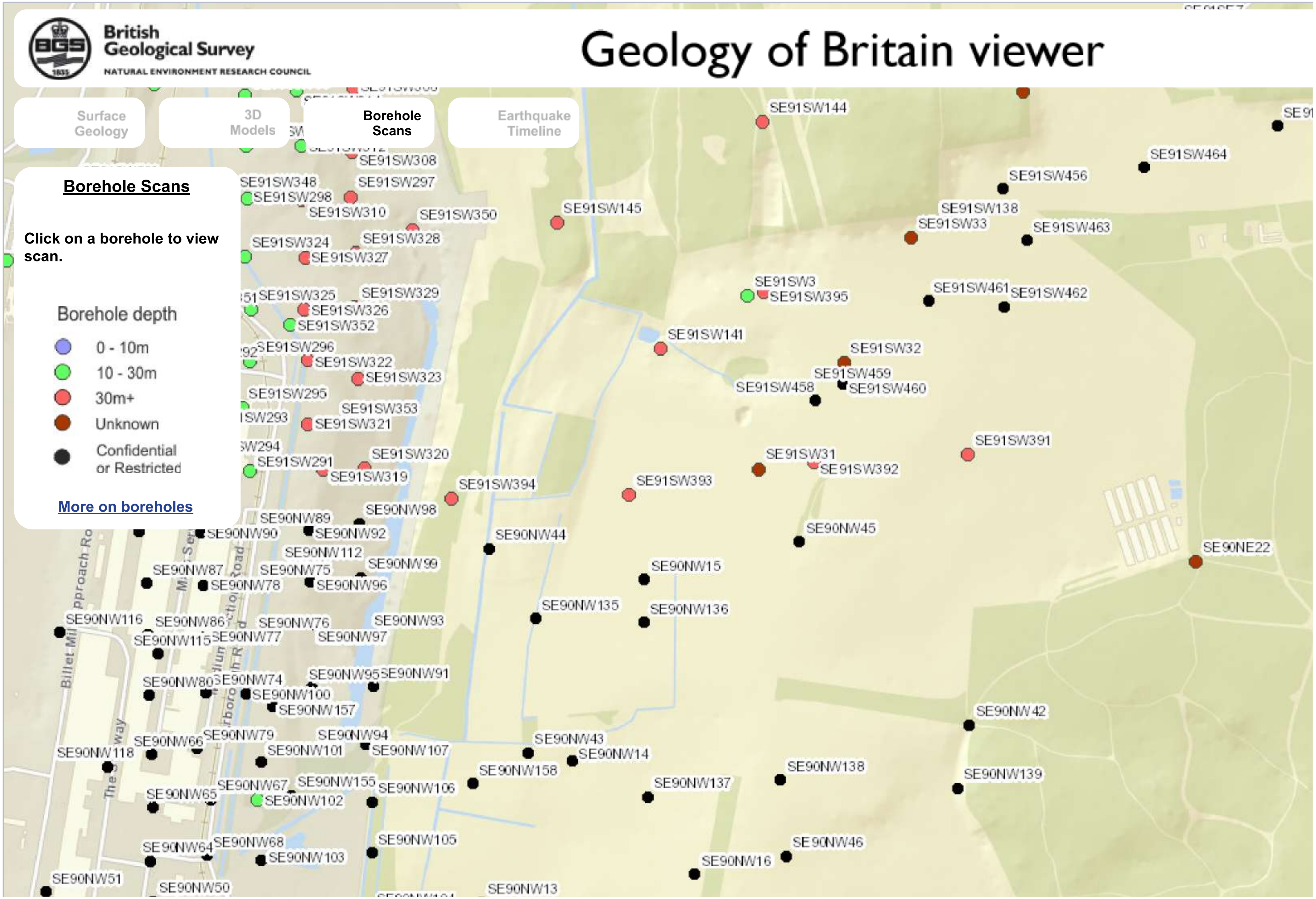
Pecten Ironstone

Higher area mapped as
overlain by Sutton Sand
(Devensian Blown Sand) may
extend locally as thin deposits
within site boundaries

Frodingham Ironstone
Backfilled Opencast

Kirton Cementstones with
limestones

British Geological Survey © NERC



British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Geology of Britain viewer

Surface Geology | 3D Models | **Borehole Scans** | Earthquake Timeline

Borehole Scans

Click on a borehole to view scan.

Borehole depth

●	0 - 10m
🟢	10 - 30m
🔴	30m+
●	Unknown
●	Confidential or Restricted

[More on boreholes](#)

(*11932) Wt.30370/0370 10,000 9/39 A.& E.W.Ltd. Gp.685

RECORD OF SHAFT OR BORE FOR MINERALS

SE 91 SW/14-1

County LINCS
6" Quarter Sheet SE 91 SW/SE
1" N.S. Geol. Map 89 Brigg
1" O.S. Geol. Map
Whether Confidential
SE 93871039

Name and Number of Shaft or Bore given by Geological Survey: Gokewell Priory Farm

Name and Number given by owner (if different from above): M106

Town or Village Date of sinking

Exact site near pond to west of Gokewell Priory Farm

A sketch-map or tracing from a large-scale map is desirable.

Purpose for which made 29.51

Level at which bore commenced relative to O.D. 96·8 If not down bore, state if horizontal or up

Made by for Messrs.

Information from Date received

Specimens Dip of strata

Geological Classification	Description	Thickness			Depth		
	Blown Sand				3.66	12	0
	Blue clay				11.58	38	0
	Pecten Bed 41.61–42.06				12.80	42	0
	Blue clay. Soft clayey ironstone band at 136'6"-138';						
	the clays are sandy bet. 138' + 142'. Practically no	42.06	– 43.28				
	fossils above 85'. Bottom 6' no core				47.55	156	0
	Frod. Ironstone: red-brown and golden brown and					11 4	
	greenish brown ool. + shelly ironstones. Blue grey						
	calc. + clayey beds 160'-163'6"; bluish clayey ironstone	48.77	– 49.84				
	164'9"-165'6"; band of re-worked ironstone pebbles	50.22	– 50.44				
	174'-5'.	53.04	– 53.34		56.16	184	3
	Blue clay				56.39	185	0

FOSSILS Plicatula spinosa from 47'-48'; Serpula plicatilis from 61'; "Polymorphites" (gen. nov.) sp. nov., Coeloderoceras sp. ind., Cuneirhynchia sp., Eucyclus sp., Lima sp., L. pectinoides, Entolium lehli, Zygopleura sp., Hemipedina loriesi, Katosira aff. periniana, Nuculana minor, Cuneirhynchia cf. dalmasi, Nuculana complanata, Zygopleura sp. nov., Katosira sp., Procerithium cf. 5 granosum, Riselloidea subdisjuncta, + Plicatula spinosa all from 85'-102' (taylori zone).
Rimirhynchia sp. from 96' to 100'
Nuculana complanata β, Astarte striato-sulcata, Procerithium cf. slatteri, Grandirhynchia + Zygopleura sp. all from 110'.
Echioceras (Enechioceras) sp. nov. + Hemimicroceras sp. from 115' (macdonnelli zone)
Echioceras aff. raricostatoides, E. sp. juv., + Chlamys torulosi from 132'-138' (raricostatoides zone)
Gagaticeras gagateum, G. spp. juv., Parechioceras spp. juv. from 142'-148' (gagateus zone)

Top of F.I. – 59·2

Drawn up TPF

GEOLOGICAL SURVEY AND MUSEUM,
SOUTH KENSINGTON,
LONDON, S.W.7.

G.S.M. Office File No.	Site marked on 6″ Map by	Site marked on 1″ Map by

BGS ID: 134475 : BGS Reference: SE91SW391
British National Grid (27700) : 494555,410167

Report an issue with this borehole

<< < Prev Page 1 of 1 ▾ Next > >>

Yokewell Southeast SE 91 SW/391

The United Steel Cos. Ltd.
ORE MINING BRANCH
Colsterworth/Scunthorpe

EXPLORATION RECORD

Hole No. Y.192

O.S. Sheet Ref.
Lease Yarboro'
Area Yarboro'
Date Started 28.3.64
Position 9454 1016 O.S.224 Parish of Broughton.
Date Completed 19.4.64

GEOLOGICAL LOG

Depth Feet From	To	Thick. Ft.	Description		Geological Horizon
0.0	0.76 2.5	0.76 2.5	Top Soil	) Lincs.)	
2.5	3.66 12.0	2.90 9.5	Cream oolitic limestone	) Limestone)	Inferior Oolite
12.0	6.40 21.0	2.74 9.0	Grey sandy clay)	)	
21.0	6.71 22.0	0.30 1.0	Brown Sandy clay)	L.E.S.)	
22.0	11.28 37.0	4.57 15.0	Sandstone)	)	
37.0	23.77 78.0	12.50 41.0	Grey clay)		
78.0	26.82 88.0	3.05 10.0	Brown Shale)		Upper Lias
88.0	32.00 105.0	5.18 17.0	Grey clay)		
105.0	34.14 112.0	2.13 7.0	Marlstone)		
112.0	58.52 192.0	24.38 80.0	Grey clay)		Middle Lias
192.0	59.59 195.5	1.07 3.5	Pecten)		
195.5	93.05 302.0	32.46 106.5	Grey clay)		Lower Lias
302.0	101.89 334.3	9.85 32.3	F.I.B.)		
334.3	102.11 335.0	0.21 0.7	Blue Bind)		

Hole Plugged at 302.0'.

1 Surface level
2 Kirton Cementstones
3 Santon Oolite
4 Raventhorpe Beds and
5 [illegible] Cementstone
6 Northampton Sand
7 Coleby Mudstones with
8 Marlstone Rock (2.13 at
32.00) and Pecten
9 Ironstone (1.07 at 58.52)
10
11 Frodingham Ironstone
12 Scunthorpe Mudstones
on [illegible]
13

92 05
32.00
60.05 (2.13)

92.05
58 52
33.53

92 05
60.45
-31.60

DRILL LOG

CROWNS USED

Size	No.	Feet
143		5.0
131		35.5
114		10.5
116	FB	251.0
101	631269	33.0

REAMERS USED

Size	No.	Feet

CASING USED

Size	Set (Ft.)	Recovered (Ft.)
143	5.3	5.3
128	41.3	41.3

Water Used 48,600

Rest Water Level

LEVELS 60.45

Surface	198.3
Top I'st.	-103.7
Bottom I'st.	-136.0

Signed R.J.[illegible]

P. & H. 1/59.

Yokewell South SE 91 SW/392

The United Steel Cos. Ltd.
ORE MINING BRANCH
Colsterworth/Scunthorpe

EXPLORATION RECORD

Hole No. Y.188

O.S. Sheet Ref.

Lease Yarboro'

Area Yarboro'

Date Started 12.3.64

Position 94171016 O.S.268 Parish of Broughton

Date Completed 28.3.64

GEOLOGICAL LOG

Depth Feet From	Depth Feet To	Thick. Ft.	Description	Geological Horizon
0.0	4.42 14.5	4.42 14.5	Yellow Clay	Recent
14.5	4.88 16.0	0.46 1.5	Hard Grey Limestone)	
16.0	10.52 34.5	5.63 18.5	Brown Sandy Shale)	Middle
34.5	15.85 52.0	5.33 17.5	Grey Clay)	Lias
52.0	17.98 59.0	2.13 7.0	Marlstone)	
59.0	42.37 139.0	24.38 80.0	Grey Clay))	
139.0	43.26 142.5	1.07 3.5	Pecten)	
142.5	76.81 252.0	33.38 109.5	Grey clay)	Lower
252.0	86.04 282.3	9.24 30.5	F.I.B.)	Lias
282.3	86.56 284.0	0.52 1.7	Grey Clay)	

Hole plugged at 282'-3"

DRILL LOG

CROWNS USED

Size	No.	Feet
143		14.5
131		27.5
116		10.5
116	FB	199.5
101	631269	32.0

REAMERS USED

Size	No.	Feet

CASING USED

Size	Set (Ft.)	Recovered (Ft.)
143	15.1	15.1
128	162.3	162.3

Water Used 36,100

Rest Water Level

LEVELS

Surface	161.3
Top I'st.	- 90.7
Bottom I'st.	-120.7

Signed

P. & H. 1/59.

Little Cross Covert East SE 91 SW/393

The United Steel Cos. Ltd.
ORE MINING BRANCH
Colsterworth/Scunthorpe

EXPLORATION RECORD

Hole No. Y.189

O.S. Sheet Ref.

Lease Yarboro'

Area Yarboro'

Date Started 12.3.64

Position 93841020 O.S.268 Parish of Broughton.

Date Completed 23.3.64

GEOLOGICAL LOG

Depth Feet From	Depth Feet To	Thick. Ft.	Description	Geological Horizon
0.0	3.05 10.0	3.05 10.0	Yellow clay	
10.0	20.03 67.5	17.53 57.5	Grey clay	
67.5	21.64 71.0	1.07 3.5	Pecten	Lower
71.0	54.86 180.0	33.32 109.0	Grey clay	Lias
180.0	64.31 211.0	9.45 31.0	F.I.B.	
211.0	64.92 213.0	0.30 2.0	Grey Bed	

54.86
20.03
34.83(1.07)

54.86
36.40
~~32.22~~
-18.46

DRILL LOG

CROWNS USED

Size	No.	Feet
131	FB	61.5
131	-	3.5
116	FB	116.0
101	631723	33.0

REAMERS USED

Size	No.	Feet

CASING USED

Size	Set (Ft.)	Recovered (Ft.)
143	5.0	5.0
128	72.0	72.0

Water Used 24,520

Rest Water Level

LEVELS

36.40

Surface	119.4
Top I'st.	-60.6
Bottom I'st.	-91.6

Signed R.J.M.

P. & H. 1/59.

BGS ID: 134479 : BGS Reference: SE91SW395
British National Grid (27700) : 494087,410523
Report an issue with this borehole

<< | < Prev | Page 1 of 2 ▾ | Next > | >>

Tokewell Farm North SE 91 SW/395

The United Steel Cos. Ltd.
ORE MINING BRANCH
Colsterworth/Scunthorpe

EXPLORATION RECORD

Hole No. X.193.

O.S. Sheet Ref.
Lease Yarboro'
Area Yarboro'
Date Started 15.4.64
Position 94901 051 0.S.273 Parish of Broughton.
Date Completed 29.4.64

GEOLOGICAL LOG

Depth Feet From	To	Thick. Ft.	Description	Geological Horizon
0.0	1·83 6.0	1·83 6.0	Brown Sand)	Recent
6.0	4·27 14.0	2·44 8.0	Yellow Clay)	Middle Lias
14.0	6·40 21.0	2·13 7.0	Marlstone)	
21.0	31·70 104.0	25·30 83.0	Grey Clay)	
104.0	32·61 107.0	0·91 3.0	Pecten)	
107.0	66·14 217.0	33·53 110.0	Grey Clay)	Lower Lias
217.0	74·89 245.7	8·75 28.7	F.I.B.)	
245.7	76·41 250.7	0·30 1.0	Blue Bind)	

Water lost in ironstone.

Hole plugged at 245.7'

DRILL LOG

CROWNS USED

Size	No.	Feet
143		9.0
131		16.0
114	FB	192.0
101	642333	33.7

REAMERS USED

Size	No.	Feet

CASING USED

Size	Set (Ft.)	Recovered (Ft.)
143	10.3	10.3
128	131.9	131.9

Water Used 30,600

Rest Water Level

LEVELS 43·54

Surface	142.8
Top I'st.	-74.2
Bottom I'st.	-102.9

Signed

P. & H. 1/59.

Soil Site Report

Extended Soil Report

Santon 1844

Easting: 493973
Northing: 409748
Site Area: 1km x 1km

Prepared for: Kay Boreland, Integrale Ltd
Date: 08 Aug 2017

Citation

Citations to this report should be made as follows:

National Soil Resources Institute (2017) Soils Site Report for location 493973E, 409748N, 1km x 1km, National Soil Resources Institute, Cranfield University. Accessed via: https://www.landis.org.uk/sitereporter

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About this report

This Soil Site Report identifies and describes the properties and capacities of the soil at your specified location as recorded in the National Soil Map for England and Wales. It has been produced by Cranfield University's National Soil Resources Institute.

The National Soil Map represents the most accurate and comprehensive source of information about the soil at the national coverage in England and Wales. It maps the distribution of soil mapping units (termed soil associations) which are defined in terms of the main soil types (or soil series) that were recorded for each soil association during field soil survey. Each soil association is named after its principal soil series and these bear the location name from where they were first described (e.g. Windsor). Each of these soil associations have differing environmental characteristics (physical, chemical and biological) and it is by mapping these properties that the range of thematic maps in this report have been produced.

Soil types and properties vary locally, as well as at the landscape scale. It is not possible to identify precisely the soil conditions at a specific location without first making a site visit. We have therefore provided you with information about the range of soil types we have identified at and around your selected location. Schematic diagrams are also provided to aid accurate identification of the soil series at your site.

Whilst an eight-figure national grid reference should be accurate to within 100m, a single rural Postcode can cover a relatively large geographical area. Postcodes can therefore be a less precise basis for specifying a location. The maps indicate the bounded area the reports relate to.

Your Site Soil Report will enable you to:

- identify the soils most likely to be present at and immediately around your specified location;
- understand the patterns of soil variation around your location and how these correlate with changes in landscape;
- identify the nature and properties of each soil type present within the area;
- understand the relevant capacities and limitations of each of the soils and how these might impact on a range of factors such as surface water quality.

Provided that this Site Soil Report is not modified in any way, you may reproduce it for a third-party.

Table of Contents

1. Soil Thematic Maps

This section contains a series of maps of the area surrounding your selected location, presenting a number of themes relating to the characteristics of the soils. These provide an overview of the nature and condition of the local soil conditions. It is these conditions that may be used to infer the response of an area to certain events (with the soil as a receptor), such as pollution contamination from a chemical spill, or an inappropriate pesticide application and the likelihood of these materials passing though the soil to groundwater. Other assessments provide an insight into the way a location may impact, by corrosive attack or ground movement, upon structures or assets within the ground, for example building or engineering foundations or pipes and street furniture.

Soil is a dynamic environment with many intersecting processes, chemical, physical and biological at play. Even soils 'sealed' over by concrete and bitumen are not completely dormant. The way soils respond to events and actions can vary considerably according to the properties of the soil as well as other related factors such as land-use, vegetation, topography and climate. There are many threats facing our national soil resource today and importance should be given to identifying the best measures aimed towards soil protection, ensuring the usage of soils in the most sustainable way. This report is therefore a useful snapshot of the soil properties for your given area, providing a summary of a broad range of ground conditions

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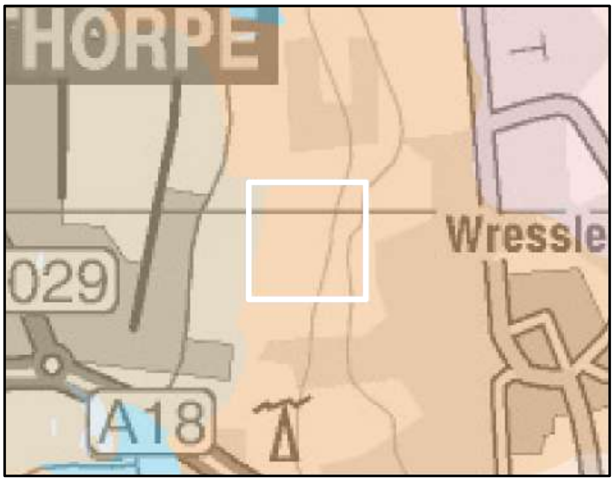
Figure 1: Location of study area

1a Soils - Spatial Distribution



Soils - Spatial Distribution Key

■ 544 BANBURY
Well drained brashy fine and coarse loamy ferruginous soils over ironstone.

■ 551d NEWPORT 1
Deep well drained sandy and coarse loamy soils.

SOIL ASSOCIATION DESCRIPTION

Soil associations represent a group of soil series (soil types) which are typically found occurring together, associated in the landscape (Avery, 1973; 1980; Clayden and Hollis, 1984). Soil associations may occur in many geographical locations around the country where the environmental conditions are comparable. For each of these soil associations, a collection of soil types (or soil series) are recorded together with their approximate proportions within the association. Soil associations have codes as well as textual names, thus code '554a' refers to the 'Frilford' association. Where a code is prefixed with 'U', the area is predominantly urbanised (e.g. 'U571v'). The soil associations for your location, as mapped above, are described in more detail in Section 2: Soil Association Descriptions.

1b Hydrology of Soil Type (HOST)

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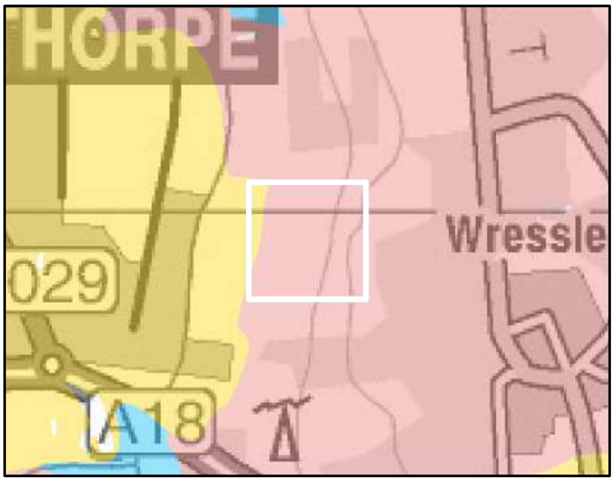


Hydrology of Soil Type (HOST) Key

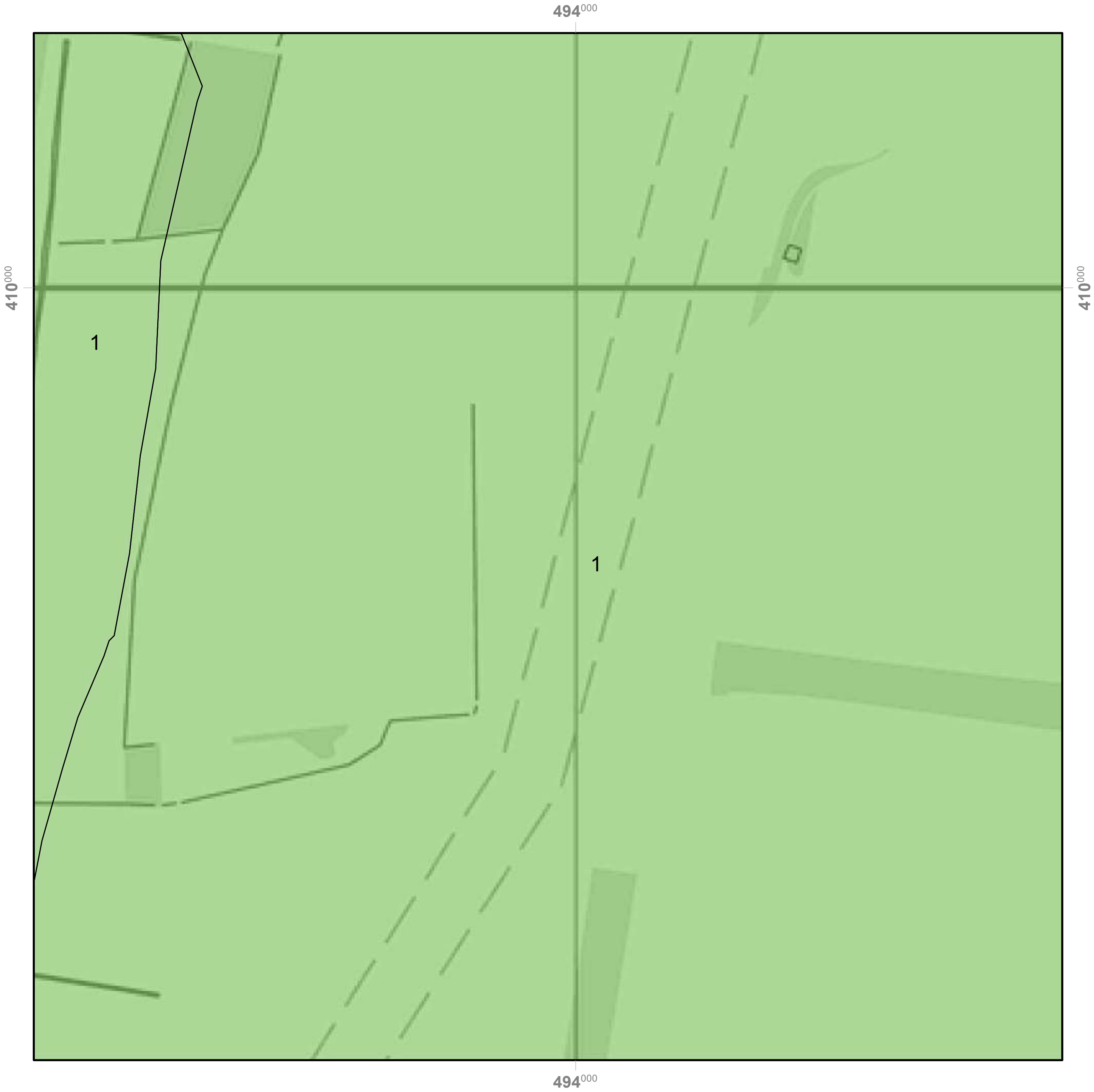
🟨 2 Free draining permeable soils on 'brashy' or dolomitic limestone substrates with high permeability and moderate storage capacity

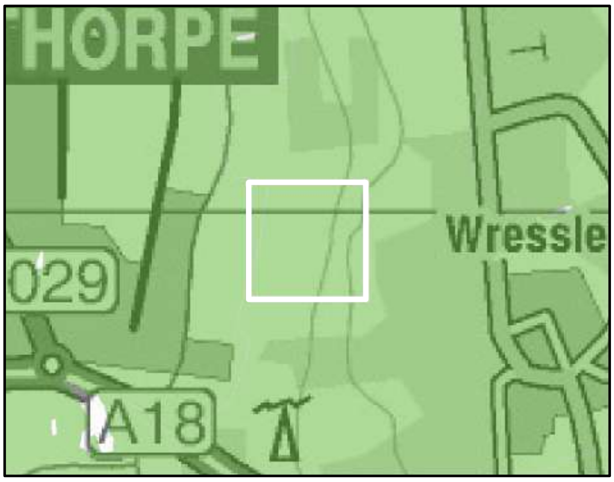
🟥 5 Free draining permeable soils in unconsolidated sands or gravels with relatively high permeability and high storage capacity

HOST CLASS DESCRIPTION

The Hydrology of Soil Types (HOST) classification describes the dominant pathways of water movement through the soil and, where appropriate, the underlying substrate. Eleven drainage models are defined according to the permeability of the soil and its substrate and the depth to a groundwater table, where one is present (Boorman et al,1995). These are further subdivided into 29 HOST classes to which all soil series have been assigned. These classes identify the way soil water flows are partitioned, with water passing over, laterally through, or vertically down the soil column. Analysis of the river hydrograph and the extent of soil series for several hundred gauged catchments allowed mean values for catchment hydrological variables to be identified for each HOST class, The HOST classification is widely used to predict river flows and the frequency and severity of flood events and also to model the behaviour of diffuse pollutants (Hollis et al, 1995).

1c Ground Movement Potential





Ground Movement Potential Key

🟩 1 Very low

* If a High class is starred, a Very High ground movement potential is likely to be achieved if these soils are drained to an effective depth of at least two metres.

GROUND MOVEMENT POTENTIAL DESCRIPTION

Clay-related ground movement is the most widespread cause of foundation failure in the UK and is linked to seasonal swelling and shrinkage of the clay. The content of clay within the soils of your selected area has therefore a direct bearing upon the likelihood of ground movement.

Among the inorganic particles that constitute the solid component of any soil, clay particles are the smallest and defined as being less than 0.002 mm - equivalent spherical diameter (esd) in size. Clay particles occur in most kinds of soil but they only begin to exert a predominant influence on the behaviour of the whole soil where there is more than 35 per cent (by weight) of clay-sized material present.

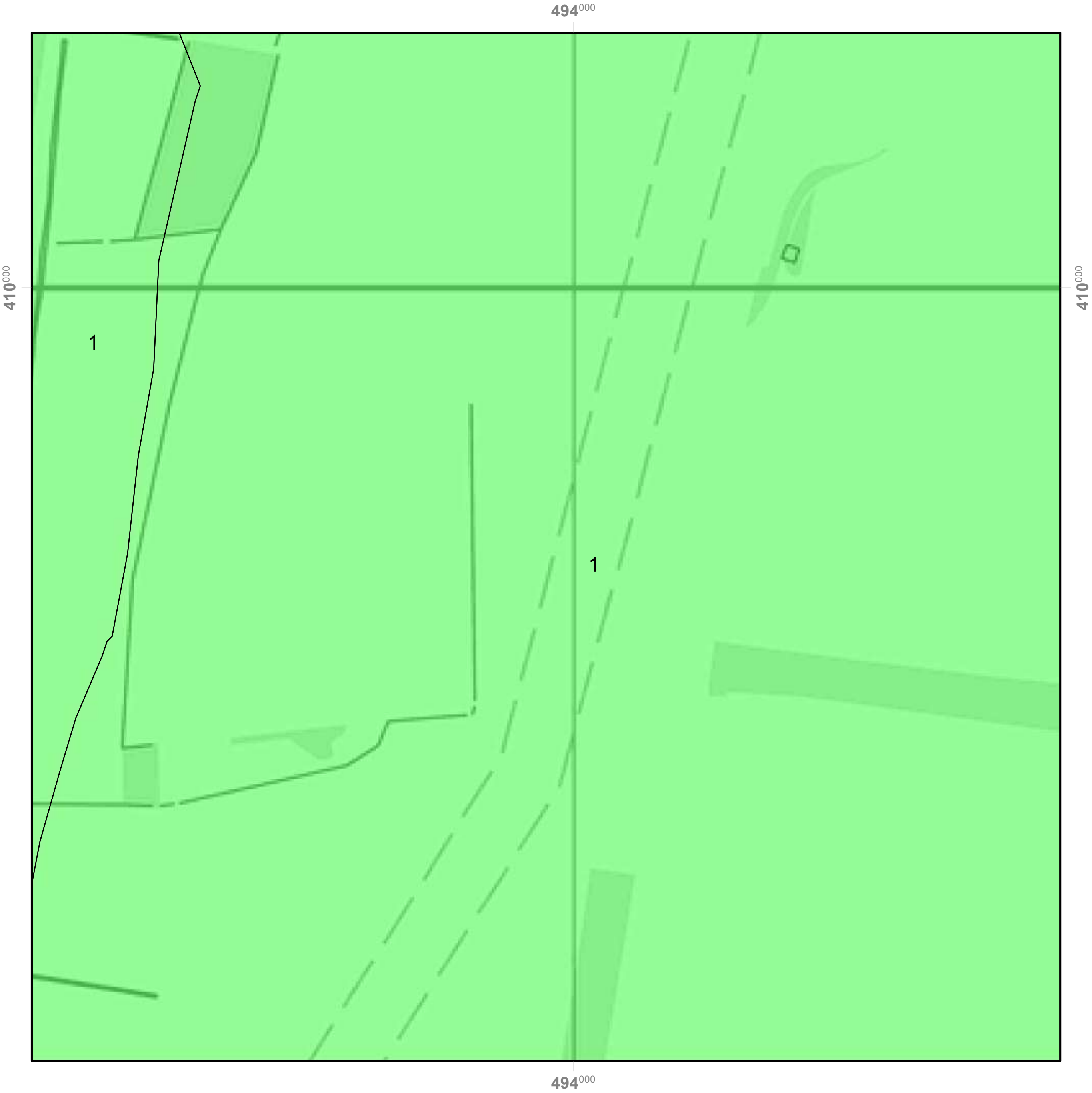
Because clay particles are very small and commonly platy in shape they have an immense surface area onto which water can be attracted, relative to the total volume of the soil material. In addition to surface attraction or inter-crystalline absorption of water, some clay minerals, those with three layers of atoms (most other kinds of clay have only two layers of atoms) are able to absorb and hold additional water between these layers. It is these types of clay mineral, which are widespread in British soils and commonly known as smectites that have the greatest capacity to shrink and swell.

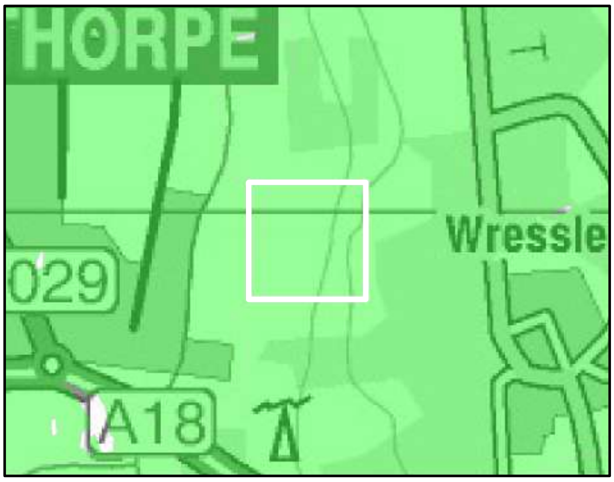
In a natural undisturbed condition, the moisture content of deep subsoil clay does not change greatly through the year and consequently there are no changes in volume leading to shrinkage and swelling. However, when clays are exposed at or near the ground surface and especially when vegetation is rooting in them seasonal moisture and volume changes can be dramatic. Plants and trees transpire moisture from the soil to support their growth and transfer necessary nutrients into their structures. Surface evaporation also takes place from soil and plant structures, and the combination of evaporation from surfaces and transpiration by plants and trees is termed evapotranspiration. Thus, the layer of soil material down to 2m depth into which plants will root is critical when assessing the vulnerability of land to subsidence.

Whenever soil moisture is continuously being replenished by rainfall, the soil moisture reserves will be unaffected by the removal of moisture by plants as there is no net loss. However, in many parts of Britain, particularly in the south and east, summer rainfall is small and is exceeded by evapotranspiration. Water reserves are then not sufficiently replenished by rainfall and so a soil moisture deficit develops. The water removed from a clayey soil by evapotranspiration leads to a reduction in soil volume and the consequent shrinkage causes stress in the soil materials leading in turn to stress on building foundations that are resting in the soil (Hallett, et al, 1994).

The foundations themselves may then move and thus cause damage to building structures. This problem can be exacerbated by the fact that the soil beneath the structure may not dry out uniformly, so that any lateral pressure exerted on the building foundation is made effectively greater. This assessment identifies the likelihood of soil conditions being prone to ground movement given these other factors.

1d Flood Vulnerability





Flood Vulnerability Key

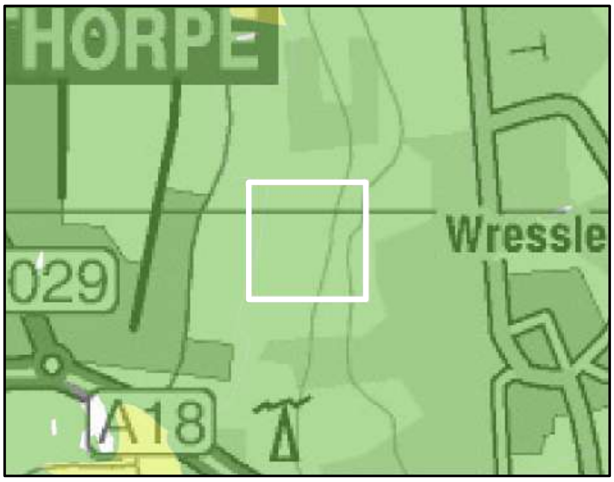
🟩 1 Minor risk

FLOOD VULNERABILITY DESCRIPTION

The inundation of properties by flood water can occur in a number of circumstances. Surface run-off can collect on low-lying land from upslope following heavy rainfall. More commonly rivers, lakes and/or the sea extend beyond their normal limits as a result of prolonged or intense rainfall, unusually high tides and/or extreme wind events. Water damage to properties and their contents is compounded by the deposition of sediment suspended in the flood waters. The spatial distribution of such waterborne sediment (or alluvium as defined in soil science) is one basis upon which land that has been subject to historical flooding can be mapped, and this forms a basis for present-day flooding risk assessment.

Both riverine and marine alluvium are identified as distinct soil parent materials within the British soil classifications. Combining soil map units that are dominated by soil series developed in alluvium across Great Britain identifies most of the land that is vulnerable to flooding. This assessment does not account for man-made flood defence measures, showing instead the areas where once water has stood.

1e Risk of Corrosion to Ferrous Iron



Risk of Corrosion to Ferrous Iron Key

🟩 1 Non-aggressive

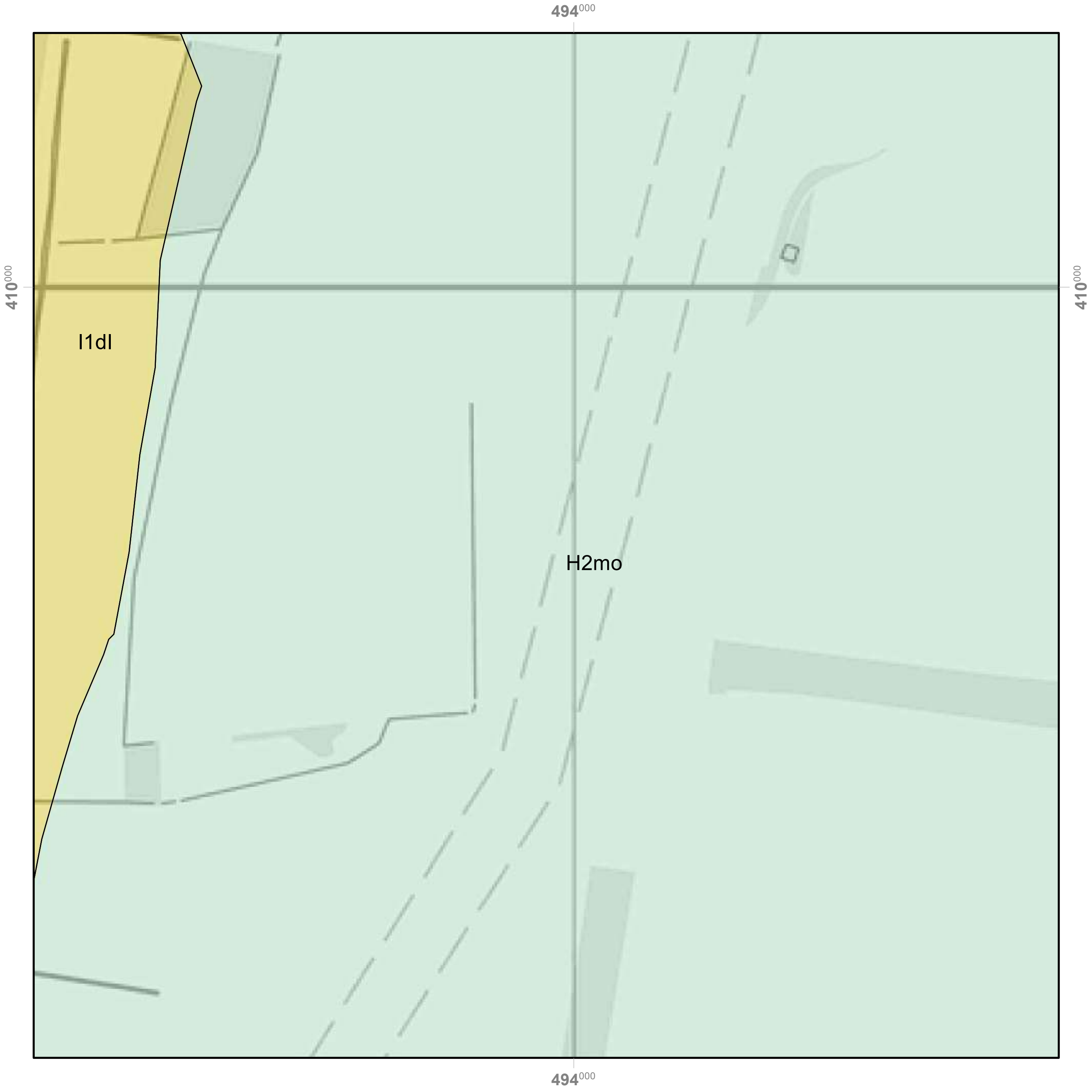
* If a class is starred, it is assumed that there are moderate amounts of sulphate in the soil. If there is abundant sulphate present, the soil may be one class more aggressive. Conversely, if there is very little sulphate, the soil may be one class less aggressive to

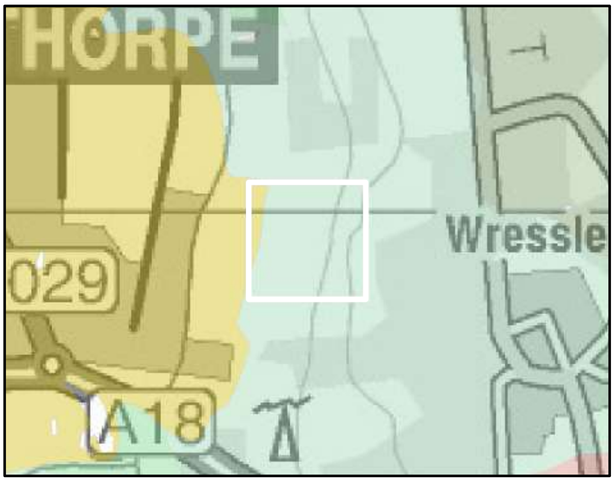
buried ferrous iron.

RISK OF CORROSION TO FERROUS IRON DESCRIPTION

Buried iron pipes and other infrastructure corrode at rates that are influenced by soil conditions (Jarvis and Hedges, 1994). Soil acidity, sulphide content, aeration and wetness all influence the corrosivity of the soil. These factors are used to map 5 major classes of relative corrosivity.

1f Pesticide Leaching Risk





Pesticide Leaching Risk Key

🟩 H2mo Sandy soil with low organic matter; groundwater at moderate depth

🟨 I1dl Deep loamy soil over soft limestone with deep groundwater

PESTICIDE LEACHING CLASS DESCRIPTION

The natural permeability and water regime of soils are influential in determining the fate and behaviour of pesticides applied to the crop and soil surface (Hollis et al, 1995). A system of vulnerability assessment was devised as part of the national system for Policy and Practice for the Protection of Groundwater. This divided soils into three primary vulnerability classes.

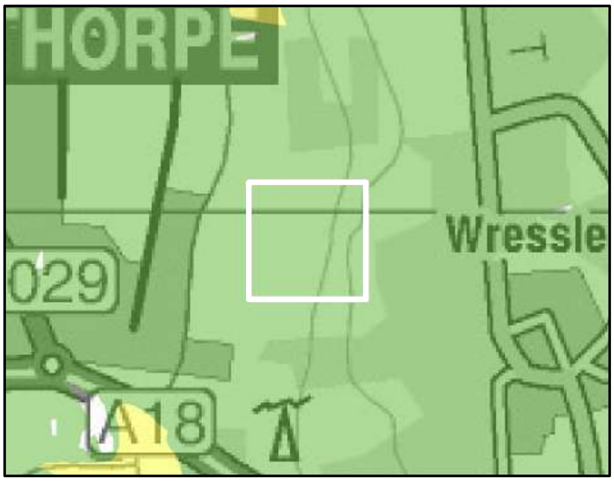
H - Soils of high leaching capacity with little ability to attenuate non-adsorbed pesticide leaching which leave underlying groundwater vulnerable to pesticide contamination.

I - Soils of intermediate leaching capacity with a moderate ability to attenuate pesticide leaching.

L - Soils of low leaching capacity through which pesticides are unlikely to leach.

The primary classes have been further subdivided into nearly forty subclasses. These subclasses, with their descriptions, are mapped above. These classes do not account for differences in land cultivation, which can also have a significant impact on pesticide behaviour.

1g Pesticide Runoff Risk



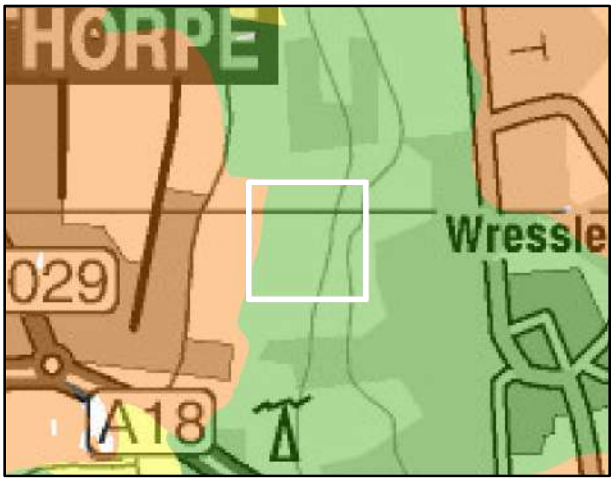
Pesticide Runoff Risk Key

🟩 S5 Very low run-off potential.

PESTICIDE RUNOFF RISK DESCRIPTION

The physical properties and natural water regime of soils influence the speed and extent of lateral water movement over and through the soil at different depths (Hollis et al, 1995). At as result, soils can be classed according to the potential for pesticide run-off. Five runoff potential classes are identified for mineral soils and a further two for peat soils.

1h Potential for Pesticide Adsorption



Potential for Pesticide Adsorption Key

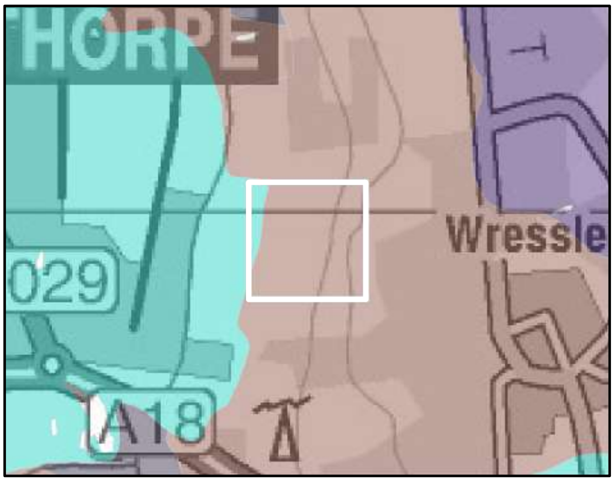
🟧 m Moderate adsorption potential.

🟩 v Very low adsorption potential.

POTENTIAL FOR PESTICIDE ADSORPTION DESCRIPTION

The physical properties and natural water regime of soils influence the speed and extent of lateral water movement over and through the soil at different depths (Hollis et al, 1995). The mineral soil classes are further subdivided according to their potential for pesticide adsorption.

1i Hydrogeological Rock Type



Hydrogeological Rock Type Key

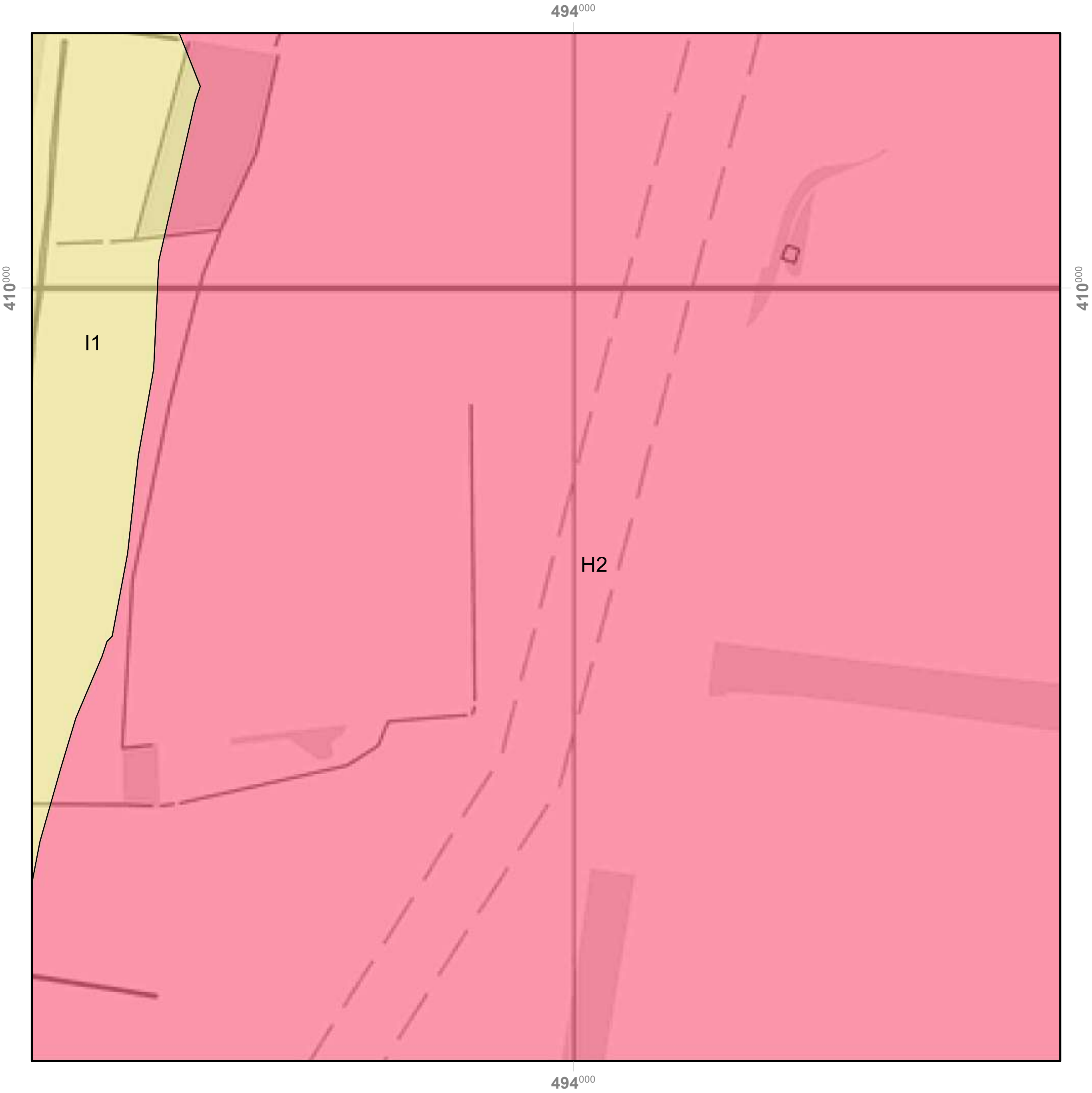
🟦 4 soft Magnesian, brashy or Oolitic limestone and ironstone

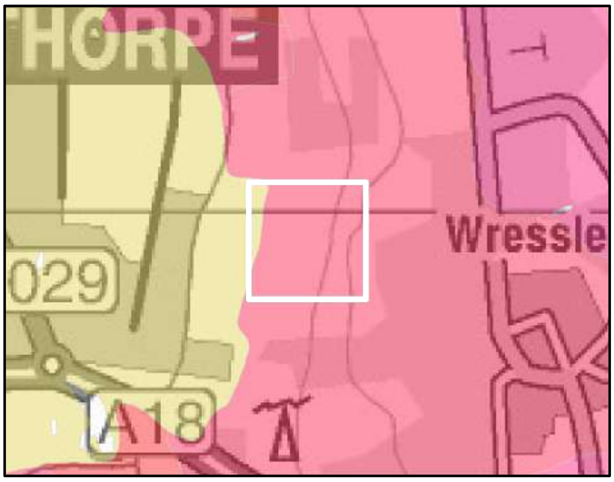
🟫 34 sand

HYDROGEOLOGICAL ROCK TYPE DESCRIPTION

The hydrogeological classification of the soil parent materials provides a framework for distinguishing between soil substrates according to their general permeability and whether they are likely to overlie an aquifer. Every soil series has been assigned one of the 32 substrate classes and each of these is characterised according to its permeability (being characterised as permeable, slowly permeable or impermeable). For further information, see Boorman et al (1995).

1j Ground Water Protection Policy (GWPP)





Ground Water Protection Policy (GWPP) Key

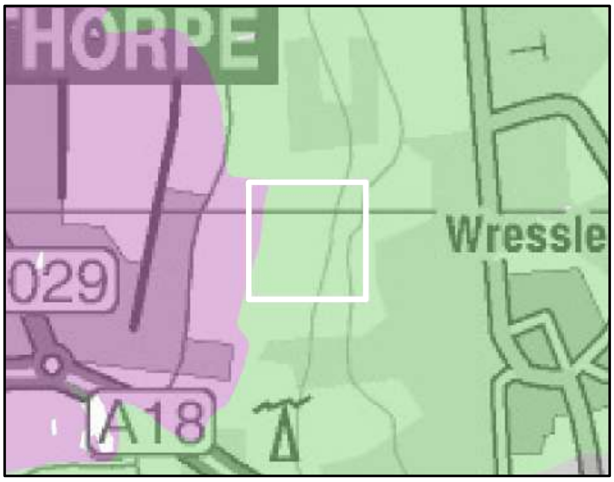
🟥 H2 Deep, permeable coarse textured soils of high leaching potential, which readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential

🟨 I1 Soils of intermediate leaching potential which have a moderate ability to attenuate a wide range of diffuse source pollutants but in which it is possible that some non-adsorbed diffuse source pollutants and liquid discharges could penetrate the soil layer

GWPP LEACHING CLASS DESCRIPTION

The Ground Water Protection Policy classes describe the leaching potential of pollutants through the soil (Hollis, 1991; Palmer et al, 1995). The likelihood of pollutants reaching ground water is described. Different classes of pollutants are described, including liquid discharges adsorbed and non-adsorbed pollutants.

1k Soil Parent Material



Soil Parent Material Key

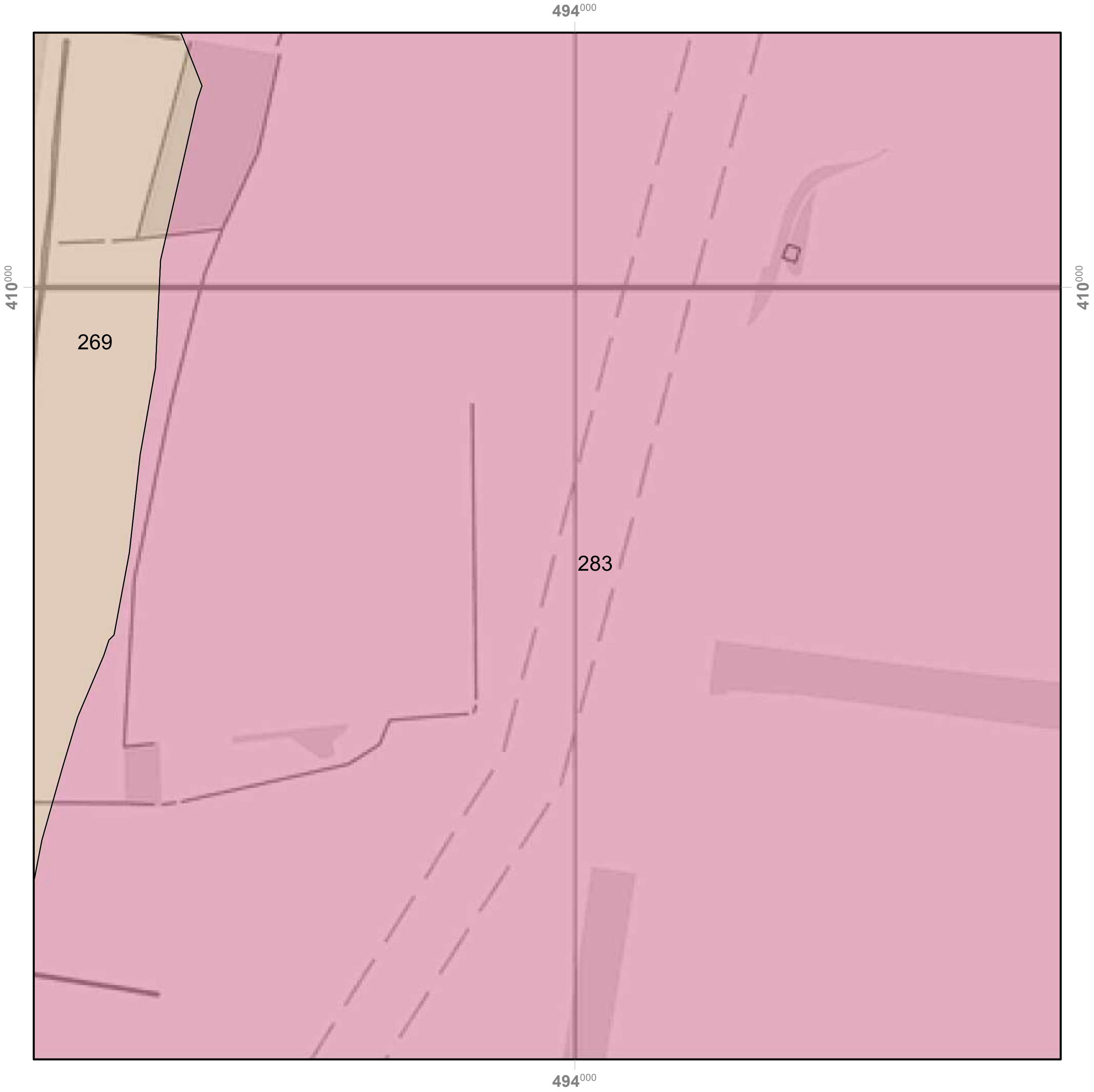
🟩 85 Glaciofluvial drift

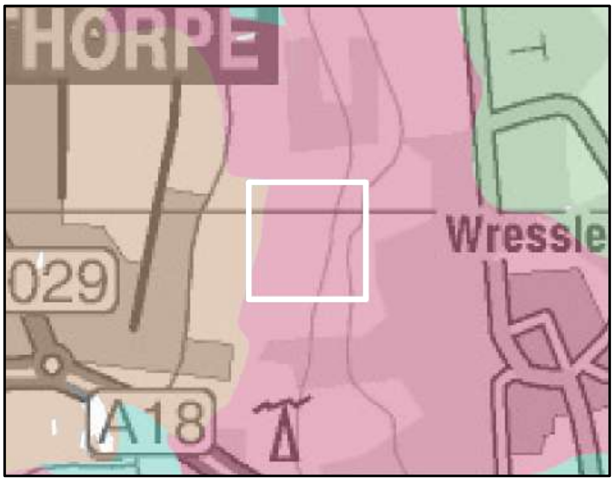
🟪 106 Jurassic and Cretaceous ironstone

SOIL PARENT MATERIAL DESCRIPTION

Along with the effects of climate, relief, organisms and time, the underlying geology or 'parent material' has a very strong influence on the development of the soils of England and Wales. Through weathering, rocks contribute inorganic mineral grains to the soils and thus exhibit control on the soil texture. During the course of the creation of the national soil map, soil surveyors noted the parent material underlying each soil in England and Wales. It is these general descriptions of the regional geology which is provided in this map.

1l Expected Crops and Land Use





Expected Crops and Land Use Key

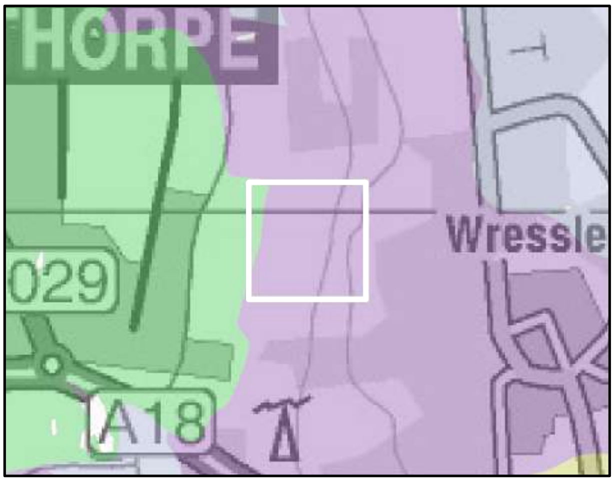
■ 269 Winter cereals with short term grassland, some potatoes; permanent grassland on valley slopes; some sugar beet In Eastern Region.

■ 283 cereals, sugar beet and potatoes; dairying on short term grassland in Cheshire and Wales.

EXPECTED CROPS AND LAND USE DESCRIPTION

Individual soils are commonly associated with particular forms of land cover and land use. Whilst the soil surveyors were mapping the whole of England and Wales, they took careful note of the range of use to which the land was being put. This map shows the most common forms of land use found on each soil unit.

1m Natural Soil Fertility



Natural Soil Fertility Key

🟩 1 High

🟪 5 Low

NATURAL SOIL FERTILITY DESCRIPTION

Soil fertility can be greatly altered by land management especially through the application of manures, lime and mineral fertilisers. What is shown in this map, however, is the likely natural fertility of each soil type. Soils that are very acid have low numbers of soil-living organisms and support heathland and acid woodland habitats. These are shown as of very low natural fertility. Soils identified as of low natural fertility are usually acid in reaction and are associated with a wide range of habitat types. The moderate class contains neutral to slightly acid soils, again with a wide range of potential habitats. Soil of high natural fertility are both naturally productive and able to support the base-rich pastures and woodlands that are now rarely encountered. Lime-rich soils contain chalk and limestone in excess, and are associated with downland, herb-rich pastures and chalk and limestone woodlands.

1n Simple Topsoil Texture

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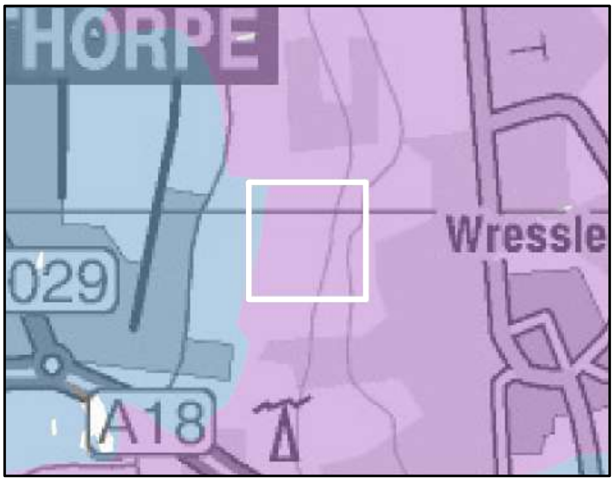

Simple Topsoil Texture Key

🟦 2 Loamy

🟪 4 Sandy

SIMPLE TOPSOIL TEXTURE DESCRIPTION

Soil texture is a term used in soil science to describe the physical composition of the soil in terms of the size of mineral particles in the soil. Specifically, we are concerned with the relative proportions of sand, silt and clay. Soil texture can vary between each soil layer or horizon as one moves down the profile. This map indicates the soil texture group of the upper 30 cm of the soil. `Light? soils have more sand grains and are described as sandy, while `heavy? soils have few sand grains but a lot of extremely small particles and are described as clayey. Loamy soils have a mix of sand, silt and clay-sized particles and are intermediate in character. Soils with a surface layer that is dominantly organic are described as Peaty. A good understanding of soil texture can enable better land management.

1o Typical Habitats

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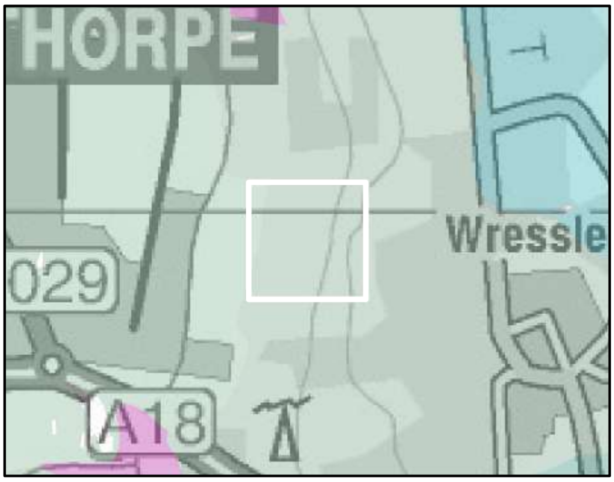


Typical Habitats Key

🟩 1 Acid dry pastures; acid deciduous and coniferous woodland; potential for lowland heath

🟩 3 Base-rich pastures and deciduous woodlands

TYPICAL HABITATS DESCRIPTION

There is a close relationship between vegetation and the underlying soil. Information about the types of broad habitat associated with each soil type is provided in this map. Soil fertility, pH, drainage and texture are important factors in determining the types of habitats which can be established. Elevation above sea level and sometimes even the aspect, the orientation of a hillslope, can affect the species present. This map does not take into account the recent land management, but provides the likely natural habitats assuming good management has been carried out.

2. Soil Association Descriptions

The following pages describe the following soil map units, (soil associations), in more detail.

🟫	BANBURY 544 *Well drained brashy fine and coarse loamy ferruginous soils over ironstone.*
🟧	NEWPORT 1 551d *Deep well drained sandy and coarse loamy soils.*

The soil associations are described in terms of their texture and drainage properties and potential risks may be identified. The distribution of the soils across England and Wales are provided. Further to this, properties of each association's component soil series are described in relation to each other. Lastly, schematic diagrams of each component series are provided for greater understanding and in-field verification purposes.

BANBURY (544)

Well drained brashy fine and coarse loamy ferruginous soils over ironstone.

a. General Description

Well drained brashy fine and coarse loamy ferruginous soils over ironstone.Some deep fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging.
The major landuse on this association is defined as Winter cereals with short term grassland, some potatoes; permanent grassland on valley slopes; some sugar beet In Eastern Region.

b. Distribution (England and Wales)

The BANBURY association covers 712 km² of England and Wales which accounts for 0.47% of the landmass. The distribution of this association is shown in figure 2. Note that the yellow shading represents a buffer to highlight the location of very small areas of the association.

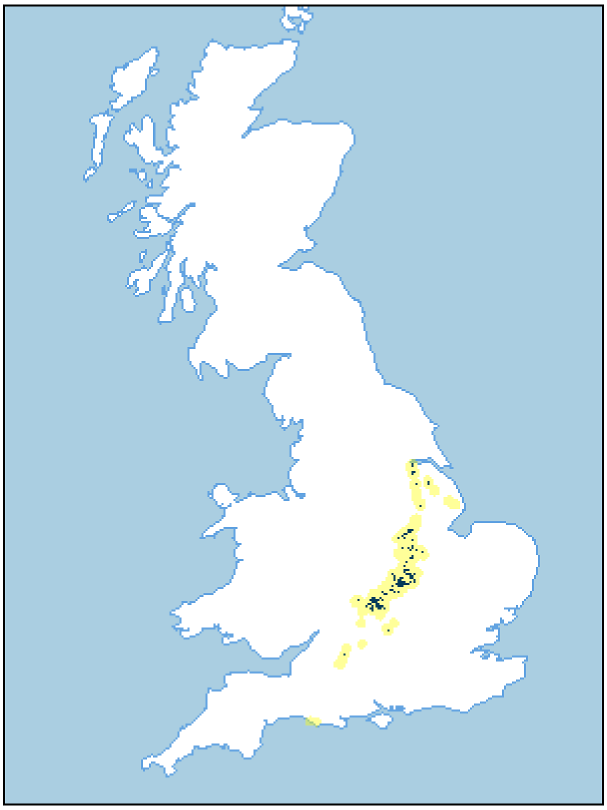


Figure 2: Association Distribution

c. Comprising Soil Series

Multiple soil series comprise a soil association. The soil series of the BANBURY association are outlined in Table 1 below. In some cases other minor soil series are present at a particular site, and these have been grouped together under the heading 'OTHER'. We have endeavoured to present the likelihood of a minor, unnamed soil series occuring in your site in Table 1.

Schematic diagrams of the vertical soil profile of the major constituent soil series are provided in Section D to allow easier identification of the particular soil series at your site.

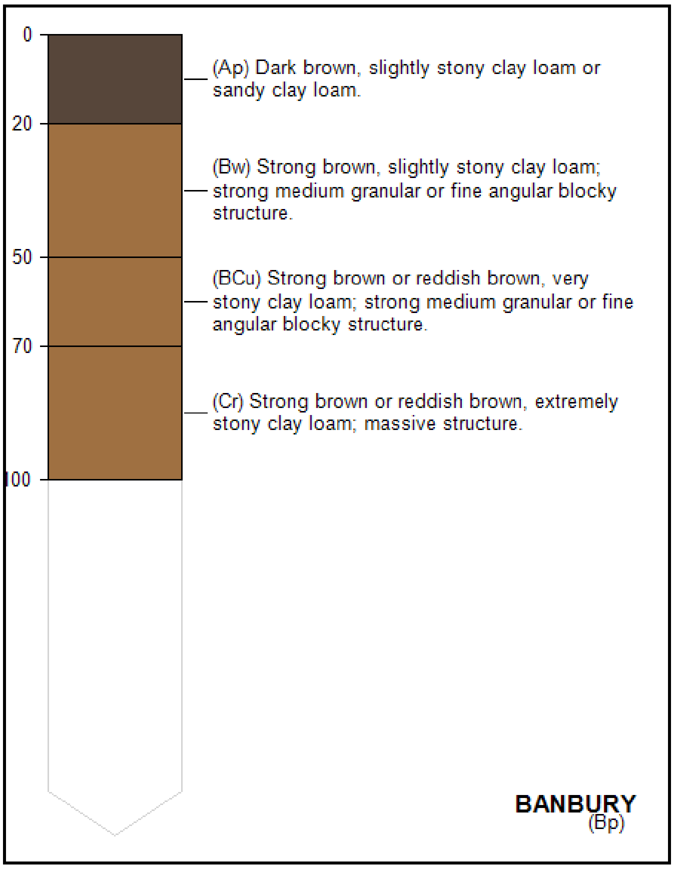
Table 1: The component soil series of the BANBURY soil association. Because absolute proportions of the comprising series in this association vary from location to location, the national proportions are provided.

Soil Series	Description	Area %
BANBURY (Bp)	ferruginous medium loamy material over lithoskeletal ironstone	50%
TADMARTON (tM)	ferruginous light loamy material over lithoskeletal ironstone	25%
IRONDOWN (Ir)	ferruginous medium loamy or medium silty drift over clayey material passing to clay or soft mudstone	15%
OTHER	other minor soils	10%

BANBURY (544)

Well drained brashy fine and coarse loamy ferruginous soils over ironstone.

d. BANBURY Component Series Profiles



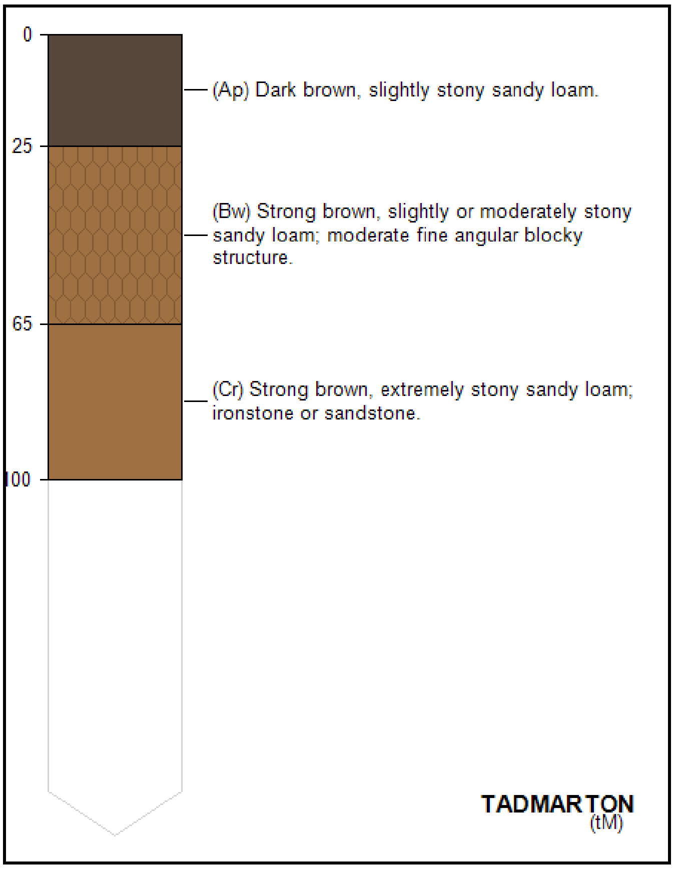
(Ap) Dark brown, slightly stony clay loam or sandy clay loam.

(Bw) Strong brown, slightly stony clay loam; strong medium granular or fine angular blocky structure.

(BCu) Strong brown or reddish brown, very stony clay loam; strong medium granular or fine angular blocky structure.

(Cr) Strong brown or reddish brown, extremely stony clay loam; massive structure.

BANBURY
(Bp)

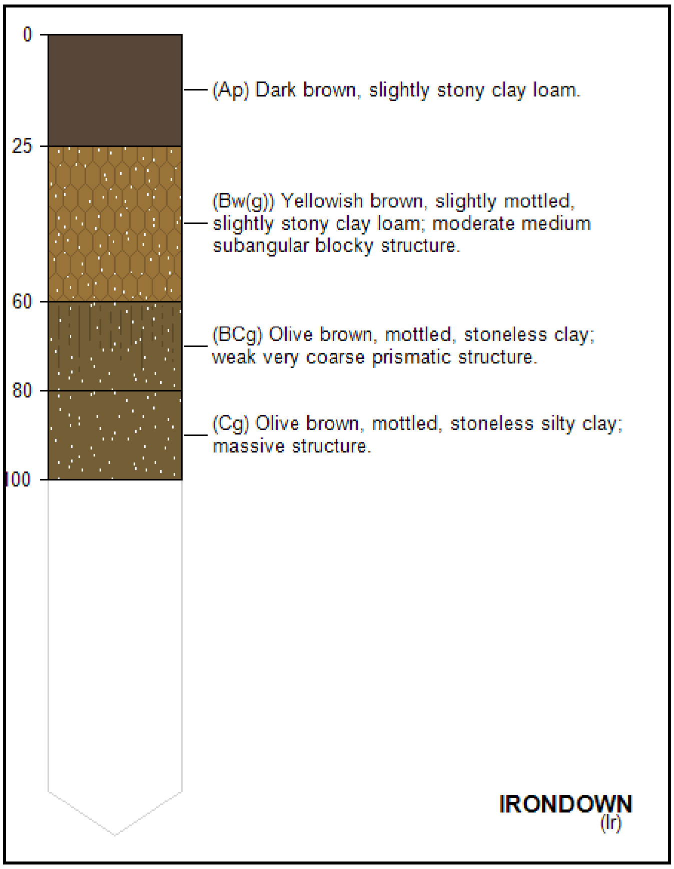


(Ap) Dark brown, slightly stony sandy loam.

(Bw) Strong brown, slightly or moderately stony sandy loam; moderate fine angular blocky structure.

(Cr) Strong brown, extremely stony sandy loam; ironstone or sandstone.

TADMARTON
(tM)



(Ap) Dark brown, slightly stony clay loam.

(Bw(g)) Yellowish brown, slightly mottled, slightly stony clay loam; moderate medium subangular blocky structure.

(BCg) Olive brown, mottled, stoneless clay; weak very coarse prismatic structure.

(Cg) Olive brown, mottled, stoneless silty clay; massive structure.

IRONDOWN
(Ir)

NEWPORT 1 (551d)

Deep well drained sandy and coarse loamy soils.

a. General Description

Deep well drained sandy and coarse loamy soils.Some sandy soils affected by groundwater.
The major landuse on this association is defined as cereals, sugar beet and potatoes; dairying on short term grassland in Cheshire and Wales.

b. Distribution (England and Wales)

The NEWPORT 1 association covers 1191 km² of England and Wales which accounts for 0.79% of the landmass. The distribution of this association is shown in figure 3. Note that the yellow shading represents a buffer to highlight the location of very small areas of the association.

c. Comprising Soil Series

Multiple soil series comprise a soil association. The soil series of the NEWPORT 1 association are outlined in Table 1 below. In some cases other minor soil series are present at a particular site, and these have been grouped together under the heading 'OTHER'. We have endeavoured to present the likelihood of a minor, unnamed soil series occuring in your site in Table 2.

Schematic diagrams of the vertical soil profile of the major constituent soil series are provided in Section D to allow easier identification of the particular soil series at your site.

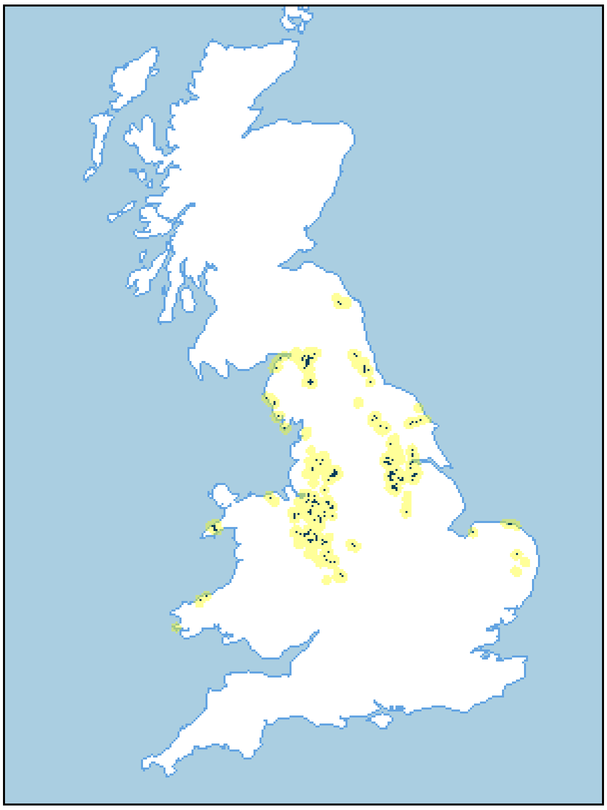


Figure 3: Association Distribution

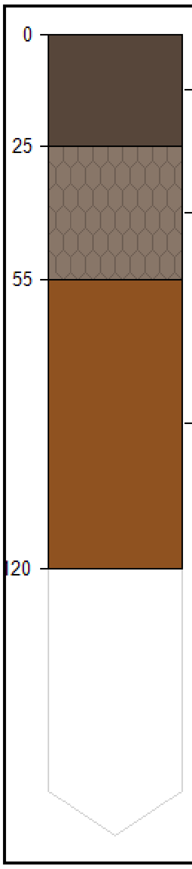
Table 2: The component soil series of the NEWPORT 1 soil association. Because absolute proportions of the comprising series in this association vary from location to location, the national proportions are provided.

Soil Series	Description	Area %
NEWPORT (Na)	sandy drift with siliceous stones	40%
WICK (wQ)	light loamy drift with siliceous stones	20%
BLACKWOOD (bK)	sandy drift with siliceous stones	10%
RUDGE (rJ)	sandy drift with siliceous stones	10%
OTHER	other minor soils	20%

NEWPORT 1 (551d)

Deep well drained sandy and coarse loamy soils.

d. NEWPORT 1 Component Series Profiles

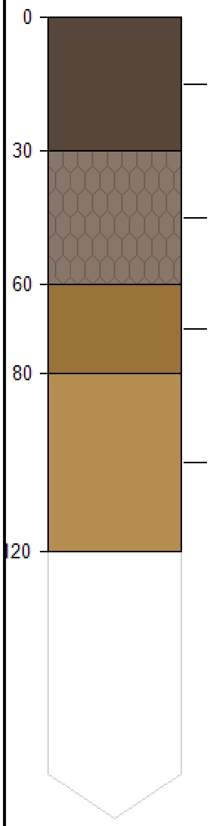


(Ap) Dark brown, slightly stony sandy loam or loamy sand.

(Bw) Brown, slightly stony loamy sand or sand; weak fine subangular blocky structure.

(Cu) Yellowish red or brownish yellow, slightly stony sand; single grain structure.

NEWPORT
(Na)



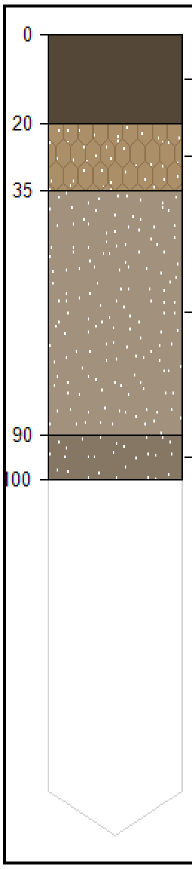
(Ap) Dark brown, slightly stony sandy loam or sandy silt loam.

(Bw) Brown, slightly stony sandy loam or sandy silt loam; moderate medium subangular blocky structure.

(Bw) Yellowish brown, slightly or moderately stony loamy sand or sandy loam; weak medium angular blocky or single grain structure.

(2BCu) Brownish yellow, slightly or moderately stony sand or loamy sand; weak coarse angular blocky or single grain structure.

WICK
(wQ)



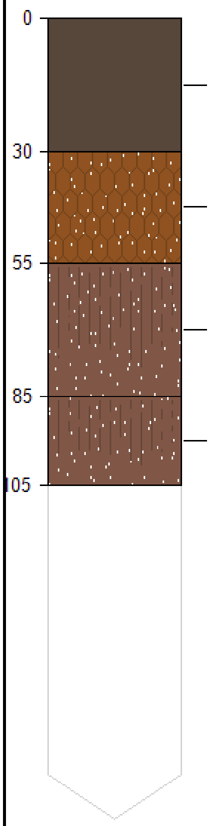
(Ap) Very dark greyish brown, slightly stony or stoneless loamy sand.

(Bg1) Pale brown, mottled, slightly stony loamy sand; weak medium and coarse subangular blocky structure.

(Bg2) Light brownish grey, mottled, slightly stony loamy sand; weak medium subangular blocky or single grain structure.

(Cg) Greyish brown, mottled, stoneless, slightly or moderately stony sand; single grain structure.

BLACKWOOD
(bK)



(Ap) Dark brown, slightly stony sandy loam.

(Eb(g)) Yellowish red, slightly mottled, slightly stony loamy sand; very weak medium subangular blocky structure.

(Btg) Reddish brown, mottled, slightly stony loamy sand; weak coarse prismatic structure.

(2Btg) Reddish brown, mottled, slightly stony sandy clay loam or sandy loam; weak coarse prismatic structure.

RUDGE
(rJ)

3. Soil Series Properties

The following pages describe the following soil series in more detail:

BANBURY (Bp)	ferruginous medium loamy material over lithoskeletal ironstone
BLACKWOOD (bK)	sandy drift with siliceous stones
IRONDOWN (Ir)	ferruginous medium loamy or medium silty drift over clayey material passing to clay or soft mudstone
NEWPORT (Na)	sandy drift with siliceous stones
RUDGE (rJ)	sandy drift with siliceous stones
TADMARTON (tM)	ferruginous light loamy material over lithoskeletal ironstone
WICK (wQ)	light loamy drift with siliceous stones

SOIL PROPERTY DEFINITIONS

The following terms are used in the report.

DROCK (Depth to rock (cm))
Depth (cm) to rock. 999 implies no rock

DGLEY (Depth to gleying (cm))
Depth to gleyed horizon (cm). 999 implies NO gleyed horizon present.

DIMP_DP (Depth to slowly permeable layer (downward percolation) (cm))
Depth (cm) to slowly permeable layer, i.e. in which effectively there is no downward percolation of water - 999 implies NO slowly permeable layer

DIMP_UD (Depth to slowly permeable layer (upward diffusion) (cm))
Depth (cm) to slowly permeable layer - upward diffusion, i.e. in which effectively there is no upward movement of water - 999 implies NO slowly permeable layer

IAC_DP (Integrated air capacity (IAC) (mm))
Integrated air capacity (downward percolation), a measurement of the volume of air in moist soils (0.05 bar suction) integrated from the surface to either an impermeable horizon, bedrock or 1m whichever is the shallowest, used for estimating the water storage potential of a soil

SPR (Standard percentage runoff (SPR) (%))
Standard Percentage Run-off. Dimensionless variable (range 0 to 100 %) that represents the percentage of rainfall that causes the short-term increase in flow at the catchment outlet seen after the storm event

BFI (Base flow index (BFI) (0 to 1))
Baseflow index. Dimensionless variable (range 0 to 1) that expresses the fraction of the average flow volume (in a river), represented by the contribution from groundwater storage

AWC (Available water (AWC) (mm))
Available water to 1m for a specific soil type, water available between suctions 5 and 1500kPa

AP_GRASS (Available water for grass (mm))
Available water (AP) in the profile for grass (mm); water available between suctions 5 and 1500 kPa

AP_CEREAL (Available water for cereal (mm))
Available water (AP) in the profile for cereals (mm); water available between suctions 5 and 1500 kPa

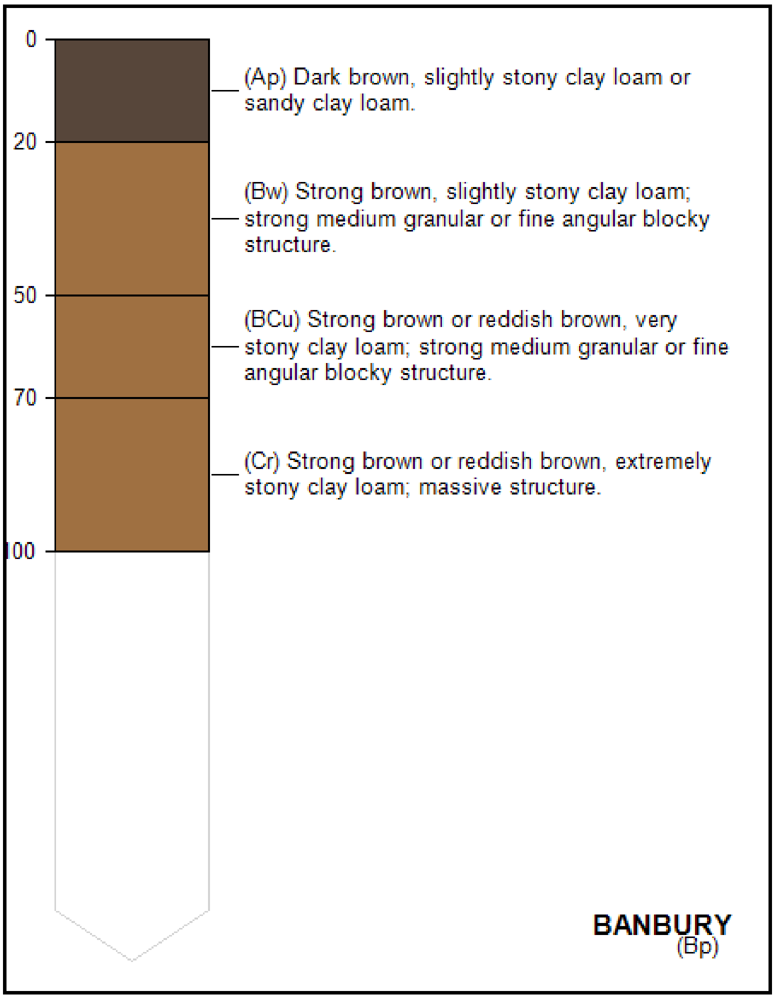
AP_SB (Available water for sugar (mm))
Available water (AP) in the profile for sugar beet (mm); water available between suctions 5 and 1500 kPa

AP_POT (Available water for potatoes (mm))
Available water (AP) in the profile for potatoes (mm); water available between suctions 5 and 1500 kPa

5.44 BANBURY (Bp) (101)

Major soil group:	05 brown soils	With dominantly brownish or reddish subsoils and no prominent mottling or greyish colours (gleying) above 40 cm depth. They are developed mainly on permeable materials at elevations below about 300 m.0.D. Most are in agricultural use.
Soil group:	4 brown earths	Non-alluvial, with non-calcareous loamy or clayey subsoils without significant clay enrichment.
Soil Subgroup:	4 ferritic brown earths	(unmottled with bright ochreous iron-rich subsoil)
Soil Series:	Banbury series	ferruginous medium loamy material over lithoskeletal ironstone

Property	**Value**
Depth to rock (cm)	70
Depth to gleying (cm)	n/a*
Depth to slowly permeable layer (downward percolation) (cm)	n/a*
Depth to slowly permeable layer (upward diffusion) (cm)	n/a*
Integrated air capacity (IAC) (mm)	157
Standard percentage runoff (SPR) (%)	2
Base flow index (BFI) (0 to 1)	0.98
Available water (AWC) (mm)	120
Available water for grass (mm)	120
Available water for cereal (mm)	115
Available water for sugar (mm)	120
Available water for potatoes (mm)	120

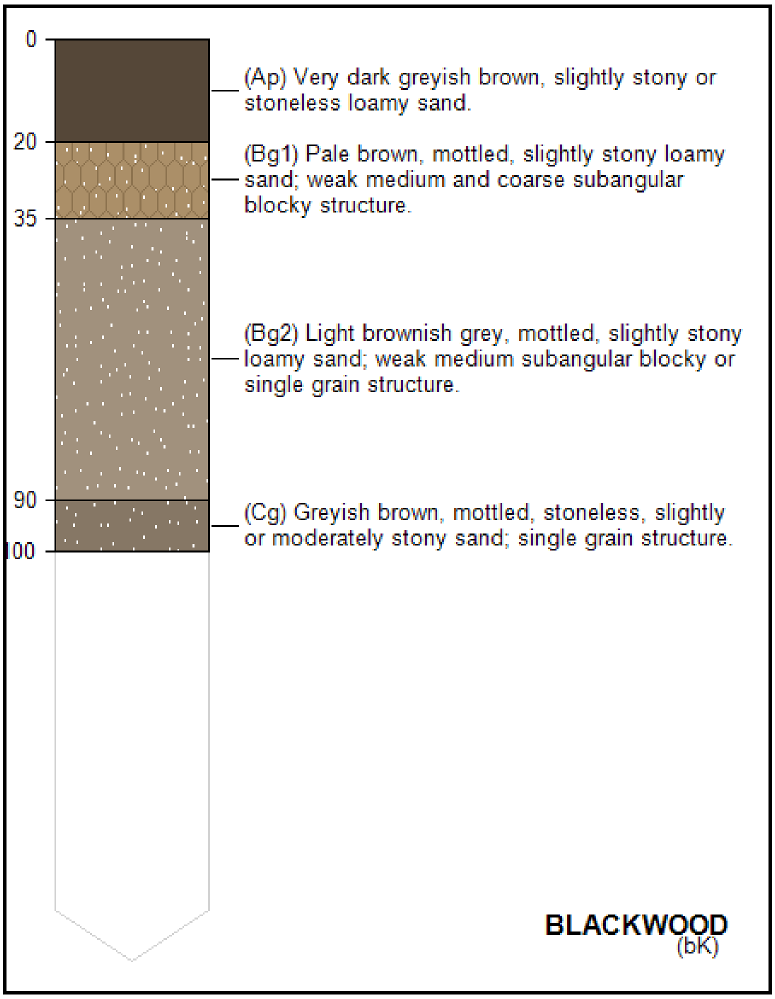


* not present within 150cm

8.21 BLACKWOOD (bK) (124)

Major soil group:	08 ground-water gley soils	Seasonally waterlogged soils affected by a shallow fluctuating groundwater-table. They are developed mainly within or over permeable material and have prominently mottled or greyish coloured horizons within 40 cm depth Most occupy low-lying or depressional sites.
Soil group:	2 sandy gley soils	Sandy, with distinct topsoil and no clay-enriched subsoil.
Soil Subgroup:	1 typical sandy gley soils	(with non calcareous subsoil)
Soil Series:	Blackwood series	sandy drift with siliceous stones

Property	**Value**
Depth to rock (cm)	n/a*
Depth to gleying (cm)	30
Depth to slowly permeable layer (downward percolation) (cm)	n/a*
Depth to slowly permeable layer (upward diffusion) (cm)	n/a*
Integrated air capacity (IAC) (mm)	208
Standard percentage runoff (SPR) (%)	35
Base flow index (BFI) (0 to 1)	0.52
Available water (AWC) (mm)	130
Available water for grass (mm)	125
Available water for cereal (mm)	125
Available water for sugar (mm)	145
Available water for potatoes (mm)	105

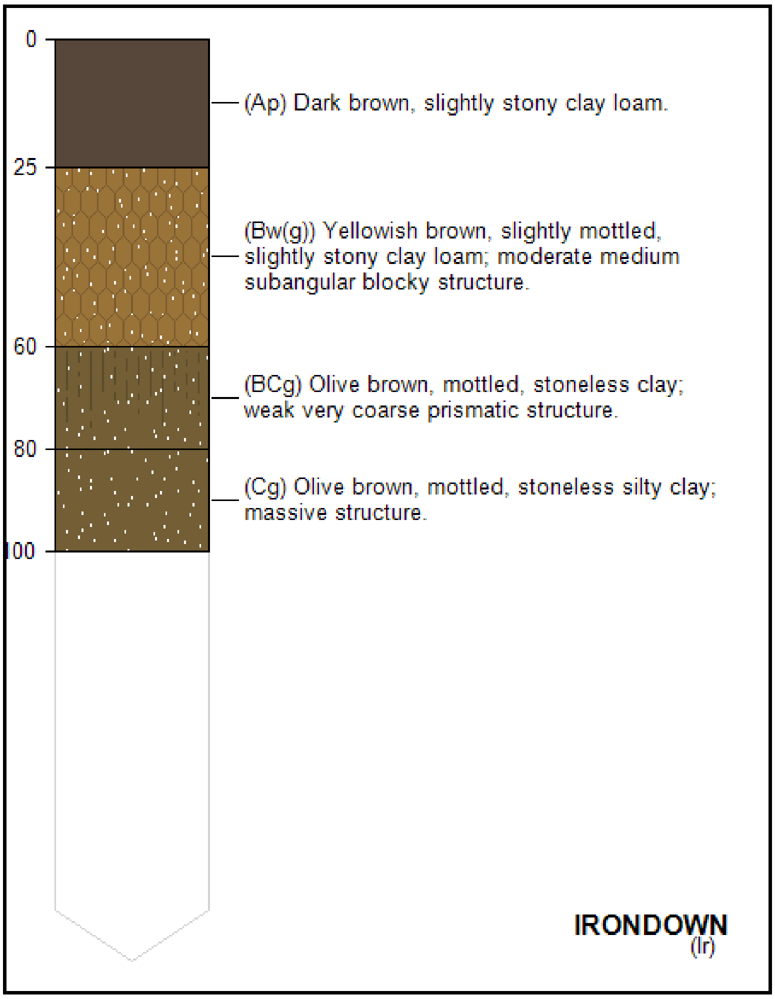


* not present within 150cm

5.45 IRONDOWN (Ir) (802)

Major soil group:	05 brown soils	With dominantly brownish or reddish subsoils and no prominent mottling or greyish colours (gleying) above 40 cm depth. They are developed mainly on permeable materials at elevations below about 300 m.0.D. Most are in agricultural use.
Soil group:	4 brown earths	Non-alluvial, with non-calcareous loamy or clayey subsoils without significant clay enrichment.
Soil Subgroup:	5 stagnogleyic ferritic brown earths	(faintly mottled with bright ochreous iron-rich slowly permeable subsoil)
Soil Series:	Irondown series	ferruginous medium loamy or medium silty drift over clayey material passing to clay or soft mudstone

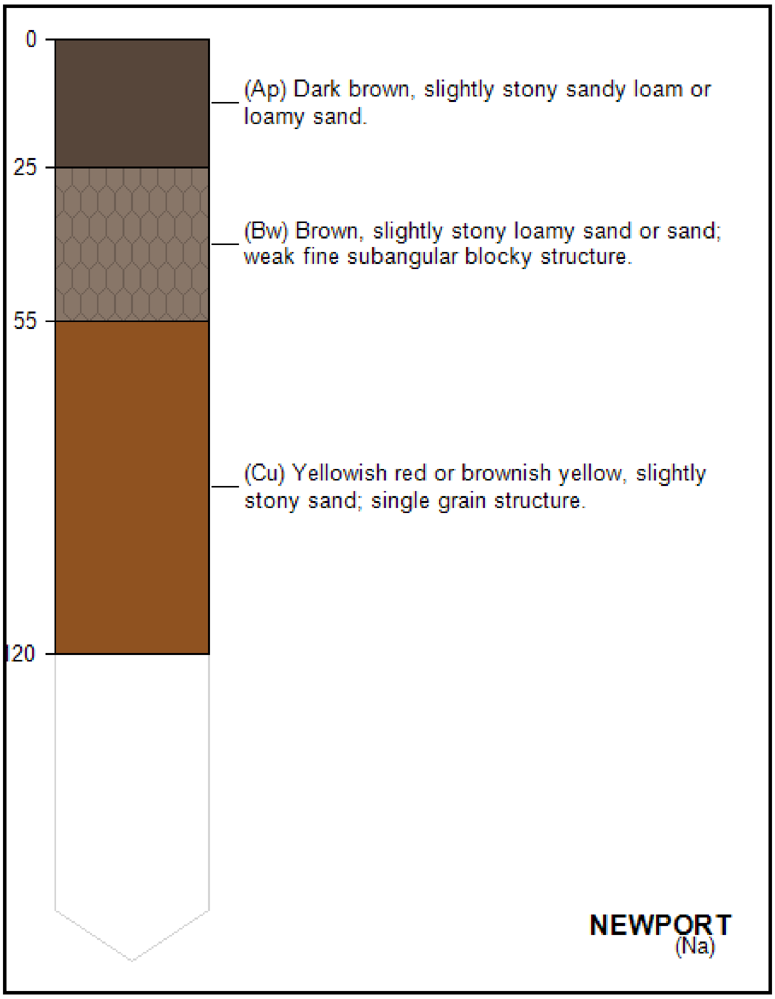
Property	**Value**
Depth to rock (cm)	100
Depth to gleying (cm)	57
Depth to slowly permeable layer (downward percolation) (cm)	57
Depth to slowly permeable layer (upward diffusion) (cm)	57
Integrated air capacity (IAC) (mm)	78
Standard percentage runoff (SPR) (%)	47
Base flow index (BFI) (0 to 1)	0.52
Available water (AWC) (mm)	145
Available water for grass (mm)	125
Available water for cereal (mm)	125
Available water for sugar (mm)	160
Available water for potatoes (mm)	105



5.51 NEWPORT (Na) (1310)

Major soil group:	05 brown soils	With dominantly brownish or reddish subsoils and no prominent mottling or greyish colours (gleying) above 40 cm depth. They are developed mainly on permeable materials at elevations below about 300 m.0.D. Most are in agricultural use.
Soil group:	5 brown sands	Non-calcareous sandy or sandy gravelly.
Soil Subgroup:	1 typical brown sands	(unmottled with no clay-enriched subsoil)
Soil Series:	Newport series	sandy drift with siliceous stones

Property	**Value**
Depth to rock (cm)	n/a*
Depth to gleying (cm)	n/a*
Depth to slowly permeable layer (downward percolation) (cm)	n/a*
Depth to slowly permeable layer (upward diffusion) (cm)	n/a*
Integrated air capacity (IAC) (mm)	256
Standard percentage runoff (SPR) (%)	12
Base flow index (BFI) (0 to 1)	0.88
Available water (AWC) (mm)	95
Available water for grass (mm)	85
Available water for cereal (mm)	95
Available water for sugar (mm)	110
Available water for potatoes (mm)	70

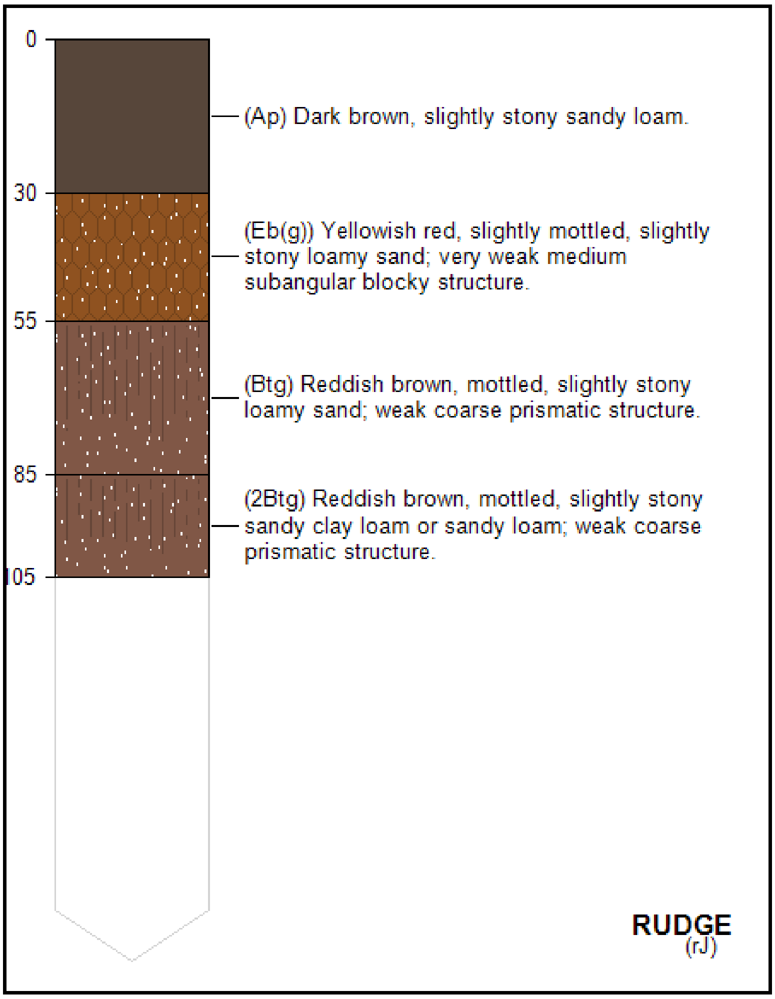


* not present within 150cm

5.53 RUDGE (rJ) (1743)

Major soil group:	05 brown soils	With dominantly brownish or reddish subsoils and no prominent mottling or greyish colours (gleying) above 40 cm depth. They are developed mainly on permeable materials at elevations below about 300 m.0.D. Most are in agricultural use.
Soil group:	5 brown sands	Non-calcareous sandy or sandy gravelly.
Soil Subgroup:	3 stagnogleyic brown sands	(faintly mottled with slowly permeable subsoil)
Soil Series:	Rudge series	sandy drift with siliceous stones

Property	**Value**
Depth to rock (cm)	n/a*
Depth to gleying (cm)	70
Depth to slowly permeable layer (downward percolation) (cm)	80
Depth to slowly permeable layer (upward diffusion) (cm)	80
Integrated air capacity (IAC) (mm)	176
Standard percentage runoff (SPR) (%)	47
Base flow index (BFI) (0 to 1)	0.52
Available water (AWC) (mm)	120
Available water for grass (mm)	110
Available water for cereal (mm)	115
Available water for sugar (mm)	135
Available water for potatoes (mm)	95

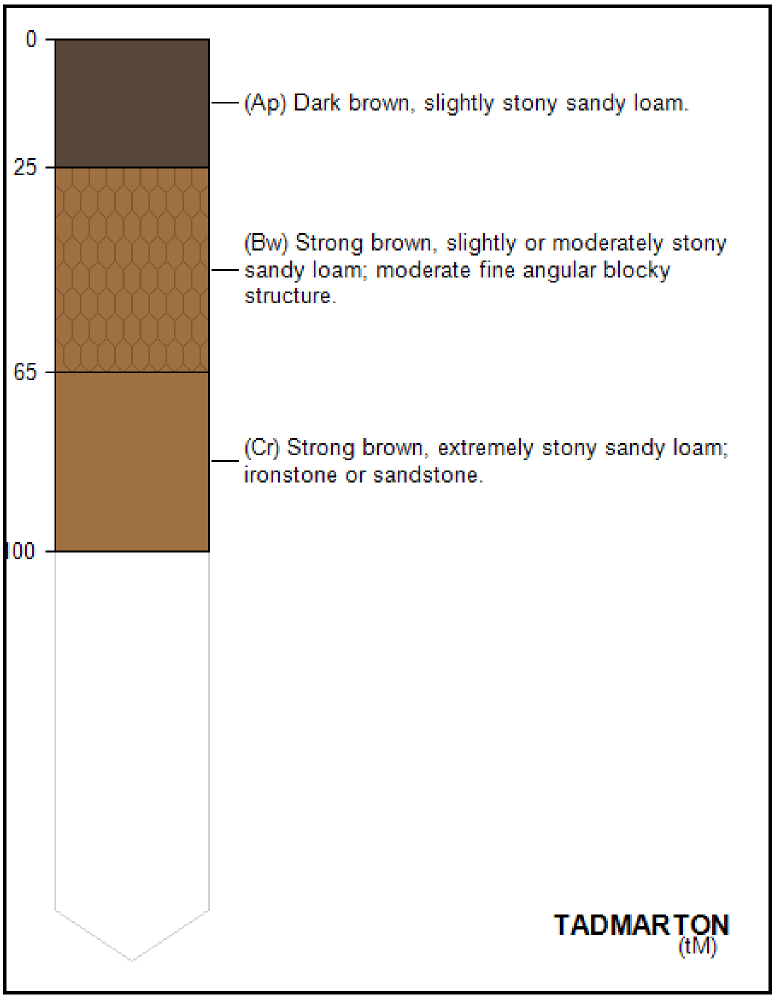


* not present within 150cm

5.44 TADMARTON (tM) (1900)

Major soil group:	05 brown soils	With dominantly brownish or reddish subsoils and no prominent mottling or greyish colours (gleying) above 40 cm depth. They are developed mainly on permeable materials at elevations below about 300 m.0.D. Most are in agricultural use.
Soil group:	4 brown earths	Non-alluvial, with non-calcareous loamy or clayey subsoils without significant clay enrichment.
Soil Subgroup:	4 ferritic brown earths	(unmottled with bright ochreous iron-rich subsoil)
Soil Series:	Tadmarton series	ferruginous light loamy material over lithoskeletal ironstone

Property	**Value**
Depth to rock (cm)	70
Depth to gleying (cm)	n/a*
Depth to slowly permeable layer (downward percolation) (cm)	n/a*
Depth to slowly permeable layer (upward diffusion) (cm)	n/a*
Integrated air capacity (IAC) (mm)	174
Standard percentage runoff (SPR) (%)	2
Base flow index (BFI) (0 to 1)	0.98
Available water (AWC) (mm)	115
Available water for grass (mm)	115
Available water for cereal (mm)	110
Available water for sugar (mm)	115
Available water for potatoes (mm)	100

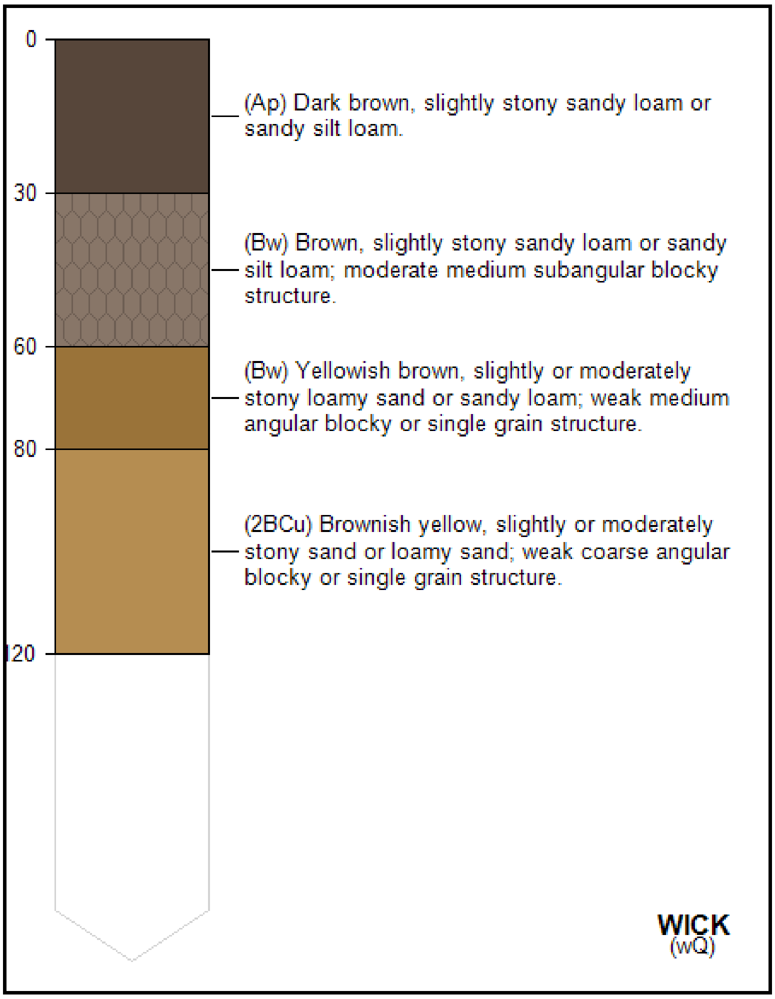


* not present within 150cm

5.41 WICK (wQ) (2225)

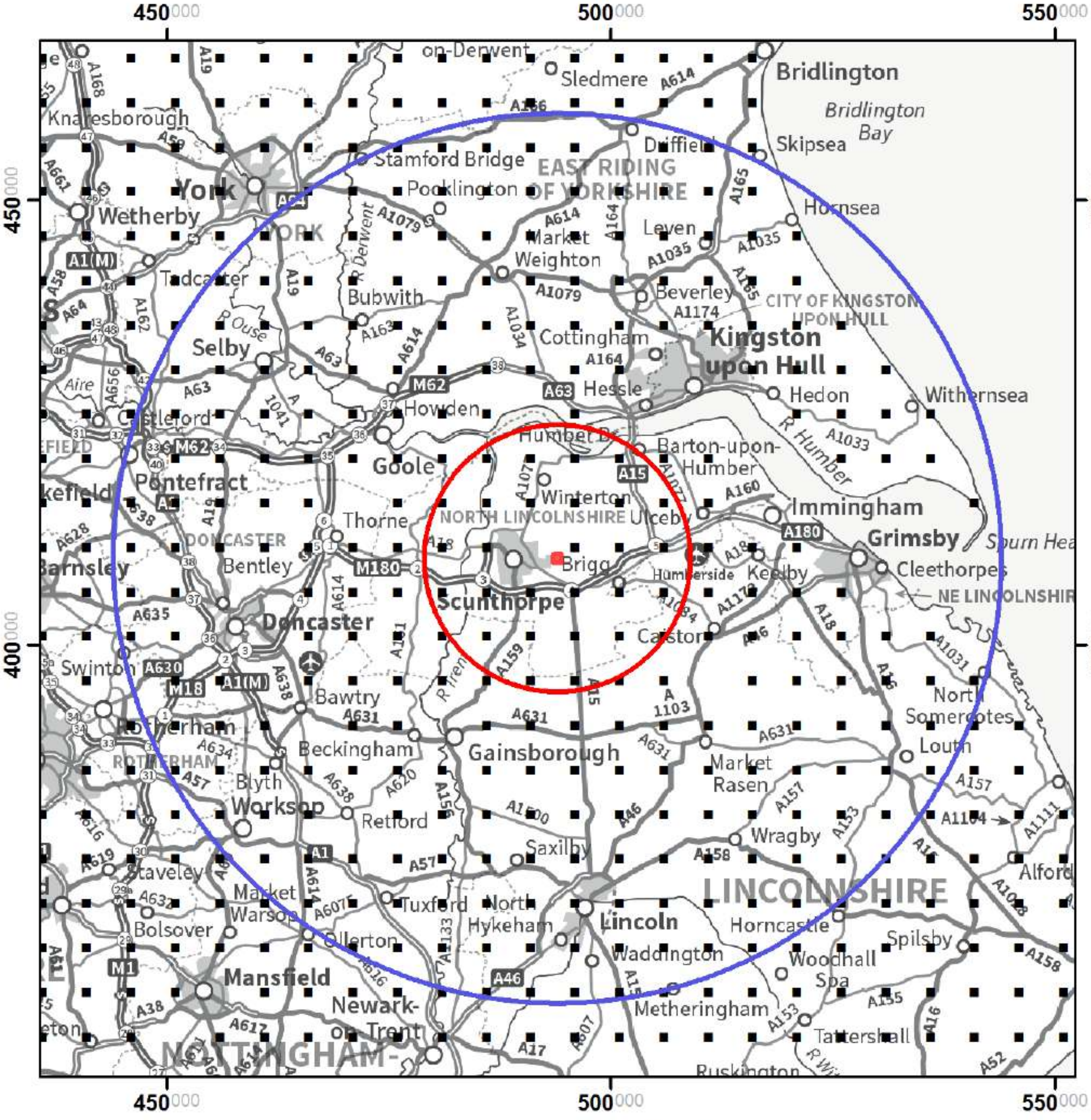
Major soil group:	05 brown soils	With dominantly brownish or reddish subsoils and no prominent mottling or greyish colours (gleying) above 40 cm depth. They are developed mainly on permeable materials at elevations below about 300 m.0.D. Most are in agricultural use.
Soil group:	4 brown earths	Non-alluvial, with non-calcareous loamy or clayey subsoils without significant clay enrichment.
Soil Subgroup:	1 typical brown earths	(unmottled)
Soil Series:	Wick series	light loamy drift with siliceous stones

Property	**Value**
Depth to rock (cm)	n/a*
Depth to gleying (cm)	n/a*
Depth to slowly permeable layer (downward percolation) (cm)	n/a*
Depth to slowly permeable layer (upward diffusion) (cm)	n/a*
Integrated air capacity (IAC) (mm)	206
Standard percentage runoff (SPR) (%)	12
Base flow index (BFI) (0 to 1)	0.88
Available water (AWC) (mm)	140
Available water for grass (mm)	130
Available water for cereal (mm)	140
Available water for sugar (mm)	165
Available water for potatoes (mm)	100



* not present within 150cm

4. Topsoil Element Background Levels



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Topsoil Element Background Levels Key

- 🟥 Report area
- □ 15 km radius - local area
- □ 50 km radius - regional area
- ■ NSI sample points

TOPSOIL ELEMENT BACKGROUND LEVELS DESCRIPTION

The National Soil Inventory (NSI) covers England and Wales on a 5 km grid and provides detailed information for each intersect of the grid. Collectively NSI data are statistically representative of England and Wales soils. The original sampling was undertaken around 1980 and there were partial resamplings in the mid-1990s. The most up-to-date data is presented here.

Analysis of the NSI samples provides detailed measurements of over 20 elements from the soils, in addition to pH. This data is summarised over three areas to provide you with an understanding of how your site, and your data for it, sits within the local, regional and national context.

Where available, the soil element levels are compared with the Soil Guideline Values and where a soil sample we have analysed has been found in excess of the SGV guidelines for "residential with plant uptake" land, this is displayed in red in the tables which follow.

SGV levels are provided for the following elements: lead, selenium, nickel, mercury, chromium, cadmium and arsenic.

In the following pages, a number of analyses of the topsoil are provided. The majority of analyses have been performed on the full compliment of sample points, however, in some areas, for some elements, only a few samples were analysed as part of subsequent programmes. In order to present the full suite of possible datasets, and accurately convey the validity of the data, the number of actual measured samples is stated for each analysis. Care should be taken where the number of samples is disproportionately low.

a. Analysis Within a 15km Radius (28 Sample Points)

ANALYSES	SAMPLES	MEAN	MIN	MAX	ST.DEV
pH (PH)	28	7.2	4.8	8.3	0.9
Carbon (CARBON)	28	2.8	0.7	12.6	2.3
Aluminium (AL_ACID)	28	26493.0	3935.0	56855.0	13742.5
Arsenic (AS_ACID)	23	7.4	0.0	35.2	9.2
Barium (BA_ACID)	28	139.7	27.0	391.0	94.8
Calcium (CA_ACID)	28	13982.2	1412.0	61625.0	15388.1
Cadmium (CD_ACID)	28	0.6	0.0	1.5	0.5
Cadmium (Extractable) (CD_EDTA)	28	0.3	0.1	0.6	0.1
Cobalt (CO_ACID)	28	11.7	2.6	29.7	5.9
Cobalt (Extractable) (CO_EDTA)	28	1.4	0.1	7.2	1.5
Chromium (CR_ACID)	28	34.5	4.3	78.9	19.9
Copper (CU_ACID)	28	17.7	4.9	34.4	7.0
Copper (Extractable) (CU_EDTA)	28	6.1	2.8	12.0	2.4
Fluoride (F_ACID)	20	87.3	0.0	185.8	39.7
Iron (FE_ACID)	28	31167.9	8909.0	90620.0	15853.3
Mercury (HG_ACID)	19	0.1	0.0	0.3	0.1
Potassium (K_ACID)	28	4955.0	755.0	11384.0	3222.3
Potassium (Extractable) (K_NITRATE)	28	261.0	71.0	824.0	176.3
Magnesium (MG_ACID)	28	4602.7	452.0	11610.0	3908.3
Magnesium (Extractable) (MG_NITRATE)	28	128.9	5.0	412.0	104.0
Manganese (MN_ACID)	28	838.4	230.0	3915.0	698.0
Manganese (Extractable) (MN_EDTA)	28	252.2	53.0	1666.0	303.5
Molybdenum (MO_ACID)	23	0.8	0.0	5.7	1.1
Sodium (NA_ACID)	28	315.5	104.0	783.0	209.3
Nickel (NI_ACID)	28	28.4	6.6	58.1	15.3
Nickel (Extractable) (NI_EDTA)	28	2.5	0.5	6.1	1.9
Phosphorus (P_ACID)	28	755.2	387.0	1585.0	246.2
Phosphorus (Extractable) (P_OLSEN)	28	37.5	11.0	82.0	18.1
Lead (PB_ACID)	28	41.4	15.0	111.0	25.6
Lead (Extractable) (PB_EDTA)	28	17.0	6.4	43.7	9.3
Selenium (SE_ACID)	23	0.3	0.0	0.8	0.2
Strontium (SR_ACID)	28	45.0	12.0	115.0	29.1
Vanadium (V_ACID)	23	51.2	9.2	172.0	37.1
Zinc (ZN_ACID)	28	86.0	33.0	161.0	33.8
Zinc (Extractable) (ZN_EDTA)	28	7.2	2.8	26.1	4.8

for units, see Analyses Denitions (p52)

b. Analysis Within a 50km Radius (271 Sample Points)

ANALYSES	SAMPLES	MEAN	MIN	MAX	ST.DEV
pH (PH)	270	7.1	3.5	8.6	0.9
Carbon (CARBON)	269	3.3	0.1	48.8	4.8
Aluminium (AL_ACID)	270	26629.6	2974.0	66580.0	12042.5
Arsenic (AS_ACID)	145	4.6	0.0	35.2	5.6
Barium (BA_ACID)	270	149.3	16.0	847.0	105.5
Calcium (CA_ACID)	270	16783.6	91.0	277260.0	31281.7
Cadmium (CD_ACID)	270	0.6	0.0	10.4	0.9
Cadmium (Extractable) (CD_EDTA)	270	0.3	0.0	7.3	0.6
Cobalt (CO_ACID)	270	9.9	0.3	42.6	5.3
Cobalt (Extractable) (CO_EDTA)	270	1.0	0.0	7.2	1.0
Chromium (CR_ACID)	270	33.7	0.0	165.6	20.1
Copper (CU_ACID)	270	21.0	4.1	322.6	21.8
Copper (Extractable) (CU_EDTA)	270	7.5	0.7	196.9	12.6
Fluoride (F_ACID)	162	70.9	0.0	452.8	64.0
Iron (FE_ACID)	270	25555.2	3032.0	104642.0	12432.5
Mercury (HG_ACID)	124	0.1	0.0	0.6	0.1
Potassium (K_ACID)	270	4614.5	643.0	12048.0	2575.9
Potassium (Extractable) (K_NITRATE)	270	221.0	16.0	1294.0	156.8
Magnesium (MG_ACID)	270	4629.3	286.0	55895.0	5623.3
Magnesium (Extractable) (MG_NITRATE)	270	213.5	5.0	1128.0	214.0
Manganese (MN_ACID)	270	641.1	24.0	3915.0	496.9
Manganese (Extractable) (MN_EDTA)	270	154.1	3.0	1666.0	157.2
Molybdenum (MO_ACID)	224	0.8	0.0	7.4	1.0
Sodium (NA_ACID)	270	279.8	46.0	2397.0	196.8
Nickel (NI_ACID)	270	24.9	0.0	104.0	13.4
Nickel (Extractable) (NI_EDTA)	270	1.9	0.2	19.0	1.9
Phosphorus (P_ACID)	270	688.5	164.0	3240.0	339.2
Phosphorus (Extractable) (P_OLSEN)	269	36.6	2.0	337.0	29.2
Lead (PB_ACID)	270	41.3	7.0	556.0	44.2
Lead (Extractable) (PB_EDTA)	270	17.3	1.8	259.3	19.9
Selenium (SE_ACID)	145	0.4	0.0	2.4	0.4
Strontium (SR_ACID)	270	45.4	0.0	441.0	47.1
Vanadium (V_ACID)	224	38.4	0.0	235.3	27.6
Zinc (ZN_ACID)	270	84.1	6.0	993.0	74.3
Zinc (Extractable) (ZN_EDTA)	270	9.6	1.1	320.4	25.6

for units, see Analyses Denitions (p52)

c. National Analysis (5686 Sample Points)

ANALYSES	SAMPLES	MEAN	MIN	MAX	ST.DEV
pH (PH)	5630	6.0	3.1	9.2	1.3
Carbon (CARBON)	5672	6.1	0.1	61.5	8.9
Aluminium (AL_ACID)	5677	26775.3	491.0	79355.0	12772.2
Arsenic (AS_ACID)	2729	4.6	0.0	110.0	5.7
Barium (BA_ACID)	5677	150.0	7.0	3840.0	159.5
Calcium (CA_ACID)	5677	13768.7	0.0	339630.0	37785.0
Cadmium (CD_ACID)	5677	0.7	0.0	40.9	1.0
Cadmium (Extractable) (CD_EDTA)	5655	0.5	0.0	85.0	3.0
Cobalt (CO_ACID)	5677	10.6	0.0	567.0	13.7
Cobalt (Extractable) (CO_EDTA)	5655	1.1	0.0	26.5	1.2
Chromium (CR_ACID)	5677	38.9	0.0	2339.8	43.7
Copper (CU_ACID)	5677	22.6	0.0	1507.7	36.8
Copper (Extractable) (CU_EDTA)	5655	6.4	0.3	431.4	11.1
Fluoride (F_ACID)	3320	58.5	0.0	6307.9	186.2
Iron (FE_ACID)	5677	28147.8	395.0	264405.0	16510.5
Mercury (HG_ACID)	2159	0.1	0.0	2.4	0.2
Potassium (K_ACID)	5677	4727.7	60.0	23905.0	2700.2
Potassium (Extractable) (K_NITRATE)	5609	182.0	6.0	2776.0	151.6
Magnesium (MG_ACID)	5677	3648.1	0.0	62690.0	3284.1
Magnesium (Extractable) (MG_NITRATE)	5609	146.0	1.0	1601.0	147.5
Manganese (MN_ACID)	5677	777.0	3.0	42603.0	1068.8
Manganese (Extractable) (MN_EDTA)	5654	159.4	0.0	3108.0	188.6
Molybdenum (MO_ACID)	4417	0.9	0.0	56.3	2.0
Sodium (NA_ACID)	5677	323.3	17.0	25152.0	572.3
Nickel (NI_ACID)	5677	25.4	0.0	1350.2	29.2
Nickel (Extractable) (NI_EDTA)	5655	1.6	0.1	73.2	2.0
Phosphorus (P_ACID)	5677	792.1	41.0	6273.0	433.9
Phosphorus (Extractable) (P_OLSEN)	5604	27.4	0.0	534.0	25.5
Lead (PB_ACID)	5677	73.3	0.0	17365.0	280.6
Lead (Extractable) (PB_EDTA)	5655	27.8	1.2	6056.5	119.7
Selenium (SE_ACID)	2729	0.6	0.0	22.8	0.8
Strontium (SR_ACID)	5677	42.3	0.0	1445.0	67.8
Vanadium (V_ACID)	4428	41.0	0.0	854.4	33.9
Zinc (ZN_ACID)	5677	90.2	0.0	3648.0	104.4
Zinc (Extractable) (ZN_EDTA)	5655	9.6	0.5	712.0	24.6

for units, see Analyses Denitions (p52)

SOIL GUIDELINE VALUES (SGV)

Defra and the Environment Agency have produced soil guideline values (SGVs) as an aid to preliminary assessment of potential risk to human health from land that may be contaminated. SGVs represent ‘intervention values’, which, if exceeded, act as indicators of potential unacceptable risk to humans, so that more detailed risk assessment is needed.

The SGVs were derived using the Contaminated Land Exposure Assessment (CLEA) model for four land uses:

1. residential (with plant uptake / vegetable growing)
2. residential (without vegetable growing)
3. allotments
4. commercial / industrial

SGVs are only designed to indicate whether further site-specific investigation is needed. Where a soil guideline value is exceeded, it does not mean that there is necessarily a chronic or acute risk to human health.

The values presented in this report represent those from a number of sample points (given in the "Samples" column in each table) providing local, regional and national background levels. Figures which appear in red indicate that a bulked sample from 20m surrounding a sample point, has at a past date, exceeded the SGV for the ‘residential with plant uptake’ land use.

It is always advisable to perform site specific investigations.

More details on all the SGVs can be found on the Environment Agency Website.

All units are mg/kg which is equivalent to parts per million (ppm)

SUBSTANCE	**RESIDENTIAL WITH PLANT UPTAKE**	**RESIDENTIAL WITHOUT PLANT UPTAKE**	**ALLOTMENTS**	**COMMERCIAL /INDUSTRIAL**
LEAD	450	450	450	750
SELENIUM	35	260	35	8000
NICKEL	50	75	50	5000
MERCURY	8	15	8	450
CHROMIUM	130	200	130	5000
CADMIUM (pH 6)	1	30	1	1400
CADMIUM (pH 7)	2	30	2	1400
CADMIUM (pH 8)	8	30	8	1400
ARSENIC	20	20	20	500

ANALYSES DEFINITIONS

PH (pH)
pH of soil measure after shaking 10ml of soil for 15 minutes with 25ml of water

CARBON (Carbon)
Organic Carbon (% by wt) measured either by loss-on-ignition for soils estimated to contain more than about 20% organic carbon or by dichromate digestion.

AL_ACID (Aluminium)
Total Aluminium concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

AS_ACID (Arsenic)
Total Arsenic concentration (mg/kg) determined by Hydride Atomic Absorption Spectrometry (AAS), extracted into hydrochloric acid after digestion with nitric acid and ashing with magnesium nitrate

BA_ACID (Barium)
Total Barium concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

CA_ACID (Calcium)
Total Calcium concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

CD_ACID (Cadmium)
Total Cadmium concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

CD_EDTA (Cadmium Extractable)
Extractable Cadmium concentration (mg/l) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) after shaking 10ml of soil with 50ml of 0.05M EDTA at pH 7.0 for 1h at 20 deg. C and then filtering

CO_ACID (Cobalt)
Total Cobalt concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

CO_EDTA (Cobalt Extractable)
Extractable Cobalt concentration (mg/l) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) after shaking 10ml of soil with 50ml of 0.05M EDTA at pH 7.0 for 1h at 20 deg. C and then filtering

CR_ACID (Chromium)
Total Chromium concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

CU_ACID (Copper)
Total Copper concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

CU_EDTA (Copper Extractable)
Extractable Copper concentration (mg/l) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) after shaking 10ml of soil with 50ml of 0.05M EDTA at pH 7.0 for 1h at 20 deg. C and then filtering

ANALYSES DEFINITIONS continued

F_ACID (Flouride)
Flouride extracted with 1mol / l sulphuric acid and determined by Ion Selective Electrode (ISE)

FE_ACID (Iron)
Total Iron concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

HG_ACID (Mercury)
Total Mercury concentration (mg/kg) determined by Hydride Atomic Absorption Spectrometry (AAS), digested in a nitric/sulphuric acid mixture

K_ACID (Potassium)
Total Potassium concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

K_NITRATE (Potassium Extractable)
Extractable Potassium concentration (mg/l) determined by shaking 10ml of air dry soil with 50ml of 1.0M ammonium nitrate for 30mins, filtering and then measuring the concentration by flame photometry

MG_ACID (Magnesium)
Total Magnesium concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

MG_NITRATE (Magnesium Extractable)
Extractable Magnesium concentration (mg/l) determined by shaking 10ml of air dry soil with 50ml of 1.0M ammonium nitrate for 30mins, filtering and then measuring the concentration by flame photometry

MN_ACID (Manganese)
Total Manganese concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

MN_EDTA (Manganese Extractable)
Extractable Manganese concentration (mg/l) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) after shaking 10ml of soil with 50ml of 0.05M EDTA at pH 7.0 for 1h at 20 deg. C and then filtering

MO_ACID (Molybdenum)
Total Molybdenum concentration (mg/kg) determined by Atomic Adsorption Spectrometyr (AAS) in an aqua regia digest

MO_EDTA (Molybdenum Extractable)
Extractable Molybdenum concentration (mg/l) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) after shaking 10ml of soil with 50ml of 0.05M EDTA at pH 7.0 for 1h at 20 deg. C and then filtering

NA_ACID (Sodium)
Total Sodium concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

NI_ACID (Nickel)
Total Nickel concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

ANALYSES DEFINITIONS continued

NI_EDTA (Nickel Extractable)
Extractable Nickel concentration (mg/l) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) after shaking 10ml of soil with 50ml of 0.05M EDTA at pH 7.0 for 1h at 20 deg. C and then filtering

P_ACID (Phosphorus)
Total Phosphorus concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

P_OLSON (Phosphorous Extractable)
Extractable Phosphorus concentration (mg/l) determined by shaking 5ml of air dry soil with 100ml of 0.5M sodium bicarbonate for 30mins at 20 deg.C, filtering and then measuring the absorbance at 880 nm colorimetrically with acid ammonium molybdate solution

PB_ACID (Lead)
Total Lead concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

PB_EDTA (Lead Extractable)
Extractable Lead concentration (mg/l) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) after shaking 10ml of soil with 50ml of 0.05M EDTA at pH 7.0 for 1h at 20 deg. C and then filtering

SE_ACID (Selenium)
Total Selenium concentration (mg/kg) determined by Hydride Atomic Absorption Spectrometry (AAS), extracted into hydrochloric acid after digestion with nitric acid and ashing with magnesium nitrate

SR_ACID (Strontium)
Total Strontium concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

V_ACID (Vanadium)
Total Vanadium concentration (mg/kg) determined by Atomic Adsorption Spectrometyr (AAS) in an aqua regia digest

ZN_ACID (Zinc)
Total Zinc concentration (mg/kg) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) in an aqua regia digest

ZN_EDTA (Zinc Extractable)
Extractable Zinc concentration (mg/l) determined by Inductively Coupled Plasma Emission Spectrometry (ICP) after shaking 10ml of soil with 50ml of 0.05M EDTA at pH 7.0 for 1h at 20 deg. C and then filtering

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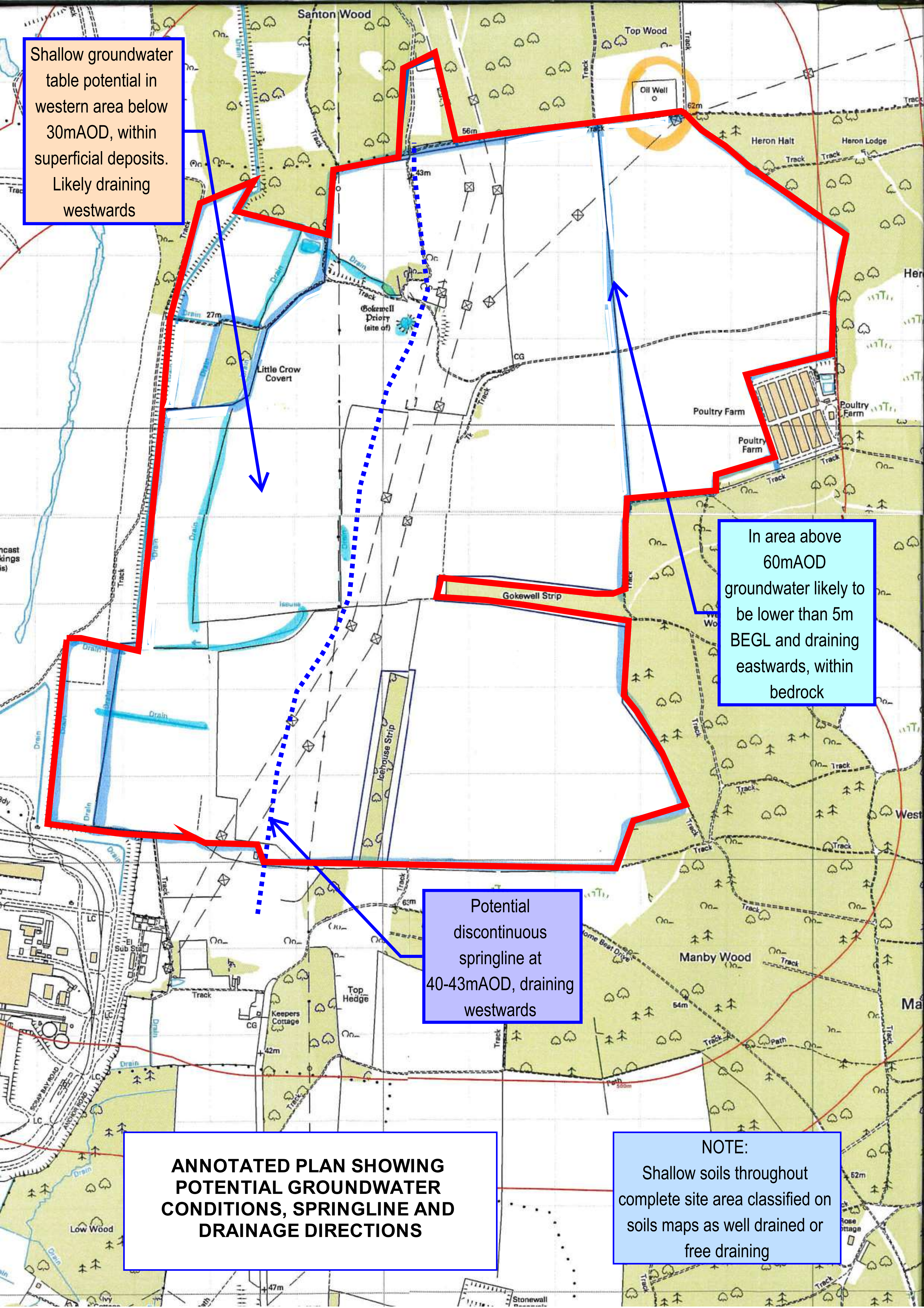
To view a glossary visit: www.landis.org.uk/sitereporter/glossary.pdf
For a list of further reading visit: www.landis.org.uk/sitereporter/FURTHER_READING.pdf

GIS Datasets:
The GIS data used in the creation of this report is available to lease for use in projects.
To learn more about, or acquire the GIS datasets used in the creation of this report, please contact the Nationals Soil Resources Institute:
nsridata@cranfield.ac.uk
+44 (0) 1234 75 2992
National Soil resources Institute
Cranfield University
Bedfordshire
MK43 0AL
United Kingdom
www.landis.org.uk



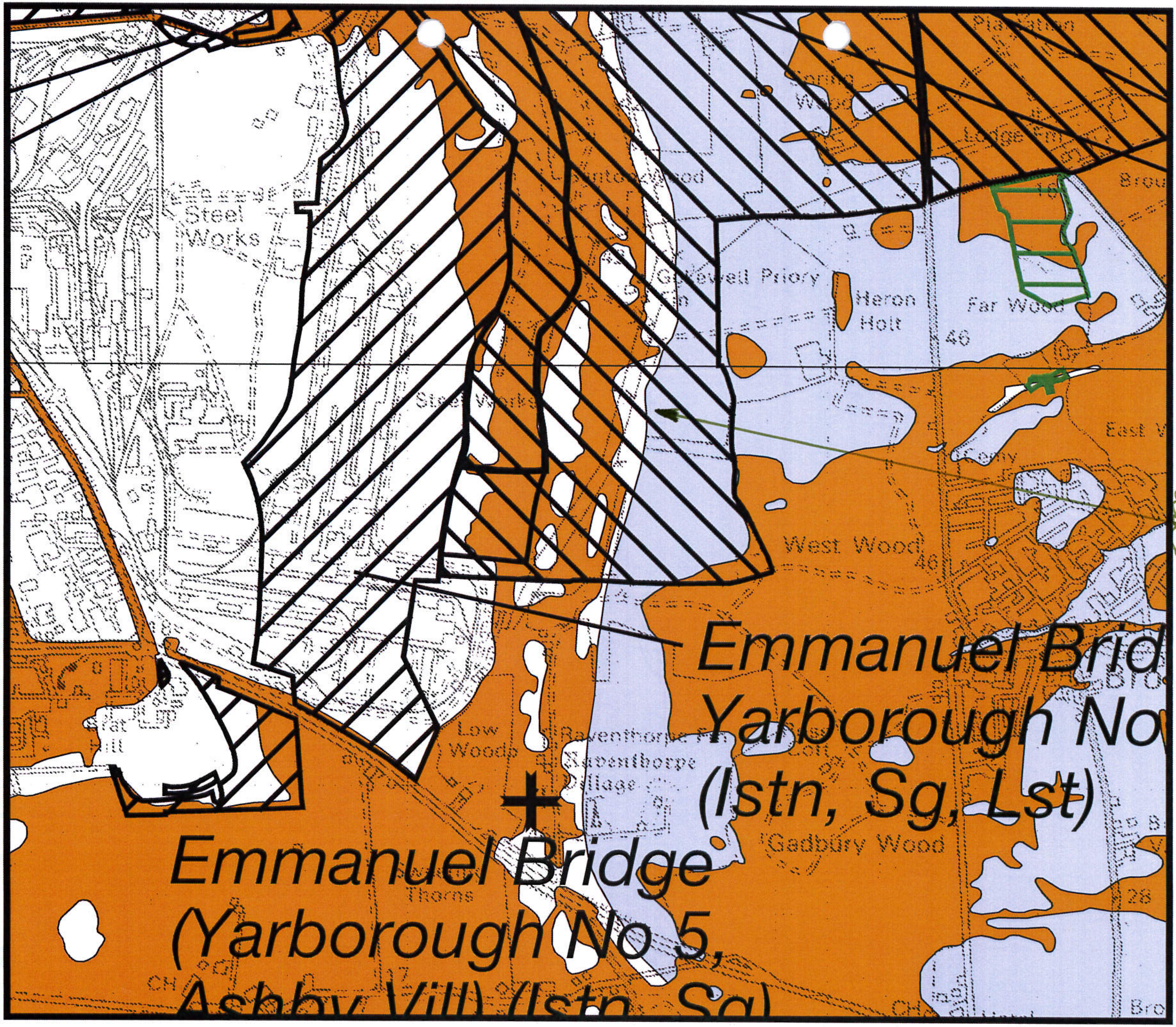
Shallow groundwater table potential in western area below 30mAOD, within superficial deposits. Likely draining westwards

In area above 60mAOD groundwater likely to be lower than 5m BEGL and draining eastwards, within bedrock

Potential discontinuous springline at 40-43mAOD, draining westwards

ANNOTATED PLAN SHOWING POTENTIAL GROUNDWATER CONDITIONS, SPRINGLINE AND DRAINAGE DIRECTIONS

NOTE:
Shallow soils throughout complete site area classified on soils maps as well drained or free draining



SITE AREA

EXTRACT:
HUMBERSIDE
MINERAL
RESOURCES
1:100,000
ORIGINAL
(2006)

30

20

EVAPORITES

Potash

▨ Approximate western limit of Boulby Potash

Salt

▨ Approximate western limit of Boulby Halite

} Permian

MINERAL PLANNING PERMISSION (as at 01.08.05)

Source: Mineral Planning Authorities

▨ Surface planning permission (valid and expired)

▨ Underground planning permission (valid and expired)

MINERAL WORKINGS

▨ ●	Melton Ross	Active site
▨	*Burstwick*	Inactive (including yet to be worked), worked-out and/or restored site

Mineral commodity

Ch	Chalk	Istn	Ironstone	Peat	Peat
Cl	Clay & Shale	Lst	Limestone	San	Sand
CR	Crushed Rock	Oil	Oil	Sg	Sand & Gravel
Fi	Flint	Min	Unspecified mineral	SiS	Silica Sand
Gas	Natural Gas	MSg	Marine sand and gravel		

■ Active rail aggregate depot ◆ Active marine wharf

ENVIRONMENTAL DESIGNATIONS (as at 03/11/04)

▤ National nature conservation designations (SSSIs and NNRs)

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INTERACTIVE MAP FULL SCREEN

V 3.8.0

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Wellname: BROUGHTON B1

Show Legend

Main | Depths | Directional | Images

Contents

- ☐ Wells
- ☐ Seismic
- ☐ UKOGL Interpretations
- ☐ Licences
- ☐ Contexts

Datum (ft)	RT 224
Datum (m)	RT 68.2
GL (ft)	207
GL (m)	63.1
TD (ft)	6300
TD (m)	1920
TVD SS (ft)	6076
TVD SS (m)	1851.8
TD Period	Carboniferous
TD Detail	Dinantian

Add to Selection | Zoom To

Additional Borehole Coverage

As a supplement to our primary Exploration wells coverage we now serve an additional wells layer of selected additional deep boreholes compiled over areas of limited exisiting coverage and control.

Providing access to an expanded Formation Tops database this resource has been compiled from a number of open access sources and sub surface memoirs, primarily derived from information held within the British Geological Survey’s Borehole Scans archive. For further information and access to extensive source records please visit the BGS site.

This compilation is an ongoing project and is still in its early stages, with the initial focus being across the south of England. New data will be added on a regular basis and this layer, shown as blue ringed well

BROUGHTON B1

Surface Easting:	494627	Datum for MD:	RT		
Surface Northing:	410760			(f)	(m)
Deviated:	N	Elevation Datum:		224	68.2
Original Depth Units:	metres	Elevation GL:		207	63.1
Surface Formation:	Upper Lias				

Top	MD (f)	MD (m)	TVDSS (f)	TVDSS (m)	TWT (s)	Detail
Upper Lias	17	5.1	-207	-63.1	-	-
Middle Lias	90	27.5	-134	-40.7	-	-
Lower Lias	330	100.5	106	32.2	0.031	-
Triassic	603	183.8	379	115.6	0.100	-
Penarth Group (Rhaetic)	603	183.8	379	115.6	0.100	-
Mercia Mudst (Keuper)	631	192.2	407	124.0	0.107	-
Muschelkalk	1460	445.0	1236	376.8	0.283	-
Zechstein (U.Permian)	2630	801.5	2406	733.3	0.522	-
L. Permian Marl/Shale	3597	1096.2	3373	1028.0	0.643	-
Rotliegendes/Leman SS	3674	1119.8	3450	1051.6	0.654	-
Westphalian C & D	3697	1126.8	3473	1058.6	0.659	-
Westphalian B	4099	1249.2	3875	1181.0	0.731	-
Westphalian A	4672	1424.0	4448	1355.8	0.835	-
Namurian	5211	1588.3	4987	1520.1	0.923	-
Dinantian	6188	1886.0	5964	1817.8	1.067	-
TD	6300	1920.0	6076	1851.8	1.078	Dinantian

Comments: -

BROUGHTON B1

BP PETROLEUM DEVELOPMENT LIMITED

BROUGHTON B-1

LICENCE: PL185

L46/13-3

BROUGHTON B–1

WELL RECORD CENTRE

DRILLED DEPTH

Humbs

29 MAY 1985

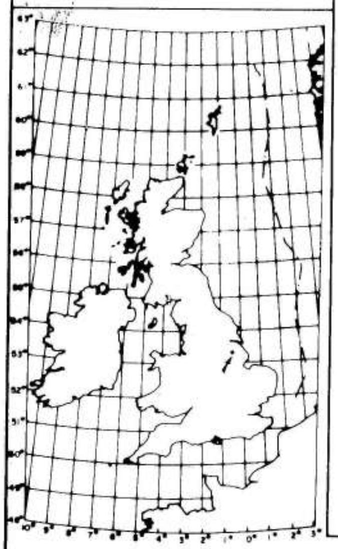
DEPARTMENT OF ENERGY

NATIONAL GRID REFERENCE:
SURFACE LOCATION SE494627410760 0 34 13·493 W 53 35 04·694
TOP RESERVOIR LOCATION —
BOTTOM HOLE LOCATION —
R.T.E. 68·2 m A.O.D. 5·1 m A.G.L. G.L.E. 63·1 m A.O.D.
RIG KENTING-36 SPUDDED 18th. JULY, 1984. COMPLETED DRILLING 17th. AUG, '84
TOTAL DEPTH DRILLED 1920·0 m B.R.T. TOTAL DEPTH (T.V.D.) — m B.R.T. — m S.S.
AVERAGE ANGLE OF DEVIATION THROUGH RESERVOIR 1·25° MAXIMUM DEVIATION 2°
WELL STATUS SUSPENDED OIL WELL

CASING

G.L.E.
13⅜" at 45·5m.
9⅝" at 821·0m.
5½" at 1909·0m.

LOCATION MAP
SCALE 1:50,000



LITHOLOGICAL

- Limestone
- Dolomite
- Misc Carbonate
- Dolomitic Limestone
- Calcareous Dolomite
- Clay, Mudstone, Shale (LT 70)
- Siltstone
- Sandstone, Sand
- Conglomerate, Gravel
- Siliceous Rock
- Coal, Lignite & other Carbonaceous Rock

- Anhydrite, Gypsum
- Halite
- Miscellaneous Chlorides and Sulphates
- Iron, Manganese, Phosphate and other Misc. Mins.
- Chert
- Extrusive Igneous
- Tuff
- Intrusive Igneous
- Metamorphic
- Cement (LT 110)
- No Samples

LITHOLOGICAL QUALIFIERS

- Clayey
- Sandy
- Silty
- Gravelly
- Calcareous
- Dolomitic
- Significant Glauconite
- Significant Carb Frags
- Phosphatic, Ferruginous Manganiferrous
- Bituminous
- Tuffaceous

GRAIN TYPE FOSSILIFEROUS: SKELETAL

- Benthonic Macrofossils
- Planktonic Macrofossils
- Benthonic Microfossils
- Planktonic Microfossils
- Plant remains

WELL SYMBOLS

- Water Flow
- Loss to Formation
- Gas Trace
- Gas Show

- ● Oil Show
- Gas & Condensate Show
- Oil and Gas Show
- Hydrocarbon Fluorescence

- Cored Interval
- Sidewall Core
- No Recovery
- Formation Interval Test

- Drill Stem Test
- Perforated Interval
- Casing Shoe
- Liner Hanger

Appendix D

Terrafirma Mining Report

TERRASEARCH® ASSESS

NON-RESIDENTIAL

PASSED

COAL	NEGLIGIBLE RISK 🟩
STONE (Incl. Limestone, Clay, Bath Stone & Chalk)	MODERATE RISK 🟧
EVAPORITES (Incl. Gypsum)	NEGLIGIBLE RISK 🟩
METALLIFEROUS (Incl. Tin, Lead and Iron)	LOW RISK 🟨
HYDROCARBONS (Incl. Fracking)	MODERATE RISK 🟧
CHESHIRE BRINE	NEGLIGIBLE RISK 🟩
DEVELOPMENT POTENTIAL	HIGH RISK 🟥
PLANNED/FUTURE MINERAL EXTRACTION	MODERATE RISK 🟧

Professional Opinion

Within the scope of this assessment, the Site is not considered to be at a significant risk from past, present or future mineral extraction. Mining hazards are unlikely to have an adverse effect on the security of the Site for normal lending purposes. However, your attention is drawn to the prudent enquiries suggested in the report recommendations.

Contact the report author directly by telephone on: 0330 900 7500

Report on:

LARGE SITE AT SANTON, SCUNTHORPE

Date:

14/08/2017

Our Ref:

TFC201708081425-SITE

Client Ref:

LARGE SITE

TerraSearch® Assess is a site-specific evaluation of all mining and mineral extraction hazards. The report reviews available records, allowing us to expertly conclude the risk to the site from past, present and planned mining hazards, before providing practical next steps, based on the level of risk identified.

Terrafirma's terms & conditions provide liability cover of £10m per report. All TerraSearch® Assess reports adhere to The Search Code and are regulated by the Council of Property Search Organisations.

TERRAFIRMA

COPSO ASSOCIATE MEMBER

REGULATED COMBINED MINING SEARCH

Conclusions and Expert Interpretation of Risk

Considering the ongoing current use of the Site:

MODERATE RISK

Terrafirma have reviewed all available site investigation, local geological, historical and land use records and consider that, in this instance and considering its ongoing current use, the Site is at **moderate risk** from ground instability associated with historical **ironstone** extraction.

The Site is located in an area that has been extensively exploited for ironstone resources. Within the Site a number of suspected extraction features have been identified (highlighted by dashed lines - see hazard map) and these are considered likely to be associated with ironstone mining. Furthermore, northeast of the Site a historic hydrocarbon well, operated by BP for oil extraction, has also been located. The hydrocarbon field associated with this well extends within the Site boundary. Due to the nature of mineral extraction in the area and suitable geological conditions on Site, it is considered possible that both ironstone and oil extraction occurred within the Site boundary. Therefore, associated extraction features, including underground workings and shafts could be present and have the potential to impact ground stability in the area.

Considering the future development of the Site:

HIGH RISK

The presence of unrecorded surface and/or shallow mineral workings beneath the Site cannot be discounted and therefore prior to any site works or future development activity, it is considered prudent to commission a full Site Survey by a qualified mining geologist/engineer. Please contact Terrafirma directly if you require further information.

Professional Recommendations

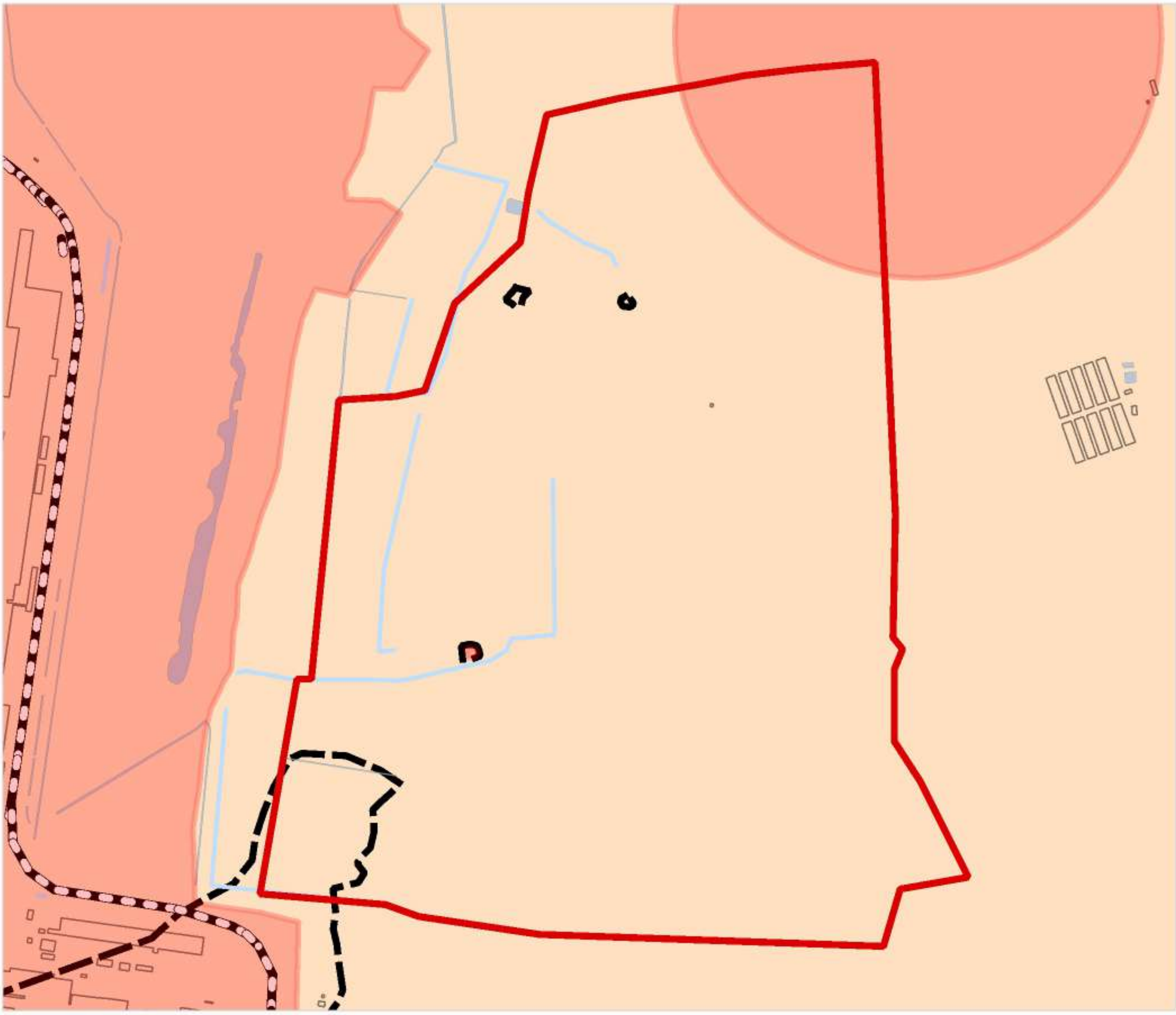
Based on the Site's current use, no further assessment of mineral extraction is required. However, due to suspected historic extraction on Site, it is strongly recommended that should the Site be developed, a full site investigation is undertaken prior to development. It is further recommended that close attention is also paid to the suspected features highlighted in the included hazard map (page 5.) during any future Site works.

Mining Hazards:

NOT DETECTED WITHIN 1000 METRES ✓ DETECTED WITHIN 1000 METRES !

Alabaster	✓	Alum Shale	✓	Anhydrite	✓	Antimony	✓
Arsenic	✓	Ball Clay	✓	Barite	✓	Bath Stone	✓
Bideford Black	✓	Brick Clay	✓	Brine Solution	✓	Celestine	✓
Chalk	✓	Chert	✓	China Clay	✓	Clay and Shale	✓
Coal	✓	Copper	✓	Coprolite	✓	Delphstone	✓
Diatomite	✓	Dolerite/Basalt	✓	Dolomite	✓	Flagstone	✓
Fireclay	✓	Fluorspar/Calcite	✓	Free Stone	✓	Fuller’s Earth	✓
Gas	✓	Granite	✓	Gold	✓	Gypsum	✓
Iron Ore/Hematite	✓	Iron Ochre	✓	Ironstone	!	Jet	✓
Kentish Ragstone	✓	Lead/Zinc	✓	Lignite	✓	Limestone	✓
Manganese	✓	Metamorphic Rock	✓	Non-Ferrous Metals	✓	Oil	✓
Oil Shale	✓	Peat	✓	Platinum	✓	Potash	✓
Rock Salt/Halite	✓	Sand and Gravel	✓	Sandstone	✓	Sec. Aggregate	✓
Shale Gas	✓	Silica Sand	✓	Siltstone	✓	Silver	✓
Slate	✓	Soapstone	✓	Tin	✓	Tufa	✓
Tungsten	✓	Witherite	✓	Whinstone	✓	Whetstone	✓

Mining Hazard Map



Site Address	LARGE SITE AT SANTON, SCUNTHORPE

Hazard Map Key

Coal Authority Data

Mine Entries
- ⇧ Adit
- ✕ Shaft

Subsidence Claims
- ⬚ 01 - Awaiting D
- ☐ 02 - Rejected
- ■ 05 - Settled
- ▦ 06 - Withdrawn

Hazard Zones
- 🟥 High Risk Zone
- 🟧 Moderate Risk Zone

- ☐ Site Boundary
- ⬚ Suspected Extraction Features

Geological Conditions

Bedrock Geology	Jurassic Age Charmouth Mudstone Formation, Pecten Ironstone, Marlstone Rock Formation (Limestone And Sandstone), Whitby Mudstone Formation, Grantham Formation, Northampton Sand Formation, Kirton Cementstone Beds and Hibaldstow Limestone
Superficial Geology	Quaternary Age Sutton Sand Formation - Sand
Geological Faults	None Recorded
Artificial Deposits	Artificially infilled ground is present in the South West region of the site
Mineralised Deposits	Iron mineralisation is known to be present within the local bedrock
Wells	None Recorded

Detailed Findings of Past Non-Coal Mineral Extraction (Within 500 Metres of Site)

Ironstone	Overall Risk:	**MODERATE**
Background Information: The Site is located within an area that has been historically exploited for Ironstone by surface and underground mining.	Mining Hazards Within:	Beneath Site
	Nearest Mining Hazard:	See hazard Map
	Type of Mining Hazard:	Suspected Extraction Features

Expert Interpretation of Risk:

The Site is **considered** to be at moderate risk from ground instability associated with historical Ironstone extraction. The local geological conditions are considered to be suitable for small, unrecorded extraction features to be present within/beneath the Site boundary.

Present Non-Coal Mineral Extraction

Overall Impact: **NEGLIGIBLE**

Expert Interpretation of Mineral Extraction Activity:

The Site is considered to be at a low risk from the impact of current non-coal mineral extraction.

No Extraction Sites Within:	1000 metres
Nearest Extraction Site:	N/A
Type of Extraction Activity:	N/A
Type of Mineral Resource:	N/A

Recommendation:

None.

Planned Non-Coal Mineral Extraction

Overall Impact: **MODERATE**

Expert Interpretation of Mineral Extraction Activity:

The Site is considered to be at a moderate risk from the impact of current non-coal mineral extraction. A dormant mineral planning permission associated with Emmanuel Bridge extends within the western Site boundary. It is considered, due to the underground nature of the licence, that future extraction could occur. This has the potential to impact both ground stability and the quiet enjoyment of the Site.

Extraction Sites Within:	Within Site boundary
Nearest Extraction Site:	N/A
Type of Extraction Activity:	Underground and Surface Mining
Type of Mineral Resource:	Ironstone, Limestone, Sand and Gravel

Recommendation:

For more information, contact the area's local council.

Hydrocarbons (Inc. Fracking)

Overall Impact: **MODERATE**

Recommendation:

The Site is within PEDL 180 (south) and 182 (north) operated by Europe Oil & Gas and Egdon Resources U.K. respectively. Records show a well associated with the PEDL 185 block, 165 metres north east of the site, was constructed in 1984 and used for oil extraction. This was operated by BP and was abandoned/released in 1989. Egdon Resources U.K. have now developed a new well up-dip, approximately 1000 metres from the Site. There is no evidence for the depth of the well(s).

License Block Name:	PEDL 180 & 182
Type of License Block:	Exploration
Hydrocarbon Well Within:	1000 metres
Hydrocarbon Resource:	Oil Shale

Expert Interpretation of Hydrocarbon Extraction:

The property is situated within a block awarded for exploration, as defined by the OGA or DECC.

An assessment of Petroleum Exploration and Development Licence areas (PEDL's), has been made by reference to information provided by the Oil and Gas Authority (OGA) and the Department of Energy and Climate Change (DECC). A PEDL offers exclusive rights for the exploration and retrieval of hydrocarbons using conventional oil and gas extraction techniques, coal bed methane extraction, mine gas exploitation or shale gas fracking techniques within set Ordnance Survey (OS) referenced 'blocks'.

TERRASEARCH® COAL

Overall Coal Mining Assessment	**NEGLIGIBLE RISK**
Within Coal Mining Reporting Area	No
Within Brine Compensation District	No

Coal Mining Features*		**Assessment****
Past underground	No	NEGLIGIBLE RISK 🟩
Present underground	No	NEGLIGIBLE RISK 🟩
Planned underground	No	NEGLIGIBLE RISK 🟩
Mine shafts and adit entries	No	NEGLIGIBLE RISK 🟩
Geological conditions	No	NEGLIGIBLE RISK 🟩
Past opencast	No	NEGLIGIBLE RISK 🟩
Present opencast	No	NEGLIGIBLE RISK 🟩
Planned opencast	No	NEGLIGIBLE RISK 🟩
Coal subsidence claims	No	NEGLIGIBLE RISK 🟩
Mine gas	No	NEGLIGIBLE RISK 🟩
Hazards	No	NEGLIGIBLE RISK 🟩
Withdrawal of Support	No	NEGLIGIBLE RISK 🟩
Working Facilities Order	No	NEGLIGIBLE RISK 🟩
Payments to Copyhold Land	No	NEGLIGIBLE RISK 🟩
Brine Subsidence	No	NEGLIGIBLE RISK 🟩

*Coal Mining Features are identified solely from The Coal Authority licensed data.

**Assessment is the risk of subsidence or impact to the Site based on Terrafirma's interpretation of Coal Authority licensed data and third party data.

Detailed Findings of Coal Mining Hazards:

Past underground

NEGLIGIBLE RISK 🟩

The Site is not within a surface area that could be affected by historical deep underground mining.

The Site is not within a surface area that could be affected by historical recorded shallow underground mining.

The Site is not within a surface area that could be affected by historical unrecorded shallow underground mining.

Present underground

NEGLIGIBLE RISK 🟩

The Site is not situated within an area which could be affected by currently active underground coal mining.

Planned underground

NEGLIGIBLE RISK 🟩

The Site is not situated within an area which could be affected by any future underground coal mining.

The Site is not situated within 50 metres of a Section 46 Notice.

Mine shafts and adit entries	**NEGLIGIBLE RISK** 🟩
There are no recorded mine entries within 20 metres of the Site.	

Geological conditions	**NEGLIGIBLE RISK** 🟩
There are no recorded faults, fissures or breaklines beneath or within the vicinity of the Site.	

Past opencast	**NEGLIGIBLE RISK** 🟩
The Site is not situated within or proximal to any past licence areas for the opencast extraction of coal. There are no unlicensed opencast pits or extraction sites within 200 metres of the Site.	

Present opencast

NEGLIGIBLE RISK 🟩

The Site is not situated within an area which could be affected by currently active opencast coal mining.

Planned opencast

NEGLIGIBLE RISK 🟩

There are no plans by the Coal Authority to grant a licence to extract coal using opencast methods within 800 metres surrounding the Site.

Coal subsidence claims

NEGLIGIBLE RISK 🟩

There is no record of any coal mining-related damage notices or subsidence claims for the Site or for any Site within 50 metres of the Site, since 1994.

There is no record of a request that has been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

NEGLIGIBLE RISK 🟩

There are no records of any mine gas wells within 25 metres of the Site and there is no record of a mine gas emission requiring action.

Hazards

NEGLIGIBLE RISK 🟩

The Site is not situated within 25 metres of a coal mining-related hazard. There have been no remedial works undertaken by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

Withdrawal of Support

NEGLIGIBLE RISK 🟩

The property is not within an area where notices to withdraw support were given in 1946.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Working Facilities Order

NEGLIGIBLE RISK 🟩

The property is not in an area for which the Sherwood Area Order dated 1938 has been made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to former owners of Copyhold Land

NEGLIGIBLE RISK 🟩

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Brine subsidence

NEGLIGIBLE RISK 🟩

Site is not situated within 25 metres of a coal mining-related hazard. There have been no remedial works undertaken by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

Notice of Statutory Cover

In the unlikely event of any future damage, the terms of the Coal Mining Subsidence Act 1991 (as amended by the Coal Industry Act 1994) apply, and the Coal Authority / Licensee has a duty to take remedial action in respect of subsidence caused by the withdrawal of support from land and/or property in connection with lawful coal-mining operations. Typically, these actions will not need to involve either your insurance company or mortgage lender and therefore the end user(s) should not incur any costs or liability.

In addition to the above, it should also be noted that the Coal Authority offer a Public Safety and Subsidence Department that provides a 24 hour 7 day a week call out service (Tel: 01623 646 333) to take remedial action in respect of hazards associated with the movement or collapse of any coal mineshaft or entrances to coal mines and from other coal mining related surface hazards. Further information can be found on their website: www.groundstability.com.

Report Limitations

This TerraSearch® Report has been carried out with reference to Terrafirma's bespoke GIS, an extensive collection of abandoned mine plans, maps, records and archives in our possession. **The report does not consider natural ground stability hazards, such as subsidence, landslip or coastal erosion.**

From this material, we have endeavoured to provide as accurate a report as possible. It should be realised that totally unrecorded or unindicated workings can exist between known workings and therefore Terrafirma cannot be held responsible for any settlement or subsidence problems as a result of a Site being affected by unrecorded mining features or natural ground cavities. The assessment of the 'risk' of ground instability arising from existing or planned mineral exploration or extraction is based on extant mineral planning or safeguarding areas as defined by the relevant Mineral Planning Authority (MPA) policies at the time of writing. Terrafirma cannot be held liable for any updates or changes in existing mineral operations or policies.

It is a 'remote' investigation and reviews only information provided by the client and from the databases of publicly available information that have been chosen to enable a desk based environmental assessment of the Site. The Certificate does not include a Site Investigation, nor does Terrafirma make specific information requests of the regulatory authorities for any relevant information they may hold.

This report is concerned solely with the Site searched and should not be used in connection with adjacent properties as only relevant known mining features have been mentioned and any known features that could potentially have a direct influence upon the target Site. Other features which may be present in the general area may have been omitted for clarity.

The report is based upon the Site boundaries as shown on the supplied location plan. This report is confidential to the client, the client's legal advisor and the client's Mortgage lender, as defined in the TerraSearch® terms & conditions, and as such may be used by them for conveyancing or related purposes. We have no liability toward any person or organisation not party to commissioning this report. This report or any part of it is not permitted to be reproduced, copied, altered or in any other way distributed by any other person or organisation.

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This report may contain plans and records held by the Coal Authority and made publicly available at the time of inspection which may include British Geological Survey and Ordnance Survey data.

Where mining reports and ground stability reports sourced from the Coal Authority are incorporated into this report, the integrity of the text is preserved and has not been disassembled, modified or paraphrased in any way and no deletions, omissions or reorganisation have been made to the text. The relevant text is identified as originating with the Coal Authority who are acknowledged as the author.

Important Consumer Information

This search has been produced by **TERRAFIRMA MINE SEARCHES LTD** – Address: 2440 The Quadrant, Aztec West Business Park, Almondsbury, Bristol, BS32 4AQ; Email: info@terrafirmasearch.co.uk; Telephone: 01934806515) which is registered with the Site Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

This report meets the principles and requirements of the Property Codes Compliance Board Compliance Note CN02J in respect of Coal Mining Searches.

The Search Code

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in Site search reports undertaken by subscribers on residential and commercial Site within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practice and quality standards within the industry for the benefit of consumers and Site professionals
- enables consumers and Site professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles (Firms which subscribe to the Search Code will):

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

CONTACT TERRAFIRMA IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Site Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details:

The Site Ombudsman scheme, Milford House, 43-55 Milford Street, Salisbury, Wiltshire SP1 2BP, Tel: 01722 333306, Fax: 01722 332296, Email: admin@tpos.co.uk

You can get more information about the PCCB from www.Sitecodes.org.uk or from our website at www.minesearches.co.uk.

Complaints Procedure

If you want to make a complaint directly to Terrafirma, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

Complaints should be sent to: Tom Backhouse, Managing Director & Senior Executive, Terrafirma Mine Searches Ltd - Address: 2440 The Quadrant, Aztec West Business Park, Almondsbury, Bristol, BS32 4AQ; Email: info@terrafirmaminesearches.co.uk; Telephone: 0330 900 7500.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk. We will co-operate fully with the Ombudsman during an investigation and comply with his final decision.

WE TRUST THIS REPORT PROVIDES THE INFORMATION YOU REQUIRE. PLEASE CONTACT US IF YOU HAVE ANY QUERIES OR IF WE CAN BE OF ANY FURTHER ASSISTANCE.

Appendix E

Groundsure Data Report

CENTREMAPS

Open Space, Upper Interfields,
Worcester, WR14 1UT

Groundsure Reference:	CMAPS-CM-643992-13238-310717EDR
Your Reference:	13238
Report Date	31 Jul 2017
Report Delivery Method:	Email - pdf

Enviro Insight

Address: Santon, Scunthorpe, DN16 1XP

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviro Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 01886 832972 quoting the above CENTREMAPS reference number.

Yours faithfully,

CENTREMAPS

Enc.
Groundsure Enviroinsight

Enviro Insight

Address:	**Santon, Scunthorpe, DN16 1XP**
Date:	**31 Jul 2017**
Reference:	**CMAPS-CM-643992-13238-310717EDR**
Client:	**CENTREMAPS**

Aerial Photograph Capture date:	16-Aug-2015
Grid Reference:	494018,409842
Site Size:	156.74ha

Report Reference: CMAPS-CM-643992-13238-310717EDR
Client Reference: 13238

Contents Page

Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	19	0	18	12
1.2 Additional Information – Historical Tank Database	0	0	4	19
1.3 Additional Information – Historical Energy Features Database	0	0	3	2
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	0	0
1.6 Potentially Infilled Land	17	0	25	24

Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	9
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	0
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	1	0
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	1	0	0	0
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	0	1
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency/Natural Resources Wales Registered Landfill Sites	0	0	1	0	0	Not searched
3.1.2 Environment Agency/Natural Resources Wales Historic Landfill Sites	0	0	1	0	0	2
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	0
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
3.2.2 Environment Agency/Natural Resources Wales Licensed Waste Sites	0	0	0	0	0	3

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	15	0	8	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	0
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	Yes
5.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	Yes
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology	0-500m
6.1 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?	Yes
6.2 Are there any records of Strata Classification in the Bedrock Geology within 500m of the study site?	Yes

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	1
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	6	0	0	0	Not searched	Not searched

Section 6: Hydrogeology and Hydrology

	0-500m					
	On-site	0-50m	51-250	251-500	501-1000	1000-1500
6.9 Is there any Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site?	No	No	No	No	No	Yes
6.10 Detailed River Network entries within 500m of the site	11	1	6	3	Not searched	Not searched
6.11 Surface water features within 250m of the study site	Yes	Yes	Yes	Not searched	Not searched	Not searched

Section 7: Flooding

7.1 Are there any Enviroment Agency Zone 2 floodplains within 250m of the study site?	No
7.2 Are there any Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	No
7.3 What is the Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site?	Very Low
7.4 Are there any Flood Defences within 250m of the study site?	No
7.5 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
7.6 Are there any areas used for Flood Storage within 250m of the study site?	No
7.7 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Potential at Surface
7.8 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	High

Section 8: Designated Environmentally Sensitive Sites

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	4
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	1	0	0	4	1
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	6	0	0	0	0	0
8.14 Records of Green Belt land	0	0	0	0	0	0

Section 9: Natural Hazards

9.1 What is the maximum risk of natural ground subsidence?	Moderate
9.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?	Low
9.1.2 What is the maximum Landslides hazard rating identified on the study site?	Moderate
9.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?	Very Low
9.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?	Moderate
9.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?	Very Low
9.1.6 What is the maximum Running Sand hazard rating identified on the study site?	Low
9.2 Radon	
9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is in a Radon Affected Area, as between 10 and 30% of properties are above the Action Level.
9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	Full radon protective measures are necessary.

Section 10: Mining

10.1 Are there any coal mining areas within 75m of the study site?	No
10.2 Are there any Non-Coal Mining areas within 50m of the study site boundary?	Yes
10.3 Are there any brine affected areas within 75m of the study site?	No

Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

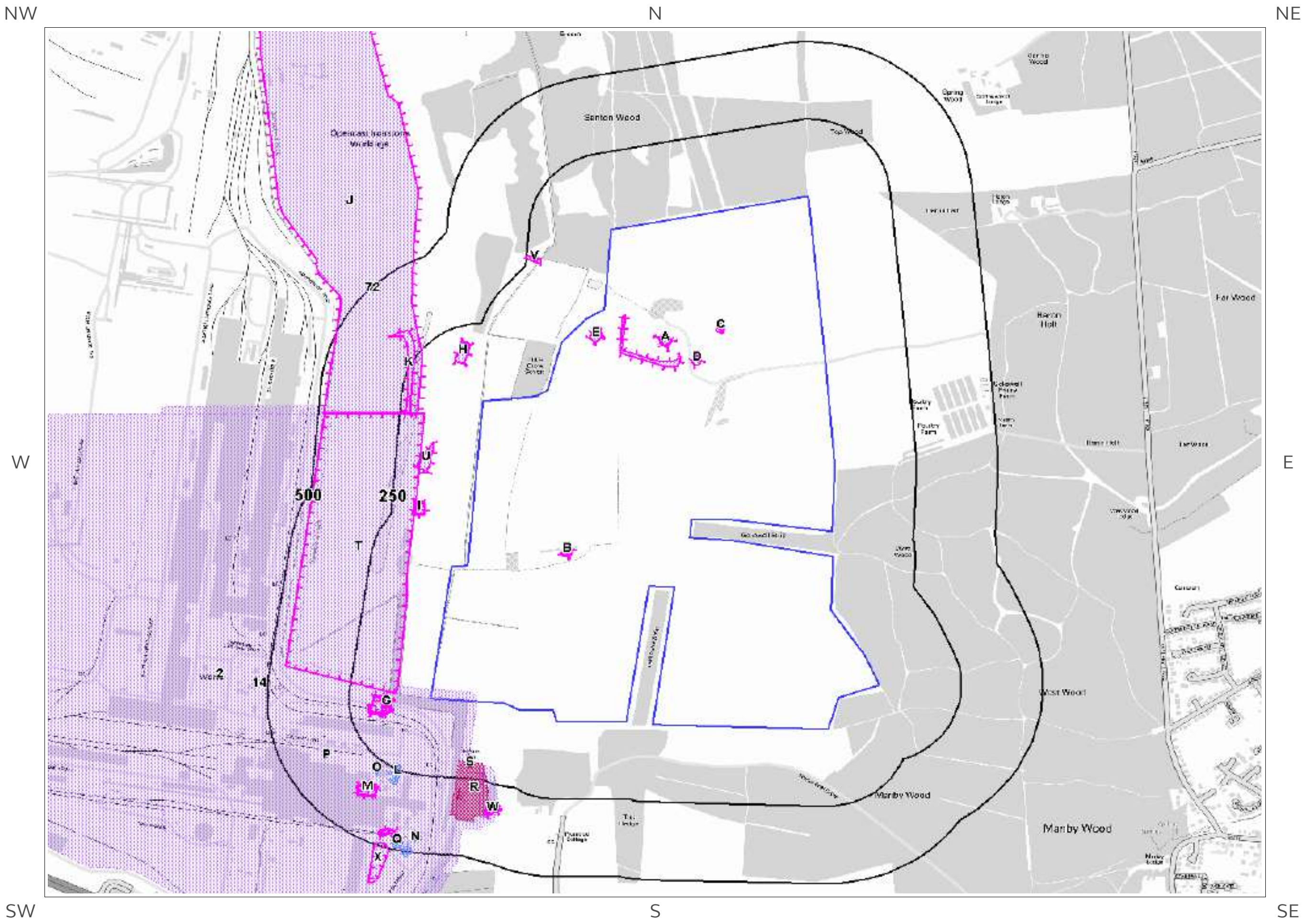
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Historical Land Use



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⬠ Site Outline

250 / 500 Search Buffers (m)

Historical 1:10,000 and 1:10,560 scale mapping

▨ Industrial Land Use

☐ Potentially Infilled Land

Historical 1:2,500, 1:1,250 and 1:500 scale mapping

▨ Energy Features

▨ Petrol Stations

▨ Tanks

▨ Garages

1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 49

ID	Distance [m]	Direction	Use	Date
1B	0	On Site	Unspecified Pit	1948
2	0	On Site	Railway Sidings	1979
3C	0	On Site	Unspecified Ground Workings	1977
4A	0	On Site	Unspecified Pit	1977
5D	0	On Site	Unspecified Pit	1977
6A	0	On Site	Unspecified Pit	1886
7E	0	On Site	Unspecified Pit	1886
8B	0	On Site	Unspecified Pit	1906
9B	0	On Site	Unspecified Pit	1955
10C	0	On Site	Unspecified Ground Workings	1994
11D	0	On Site	Unspecified Pit	1994
12A	0	On Site	Unspecified Pit	1994
13F	0	On Site	Unspecified Ground Workings	1977
14	0	On Site	Unspecified Works	1979
15B	0	On Site	Unspecified Pit	1906
16B	0	On Site	Unspecified Pit	1886
17E	0	On Site	Unspecified Pit	1886
18F	0	On Site	Unspecified Ground Workings	1994
19B	0	On Site	Unspecified Pit	1906
20T	105	W	Opencast Ironstone Workings	1979
21G	123	W	Unspecified Pit	1885
22G	123	W	Unspecified Pit	1885
23G	123	W	Unspecified Ground Workings	1905
24G	123	W	Unspecified Ground Workings	1905
25G	123	W	Unspecified Ground Workings	1886
26G	126	W	Unspecified Pit	1968
27H	134	NW	Unspecified Pit	1886
28H	135	NW	Unspecified Pit	1886
29U	139	W	Unspecified Pit	1886

30I	147	W	Unspecified Pit	1886
31I	147	W	Unspecified Pit	1886
32J	195	W	Opencast Ironstone Workings	1977
33J	195	W	Opencast Ironstone Workings	1994
34K	217	W	Unspecified Ground Workings	1977
35K	217	W	Unspecified Ground Workings	1994
36R	228	S	Electric Substation	1979
37L	232	SW	Unspecified Tanks	1979
38L	266	SW	Unspecified Tanks	1979
39M	326	SW	Sand Pit	1885
40M	328	SW	Unspecified Pit	1905
41M	328	SW	Unspecified Pit	1905
42M	328	SW	Unspecified Pit	1886
43M	330	SW	Unspecified Pit	1955
44M	330	SW	Unspecified Heap	1968
45M	332	SW	Unspecified Pit	1948
46M	332	SW	Unspecified Pit	1938
47N	456	S	Unspecified Tanks	1979
48N	458	S	Unspecified Tanks	1979
49X	489	S	Unspecified Pit	1979

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary:	23

ID	**Distance (m)**	**Direction**	Use	**Date**
50L	235	SW	Unspecified Tank	1975
51L	236	SW	Unspecified Tank	1997
52L	237	SW	Unspecified Tank	1975
53L	239	SW	Unspecified Tank	1997
54L	266	SW	Tanks	1975
55L	266	SW	Unspecified Tank	1997
56O	274	SW	Tanks	1975
57O	275	SW	Tanks	1997
58L	286	SW	Unspecified Tank	1975
59L	287	SW	Unspecified Tank	1997
60L	292	S	Unspecified Tank	1975
61L	293	S	Unspecified Tank	1997

62P	370	SW	Unspecified Tank	1975
63P	372	SW	Unspecified Tank	1997
64N	454	S	Unspecified Tank	1997
65N	454	S	Unspecified Tank	1975
66N	458	S	Unspecified Tank	1997
67N	458	S	Unspecified Tank	1975
68Q	461	S	Unspecified Tank	1997
69Q	461	S	Unspecified Tank	1975
70N	483	S	Unspecified Tank	1975
71N	483	S	Unspecified Tank	1997
72	485	NW	Unspecified Tank	1964

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary: 5

ID	**Distance (m)**	Direction	**Use**	**Date**
73R	194	S	Electricity Transformer Station	1997
74S	203	S	Electricity Substation	1975
75S	204	S	Electricity Substation	1997
76R	282	S	Electricity Substation	1975
77R	283	S	Electricity Substation	1997

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 0

Database searched and no data found.

1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 66

The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
78B	0	On Site	Unspecified Pit	1955
79B	0	On Site	Unspecified Pit	1886
80F	0	On Site	Unspecified Ground Workings	1977
81F	0	On Site	Unspecified Ground Workings	1994
82A	0	On Site	Unspecified Pit	1977
83A	0	On Site	Unspecified Pit	1994
84A	0	On Site	Unspecified Pit	1886
85E	0	On Site	Unspecified Pit	1886
86C	0	On Site	Unspecified Ground Workings	1994
87C	0	On Site	Unspecified Ground Workings	1977
88B	0	On Site	Unspecified Pit	1906
89B	0	On Site	Unspecified Pit	1906
90B	0	On Site	Unspecified Pit	1906
91B	0	On Site	Unspecified Pit	1948
92D	0	On Site	Unspecified Pit	1994
93D	0	On Site	Unspecified Pit	1977
94E	0	On Site	Unspecified Pit	1886
95T	105	W	Opencast Ironstone Workings	1979
96G	123	W	Unspecified Pit	1885
97G	123	W	Unspecified Pit	1885
98G	123	W	Unspecified Ground Workings	1886
99G	123	W	Unspecified Ground Workings	1905
100G	123	W	Unspecified Ground Workings	1905
101G	124	W	Ponds	1948
102G	124	W	Ponds	1938
103G	126	W	Ponds	1955
104G	126	W	Unspecified Pit	1968
105H	134	NW	Unspecified Pit	1886
106H	135	NW	Unspecified Pit	1886
107U	139	W	Unspecified Pit	1886
108G	145	W	Ponds	1885
109G	147	W	Pond	1905

110G	147	W	Pond	1905
111G	147	W	Pond	1886
112I	147	W	Unspecified Pit	1886
113I	147	W	Unspecified Pit	1886
114J	195	W	Opencast Ironstone Workings	1977
115J	195	W	Opencast Ironstone Workings	1994
116V	205	W	Pond	1977
117V	205	W	Pond	1994
118K	217	W	Unspecified Ground Workings	1977
119K	217	W	Unspecified Ground Workings	1994
120W	323	S	Pond	1885
121W	323	S	Pond	1938
122W	323	S	Pond	1948
123W	323	S	Pond	1886
124W	323	S	Pond	1905
125W	323	S	Pond	1905
126W	325	S	Pond	1955
127M	326	SW	Sand Pit	1885
128M	328	SW	Unspecified Pit	1905
129M	328	SW	Unspecified Pit	1886
130M	328	SW	Unspecified Pit	1905
131M	330	SW	Unspecified Pit	1955
132M	330	SW	Unspecified Heap	1968
133M	332	SW	Unspecified Pit	1948
134M	332	SW	Unspecified Pit	1938
135Q	440	S	Pond	1886
136Q	440	S	Pond	1905
137Q	440	S	Pond	1905
138Q	440	S	Pond	1885
139Q	441	S	Pond	1955
140Q	441	S	Pond	1968
141Q	441	S	Pond	1938
142Q	441	S	Pond	1948
143X	489	S	Unspecified Pit	1979

2. Environmental Permits, Incidents and Registers Map

⬠ Site Outline

250 / 500 Search Buffers (m)

★ Recorded Pollution Incident

◆ Dangerous Substances (List 1)

◇ Dangerous Substances (List 2)

◩ Water Industry Referrals

🟦 Licenced Discharge Consents

🟨 Red List Discharge Consents

▼ RAS 3 & 4 Authorisations

▲ Part A(1) Authorised Processes and Historic IPC Authorisations

▲ Part A(2) and Part B Authorised Processes

⬠ COMAH / NIHHS Sites

⬠ Sites Determined as Contaminated Land

● Hazardous Substance Consents and Enforcements

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency/Natural Resources Wales and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

9

The following Part A(1) and IPPC Authorised Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
13A	469	E	495020 410050	Operator: Hook2sisters Ltd Installation Name: Gokewell Farm Process: ASSOCIATED PROCESS	Permit Number: HP3633UU Original Permit Number: HP3633UU EPR Reference: - Issue Date: 26/10/2007 Effective Date: 26/10/2007 Last date noted as effective: 2017-04-01 Status: Superceded
14A	469	E	495020 410050	Operator: Hook2sisters Ltd Installation Name: Gokewell Farm Process: ASSOCIATED PROCESS	Permit Number: TP3139TA Original Permit Number: HP3633UU EPR Reference: - Issue Date: 25/3/2010 Effective Date: 25/3/2010 Last date noted as effective: 2017-04-01 Status: Effective
15A	469	E	495020 410050	Operator: Hook2sisters Ltd Installation Name: Gokewell Farm Process: INTENSIVE FARMING; > 40,000 POULTRY	Permit Number: HP3633UU Original Permit Number: HP3633UU EPR Reference: - Issue Date: 26/10/2007 Effective Date: 26/10/2007 Last date noted as effective: 2017-04-01 Status: Superceded

ID	Distance (m)	Direction	NGR	Details	
16A	469	E	495020 410050	Operator: Hook2sisters Ltd Installation Name: Gokewell Farm Process: INTENSIVE FARMING; > 40,000 POULTRY	Permit Number: TP3139TA Original Permit Number: HP3633UU EPR Reference: - Issue Date: 25/3/2010 Effective Date: 25/3/2010 Last date noted as effective: 2017-04-01 Status: Effective
17B	496	NW	493300 410500	Operator: Tata Steel Uk Limited Installation Name: Yarborough Quarry Epr/qp3334sk Process: WASTE LANDFILLING; >10 T/D WITH CAPACITY >25,000T EXCLUDING INERT WASTE	Permit Number: NP3631FV Original Permit Number: QP3334SK EPR Reference: - Issue Date: 12/1/2012 Effective Date: 12/1/2012 Last date noted as effective: 2017-04-01 Status: Superceded
18B	496	NW	493300 410500	Operator: Tata Steel Uk Limited Installation Name: Yarborough Quarry Epr/qp3334sk Process: WASTE LANDFILLING; >10 T/D WITH CAPACITY >25,000T EXCLUDING INERT WASTE	Permit Number: QP3334SK Original Permit Number: QP3334SK EPR Reference: - Issue Date: 13/6/2006 Effective Date: 13/6/2006 Last date noted as effective: 2017-04-01 Status: Superceded
19B	496	NW	493300 410500	Operator: Longs Steel Uk Limited Installation Name: Yarborough Quarry Epr/fp3136al Process: WASTE LANDFILLING; >10 T/D WITH CAPACITY >25,000T EXCLUDING INERT WASTE	Permit Number: FP3136AL Original Permit Number: FP3136AL EPR Reference: - Issue Date: 21/8/2015 Effective Date: 21/8/2015 Last date noted as effective: 2017-04-01 Status: Superceded
20B	496	NW	493300 410500	Operator: British Steel Ltd Installation Name: Yarborough Quarry Landfill Process: WASTE LANDFILLING; >10 T/D WITH CAPACITY >25,000T EXCLUDING INERT WASTE	Permit Number: TP3639DC Original Permit Number: FP3136AL EPR Reference: - Issue Date: 8/6/2016 Effective Date: 8/6/2016 Last date noted as effective: 2017-04-01 Status: Effective
21B	496	NW	493300 410500	Operator: Longs Steel Uk Limited Installation Name: Yarborough Quarry Epr/fp3136al Process: WASTE LANDFILLING; >10 T/D WITH CAPACITY >25,000T EXCLUDING INERT WASTE	Permit Number: NP3036RS Original Permit Number: FP3136AL EPR Reference: - Issue Date: 24/2/2016 Effective Date: 24/2/2016 Last date noted as effective: 2017-04-01 Status: Superceded

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

1

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
2	245	E	494800 410000	Address: SITE 49 GOKEWELL PRIORY, HERON HOLT, BROUGHTON, BRIGG, SOUTH HUMBERSIDE, DN20 0BQ Effluent Type: UNSPECIFIED Permit Number: PR3LF520 Permit Version: 1	Receiving Water: Into Land Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 24/11/1987 Effective Date: 24-Nov-1987 Revocation Date: 09/05/1997

2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 1

The following COMAH & NIHHS Authorisation records provided by the Health and Safety Executive are represented as polygons or buffered points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	Company	Address	Operational Status	Tier
12	0	On Site	Tata Steel UK Limited	Tata Steel UK Limited, Scunthorpe, Po Box 1, Brigg Road, Scunthorpe, North Lincolnshire, DN16 1BP	Current COMAH Site	COMAH Upper Tier Operator

2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

1

The following NIRS List 2 records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
1	461	SW	493000 408760	Incident Date: 13-Jul-2002 Incident Identification: 91233 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Fumes	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

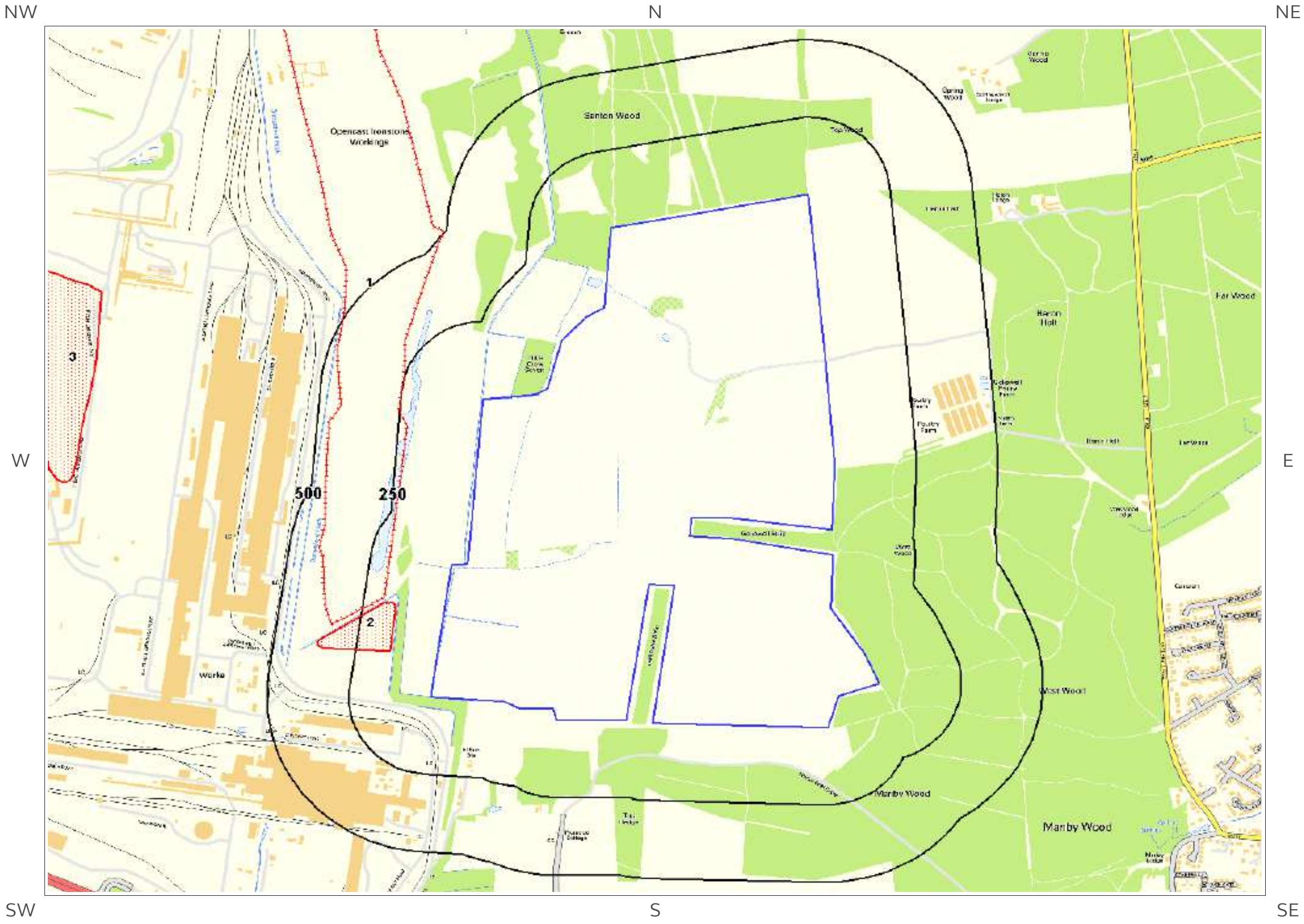
Database searched and no data found.

2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? 0

Database searched and no data found.

3. Landfill and Other Waste Sites Map



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- Site Outline
- Search Buffers (m): —250— —500—
- EA/NRW Active Landfill
- EA/NRW Historic Landfill
- ● BGS / DoE Survey Landfill
- Historic and Planned Waste Sites
- 🟥 EA/NRW Licensed Waste Site
- Local Authority/Historical Mapping Landfill Records

3. Landfill and Other Waste Sites

3.1 Landfill Sites

3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site:

1

The following Environment Agency/Natural Resources Wales landfill records are represented as polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
1	190	W	493300 410500	Address: Crosby North Landfill, Brigg Road, South Humberside, DN16 1BP Landfill Reference: -9999.0 Environmental Permitting Regulations (Waste) Reference: - Landfill Type: WASTE LANDFILLING; >10 T/D WITH CAPACITY >25,000T EXCLUDING INERT WASTE	Operator: British Steel Ltd Status: Effective IPPC Reference: EPR Reference:

3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site:

3

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
2	144	W	493100 409200	Site Address: Scunthorpe Concast, Scunthorpe, Lincolnshire Waste Licence: Yes Site Reference: 55/19/0702, A702 Waste Type: Industrial, Liquid, sludge Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 24-Sep-1981 Licence Surrendered: 23-Sep-1992 Licence Holder Address: - Operator: British Steel Corporation Licence Holder: British Steel Corporation First Recorded: 31-Dec-1981 Last Recorded: 31-Dec-1992
3	1190	W	492100 410200	Site Address: Slag Pit, Scunthorpe, Lincolnshire Waste Licence: Yes Site Reference: 55/19/0716, A716 Waste Type: Inert, Industrial Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 01-Jan-1986 Licence Surrendered: 23-Sep-1992 Licence Holder Address: - Operator: - Licence Holder: British Steel Corporation First Recorded: 31-Dec-1986 Last Recorded: 23-Sep-1992

ID	Distance (m)	Direction	NGR	Details	
Not shown	1446	SW	491900 408500	Site Address: Ashby Village, Scunthorpe, Lincolnshire Waste Licence: Yes Site Reference: 55/19/0843 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 06-Apr-1992 Licence Surrendered: 25-Apr-1993 Licence Holder Address: - Operator: - Licence Holder: Anchor Village Developments First Recorded: 31-Dec-1992 Last Recorded: 25-Apr-1993

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

0

Database searched and no data found.

3.2 Other Waste Sites

3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

0

Database searched and no data found.

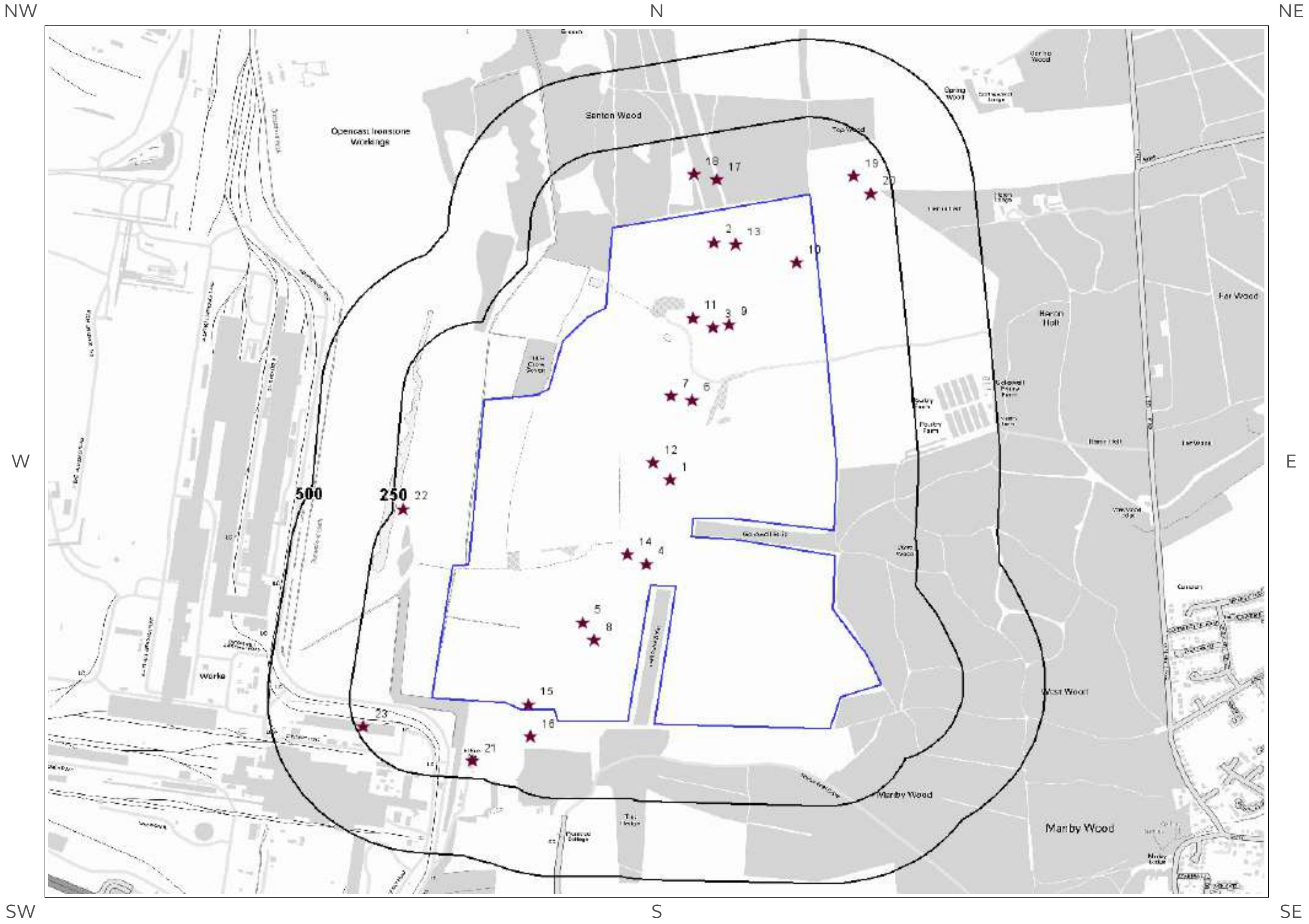
3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site:

3

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1257	NW	492947 411434	Site Address: Yarborough Landfill Site, P O Box 1, Brigg Road, Scunthorpe, Lincolnshire, DN16 1BP Type: Industrial Waste Landfill (Factory curtilage) Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: COR003 EPR reference: - Operator: Corus Uk Ltd Waste Management licence No: 43126 Annual Tonnage: 0.0	Issue Date: 10/05/1978 Effective Date: - Modified: 05/08/2004 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Yarborough Landfill Site Correspondence Address: P O Box 1, Brigg Road, Scunthorpe, Lincolnshire, DN16 1BP
Not shown	1257	NW	492947 411434	Site Address: Yarborough Landfill Site, P O Box 1, Brigg Road, Scunthorpe, N Lincolnshire, DN16 1BP Type: Industrial Waste Landfill (Factory curtilage) Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: COR003 EPR reference: - Operator: Corus U K Ltd Waste Management licence No: 43126 Annual Tonnage: 637500.0	Issue Date: 10/05/1978 Effective Date: - Modified: 05/08/2004 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Yarborough Landfill Site Correspondence Address: P O Box 1, Brigg Road, Scunthorpe, N Lincolnshire, DN16 1BP
Not shown	1257	NW	492946 411433	Site Address: Yarborough Landfill Site, P O Box 1, Brigg Road, Scunthorpe, Lincolnshire, DN16 1BP Type: Industrial Waste Landfill (Factory curtilage) Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: COR003 EPR reference: - Operator: Corus Waste Management licence No: 43126 Annual Tonnage: 0.0	Issue Date: 10/05/1978 Effective Date: - Modified: 06/02/2001 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Yarborough Landfill Site Correspondence Address: Scunthorpe Works, P O Box 1, Brigg Road, Scunthorpe, North Lincs, DN16 1BP

4. Current Land Use Map



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⬠	Site Outline	★	Current Industrial Sites	—	Electricity Transmission Cables
250 500	Search Buffers (m)	●	Petrol & Fuel Sites	—	Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 23

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	0	On Site	Pylon	494059 409785	Pylon, DN16	Electrical Features	Infrastructure and Facilities
2	0	On Site	Pylon	494193 410550	Pylon, DN20	Electrical Features	Infrastructure and Facilities
3	0	On Site	Pylon	494188 410277	Pylon, DN20	Electrical Features	Infrastructure and Facilities
4	0	On Site	Pylon	493986 409514	Pylon, DN16	Electrical Features	Infrastructure and Facilities
5	0	On Site	Pylon	493792 409325	Pylon, DN16	Electrical Features	Infrastructure and Facilities
6	0	On Site	Pylon	494126 410042	Pylon, DN20	Electrical Features	Infrastructure and Facilities
7	0	On Site	Pylon	494062 410055	Pylon, DN16	Electrical Features	Infrastructure and Facilities
8	0	On Site	Pylon	493828 409268	Pylon, DN16	Electrical Features	Infrastructure and Facilities
9	0	On Site	Pylon	494240 410285	Pylon, DN20	Electrical Features	Infrastructure and Facilities
10	0	On Site	Pylon	494445 410485	Pylon, DN20	Electrical Features	Infrastructure and Facilities
11	0	On Site	Pylon	494129 410306	Pylon, DN20	Electrical Features	Infrastructure and Facilities
12	0	On Site	Pylon	494007 409840	Pylon, DN16	Electrical Features	Infrastructure and Facilities
13	0	On Site	Pylon	494258 410543	Pylon, DN20	Electrical Features	Infrastructure and Facilities
14	0	On Site	Pylon	493929 409544	Pylon, DN16	Electrical Features	Infrastructure and Facilities
15	0	On Site	Pylon	493627 409061	Pylon, DN16	Electrical Features	Infrastructure and Facilities
16	84	S	Pylon	493632 408958	Pylon, DN16	Electrical Features	Infrastructure and Facilities
17	99	N	Pylon	494202 410751	Pylon, DN15	Electrical Features	Infrastructure and Facilities
18	130	N	Pylon	494131 410769	Pylon, DN15	Electrical Features	Infrastructure and Facilities
19	146	NE	Oil Well	494620 410763	Oil Well, DN15	Oil and Gas Extraction, Refinery and Product Manufacture	Extractive Industries

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
20	183	E	Pylon	494671 410706	Pylon, DN20	Electrical Features	Infrastructure and Facilities
21	193	S	Electricity Sub Station	493454 408879	Electricity Sub Station, DN16	Electrical Features	Infrastructure and Facilities
22	217	W	Opencast Workings (Disused)	493243 409690	Opencast Workings (Disused), DN16	Unspecified Quarries Or Mines	Extractive Industries
23	228	SW	Works	493122 408989	Works, DN16	Unspecified Works Or Factories	Industrial Features

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 0

Database searched and no data found.

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

5. Geology

5.1 Artificial Ground and Made Ground

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
WMGR-ARTDP	INFILLED GROUND	ARTIFICIAL DEPOSIT

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
SUTN-S	SUTTON SAND FORMATION	SAND
SUTN-S	SUTTON SAND FORMATION	SAND

5.3 Bedrock and Solid Geology

The database has been searched on site, including a 50m buffer.

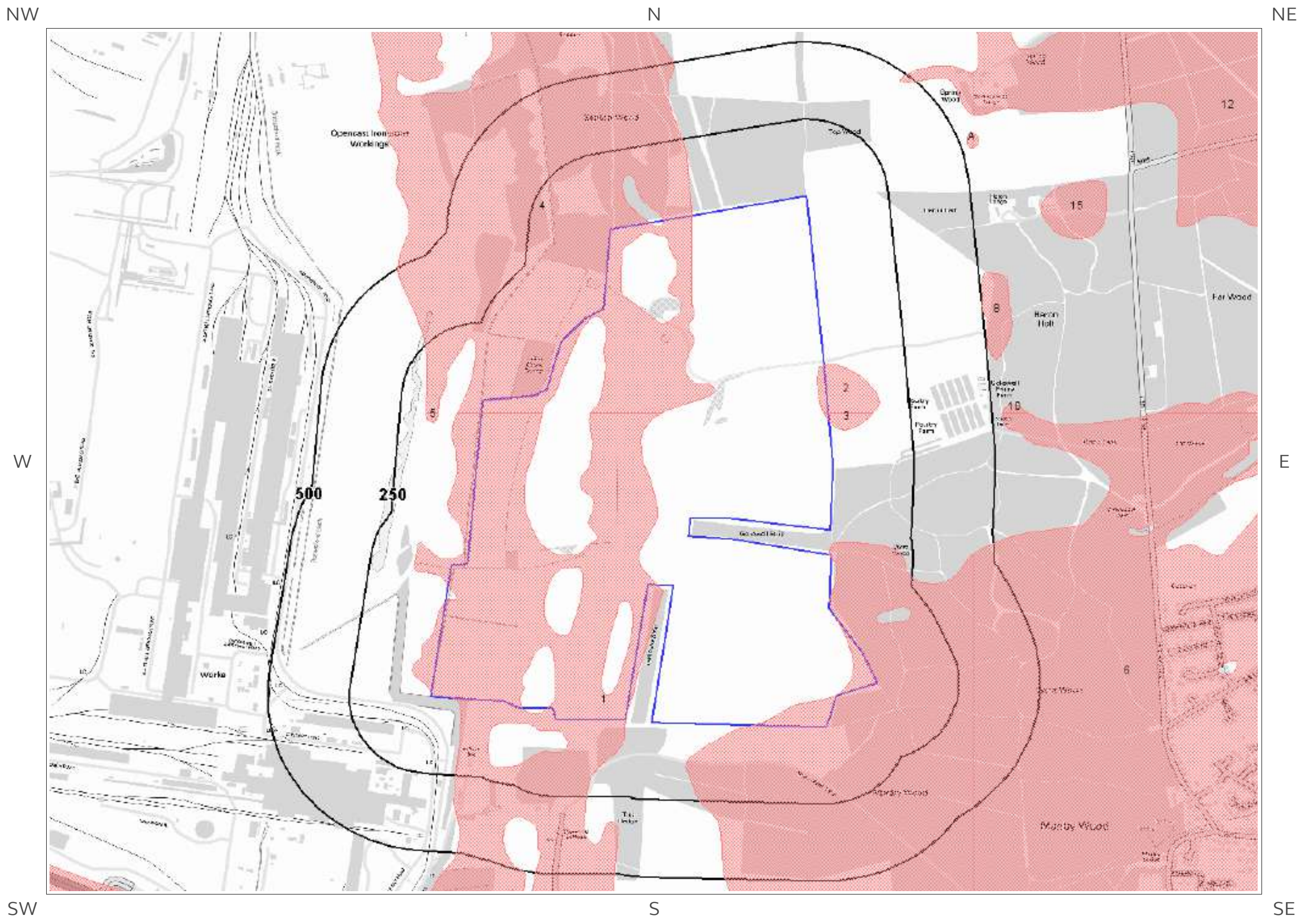
Lex Code	Description	Rock Type
MRB-FGLS	MARLSTONE ROCK FORMATION	FERRUGINOUS LIMESTONE AND FERRUGINOUS SANDSTONE
GRF-SDSM	GRANTHAM FORMATION	SANDSTONE, SILTSTONE AND MUDSTONE
WHM-MDST	WHITBY MUDSTONE FORMATION	MUDSTONE
NS-FGSST	NORTHAMPTON SAND FORMATION	SANDSTONE, FERRUGINOUS
HIL-LMOOL	HIBALDSTOW LIMESTONE	LIMESTONE, OOIDAL
KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF)	LIMESTONE
KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF)	LIMESTONE
KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF)	LIMESTONE
KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF)	LIMESTONE
KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF)	LIMESTONE

Lex Code	Description	Rock Type
SYL-LMAR	SCAWBY LIMESTONE	LIMESTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED
LLL-LMST	LOWER LINCOLNSHIRE LIMESTONE MEMBER	LIMESTONE
KCM-MDLM	KIRTON CEMENTSTONE BEDS	MUDSTONE AND LIMESTONE, INTERBEDDED
RVB-LMAR	RAVENTHORPE BEDS	LIMESTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED
KCM-LMST	KIRTON CEMENTSTONE BEDS	LIMESTONE
KCM-LMST	KIRTON CEMENTSTONE BEDS	LIMESTONE
KCM-MDLM	KIRTON CEMENTSTONE BEDS	MUDSTONE AND LIMESTONE, INTERBEDDED
CHAM-MDST	CHARMOUTH MUDSTONE FORMATION	MUDSTONE
PTNI-FEST	PECTEN IRONSTONE (BED)	IRONSTONE
CHAM-MDST	CHARMOUTH MUDSTONE FORMATION	MUDSTONE

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



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Site Outline

250 500 Search Buffers (m)

🟪 Principal Aquifer

🟥 Secondary (A) Aquifer - Permeable Layers

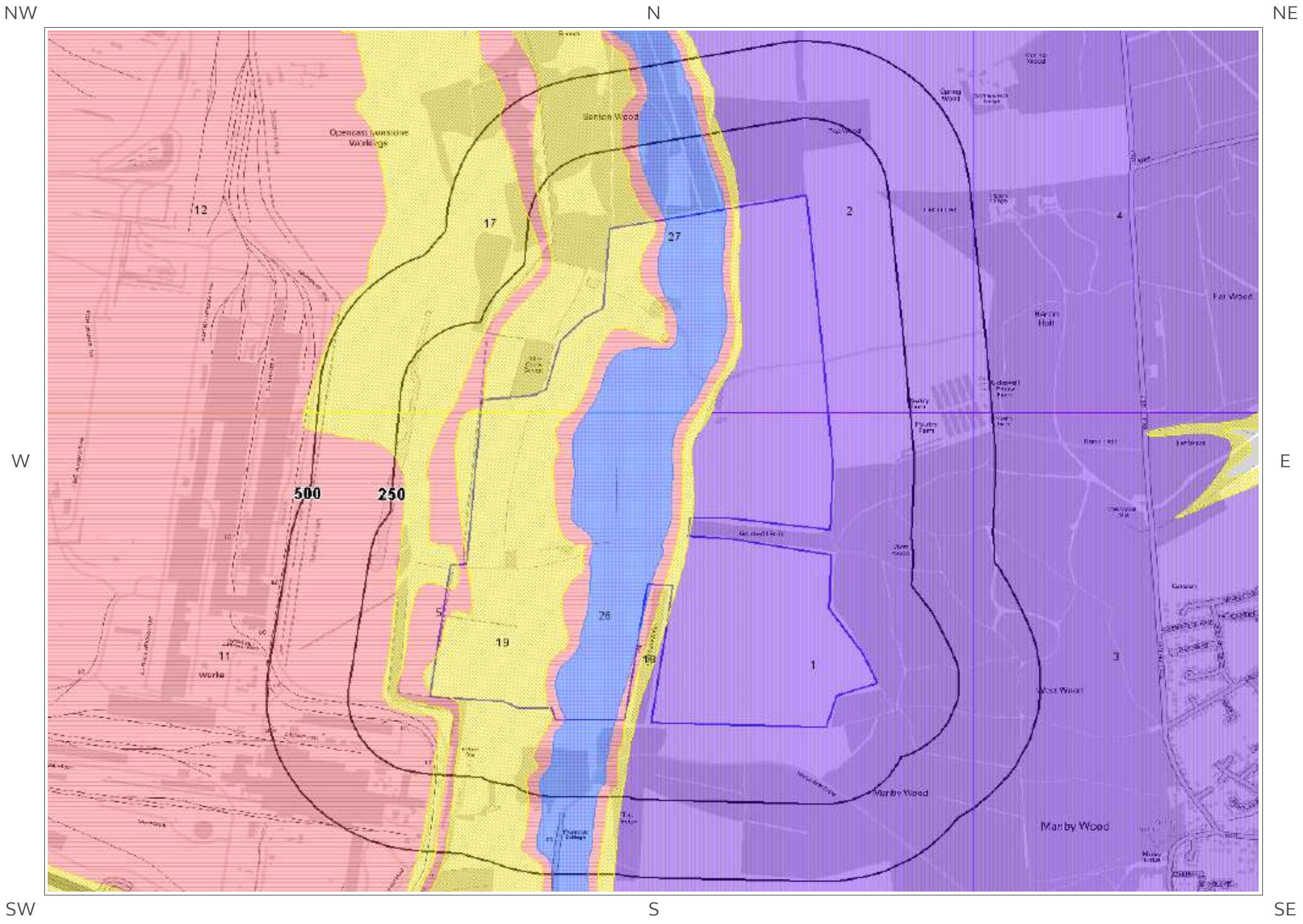
🟧 Secondary (B) Aquifer - Lower Permeability Layers

🟨 Secondary Aquifer - Undifferentiated Layers

🟦 Unproductive

🟦 Unknown (lakes and landslip)

6b. Aquifer Within Bedrock Geology and Abstraction Licenses



⬠ Site Outline

— 250 — / — 500 — Search Buffers (m)

🟪 Principal Aquifer

▨ Secondary (A) Aquifer - Permeable Layers

▨ Secondary (B) Aquifer - Lower Permeability Layers

● ▨ Groundwater Abstraction Licence

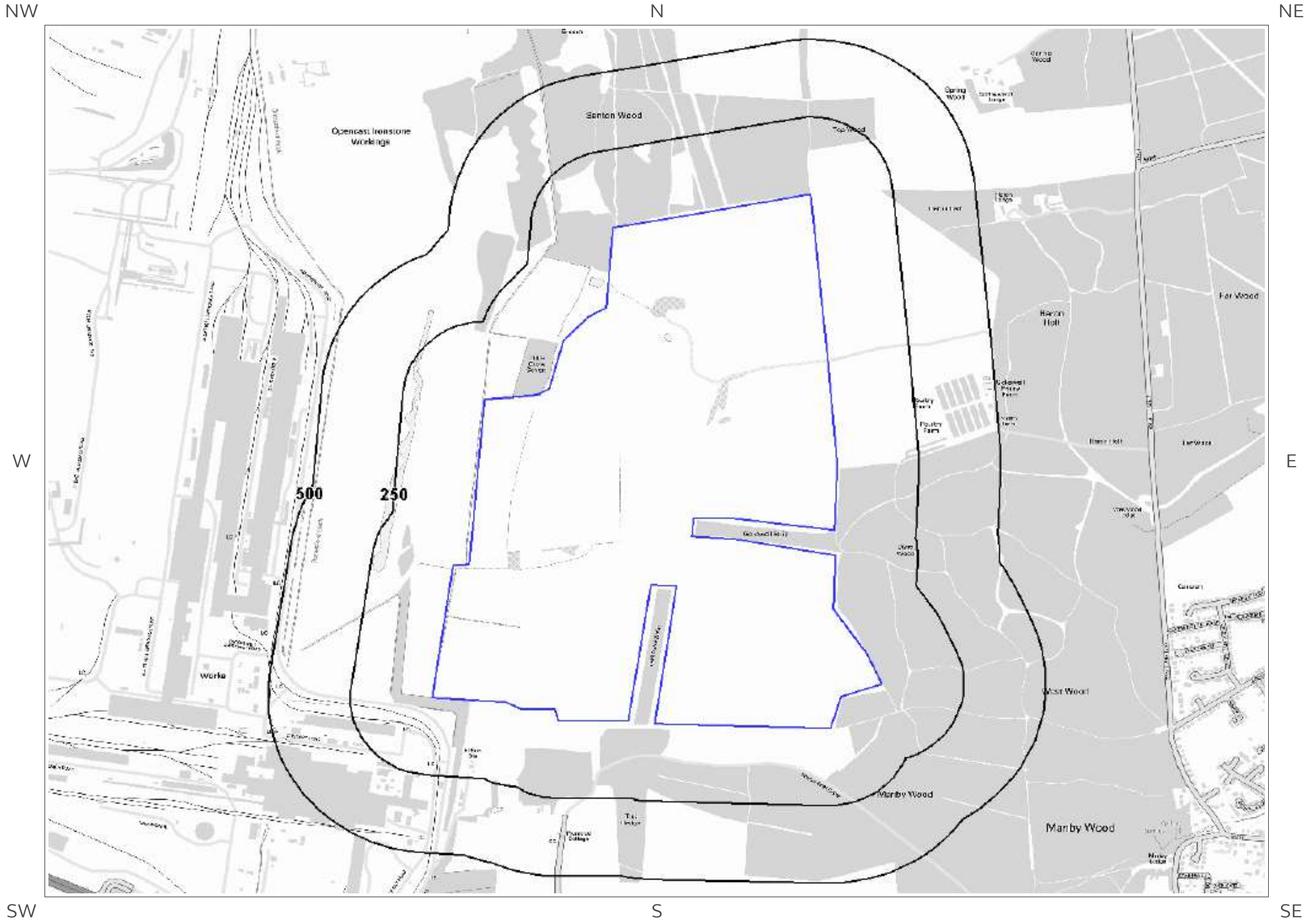
🟨 Secondary Aquifer - Undifferentiated Layers

🟦 Unproductive

▨ Unknown (lakes and landslip)

● ▨ Surface Water Abstraction Licence

6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses



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☐ Site Outline

250 / 500 Search Buffers (m)

▨ Source Protection Zone 1 - Inner Catchment

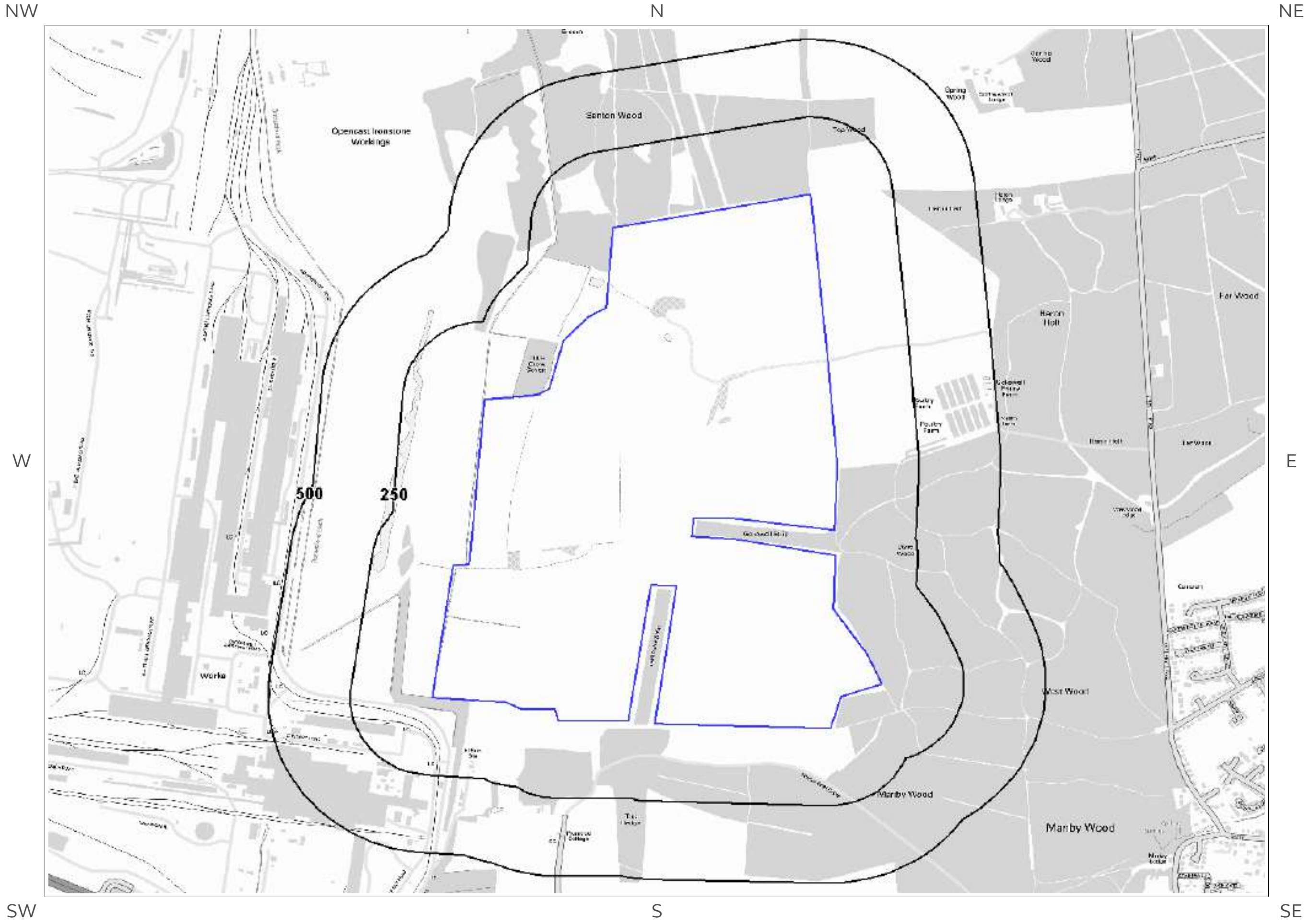
🟪 Source Protection Zone 2 - Outer Catchment

🟦 Source Protection Zone 3 - Total Catchment

▨ Source Protection Zone 4 - Zone of Special Interest

● Potable Water Abstraction Licence

6d. Hydrogeology – Source Protection Zones within confined aquifer



⬡ Site Outline

— 250 — / — 500 — Search Buffers (m)

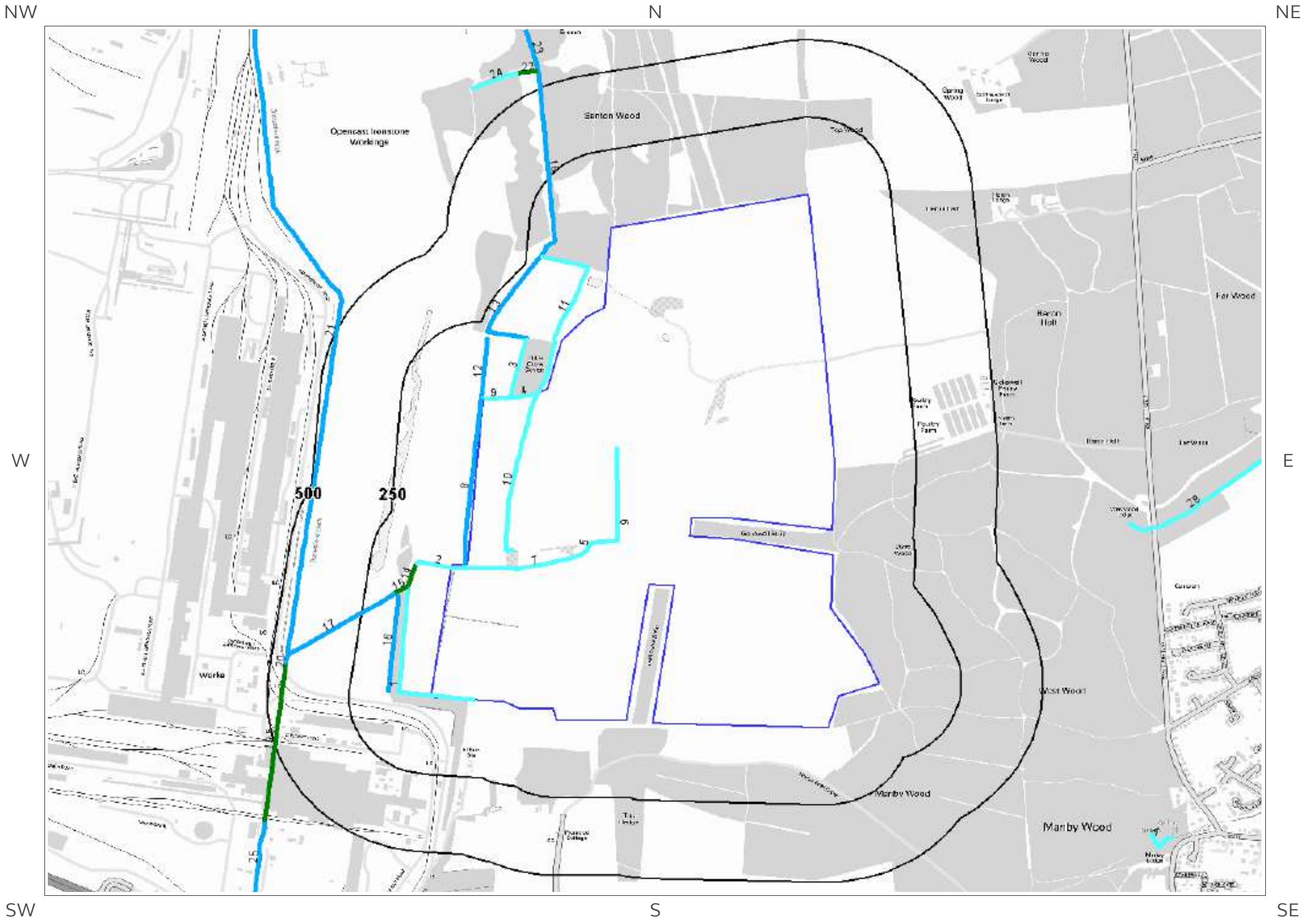
▨ Source Protection Zone 1 - Inner Catchment

▨ Source Protection Zone 2C - Outer Catchment within Confined Aquifer

▨ Source Protection Zone 3C - Total Catchment within Confined Aquifer

● ▨ Potable Water Abstraction Licence

6e. Hydrology – Detailed River Network and River Quality



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- ▬ Primary River
- ▬ Secondary River
- ▬ Tertiary River
- - - - Lake/Reservoir
- - - - Underground River (inferred)
- ▽ General Quality Assessment: Biology
- △ General Quality Assessment: Chemistry
- ▬ Canal
- - - - Canal Tunnel
- ▬ Culvert
- - - - Multiple Channel Culvert
- - - - Underground River (Potential Sewer)
- ▬ Underground River (local knowledge)
- ⬠ Site Outline
- — 250 — — 500 — Search Buffers (m)

6.Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Are there records of strata classification within the superficial geology at or in proximity to the property?
Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
3	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
4	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
5	132	W	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
6	295	E	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
7	472	NE	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
8	499	E	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.2 Aquifer within Bedrock Deposits

Are there records of strata classification within the bedrock geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
2	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
5	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
6	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
7	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
8	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
9	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
10	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
16	0	On Site	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
17	0	On Site	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
18	0	On Site	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
19	0	On Site	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
20	0	On Site	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
26	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
27	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
11	61	S	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

ID	Distance (m)	Direction	Designation	Description
3	295	E	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
4	444	E	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers

6.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site?	Yes

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
Not shown	1803	S	493550 407210	Status: Historical Licence No: 03/28/81/0036 Details: Spray Irrigation - Direct Direct Source: Groundwater Midlands Region Point: Holme - Lagoon Data Type: Point Name: C P MARSHALL (FARMS) LIMITED	Annual Volume (m^3): 13000 Max Daily Volume (m^3): 2600 Original Application No: - Original Start Date: 3/9/1996 Expiry Date: - Issue No: 100 Version Start Date: 1/4/2010 Version End Date:

6.4 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 2000m of the study site?	No

Database searched and no data found.

6.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site?	No

Database searched and no data found.

6.6 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site?	No

Database searched and no data found.

6.7 Source Protection Zones within Confined Aquifer

Are there any Source Protection Zones within the Confined Aquifer within 500m of the study site? No

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

Is there any Environment Agency/Natural Resources Wales information on groundwater vulnerability and soil leaching potential within 500m of the study site? Yes

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Minor Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
0	On Site	Minor Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
0	On Site	Minor Aquifer/High Leaching Potential	H2	Deep, permeable, coarse textured soils which readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential.
0	On Site	Minor Aquifer/High Leaching Potential	H2	Deep, permeable, coarse textured soils which readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential.
0	On Site	Major Aquifer/High Leaching Potential	H2	Deep, permeable, coarse textured soils which readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential.
0	On Site	Major Aquifer/High Leaching Potential	H2	Deep, permeable, coarse textured soils which readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential.

6.9 River Quality

Is there any Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site? Yes

6.9.1 Biological Quality:

Database searched and no data found.

6.9.2 Chemical Quality:

Chemical quality data is based on the General Quality Assessment Headline Indicators scheme (GQAHI). In England, each chemical sample is measured for ammonia and dissolved oxygen. In Wales, the samples are measured for biological oxygen demand (BOD), ammonia and dissolved oxygen. The results are graded from A ('Very Good') to F ('Bad').

The following Chemical Quality records are shown on the Hydrology Map (6e):

					Chemical Quality Grade				
ID	**Distance (m)**	**Direction**	**NGR**	**River Quality Grade**	**2005**	**2006**	**2007**	**2008**	**2009**
Not shown	1104	SW	492470 408390	River Name: Brumby Beck Reach: B Steel Outlet To Bottesford Beck End/Start of Stretch: Sample Point NGR	E	E	E	E	E
Not shown	1127	SW	492480 408341	River Name: Bottesford Beck Reach: Br Culvert Exit To Black Head Ponds Bk End/Start of Stretch: Sample Point NGR	E	E	E	E	D
Not shown	1153	SW	492400 408400	River Name: Brumby Beck Reach: B Steel Outlet To Bottesford Beck End/Start of Stretch: End of Stretch NGR	E	E	E	E	E

6.10 Detailed River Network

Are there any Detailed River Network entries within 500m of the study site? Yes

The following Detailed River Network records are represented on the Hydrology Map (6e):

ID	Distance (m)	Direction	Details	
1	0	On Site	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
2	0	On Site	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined

ID	Distance (m)	Direction	Details	
3	0	On Site	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
4	0	On Site	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
5	0	On Site	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
6	0	On Site	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
7	0	On Site	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
8	0	On Site	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
9	0	On Site	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
10	0	On Site	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
11	0	On Site	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
12	7	W	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
13	104	W	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
14	110	W	River Name: - Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
15	122	W	River Name: - Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
16	129	W	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
17	159	W	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
18	168	W	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
19	452	W	River Name: Bottesford Beck Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
20	453	W	River Name: Bottesford Beck Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
21	453	W	River Name: Bottesford Beck Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined

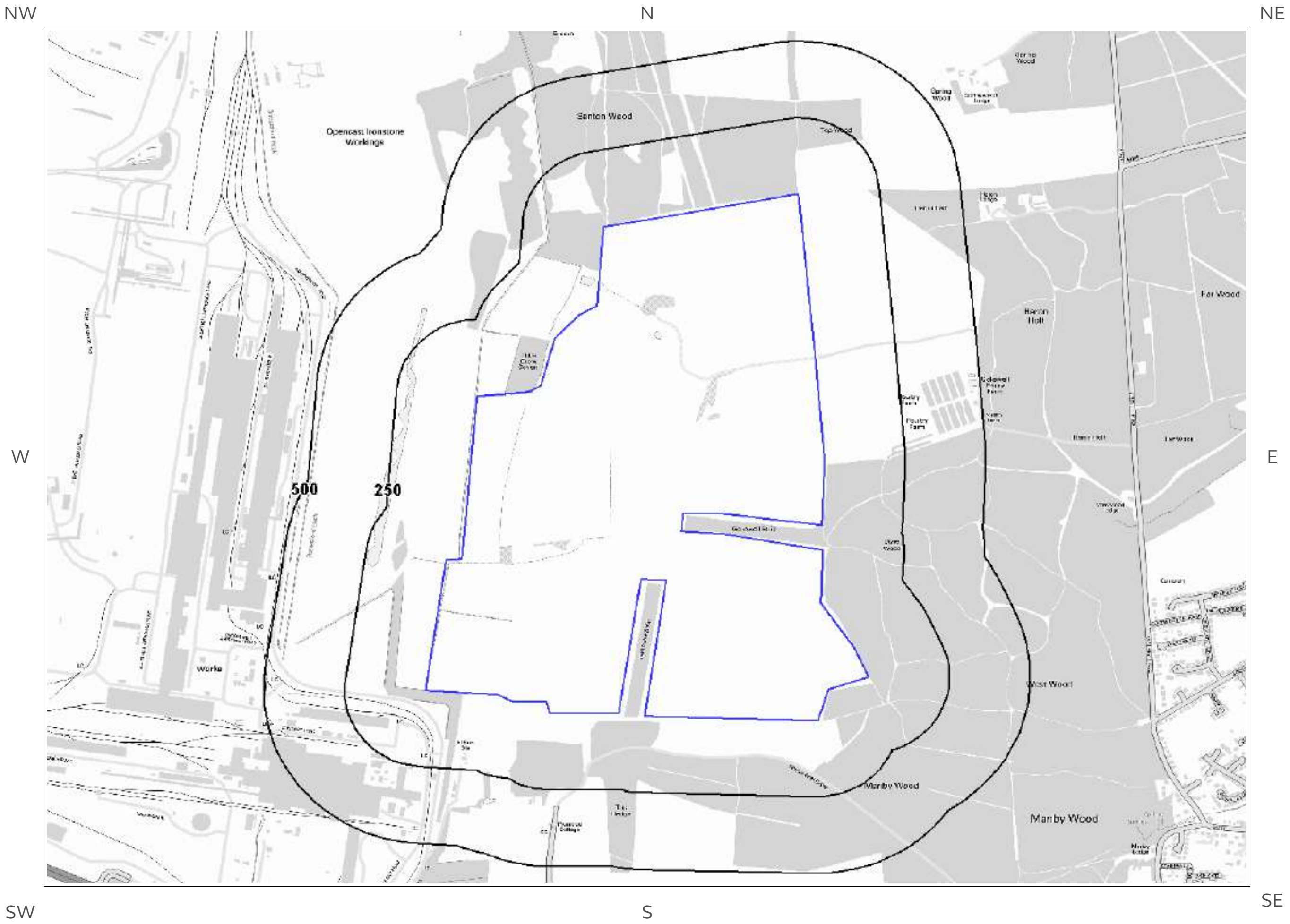
6.11 Surface Water Features

Are there any surface water features within 250m of the study site? Yes

The following surface water records are not represented on mapping:

Distance (m)	Direction
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
17	W
22	W
115	W
128	W
199	W

7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



⬠ Site Outline

100 / 250 Search Buffers (m)

🟩 Zone 2 Floodplain

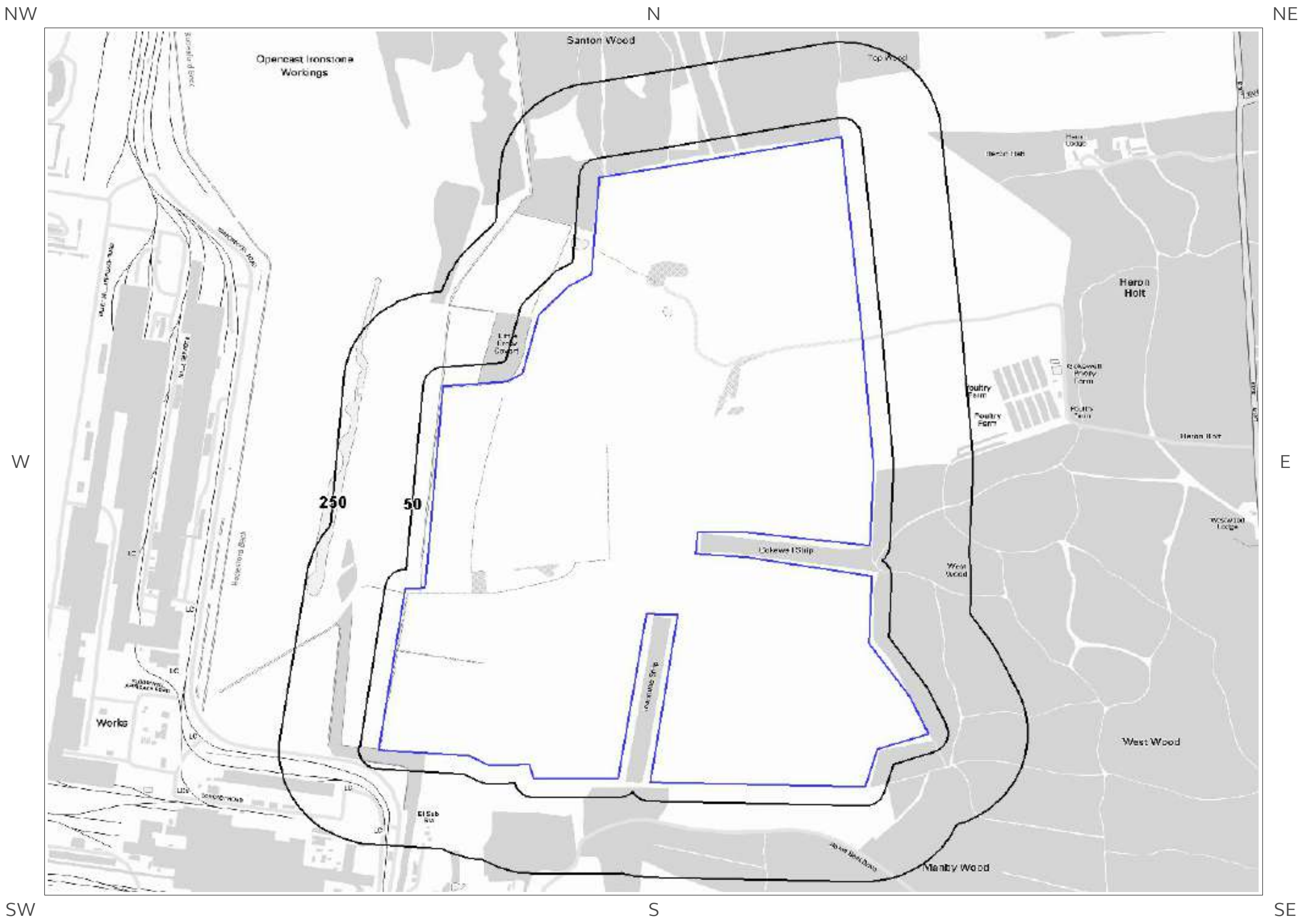
▨ Zone 3 Floodplain

▬ Flood Defences

🟥 Area used for Flood Storage

▦ Area Benefiting from Flood Defences

7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Map



Site Outline

100
250 Search Buffers (m)

RoFRaS Rating

🟩 Very Low

🟦 Low

🟪 Medium

🟧 High

7 Flooding

7.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 2 floodplain?	No

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

Database searched and no data found.

7.2 River and Coastal Zone 3 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 3 floodplain?	No

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

Database searched and no data found.

7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

What is the highest risk of flooding onsite?	Very Low

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a Very Low (less than 1 in 1000) chance of flooding in any given year.

7.4 Flood Defences

Are there any Flood Defences within 250m of the study site?	No

Database searched and no data found.

7.5 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site?	No

7.6 Areas benefiting from Flood Storage

Are there any areas used for Flood Storage within 250m of the study site?	No

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 Are there any British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site?

Yes

Does this relate to Clearwater Flooding or Superficial Deposits Flooding?	Superficial Deposits Flooding

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

7.7.2 What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?

Potential at Surface

Where potential for groundwater flooding to occur at surface is indicated, this means that given the geological conditions in the area groundwater flooding hazard should be considered in all land-use planning decisions. It is recommended that other relevant information e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information be investigated in order to establish relative, but not absolute, risk of groundwater flooding.

7.8 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result?	High

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

8. Designated Environmentally Sensitive Sites Map

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- ⬠ Site Outline
- —100— —250— Search Buffers (m)
- ▦ AONB
- ▦ National Park
- ▨ SSSI
- ▨ Special Protection Areas
- ▦ Nitrate Vulnerable Zones
- + Green Belt
- ▤ Environmentally Sensitive Areas
- ▤ Special Areas of Conservation
- ▨ World Heritage Sites
- ▦ Nitrate Sensitive Areas
- ▦ Ancient Woodland
- ▥ National Nature Reserve
- ▥ Local Nature Reserves
- ▤ Ramsar Sites

8. Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site? Yes

8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

4

The following Site of Special Scientific Interest (SSSI) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SSSI Name	Data Source
1	1300	E	Broughton Far Wood	Natural England
2	1387	E	Broughton Alder Wood	Natural England
3	1549	E	Broughton Alder Wood	Natural England
4	1570	E	Broughton Far Wood	Natural England

8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

0

Database searched and no data found.

8.5 Records of Ramsar sites within 2000m of the study site:

0

Database searched and no data found.

8.6 Records of Ancient Woodland within 2000m of the study site:

6

The following records of Designated Ancient Woodland provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	Ancient Woodland Name	Data Source
11	1	NE	UNKNOWN	Ancient Replanted Woodland
12	633	NE	UNKNOWN	Ancient Replanted Woodland
13	759	S	UNKNOWN	Ancient Replanted Woodland
14	958	NE	UNKNOWN	Ancient Replanted Woodland
15	967	SE	UNKNOWN	Ancient Replanted Woodland
16	1300	E	UNKNOWN	Ancient and Semi-Natural Woodland

8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

0

Database searched and no data found.

8.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

8.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

6

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NVZ Name	Data Source
5	0	On Site	Existing	DEFRA
6	0	On Site	Existing	DEFRA
7	0	On Site	Existing	DEFRA
8	0	On Site	Existing	DEFRA
9	0	On Site	Existing	DEFRA
10	0	On Site	Existing	DEFRA

8.14 Records of Green Belt land within 2000m of the study site:

0

Database searched and no data found.

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a Groundsure Geo Insight, available from our website. The following information has been found:

9.1.1 Shrink Swell

What is the maximum Shrink-Swell** hazard rating identified on the study site?	Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

9.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site?	Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant potential for slope instability with relatively small changes in ground conditions. Avoid large amounts of water entering the ground through pipe leakage or soak-aways. Do not undercut or place large amounts of material on slopes without technical advice. For new build consider the potential and consequences of ground movement during excavations, or consequence of changes to loading or drainage. For existing property probable increase in insurance risk is likely due to potential natural slope instability after changes to ground conditions such as a very long, excessively wet winter.

9.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site?	Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant soluble rocks are present. Problems unlikely except with considerable surface or subsurface water flow. No special actions required to avoid problems due to soluble rocks. No special ground investigation required or increased construction costs are likely. An increase in financial risk due to potential problems with soluble rocks is unlikely.

---

* This indicates an automatically generated 50m buffer and site.

9.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site?	Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.

9.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site?	Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

9.1.6 Running Sand

What is the maximum Running Sand*[*] hazard rating identified on the study site?	Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property no significant increase in insurance risk due to running sand problems is likely.

9.2 Radon

9.2.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is in a Radon Affected Area, as between 10 and 30% of properties are above the Action Level.

---

[*] This indicates an automatically generated 50m buffer and site.

9.2.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	Full radon protective measures are necessary.

10. Mining

10.1 Coal Mining

Are there any coal mining areas within 75m of the study site?	No

Database searched and no data found.

10.2 Non-Coal Mining

Are there any Non-Coal Mining areas within 50m of the study site boundary?	Yes

The following non-coal mining information is provided by the BGS:

Distance (m)	Direction	Name	Commodity	Assessment of likelihood
0.0	On Site	Not available	Jet	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered
0.0	On Site	Not available	Jet	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered

Past underground mine workings are uncommon, localised and of limited area. The rock types present in this area are such that minor mineral veins may be present within them on which it is possible that there have been attempts to work these by underground methods and/or it is possible that small scale underground extraction of other materials may have occurred. All such occurrences are likely to be restricted in size and infrequent. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters/bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of this dataset. However, if in a coalfield area you should still consider a Coal Authority mining search for the area of interest.

10.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site? Guidance: No Guidance Required.	No

Contact Details

CENTREMAPS
Telephone: 01886 832972
Groundsure@centremaps.co.uk
Open Space, Upper Interfields, Malvern, Worcester, WR14 1UT

British Geological Survey Enquiries
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries:
enquiries@bgs.ac.uk

Environment Agency
National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 03708 506 506
Web: **www.environment-agency.gov.uk**
Email: enquiries@environment-agency.gov.uk

Public Health England
Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
www.gov.uk/phe
Email:**enquiries@phe.gov.uk**
Main switchboard**: 020 7654 8000**

The Coal Authority
200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Ordnance Survey
Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505

Local Authority
Authority: North Lincolnshire Council
Phone: 01724 296 296
Web: http://www.northlincs.gov.uk/
Address: Civic Centre, Ashby Road, Scunthorpe, North Lincolns, DN16

Gemapping PLC
Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444

Acknowledgements: Site of Special Scientific Interest, National Nature Reserve, Ramsar Site, Special Protection Area, Special Area of Conservation data is provided by, and used with the permission of, Natural England who retain the Copyright and Intellectual Property Rights for the data.

Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:
https://www.groundsure.com/terms-and-conditions-sept-2016

CENTREMAPS

Open Space, Upper Interfields,
Worcester, WR14 1UT

Report Reference: CMAPS-CM-643992-13238-310717GEO

Your Reference: 13238

Report Date 31 Jul 2017

Report Delivery Method: Email - pdf

Geo Insight

Address: Santon, Scunthorpe, DN16 1XP

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Geo Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 01886 832972 quoting the above CENTREMAPS reference number.

Yours faithfully,

CENTREMAPS

Enc.
Groundsure Geo Insight

Groundsure
LOCATION INTELLIGENCE

Geo Insight

Address:	**Santon, Scunthorpe, DN16 1XP**
Date:	**31 Jul 2017**
Reference:	**CMAPS-CM-643992-13238-310717GEO**
Client:	**CENTREMAPS**

Aerial Photograph Capture date:	16-Aug-2015
Grid Reference:	494018,409842
Site Size:	156.74ha

Contents Page

Overview of Findings

The Groundsure Geo Insight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 and 1:10,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Non-coal mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Geology 1:10,000 Scale

1.1 Artificial Ground	1.1 Is there any Artificial Ground/ Made Ground present beneath the study site at 1:10,000 scale?	Yes
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site at 1:10,000 scale?*	Yes
	1.2.2 Are there any records of landslip within 500m of the study site boundary at 1:10,000 scale?	No
1.3 Bedrock, Solid Geology and Faults	1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	1.3.2 Are there any records of faults within 500m of the study site boundary at 1:10,000 scale?	Yes

Section 2: Geology 1:50,000 Scale

2.1 Artificial Ground	2.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	Yes
	2.1.2 Are there any records relating to permeability of artificial ground within the study site*boundary?	Yes
2.2 Superficial Geology and Landslips	2.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?*	Yes
	2.2.2 Are there any records of permeability of superficial ground within 500m of the study site?	Yes
	2.2.3 Are there any records of landslip within 500m of the study site boundary?	No
	2.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No

Section 2: Geology 1:50,000 Scale

2.3 Bedrock, Solid Geology and Faults	2.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	2.3.2 Are there any records relating to permeability of bedrock ground within the study site boundary?	Yes
	2.3.3 Are there any records of faults within 500m of the study site boundary?	Yes

Section 3: Radon

3. Radon	3.1Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is in a Radon Affected Area, as between 10 and 30% of properties are above the Action Level.
	3.2Radon Protection	Full radon protective measures are necessary.

Section 4: Ground Workings	On-site	0-50m	51-250	251-500	501-1000
4.1 Historical Surface Ground Working Features from Small Scale Mapping	13	0	14	Not Searched	Not Searched
4.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	0
4.3 Current Ground Workings	0	0	0	2	0

Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.1 Historical Mining	0	0	3	0	2
5.2 Coal Mining	0	0	0	0	0
5.3 Johnson Poole and Bloomer Mining Area	5	1	0	8	4
5.4 Non-Coal Mining*	2	0	0	0	1
5.5 Non–Coal Mining Cavities	1	0	0	1	0
5.5 Natural Cavities	0	0	0	0	0

Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.6 Brine Extraction	0	0	0	0	0
5.7 Gypsum Extraction	0	0	0	0	0
5.8 Tin Mining	0	0	0	0	0
5.9 Clay Mining	0	0	0	0	0

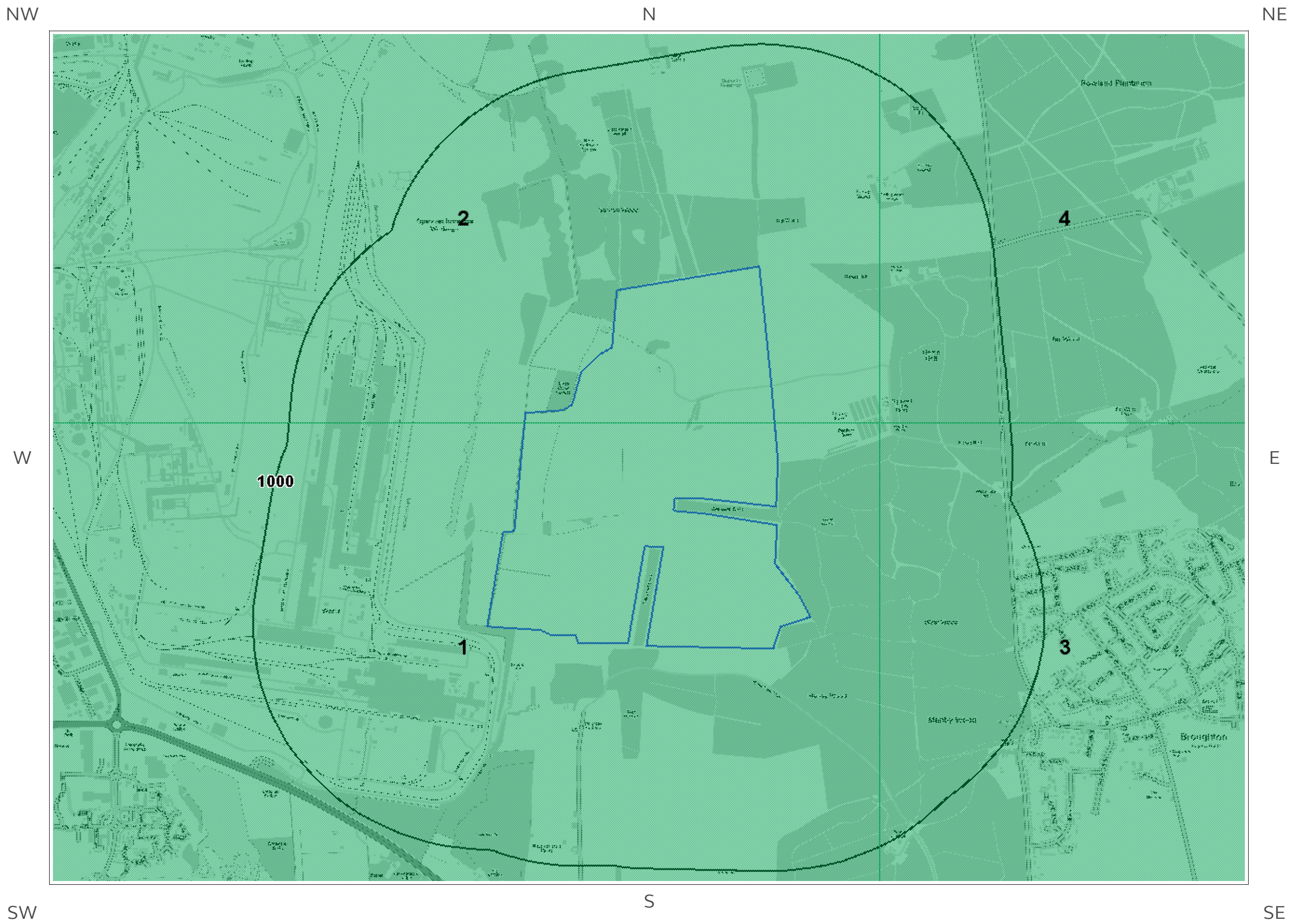
Section 6: Natural Ground Subsidence	On-site
6.1 Shrink-Swell Clay	Low
6.2 Landslides	Moderate
6.3 Ground Dissolution of Soluble Rocks	Very Low
6.4 Compressible Deposits	Moderate
6.5 Collapsible Deposits	Very Low
6.5 Running Sand	Low

Section 7: Borehole Records	On-site	0-50m	51-250
7 BGS Recorded Boreholes	27	8	14

Section 8: Estimated Background Soil Chemistry	On-site	0-50m	51-250
8 Records of Background Soil Chemistry	164	37	0

Section 9: Railways and Tunnels	On-site	0-50m	51-250	250-500
9.1 Tunnels	0	0	0	Not Searched
9.2 Historical Railway and Tunnel Features	1	0	3	Not Searched
9.3 Historical Railways	0	0	0	Not Searched
9.4 Active Railways	0	0	16	Not Searched
9.5 Railway Projects	0	0	0	0

1:10,000 Scale Availability



1_10,000 Availability Legend

⬠ Site Outline

— 50 — / — 250 — Search Buffers (m)

🟩 Full Coverage

🟧 Partial Coverage

☐ No Coverage

Availability of 1:10,000 Scale Geology Mapping

The following information represents the availability of the key components of the 1:10,000 scale geological data.

ID	Distance	Artificial Coverage	Superficial Coverage	Bedrock Coverage	Mass Movement Coverage
1	0.0	Some deposits are mapped	Full	Full	No coverage
2	0.0	Some deposits are mapped	Full	Full	Some deposits are mapped
3	295.0	Some deposits are mapped	Full	Full	No coverage
4	444.0	Some deposits are mapped	Full	Full	No coverage

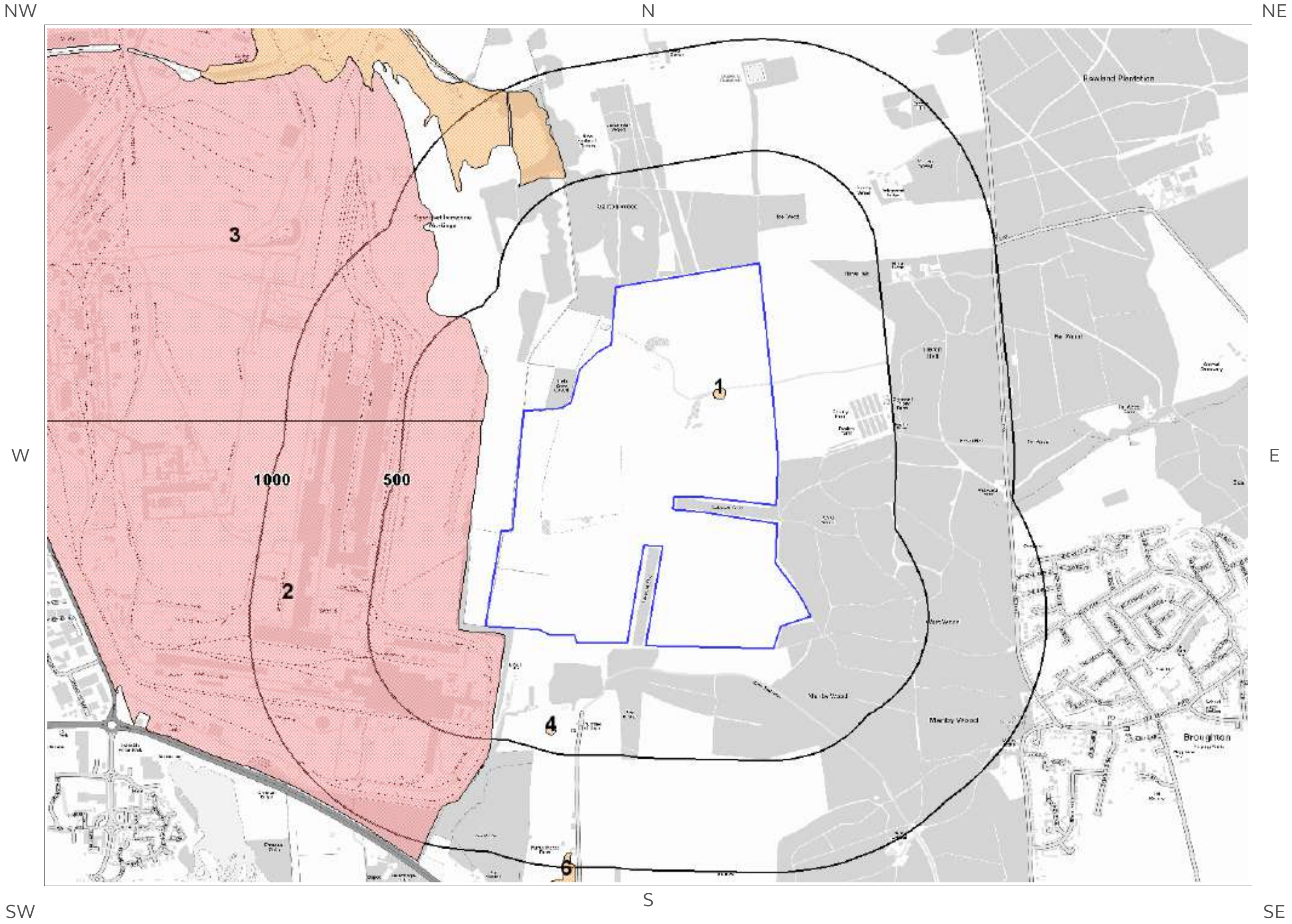
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not all themes are mapped or available on every map sheet. Therefore a coverage layer showing the availability of the four themes is presented above.

The definitions of coverage are as follows:

Geology	Full Coverage	Partial Coverage	No Coverage
Bedrock	The whole tile has been mapped	Some but not all the tile has been mapped	No coverage
Superficial	The whole tile has been mapped	Some but not all of the tile has been mapped	No coverage
Artificial	Some deposits are mapped on this tile	-	No deposits are mapped
Mass Movement	Some deposits are mapped on this tile	-	No coverage

1 Geology (1:10,000 scale).

1.1 Artificial Ground Map (1:10,000 scale)



Artificial Ground Legend

⬠	Site Outline
— 500 — — 1000 —	Search Buffers (m)
▨	Made Ground (undivided)
▨	Worked Ground (undivided)
▨	Infilled Ground
▨	Disturbed Ground (undivided)
▨	Landscaped Ground (undivided)
▨	Reclaimed Ground

1. Geology 1:10,000 scale

1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

Are there any records of Artificial/ Made Ground within 500m of the study site boundary at 1:10,000 scale? Yes

ID	Distance	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
2	24.0	S	WMGR-ARTDP	Infilled Ground	Artificial Deposit
3	165.0	W	WMGR-ARTDP	Infilled Ground	Artificial Deposit
4	390.0	S	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit

1.2 Superficial Deposits and Landslips Map (1:10,000 scale)

Artificial Ground Legend

⬠	Site Outline
—500— —1000—	Search Buffers (m)

1.2 Superficial Deposits and Landslips

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary at 1:10,000 scale? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	BSA1-S	Blown Sand, 1 - Sand	Sand
2A	0.0	On Site	BSA1-S	Blown Sand, 1 - Sand	Sand
3	0.0	On Site	BSA1-S	Blown Sand, 1 - Sand	Sand
4	0.0	On Site	ALV-XCZSV	Alluvium - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel
5A	0.0	On Site	BSA1-S	Blown Sand, 1 - Sand	Sand
6	128.0	W	BSA1-S	Blown Sand, 1 - Sand	Sand
7	295.0	E	BSA1-S	Blown Sand, 1 - Sand	Sand
8	479.0	NE	BSA1-S	Blown Sand, 1 - Sand	Sand

1.2.2 Landslip

Are there any records of Landslip within 500m of the study site boundary at 1:10,000 scale?

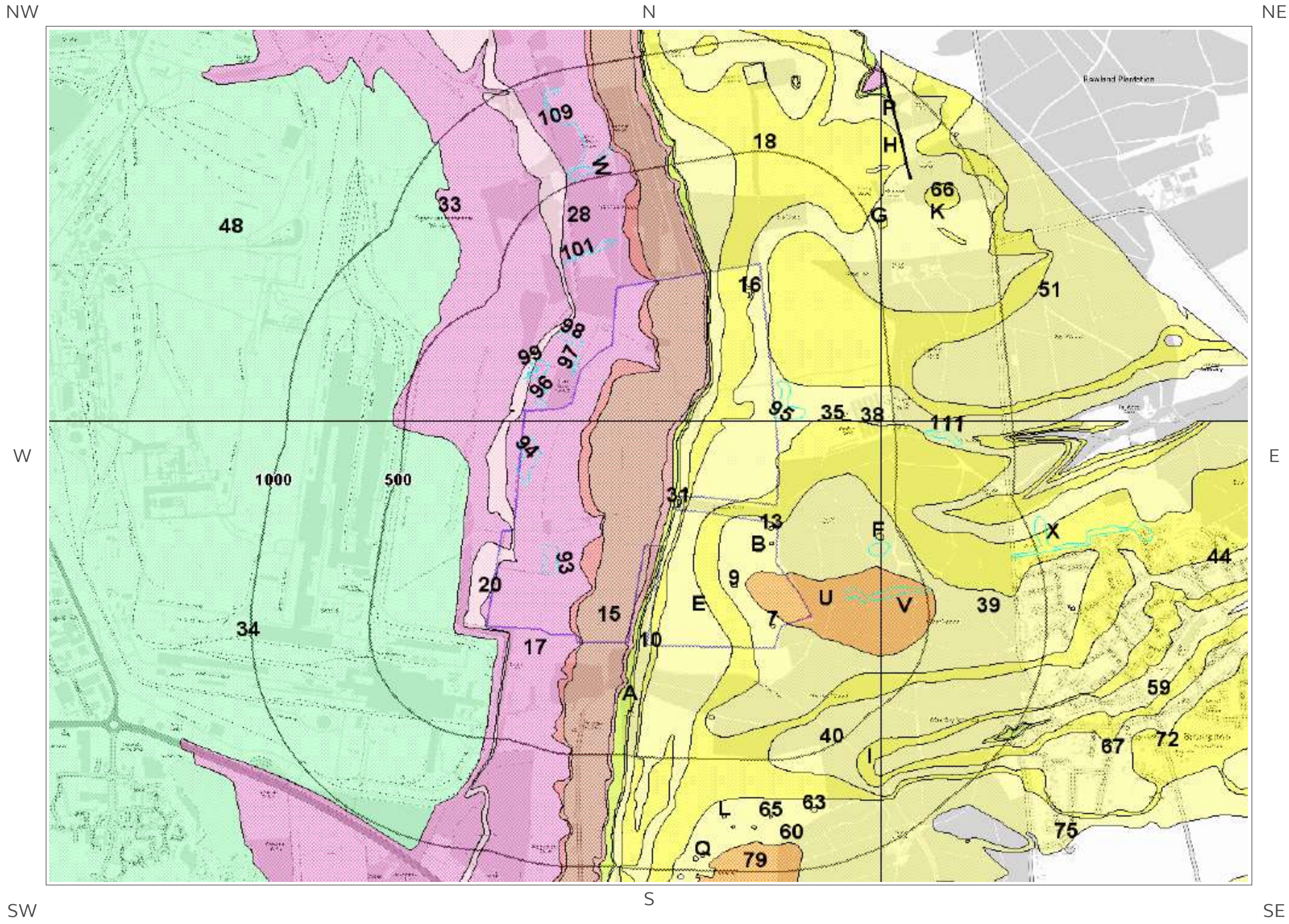
No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:10,000 scale

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.3 Bedrock and Faults Map (1:10,000 scale)



Bedrock and Faults Legend

⬠	Site Outline
500 / 1000	Search Buffers (m)

1.3 Bedrock and Faults

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

1.3.1 Bedrock/ Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary at 1:10,000 scale.

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1A	0.0	On Site	GRF-SDSM	Grantham Formation - Sandstone, Siltstone And Mudstone	Aalenian Age
2	0.0	On Site	SNO-LMOOL	Santon Oolite - Ooidal Limestone	Bajocian Age
3E	0.0	On Site	KCM-MDLM	Kirton Cementstone Beds - Mudstone And Limestone, Interbedded	Bajocian Age
4U	0.0	On Site	HIL-LMOOL	Hibaldstow Limestone - Ooidal Limestone	Bajocian Age
5	0.0	On Site	NS-FGSST	Northampton Sand Formation - Ferruginous Sandstone	Aalenian Age
6	0.0	On Site	SYL-LMAR	Scawby Limestone - Interbedded Limestone And [subequal/subordinate] Argillaceous Rocks	Bajocian Age
7	0.0	On Site	KCMK-LMST	Kirton Cementstone Beds (knoll-reef) - Limestone	Bajocian Age
8B	0.0	On Site	KCMK-LMST	Kirton Cementstone Beds (knoll-reef) - Limestone	Bajocian Age
9	0.0	On Site	KCMK-LMST	Kirton Cementstone Beds (knoll-reef) - Limestone	Bajocian Age
10	0.0	On Site	RVB-LMAR	Raventhorpe Beds - Interbedded Limestone And [subequal/subordinate] Argillaceous Rocks	Bajocian Age
11	0.0	On Site	KCM-MDLM	Kirton Cementstone Beds - Mudstone And Limestone, Interbedded	Bajocian Age
12A	0.0	On Site	CML-LMST	Cleatham Limestone - Limestone	Bajocian Age
13	0.0	On Site	KCMK-LMST	Kirton Cementstone Beds (knoll-reef) - Limestone	Bajocian Age
14B	0.0	On Site	KCMK-LMST	Kirton Cementstone Beds (knoll-reef) - Limestone	Bajocian Age
15	0.0	On Site	WHM-MDST	Whitby Mudstone Formation - Mudstone	Toarcian Age
16	0.0	On Site	RVB-LMAR	Raventhorpe Beds - Interbedded Limestone And [subequal/subordinate] Argillaceous Rocks	Bajocian Age
17	0.0	On Site	CHAM-MDST	Charmouth Mudstone Formation - Mudstone	Pliensbachian Age - Sinemurian Age
18	0.0	On Site	SNO-LMOOL	Santon Oolite - Ooidal Limestone	Bajocian Age
19	0.0	On Site	MRB-FGLS	Marlstone Rock Formation - Ferruginous Limestone And Ferruginous Sandstone	Toarcian Age - Pliensbachian Age
20	0.0	On Site	PTNI-FEST	Pecten Ironstone (bed) - Ironstone	Pliensbachian Age
21	0.0	On Site	CHAM-MDST	Charmouth Mudstone Formation - Mudstone	Pliensbachian Age - Sinemurian Age
22C	0.0	On Site	MRB-FGLS	Marlstone Rock Formation - Ferruginous Limestone And Ferruginous Sandstone	Toarcian Age - Pliensbachian Age

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
23C	0.0	On Site	WHM-MDST	Whitby Mudstone Formation - Mudstone	Toarcian Age
24D	0.0	On Site	KCM-MDLM	Kirton Cementstone Beds - Mudstone And Limestone, Interbedded	Bajocian Age
25S	0.0	On Site	GRF-SDSM	Grantham Formation - Sandstone, Siltstone And Mudstone	Aalenian Age
26	0.0	On Site	CML-LMST	Cleatham Limestone - Limestone	Bajocian Age
27J	0.0	On Site	RVB-LMAR	Raventhorpe Beds - Interbedded Limestone And [subequal/subordinate] Argillaceous Rocks	Bajocian Age
28	0.0	On Site	CHAM-MDST	Charmouth Mudstone Formation - Mudstone	Pliensbachian Age - Sinemurian Age
29	0.0	On Site	NS-FGSST	Northampton Sand Formation - Ferruginous Sandstone	Aalenian Age
30D	0.0	E	SYL-LMAR	Scawby Limestone - Interbedded Limestone And [subequal/subordinate] Argillaceous Rocks	Bajocian Age
31	9.0	S	GRF-SDSM	Grantham Formation - Sandstone, Siltstone And Mudstone	Aalenian Age
32	11.0	W	PTNI-FEST	Pecten Ironstone (bed) - Ironstone	Pliensbachian Age
33	48.0	W	CHAM-MDST	Charmouth Mudstone Formation - Mudstone	Pliensbachian Age - Sinemurian Age
34	52.0	S	FI-FEST	Frodingham Ironstone Member - Ironstone	Sinemurian Age
35	171.0	E	SYL-LMAR	Scawby Limestone - Interbedded Limestone And [subequal/subordinate] Argillaceous Rocks	Bajocian Age
36V	295.0	E	HIL-LMOOL	Hibaldstow Limestone - Ooidal Limestone	Bajocian Age
37E	302.0	S	KCMK-LMST	Kirton Cementstone Beds (knoll-reef) - Limestone	Bajocian Age
38	338.0	E	KCM-MDLM	Kirton Cementstone Beds - Mudstone And Limestone, Interbedded	Bajocian Age
39	344.0	SE	KCM-MDLM	Kirton Cementstone Beds - Mudstone And Limestone, Interbedded	Bajocian Age
40	347.0	SE	KCM-MDLM	Kirton Cementstone Beds - Mudstone And Limestone, Interbedded	Bajocian Age
41X	388.0	SE	SYL-LMAR	Scawby Limestone - Interbedded Limestone And [subequal/subordinate] Argillaceous Rocks	Bajocian Age
42F	409.0	NE	KCMK-LMST	Kirton Cementstone Beds (knoll-reef) - Limestone	Bajocian Age
43F	420.0	NE	KCMK-LMST	Kirton Cementstone Beds (knoll-reef) - Limestone	Bajocian Age
44	442.0	E	KCM-MDLM	Kirton Cementstone Beds - Mudstone And Limestone, Interbedded	Bajocian Age
45	444.0	E	KCM-MDLM	Kirton Cementstone Beds - Mudstone And Limestone, Interbedded	Bajocian Age
46	457.0	E	SYL-LMAR	Scawby Limestone - Interbedded Limestone And [subequal/subordinate] Argillaceous Rocks	Bajocian Age
47K	492.0	E	KCM-MDLM	Kirton Cementstone Beds - Mudstone And Limestone, Interbedded	Bajocian Age

1.3.2 Faults

Are there any records of Faults within 500m of the study site boundary at 1:10,000 scale? Yes

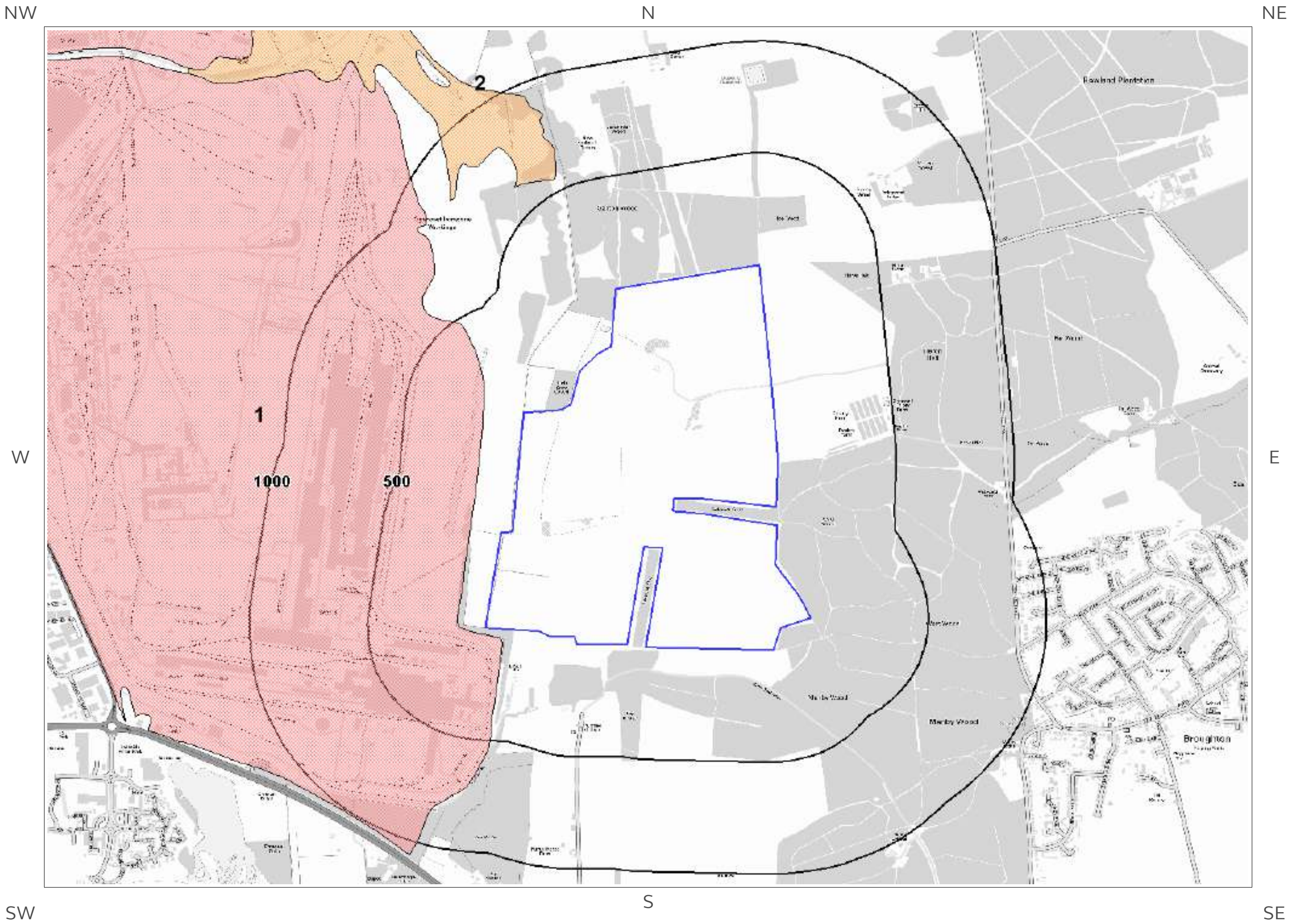
ID	Distance (m)	Direction	Category Description	Feature Description
93	0.0	On Site	LANDFORM	Dune, form-line at base of mound
94	0.0	On Site	LANDFORM	Dune, form-line at base of mound
95	0.0	On Site	LANDFORM	Dune, form-line at base of mound
96	17.0	N	LANDFORM	Dune, form-line at base of mound
97	27.0	W	LANDFORM	Dune, form-line at base of mound
98	73.0	NW	LANDFORM	Dune, form-line at base of mound
99	135.0	W	LANDFORM	Dune, form-line at base of mound
100U	174.0	NE	LANDFORM	Dune, form-line at base of mound
101	181.0	NW	LANDFORM	Dune, form-line at base of mound
102V	263.0	E	LANDFORM	Dune, form-line at base of mound
103V	264.0	E	LANDFORM	Dune, form-line at base of mound
104V	305.0	E	LANDFORM	Dune, form-line at base of mound
105F	346.0	NE	LANDFORM	Dune, form-line at base of mound
106F	350.0	NE	LANDFORM	Dune, form-line at base of mound
107F	382.0	NE	LANDFORM	Dune, form-line at base of mound

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of great Britain at 1:10,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2 Geology 1:50,000 Scale

2.1 Artificial Ground Map



Ground Workings Legend

⬠	Site Outline
— 500 — — 1000 —	Search Buffers (m)
▨	Made Ground (undivided)
▨	Worked Ground (undivided)
▨	Infilled Ground
▨	Disturbed Ground (undivided)
▨	Landscaped Ground (undivided)
▨	Reclaimed Ground

2. Geology 1:50,000 scale

2.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 089

2.1.1 Artificial/ Made Ground

Are there any records of Artificial/ Made Ground within 500m of the study site boundary? Yes

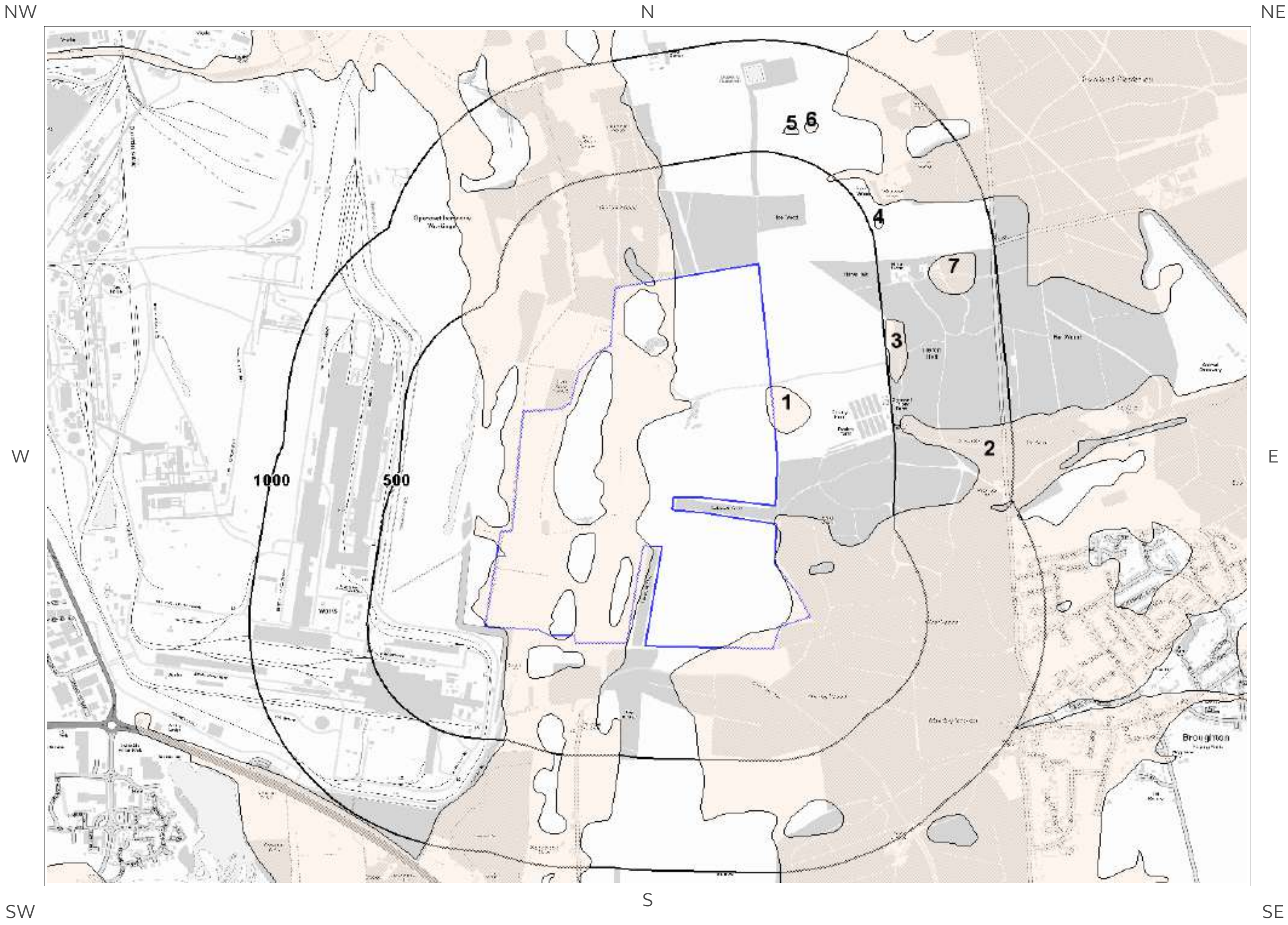
ID	**Distance (m)**	**Direction**	**LEX Code**	**Description**	**Rock Description**
1	28.0	S	WMGR-ARTDP	INFILLED GROUND	ARTIFICIAL DEPOSIT

2.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site boundary? Yes

Distance (m)	**Direction**	**Flow Type**	**Maximum Permeability**	**Minimum Permeability**
28.0	S	Mixed	Very High	Low

2.2 Superficial Deposits and Landslips Map (1:50,000 scale)



Ground Workings Legend

Site Outline

500
1000
Search Buffers (m)

2.2 Superficial Deposits and Landslips

2.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

ID	Distance	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	SUTN-S	SUTTON SAND FORMATION	SAND
2	0.0	On Site	SUTN-S	SUTTON SAND FORMATION	SAND
3	499.0	E	SUTN-S	SUTTON SAND FORMATION	SAND

2.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Intergranular	High	High
0.0	On Site	Intergranular	High	High
0.0	On Site	Intergranular	High	High
0.0	On Site	Intergranular	High	High

2.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

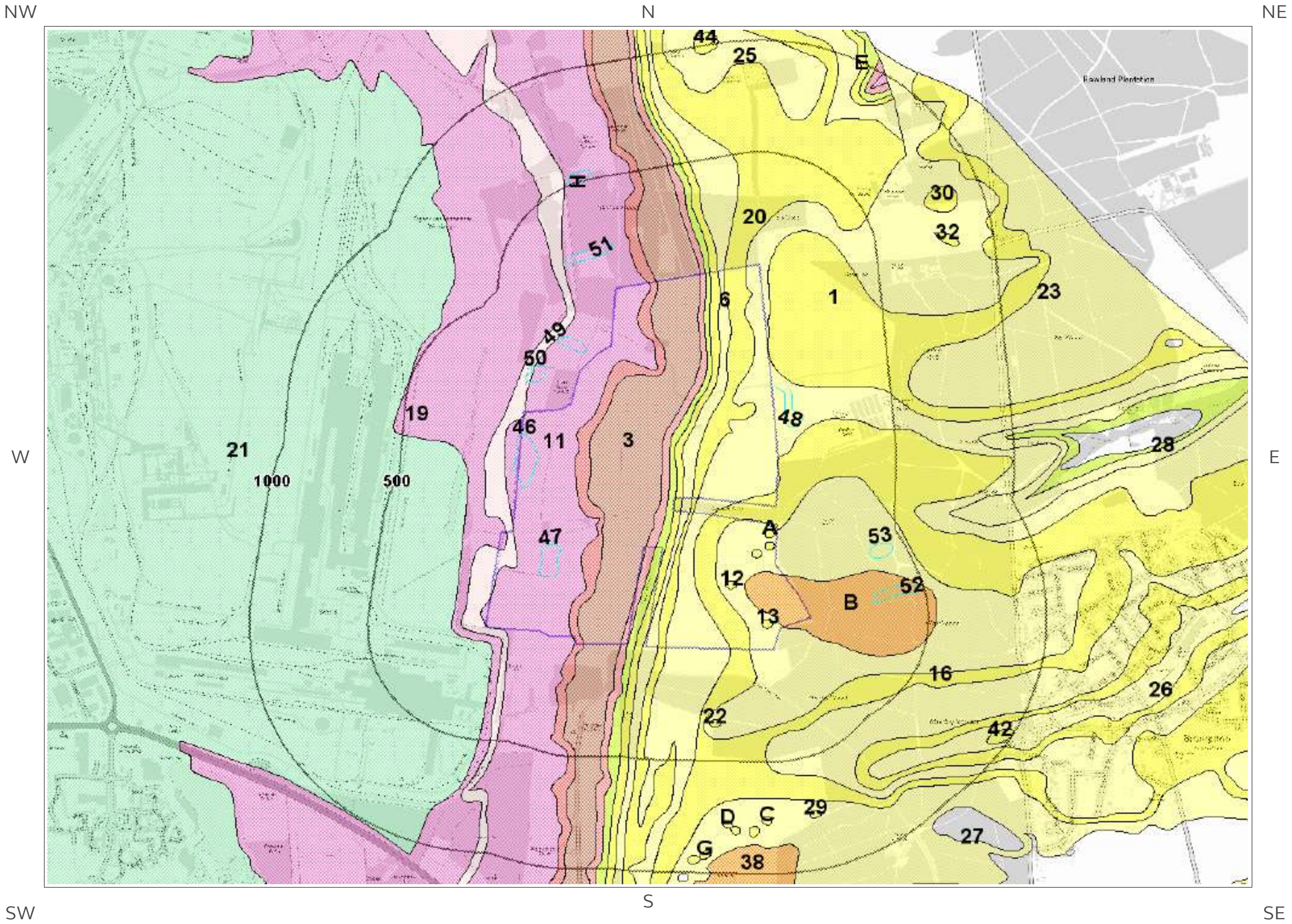
This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site boundary? No

Database searched and no data found.

2.3 Bedrock and Faults Map (1:50,000 scale)



Ground Workings Legend

Site Outline

Search Buffers (m)

2.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 089

2.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

ID	Distance	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	SYL-LMAR	SCAWBY LIMESTONE - LIMESTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	BAJOCIAN
2	0.0	On Site	NS-FGSST	NORTHAMPTON SAND FORMATION - SANDSTONE, FERRUGINOUS	AALENIAN
3	0.0	On Site	WHM-MDST	WHITBY MUDSTONE FORMATION - MUDSTONE	TOARCIAN
4	0.0	On Site	LLL-LMST	LOWER LINCOLNSHIRE LIMESTONE MEMBER - LIMESTONE	BAJOCIAN
5	0.0	On Site	GRF-SDSM	GRANTHAM FORMATION - SANDSTONE, SILTSTONE AND MUDSTONE	AALENIAN
6	0.0	On Site	RVB-LMAR	RAVENTHORPE BEDS - LIMESTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	BAJOCIAN
7	0.0	On Site	MRB-FGLS	MARLSTONE ROCK FORMATION - FERRUGINOUS LIMESTONE AND FERRUGINOUS SANDSTONE	PLIENSBACHIAN
8A	0.0	On Site	KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF) - LIMESTONE	BAJOCIAN
9A	0.0	On Site	KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF) - LIMESTONE	BAJOCIAN
10A	0.0	On Site	KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF) - LIMESTONE	BAJOCIAN
11	0.0	On Site	CHAM-MDST	CHARMOUTH MUDSTONE FORMATION - MUDSTONE	SINEMURIAN
12	0.0	On Site	KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF) - LIMESTONE	BAJOCIAN
13	0.0	On Site	KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF) - LIMESTONE	BAJOCIAN
14B	0.0	On Site	HIL-LMOOL	HIBALDSTOW LIMESTONE - LIMESTONE, OOIDAL	BAJOCIAN
15B	0.0	On Site	KCM-MDLM	KIRTON CEMENTSTONE BEDS - MUDSTONE AND LIMESTONE, INTERBEDDED	BAJOCIAN
16	0.0	On Site	KCM-LMST	KIRTON CEMENTSTONE BEDS - LIMESTONE	BAJOCIAN
17	0.0	On Site	KCM-MDLM	KIRTON CEMENTSTONE BEDS - MUDSTONE AND LIMESTONE, INTERBEDDED	BAJOCIAN
18	0.0	On Site	PTNI-FEST	PECTEN IRONSTONE (BED) - IRONSTONE	PLIENSBACHIAN
19	0.0	On Site	CHAM-MDST	CHARMOUTH MUDSTONE FORMATION - MUDSTONE	SINEMURIAN
20	0.0	On Site	KCM-LMST	KIRTON CEMENTSTONE BEDS - LIMESTONE	BAJOCIAN

ID	Distance	Direction	LEX Code	Rock Description	Rock Age
21	61.0	S	FI-FEST	FRODINGHAM IRONSTONE MEMBER - IRONSTONE	SINEMURIAN
22	313.0	S	KCMK-LMST	KIRTON CEMENTSTONE BEDS (KNOLL-REEF) - LIMESTONE	BAJOCIAN

2.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site boundary? Yes

Distance	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Mixed	High	Moderate
0.0	On Site	Fracture	Low	Low
0.0	On Site	Mixed	Very High	Very High
0.0	On Site	Mixed	High	Moderate
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Fracture	Very High	Low
0.0	On Site	Fracture	High	Low
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Mixed	High	Moderate
0.0	On Site	Mixed	High	Moderate
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Fracture	Very High	Very Low
0.0	On Site	Fracture	Very High	Very Low
0.0	On Site	Fracture	Low	Low
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Fracture	Low	Low
0.0	On Site	Mixed	High	Moderate
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Fracture	High	Low
0.0	On Site	Mixed	Moderate	Low
0.0	On Site	Mixed	Moderate	Low
0.0	On Site	Fracture	Very High	Very Low
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Fracture	Low	Low
0.0	On Site	Mixed	High	Moderate
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Fracture	Low	Low

2.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? Yes

ID	Distance	Direction	Category Description	Feature Description
46	0.0	On Site	LANDFORM	Dune, form line at base
47	0.0	On Site	LANDFORM	Dune, form line at base
48	13.0	E	LANDFORM	Dune, form line at base
49	41.0	NW	LANDFORM	Dune, form line at base
50	130.0	N	LANDFORM	Dune, form line at base
51	160.0	NW	LANDFORM	Dune, form line at base
52	275.0	E	LANDFORM	Dune, form line at base
53	352.0	NE	LANDFORM	Dune, form line at base
54H	490.0	N	LANDFORM	Dune, form line at base
55H	492.0	N	LANDFORM	Dune, form line at base

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nation wide coverage.

3 Radon Data

3.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?The property is in a Radon Affected Area, as between 10 and 30% of properties are above the Action Level.

3.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? Full radon protective measures are necessary.

4 Ground Workings Map

Ground Workings Legend

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Site Outline

125
250
Search Buffers (m)

▨ Historic Surface Ground Workings

▨ Historic Underground Workings

▲ Current Ground Workings

4 Ground Workings

4.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

ID	Distance (m)	Direction	NGR	Use	Date
1E	0.0	On Site	493748 409553	Unspecified Pit	1951
2A	0.0	On Site	494217 410278	Unspecified Ground Workings	1994
3A	0.0	On Site	494217 410278	Unspecified Ground Workings	1977
4B	0.0	On Site	494146 410173	Unspecified Pit	1977
5B	0.0	On Site	494146 410173	Unspecified Pit	1994
6C	0.0	On Site	494048 410235	Unspecified Pit	1977
7C	0.0	On Site	494048 410235	Unspecified Pit	1994
8D	0.0	On Site	493917 410234	Unspecified Ground Workings	1977
9D	0.0	On Site	493917 410234	Unspecified Ground Workings	1994
10E	0.0	On Site	493749 409556	Unspecified Pit	1948
11E	0.0	On Site	493749 409556	Unspecified Pit	1906
12C	0.0	On Site	494049 410235	Unspecified Pit	1886
13	0.0	On Site	493837 410252	Unspecified Pit	1886
14	105.0	W	493099 409549	Opencast Ironstone Workings	1979
15F	124.0	W	493174 409059	Ponds	1938
16F	124.0	W	493174 409059	Ponds	1905
17F	126.0	W	493174 409059	Unspecified Pit	1968
18F	126.0	W	493174 409059	Ponds	1951
19	134.0	NW	493429 410197	Unspecified Pit	1886
20	139.0	W	493314 409857	Unspecified Pit	1886
21	147.0	W	493294 409694	Unspecified Pit	1886

ID	Distance (m)	Direction	NGR	Use	Date
22G	195.0	W	493058 410820	Opencast Ironstone Workings	1977
23G	195.0	W	493058 410820	Opencast Ironstone Workings	1994
24H	205.0	W	493644 410496	Pond	1977
25H	205.0	W	493644 410496	Pond	1994
26I	217.0	W	493270 410135	Unspecified Ground Workings	1994
27I	217.0	W	493270 410135	Unspecified Ground Workings	1977

4.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary?	No

Database searched and no data found.

4.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary?	Yes

The following Current Ground Workings information is provided by British Geological Survey:

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
28	340.0	W	493000 409000	Ironstone	Yarborough	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
29	462.0	NW	493200 410400	Ironstone	Emanuel Bridge	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Inactive

5 Mining, Extraction & Natural Cavities Map

Mining, Extraction and Natural Cavities Legend

- ⬠ Site Outline
- —250— —500— Search Buffers (m)
- ▨ Historical Mining
- ■ Non-Coal Mining Cavities
- ◆ Natural Cavities

Non-Coal Mining

- ▨ Highly likely
- ▨ Likely
- ▨ Unlikely
- ▨ Highly unlikely
- ▨ Rare

5 Mining, Extraction & Natural Cavities

5.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? Yes

The following Historical Mining information is provided by Groundsure:

ID	Distance (m)	Direction	NGR	Details	Date
6	105.0	W	493099 409549	Opencast Ironstone Workings	1979
7A	195.0	W	493058 410820	Opencast Ironstone Workings	1977
8A	195.0	W	493058 410820	Opencast Ironstone Workings	1994
9	730.0	W	492399 409130	Opencast Ironstone Workings	1968
10	872.0	W	492409 409222	Iron Stone Quarry	1951

5.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? Yes

The following information provided by JPB is not represented on mapping: Whilst outside of an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property. Further details and a quote for services can be obtained by emailing this report to enquiries.gs@jpb.co.uk.

5.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary?	Yes

The following non-coal mining information is provided by the BGS:

ID	Distance (m)	Direction	Name	Commodity	Assessment of likelihood
1	0.0	On Site	Not available	Jet	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered
2	0.0	On Site	Not available	Jet	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered
Not shown	834.0	S	Ashby	Iron Ore (Bedded)	Underground mining is known to have occurred within or very close to the area. Potential for difficult ground conditions should be investigated. Potential for localised subsidence is at a level where it should be considered

5.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled "Review of mining instability in Great Britain, 1990" PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary?	Yes

The following Non-Coal Mining Cavities information provided by Peter Brett Associates:

ID	Distance (m)	Direction	NGR	Address	Superficial Deposits	Bedrock Deposits	Extracted Mineral
4	0.0	On Site	494000 410000	HIGH SANTON, Humberside	-	-	Magnatite, Marcasite, Siderite, Ironstone
5	486.0	W	493000 410000	EMMANUEL BRIDGE, Humberside	-	-	Magnatite, Marcasite, Siderite, Ironstone

5.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary?	No

Database searched and no data found.

5.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

5.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

5.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level..

Are there any Tin Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.10 Clay Mining

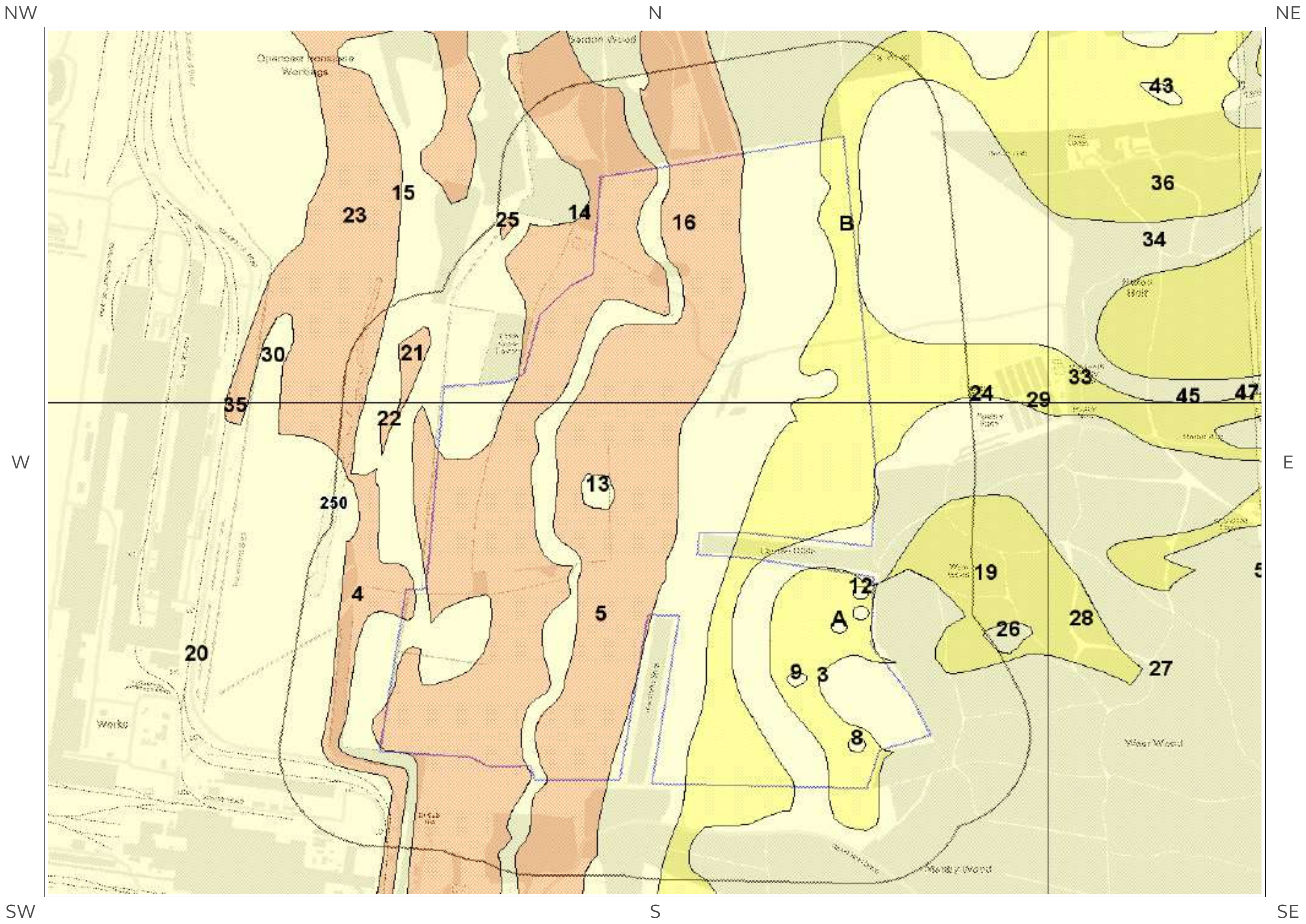
This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

6 Natural Ground Subsidence

6.1 Shrink-Swell Clay Map



Shrink Swell Clay Legend

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6.2 Landslides Map

Landslides Legend

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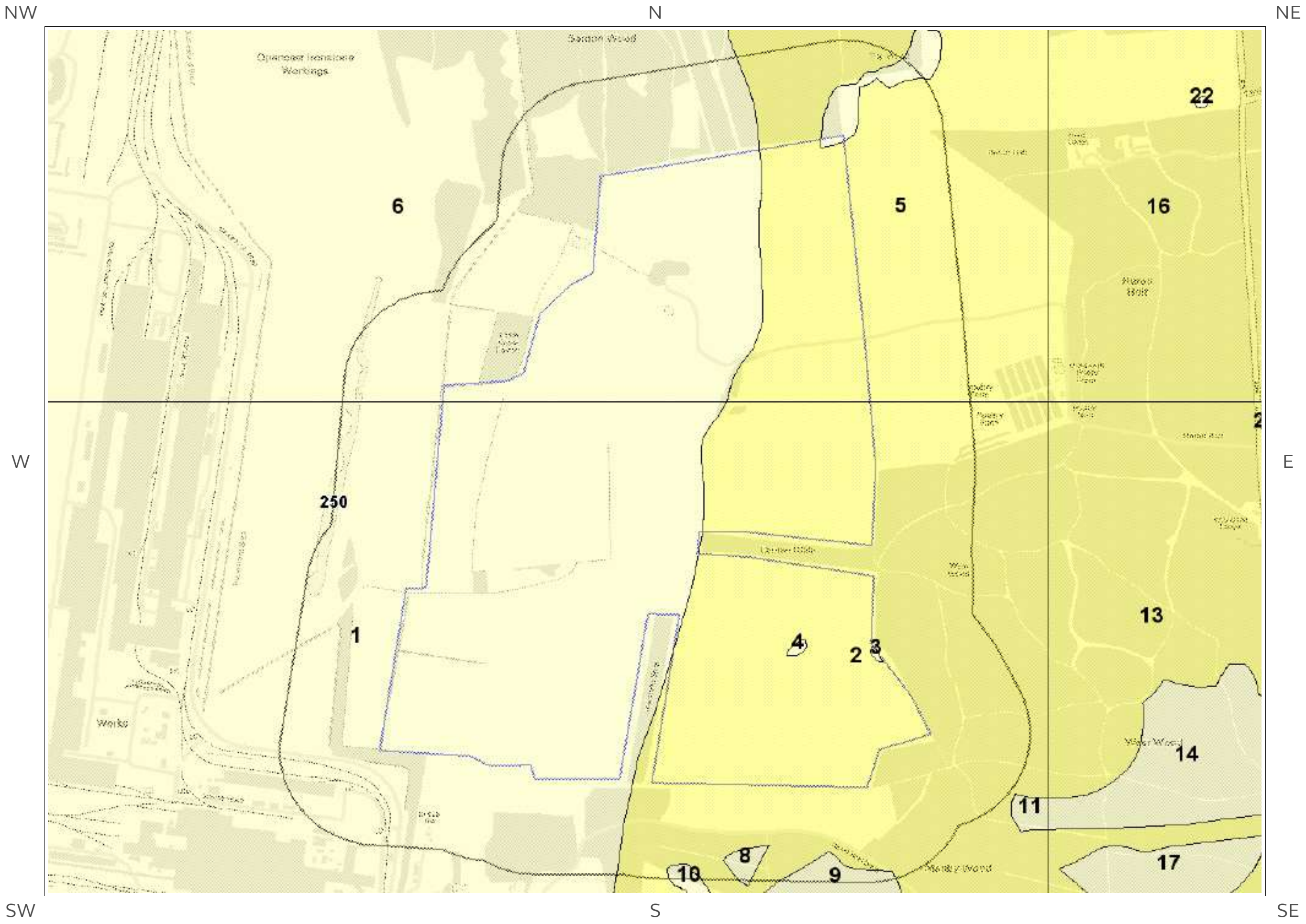
- Site Outline
- Search Buffers (m): 125, 250
- ☐ No Data / Null
- ▨ Negligible
- ▨ Very Low
- ▨ Low
- ▨ Moderate
- ▨ High

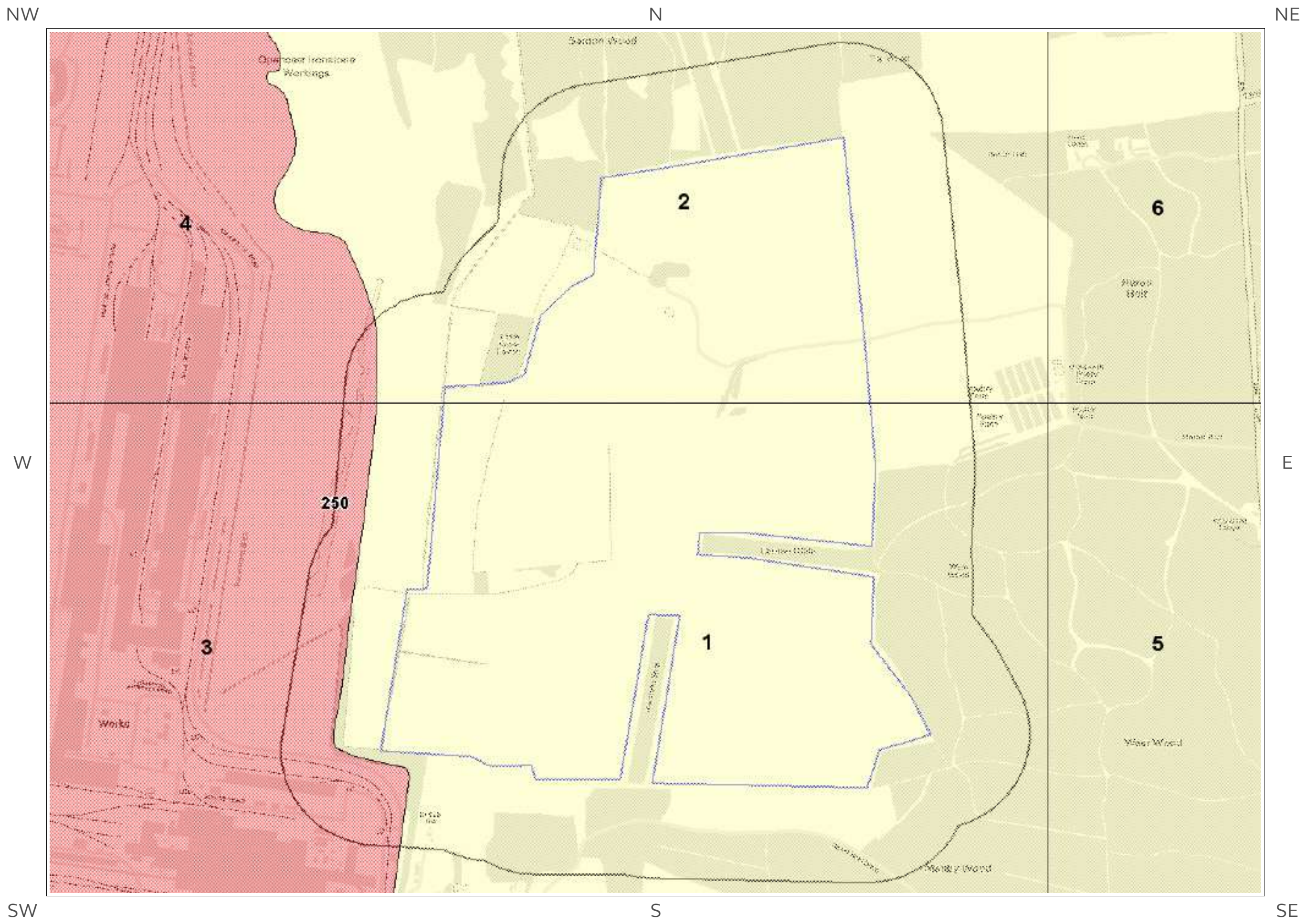
6.3 Ground Dissolution of Soluble Rocks Map



Ground Dissolution Soluble Rocks Legend

⬠	Site Outline	☐	No Data / Null	🟧	Low
— 125 — — 250 —	Search Buffers (m)	▨	Negligible	🟥	Moderate
		🟨	Very Low	🟫	High

6.4 Compressible Deposits Map



Compressible Deposits Legend

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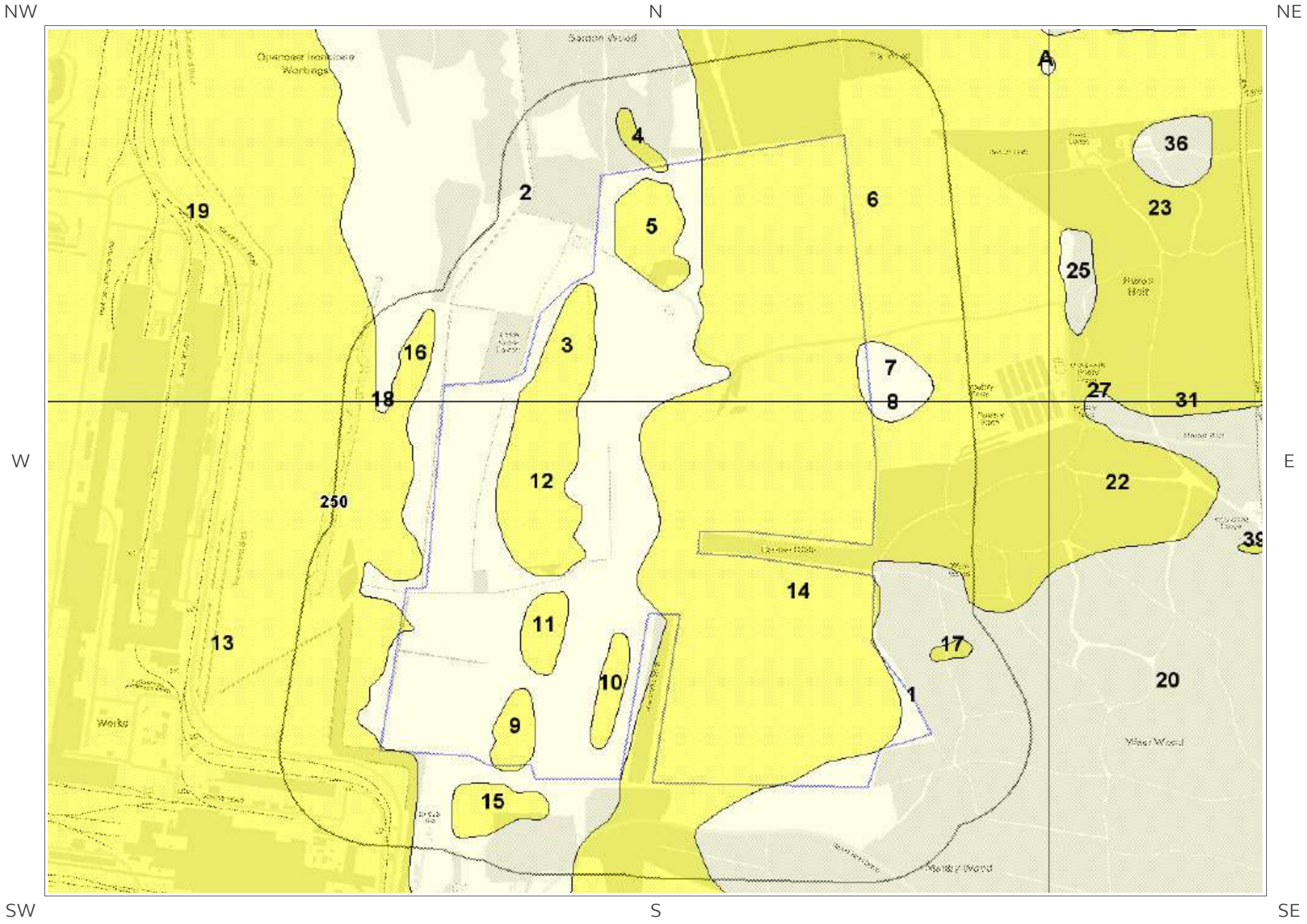
⬡	Site Outline	☐	No Data / Null	🟧	Low
—125— —250—	Search Buffers (m)	🟨	Negligible	🟥	Moderate
		🟨	Very Low	🟫	High

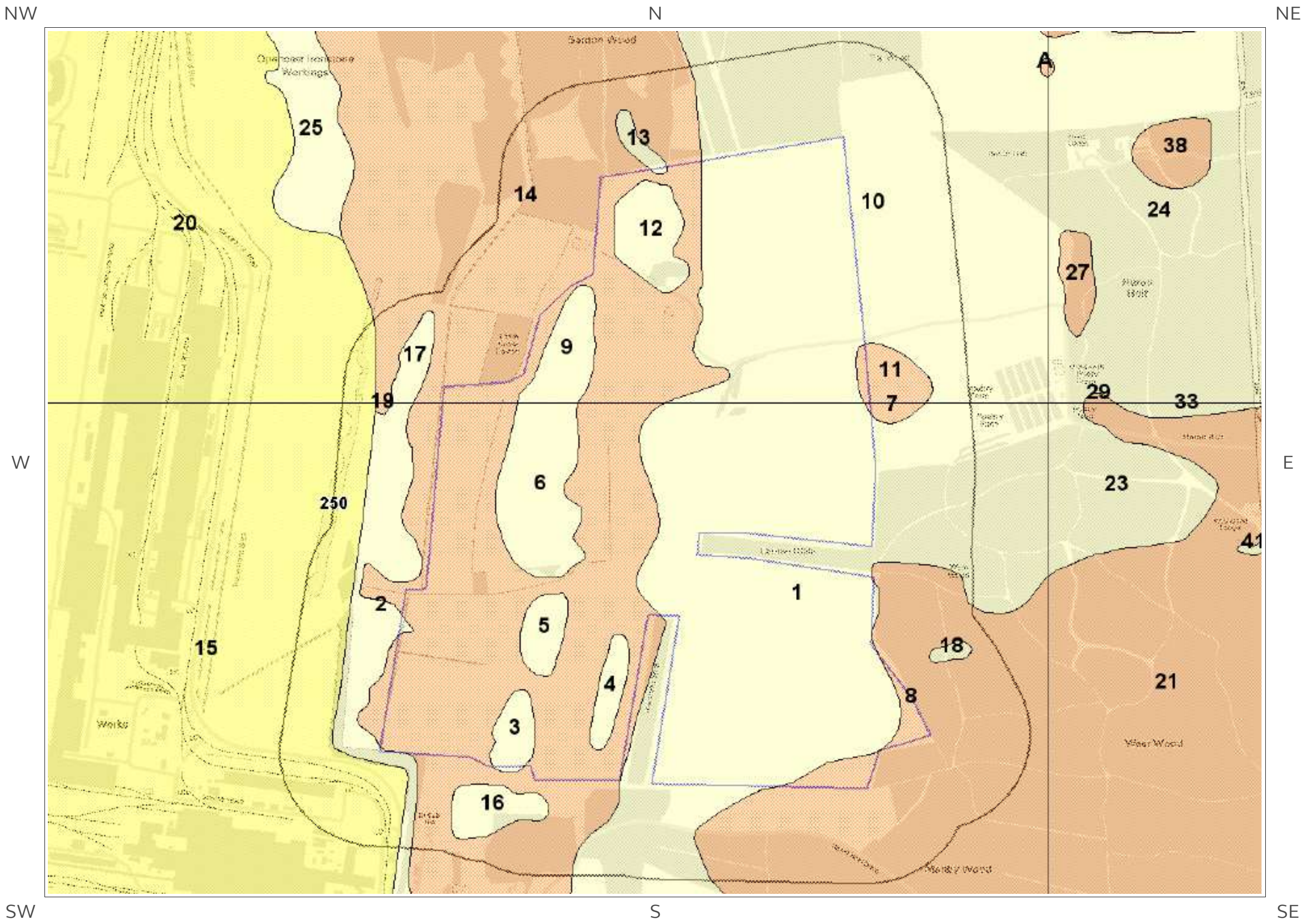
6.5 Collapsible Deposits Map



Collapsible Deposits Legend

- ⬠ Site Outline
- 125 / 250 Search Buffers (m)
- ☐ No Data / Null
- 🟨 Negligible
- 🟨 Very Low
- 🟧 Low
- 🟥 Moderate
- 🟫 High

6.6 Running Sand Map



Running Sand Legend

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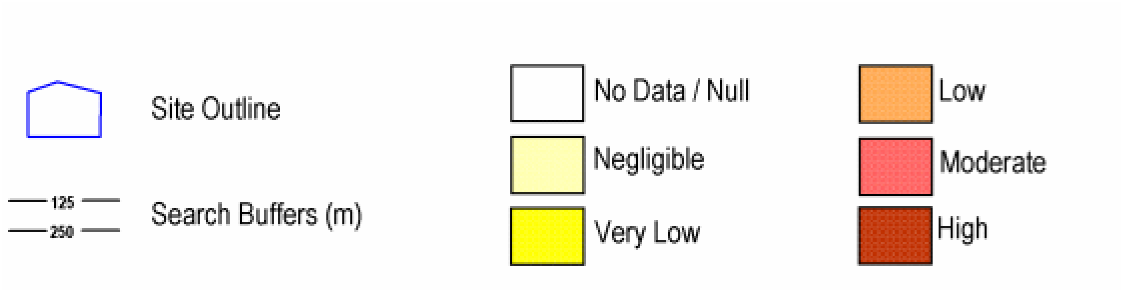

6 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site*[*] boundary? Moderate

6.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.
2	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
3	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
4	0.0	On Site	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

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* This includes an automatically generated 50m buffer zone around the site

ID	Distance (m)	Direction	Hazard Rating	Details
5	0.0	On Site	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.
6	0.0	On Site	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.
7	0.0	On Site	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.
8	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
9	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
10A	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
11A	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
12	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.

ID	Distance (m)	Direction	Hazard Rating	Details
13	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
14	0.0	On Site	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.
15	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
16	0.0	On Site	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.
17B	0.0	On Site	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.
18B	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
19	17.0	E	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

6.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.
2	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
3	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
4	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
5	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
6	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
7	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.

ID	Distance (m)	Direction	Hazard Rating	Details
8	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
9	0.0	On Site	Moderate	Significant potential for slope instability with relatively small changes in ground conditions. Avoid large amounts of water entering the ground through pipe leakage or soak-aways. Do not undercut or place large amounts of material on slopes without technical advice. For new build - consider the potential and consequences of ground movement during excavations, or consequence of changes to loading or drainage. For existing property - probable increase in insurance risk is likely due to potential natural slope instability after changes to ground conditions such as a very long, excessively wet winter.
10	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
11	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

6.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.
2	0.0	On Site	Very Low	Significant soluble rocks are present. Problems unlikely except with considerable surface or subsurface water flow. No special actions required to avoid problems due to soluble rocks. No special ground investigation required or increased construction costs are likely. An increase in financial risk due to potential problems with soluble rocks is unlikely.
3	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

ID	Distance (m)	Direction	Hazard Rating	Details
4	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.
5	0.0	On Site	Very Low	Significant soluble rocks are present. Problems unlikely except with considerable surface or subsurface water flow. No special actions required to avoid problems due to soluble rocks. No special ground investigation required or increased construction costs are likely. An increase in financial risk due to potential problems with soluble rocks is unlikely.
6	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.
7	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

6.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.
2	0.0	On Site	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.
3	28.0	S	Moderate	Significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build - consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property - possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.

6.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

ID	Distance (m)	Direction	Hazard Rating	Details
2	0.0	On Site	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
3	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
4	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
5	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
6	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
7	0.0	On Site	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
8	0.0	On Site	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
9	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
10	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
11	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
12	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
13	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
14	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
15	34.0	S	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

6.6 Running Sands

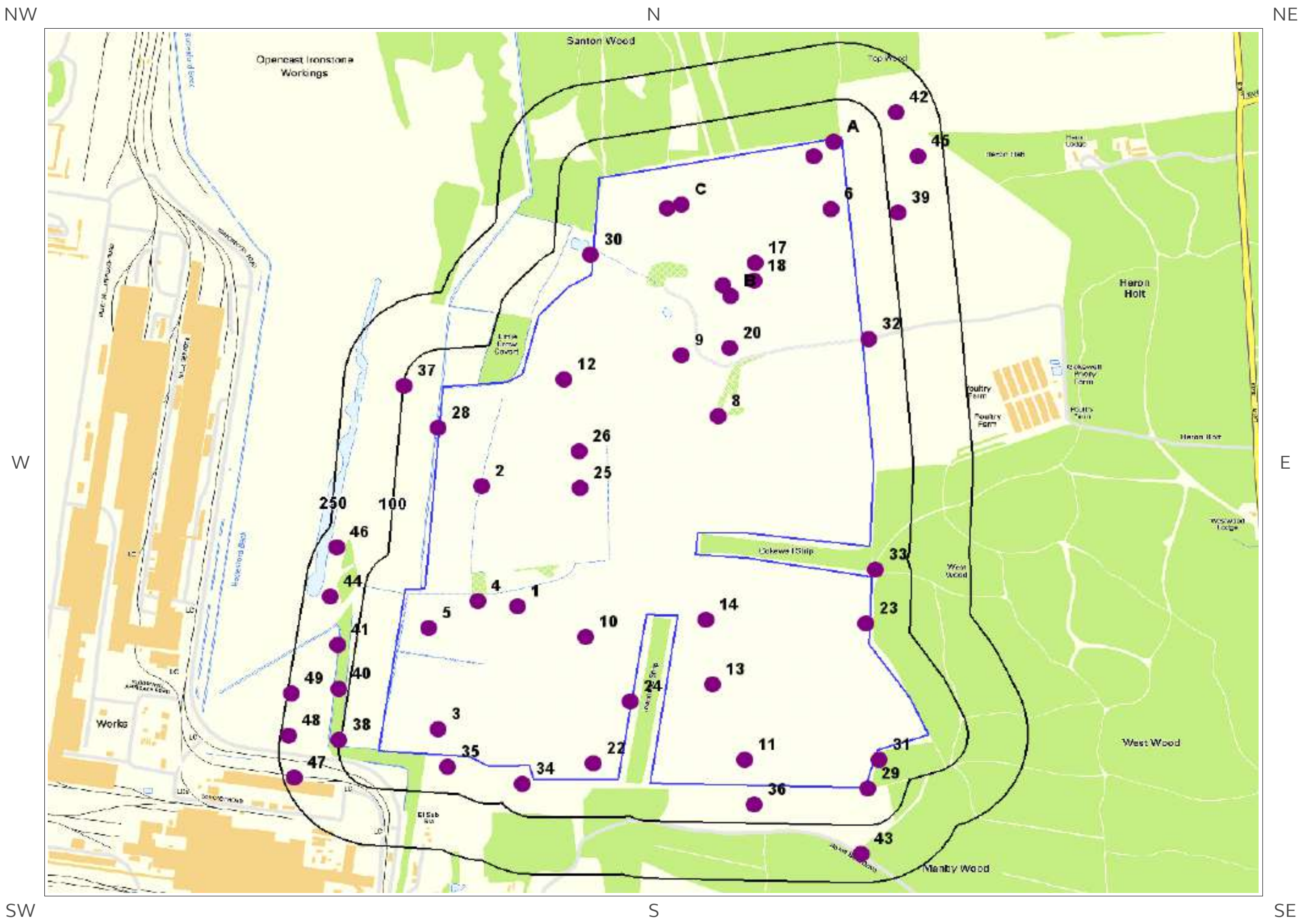
The following Running Sands information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

ID	Distance (m)	Direction	Hazard Rating	Details
2	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
3	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
4	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
5	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
6	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
7	0.0	On Site	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build - consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property - no significant increase in insurance risk due to running sand problems is likely.
8	0.0	On Site	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build - consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property - no significant increase in insurance risk due to running sand problems is likely.
9	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
10	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
11	0.0	On Site	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build - consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property - no significant increase in insurance risk due to running sand problems is likely.
12	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
13	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

ID	Distance (m)	Direction	Hazard Rating	Details
14	0.0	On Site	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build - consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property - no significant increase in insurance risk due to running sand problems is likely.
15	28.0	S	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
16	34.0	S	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

7 Borehole Records Map



Borehole Records Legend

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⬠ Site Outline

● Borehole Locations

125
250
Search Buffers (m)

7 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary:	49

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1	0.0	On Site	493678 409460	SE90NW14	-1.0	SHOTHOLE RECORDS SCUNTHORPE
2	0.0	On Site	493587 409778	SE90NW135	-1.0	SODWALL PLANTATION EAST NO 1
3	0.0	On Site	493479 409136	SE90NW13	-1.0	SHOTHOLE RECORDS SCUNTHORPE
4	0.0	On Site	493578 409476	SE90NW43	-1.0	GOKEWELL ICEHOUSE WEST
5	0.0	On Site	493454 409404	SE90NW158	-1.0	MANBY HALL SOUTH-EAST
6	0.0	On Site	494460 410510	SE91SW461	-1.0	OVERHEAD LINE TOWERS TP 2
7B	0.0	On Site	494210 410280	SE91SW458	-1.0	OVERHEAD LINE TOWERS PBR7
8	0.0	On Site	494180 409963	SE90NW45	-1.0	GOKEWELL
9	0.0	On Site	494086 410124	SE91SW31	-1.0	SHOTHOLE REORDS RETFORD & SCUNTHORPE
10	0.0	On Site	493848 409381	SE90NW137	-1.0	GOKEWELL STRIP SOUTH 1
11	0.0	On Site	494245 409055	SE90NW142	-1.0	WEST WOOD WEST NO.3
12	0.0	On Site	493793 410059	SE91SW393	64.92	LITTLE CROW COVERT EAST
13	0.0	On Site	494165 409255	SE90NW46	-1.0	ICEHOUSE STRIP EAST
14	0.0	On Site	494148 409426	SE90NW138	-1.0	GOKEWELL STRIP PLANTATION NO.2
15A	0.0	On Site	494468 410687	SE91SW138	102.11	TOP WOOD 1
16A	0.0	On Site	494419 410651	SE91SW33	-1.0	SHOTHOLE REORDS RETFORD & SCUNTHORPE
17	0.0	On Site	494272 410368	SE91SW32	-1.0	SHOTHOLE REORDS RETFORD & SCUNTHORPE
18	0.0	On Site	494270 410320	SE91SW460	-1.0	OVERHEAD LINE TOWERS 1
19B	0.0	On Site	494190 410310	SE91SW459	-1.0	OVERHEAD LINE TOWERS JP PBR7
20	0.0	On Site	494208 410142	SE91SW392	86.56	GOKEWELL SOUTH
21C	0.0	On Site	494087 410523	SE91SW395	76.2	GOKEWELL FARM NORTH

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
22	0.0	On Site	493867 409046	SE90NW141	-1.0	WEST WOOD WEST NO.2
23	0.0	On Site	494548 409415	SE90NW139	-1.0	GOKEWELL STRIP SOUTH 3
24	0.0	On Site	493959 409210	SE90NW16	-1.0	SHOTHOLE RECORDS SCUNTHORPE
25	0.0	On Site	493833 409774	SE90NW136	-1.0	SODWALL PLANTATION EAST NO 2
26	0.0	On Site	493832 409871	SE90NW15	-1.0	SHOTHOLE RECORDS SCUNTHORPE
27C	0.0	On Site	494052 410512	SE91SW3	12.8	GOKEWELL COTTAGE, HIGH SANTON LANE, LINCS
28	3.0	W	493479 409933	SE90NW44	-1.0	SODWALL PLANTATION
29	7.0	SE	494553 408979	SE90NW49	-1.0	MANBY WOOD
30	8.0	W	493859 410390	SE91SW141	56.39	GOKEWELL PRIORY FARM
31	13.0	E	494583 409056	SE90NW143	-1.0	WEST WOOD WEST NO.4
32	15.0	E	494555 410167	SE91SW391	102.11	GOKEWELL SOUTHEAST
33	20.0	NE	494572 409558	SE90NW42	-1.0	GOKEWELL STRIP
34	33.0	SW	493689 408992	SE90NW48	-1.0	GOKEWELL ICEHOSE NO 2
35	33.0	S	493501 409036	SE90NW140	-1.0	WEST WOOD WEST NO.1
36	51.0	S	494269 408938	SE90NW17	-1.0	SHOTHOLE RECORDS SCUNTHORPE
37	100.0	W	493392 410044	SE91SW394	44.81	LITTLE CROW COVERT WEST
38	105.0	W	493229 409108	SE90NW104	-1.0	YARBOROUGH
39	122.0	E	494630 410500	SE91SW462	-1.0	OVERHEAD LINE TOWERS TP 3
40	125.0	W	493229 409243	SE90NW105	-1.0	YARBOROUGH
41	146.0	W	493226 409358	SE90NW106	-1.0	YARBOROUGH
42	150.0	NE	494624 410766	SE91SW456	-1.0	BROUGHTON B1
43	175.0	S	494537 408808	SE90NW18	-1.0	SHOTHOLE RECORDS SCUNTHORPE
44	182.0	W	493209 409486	SE90NW107	-1.0	YARBOROUGH
45	186.0	E	494680 410650	SE91SW463	-1.0	OVERHEAD LINE TOWERS 3
46	204.0	NW	493224 409617	SE90NW91	-1.0	YARBOROUGH MINES
47	224.0	W	493119 409009	SE90NW47	-1.0	GOKEWELL ICEHOSE NO 2
48	230.0	W	493104 409120	SE90NW110	-1.0	YARBOROUGH
49	240.0	W	493111 409232	SE90NW109	-1.0	YARBOROUGH

The borehole records are available using the hyperlinks below: Please note that if the donor of the borehole record has requested the information be held as commercial-in-confidence, the additional data will be held separately by the BGS and a formal request must be made for its release.

#9: scans.bgs.ac.uk/sobi_scans/boreholes/134113
#12: scans.bgs.ac.uk/sobi_scans/boreholes/134477
#15A: scans.bgs.ac.uk/sobi_scans/boreholes/134222
#16A: scans.bgs.ac.uk/sobi_scans/boreholes/134115
#17: scans.bgs.ac.uk/sobi_scans/boreholes/134114
#20: scans.bgs.ac.uk/sobi_scans/boreholes/134476
#21C: scans.bgs.ac.uk/sobi_scans/boreholes/134479
#27C: scans.bgs.ac.uk/sobi_scans/boreholes/134078
#30: scans.bgs.ac.uk/sobi_scans/boreholes/134225
#32: scans.bgs.ac.uk/sobi_scans/boreholes/134475
#37: scans.bgs.ac.uk/sobi_scans/boreholes/134478

8 Estimated Background Soil Chemistry

Records of background estimated soil chemistry within 250m of the study site boundary: 201

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geo Insight User Guide, available on request.

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
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0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
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0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
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Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
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0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
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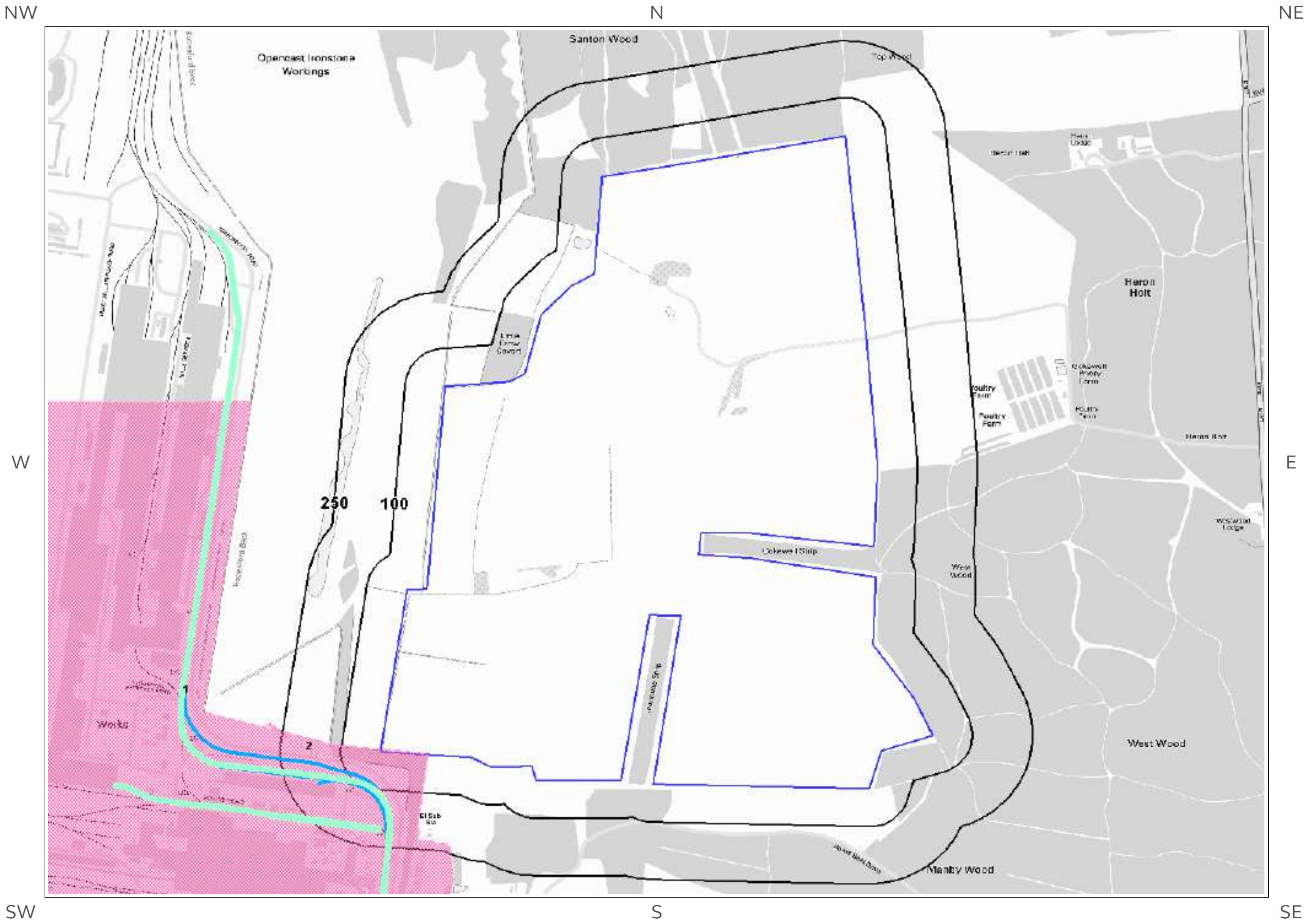
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
1.0	E	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
4.0	N	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
4.0	N	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
5.0	S	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
5.0	S	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
5.0	S	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
5.0	S	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
5.0	S	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
5.0	S	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
5.0	S	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
5.0	S	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
6.0	E	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
7.0	E	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
10.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
10.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
10.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
10.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
10.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
10.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
11.0	N	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
11.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
11.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
13.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
13.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
16.0	W	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
17.0	W	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
17.0	W	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
20.0	N	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	<100 mg/kg
24.0	N	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
24.0	N	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
25.0	E	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
29.0	E	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
34.0	S	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
34.0	S	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
43.0	W	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
43.0	W	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 mg/kg
47.0	SW	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	<100 mg/kg

*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

9 Railways and Tunnels Map



Railways and Tunnels Legend

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- Site Outline
- Search Buffers (m): — 250 —, — 500 —
- Underground or Partially Underground Railway / Subway System
- Railway Tunnel (OS Mapping)
- Abandoned or Dismantled Railway (OpenStreetMap)
- Railway Track (OS Mapping)
- Railway Track (OpenStreetMap)
- High Speed 2
- High Speed 2 Revised Proposed Route
- Crossrail 1
- ▨ Railway and/or Tunnel Feature from Historical Mapping

9 Railways and Tunnels

9.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary?	No
Have any underground railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary?	No
Have any other railway tunnels been identified within 250m of the site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

9.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary?	Yes
Have any historical railway or tunnel features been identified within 250m of the study site boundary?	Yes

ID	**Distance (m)**	**Direction**	**NGR**	**Details**	**Date**
1	0	On Site	492330 409132	Railway Sidings	1979
2	87	SW	493155 409087	Railway Sidings	1997
3	212	SW	493303 408773	Railway Sidings	1997
4	221	SW	493324 408599	Railway Sidings	1975

Any records that have been identified are represented on the Railways and Tunnels Map.

9.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary?	No
Have any historical railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels Map.

9.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary?	No
Have any active railway lines been identified within 250m of the study site boundary?	Yes

Distance (m)	Direction	Name	Type
82	SW	Not given	Multi Track
82	SW	Not given	Multi Track
95	S	Not given	Rail
95	S	Not given	Rail
104	SW	Not given	Multi Track
104	SW	Not given	Multi Track
119	SW	Not given	Multi Track
119	SW	Not given	Multi Track
119	SW	Not given	Multi Track
119	SW	Not given	Multi Track
200	S	Not given	Rail
200	S	Not given	Rail
204	S	Not given	Rail
204	S	Not given	Rail
215	SW	Not given	Rail
215	SW	Not given	Rail

Multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels Map.

9.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project?	No
Is the study site within 500m of the route of the Crossrail 1 rail project?	No

Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a Groundsure HS2 and Crossrail 1 Report.

The route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

Please note that this assessment takes account of both the original Phase 2b proposed route and the amended route proposed in 2016. As the Phase 2b route is still under consultation, Groundsure are providing information on both options until the final route is formally confirmed. Practitioners should take account of this uncertainty when advising clients.

Contact Details

CENTREMAPS

Telephone: 01886 832972
Groundsure@centremaps.co.uk
Open Space, Upper Interfields, Malvern, Worcester, WR14 1UT

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:**enquiries@bgs.ac.uk**
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries

British Gypsum

British Gypsum Ltd
East Leake
Loughborough
Leicestershire
LE12 6HX

The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
https://www.gov.uk/government/organisations/public-health-england
Email: **enquiries@phe.gov.uk**
Main switchboard: 020 7654 8000

Johnson Poole & Bloomer Limited

Harris and Pearson Building, Brettel Lane
Brierley Hill, West Midlands
DY5 3LH
Tel: +44 (0) 1384 262 000
Email:**enquiries.gs@jpb.co.uk**
Website: **www.jpb.co.uk**

Ordnance Survey

Adanac Drive, Southampton
SO16 0AS

Tel: 08456 050505
Website: http://www.ordnancesurvey.co.uk/

Getmapping PLC

Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444
Website:**http://www1.getmapping.com/**

Peter Brett Associates

Caversham Bridge House
Waterman Place
Reading
Berkshire RG1 8DN
Tel: +44 (0)118 950 0761 E-mail:**reading@pba.co.uk**
Website:**http://www.peterbrett.com/home**

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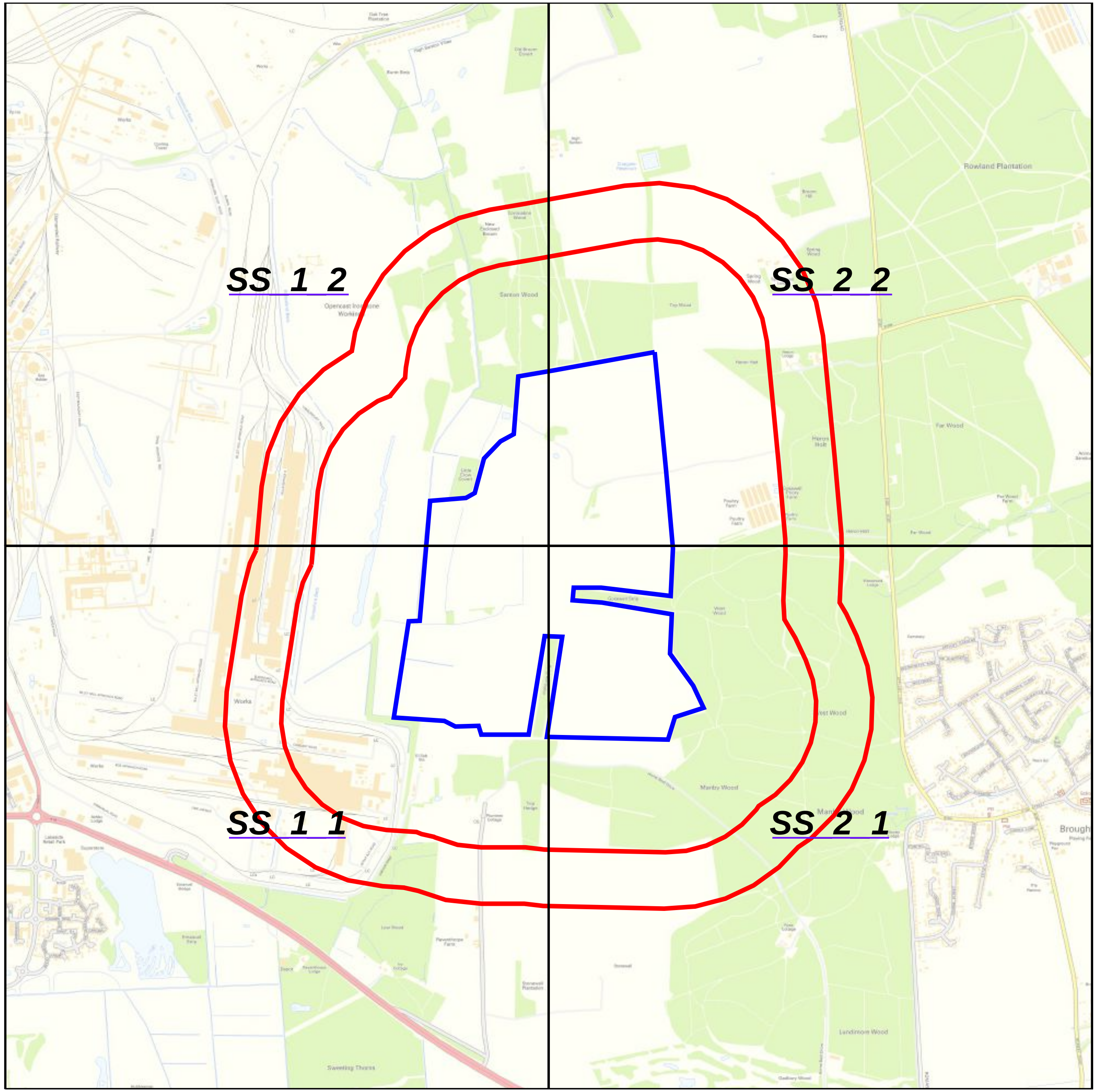

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Small Scale Grid Index

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Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref:	492812, 408637

Map Name:	County Series
Map date:	**1885-1886**
Scale:	1:10,560
Printed at:	1:10,560

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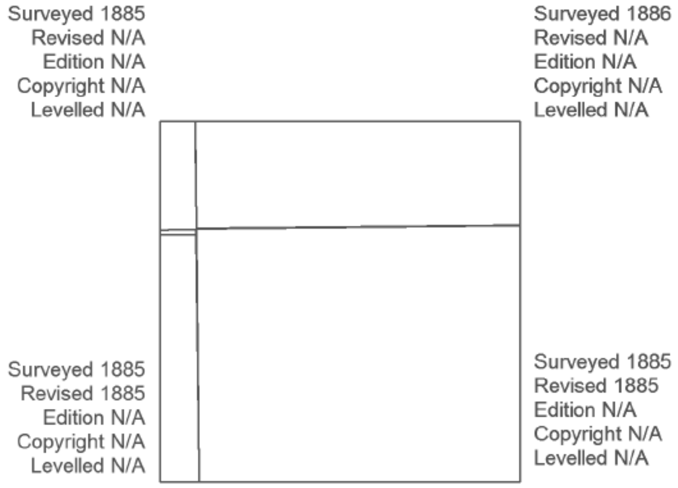

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Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref:	492812, 408637

Map Name:	County Series
Map date:	**1885-1886**
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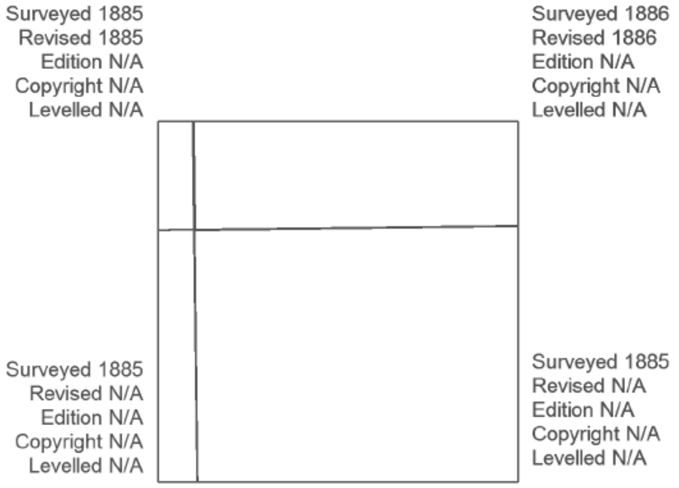

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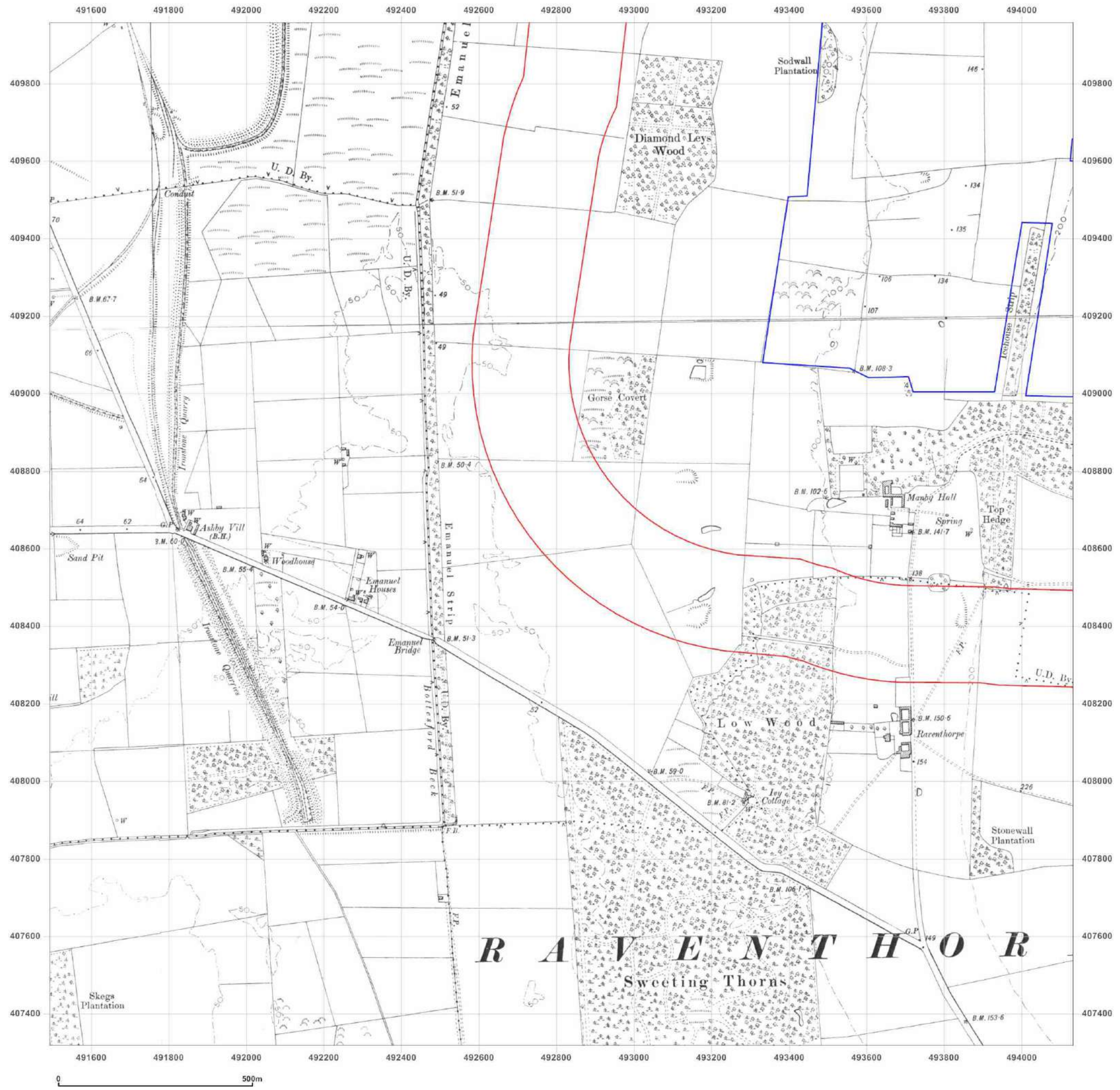

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref: 492812, 408637

Map Name: County Series

Map date: **1905-1906**

Scale: 1:10,560

Printed at: 1:10,560

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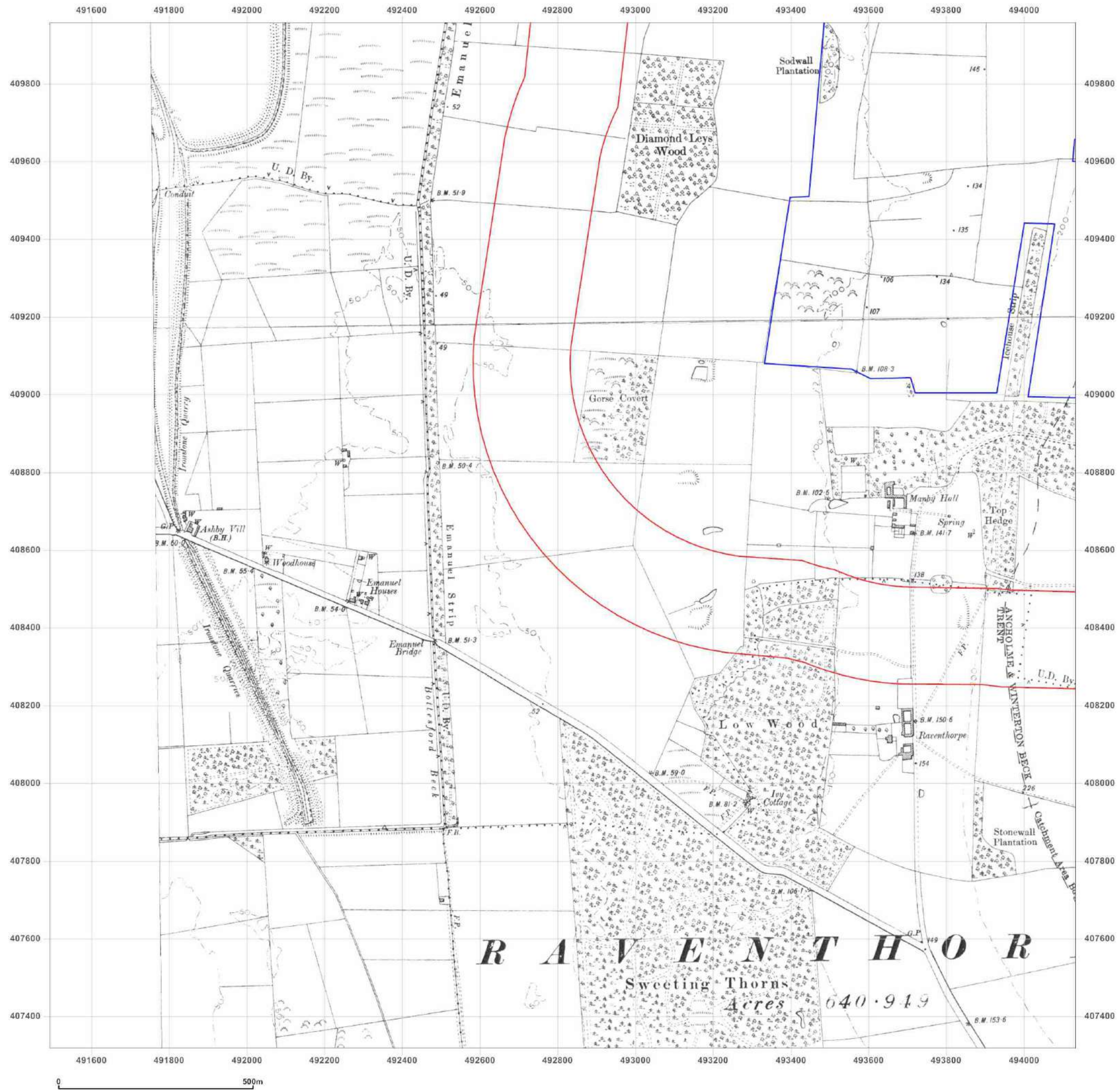


Site Details:

Santon, Scunthorpe, DN16 1XP

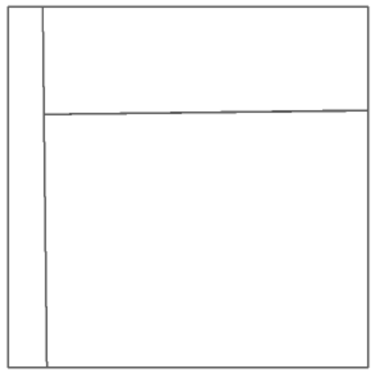
Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref: 492812, 408637

Map Name: County Series

Map date: **1905-1906**

Scale: 1:10,560

Printed at: 1:10,560



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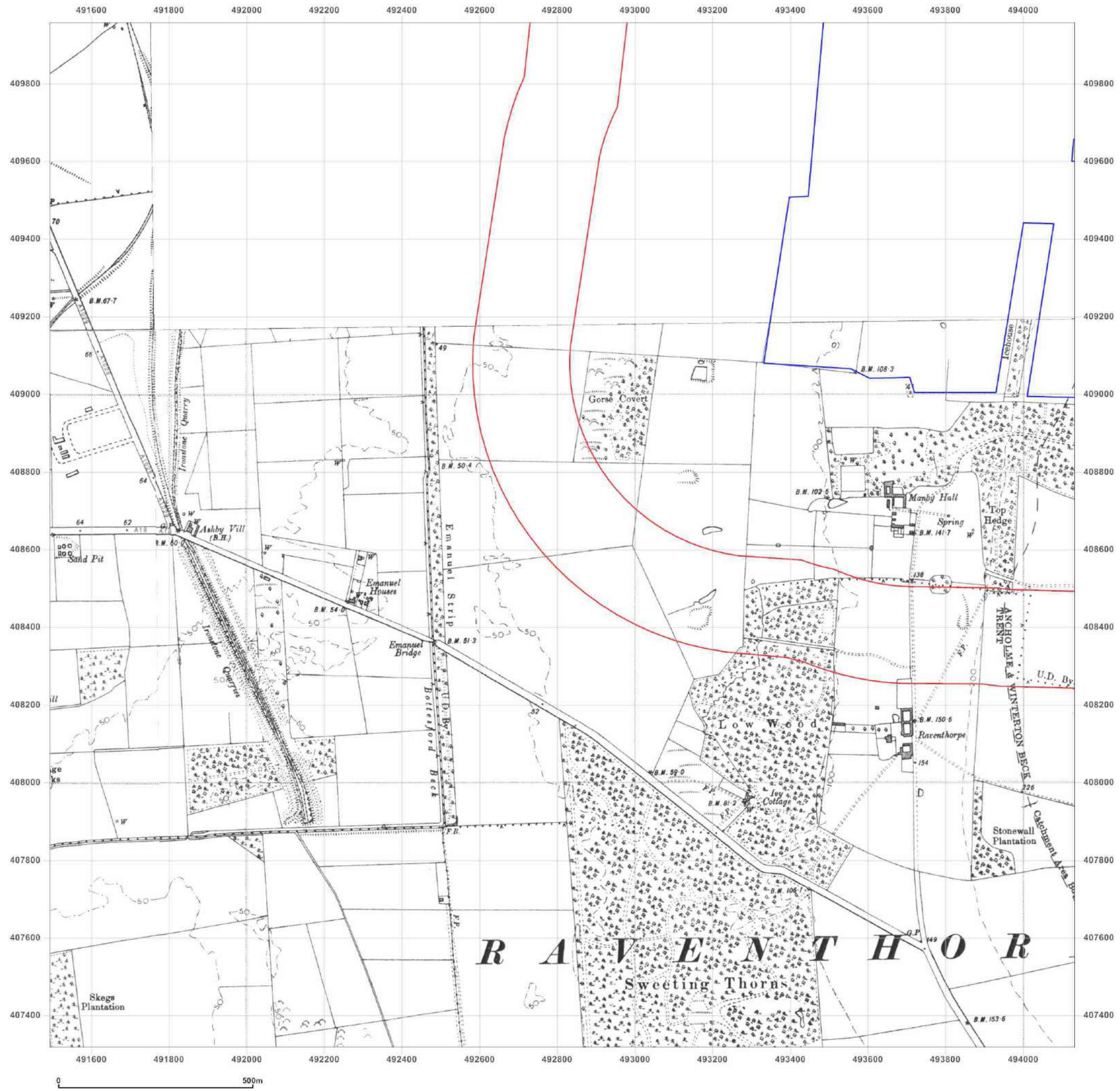

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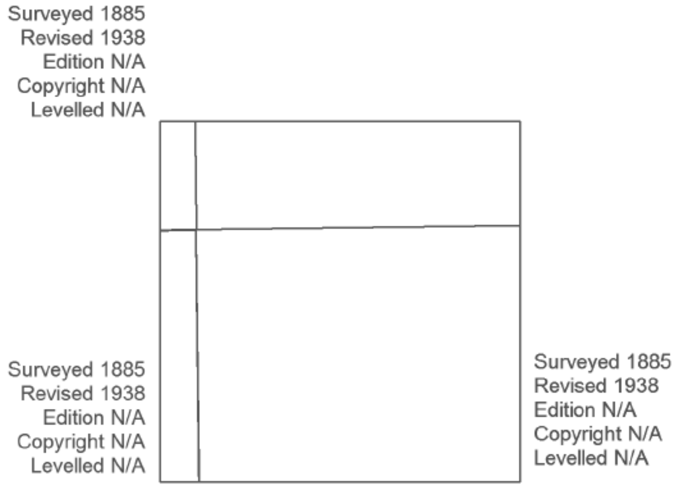
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref:	492812, 408637

Map Name:	County Series
Map date:	**1938**
Scale:	1:10,560
Printed at:	1:10,560



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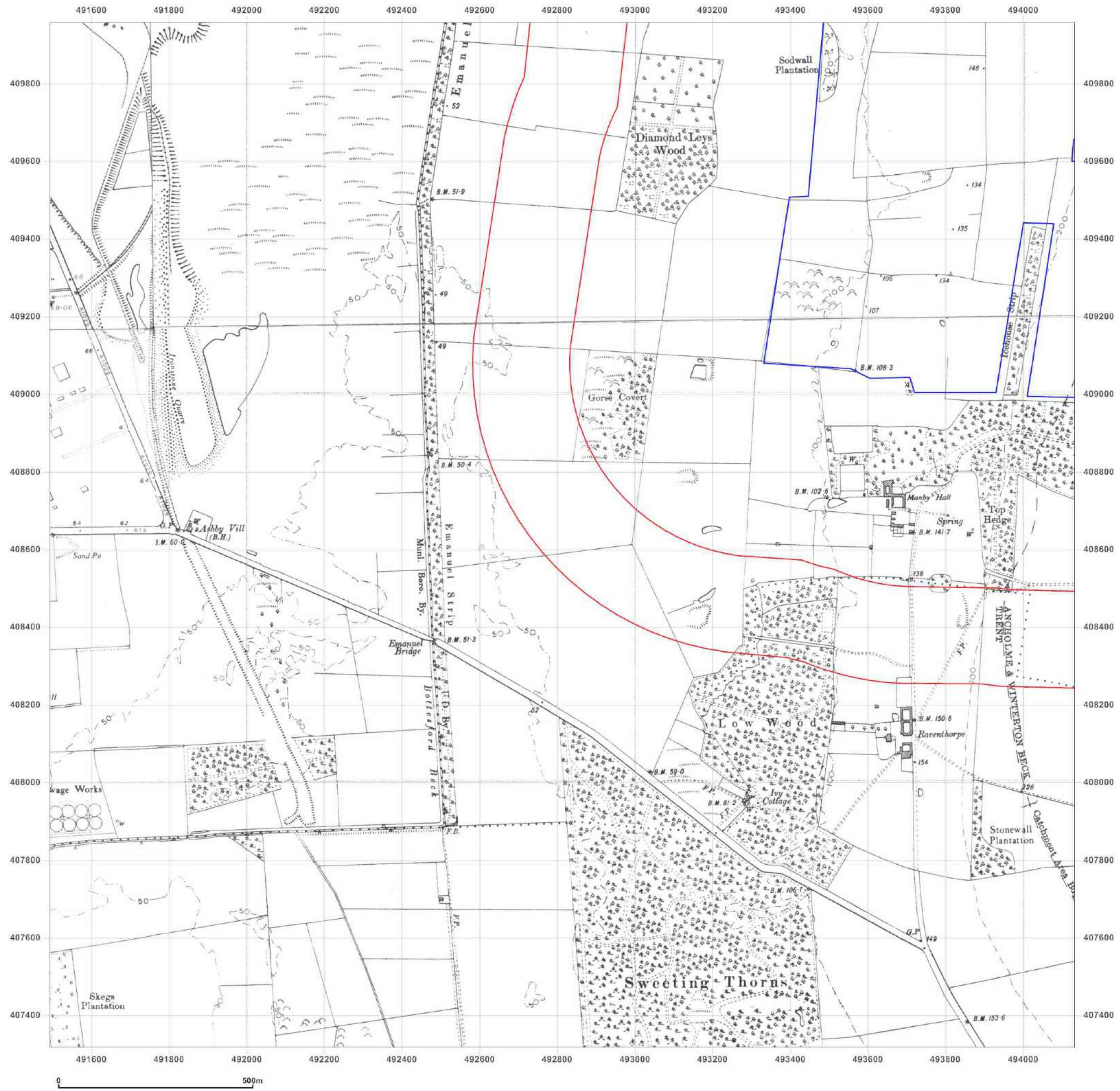

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Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref:	492812, 408637
Map Name:	County Series
Map date:	**1948**
Scale:	1:10,560
Printed at:	1:10,560

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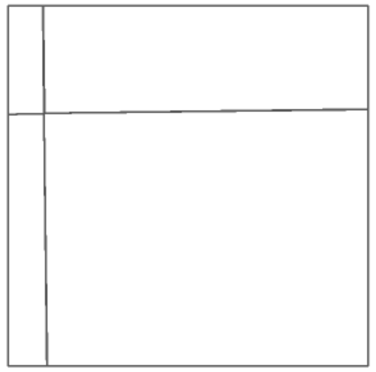

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Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref:	492812, 408637

Map Name:	Provisional
Map date:	**1955**
Scale:	1:10,560
Printed at:	1:10,560

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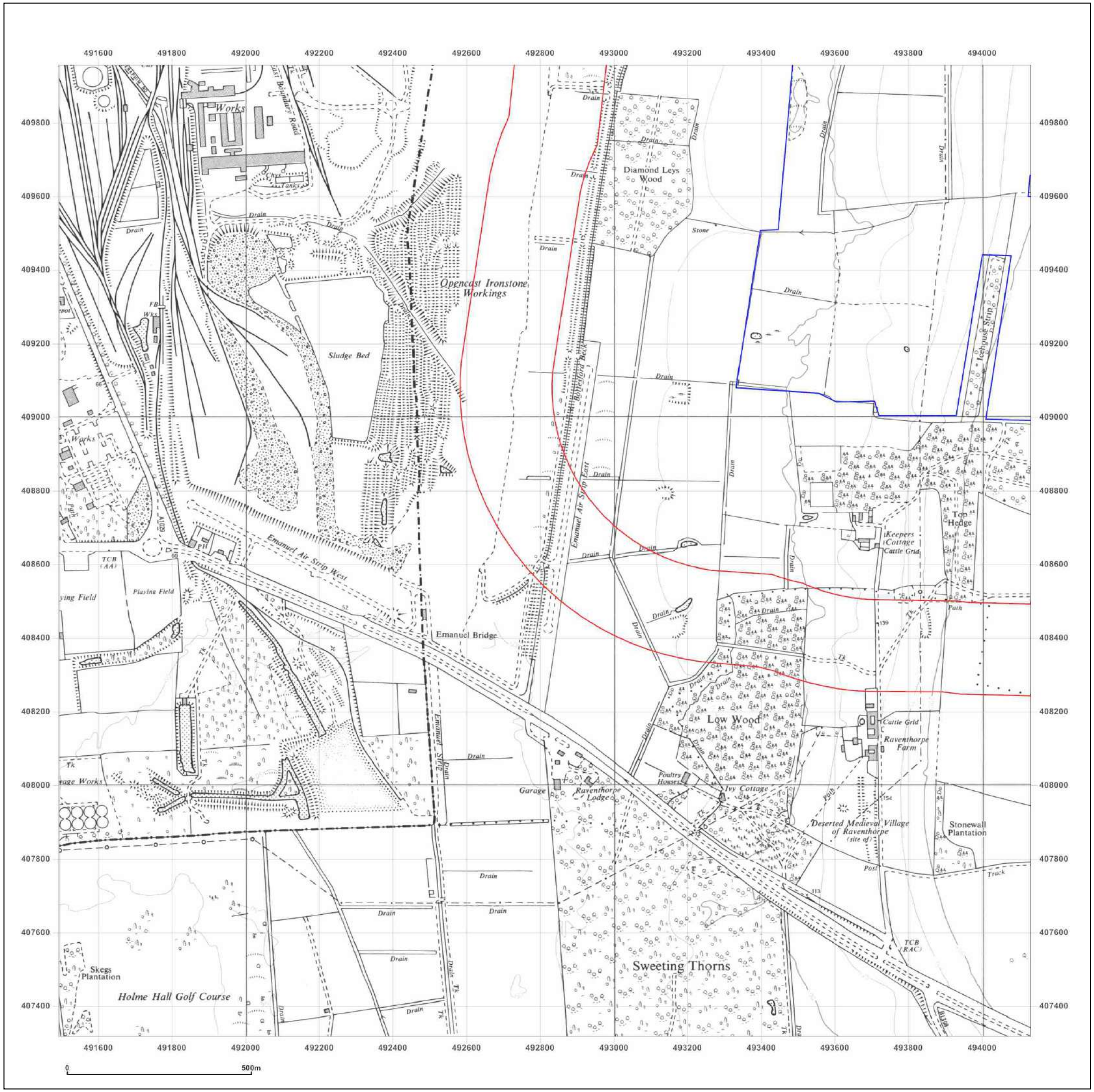

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Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref: 492812, 408637

Map Name: Provisional

Map date: **1968**

Scale: 1:10,560

Printed at: 1:10,560

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Production date: 01 August 2017

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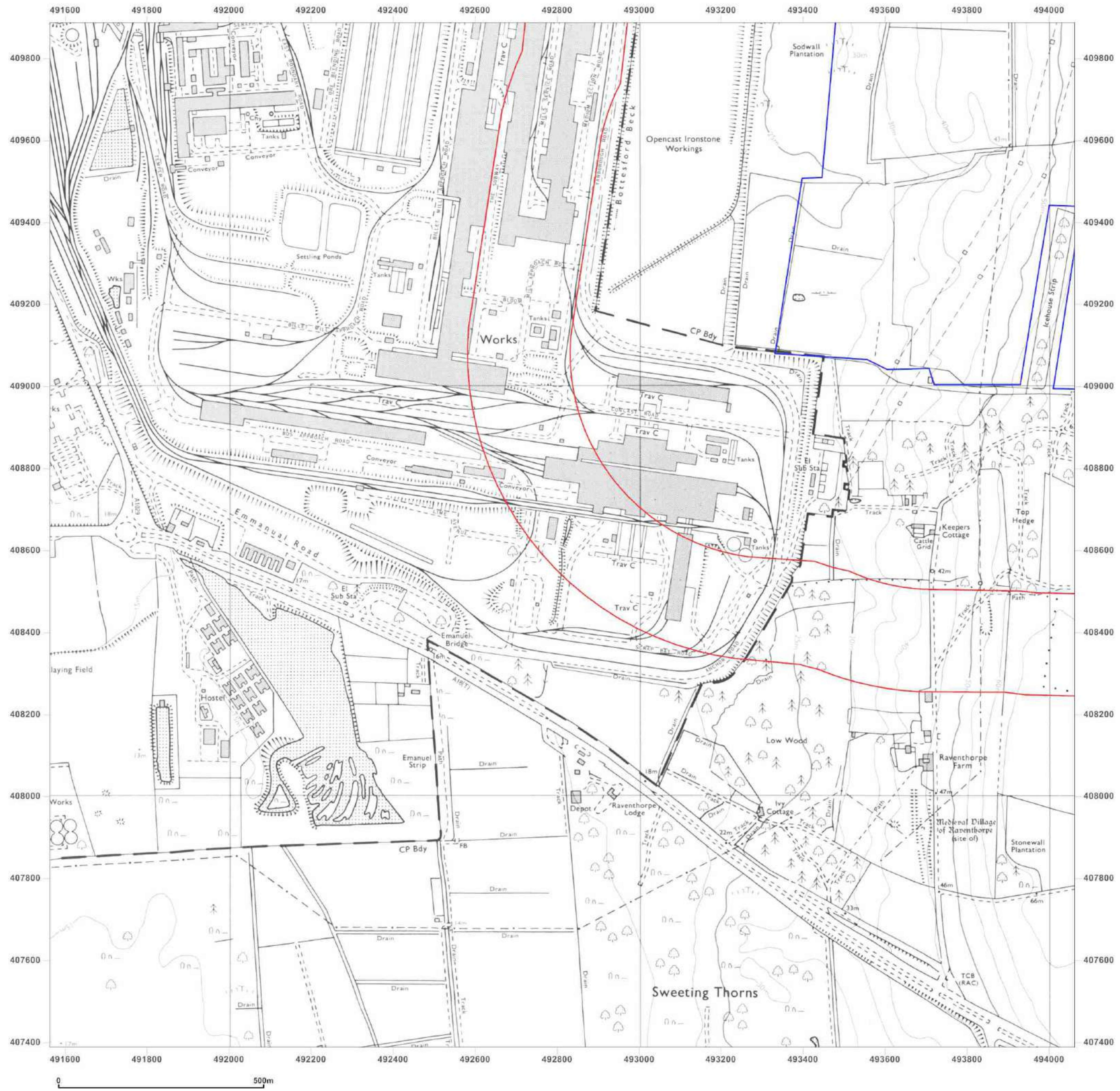

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FOR A BETTER POINT OF VIEW

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref:	492812, 408637

Map Name:	National Grid
Map date:	**1979**
Scale:	1:10,000
Printed at:	1:10,000

N
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Surveyed 1978
Revised 1979
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 01 August 2017

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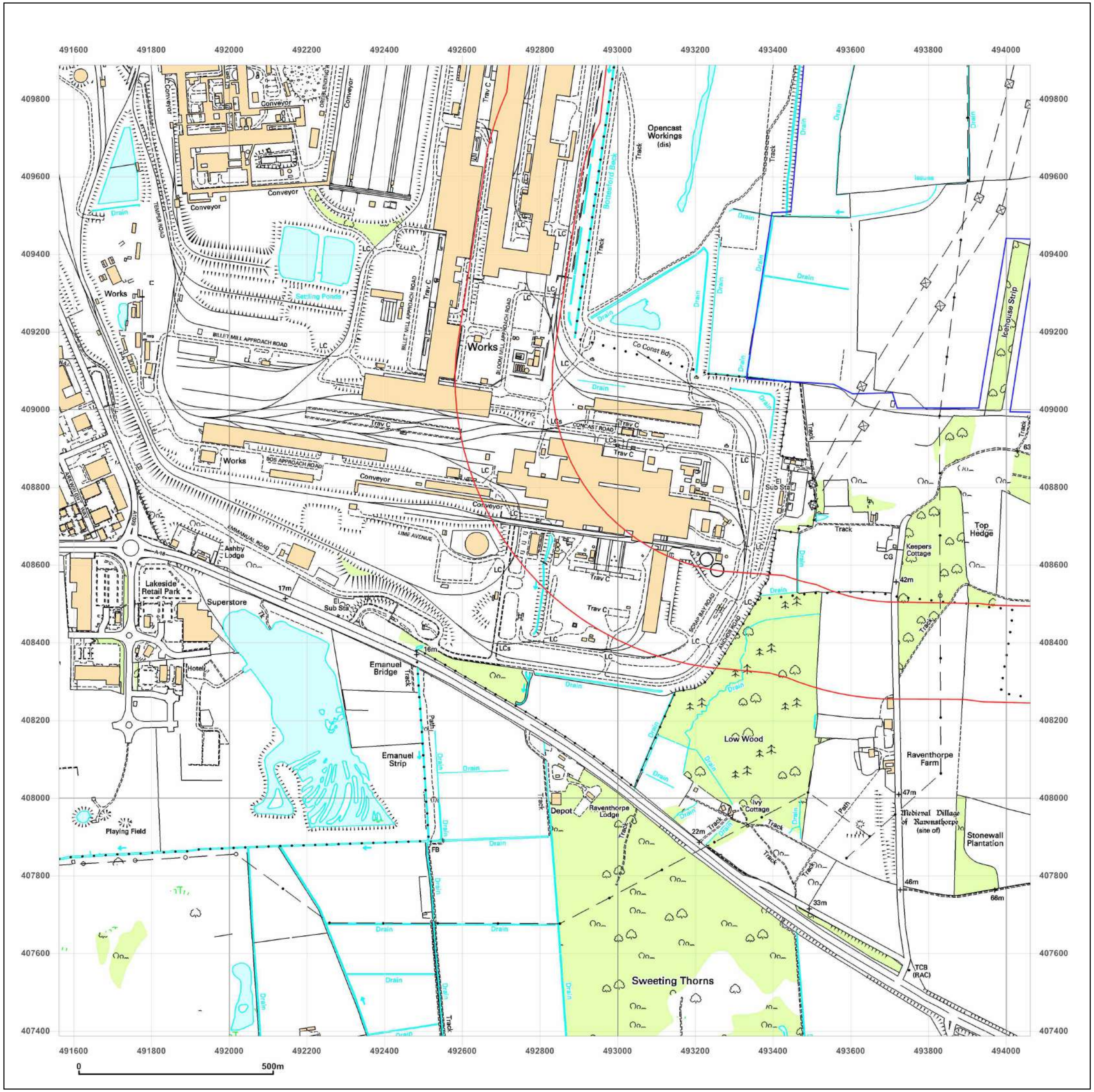

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref:	492812, 408637

Map Name:	1:10,000 Raster
Map date:	**2002**
Scale:	1:10,000
Printed at:	1:10,000

N
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2002

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Production date: 01 August 2017

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Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref:	492812, 408637

Map Name:	National Grid
Map date:	**2010**
Scale:	1:10,000
Printed at:	1:10,000

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2010

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Production date: 01 August 2017

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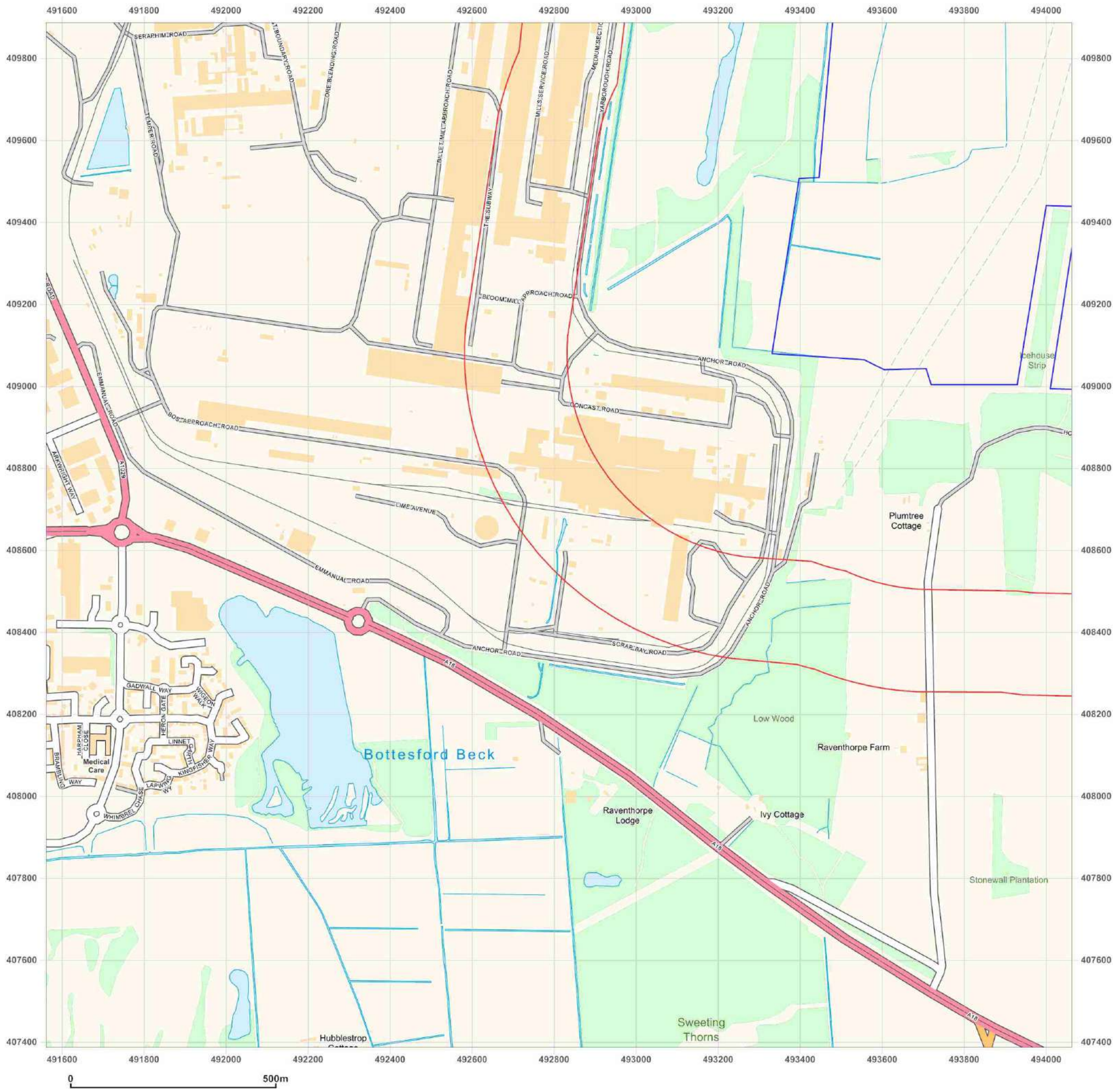

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_1_1
Grid Ref: 492812, 408637

Map Name: National Grid

Map date: **2014**

Scale: 1:10,000

Printed at: 1:10,000

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Production date: 01 August 2017

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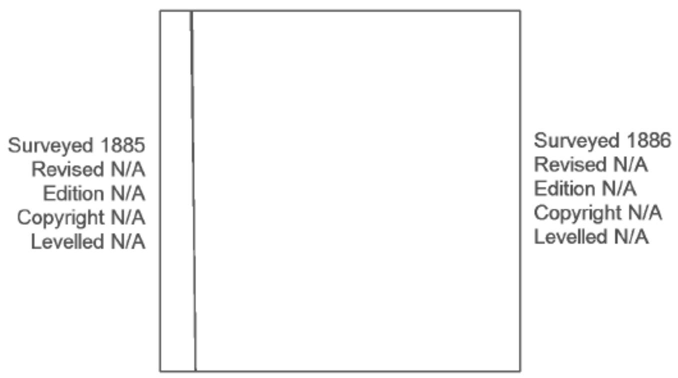
Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref:	492812, 411047
Map Name:	County Series
Map date:	**1886**
Scale:	1:10,560
Printed at:	1:10,560



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Production date: 01 August 2017

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Site Details:

Santon, Scunthorpe, DN16 1XP

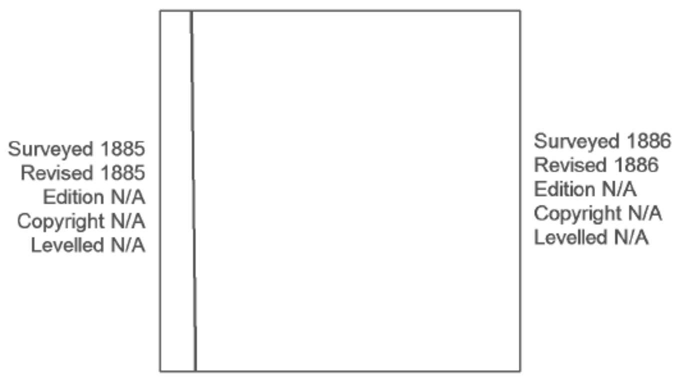
Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref: 492812, 411047

Map Name: County Series

Map date: **1885-1886**

Scale: 1:10,560

Printed at: 1:10,560



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Production date: 01 August 2017

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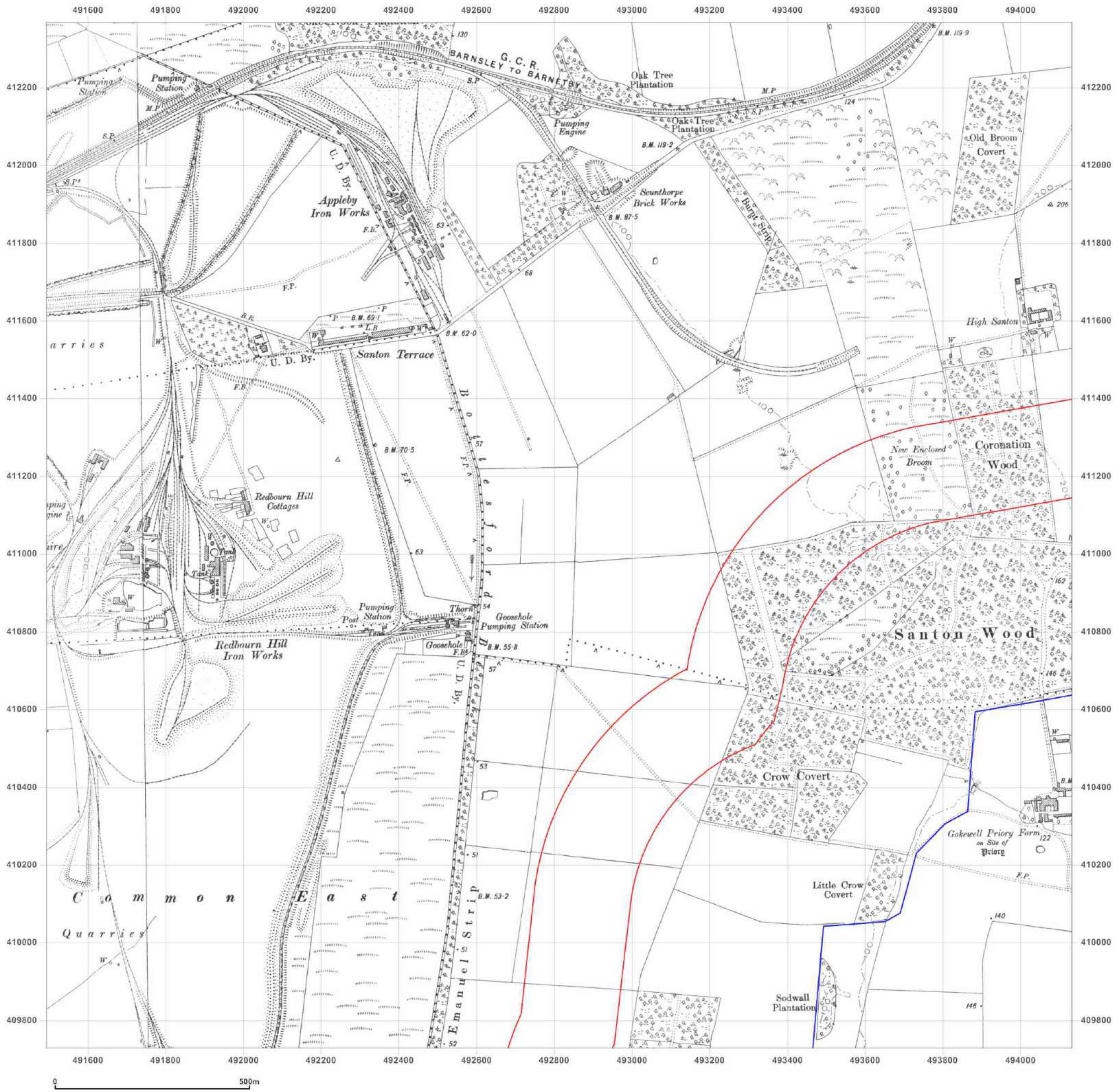


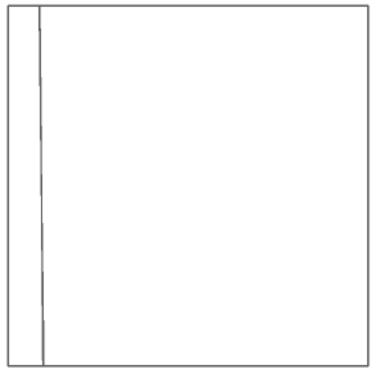
Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref:	492812, 411047

Map Name:	County Series
Map date:	**1906**
Scale:	1:10,560
Printed at:	1:10,560

Surveyed 1885
Revised 1906
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1885
Revised 1906
Edition N/A
Copyright N/A
Levelled N/A

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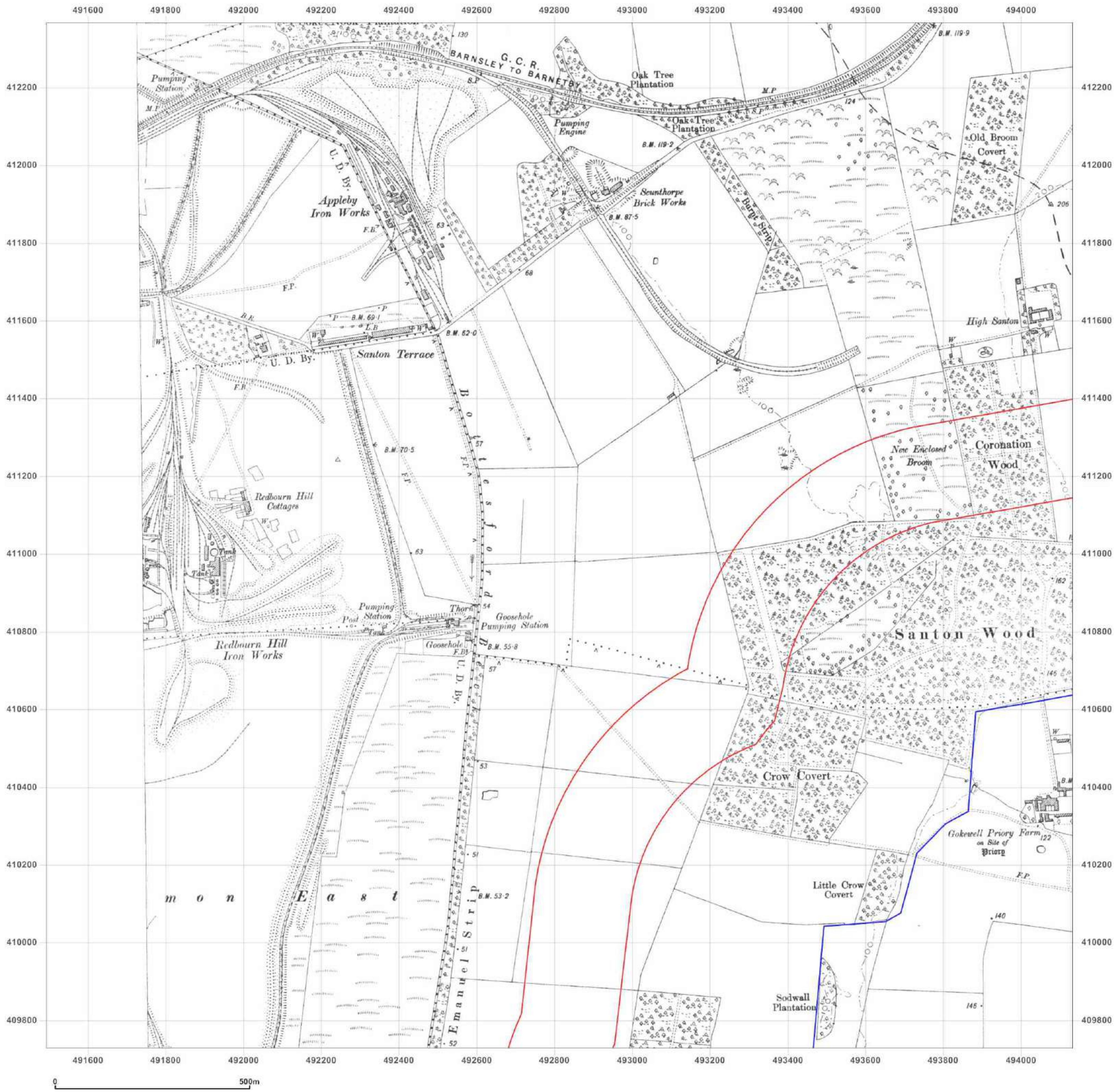
Production date: 01 August 2017

To view map legend click here Legend



Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref: 492812, 411047

Map Name: County Series

Map date: 1906

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1885
Revised 1906
Edition N/A
Copyright N/A
Levelled N/A

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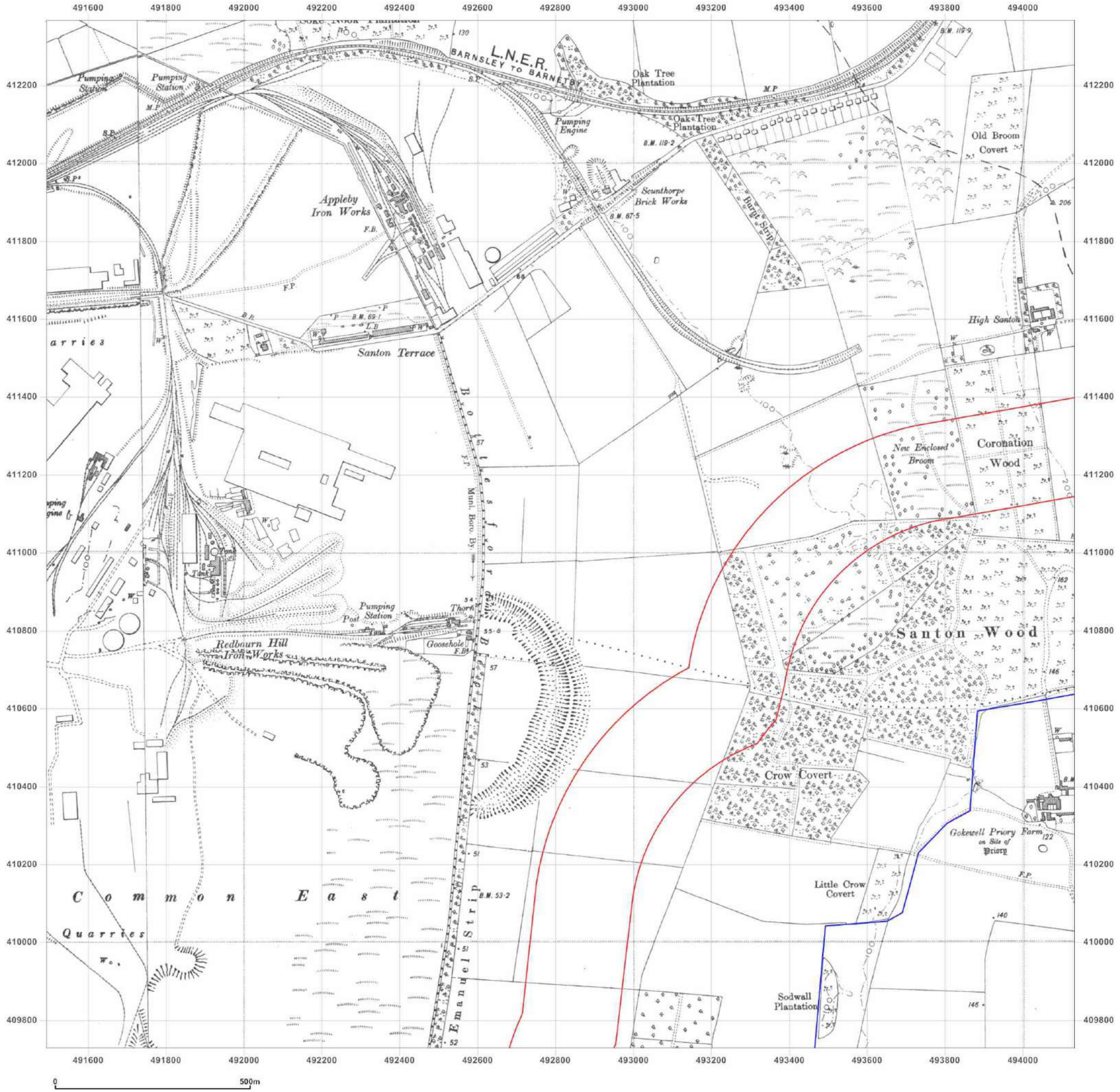
Production date: 01 August 2017

To view map legend click here Legend



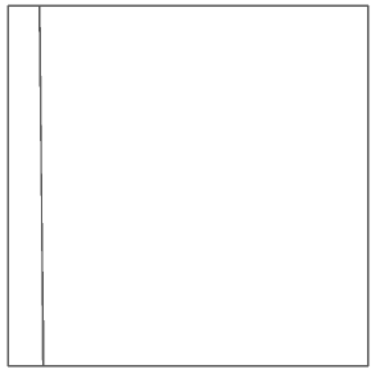
Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref:	492812, 411047

Map Name:	County Series
Map date:	**1948**
Scale:	1:10,560
Printed at:	1:10,560

Surveyed 1885
Revised 1948
Edition 1948
Copyright N/A
Levelled N/A



Surveyed 1885
Revised 1948
Edition N/A
Copyright N/A
Levelled N/A

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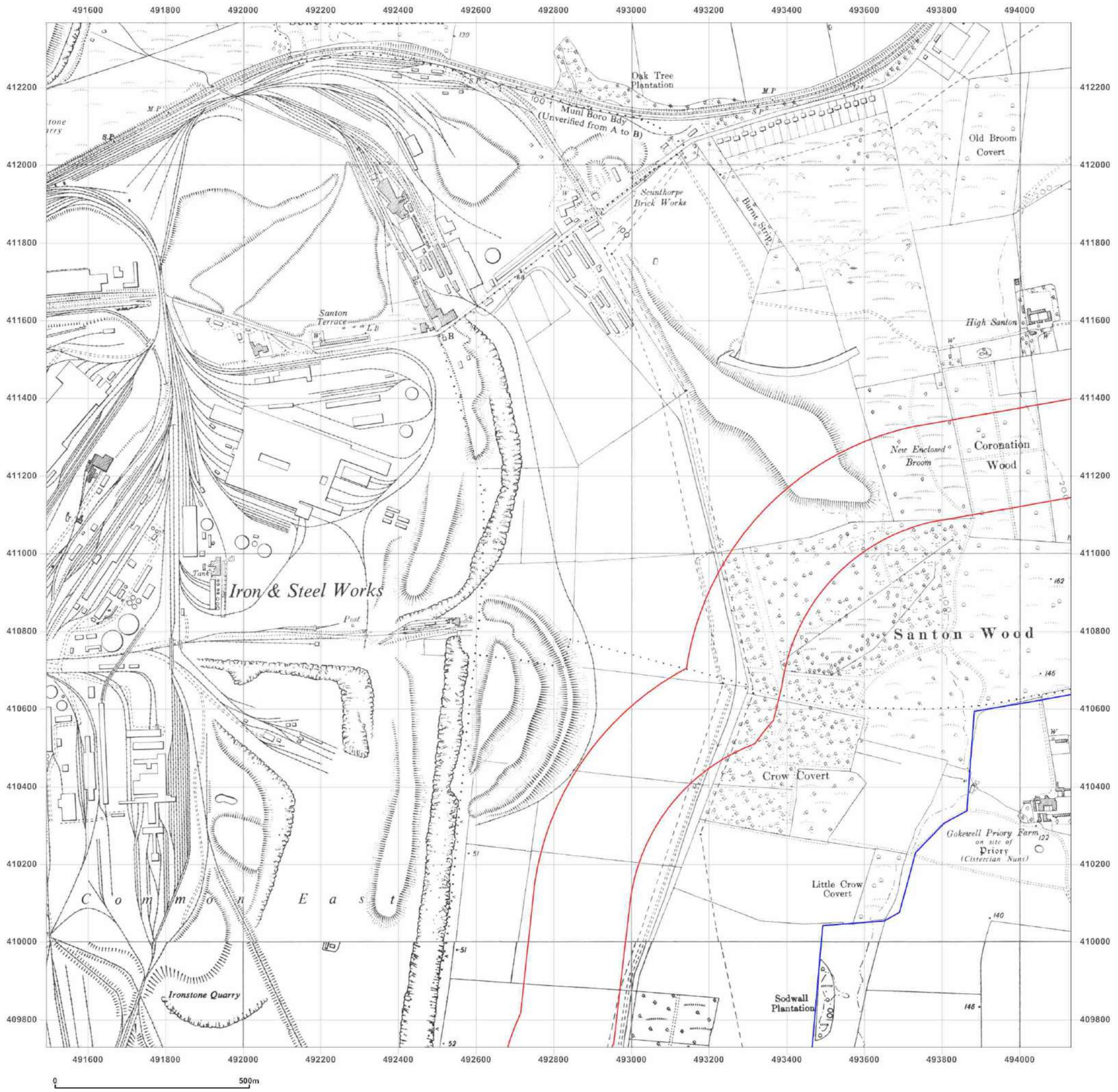


Site Details:

Santon, Scunthorpe, DN16 1XP

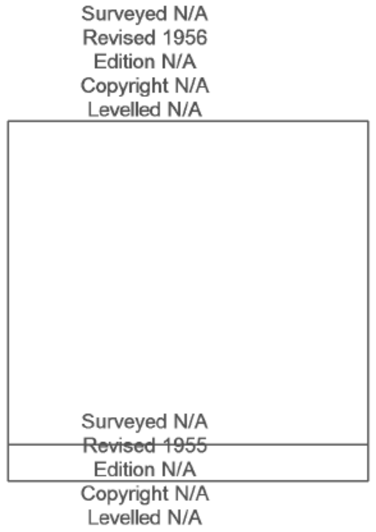
Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref: 492812, 411047

Map Name: Provisional

Map date: **1955-1956**

Scale: 1:10,560

Printed at: 1:10,560



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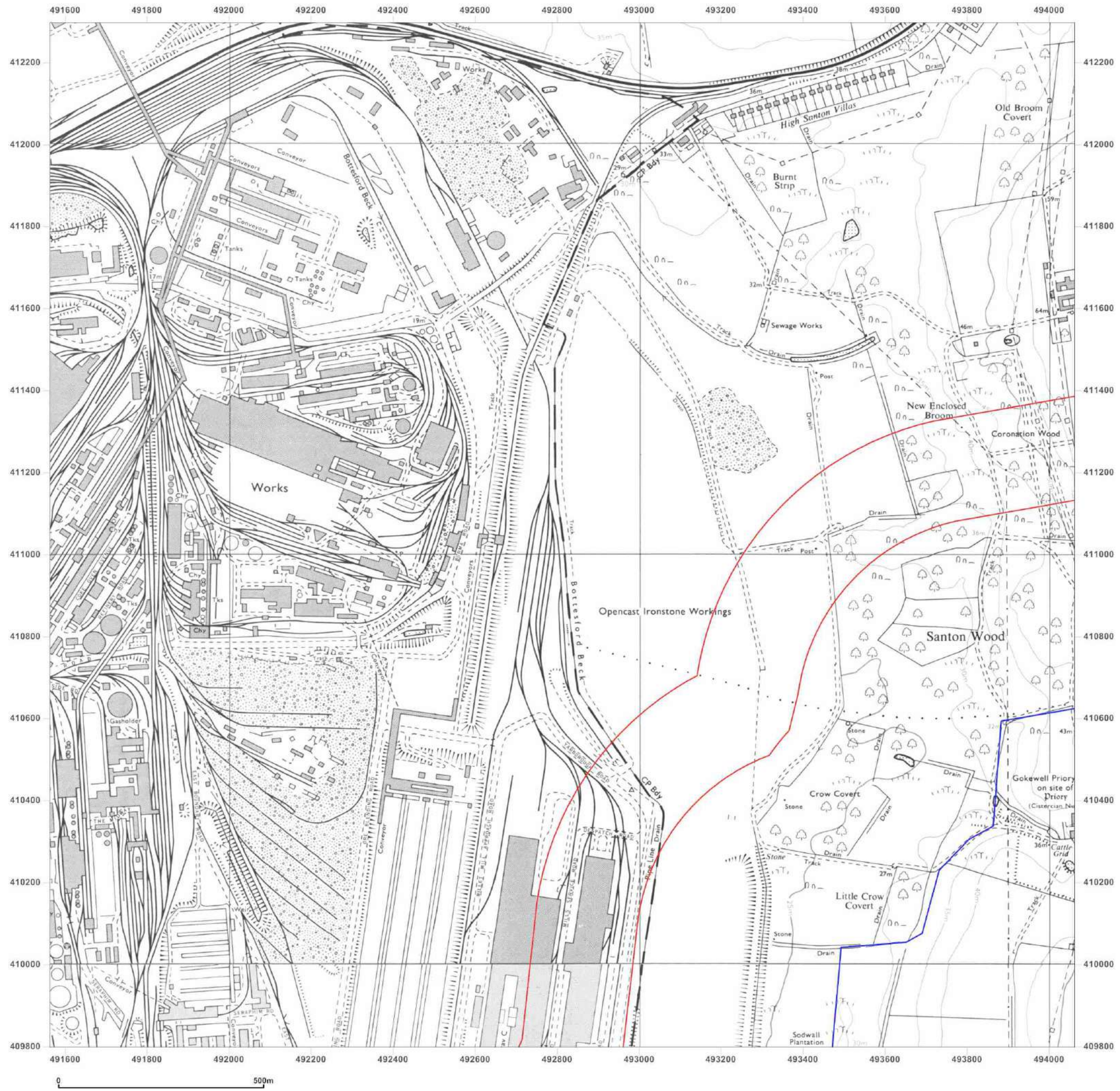

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref: 492812, 411047

Map Name: National Grid

Map date: **1977-1979**

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1974
Revised 1977
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1978
Revised 1979
Edition N/A
Copyright N/A
Levelled N/A

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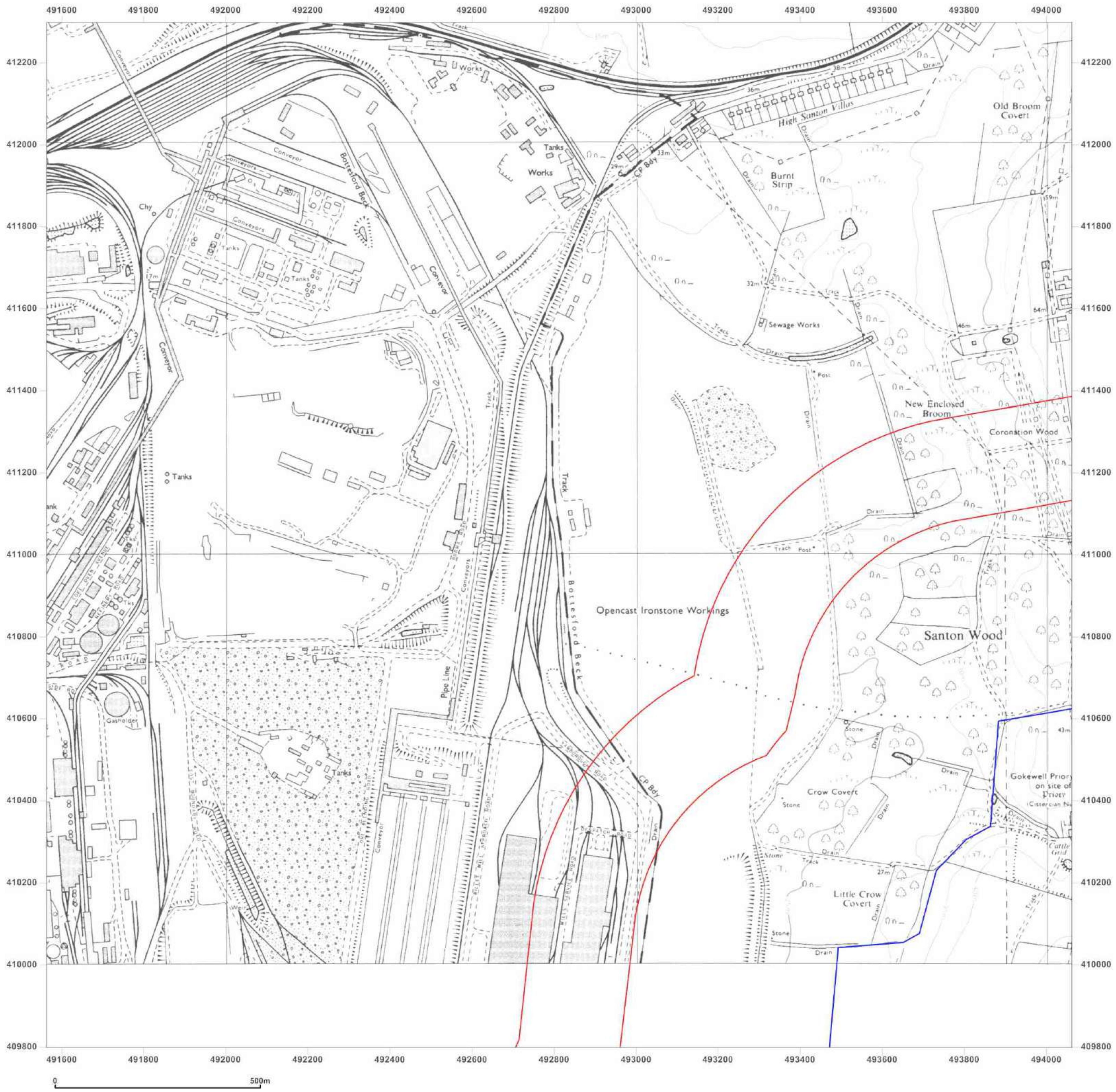

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Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref:	492812, 411047

Map Name:	National Grid
Map date:	**1994**
Scale:	1:10,000
Printed at:	1:10,000

N
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Surveyed 1974
Revised 1994
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 01 August 2017

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Site Details:

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Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref:	492812, 411047
Map Name:	1:10,000 Raster
Map date:	2002
Scale:	1:10,000
Printed at:	1:10,000

N
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2002

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Production date: 01 August 2017

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FOR A BETTER POINT OF VIEW

Site Details:

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Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref:	492812, 411047

Map Name:	National Grid
Map date:	**2010**
Scale:	1:10,000
Printed at:	1:10,000

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2010

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Production date: 01 August 2017

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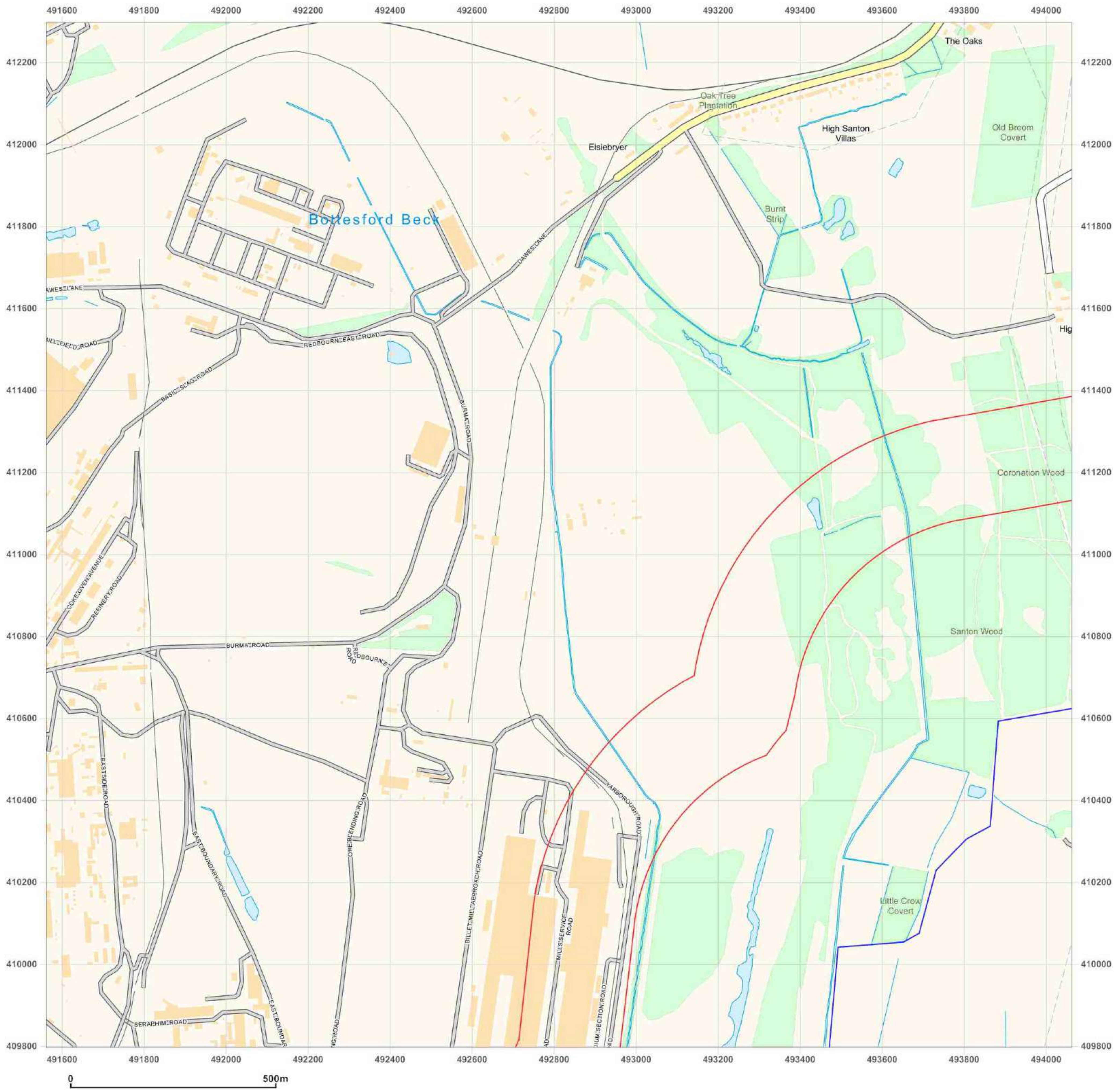

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_1_2
Grid Ref:	492812, 411047

Map Name:	National Grid
Map date:	**2014**
Scale:	1:10,000
Printed at:	1:10,000

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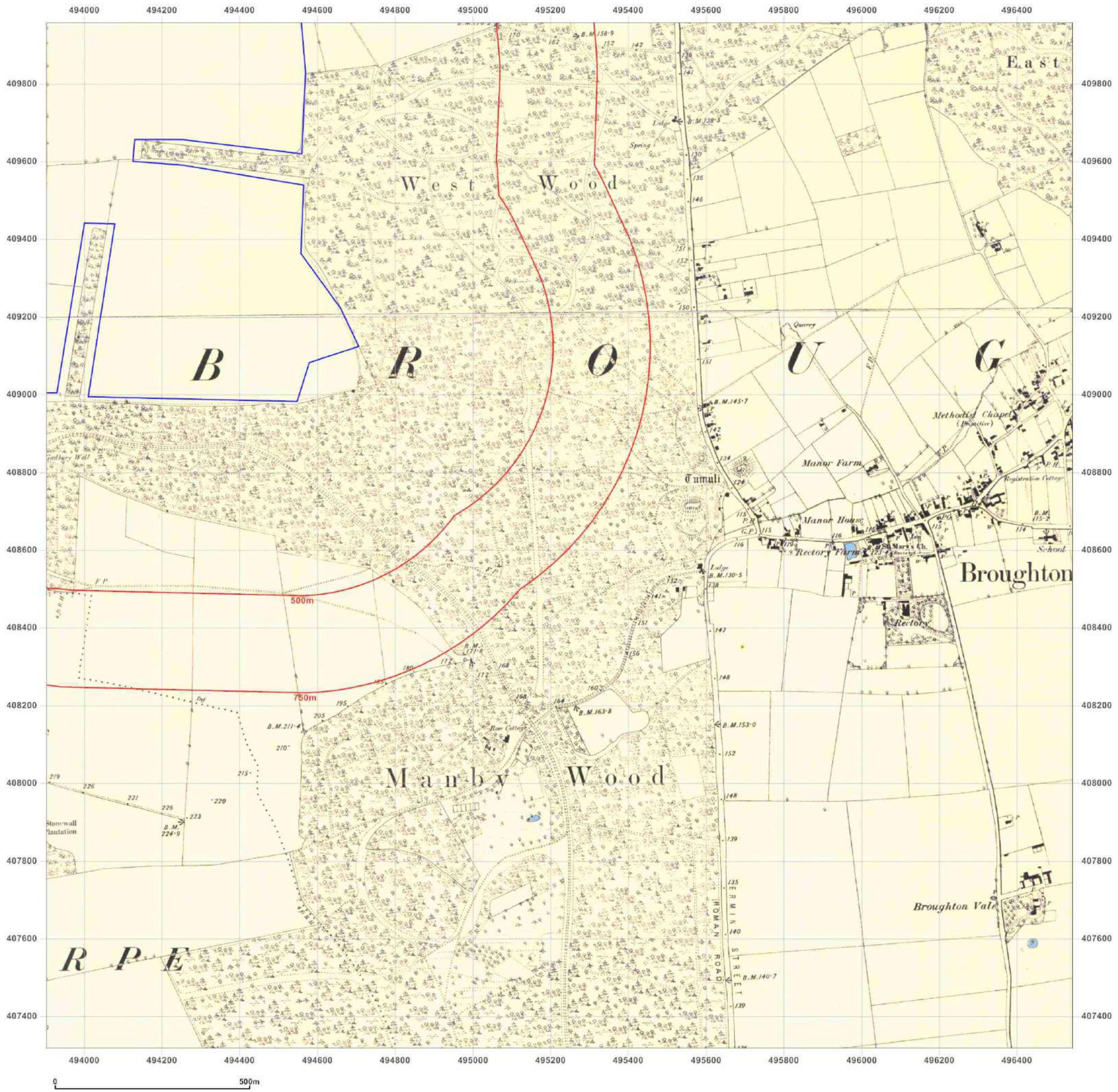
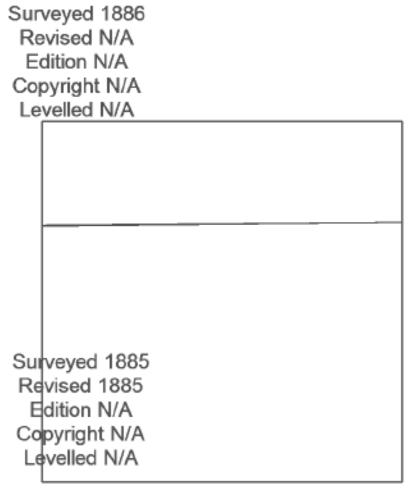


Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref:	495222, 408637

Map Name:	County Series
Map date:	**1885-1886**
Scale:	1:10,560
Printed at:	1:10,560



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Production date: 01 August 2017

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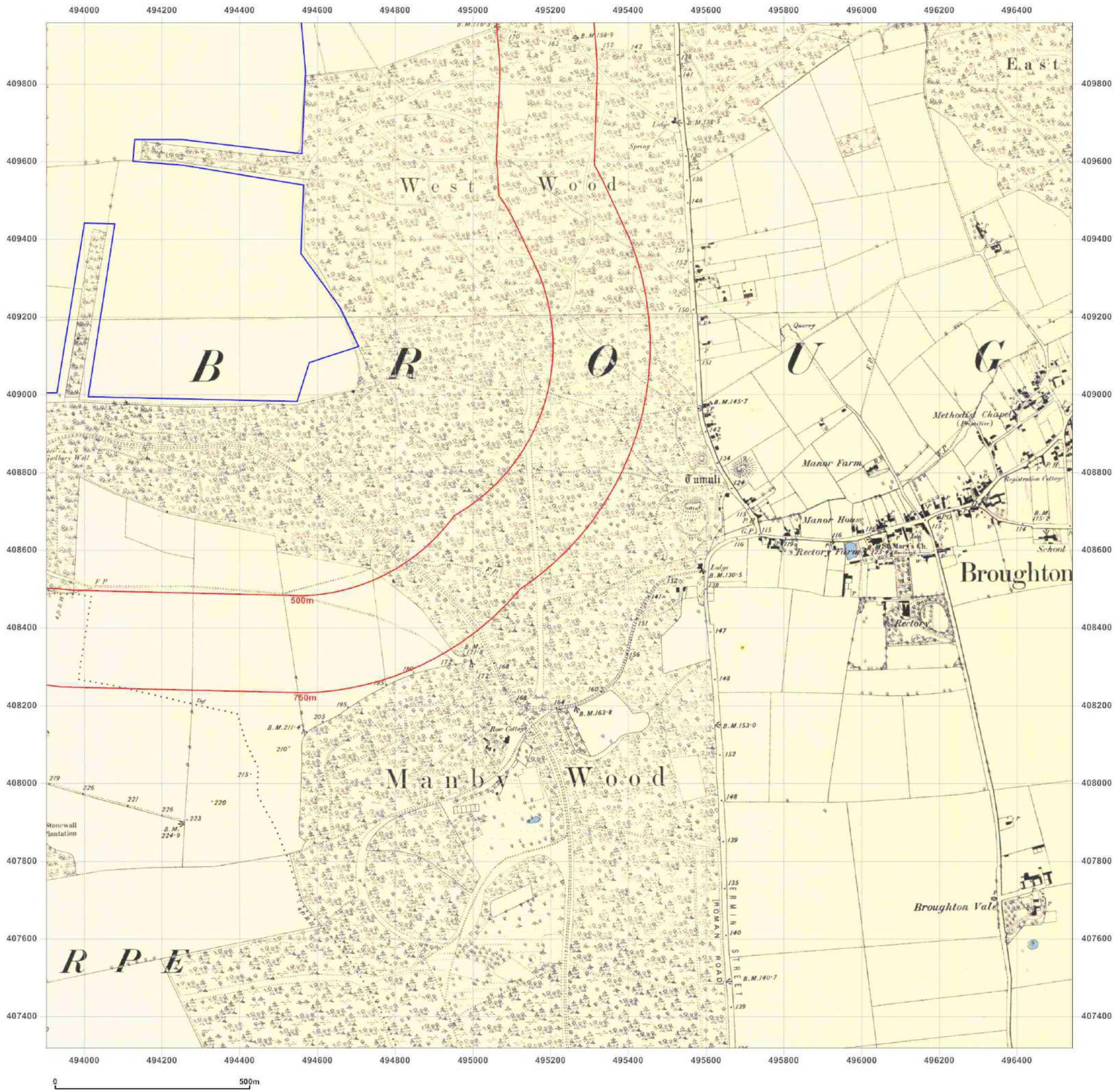
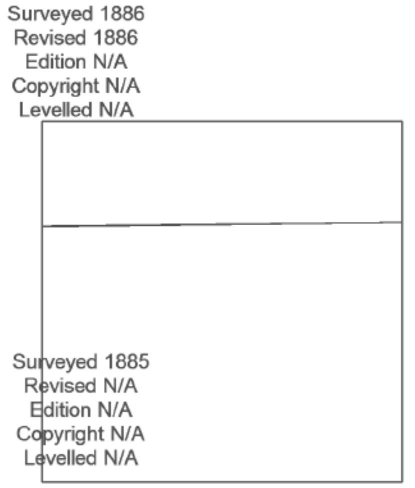


Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref:	495222, 408637
Map Name:	County Series
Map date:	**1886**
Scale:	1:10,560
Printed at:	1:10,560



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Production date: 01 August 2017

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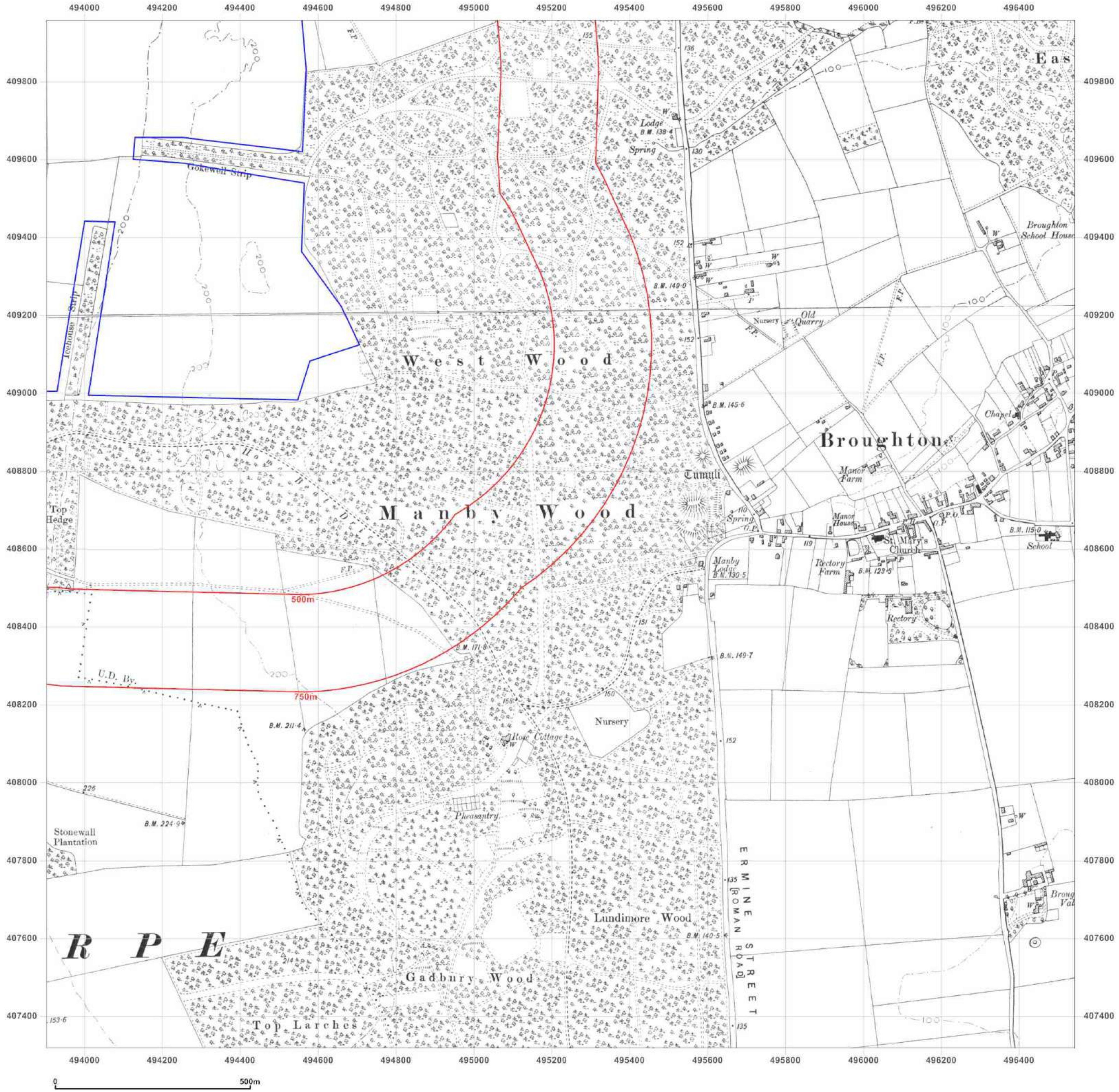


Site Details:

Santon, Scunthorpe, DN16 1XP

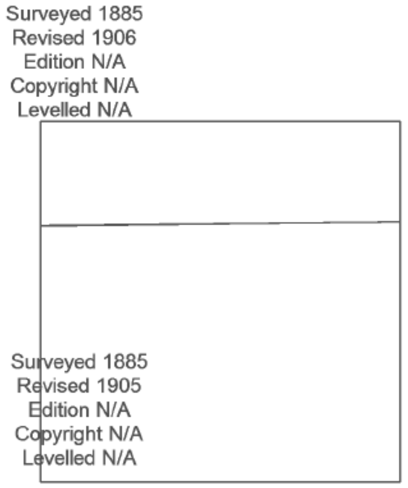
Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref: 495222, 408637

Map Name: County Series

Map date: **1905-1906**

Scale: 1:10,560

Printed at: 1:10,560



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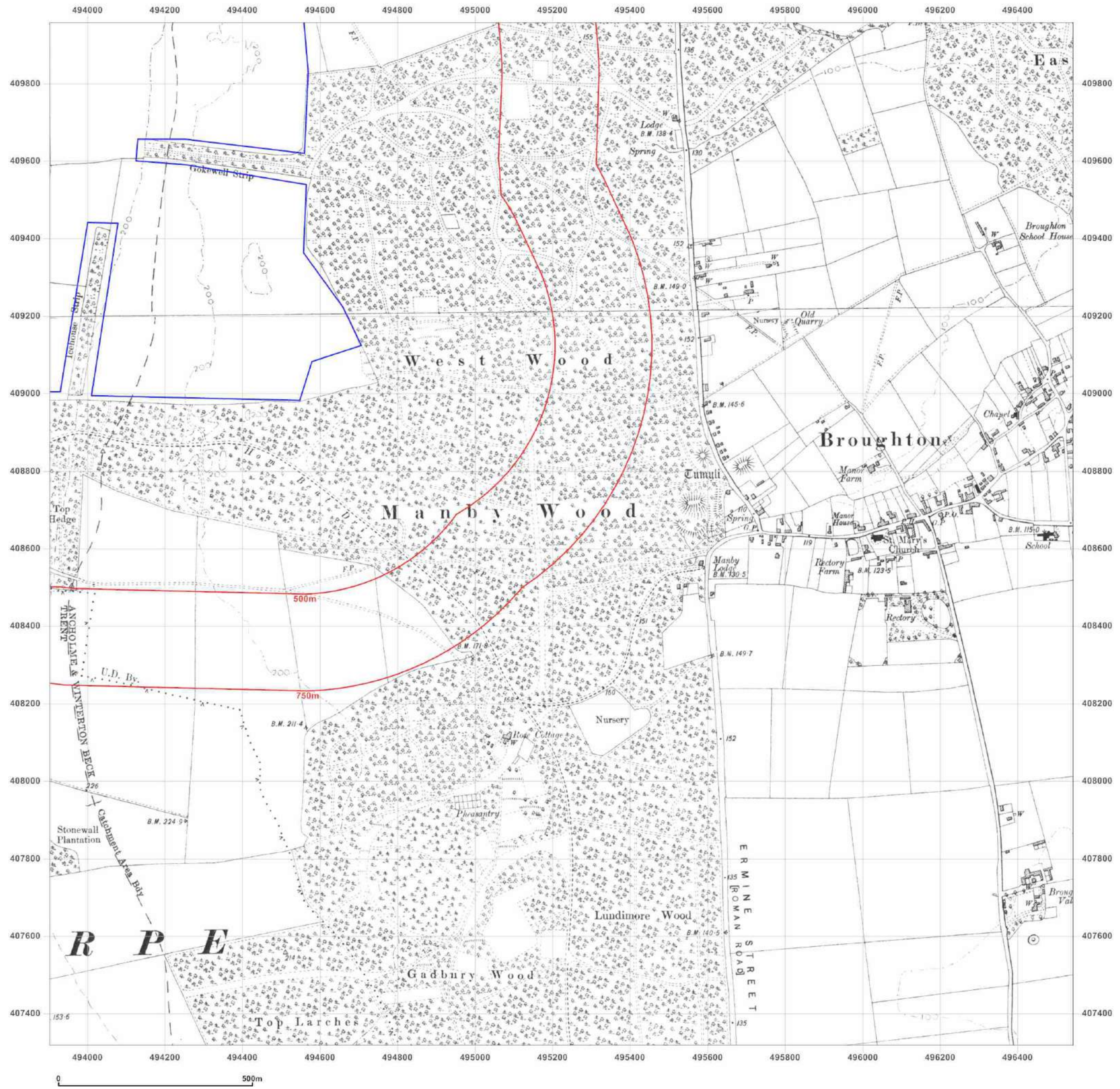
Production date: 01 August 2017

To view map legend click here *Legend*



Site Details:

Santon, Scunthorpe, DN16 1XP

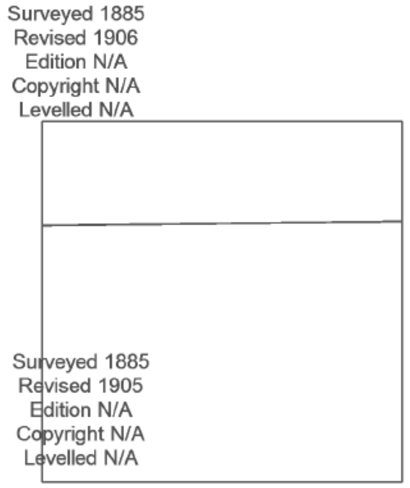
Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref: 495222, 408637

Map Name: County Series

Map date: **1905-1906**

Scale: 1:10,560

Printed at: 1:10,560



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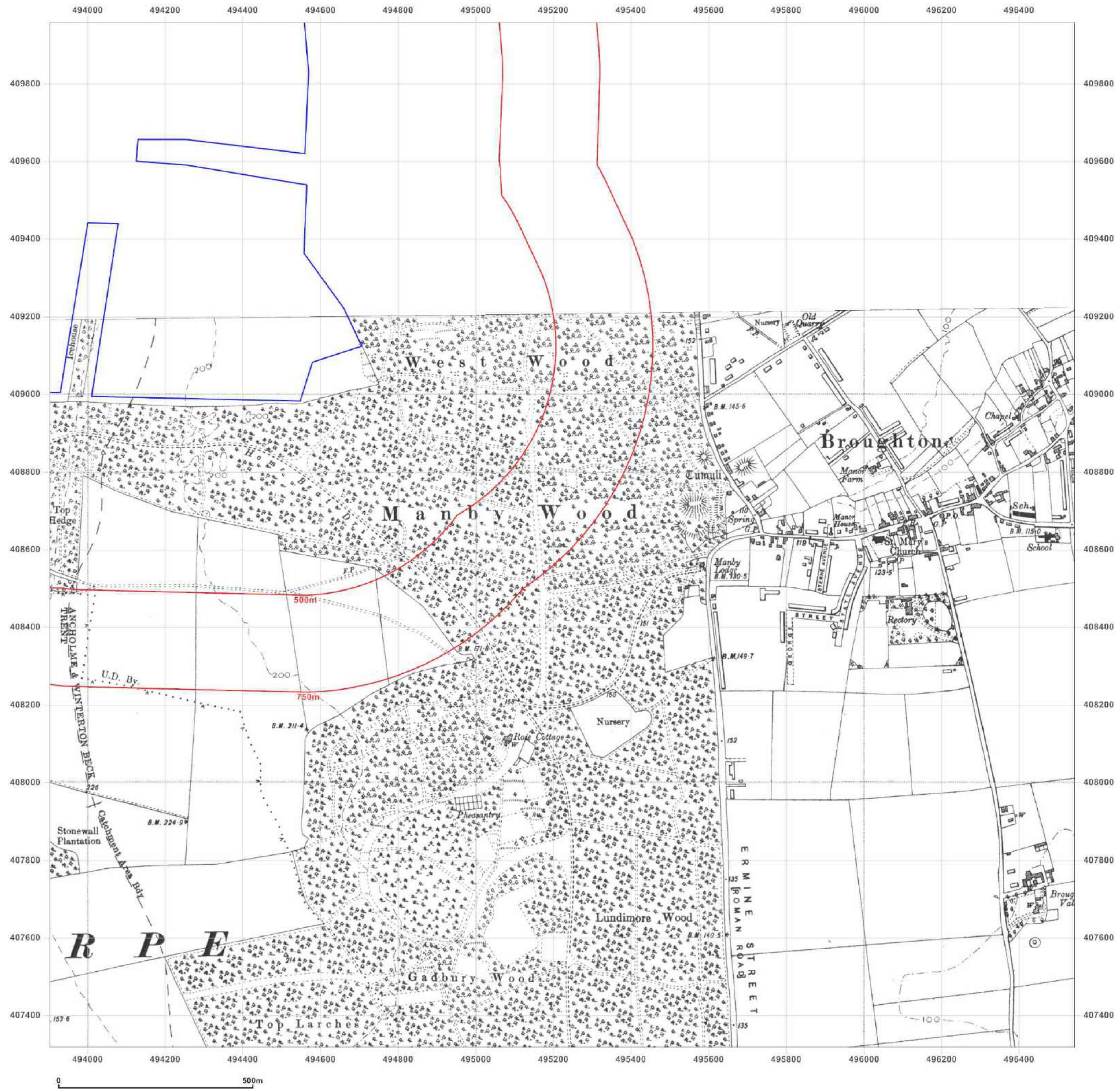
Production date: 01 August 2017

To view map legend click here *Legend*



Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref:	495222, 408637

Map Name:	County Series
Map date:	**1938**
Scale:	1:10,560
Printed at:	1:10,560

N
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Surveyed 1885
Revised 1938
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 01 August 2017

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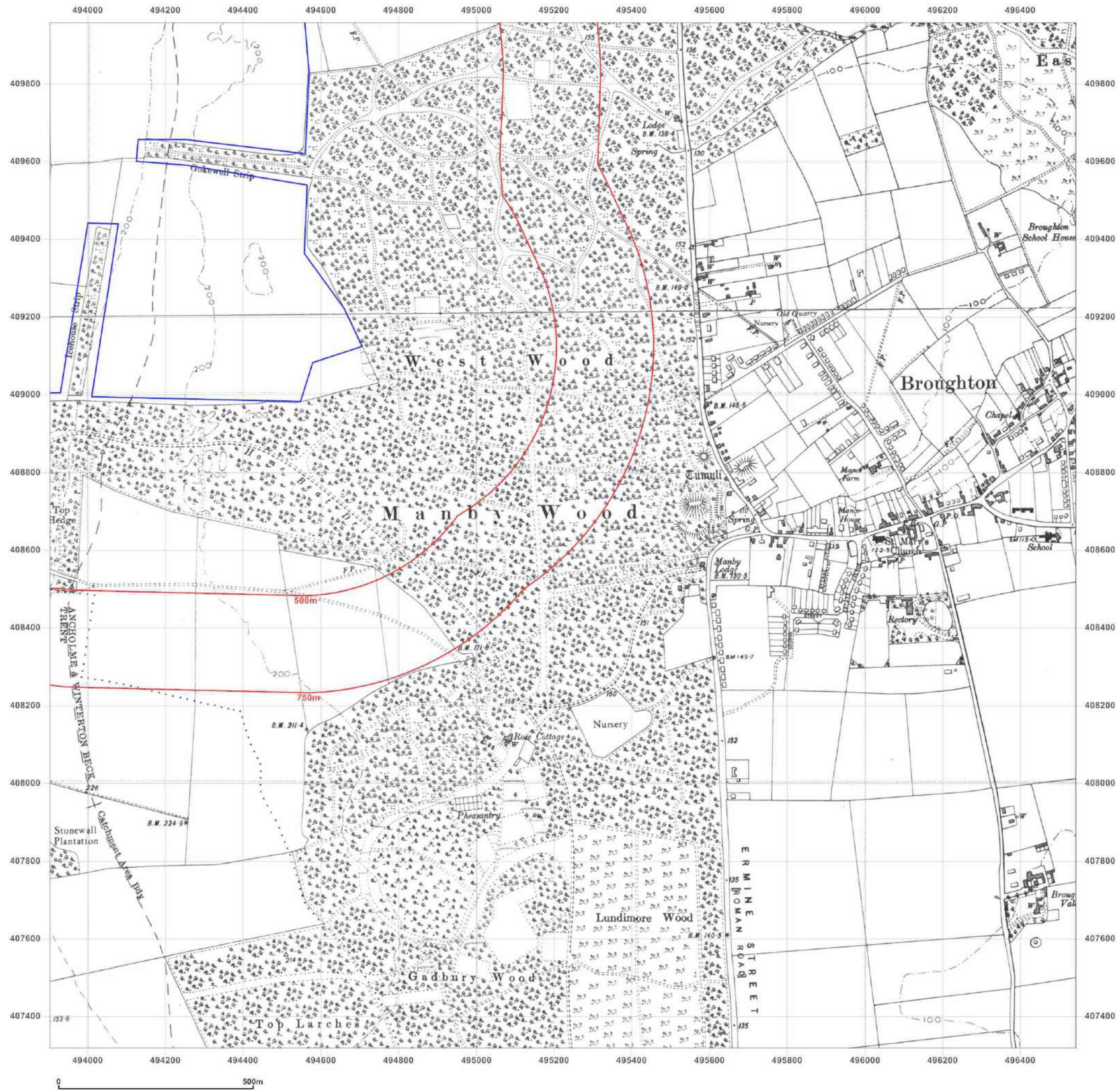

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref:	495222, 408637

Map Name:	County Series
Map date:	**1948**
Scale:	1:10,560
Printed at:	1:10,560

N
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Surveyed 1885
Revised 1948
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1885
Revised 1948
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 01 August 2017

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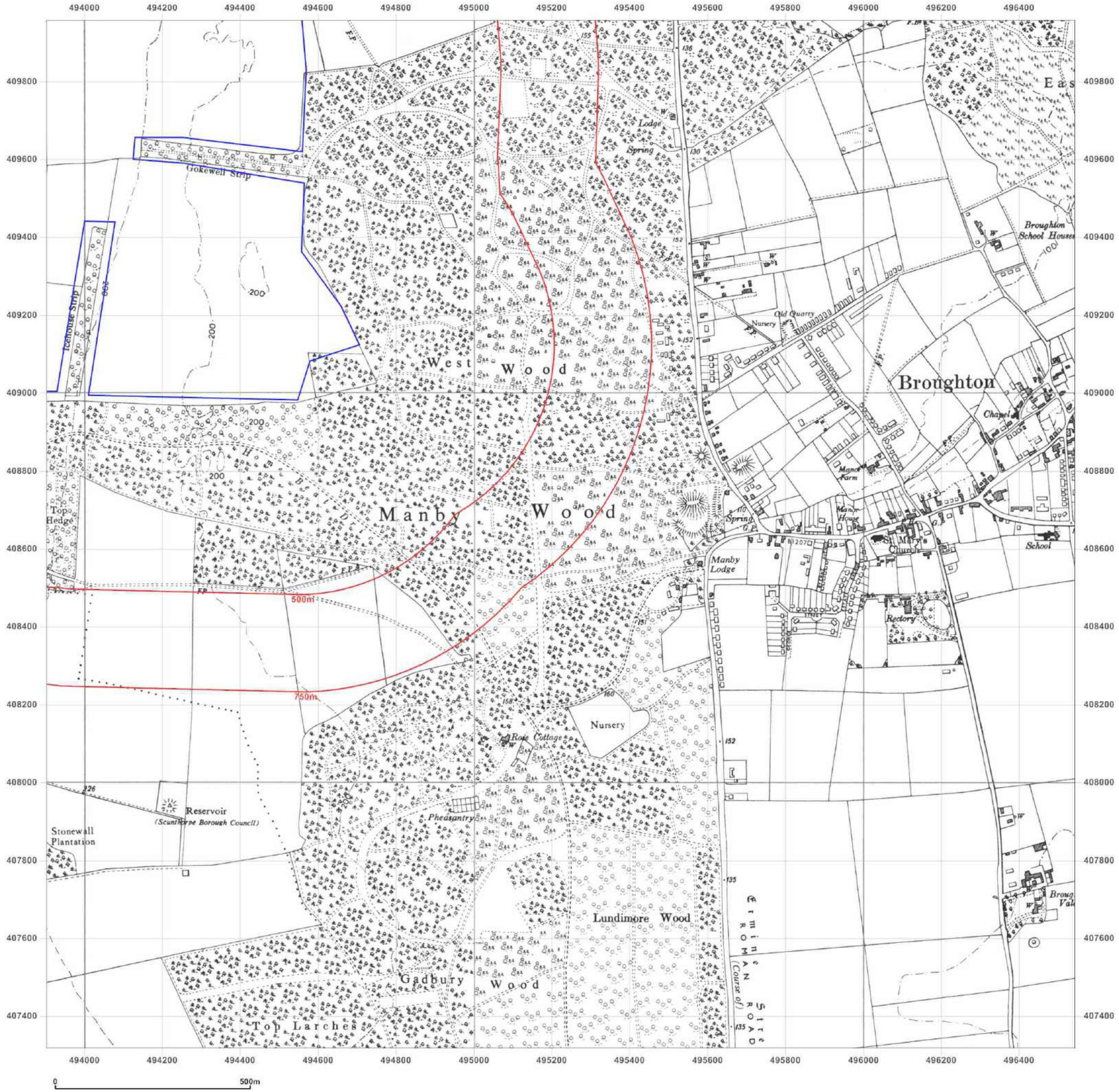

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Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref: 495222, 408637

Map Name: Provisional

Map date: **1951-1955**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed N/A
Revised 1955
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1951
Revised 1951
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 01 August 2017

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Site Details:

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Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref:	495222, 408637
Map Name:	Provisional
Map date:	**1968**
Scale:	1:10,560
Printed at:	1:10,560

N
W E
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Surveyed 1968
Revised 1968
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 01 August 2017

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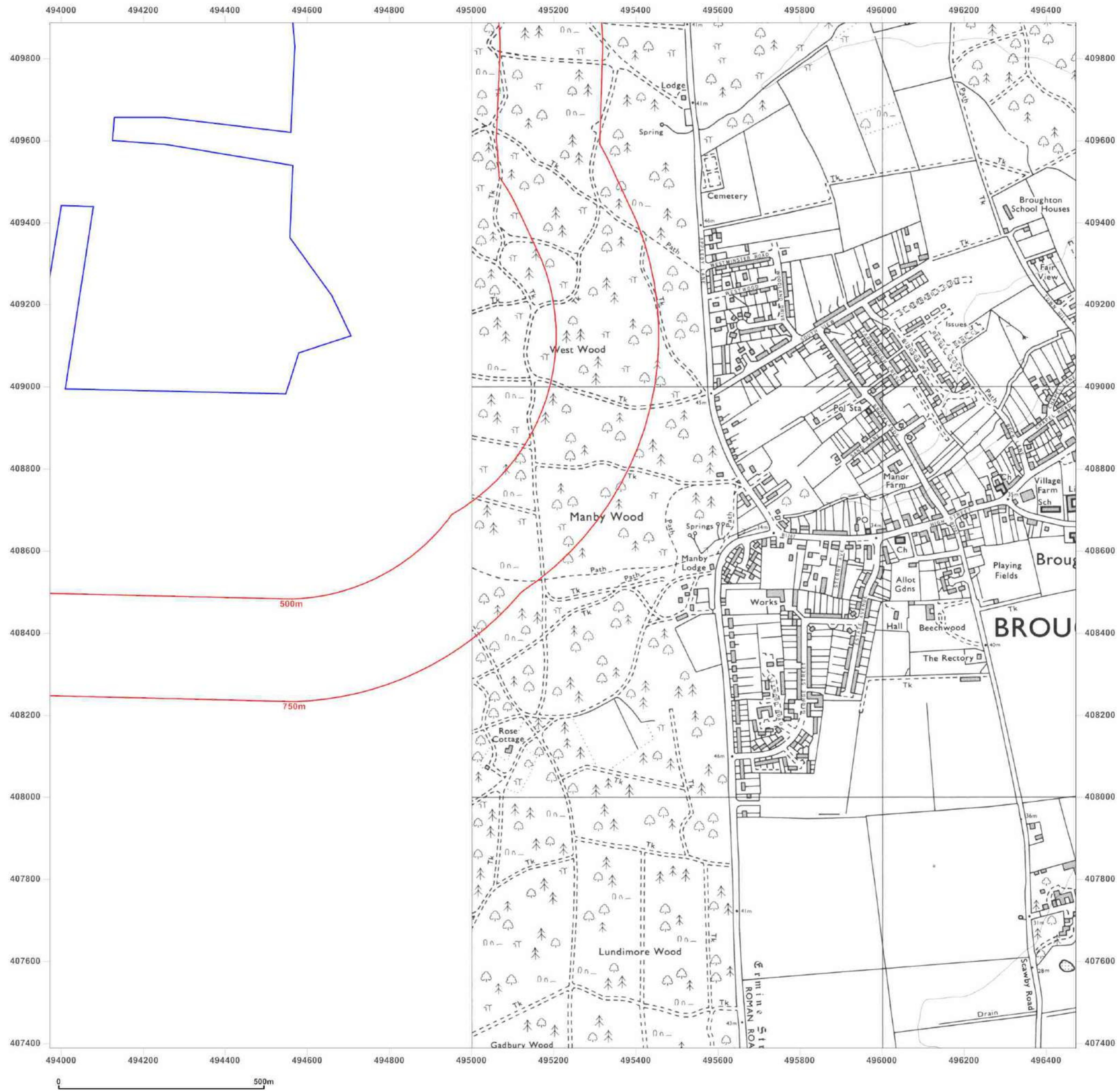

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref:	495222, 408637
Map Name:	National Grid
Map date:	**1971**
Scale:	1:10,000
Printed at:	1:10,000

Surveyed 1971
Revised 1971
Edition N/A
Copyright N/A
Levelled N/A

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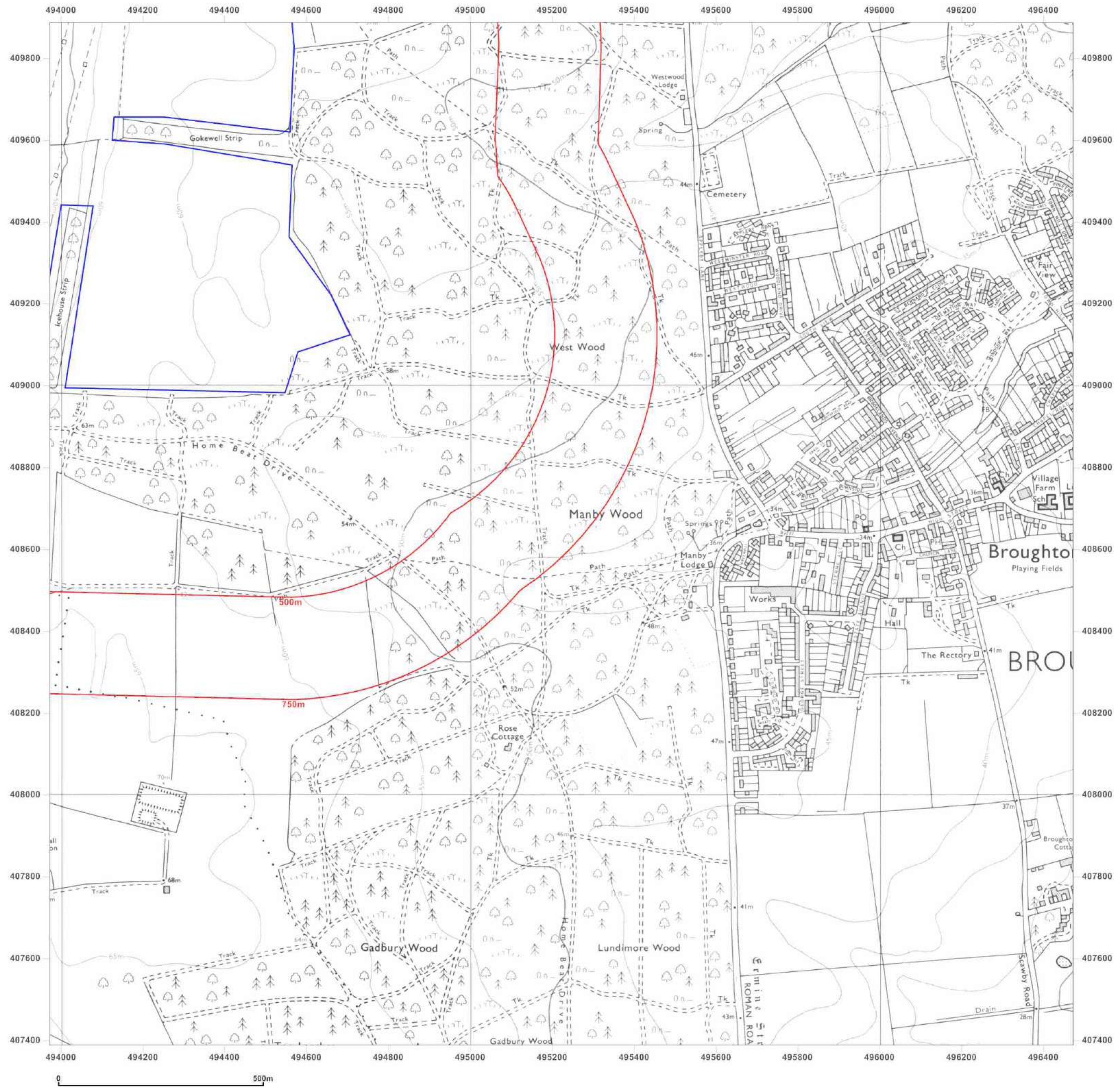

FOR A BETTER POINT OF VIEW

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref:	495222, 408637

Map Name:	National Grid
Map date:	**1979-1982**
Scale:	1:10,000
Printed at:	1:10,000

N
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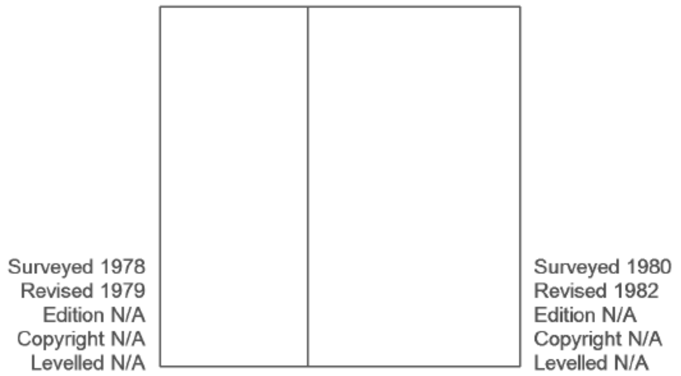

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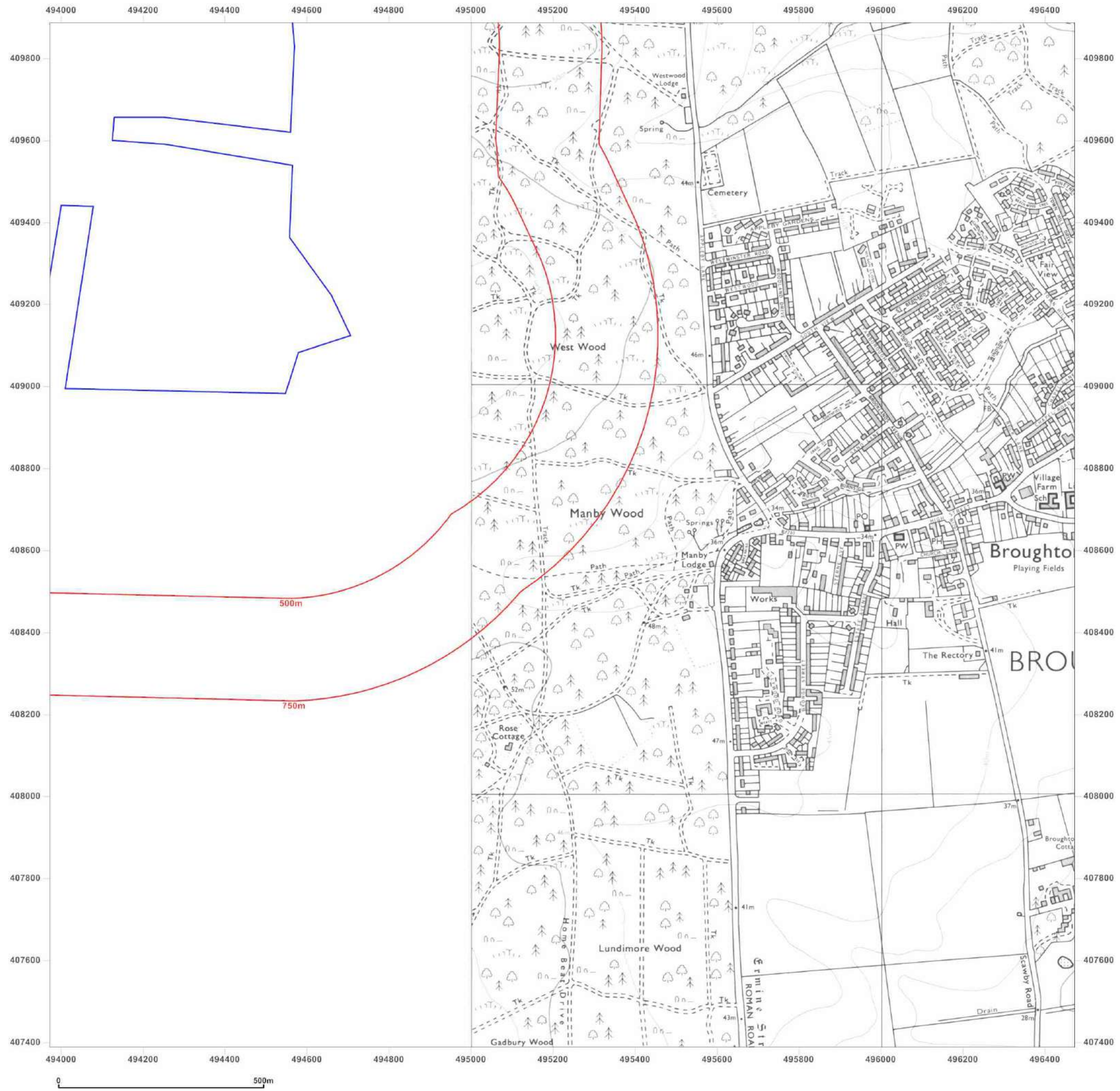
Production date: 01 August 2017

To view map legend click here *Legend*



Site Details:

Santon, Scunthorpe, DN16 1XP

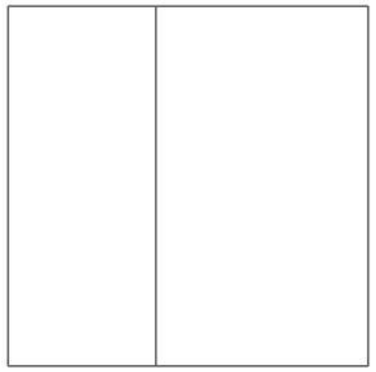
Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref: 495222, 408637

Map Name: National Grid

Map date: **1994**

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1980
Revised 1994
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 01 August 2017

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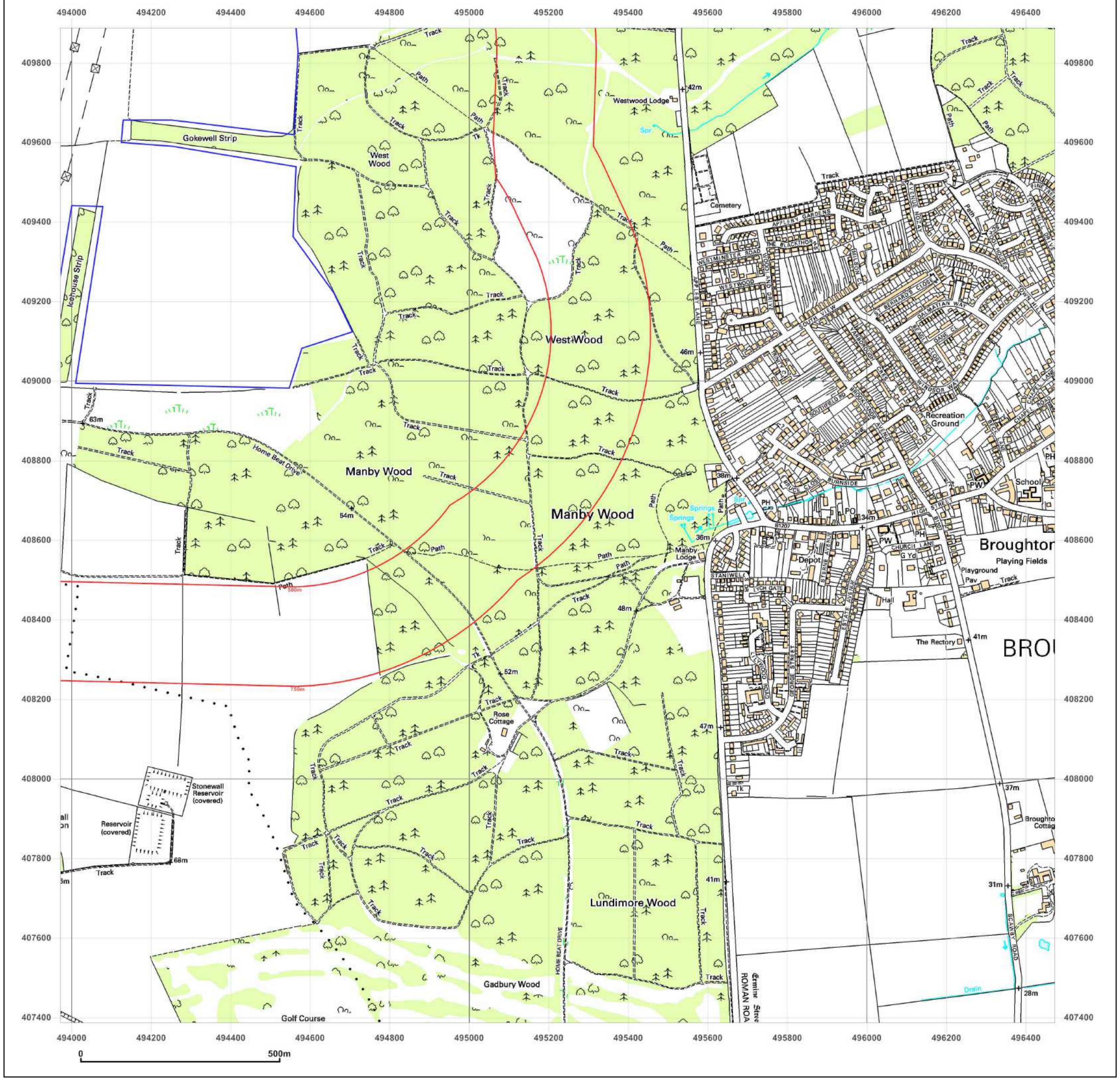

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref: 495222, 408637

Map Name: 1:10,000 Raster

Map date: **2002**

Scale: 1:10,000

Printed at: 1:10,000

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Production date: 01 August 2017

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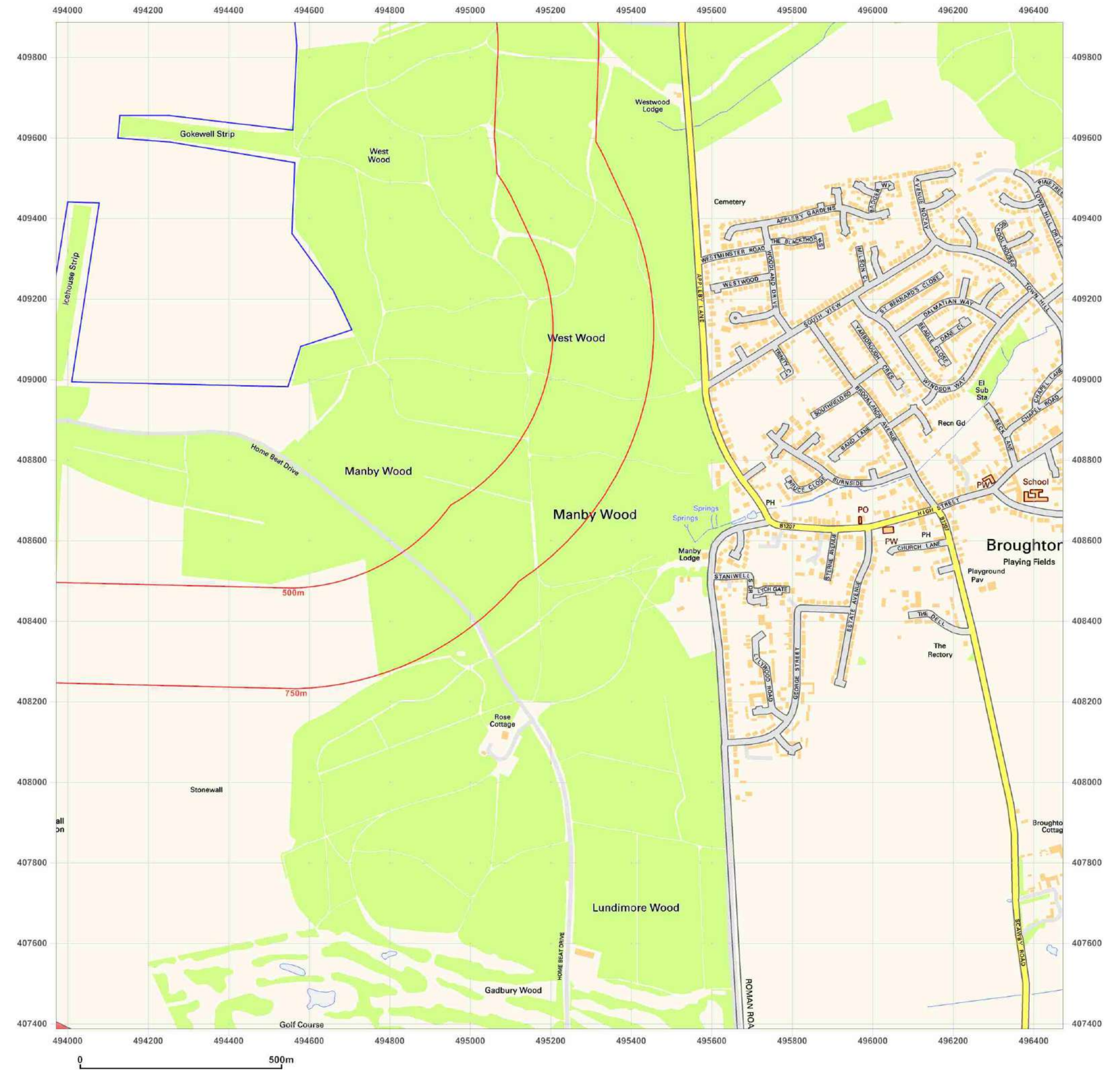

![CENTRE MAPS LIVE. FOR A BETTER POINT OF VIEW]

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref: 495222, 408637

Map Name: National Grid

Map date: **2010**

Scale: 1:10,000

Printed at: 1:10,000

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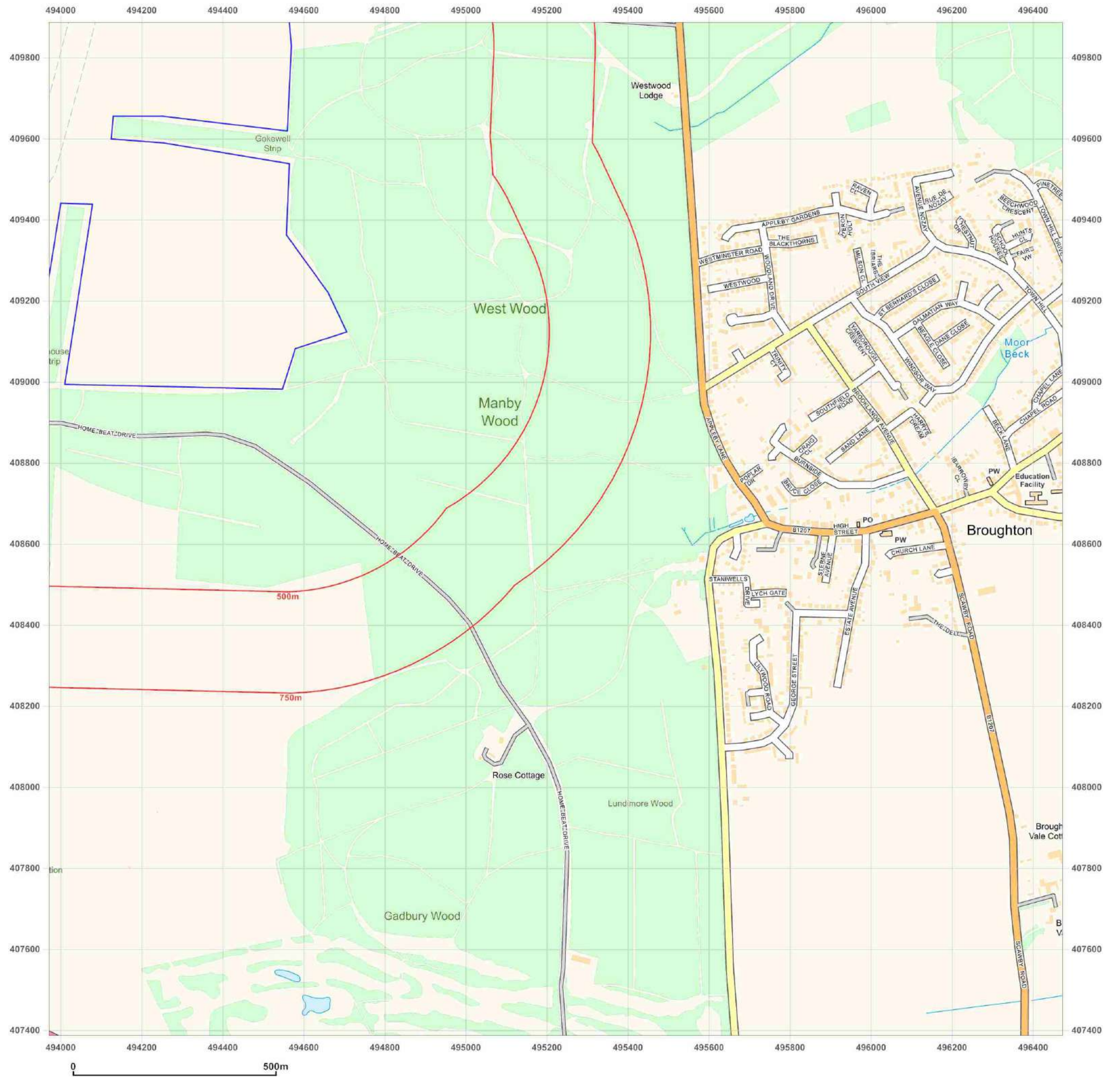

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Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_1
Grid Ref: 495222, 408637

Map Name: National Grid

Map date: **2014**

Scale: 1:10,000

Printed at: 1:10,000

2014

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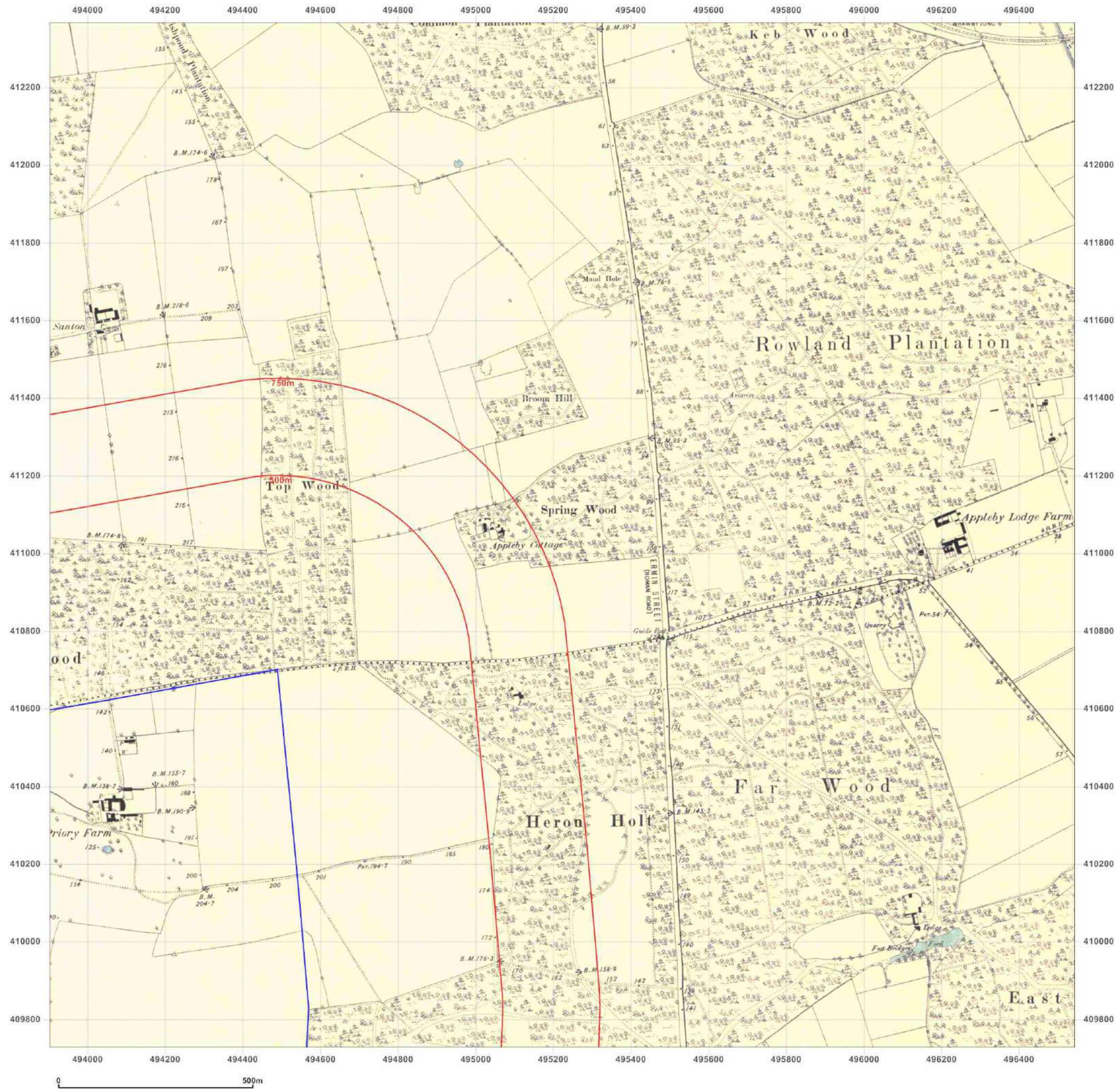

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_2
Grid Ref: 495222, 411047

Map Name: County Series

Map date: **1886**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1886
Revised N/A
Edition N/A
Copyright N/A
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Production date: 01 August 2017

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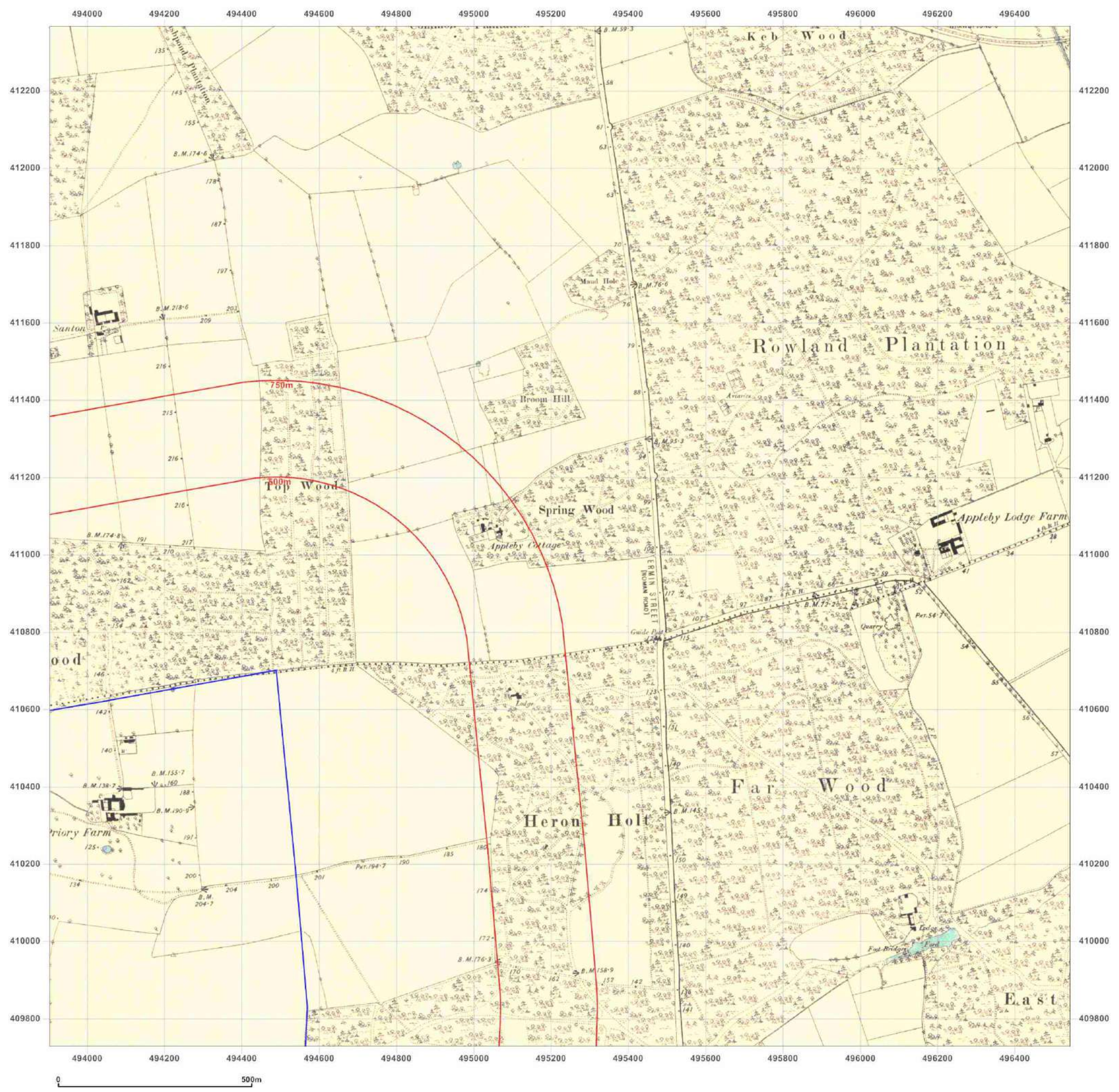

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_2
Grid Ref:	495222, 411047

Map Name:	County Series
Map date:	**1886**
Scale:	1:10,560
Printed at:	1:10,560

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Surveyed 1886
Revised 1886
Edition N/A
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Production date: 01 August 2017

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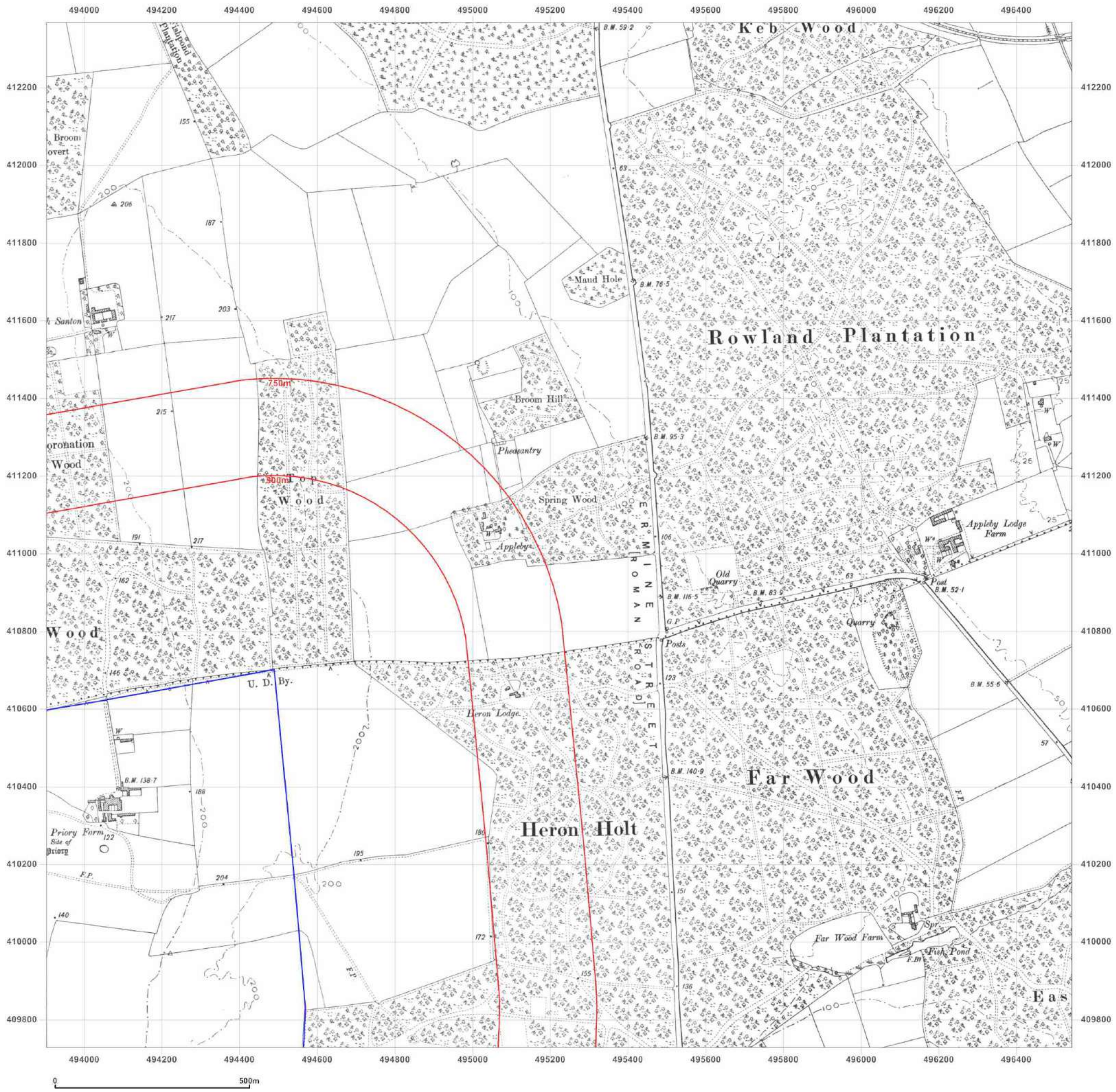

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_2
Grid Ref:	495222, 411047

Map Name:	County Series
Map date:	**1906**
Scale:	1:10,560
Printed at:	1:10,560

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Surveyed 1885
Revised 1906
Edition N/A
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Production date: 01 August 2017

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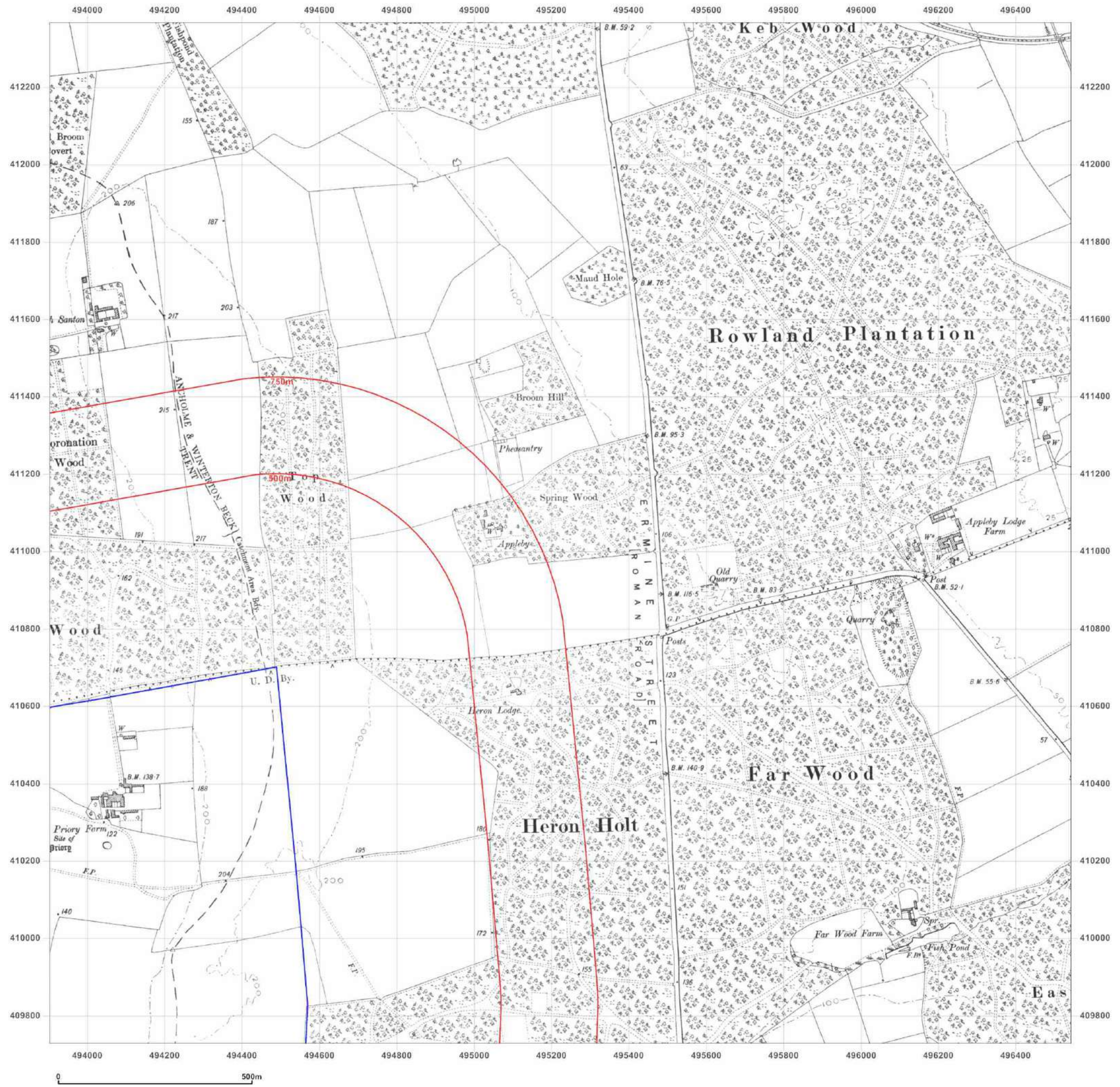

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Santon, Scunthorpe, DN16 1XP

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Grid Ref:	495222, 411047
Map Name:	County Series
Map date:	**1906**
Scale:	1:10,560
Printed at:	1:10,560

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Surveyed 1885
Revised 1906
Edition N/A
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Production date: 01 August 2017

To view map legend click here *Legend*

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_2
Grid Ref: 495222, 411047

Map Name: County Series

Map date: **1948**

Scale: 1:10,560

Printed at: 1:10,560

Surveyed 1885
Revised 1948
Edition N/A
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Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref: 13238
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_2
Grid Ref: 495222, 411047

Map Name: Provisional

Map date: **1951-1956**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed N/A
Revised 1956
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1951
Revised 1951
Edition N/A
Copyright N/A
Levelled N/A

Surveyed N/A
Revised 1955
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1951
Revised 1951
Edition N/A
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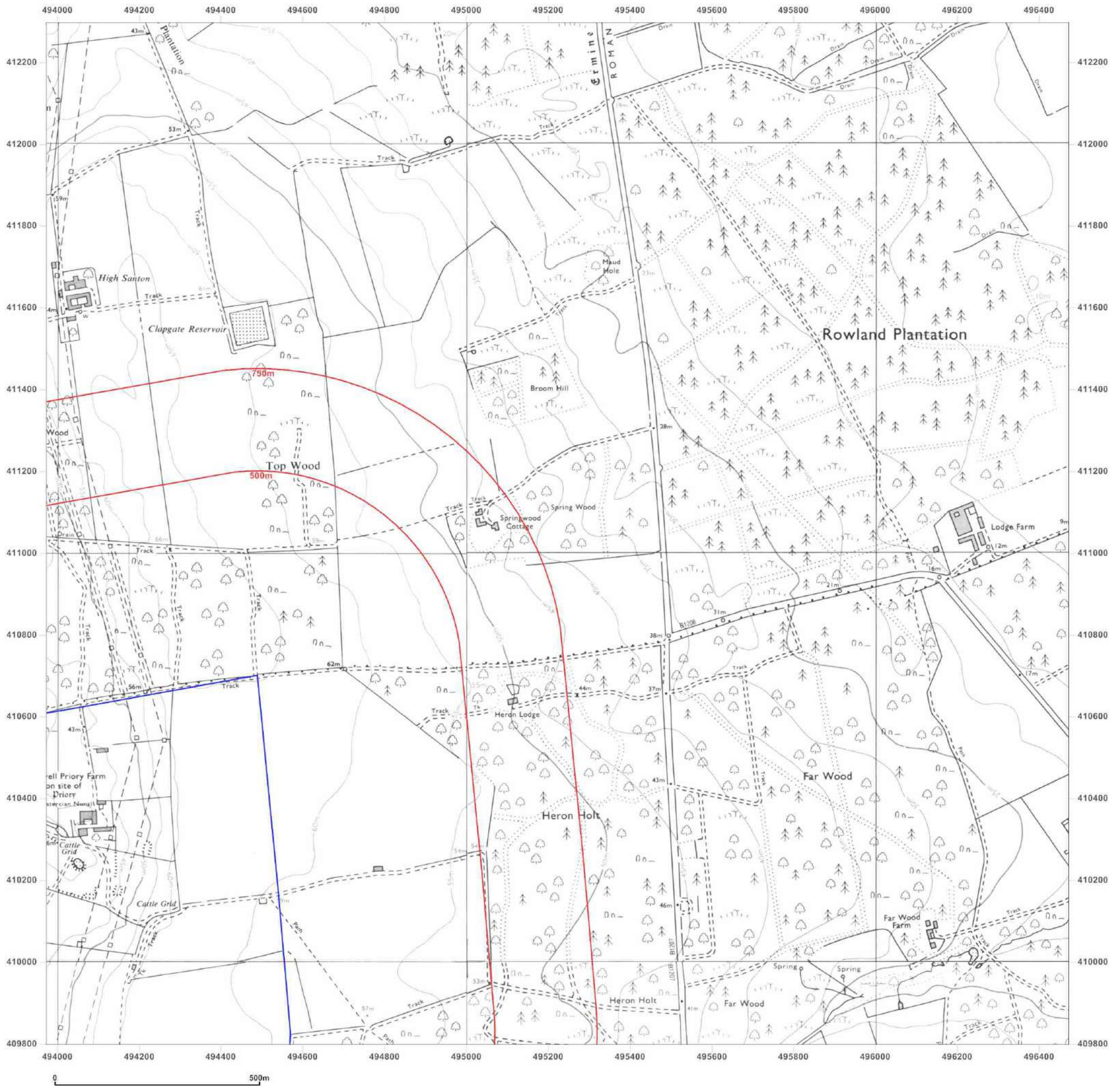

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Santon, Scunthorpe, DN16 1XP

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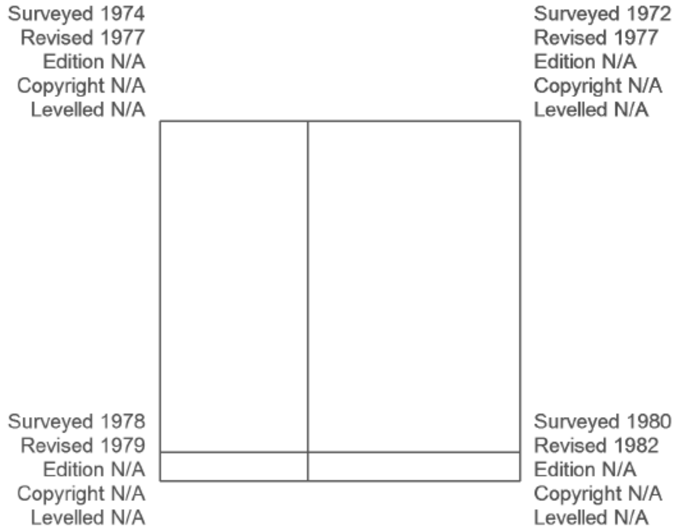
Report Ref: CMAPS-CM-643992-13238-310717HIS_SS_2_2
Grid Ref: 495222, 411047

Map Name: National Grid

Map date: **1977-1982**

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1974
Revised 1977
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1972
Revised 1977
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1978
Revised 1979
Edition N/A
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Surveyed 1980
Revised 1982
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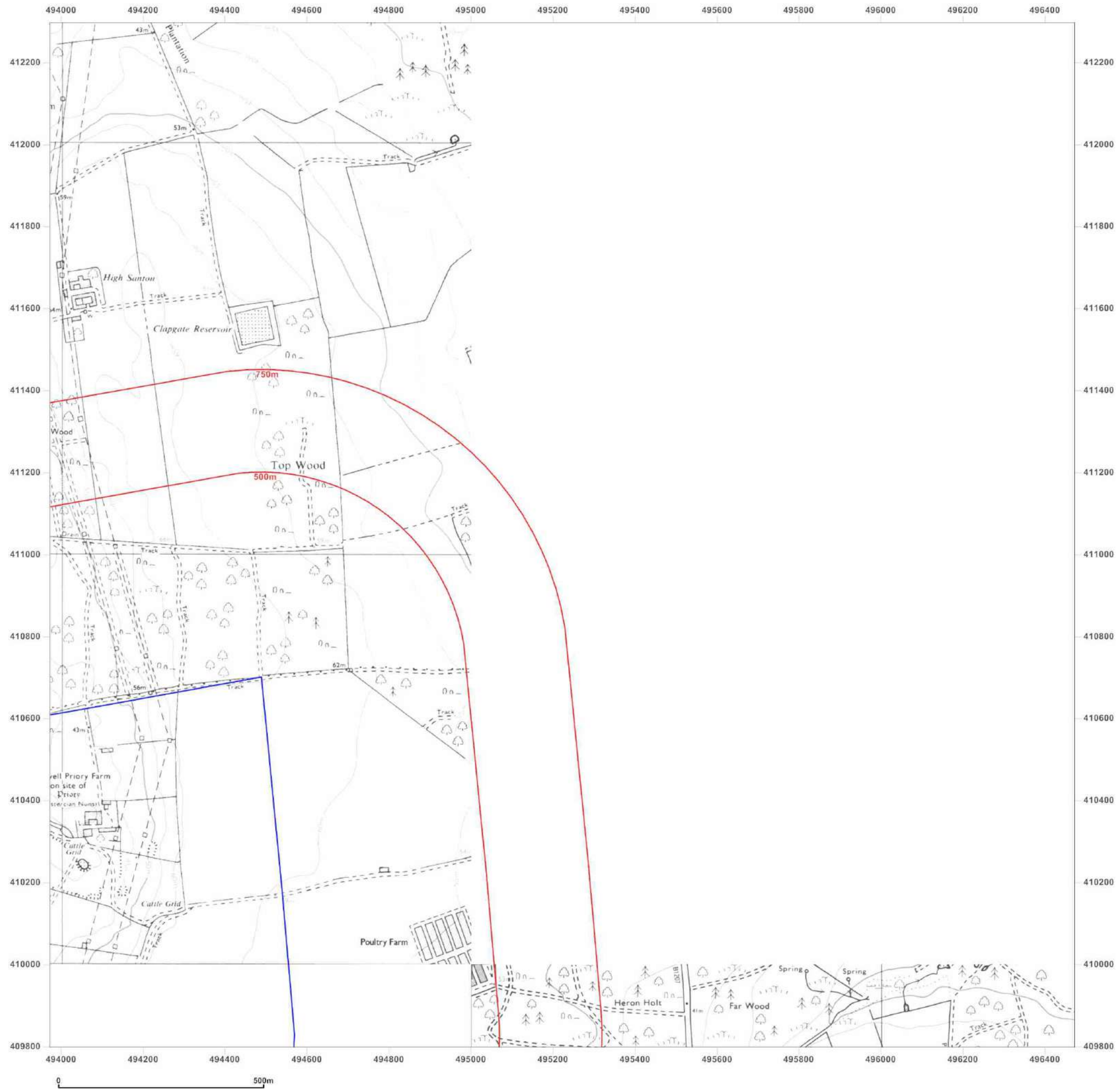

CENTRE MAPS LIVE.
FOR A BETTER POINT OF VIEW

Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_2
Grid Ref:	495222, 411047

Map Name:	National Grid
Map date:	**1994**
Scale:	1:10,000
Printed at:	1:10,000

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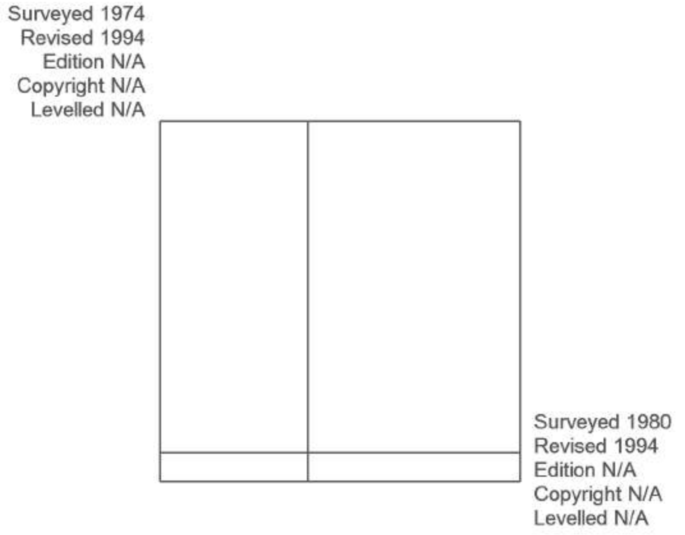

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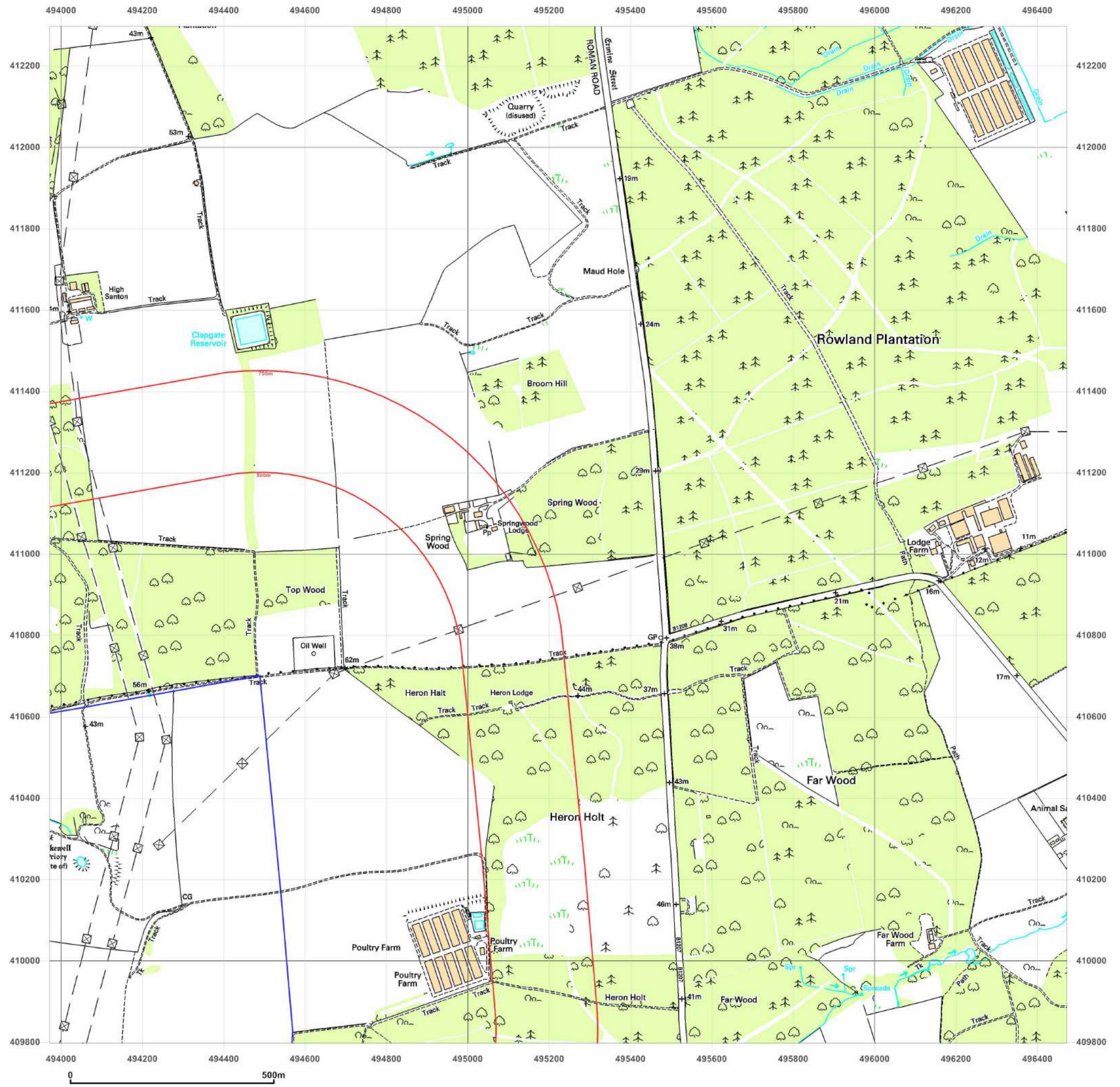
Production date: 01 August 2017

To view map legend click here Legend



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Santon, Scunthorpe, DN16 1XP

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Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_2
Grid Ref:	495222, 411047

Map Name:	1:10,000 Raster
Map date:	**2002**
Scale:	1:10,000
Printed at:	1:10,000

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Production date: 01 August 2017

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Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_2
Grid Ref:	495222, 411047

Map Name:	National Grid
Map date:	**2010**
Scale:	1:10,000
Printed at:	1:10,000

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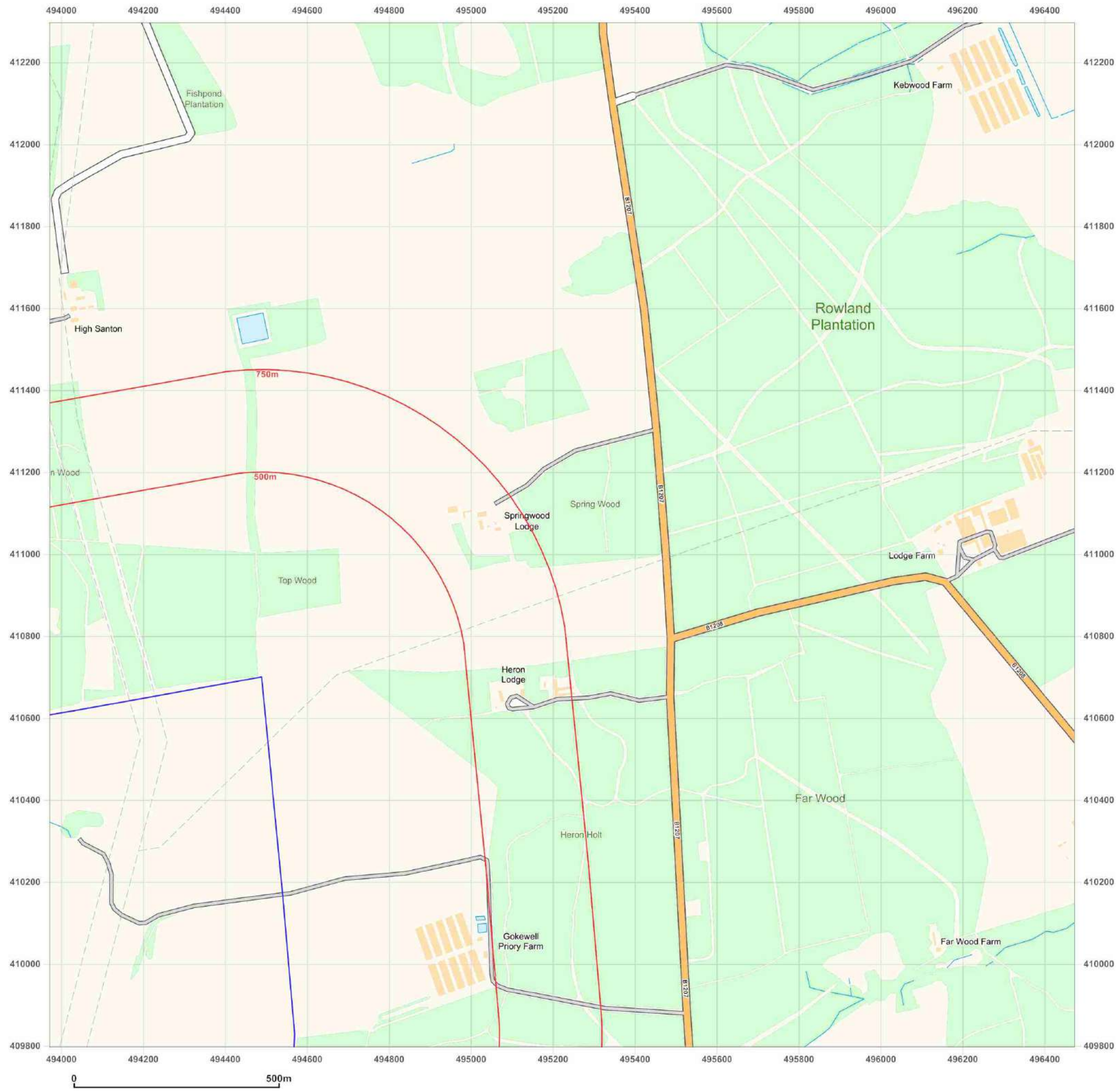
Production date: 01 August 2017

To view map legend click here *Legend*



Site Details:

Santon, Scunthorpe, DN16 1XP

Client Ref:	13238
Report Ref:	CMAPS-CM-643992-13238-310717HIS_SS_2_2
Grid Ref:	495222, 411047

Map Name:	National Grid
Map date:	**2014**
Scale:	1:10,000
Printed at:	1:10,000

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2014

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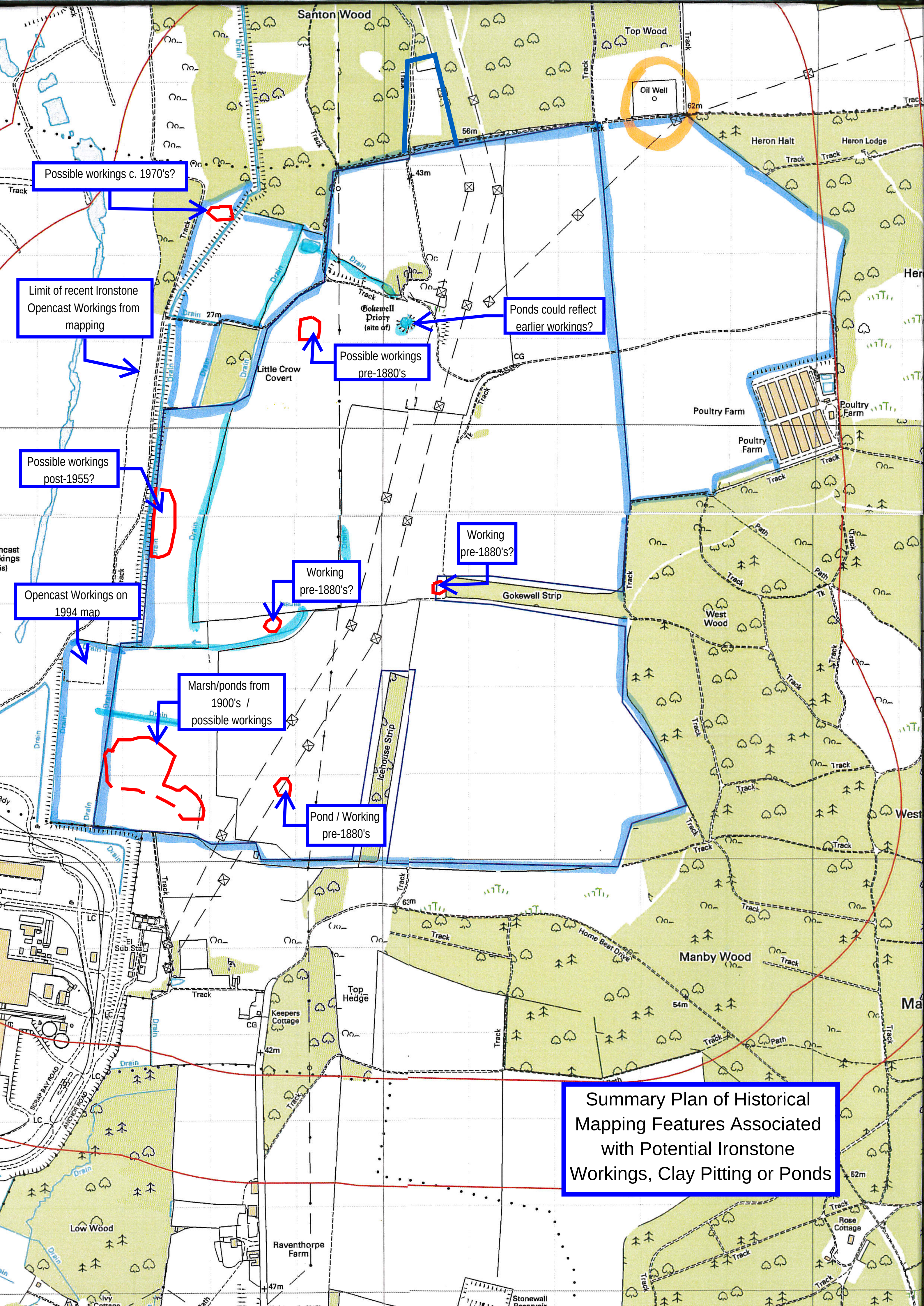
Production date: 01 August 2017

To view map legend click here *Legend*



Summary Plan of Historical Mapping Features Associated with Potential Ironstone Workings, Clay Pitting or Ponds

Possible workings c. 1970's?

Limit of recent Ironstone Opencast Workings from mapping

Possible workings post-1955?

Opencast Workings on 1994 map

Marsh/ponds from 1900's / possible workings

Possible workings pre-1880's

Ponds could reflect earlier workings?

Working pre-1880's?

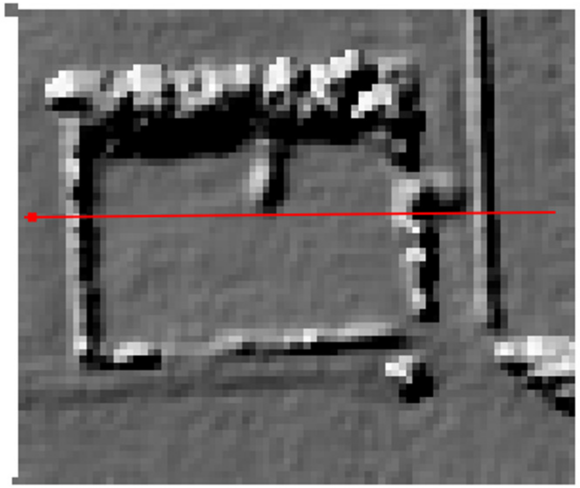
Working pre-1880's?

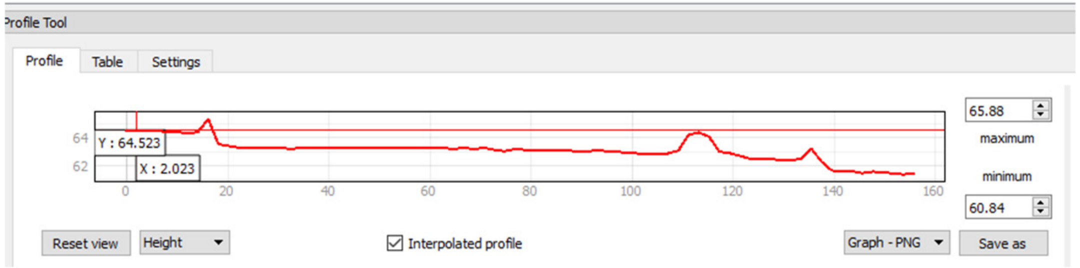
Pond / Working pre-1880's

Appendix F

Off-Site Conventional Oil Exploration Well

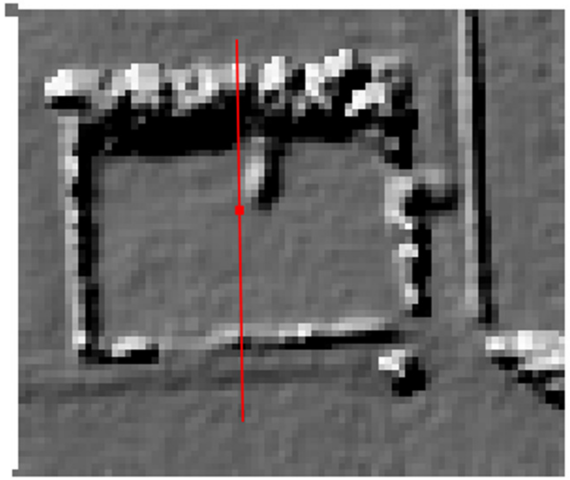

Off-Site Former Oil Well
Google Earth
© 2018 Google
N
100 m

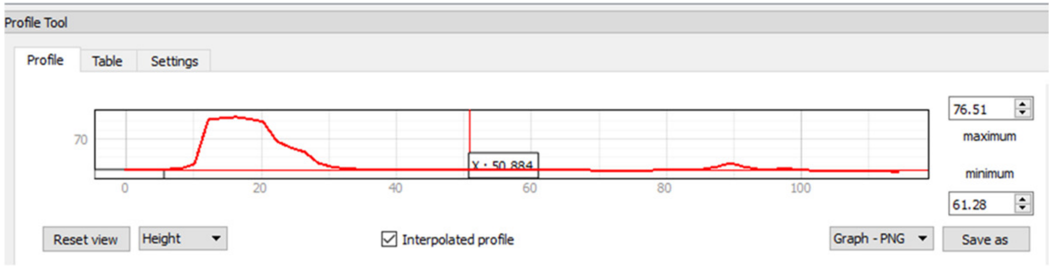




Y : 64.523
X : 2.023
maximum 65.88
minimum 60.84

East-West Profile
across Oil Well site





X : 50.884
maximum 76.51
minimum 61.28

North-South Profile
across Oil Well site

Little Crow
Off-Site Oil Well
Contours

DOCID 39902

PETROLEUM DEVELOPMENT LIMITED

EXPLORATION AND PRODUCTION

[illegible]
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COPY 1 OF 2

Drilling Completion Report
Broughton B1
by
D.J. Hodson

Eakring
November 1984 Broughton B1/W38

I Objectives/Results/Summary

OBJECTIVES:

Broughton B-1 was a pure exploration well, the primary objective was the Chatsworth sandstone in the Namurian and the secondary objectives were the Wingfield Flags (in the Westphalian) and the Ashover Grits (in the Namurian Group). The structure which it was drilled on is West of the Brigg structure which has now had two dry wells drilled in it.

RESULTS:

The drilling programme specified that cores should be cut through any section which indicated good hydrocarbon shows. Accordingly seven cores were cut; the formations cored were as follows:

1. The Penistone Flags (1497 m)
2. An un-named Westphalian Sand immediately below the Penistone Flags (1510 m)
3. The Wingfield Flags (1569 m)
4. The Chatsworth Sandstone (1629 m)
5. The Ashover Grit (1657 m)
6. The Ashover/Wrestle Sands (1668 m) and
7. The Sandton Sand (1855 m)

After the first two cores had been cut, indications were so encouraging that it was decided that the section should be logged and tested immediately, it was and the presence of moveable oil was established.

The comprehensive T.D. logging suite indicated that six zones should definitely be tested and a further two should also be evaluated if hole conditions permitted. Seven DST's were carried out in open-hole and one (in the Sandton at 1865 m) was repeated in cased hole because the hole was badly washed out at this depth. All formations except for the Penistone Flags were water, rather than hydrocarbon, bearing.

SUMMARY:

Broughton B-1 was a vertical exploration well drilled with Kenting Rig 36. It was spudded shortly after midnight on the 19th July 1984, drilling to T.D. was completed four days ahead of schedule, however the well was actually suspended eight days after the scheduled date mainly because of the extended testing programme and partly because time was lost:

a. When circulation was lost during cementing of the 5½" casing and remedial work had to be carried out,

and

b. When the 5½" casing hanger failed to set upon the first attempt.

The rig was released at 08.00 on the 9th September 1984

II Location Diagram

BP PETROLEUM DEVELOPMENT LTD.

LOCATION PLAT

BROUGHTON B1

COUNTRY- UK LAND

LICENCE NO. PL 185

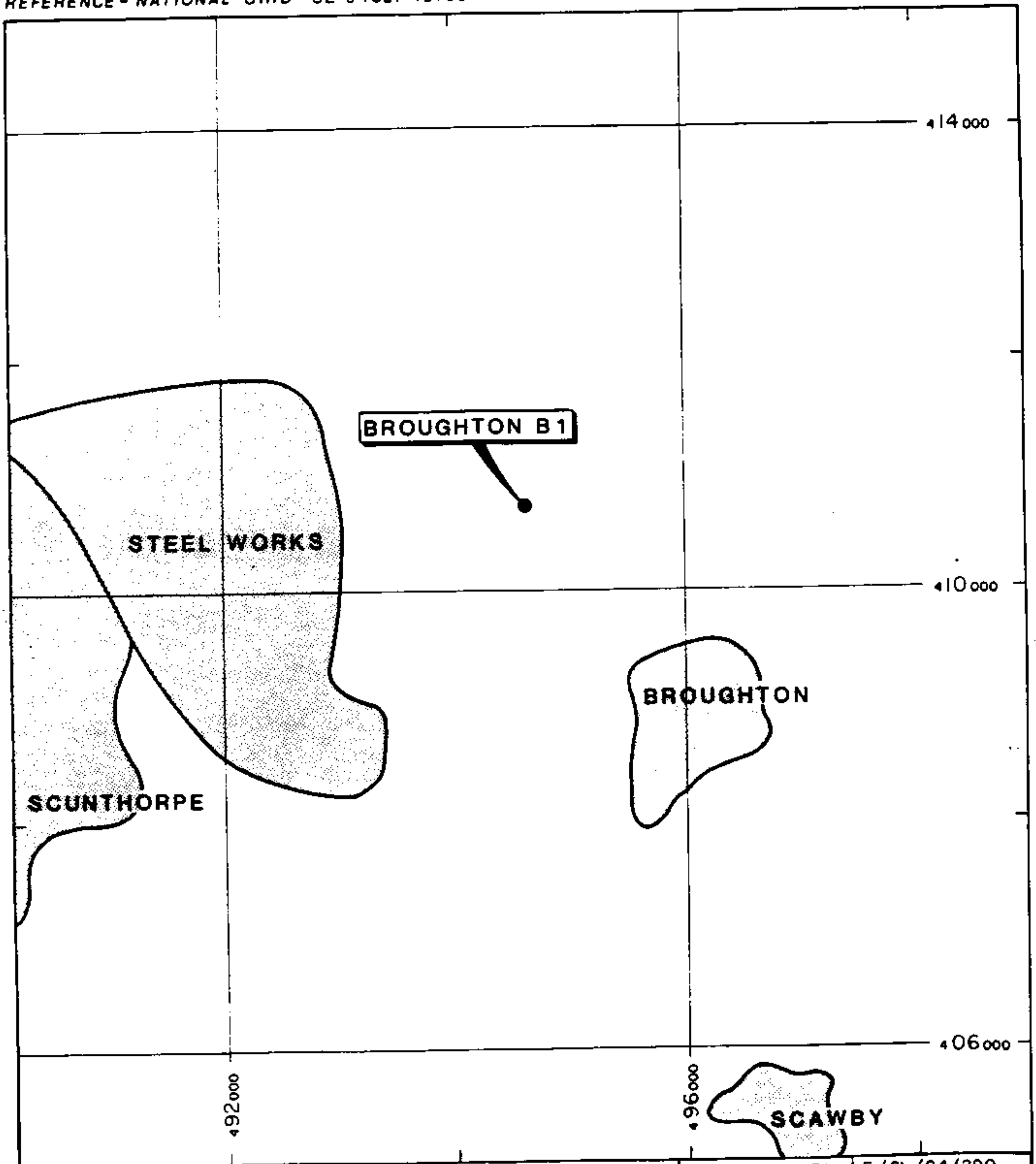
COORDINATES - *LAT.* 49° 55' 5·704"

LONG. 6° 15' 17·496"

ELEVATION OF ROTARY TABLE A.O.D. 68·192m

REFERENCE - NATIONAL GRID SE 94627 10760

SCALE: 1:50,000



Ref: Broughton B1.	E/GL/84/290.
September, 1984.	G. Taylor.

Base Drg. E/MB/74/5

III General Well Data

GENERAL WELL DATA

a. Licence No. : UK Land Licence PL 185

b. Well Name : Broughton B-1

c. Well Classification : Exploration

d. Drilling Unit : Kenting Rig 36

e. Well Location : National Grid SE 94623 10755
Geophysicals 53° 35' 4.54" N
0° 34' 13.72" W

f. Rotary Table Elevation : 5 m AGL
68 m AOD

g. Total Depth : 1920 m DD BRT

h. Timing Spud : Midnight (00.00) 19.7.84
Rig Release : 08.00 9.9.84

i. Hole Depths (DD BRT) : 17½" hole to 46 m
: 12¼" hole to 824 m
: 8½" hole to 1920 m

j. Casing Depth (DD BRT) : 13⅜" shoe at 45 m
: 9⅝" shoe at 821 m
: 5½" shoe at 1920 m

IV Diary

DRILLING / WORKOVER DIARY

Rig: KENTING 36E Well Nº: BROUGHTON B1 Month: JULY 1984.

DATE	DAY Nº (from spud)	DEPTH (m)	MUD (s.g)	OPERATION
18.7.84	0	-	-	Commenced drilling rathole and mousehole at 1500 - made up spud-in BHA.
19.7.84	1	46	1.04	Drilled 12¼" pilot hole to 46m. Experienced 120 bbl loss @ 23m. Cured by mudding up. Opened hole to 17½". Ran 13 3/8" casing to 45m. Cemented to surface. Waited on cement, nippled BOP's up.
20.7.84	2	255	1.04	Nippled BOP's up - tested diverter to 200 psi - Drilled cement out and drilled 12¼" hole to 255m. Had 20 Bbl/Hr. losses at 152m - cured with a mica pill.
21.7.84	3	424	1.04	Drilled with surveys to 409m. POH to change bit and wipe hole - Changed bit and BHA - RIH drilled to 424m.
22.7.84	4	745	1.04	Drilled to 745m.
23.7.84	5	824	1.04	Drilled to 824m - POH - Rigged up to log - 120 BBl/Hr losses - Cured with LCM pill - logged BHCS/Cal/GR.
24.7.84	6	824	1.04	Logged verticality survey - RIH Wiper tip - Reamed last 14m to 824m - POH - Ran 9 5/8" casing to 821m - Cemented - lead 105 Bbls Extended G @ 1.38SG - Tail 90 Bbls Thixotropic @ 1.78 SG - lost 10 Bbls fluid. Regained circulation - Displaced cement with 201 Bbls mud. Bumped plug and held 1500 psi.
25.7.84	7	826	1.04	WOC - N.U. Wellhead and BOP. Broke down BHA - Tested choke manifold and line and kill line 2500 psi. Made up 8½" BHA and RIH. Tagged float at 793m. Drilled shoe track out. Tested pipe rams and Kelly cocks to 2500 psi. Annular to 1500 psi - Drilled 2m new formation.

DATE	DAY Nº (from spud)	DEPTH (m)	MUD (s.g.)	OPERATION
26.7.84	8	969	1.06	Circulated. Carried out L.O.T. (E.M.W. = 1.98 SG) - Drilled to 969m.
27.7.84	9	1026	1.08	Drilled to 973m - Tripped for bit (Survey $3/4^{\circ}$) - Drilled to 1026m.
28.7.84	10	1067	1.09	Drilled to 1067m - Tripped for bit change.
29.7.84	11	1245	1.10	Drilled to 1245m.
30.7.84	12	1394	1.12	Drilled to 1315m. Survey (1°). Check trip to shoe - Hole tight 1021-1231m. (Max 75000 lbs o'pull). Kick drill. RIH to 1302m. Wash/ream to 1315m. Drilled to 1391m. Circ. B.U. Drilled to 1394m.
31.7.84	13	1492	1.15	Drilled to 1478m. Survey - 1°. Check trip to shoe - Hole tight 1157-1325 (Max 60000 lbs o'pull). Kick drill. RIH to 1463m - 15m fill - hole sloughing. Inc. mud weight to 1.14 SG. Drilled to 1492m. Circ. B.U. POOH to Core.
1.8.84	14	1515	1.14	M.U. corebarrel. RIH to shoe. Kick Drill + Rig Serv. RIH to btm (washed from 1381-1392). Cut core No.1 (1492-1510m). POOH. Service corebarrel. RIH. Cut core No.2 (1510-1515).
2.8.84	15	1568	1.15	Cont Cut Core No.2 (1515-1528). CIRC clean. POOH. STD CB back. M.U. $8\frac{1}{2}$ Bit + BHA. RIH to SHOE. BOP FUNCTN TST & DRILL RIH. REAMED RATHOLE 1486-1528m. DRILLED 1528-1568. CIRC B.U. Survey ($\frac{3}{4}$). POOH.
3.8.84	16	1578	1.15	M.U. Core Barrel. RIH. Cut Core # 3 1568-1578m. Circ hole clean. POOH. Tight from 1568-1510m (25000 Max o'pull). M.U. $8\frac{1}{2}$ BHA. RIH. Check Trip.
4.8.84	17	1580	1.15	Cont. Check trip. Reamed 1557-1578m (Drilled 2m to 1580. Pipe Tally error). Circ. clean. POOH. R.U. Welex and ran DLL/BHCS/GR/SP/CAL. Press. tested BOP's - OK. M.U. DST assy. RIH DST # 1 to 1520m. Set packers. Opened for init. flow.

DATE	DAY Nº (from spud)	DEPTH (m)	MUD (s.g.)	OPERATION
4.8.84 (cont'd)	17	1580	1.15	Shut in for init PBU. Opened tools for final flow period.
5.8.84	18	1580	1.14	Cont final flow. Shut in for final PBU. Drop Bar. Top up annulus. Close Hydril. Rev circ. contents of string. Circ norm. - cond. mud. POOH DST # 1.
6.8.84	19	1620	1.15	Pulled and laid D.S.T. tools out. RIH and drilled 1580m. to 1620m. Tripped for bit.
7.8.84	20	1638.5	1.16	(Mud weight increase due to caveins and connection gas). RIH drilled 1620 to 1629m. C.B.U. POH for core barrel. RIH and cored 1629m to 1638.5m.
8.8.84	21	1656	1.16	Cut core # 4 1638.5m to 1642.5m. POH - Recovered core 100% - RIH - Drilled 1643m to 1656.5m. C.B.U. POH.
9.8.84	22	1667.5	1.17	POH - Picked core barrel up - RIH. Cut core # 5 1656.5m to 1657.95m. jammed off - POH - Recovered core - RIH - Drilled 1657.95m to 1667.5m C.B.U. - POH - Picked core barrel up.
10.8.84	23	1685.51	1.17	RIH - Cut core No.6 1667.5m to 1685.51m - POH - (Tight from 1676m to 1666m). Recovered core. RIH to drill.
11.8.84	24	1761	1.17	Drilled to 1761m (Drilling stopped for 1 hour for SCR repairs).
12.8.84	25	1855	1.16	POH. Changed bit - RIH. Drilled to 1844m.
13.8.84	26	1861.5	1.16	Drilled to 1855m. - C.B.U. - Tripped for core barrel. Cut core # 7 from 1855m to 1861.5m. POH. Observed lost core and catcher. RIH with bit and junk sub.
14.8.84	27	1876	1.17	Cleaned out final 10m - Worked junk sub - Drilled to 1872m - Worked junk sub - POH - Recovered ½ core catcher - RIH new bit - Drilled 1872m to 1876m. Tripped for bit (No junk) - RIH.

DATE	DAY Nº (from spud)	DEPTH (m)	MUD (s.g.)	OPERATION
15.8.84	28	1898	1.16	RIH - Reamed u/g hole 1840m to 1876m - Circulated viscous pill for junk. Drilled 1876m to 1898m.
16.8.84	29	1920	1.19	Circulated clean with viscous pill. POH changed bit. Drilled to 1920m. Circulated. Check tripped back to 1650m. RIH to 1920m. Circulated, conditioned mud weighted up to 1.19 SG - Dropped survey and POH to log.
17.8.84	30	1920	1.19	POH - logged with Gearhart - MSFL/DLL - NEUTRON/DENSITY - BHCS/SP DIPMETER - Rigged up Tesel Dipmeter.
18.8.84	31	1920	1.19	RIH Dipmeter - Hung up @ 1250m. Rigged Tesel down. Carried out wiper tip - (conditioned hole). RIH Tesel again; logged Dipmeter and Merlin Velpro V.S.P.
19.8.84	32	1920	1.19	Continued V.S.P. - Rigged Tesel down - Tested BOP's (Rams, valves and manifolds to 2500 psi; annular to 1500 psi) - RIH wiper trip conditioned hole - POH - Picked DST tools up. RIH. Attempted to set packers at 1805m - failed. POH packers to reset gauges and check tools.
20.8.84	33	1920	1.18	Pulled and redressed test tools - RIH and set pkr. @ 1865m. Opened tool for DST # 2. Opened 5 mins. Closed 1 hour - Opened 2 hours - Closed 2 hours - No good. Pulled packers and set at 1803m. Opened tool for DST # 3. Opened 5 mins. Shut 1 hour. Opened up and flowed well.
21.8.84	34	1920	1.19	Continued to flow well DST # 3 - Shut in for 12 hours. Deflated packers reverse-circulated out contents of drill string - POH DST tools and RIH wiper tip.
22.8.84	35	1920	1.17	Carried out wiper trip to btm. @ 1910m - circulated and conditioned mud - POH - RIH DST tools to 1865m. Opened up for DST # 4A. 5 minute flow - 1 hour shut in. Attempted to open again - did not appear to succeed. Unseated packers. Observed string full.

DATE	DAY Nº (from spud)	DEPTH (m)	MUD (s.g.)	OPERATION
22.8.84 (cont'd)	35	1920	1.17	Reverse - circulated out contents of pipe. Circulated conventionally and conditioned mud - POH - DST tools.
23.8.84	36	1920	1.18	Redress D.S.T. tools + R.I.H. to shoe. Wait @ shoe. R.I.H. D.S.T. tools to 1658m. Tested surface equipment OK. Inflated packers - open valve. 5 mins/ shut in 1 hour/Open well up 12 hours - main flow period/ Close well for main 12 hour P.B.U.
24.8.84	37	1920	1.10	Cont. with P.B.U. D.S.T. # 5. Deflate packers, drop bar, rev. circ. Circ. + cond. mud. POOH with tools. R.I.H. bit for wiper trip light ream 1660/1675, 1903/1920m. Circ. + cond. M.I.C. P.O.O.H. with bit.
25.8.84	38	1920	1.18	POOH wiper trip. Make up D.S.T. # 6 string + R.I.H. Test surface lines O.K. Inflate packers - 1637.5 to 1621.6. Open test valve - suspect burst packer POOH D.S.T. string. Change out packers R.I.H. set packers 1615.2-1636.0m. Open test tool 5 mins/close 1 hour/open for main 12 hour flow.
26.8.84	39	1920	1.17+	Cont. with main flow period of DST # 6. Close test valve for main P.B.U. DST # 6. Deflate packers/drop bar/ reverse circulate/circ. + cond. mud normally. POOH with D.S.T. # 6 test tools.
27.8.84	40	1920	1.17+	Cont. out of hole with D.S.T. # 6 string. Service tools etc. Change spacing R.I.H. tools for D.S.T. # 7. Set packers 1566.5m to 1578m. Open well 5 mins/close/hour/ open well main flow period/Close well for main P.B.U.
28.8.84	41	1920	1.17	Cont. P.B.U. D.S.T. # 7. Deflate packers, reverse circulate. Circulate normally POOH. D.S.T. string. Service tools etc. R.I.H. D.S.T. string # 8. Set packers 1490-1512.7m. Open well 5 mins/close 1 hr. Open well for main flow period D.S.T. # 8.

DATE	DAY Nº (from spud)	DEPTH (m)	MUD (s.g.)	OPERATION
29.8.84	42	1920	1.17	Cont. with flow period D.S.T. # 8. Close well for main PBU. Deflate packers POOH until top of oil. Reverse Circ. POOH. Lay down test tools
30.8.84	43	1920	1.18	Lay down excess DC's etc. R.I.H. OEDP to 1861m wash to 1920m. Circ and cond. mud work tight hole (180K O/PULL) Condition mud. P.O.O.H. OEDP. Make-up bit R.I.H. for wiper trip to 1861m wash to 1920m. Circulate hole tight 1908-1890. Spot vis. pill. POOH sideways.
31.8.84	44	1908 (5½" csg)	1.11 BRINE	POOH laying down pipe. Run 5½" Csg to 1920m - Circ. contents casing. P/test cmt. lines, pump 30 bbls. wash, 183bbls lead cmt - G + D75 @ 1.63 s.g., 130 bbls tail cmt. G NEAT @ 1.90 S.G. Displace cmt with 1.11 s.g. KCl brine - lost circ. with 130 bbls still to displace. Bump plug 2000 psi OK. No backflow.
1.9.84	45	1908 (5½" csg)	1.11 BRINE	W.O.C. Nipple down BOP's. Unable to set 5½" hanger slips - wait on replacement set of slips Run Gyro survey.
2.9.84	46	1908 (5½" csg)	1.11 BRINE	Cont. with Gyro. Welex run CBC/UDL/GR/CCL. Set 5½" hanger slips, cut and dress 5½" csg, nipple up tbg.hgr. test same 3000 psi OK. Nipple up B.O.P's test to 2000 psi - OK.
3.9.84	47	1908 (5½" csg)	1.11 BRINE	Welex perforate 1' @ 1845m. Perform injectivity test - no injection @ eq. mud cut of 1.68sg (1500 psi surface press.) Pick up 2 3/8" tbg + standback. Pick up D.S.T. string + D.C.'s + R.I.H.
4.9.84	48	1908 (5½" csg)	1.11 (BRINE)	Set packer @ 1840m - perform drawdown test - well open 2 hrs/ shut in ¼ hour. Unseat packer POOH. Wait on first light.
5.9.84	49	1908 (5½" csg)	1.11 (BRINE)	Wait on light. RIH with Welex and perforate 1860.09-1856.33m then 1856.33-1854.20m. Make up DST Tools and RIH to 1849m. Pressure test surface lines, hold safety meeting and set packers

DATE	DAY Nº (from spud)	DEPTH (m)	MUD (s.g.)	OPERATION
5.9.84 (cont'd)	49	1908 (5½" csg)	1.11 BRINE	at 1849m. Open tool for 5 mins/ close for 1 hour. Open for main flow period.
6.9.84	50	1908 (5½" csg)	1.11 BRINE	Well open for main flow. Close well in. Deflate packer and POOH. RIH for 2nd cased hole DST. Tag fill at 1891.3m. Pressure test surface lines, hold safety meeting and set packers. Open tool.
7.9.84	51	1908 (5½" csg)	1.11 BRINE	Well flowing. Deflate packer and POOH. RIH with open ended tubing, washing to bottom. Circulate hole clean.
8.9.84	52	1908 (5½" csg)	1.11 BRINE	POOH with open ended tubing. Make up bridge plug and RIH. Set plug @ 1849m. POOH, laying down tubing. Nipple down BOP's. RIH with open ended tubing as kill string.
9.9.84	53	1908 (5½" csg)	1.11 BRINE	RIH with tubing, screw on tubing bonnet and land on tubing spool. Make up bonnet and screw in valve.

V Deviation Survey

SCIENTIFIC DRILLING CONTROLS.
GT YARMOUTH

Directional survey
for

BP DEVELOPMENT LTD.

Job number : 024G 09840783
Well number : BROUGHTON B-1
Well location : BROUGHTON
Survey date : 1/09/84
Survey engineer : K. MITCHELL

Meas.	Vert.	Inc.	Direction	Coordinates		D.Leg
Depth	Depth	DEG	DEG	Latitude	Departure	/030
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00
30.00	30.00	0.82	69.22	0.08 N	0.20 E	0.82
60.00	60.00	0.87	75.82	0.21 N	0.62 E	0.11
90.00	89.99	0.83	71.21	0.33 N	1.05 E	0.07
120.00	119.99	0.82	74.25	0.46 N	1.46 E	0.04
150.00	149.99	0.82	69.68	0.59 N	1.86 E	0.06
180.00	179.98	0.80	78.11	0.71 N	2.27 E	0.12
210.00	209.98	0.93	78.04	0.80 N	2.71 E	0.13
240.00	239.98	1.02	78.79	0.91 N	3.21 E	0.08
270.00	269.97	1.10	75.75	1.03 N	3.75 E	0.10
300.00	299.96	1.12	74.51	1.18 N	4.32 E	0.03
330.00	329.96	1.10	74.81	1.33 N	4.87 E	0.00
360.00	359.95	1.18	77.51	1.47 N	5.46 E	0.09
390.00	389.95	1.20	80.87	1.59 N	6.07 E	0.07
420.00	419.94	1.25	81.13	1.69 N	6.70 E	0.04
450.00	449.93	0.98	83.91	1.77 N	7.28 E	0.27
480.00	479.93	0.85	83.89	1.82 N	7.76 E	0.13
510.00	509.93	0.52	74.44	1.88 N	8.11 E	0.35
540.00	539.93	0.33	80.80	1.93 N	8.33 E	0.19
570.00	569.93	0.23	106.17	1.93 N	8.47 E	0.16
600.00	599.93	0.15	130.52	1.89 N	8.56 E	0.11
630.00	629.93	0.18	123.50	1.83 N	8.63 E	0.03
660.00	659.93	0.20	129.22	1.77 N	8.71 E	0.03
690.00	689.93	0.27	116.16	1.71 N	8.81 E	0.08
720.00	719.93	0.27	123.76	1.64 N	8.93 E	0.02
750.00	749.93	0.35	117.83	1.56 N	9.07 E	0.09
780.00	779.92	0.42	106.97	1.48 N	9.26 E	0.10
810.00	809.92	0.33	150.39	1.38 N	9.41 E	0.29
840.00	839.92	0.35	171.08	1.21 N	9.46 E	0.12
870.00	869.92	0.43	182.39	1.01 N	9.47 E	0.11

SCIENTIFIC DRILLING CONTROLS.
GT YARMOUTH

Directional survey
for

BP DEVELOPMENT LTD.

Job number : 024G 09840783
Well number : BROUGHTON B-1

Meas. Depth	Vert. Depth	Inc. DEG	Direction DEG	Coordinates		D.Leg
				Latitude	Departure	/030
900.00	899.92	0.45	224.08	0.81 N	9.39 E	0.31
930.00	929.92	0.52	237.12	0.65 N	9.19 E	0.13
960.00	959.92	0.75	244.15	0.49 N	8.90 E	0.25
990.00	989.92	0.93	251.71	0.33 N	8.49 E	0.21
1020.00	1019.91	0.52	251.90	0.21 N	8.13 E	0.42
1050.00	1049.91	0.77	260.06	0.13 N	7.80 E	0.26
1080.00	1079.91	0.82	245.97	0.01 N	7.41 E	0.20
1110.00	1109.91	0.72	235.85	0.18 S	7.06 E	0.17
1140.00	1139.90	0.55	236.78	0.36 S	6.78 E	0.17
1170.00	1169.90	0.48	253.62	0.48 S	6.54 E	0.16
1200.00	1199.90	0.55	295.85	0.45 S	6.29 E	0.38
1230.00	1229.90	0.52	293.48	0.34 S	6.04 E	0.03
1260.00	1259.90	0.18	283.15	0.27 S	5.87 E	0.34
1290.00	1289.90	0.18	270.09	0.26 S	5.77 E	0.03
1320.00	1319.90	0.30	319.23	0.20 S	5.67 E	0.23
1350.00	1349.90	0.42	326.15	0.05 S	5.56 E	0.12
1380.00	1379.90	0.47	325.37	0.14 N	5.43 E	0.04
1410.00	1409.90	0.37	334.46	0.33 N	5.32 E	0.12
1440.00	1439.90	0.38	325.27	0.50 N	5.22 E	0.06
1470.00	1469.90	0.63	316.63	0.70 N	5.05 E	0.26
1500.00	1499.89	0.73	316.94	0.96 N	4.81 E	0.10
1530.00	1529.89	0.77	321.82	1.26 N	4.55 E	0.07
1560.00	1559.89	0.98	300.17	1.55 N	4.20 E	0.39
1590.00	1589.88	1.07	307.71	1.85 N	3.76 E	0.16
1620.00	1619.88	1.18	323.35	2.27 N	3.36 E	0.33
1650.00	1649.87	1.30	332.15	2.81 N	3.01 E	0.22
1680.00	1679.86	1.37	346.03	3.46 N	2.77 E	0.33
1710.00	1709.85	1.43	356.02	4.18 N	2.65 E	0.25
1740.00	1739.84	1.65	7.07	4.99 N	2.68 E	0.37
1770.00	1769.83	1.95	13.09	5.91 N	2.85 E	0.35

SCIENTIFIC DRILLING CONTROLS.
GT YARMOUTH

Directional survey
for

BP DEVELOPMENT LTD.

Job number : 024G 09840783
Well number : BROUGHTON B-1

Meas. Depth	Vert. Depth	Inc. DEG	Direction DEG	Coordinates Latitude	Departure	D.Leg /030
1800.00	1799.81	2.10	9.96	6.95 N	3.06 E	0.19
1830.00	1829.79	1.83	1.49	7.97 N	3.17 E	0.39
1860.00	1859.78	1.60	358.64	8.87 N	3.17 E	0.25
1890.00	1889.77	1.07	12.28	9.56 N	3.22 E	0.62

Slot coordinates : 0.00 N 0.00 E
Total closure : 10.09 metres at N 18.61 E
VERTICAL SECTION CALCULATED FROM CENTRE.
ALL DEPTHS RELATIVE TO R.K.B.
Survey run in 5.5 casing.
Survey referenced to UTM North.
Displacement from platform centre.

VI Drilling Report

SECTION BY SECTION DRILLING SUMMARY

17½" SECTION:

The hole was spudded shortly after midnight on 19th July 1984. During drilling of the 12¼" pilot hole the wellbore fluid was all lost at a depth of 23 m. This was cured by mudding up with a viscous Bentonite pill and the remainder of the section to 46 m was drilled without any problem. Hole inclination at this depth was ½°.

The hole was opened to 17½" with a 17½" bit.

12¼" SECTION:

This section was drilled with two bits and a 90' BHA throughout. The first bit, an HTC XIG, was pulled at 409 m still in the Mercia mudstone. No weight was required on the bit and ROP had to be restricted to 18 m/hr. Losses at a rate of 20 Bbl/hr were encountered at a depth of 152 m; these were cured with a Mica pill. The bit was pulled partly because it had drilled for 23¾ hrs but mainly because it was considered that the mudstone needed a wipe. Overpull on the trip out averaged at 30000 lbs and a large mud ring was found on the stabilisers.

The second bit was used to drill through the Sherwood sandstone down to 824 m. Drilling rate was again controlled to 18 m/hr. and mud weight was kept to a minimum by using the solids-control equipment all the time and not allowing mud to bypass the shaker screens. This bit run was drilled without event, a substantial reduction in ROP after the bit had completed 26¼ hours necessitated pulling out.

The logs confirmed that this depth was 20 m below Top Upper Permian Marl and that the formation was competent enough to set casing in. Heavy losses of 250 Bbl/hr were experienced shortly after logging commenced; these were cured with a 40 Bbl pill comprising 30 lbs/Bbl mixed LCM.

8½" SECTION

The section from the 9⅝" shoe at 821 m to the first core point at 1492 m was drilled with three bits (2 x HTC XIG'S and 1 x J22). Drilling parameters were: W.O.B. c. 30000 lbs, R.P.M. 100 with the sealed bearing bits and 80 with the journal bearing bit, flow rate 250 G.P.M. and bit nozzle size three 10's to begin with and two 12's and a blank later on. ROP was c. 18 m/hr. in the siltstone in the Upper Permian but it slowed down to 2 m/hr in the Dolomite/Limestone and the Anhydrite.

Few drilling problems were encountered in the Permian; however problems with tight hole on check trips in the Westphalian Coal measures (top c. 1120 m) necessitated increasing the mud weight to 1.14 SG.

Two 18 m cores were cut without event in the fairly large sand body in the lower Westphalian interval: (1485 m to 1512 m) and the third was cut lower down (from 1568 m to 1578 m).

A DST was carried out across the top sand; the logging run before the test indicated that the hole up until this stage had a continuous $9\frac{1}{2}$" diamter.

Upon resumption of drilling the mud weight was increased to 1.16 SG to combat heaving shale and connection gas. ROP through the transition from Westphalian to Namurian slowed up to 3.5 m/hr. Core No. 4 was cut through the interval 1629 m to 1643 m.

Core No. 5 was cut from 1657.9 m to 1667.5 m; upon recovery, a wedge of the mudstone in the top of the core showed why it had not been possible to core anymore. Core No. 6 was cut from 1667.5 m to 1685.51 m. Tight hole on trips at this stage necessitated increasing the mud weight to 1.17 SG.

Drilling continued with two more bits a medium hard milled tooth bit (Smiths SVH) and, when there did not appear to be any further likelihood of coring, an HTC J22.

A permeable sand with good oil shows at 1855 m necessitated more coring. Core No. 7 was cut down to 1861.5 m into what appeared to be very hard mudstone. The core barrel was tripped and found to be minus core and core-catcher.

There followed two short runs with milled-tooth bits and the junk sub. The junk was retrieved and cleared away without difficulty but a quantity of Pyrite in the formation made drilling very slow. Both bits (Smiths SVH's) came out after only 11 m and 4 hrs apiece.

A hard-formation milled-tooth bit (HTC J7) was committed; it drilled to 1898 m (top limestone was 1887 m) at an ROP of 1 m/hr. The well was completed with another hard formation, milled-tooth bit with standard bearings (W7R2J) which drilled to 1920 m at a steady 2.5 m/hr.

SUBSEQUENT OPERATIONS:

Upon completion of drilling a full T.D logging operation and a velocity survey (V.S.P.) were carried out. A wiper trip had to be carried out to wipe ledges in the coal measures to facilitate running the HDT.

Thereafter, a faily extensive DST programme was commenced: two attempts were needed to set the packer for DST 2. The remaining DST's appeared to be mechanically successful. Wiper trips were carried out between DST's 3 and 4 and between DST's 5 and 6. During the second wiper trip the intervals 1660 m to 1675 m and 1903 m to 1920 m had to be reamed out lightly (the hole section had been open for 7 days at this stage).

After the DST programme was finished it was intended to spot a cement plug back to below the Penistone Flags (1490.9 m to 1512.6 m) and run 5½" casing to the top of the plug. The reason for this was the fact that none of the formations below the Penistone had been in the least bit productive. Accordingly OEDP was run into the hole in order to spot the cement plug.

During the trip in, it was decided by P.E. Department that the interval 1854 m to 1860 m should be tested again through casing. The hole was tight on P.O.H., a wiper trip was carried out, the hole was tight from 1908 m back to 1890 m.

5½" casing was run to T.D., major losses (a total of 130 bbls) occurred during displacement of the cement.

After the standard amount of time was spent waiting on cement and lifting BOP's, much time was spent trying to set the casing hanger. Eventually the hanger was changed out and the job was completed successfully.

A CBL/VDL/CCL and a gyromultishot survey were run. The CBL indicated that there was no cement above 1100 m.

The 5½" casing was perforated to 1845 m and an injectivity test was carried out prior to running in to squeeze cement. There was no injectivity at all, so a dry test string was run in order to have definite confirmation. This proved that the formation at 1845 m was sealed off so it was decided to perforate and test the zone of interest (DST 9 from 1854.20 m to 1860.99 m).

Finally, the well was suspended by setting a bridge plug at 1849 m, running in a 2⅜" kill string to 1418 m and hanging it off with the standard tubing bonnet.

The rig was released at 08.00 on the 9th September 1984.

VII Mud/Completion Fluids Report

WELL: BROUGHTON B-1 RIG: KENTING 36

DISCUSSION BY INTERVALS

17½" HOLE SECTION

This section supplements the Daily Operations log and discusses any points of interest or problems that occurred with possible causes and what remedies were used.

The 17½" Hole Section was drilled with fresh water and viscous Bentonite pills. A pilot hole of 12¼" was initially drilled and subsequently opened up to 17½". Some losses to the formation were remedied by circulating more frequent pills. At 46M the hole was circulated, a slug pumped and pipe pulled with no problems. The 13-3/8" casing was run and cemented at 45M.

Discussion By Intervals (Cont'd)

12¼" HOLE SECTION

The cement was tagged at 39M, the annulus pressure tested for 5 mins at 200 psi, and cement drilled out to 46M. Drilling continued with periodic surveys at which time the sandtrap was dumped. Blinding of the 30/40 x 2 shaker screens was eliminated by changing out one of the shakers to 20/30. Cement contamination was treated out with sodium bicarbonate.

At 161M gradual seepage of fluid to the formation began to accelerate. 100 barrels of the Bentonite/CMC mud was isolated and treated with 10 ppb of Fibre Mica. This was circulated with the shakers bypassed only once. Losses then stopped.

The sand trap was again dumped at the next survey at 341M.

The No.1 shale shaker ceased functioning at 270M as the basket had been resting on the edge of a steel airline which finally sheared. The airline was replaced by a flexible equivalent. At the same time the screens were reduced in size to 30/40. At the next survey at 409M, the sandtrap was dumped and the shaker screens further reduced to 40/50 and 50/60. The centrifuge was run at all times and similarly the mud cleaner, but in the desilting mode, with the screen blocked off.

The bit was pulled at 409M and some tightness was experienced. Mud rings were cleared as best as possible to avoid blocking the flowline. The X3A Hughes bit (with nozzles 2 x 13/32nds + 1 14/32nds) was replaced by an XIG (with nozzles 3 x 14/32 nds) in anticipation of drilling the Bunter sandstone.

Penetration rate in the Bunter was controlled with 5 mins circulating at the half way point to kelly down, and with 10 mins circulating at kelly down.

As the need for absolute maximum densities were stipulated, low gel strengths (with accompanying minimum practical yield points) were necessaary because full use was made of the bund system. For sufficient settling out of the sandstone solids in the bund, very low gel strengths were essential in order to enable satisfactory re-use of the fluid for recirculation. The shale shakers were deliberately allowed to partially blind to allow a high proportion of the solids to precipitate in the bund, the balance of the fluid being treated by the mud cleaner in desilter mode, and the centrifuge.

The shaker screens were changed down to 30/40 nevertheless as the previous sizes were blinding excessively.

Controlled drilling continued with fluid density below 1.04 and at 775M the circulating system was reduced in size by eliminating the bund. Fluid for the premix was still however, taken from the bund.

Discussion By Intervals (Cont'd)

12¼" Hole Section (Cont'd)

At 810M mudstone and siltstone were penetrated signalling the end of the Bunter sandstone and drilling continued to 824M when the bit showed signs of failure. The hole was circulated, and pipe pulled for logging. When the pipe was out of the hole losses to the formation occured. A 30 pound per barrel mixture of loss circulation material (cellophane, Mica fine and coarse, and Nut Plug fine and coarse) was pumped into the top of the hole and allowed to subside into the thief zone, which was estimated to be at 130 metres. Losses then ceased, the hole was filled again with mud and and logging commenced. Two suites were run without problems and casing run and cemented.

CONCLUSIONS AND RECOMMENDATIONS

17½" HOLE SECTION

This section was drilled effectively and economically. It is recommended that the same practice of drilling with fresh water and viscous Bentonite slugs if continued for future wells in the area.

Conclusions And Recommendations (Cont'd)

12¼" HOLE SECTION

By keeping the density of the fluid at all times below 1.04 in the Bunter Sandstone, by keeping fluid loss below 8 secs, and by ensuring gel strengths in the region of only 2-4, this formation was drilled without problems.

The bund was incorporated into the system successfully and the low gels of the fluid allowed the fine solids to precipitate out before the Sykes pump sucked it back again.

The part of the system which was not diverted into the bund was constantly treated by the mudcleaner in desilter mode, and by the centrifuge. This helped considerably in maintaining correct density.

The requirement for low gel strength meant that low yield points were unavoidable, but the decision to drill at a controlled rate (1½-2 minutes per metre) without halt except for connections and with annular velocities of 27M/M around the pipe, proved to be correct and the hole was cleaned effectively although yield point was often below 10.

The fluid and the method employed to drill this sandstone is satisfactory in a vertical hole such as this, although it is questionable how stable the hole would remain in deviated wells.

BP OIL

WELL: BROUGHTON B-1 RIG: KENTING 36

MATERIALS AND MUD CONSUMPTION

PRODUCT	QUANTITY AND UNIT	COST IN £ STERLING	TOTAL COST IN £ STERLING
17½" HOLE SECTION			
BENTONITE	53 x 25 Kg	6.07	321.71
CAUSTIC SODA	2 x 50 Kg	12.50	25.00
	SECTION TOTAL		£ 346.71

BP OIL

WELL: BROUGHTON B-1 RIG: KENTING 36

Materials And Mud Consumption (Cont'd)

PRODUCT	QUANTITY AND UNIT	COST IN £ STERLING	TOTAL COST IN £ STERLING
12¼" HOLE SECTION			
BENTONITE	52 x 25 Kg	6.07	315.64
CMC HI-VIS	52 x 25 Kg	22.10	1,249.20
CMC LO-VIS	41 x 25 Kg	18.55	760.55
SODA ASH	2 x 50 Kg	7.15	14.30
BICARB	14 x 50 Kg	9.80	137.20
CAUSTIC SODA	11 x 50 Kg	12.50	137.50
IDFLO	16 x 50 kg	11.49	183.84
FLR	20 x 25 Kg	51.94	1,038.80
MICA F	60 x 25 Kg	4.74	284.40
MICA C	17 x 25 Kg	4.74	80.58
NUT PULGE	15 x 25 Kg	5.35	80.25
GELLOPHANE	10 x 15 Kg	5.04	50.40
	SECTION TOTAL		£ 4,232.66

Materials And Mud Consumption (Cont'd)

PRODUCT	QUANTITY AND UNIT	COST IN £ STERLING	TOTAL COST IN £ STERLING
8½" HOLE SECTION			
BARITE	759 x 50 Kg	4.02	3,051.18
BENTONITE	112 x 50 Kg	6.07	679.84
IDFLR	103 x 25 Kg	51.94	5,349.82
IDFLO	86 x 25 Kg	11.48	987.28
KCL	316 x 50 Kg	5.45	1,722.20
CAUSTIC	30 x 50 Kg	12.50	375.00
BICARB	4 x 50 Kg	9.80	39.20
SODA ASH	30 x 25 Kg	3.58	107.40
IDVIS	11 x 25 Kg	122.00	1,342.00
IDCIDE L	2 x 25 Lt	158.68	317.36
CMC HV	16 x 25 Kg	22.10	353.60
	SECTION TOTAL		£14,324.88

BP OIL

WELL: BROUGHTON B-1 RIG: KENTING 36

Materials And Mud Consumption (Cont'd)

TOTALS FOR WELL

PRODUCT	QUANTITY AND UNIT	COST IN £ STERLING	TOTAL COST IN £ STERLING
BARITE	759 x 50 Kg	4.02	3,051.18
BENTONITE	217 x 25 Kg	6.07	1,317.19
IDFLR	123 x 25 Kg	51.94	6,388.62
IDFLO	102 x 25 Kg	11.48	1,170.96
KCL	316 x 50 Kg	5.45	1,722.20
CAUSTIC	43 x 50 Kg	12.50	537.50
BICARB	18 x 50 Kg	9.80	176.40
SODA ASH	32 x 25 Kg)	3.58	121.70
	x 50 Kg)	7.15	
IDVIS	11 x 25 Kg	122.00	1,342.00
IDCIDE L	2 x 25 Kg	158.68	317.36
CMC HV	68 x 25 Kg	22.10	1,502.80
MICA F	60 x 25 Kg)	4.74	364.98
MICA C	17 x 25 Kg)		
NUT PLUG F	15 x 25 Kg	5.35	80.25
CELLOPHANE	10 x 25 Kg	5.04	50.40
CMC LV	41 x 25 Kg	18.55	760.55
	SECTION TOTAL		£18,904.09

BP OIL

WELL: BROUGHTON B-1 RIG: KENTING 36

COST SUMMARY

	ACTUAL COST
17½" HOLE SECTION & 13-3/8" CASING	
METRES DRILLED:	46M
COST PER METRE:	£7.54
DAYS ON SECTION:	2
COST PER DAY:	£173.36
ENGINEERING COST:	Per Contract
NO. OF M^3 MIXED:	26
COST PER M^3:	£13.34
INTERVAL COST	**£346.71**

12¼" HOLE SECTION & 9-5/8" CASING

METRE DRILLED:	778M
COST PER METRE:	£5.44
DAYS ON SECTION:	6
COST PER DAY:	£705.44
ENGINEERING COST:	Per Contract
NO. OF M^3 MIXED:	197
COST PER M^3:	£21.49
INTERVAL COST	**£4,232.66**

Cost Summary (Cont'd)

	ACTUAL COST
8½" HOLE SECTION & 5½" CASING	
METRES DRILLED:	1,099
COST PER METRE:	£12.32
DAYS ON SECTION:	22
COST PER DAY:	£615.00
ENGINEERING COST:	-
NO. OF BARRELS MIXED:	
COST PER BARREL:	
INTERVAL COST	**£13,540.48** based on days to TD.

INTERNATIONAL DRILLING FLUIDS

Drilling Fluid Properties Record
WATER BASE

FLUID SYSTEM GEL/CMC

WELL NAME BROUGHTON B1 AREA HUMBERSIDE U.K.
STOCK POINT BRIGG Contractor KENTING
ENGINEERS NEIL REID, KARL BACH

Day No	DATE	DEPTH	FLUID PROPERTIES WEIGHT S.G.	F.V. SEC/QT	RHEOLOGY SAMPLE TEMP °	A.V. cps	P.V. cps	Y.P. LBS/100 SQ. FT.	GELS 0 / 10	pH	FILTRATE API mls	CAKE 32nds	HT HP ° psi	FILTRATE ANALYSIS ALKALINITY Pf	Mf	Pm	CHLORIDES	☐ TOTAL HARDNESS ☑ CALCIUM	RETORT % SOLIDS	% OIL	SAND CONTENT	MBT	ppb	Pc rASH		REMARKS
1	18-7	46	1.03	90										FRESHWATER & BENTONITE PILLS												DRILLED PILOT HOLE OPENING
2	19-7	46	1.04	50											"				"			"				OPENED HOLE TO [illegible] RAN CASING, CEMENTED
3	20-7	256	1.04+	50		19	12	14	4 / 14	10.5	8	3		·8			1200	360	2.3		TR	12.5				LOSSES TO FORMATION HALTED WITH 15 [illegible] MICA
4	21-7	415	1.04	47		21	15	12	3 / 9	10	7.5	2		·2			1300	400	2.4		TR	10				SHAKER DOWN + REPAIRED CHANGE [illegible] MUD CLEANER AS [illegible] FILTER [illegible] TO NEW [illegible]
5	22-7	430	1.04	40		19	14	10	2 / 3	10	7.5	2		·3			1200	400	2.4		1	10				SAND USED IN [illegible] CHANGED REGULAR [illegible]
6	23-7	524	1.04	40		19	14	10	2 / 3	10	7.0	2		·3			1200	360	2.3		TR					DRILLED TO 524m [illegible] PUMP [illegible]
7	24-7	524			LOGGING/					RUN & CEMENT			9 5/8	CASING												COMP. LOGGING [illegible] NO PROB. RUN &
8	25-7	524								NIPPLE UP BOP'S																CEMENT 9 5/8" CSG N.O.C. NIPPLE UP BOP'S
9	26-7	969	1.06	44		20	14	11	2 / 3	11	7.8	1		·32			16000	250	3		·35					DRILL OUT SHOE & CEMENT LEAK OFF TEST [illegible] TO [illegible]
10	27-7	1040	1.08	45		20	15	10	2 / 4	10.2	6.2	1		·2			15K	550	4.5		·15	15				DRLG AHD. [illegible] MUD UP [illegible]
11	28-7	1092	1.09	44		17	12	10	2 / 3	9.8	6.3	1		·12			13.5K	450	5		TR	15				DRILLING-ANHYDRITE [illegible] NO PROBLEMS
12	29-7	1393	1.10	45		20	14	12	2 / 5	10.5	7.0	1		·2			29K	600	6		·15	15	21			BREAK OVER TO [illegible] POLYMER 1242m.
13	30-7	1441	1.12	45		23	16	14	2 / 4	9.0	6.0	1		·2			28K	600	6		·1	12	20			
14	31-7	1492	1.15	41		21	16	10	2 / 5	9.0	7.1	1		·2			26K	320	6.5		·15	12	19			PROM 1.12 - 1 [illegible]. WEIGHT UP MUD

REMARKS: –

INTERNATIONAL DRILLING FLUIDS

Drilling Fluid Properties Record
WATER BASE

FLUID SYSTEM KCL / POLYMER

WELL NAME BROUGHTON B1 AREA S. HUMBERSIDE
STOCK POINT BRIGG Contractor KENTING
ENGINEERS NEIL REID, KARL BACH, STEVE BARNARD

	DATE	DEPTH	FLUID PROPERTIES																						REMARKS
					RHEOLOGY						FILTRATE			FILTRATE ANALYSIS					RETORT						
									GELS					ALKALINITY											
			WEIGHT	F.V. SEC/QT	SAMPLE TEMP°	A.V. cps	P.V. cps	Y.P. LBS/100 SQ. FT.	0 / 10	pH	API mls	CAKE 32nds	HT HP ° psi	Pf	Mf	Pm	CHLORIDES	☐ TOTAL HARDNESS ☐ CALCIUM	% SOLIDS	% OIL	SAND CONTENT	MBT ppb	POTASH.		
15	2-8	1527	1.14	43		20	15	10	2/4	10	5.4	1		·25			36K	600	6.5		·15	10	19		CUT CORE # 1 (100% RECOVERY)
16	3-8	1569	1.15	41		20	15	10	3/4	9.5	6.2	1		·2			29K	680	6.5		·15	15	21		DRILL TO 1569 TRIP & CUT CORE # 2
17	4-8	1581	1.15	52		36	26	20	5/5	10	5.8	1		·3			30.5	280	6.5		·15	12	21		CUT CORE # 3 - [illegible] CHECK TRIP, RAISE VIS -
18	5-8	1581	1.15	50		36	26	20	5/8	10	5.8	1		·2			29.5	280	6.5		·15	12	20		PRIOR TO [illegible] LOG-WORK RIH & [illegible]
19	6-8	1581	1.14	45		27	20	15	3/5	9.5	6.5	1		·2			29	280	6		·15	12.5	20		FLOW TEST WELL - RIH & DRILL
20	7-8	1629	1.16	44		25.5	19	13	2/4	10	5.8	1		·3			30	520	6.5		·15	12.5	23		DRILL TO 1619 TRIP FOR BIT DRILL TO 1629
21	8-8	1640	1.16	43		22	17	10	2/4	9.5	5.8	1		·2			30	520	6.5		·1	12.5	22		DRILL TO 1624 - [illegible] RIH CUT CORE # 4
22	9-8	1656	1.17	46		23	16	14	3/4	9.5	5.0	1		·2			30	600	6.5		·1	12.5	22		RIH W/BIT DRILL TO [illegible] POOH RIH & CUT CORE # 5
23	10-8	1670	1.16	44		23	17	12	2/6	9.5	5.1	1		·2			29.5	520	6.5		·1	12.5	20		DRILL TO [illegible]
24	11-8	1706	1.17	48		28	21	14	3/4	9	4.4	1		·2			35K	600	6.5		·1	12.5	19		CUT CORE # 6
25	12-8	1766	1.17	46		22.5	17	11	2/4	9	3.9	1		·2			30	600	6.5		·1	15	22		DRILL TO 1766 POOH FOR BIT
26	13-8	1855	1.16	44		23	18	11	2/4	9.5	4.2	1		·2			30	520	6.5		·15	12.5	22		DRILL TO 1855 (HOLE TIGHT FIRST 2 STDS)
27	14-8	1871	1.17	45		22	16	12	2/4	9.5	5.0	1		·2			29	1120	6.5		·15	12.5	22		CUT CORE # 7 (NO CORE) RIH TO FISH
28	15-8	1881	1.17	43		22	17	10	2/4	9	5.5	1		·2			30	600	6.5		·15	12.5	22.		POOH (JUNK IN BASKET) RIH & DRILL.

REMARKS: –

INTERNATIONAL DRILLING FLUIDS

Drilling Mud Properties Record

MUD SYSTEM GEL/CMC

WELL NAME BROUGHTON B1. AREA HUMBERSIDE. U.K.

STOCK POINT BRIGG Contractor KENTING

ENGINEERS NEIL REED, KARL BACH

	DATE	DEPTH	MUD PROPERTIES																					OPERATION REMARKS
				VISCOSITY				GEL					Filtrate Analysis			RETORT								
			WEIGHT	sec/qt	A.V. cps	P.V. cps	Y.P. #/100 sq. ft.	0 / 10	X FLUID LOSS 30 Min cc's	CAKE 32 nds	H.T.H.P cc's	pH	Cl⁻ ppm	Ca⁺⁺ ppm	Pf	% OIL	% SOLIDS	% SAND	BENTONITE #/BBL	POTASH #/BBL	POLYMER #/BBL	"N"	"K"	
	1984	METRES	S.G.																					
1	18/7	46	1·03	90								FRESHWATER					4	BENTONITE				PILLS.		DRILLED PILOT HOLE. OPENING.
2	19/7	46	1·04	50										11					11			11		OPENED HOLE TO 46M. RAN CASING. CEMENTED.
3	20/7	256	1·04+	50	19	12	14	4/14	8	2	–	10·5	1200	360	·8	–	2·3	tr	12·5	–	–	–	–	LOSSES TO FORMATION HALTED WITH 18 SX MICA.
4	21/7	415	1·04	47	21	15	12	3/9	7·5	2	–	10	1300	400	·2	–	2·4	tr	10	–	–	–	–	SHAKER DOWN & REPAIRED. CHANGE SCREENS. MUDCLEANER AS DESILTER. TRIP FOR NEW BIT.
5	22/7	730	1·04	40	19	14	10	2/3	7·5	2	–	10	1200	400	·3	–	2·4	1	10	–	–	–	–	BUND USED IN CIRC. SYSTEM. SCREENS CHANGED. REGULAR SANDTRAP DUMPING
6	23/7	824	1·04	40	19	14	10	2/3	7·0	2	–	10	1200	360	·3	–	2·3	tr		–	–	–	–	DRILLED TO 824 M. POOH. L.C. ~~LOGGING~~ PUMP LCM PILL, LOG TWO RUNS.
7	24/7	824		LOGGING				/	RUN	&	CEMENT			9 5/8	CASING									COMPLETE LOGGING OPERATIONS WIPER TRIP - NO PROBLEMS. RUN &
8	25/7	824						NIPPLE		UP		BOP'S												CEMENT 9 5/8 CASING. WOC. NIPPLE UP BOP'S.
9	26/7	969	1.06	44	20	14	11	2/3	7.8	1	-	11	16800	250	.32	–	3	.35	–	–	–	-	–	DRILL OUT SHOE & CEMENT. LEAK OFF TEST EQUIVALENT TO 1.9 S.G.
10	27/7	1040	1.08	45	20	15	10	2/4	6.2	1	-	10.2	15K	550	.2	–	4.5	.15	15	-	-	-	-	DRILL AHEAD. WEIGHTING MUD UP SLOWLY WITH BENTONITE.
11	28/7	1092	1.09	44	17	12	10	2/3	6.3	1	-	9.8	13.5K	450	.12	-	5	TR	15	-	-	-	-	DRILLING ANHYDRITE. TFB - NO PROBLEMS.
12	29/7	1293	1.10	45	20	14	12	2/5	7.0	1	-	10.5	29K	600	.25	–	6	.15	15	21				BREAK OVER TO KCL/POLYMER 1245m
13	30/7	1441	1.12	48	23	16	14	2/4	6.0	1	–	9.0	28K	600	.12	-	6	.1	12	20				
14	31/7	1492	1.15	41	21	16	10	2/5	7.1	1	–	9.0	26K	320	.12	–	6.5	.15	12	19				WEIGHT UP MUD FROM 1.12 - 1.14

REMARKS:–

INTERNATIONAL DRILLING FLUIDS

Drilling Fluid & Material Consumption Report

MUD SYSTEM GEL/CMC

WELL NAME BROUGHTON 8.1 AREA HUMBERSIDE U.K.

STOCK POINT BRIGG Contractor KENTING 36

ENGINEERS NEIL REED, KARL BACH

DATE	ESTIMATED DAILY MUD VOLUMES M3			MATERIALS ADDED TO CONTROL PROPERTIES																						
						THINNERS			POLYMERS									OTHERS								
1984	LOSSES SUB SURFACE	LOSSES SURFACE	VOLUME MUD BUILT	BARITE	BENTONITE				SS100	FLR	DF VIS	HV CMC	LV CMC	IDFLO		KCl	CAUSTIC	BICARB	MKA	SODA ASH	NUT PLUG	CELLOPHANE	ZN CO3			£ COST
18/7	4	3	26		53												2									346.71
19/7					~~53~~																					
TOTAL	4	3	26		53												2									346.71
20/7	24	14	105		25							13	19				3	14	18							1051.52
21/7	-	49	61		10					6		16	4				4									850.14
22/7	-	-	31		6					14		12	8	4			2			2						1262.44
23/7	20	-	-		11							10	10	6			2		59		15	10				977.52
24/7	-	36	-									1		6												91.04
25/7	9 (BEHIND CASING)						LOGGING /			RUN 9 5/8 CASING / CEMENT NIPPLE UP STACK																-
26/7	-	20	41	•35	10					9				10			2	3		1						845.31
27/7	-	21	-	•15	33					6		13		6		•14	1			7			•6			1227.42
28/7	-	8	30		39												1			2						264.13
29/7	-	45	29	35						6						65	4			6						
30/7																										
FORWARD																										
ESTIMATED TOTALS																										

REMARKS:– • MATERIALS DAMAGED/WRITTEN OFF

INTERNATIONAL DRILLING FLUIDS

Drilling Mud Properties Record

MUD SYSTEM KCL/POLYMER.

WELL NAME BROUGHTON B1 AREA S. HUMBERSIDE

STOCK POINT BRIGG Contractor KENTING

ENGINEERS NIEL REED, KARL BACH, STEVE BARNARD.

y No	DATE	DEPTH	WEIGHT ~~ppg~~ S.G.	VISCOSITY sec/qt	VISCOSITY A.V. cps	VISCOSITY P.V. cps	VISCOSITY Y.P. #/100 sq. ft.	GEL 0 / 10	FLUID LOSS 30 Min cc's	CAKE 32 nds	H.T.H.P cc's	pH	Filtrate Analysis Cl⁻ ppm	Filtrate Analysis Ca⁺⁺ ppm	Filtrate Analysis Pf	RETORT % OIL	RETORT % SOLIDS	% SAND	BENTONITE #/BBL	POTASH #/BBL	POLYMER #/BBL	"N"	"K"	OPERATION REMARKS
15	2/8	1527	1.14	43	20	15	10	2/4	5.14	1	–	10	26K	600	.25	–	6.5	.15	10	19				CUT CORE #1 (100% RECOVERY)
16	3/8	1569	1.15	41	20	15	10	3/4	6.2	1	–	9.5	28K	680	.2	–	6.5	.15	15	21				DRILL TO 1569 TRIP & CUT CORE #2
17	4/8	1581	1.15	52	36	26	20	5/8	5.8	1	–	10	28.5	280	.3	*	6.5	.15	12	21				CUT CORE #3 - MAKE CHECK TRIP RAISE VIS PRIOR TO ~~DST~~ LOGING
18	5/8	1581	1.15	50	36	26	20	5/8	5.8	1	–	10	28.5	280	.3	*	6.5	.15	12	20				LOG WELL RIH & DST
19	6/8	1581	1.14	45	27	20	15	3/5	6.5	1	–	9.5	28	280	.2	1	6	.15	12.5	20				FLOW TEST WELL – RIH & DRILL.
20	7/8	1628	1.16	44	25.5	19	13	2/4	5.8	1	–	10	32	520	.3.	1	6.5	.15	12.5	23				DRILL TO 1619 TRIP FOR BIT DRILL TO 1628
21	8/8	1640	1.16	43	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	–	9.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.1	12.5	22				[illegible] RIH CUT CORE # 4
22	9/8	1656	1.16	46	22	16	14	3/4	[illegible]	[illegible]	–	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible] 1656 [illegible] CORE # 5
23	10/8	1670	1.17	44	[illegible]	17	12	2/6	5.1	1	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.5	20				DRILL TO [illegible]
24	11/8	1706	1.16	48	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	–	[illegible]	[illegible]	[illegible]	.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]
25	12/8	1766	1.17	46	[illegible]	17	11	2/4	[illegible]	1	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22				[illegible] 1761 [illegible] BIT
26	[illegible]	1855	1.16	44	[illegible]	[illegible]	11	2/4	[illegible]	1	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21				[illegible]
[illegible]	14/8	1871	1.17	[illegible]	22	[illegible]	12	2/4	[illegible]	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	22				[illegible]
28	15/8	1881	1.17	43	[illegible]	[illegible]	[illegible]	2/4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]				[illegible]

REMARKS:–

INTERNATIONAL DRILLING FLUIDS

Drilling Fluid & Material Consumption Report

WELL NAME BROUGHTON B1 AREA HUMBERSIDE

STOCK POINT BRIGG Contractor KENTING

FLUID SYSTEM KCL / POLYMER

ENGINEERS NEIL REED, KARL BACH, STEVE BARNARD

D. N	DATE	ESTIMATED DAILY MUD VOLUMES			MATERIALS ADDED TO CONTROL PROPERTIES																							
		LOSSES SUB SURFACE	LOSSES SURFACE	VOLUME MUD BUILT	BARITE	BENTONITE	FLR 100	CMC	IDFLO	KCL	CAUSTIC	S. ASH	SC ARB	MICA F.													
15	2-8	4	1		75		2	3	10		2	2	1	2													
16	3-8		5		20	20	2			15	2																
17	4-8		15		15		9		4		1	3															
18	5-8	←	NON	USED	→																						
19	6-8		13		5		4			8	2																
20	7-8	2		150	20		6		14	145	1	3															
21	8-8		3		15																						
22	9-8	2		10	27		3		20																		
23	10-8	2	1	20	20																						
24	11-8	1	10	10	15		6																				
25	12-8		1		15					20																	
26	13-8	4	10	30	17		3				2																
27	14-8	7	140		6						2																
28	15-8				25		3																				
FORWARD																											
ESTIMATED TOTALS																											

REMARKS:-

INTERNATIONAL DRILLING FLUIDS

Drilling Fluid & Material Consumption Report

MUD SYSTEM ~~GEL/CMC~~ – KCL/POLYMER

WELL NAME BROUGHTON B1 AREA HUMBERSIDE

STOCK POINT BRIGG Contractor KENTING

ENGINEERS NEIL REED, KARL BACH, STEVE BARNARD

DATE	ESTIMATED DAILY MUD VOLUMES			MATERIALS ADDED TO CONTROL PROPERTIES																						
						THINNERS			POLYMERS									OTHERS								
	LOSSES SUB SURFACE	LOSSES SURFACE	VOLUME MUD BUILT	BARITE	BENTONITE				SS100	FLR100	DF VIS	CMC	IDFLO			KC1	CAUSTIC	S.ASH	BICARB	MICA F						
15 2/8	4	1	–	75						2		3	10				2	2	1	2						
16 3/8		5		20	20					2						15	2									
17 4/8		15		15						8			4				1	3								
18 5/8	← NONE USED →																									
19 6/8		13		5						4						8	2									
20 7/8	2		150	20						6			14			45	1	3								
21 8/8		3		15																						
22 9/8	2		10	27						2			20													
23 10/8	2	1	20	20																						
24 11/8	1	10	10	15																						
25 12/8		1		15												20										
26 13/8	4	10	20	17						2							2									
27 14/8	7	140		6													2									
27 15/8				[illegible]						2																
FORWARD																										
ESTIMATED TOTALS																										

REMARKS:–

VIII Casing/Cement Record

SUMMARY OF BROUGHTON B-1 CEMENTING OPERATIONS:

13$\frac{3}{8}$" CEMENTATION:

This job went well, an excess of 100% over open-hole volume was pumped and the cement was displaced to within one joint of bottom. There were cement returns to surface; all surface returns were pumped out of the cellar and into the bund using the Sykes vacuum pump. This pump did not work very well and did not appear to like pumping rocks and gravel; it would be advisable, where possible, to use the cellar jet to clear the cellar out after running surface casing.

Waiting-on-cement time for the operation was 8$\frac{1}{4}$ hrs.

9$\frac{5}{8}$" CEMENTATION:

An excess of 20% over the integrated caliper volume was pumped for this job. The float cellar was positioned 2 joints above the float shoe.

The job was carried out according to plan; a temporary loss of returns (approximately 10 Bbls) was experienced during mixing and pumping of the Thixotropic Tail slurry. However normal circulation was regained and the job was completed with returns to surface.

Waiting on cement time was 16 hrs; samples of both the lead and the tail slurries were very slow to harden. When the BOP's were lifted; it was found that the cement level had dropped. A top-up job was carried out a day later using $\frac{3}{4}$" tubing (incidentally, this tubing could not be rammed further then 60 ft down the annulus; this may have been T.O.C. or it may have been a casing collar). The top up job was not very successful as the casing was moving around with all the motion of drilling at the time that it was carried out.

5$\frac{1}{2}$" CEMENTATION

Caliper volumes were used to calculate the quantity of cement required for this job. The cement programme was changed shortly before the job to involve using the heavier 1.63 SG extended lead slurry.

The job appeared to go smoothly until the displacement stage when circulation was lost never to be regained. A total of 130 Bbls was lost. Because a cased-hole DST was intended the success (or otherwise) of the cement job had to be establised; a CBL was carried out and it showed that there was little or no cement above 1100 m and the cement, there was, below that was very poor.

The casing was perforated at 1845 m in order to carry out remedial work, however injectivity and dry testing indicated a perfect seal across this point so no remedial work was required. The recommendation for the future would be to use a lower weight (1.38 SG) lead slurry or, if necessary, Thixotropic cement.

CASING AND CEMENTING.

WELL No. BROUGHTON B-1

CASING SIZE	13⅜"	9⅝"	5½"				
Weight (lb/ft)	68	36	17				
Type of Casing	BUTTRESS J55	BUTTRESS J55	BUTTRESS J55				
Number of Joints	3 + PUP	67	167				
Shoe Depth (m BRT)	45	821	1920				
D.V./Hanger Depth	-						

CEMENTING (SLURRY VOLUMES)							
Spacer/pre flush (bbls)							
S.G.							
Additives (gal/sk)							
Top of Cement (Annuli)	CELLAR FLOOR (F)	?	?				
1st STAGE (bbls)	36.6	105	183				
Type of Cement	NEAT G	EXTENDED G	EXTENDED G				
S.G.	1.9	1.38	1.63				
Additives (gal/sk)	D77 @0.88	D75 @ 0.6 D75 @0.37	D75@0.3 D77@0.37 D81@0.05				
TAIL IN (bbls)		90	130				
Type of Cement		THIXO G	G NEAT				
S.G		1.78	1.90				
Additives (gal/sk)		D111@0.8 D77@0.57	D81@0.04 D80@0.2				
2nd STAGE (bbls)							
Type of Cement							
S.G.							
Additives (gal/sk)							
TAIL IN (bbls)							
Type of Cement							
S.G.							
Additives (gal/sk)							
Displacement (bbls)							

7/84

E/DR/84/22

IX Bit Record

BP BIT RECORD — AREA: UK LAND — Page 1 of 1

WELL NO.	BROUGHTON B-1	RIG RATE £/HR	405
PUMP MAKE/TYPE	8-P-80		
RIG	KENTING 36E	TRIP TIME/1000m	4.516
OPERATOR	BP		

	Run Number	1	2	3	4	5	6	7	8	9	10
	Bit Number	1	2RR	1RR	3	4	5	6	7	7RR	8
BIT DESCRIPTION	Size (inches)	12¼"	17½"	12¼"	12¼"	8½"	8½"	8½"	8½"	8½"	8½"
	Make	HTC	HTC	HTC	HTC	HTC	HTC	HTC	CHR	CHR	HTC
	Type	X3A	R1J	X3A	X1G	X1G	X1G	J22	C22	C22	X1G
	Serial No.	119403	369GR	119403	111134	855RF	963RF	154VS	116493	116493	861NF
	IADC Code	1-1-4	1-1-4	1-1-4	1-3-4	1-3-4	1-3-4	5-1-7			1-3-4
	Bear. (R) (J)							J			
	Lub. (S) (N)							S			
	Weight on Bit (k lbs)	0-15	0-15	15	15	30	30	30/35	18	18	30/35
	R.P.M.	120	120	120	120	100	100	70/80	60	60	80/100
	Depth Out (m)	46	46	409	829	973	1067	1492	1510	1528	1568
PERFORMANCE	Hours (rot. only)	2½	2	24	26¼	20¼	35	45¾	6	8¾	5¼
	Metres	46	27	363	415	179	94	425	18	18	40
	R.O.P. (m/hr)	18.4	13.5	15	16	8.8	2.68	9.3	3	2.0	7.6
	Teeth Cone	1	-	2	8	5	5				
	Teeth Row							3	-	5%	2
	Teeth Wear										
	Bearing Seal	1	-	2	8	4	3			WORN	
	Bearing Clearance							4	-		2
	Bearing Wear										
	Cost/m (£)	-		32	32	61	182	55			
	Broken Teeth/Inserts %	-	-	-	-	3 on lead 1 on no.3	-	1BI	-	-	-
	Gauge (ins)	I		I	⅛"	I	I	1/16	-	-	I
HYDRAULICS	% HHP Bit/HHP/in²			68	57						76
	Nozzles 1	16		13	14	10	10	12			12
	Nozzles 2	16		13	14	10	10	12			12
	Nozzles 3	16		14	14	10	10	B1			B1
	Nozzles 4										
	Flow Rate (G.P.M.)	406		474	474	210	250	254	254	254	254
	Pump Pressure (PSI)	500		1500	1500	850	1200	1400	600	600	1400
	Overbalance (PSI)										
	Pore Pressure (S.G.)										
MUD	Mud Type	WATER		BENTON	BENTON	BENTON	BENTON	KCL POLYMER	KCL POLYMER	KCL POLYMER	KCL POLYMER
	Mud Weight (S.G.)	-		1.04	1.04	1.05	1.09	1.14	1.14	1.14	1.14
	P.V. (cp)			15	14	14	12	16	15	15	17
	Y.P. (100 lbs/ft²)			12	10	11	10	10	10	10	10
	Solids %			2	2	3	5	6.5	6.5	6.5	6.5
	Sand %						TR	.15	.15	.15	.15
	Lithology	LST		LST MDST	SST TR MDST SLTST	SLTST MDST LST	ANHYDRITE	ANHYDRITE MDST	SST MDST	SST MDST	MDST SST
	Completed By	DJH	DJH	DJH	DJH	DJH	DJH	FMA	FMA	FMA	FMA
	Comments Hours do not include trip or connection time.	BIT USED TO SPUD IN	OPENED SURFACE HOLE	DRILLED MDST	DRILLED SHERWOOD SDST	DRILLED SHOE TRACK & NEW FORMATION	PULLED OWING TO LONG HOURS	PULLED FOR CORING PT	CUT CORE NO. 1	CUT CORE NO. 2	PULLED FOR CORING PT

BP BIT RECORD	AREA: UK LAND	Page .2. of .3.

WELL NO.	BROUGHTON B-1	RIG RATE £/HR	405	PUMP MAKE/TYPE	NATIONAL 8-P-80
RIG	KENTING 36E	TRIP TIME/1000m	4.516	OPERATOR	BP

	Run Number	11	12	13	14	15	16	17	18	19	20
	Bit Number	7RR	8RR	8RR	9	7RR	10	11	10RR	11RR	10RR
BIT DESCRIPTION	Size (inches)	8½	8½	8½	8½	8½	8½	8½	8½	8½	8½
	Make	CHR	HTC	HTC	HTC	CHR	SMITHS	CHR	SMITHS	CHR	SMITHS
	Type	C22	XIG	XIG	XIG	C22	SVH	C22	SVH	C22	SVH
	Serial No.	116493	861NF	861NF	897RF	116493	XD2957	154125	XD2957	154125	XD2957
	IADC Code		1-3-4	1-3-4	1-3-4		2-1-5		2-1-5		2-1-5
	Bear. (R) (J)										
	Lub. (S) (N)										
	Weight on Bit (k lbs)	18	5/10	30	30	18	30	18	30	18	30
	R.P.M.	60	50/60	80/90	80/90	60	100	60/70	100	70	100
	Depth Out (m)	1578	1580	1620	1620	1643	1656.5	1657.95	1660.51	1685.51	1761
PERFORMANCE	Hours (rot. only)	7½	¾ (6)	11 (17)	1½	16⅛(33¼)	3	5¼	1¼(4¼)	14½(19¾)	20¼(24½)
	Metres	10	2 (42)	40 (82)	8	14 (54)	13.5	1.45	9.51(23.0)	18(19.4)	76 (99)
	R.O.P. (m/hr)	1.33	2.7	3.6	5.3	1.16	1.16	0.28	7.6	1.24	3.75
	Teeth Cone				2	25%					
	Teeth Row		2	6			2	5%	2	5%	8
	Teeth Wear										
	Bearing Seal				1	100 RR					
	Bearing Clearance		2	5			1		1	10%	8
	Bearing Wear										
	Cost/m (£)		-	132							152
	Broken Teeth/Inserts %										
	Gauge (ins)	I	I	1/16	I	1/16	I	I	I		¼
HYDRAULICS	% HHP Bit/HHP/in²			84	84		79		79		76
	Nozzles		12 12	12 12	12 12		12 12		12 12		12 12
	1 2 3 4		BI	B1	B1		B1		B1		B1
	Flow Rate (G.P.M.)	254	-	254	254	254	254	254	254	254	254
	Pump Pressure (PSI)	600	-	1400	1400	650	1500	650	1506	700	1550
	Overbalance (PSI)										
	Pore Pressure (S.G.)										
MUD	Mud Type	KCL POLYMER		KCL POLYMER	KCL POLYMER	KCL POLYMER	KCL POLYMER	KCL POLYMER	KCL POLYMER	KCL POLYMER	KCL POLYMER
	Mud Weight (S.G.)	1.15	-	1.15/1.16	1.16	1.16	1.16	1.16	1.17	1.17	1.17
	P.V. (cp)	26	-	22	19	16	16	17	17	17	17
	Y.P. (100 lbs/ft²)	20	-	17	13	10	10	13	13	16	11
	Solids %	6.5	-	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
	Sand %	.15	-	0.15	0.15	0.1	0.1	0.1	0.1	0.15	0.15
	Lithology	MDST & SST	MDST	MDST	MDST SST	FM SST FM MDST	MDST SST	MDST SST	MDST SST	MDST SST MDST	MDST/SST
	Completed By	FMA	FMA	DJH	DJH	DJH	DJH	DJH	DJH	DJH	DJH
	Comments Hours do not include trip or connection time.	CORE	WIPER TRIP DRILLED 2 m IN ERROR		PULLED TO CORE	CORE 4	PULLED TO CORE	JAMMED BY 1 m OF SHALE CORE 5	PULLED TO CORE	CORE 6	

BP BIT RECORD   AREA: UK LAND   Page 3. of 3.

WELL NO.	BROUGHTON B1	RIG RATE £/HR	405	PUMP MAKE/TYPE	NATIONAL 8-P-80
RIG	KENTING 36E	TRIP TIME/1000m	4.516	OPERATOR	BP

	Run Number	21	22	23	24	25	26	27	28		
	Bit Number	12	11RR	13	14	15	16	9RR	9RR		
BIT DESCRIPTION	Size (inches)	8½"	8½"	8½"	8½"	8½"	8½"	8½"	1		
	Make	HTC	CHE	SMITH	SMITH	HTC	HTC	HTC	SAME		
	Type	C22	C22	SVH	SVH	J7	W7R2J	XIG	1		
	Serial No.	310LK	154125	XB1956	XB2955	523FK	90856	897RF			
	IADC Code	5-1-7		7-1-5	2-1-5	3-1-7	3-2-1	1-3-4			
	Bear. (R) (J) / Lub. (S) (N)										
	Weight on Bit (K lbs)	30	18	30`	35	37	37	-			
	R.P.M.	65	60	100	100	80	120	-			
	Depth Out (m)	1855	1861.5	1872	1876	1898	1970	1920			
PERFORMANCE	Hours (rot. only)	18½	6(25½)	11	3	20	9¾	-(1½)			
	Metres	94	3¾(23½)	6¼	4	22	22	-(8)			
	R.O.P. (m/hr)	5	1.6	1.76	1.33	1.1	2.25				
	Teeth: Cone / Row / Wear	2		8	8	6	2	2			
	Bearing: Seal / Clearance / Wear	2	10%	4	2	2	7	1			
	Cost/m (£)	137		1444	1448	546	345				
	Broken Teeth/Inserts %										
	Gauge (ins)	I	I	1/8	1/16	1/32	I	I			
HYDRAULICS	% HHP Bit/HHP/in^2	79		79	79	79	65				
	Nozzles 1 2 3 4	17 17 BL		12 12 BL	12 12 BL	12 12 BL	11 11 11	14 14 14			
	Flow Rate (G.P.M.)	254	254	254	254	254	254	254			
	Pump Pressure (PSI)	1500	700	1500	1500	1500	1150	850			
	Overbalance (PSI)										
	Pore Pressure (S.G.)										
MUD	Mud Type	KCL POLY	KCL PLOY	KCL POLY	KCL POLY	KCL POLY	KCL POLY	KCL POLY			
	Mud Weight (S.G.)	1.16	1.16	1.17	1.17	1.16	1.17	1.19			
	P.V. (cp)	15	15	17	17	19	70	16			
	Y.P. (100 lbs/ft2)	10	10	11	11	15	11	11			
	Solids %	6.5	0.5	6.5	6.5	6.0	6.5	6.5			
	Sand %	0.15	0.15	0.15	0.15	0.15	0.15	0.15			
	Lithology	MDST SST	SST 0.6 m MDST		MDST PYRITE	MDST LST	LST	-			
	Completed By	DJH	DJH	DJH	DJH	DJH	DJH				
	Comments Hours do not include trip or connection time.	PULLED TO CUT CORE 7	PULLED OWING TO V. SLOW R.O.P. IN MDST	DRILLING ON JUNK (CORE CATCHER)	SLOWED UP BY PYRITE	PYRITE FOLLOWED BY HARD MUDSTONE	DRILLED TO T.D. BEARINGS WERE SLACK AT START	WIPER TRIP	NO. OF WIPER TRIPS		

X Bottom Hole Assembly Record

WELL Nº :

BOTTOM HOLE ASSEMBLY RECORD

HOLE SIZE	BOTTOM HOLE ASSEMBLY	DEPTH IN - OUT	COMMENTS
1	B/NBS/8"DC/SS/8"DC/SS/8"DC	Surface - 46	12¼ Pilot Hole
2	As above	Surface - 46	17½ Hole Opening
3	B/NBS/2x8"DC/SS/8"DC/SS/3x8"DC/X-O/10x6½ DC/x-O/J/x-O/2x6½DC/x-O/HWDP	46 - 409	12¼
4	B/BS/2x8"DC/SS/8"DC/SS/3x8"DC/X-O/10x6½ DC/X-O/J/X-O/2x6½DC/X-O/12xHWDP/H.S.	409 - 824	12¼
5	B/BS/1x6½DC/SS/6½DC/SS/6½DC/SS/10x6½DC-J/2x6½DC/X-O/12xHWDP/H.S.	824 - 973	8½
6	As above 5	973 - 1067	8½
7	As above 5	1067 - 1492	8½
8	CB/X-O/13x6½DC/J/2x6½DC/X-O/12xHWDP/H.S.	1492 - 1510	Core 1
9	CB/CIRC SUB/X-O/13x6½DC/J/2x6½DC/X-O/12xHWDP/H.S.	1510 - 1528	Core 2
10	B/BS/6½DC/SS/6½DC/SS/6½DC/SS/10x6½DC/J/2x6½DC/X-O/12xHWDP/H.S.	1528 - 1569	8½
11	CB/CIRC SUB/X-O/13x6½DC/J/2x6½DC/X-O/12xHWDP/H.S.	1568 - 1578	Core 3
12	B/BS/6½DC/SS/6½DC/SS/6½DC/SS/10x6½DC/J/2x6½DC/X-O/12xHWDP/H.S.	WIPER TRIP (1580)	DRILLED 2m IN ERROR
13	As bit run no. 12	1580 - 1620	POH for bit
14	Ditto - "Drilling BHA 30.60.90"	1620 - 1628	POH to Core
15	CB/CIRC SUB/X/O/DC/STAB/DC/STAB/DC/STAB/DC/STAB/10x6½"DC/JAR/X/O/2x6½"DC/X/O/12x4½"HWDP/HYDRIL SUB (Casing BHA with stabilizers)	1628 - 1693	Core 4 (left stabilizers in BHA)
16	Drilling BHA 30-60-90	1643 - 1656.5	Pulled to core
17	"Coring BHA with stabilizers"	1656.5 - 1651.95	Jammed core
18	"Drilling BHA 30-60-90"	1657.95 - 1667.51	Gauged stabilizers on RIH-1/16, 1/16,1/32
19	"Coring BHA with stabilizers"	1667.51 - 1685.51	Core 6
20	"Drilling BHA 30-60-90"	1685.51 - 1761	

WELL Nº :

BOTTOM HOLE ASSEMBLY RECORD

HOLE SIZE	BOTTOM HOLE ASSEMBLY	DEPTH IN -OUT	COMMENTS
21	Bit/Junk sub/Bit sub/"30-60-90"	1761 - 1855	Ran junk sub to fish gauge inserts from previous bit.
22	"Coring BHA with stabilizers"	1855 - 1861.5	Dropped core and catcher.
23	Bit/Junk sub/"Drilling BHA 30-60-90"	1861.5 - 1872	Fished & cleared junk.
24	Same	1872 - 1876	Fished & drilled formation containing pyrite.
25	"Drilling BHA 30-60-90"	1876 - 1898	Hard formation pyrite
26	Same	1898 - 1920	Limestone to TD

XI Formation Leak-Off Test Results

FORMATION LEAK-OFF TEST RESULTS

Well Nº : **BROUGHTON B1**

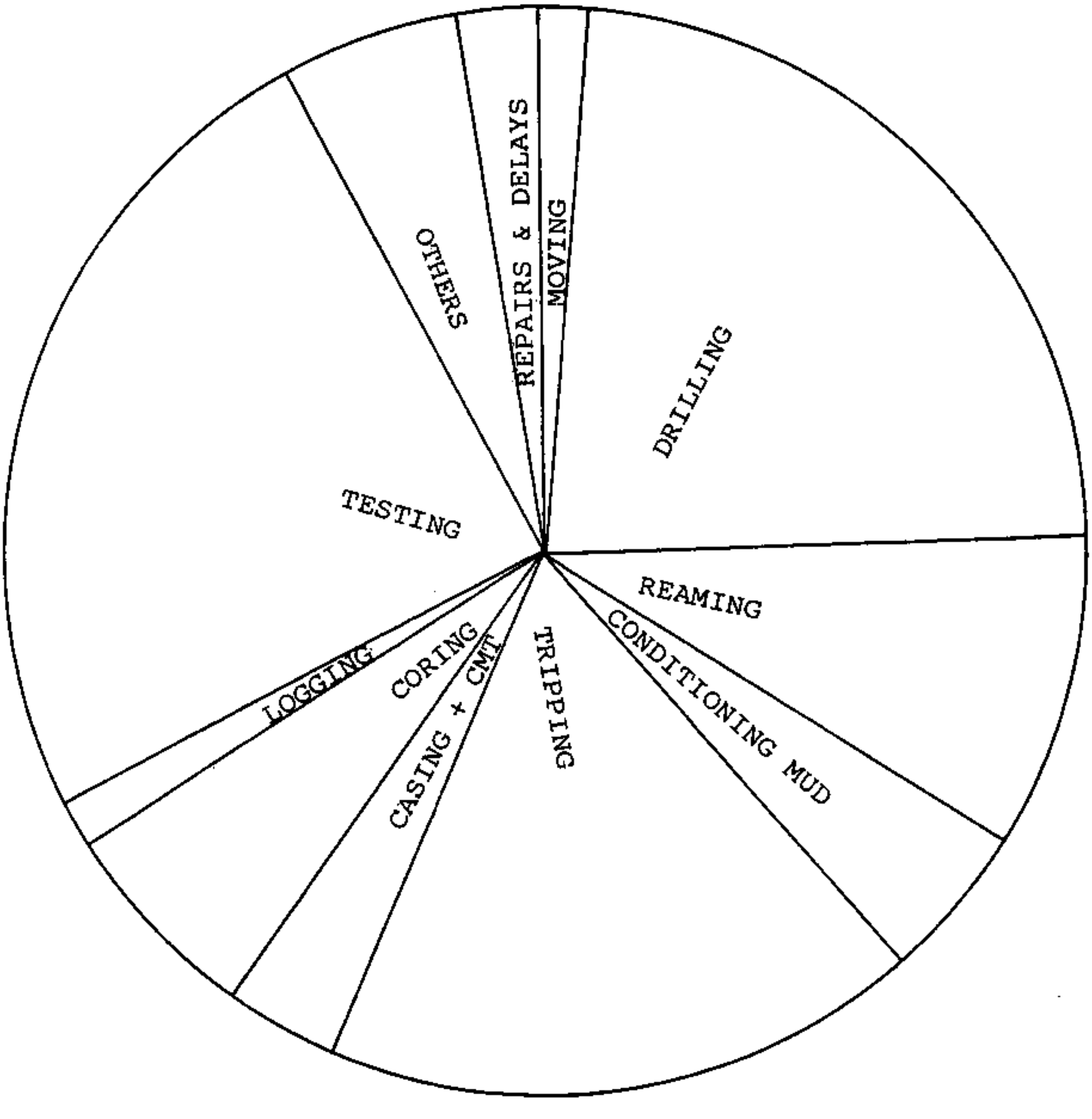
TEST NUMBER	1	2	3	4
DATE	26.7.84			
DEPTH (m T.V.D. B.R.T.)	826			
CASING SIZE (inches)	$9\frac{5}{8}$"			
SHOE DEPTH (m B.R.T.)	821			
SURFACE PRESSURE psi	1100			
MUD WEIGHT S.G.	1.04			
LEAK OFF PRESSURE psi	2320			
GRADIENT TO R.T. psi / ft	0.86			
MAXIMUM MUD WEIGHT S.G.	1.98			

XII Well Time Analysis

BROUGHTON B1 TIME ANALYSIS

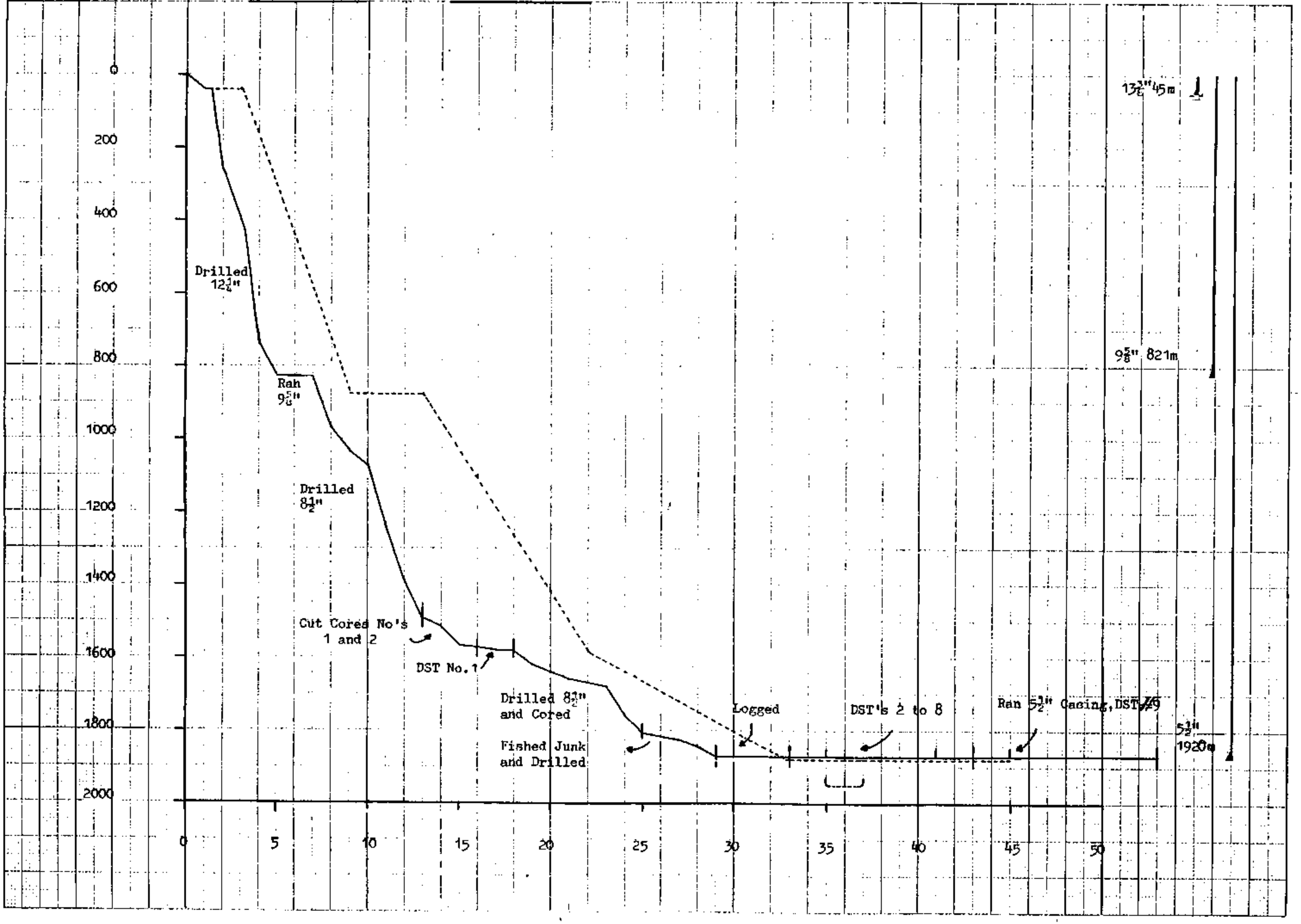
OPERATION	CUMULATIVE TOTAL (HRS)	PERCENTAGE OF TOTAL
MOVE/PREPARE TO SPUD	14½	1.12
DRILLING	307	23.66
REAMING	123	9.48
CONDITION MUD/HOLE	62¼	4.80
TRIPPING	229¼	17.67
RIG SERVICE	10¼	0.79
DEVIATION SURVEY	8	0.62
BOP's NIPPLE UP/DOWN	21¾	1.68
BOP TESTS	11½	0.88
BLOCKLINE	2¾	0.21
CORING	78¾	6.07
LOGGING	18¾	1.45
CASING	41¾	3.22
WAIT ON CEMENT	10¾	0.83
LEAK-OFF TESTS	1	0.08
D.S.T.	372¾	24.87
COMPLETION	1	0.08
REPAIRS	2¾	0.21
DELAYS AND MISC	(29¾)	2.29
	1252	100.00

BROUGHTON - B-1 TIME ANALYSIS PIE CHART



XIII Time VS Depth Plot

BROUGHTON B - 1 TIME - DEPTH CURVE



XIV Coring/Perforation Records

CORING RECORD

Well No. BROUGHTON B1

CORE No.	DATE	COREHEAD	INTERVAL	m	HOURS	R.O.P.	RECOVERY		BARREL LENGTH	COMMENTS
							m	%		
1	1.8.84	C22 (116493)	1492 m - 1510 m	18 m	8¾	2.06m/hr	18	?	18	
2A	1/2.8.84	C22 (116493)	1510 m - 1528 m	18 m	8½	2.12m/hr	18	?	18	
3	3.8.84	C22 (116493)	1568.57 m - 1578.22 m	9.65 m	7½	1.29m/hr	9.65		18	
4	7/8.8.84	C22 (116493)	1629.28 m - 1643 m	13.72 m	16¼	1.18m/hr	13.72	100	18	
5	9.8.84	C22 (154125)	1656.5 m - 1658.25 m	1.75 m	5¼	0.28	1.62	92	18	0.6 m shale (upper section of core) had a longitudinal fracture which appeared to form a wedge and jam the core.
6	10.8.84	C22 (154125)	1667.51 m - 1685.51 m	18 m	14½	1.24m/hr	18	100	18	
7	13.8.84	C22 (154125)	1855 m - 1861.5 m	6.5 m	6	1.08m/hr	0	0	18	ROP through approx 6m SST was 2m/hr - very slow through last 0.5m MDST however. On POH - found that both core and catcher had been lost.

NORTON CHRISTENSEN Drilling Products

CORING REPORT

OPERATOR:	B.P.
RIG:	Kenting Rig 36
WELL:	Broughton 1
DATE:	1.8.84 - 13.8.84

CORE NO. 1: 1492m - 1510m

Interval Cored:	18m
Interval Recovered:	18m (100% Recovery)
Bit:	Norton Christensen C22 Serial No.116493
Penetration Rate:	18m in 6 hours = 3m/hr
Formation Description:	-
Footage on Bit:	18m
Operating Parameter:	60 RPM; 252 GPM; 18 k.lb

CORE NO. 2: 1510m - 1528m

Interval Cored:	18m
Interval Recovered:	18m (100% Recovery)
Bit:	Norton Christensen C22 Serial No. 116493
Penetration Rate:	18m in 8.5 hours = 2.1m/hr
Formation Description:	-
Footage on Bit:	36m
Operating Parameter:	60 RPM; 252 GPM; 18 k.lb

CORE NO. 3: 1568.5m - 1578.5m

Interval Cored:	10m
Interval Recovered:	10m (100% Recovery)
Bit:	Norton Christensen C22 Serial No.116493
Penetration Rate:	10m in 7.5 hours = 1.3m/hr
Formation Description:	-
Footage on Bit:	46m
Operating Parameter:	60 RPM; 250 GPM; 18 k.lb

CORE NO. 4: 1629.3m - 1643.5m

Interval Cored: 14.2m
Interval Recovered: 14.1m (99% Recovery)
Bit: Norton Christensen C22 Serial No.116493
Penetration Rate: 14.2m in 15.47 hours = 0.92m/hr
Formation Description: -
Footage on Bit: 60.2m
Operating Parameter: 60 RPM; 250 GPM; 18 k.lb

CORE NO. 5: 1656.5m - 1658.25m

Interval Cored: 1.75m
Interval Recovered: 1.74m (99% Recovery)
Bit: Norton Christensen C22 Serial No. 1431121
Penetration Rate: 1.75m in 4 hours = 0.44m/hr
Formation Description: -
Footage on Bit: 1.75m
Operating Parameter: 60-100 RPM; 250 GPM; 18 k.lb

CORE NO. 6: 1667m - 1685.5m

Interval Cored: 18m
Interval Recovered: 18m (100% Recovery)
Bit: Norton Christensen C22 Serial No.1431121
Penetration Rate: 18m in 15 hours = 1.2m/hr
Formation Description: -
Footage on Bit: 19.75m
Operating Parameter: 60 RPM; 250 GPM; 18 k.lb

CORE NO. 7: 1855m - 1861.5m

Interval Cored: 6.5m
Interval Recovered: O
Bit: Norton Christensen C22 Serial No.1431121
Penetration Rate: 6.5m in 2.5 hours = 2.6m/hr
Formation Description: -
Footage on Bit: 26.35m
Operating Parameter: 60 RPM; 250 GPM; 18 k.lb

NORTON CHRISTENSEN
Drilling Products

CORE HEAD PERFORMANCE

1. Norton Christensen C22
Serial No. 116493

Size: 8½" x 4"
Total Footage Cored: 60.2m
Total Footage Recovered: 60.1m
Percentage Recovery: 100%
Average R.O.P.: 1.6m/hour
Condition: 85% worn

2. Norton Christensen C22
Serial No. 1431121

Size: 8½" x 4"
Total Footage Cored: 26.35m
Total Footage Recovered: 19.75m
Percentage Recovery: 75%
Average R.O.P.: 1.2m/hr.
Condition: -

NORTON CHRISTENSEN Drilling Products

KIRKHILL ROAD / KIRKHILL INDUSTRIAL ESTATE / DYCE / ABERDEEN AB2 0ES
PHONE: (0224) 72-2555 (4 lines) / TELEX: 73385

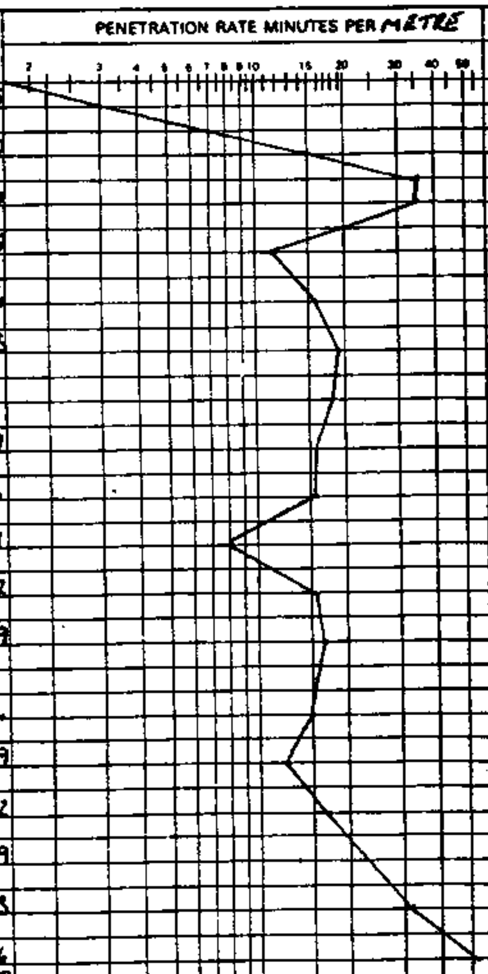
CORING LOG

CORE NO:- ONE

Service Engineer TOM GREIG
Company B.P.
Contractor KENTINGS RIG # 36
Block/Well No. BROUGHTON # 1
Field .... Location ....
Hole Size 8½
Formation Name ....
Formation Type ....
Mud-Wt. 1·15 Mud Type .... Vis. 41

Date 1st AUGUST, 1984
C/B Size 6¾" 4 Length 19·9m
Bit No. 116493
Size 8½" 4 Type C 22
Previous footage on bit RE-RUN
This core 18m
Total footage on bit ....
Bit Cond. Before .... After ....
Pump Pressure 600 Liner Size 5½" 8½" Strokes 97 Hole Angle ....

Rotating time 6HRS R.O.P. 3m/hr
Interval Cored– Finish 1510
– Start 1492
Footage Cored 18 METRES
Core Recovery 18m
% Recovery 100%
Comments:- ....



NO. METRES CORED		NO. FEET CORED	INTERVAL	TIME	OPERATING CONDITIONS				TORQUE
					PSI	WEIGHT	ROTATING RPM	FLUID GPM	
0	0	0	1492	5·45	560	5000	45	252	
0.25	0.2	1	92·5						
0.50	0.4	2	93	6·00	600	18,000	60	··	
0.75	0.6	3	93·5						
1.00	0.8	4	94	·36					
1.25	1.0	5	94·5						
1.50	1.2	6	95	·49					
1.75	1.4	7	95·5						
2.00	1.6	8	96	7·04					
	1.8	9	96·5						
	2.0	10	97	·23					
2.75	2.2	11	97·5						
3.00	2.4	12	98	·41					
3.25	2.6	13	98·5						
3.50	2.8	14	99	57					
3.75	3.0	15	99·5						
4.00	3.2	16	1500	8·13					
4.25	3.4	17	1500·5						
4.50	3.6	18	01	·21	700	18,000	60	252	
4.75	3.8	19	01·5						
5.00	4.0	20	02	·52					
5.25	4.2	21	02·5						
5.50	4.4	22	03	9·09					
5.75	4.6	23	3·5						
6.00	4.8	24	04						
6.25	5.0	25	4·5	·24					
6.50	5.2	26	05						
6.75	5.4	27	5·5	·39					
7.00	5.6	28	06						
7.25	5.8	29	6·5	·52					
7.50	6.0	30	07						
7.75	6.2	31	7·5	10·09					
8.00	6.4	32	08						
8.25	6.6	33	8·5	·23					
	6.8	34	09						
	7.0	35	09·5	56					
9.00	7.2	36	1510	11·49					
9.25	7.4	37							
9.50	7.6	38							
9.75	7.8	39							
10.00	8.0	40							
10.25	8.2	41							
10.50	8.4	42							
10.75	8.6	43							
11.00	8.8	44							
11.25	9.0	45							
11.50	9.2	46							
11.75	9.4	47							
12.00	9.6	48							
12.25	9.8	49							
12.50	10.0	50							
12.75	10.2	51							
13.00	10.4	52							
13.25	10.6	53							
13.50	10.8	54							
13.75	11.0	55							
14.00	11.2	56							
14.25	11.4	57							
14.50	11.6	58							
14.75	11.8	59							
15.00	12.0	60							

CORING LOG

NORTON CHRISTENSEN Drilling Products

KIRKHILL ROAD / KIRKHILL INDUSTRIAL ESTATE / DYCE / ABERDEEN AB2 0ES
PHONE: (0224) 72-2555 (4 lines) / TELEX: 73365

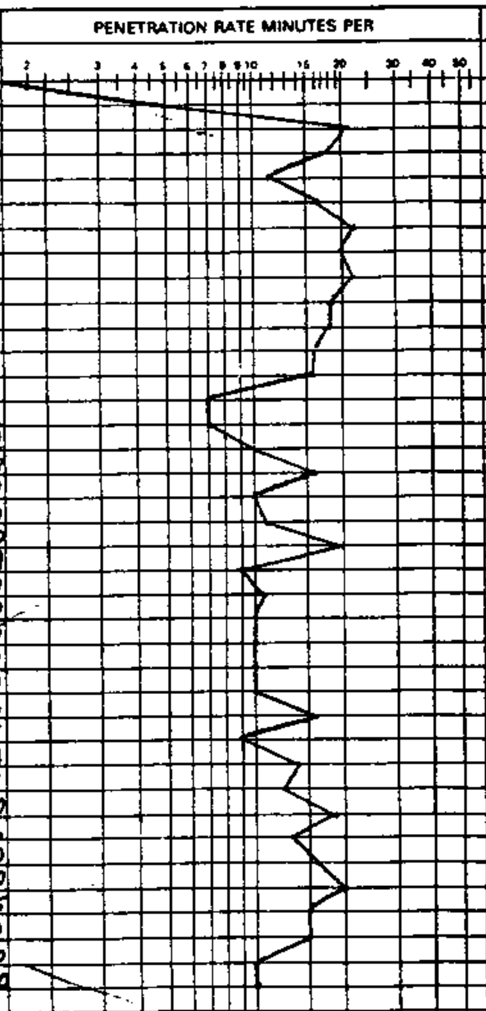
CORE NO:- TWO

Service Engineer TOM GREIS
Company B.P.
Contractor KENTING RIG # 36
Block/Well No. BROUGHTON # 1
Field .... Location ....
Hole Size 8½
Formation Name ....
Formation Type ....
Mud-Wt. 1·15 Mud Type .... Vis. 41

Date 2ND AUGUST, 1984
C/B Size 6¾" L Length 19·9M
Bit No. 116493
Size 8½ · 4 Type C22
Previous footage on bit RE-RUN
This core 18M
Total footage on bit ....
Bit Cond. Before .... After 15%
Pump Pressure 680 Liner Size 5½ · 8½ Strokes 100 Hole Angle ....

Rotating time 8½ HR. O.P. 2·1m/HR
Interval Cored- Finish 1528
- Start 1510
Footage Cored 18M
Core Recovery 18M
% Recovery 100
Comments:- ....

PENETRATION RATE MINUTES PER



NO METRES CORED		NO FEET CORED	INTERVAL	TIME	OPERATING CONDITIONS				TORQUE
					PSI	WEIGHT	ROTATING RPM	FLUID GPM	
0	0	0	1510	0900		5000	45	252	
0.25	0.2	1		·22					
0.50	0.4	2	11	·40					
0.75	0.6	3		52					
1.00	0.8	4	12	·09		18000	60		
1.25	1.0	5		32					
1.50	1.2	6	13	·52					
1.75	1.4	7		11·10					
2.00	1.6	8	14	·28					
	1.8	9		·46					
[illegible]	2.0	10	15	0002					
2.75	2.2	11		·19					
3.00	2.4	12	16	·25					
3.25	2.6	13		·32					
3.50	2.8	14	17	42					
3.75	3.0	15		·58					
4.00	3.2	16	18	0108					
4.25	3.4	17		·20					
4.50	3.6	18	19	·40					
4.75	3.8	19		·48					
5.00	4.0	20	1520	0100					
5.25	4.2	21		·10					
5.50	4.4	22	21	·20					
5.75	4.6	23		·30					
6.00	4.8	24	22	·40					
6.25	5.0	25		·56					
6.50	5.2	26	23	0305					
6.75	5.4	27		·19					
7.00	5.6	28	24	·37					
7.25	5.8	29		·50					
7.50	6.0	30	25	0404					
7.75	6.2	31		·20					
8.00	6.4	32	26	·40					
8.25	6.6	33		·55					
	6.8	34	27	0510					
8.75	7.0	35		·20					
9.00	7.2	36	1528	0530		18000			
9.25	7.4	37							
9.50	7.6	38							
9.75	7.8	39							
10.00	8.0	40							
10.25	8.2	41							
10.50	8.4	42							
10.75	8.6	43							
11.00	8.8	44							
11.25	9.0	45							
11.50	9.2	46							
11.75	9.4	47							
12.00	9.6	48							
12.25	9.8	49							
12.50	10.0	50							
12.75	10.2	51							
13.00	10.4	52							
13.25	10.6	53							
13.50	10.8	54							
13.75	11.0	55							
14.00	11.2	56							
14.25	11.4	57							
14.50	11.6	58							
14.75	11.8	59							
15.00	12.0	60							

CORING LOG

NORTON CHRISTENSEN Drilling Products

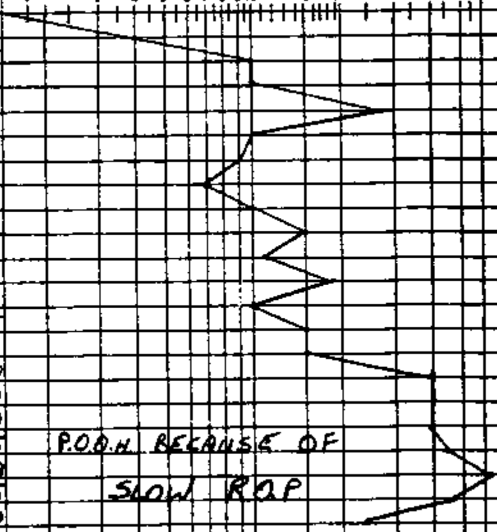
KIRKHILL ROAD / KIRKHILL INDUSTRIAL ESTATE / DYCE / ABERDEEN AB2 0ES
PHONE: (0224) 72-2555 (4 lines) / TELEX: 73385

CORE NO:- THREE

Service Engineer TOM GREIS
Company B.P.
Contractor KENTING RIG # 36
Block/Well No.
Field , Location
Hole Size 8½
Formation Name
Formation Type
Mud-Wt. 1·15 Mud Type Vis. 40

Date 3rd AUGUST 1984
C/B Size 6¾ · 4 Length 19·9m
Bit No. 116493
Size 8½ · 4 Type C22
Previous footage on bit RE-RUN
This core 10m
Total footage on bit
Bit Cond. Before 15% After 20%
Pump Pressure 650 Liner Size 5½ · 8½ Strokes 100 Hole Angle

Rotating time 7: A.R.O.P. 75m/hr
Interval Cored – Finish 1578·5
– Start 1568·5
Footage Cored 10m
Core Recovery
% Recovery
Comments:-



NO METRES CORED		NO FEET CORED	INTERVAL	TIME	PENETRATION RATE MINUTES PER	OPERATING CONDITIONS PSI	WEIGHT	ROTATING RPM	FLUID GPM	TORQUE
0	0	0	1568·5	0710			5-7		250	
0.25	0.2	1	69	·20						
0.50	0.4	2	·5	·30			18000	60		
0.75	0.6	3	70	·59						
1.00	0.8	4	·5	0809						
1.25	1.0	5	71	·18						
1.50	1.2	6	·5	·25						
1.75	1.4	7	72	·35						
	1.6	8	·5	·50						
	1.8	9	73	0902						
2.50	2.0	10	·5	·20						
2.75	2.2	11	74	·30						
3.00	2.4	12	·5	·45						
3.25	2.6	13	75	1000						
3.50	2.8	14	·5	·40						
3.75	3.0	15	76	1120						
4.00	3.2	16	·5	1200						
4.25	3.4	17	77	1245	P.O.O.H. BECAUSE OF					
4.50	3.6	18	·5	1339						
4.75	3.8	19	78	1425	SLOW ROP		18000	60	250	
5.00	4.0	20	1578·5	1450						
5.25	4.2	21								
5.50	4.4	22								
5.75	4.6	23								
6.00	4.8	24								
6.25	5.0	25								
6.50	5.2	26								
6.75	5.4	27								
7.00	5.6	28								
7.25	5.8	29								
7.50	6.0	30								
7.75	6.2	31								
8.00	6.4	32								
	6.6	33								
	6.8	34								
8.75	7.0	35								
9.00	7.2	36								
9.25	7.4	37								
9.50	7.6	38								
9.75	7.8	39								
10.00	8.0	40								
10.25	8.2	41								
10.50	8.4	42								
10.75	8.6	43								
11.00	8.8	44								
11.25	9.0	45								
11.50	9.2	46								
11.75	9.4	47								
12.00	9.6	48								
12.25	9.8	49								
12.50	10.0	50								
12.75	10.2	51								
13.00	10.4	52								
13.25	10.6	53								
13.50	10.8	54								
13.75	11.0	55								
14.00	11.2	56								
14.25	11.4	57								
14.50	11.6	58								
14.75	11.8	59								
15.00	12.0	60								

NORTON CHRISTENSEN Drilling Products
KIRKHILL ROAD / KIRKHILL INDUSTRIAL ESTATE / DYCE / ABERDEEN AB2 0ES
PHONE: (0224) 72-2555 (4 lines) / TELEX: 73365

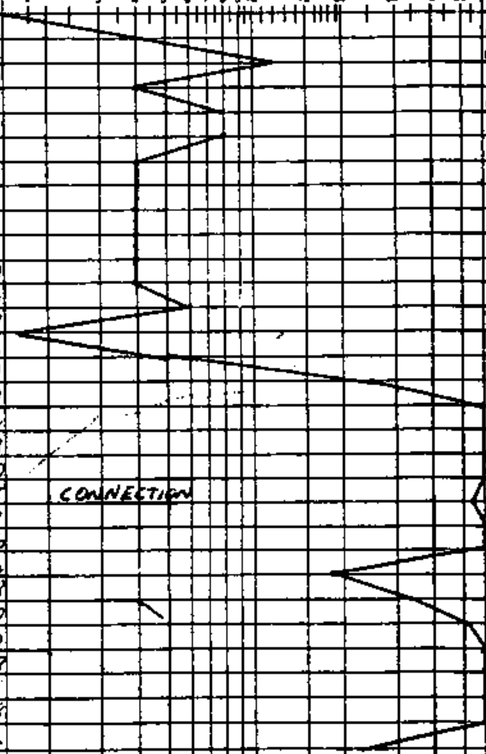
CORING LOG

CORE NO:- FOUR

Service Engineer TOM GREIG
Company B.P.
Contractor KENTING RIG #36
Block/Well No. BROUGHTON #1
Field .... Location ....
Hole Size 8½
Formation Name ....
Formation Type ....
Mud-Wt. 1:13 Mud Type .... Vis. 43

Date 7th AUGUST 1984
C/B Size 6¾ : 4 Length 19:9m
Bit No. 116493
Size 8½ : 4 Type C22
Previous footage on bit RE:RUN
This core ....
Total footage on bit ....
Bit Cond. Before .... After ....
Pump Pressure 625 Liner Size 5½ × 8½ Strokes 100 Hole Angle ....

Rotating time 6¾ R.O.P. ....
Interval Cored– Finish 1643.5
– Start 1629.28
Footage Cored 14.2
Core Recovery 14.1
% Recovery 99%
Comments:- ....



NO METRES CORED		NO FEET CORED	INTERVAL	TIME	PENETRATION RATE MINUTES PER	OPERATING CONDITIONS				TORQUE
						PSI	WEIGHT	ROTATING RPM	FLUID GPM	
0	0	0	1629.29	1646		600	5-7	60	250	
0.25	0.2	1	·5	56		625	18000	60	250	
0.50	0.4	2	1630	1700						
0.75	0.6	3	·5	09		625				
1.00	0.8	4	31	16						
1.25	1.0	5	·5	20						
1.50	1.2	6	32	26						
1.75	1.4	7	5	28						
	1.6	8	33	32						
	1.8	9	·5	36						
2.50	2.0	10	34	40						
2.75	2.2	11	·5	46						
3.00	2.4	12	35	48						
3.25	2.6	13	·5	63						
3.50	2.8	14	36	1820						
3.75	3.0	15	·5	1920						
4.00	3.2	16	37	2026						
4.25	3.4	17	·6	2138						
4.50	3.6	18	38	2240						
4.75	3.8	19	·5	2335	CONNECTION					
5.00	4.0	20	39	0038						
5.25	4.2	21	·5	0146						
5.50	4.4	22	40	0206						
5.75	4.6	23	·5	0238						
6.00	4.8	24	41	0330						
6.25	5.0	25	·5	0430						
6.50	5.2	26	42	0538						
6.75	5.4	27	·5	0645						
7.00	5.6	28	43	0748						
7.25	5.8	29	·5	0812			18000	60	250	
7.50	6.0	30								
7.75	6.2	31								
8.00	6.4	32								
	6.6	33								
	6.8	34								
8.75	7.0	35								
9.00	7.2	36								
9.25	7.4	37								
9.50	7.6	38								
9.75	7.8	39								
10.00	8.0	40								
10.25	8.2	41								
10.50	8.4	42								
10.75	8.6	43								
11.00	8.8	44								
11.25	9.0	45								
11.50	9.2	46								
11.75	9.4	47								
12.00	9.6	48								
12.25	9.8	49								
12.50	10.0	50								
12.75	10.2	51								
13.00	10.4	52								
13.25	10.6	53								
13.50	10.8	54								
13.75	11.0	55								
14.00	11.2	56								
14.25	11.4	57								
14.50	11.6	58								
14.75	11.8	59								
15.00	12.0	60								

CORING LOG

NORTON CHRISTENSEN Drilling Products

KIRKHILL ROAD / KIRKHILL INDUSTRIAL ESTATE / DYCE / ABERDEEN AB2 0ES
PHONE: (0224) 72-2555 (4 lines) / TELEX: 73385

CORE NO:- FIVE

Service Engineer TOM GREIG
Company B.P.
Contractor KENTING RIG # 36
Block/Well No. BROUGHTON #1
Field .... Location ....
Hole Size 8½
Formation Name ....
Formation Type ....
Mud Wt. 1.13 Mud Type .... Vis. 43

Date 9th AUGUST 1984
C/B Size 6¾ × 4 Length 19.9M
Bit No. 154125 (1.43112)
Size 8½ × 4 Type C22
Previous footage on bit RE-RUN
This core 1.75M
Total footage on bit ....
Bit Cond. Before .... After ....
Pump Pressure 650 Liner Size 5½ × 8½ Strokes 100 Hole Angle ....

Rotating time 4 HRS R.O.P. ....
Interval Cored- Finish 1658.25
- Start 1656.5
Footage Cored 1.75
Core Recovery 1.74
% Recovery 95%
Comments:- ....

NO. METRES CORED		NO FEET CORED	INTERVAL	TIME	PENETRATION RATE MINUTES PER 2 3 4 5 6 7 8 9 10 15 20 30 40 50	OPERATING CONDITIONS				TORQUE
						PSI	WEIGHT	ROTATING RPM	FLUID GPM	
0	0	0	1656.5	0458		620	5-7000	60	250	
0.25	0.2	1	1657	0536		650	18.660	100	250	
0.50	0.4	2	·5	0740						
0.75	0.6	3	1658	0840						
1.00	0.8	4								
1.25	1.0	5								
1.50	1.2	6								
1.75	1.4	7								
	1.6	8								
	1.8	9								
2.50	2.0	10								
2.75	2.2	11								
3.00	2.4	12								
3.25	2.6	13								
3.50	2.8	14								
3.75	3.0	15								
4.00	3.2	16								
4.25	3.4	17								
4.50	3.6	18								
4.75	3.8	19								
5.00	4.0	20								
5.25	4.2	21								
5.50	4.4	22								
5.75	4.6	23								
6.00	4.8	24								
6.25	5.0	25								
6.50	5.2	26								
6.75	5.4	27								
7.00	5.6	28								
7.25	5.8	29								
7.50	6.0	30								
7.75	6.2	31								
8.00	6.4	32								
	6.6	33								
	6.8	34								
8.75	7.0	35								
9.00	7.2	36								
9.25	7.4	37								
9.50	7.6	38								
9.75	7.8	39								
10.00	8.0	40								
10.25	8.2	41								
10.50	8.4	42								
10.75	8.6	43								
11.00	8.8	44								
11.25	9.0	45								
11.50	9.2	46								
11.75	9.4	47								
12.00	9.6	48								
12.25	9.8	49								
12.50	10.0	50								
12.75	10.2	51								
13.00	10.4	52								
13.25	10.6	53								
13.50	10.8	54								
13.75	11.0	55								
14.00	11.2	56								
14.25	11.4	57								
14.50	11.6	58								
14.75	11.8	59								
15.00	12.0	60								

NORTON CHRISTENSEN Drilling Products

KIRKHILL ROAD / KIRKHILL INDUSTRIAL ESTATE / DYCE / ABERDEEN AB2 0ES
PHONE: (0224) 72-2555 (4 lines) / TELEX: 73385

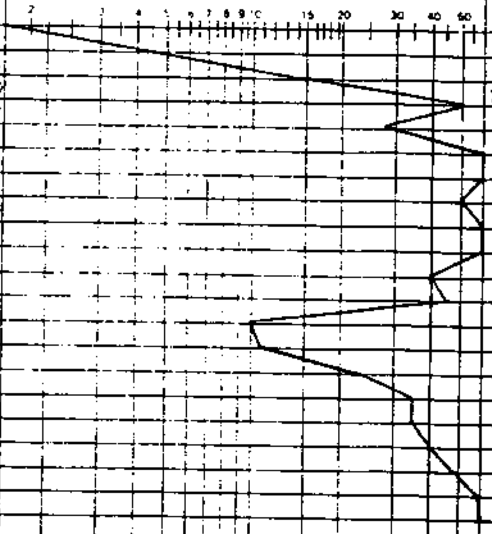
CORING LOG

CORE NO:- SIX

Service Engineer TOM GREIG
Company B.P.
Contractor KENTING RIG #36
Block/Well No. BROUGHTON #1
Field **Location**
Hole Size 8½
Formation Name
Formation Type
Mud-Wt. 1.13 **Mud Type** **Vis.** 44

Date 10th AUGUST 1986
C/B Size 6¾ x 4 **Length** 19.9m
Bit No. 156125 (1431121)
Size 8½ x 4 **Type** C22
Previous footage on bit RE-RUN
This core
Total footage on bit
Bit Cond. Before **After**
Pump Pressure 700 **Liner Size** 5½ x 8½ **Strokes** 100 **Hole Angle**

Rotating time 15hrs **R.O.P.**
Interval Cored – Finish 1868.5
– Start 1667.5
Footage Cored 18 metres
Core Recovery 18 metres
% Recovery 100
Comments:-



NO. METRES CORED		NO. FEET CORED	INTERVAL	TIME	PENETRATION RATE MINUTES PER	OPERATING CONDITIONS				TORQUE
						PSI	WEIGHT	ROTATING RPM	FLUID GPM	
0	0	0	1667.5	[illegible]			5-7000	60	250	
0.25	0.2	1	1668	[illegible]						
0.50	0.4	2	69	[illegible]		700	15000	60	250	
0.75	0.6	3	1670	[illegible]						
1.00	0.8	4	71	[illegible]						
1.25	1.0	5	72	[illegible]						
1.50	1.2	6	73	[illegible]						
1.75	1.4	7	74	[illegible]						
.00	1.6	8	75	[illegible]						
.25	1.8	9	76	[illegible]						
2.50	2.0	10	77	[illegible]						
2.75	2.2	11	78	115						
3.00	2.4	12	79	1120						
3.25	2.6	13	1680	1150						
3.50	2.8	14	81	1225						
3.75	3.0	15	82	1300						
4.00	3.2	16	83	[illegible]						
4.25	3.4	17	84	[illegible]						
4.50	3.6	18	85	1520						
4.75	3.8	19	1686.5	[illegible]						
5.00	4.0	20								
5.25	4.2	21								
5.50	4.4	22								
5.75	4.6	23								
6.00	4.8	24								
6.25	5.0	25								
6.50	5.2	26								
6.75	5.4	27								
7.00	5.6	28								
7.25	5.8	29								
7.50	6.0	30								
7.75	6.2	31								
8.00	6.4	32								
5	6.6	33								
0	6.8	34								
8.75	7.0	35								
9.00	7.2	36								
9.25	7.4	37								
9.50	7.6	38								
9.75	7.8	39								
10.00	8.0	40								
10.25	8.2	41								
10.50	8.4	42								
10.75	8.6	43								
11.00	8.8	44								
11.25	9.0	45								
11.50	9.2	46								
11.75	9.4	47								
12.00	9.6	48								
12.25	9.8	49								
12.50	10.0	50								
12.75	10.2	51								
13.00	10.4	52								
13.25	10.6	53								
13.50	10.8	54								
13.75	11.0	55								
14.00	11.2	56								
14.25	11.4	57								
14.50	11.6	58								
14.75	11.8	59								
15.00	12.0	60								

CORING LOG

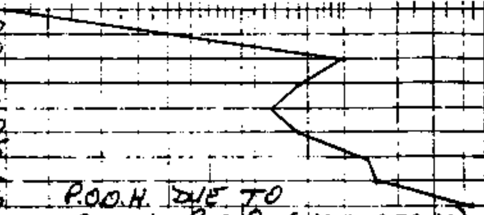
NORTON CHRISTENSEN Drilling Products
KIRKHILL ROAD / KIRKHILL INDUSTRIAL ESTATE / DYCE · ABERDEEN AB2 0ES
PHONE: (0224) 72-2555 (4 lines) / TELEX: 73385

CORE NO:- SEVEN

Service Engineer TOM GREIG
Company B.P.
Contractor KENTING RIG"36
Block/Well No BROUGHTON #1
Field
Location
Hole Size 8½
Formation Name
Formation Type
Mud-Wt. 1·14 Mud Type
Vis. 41

Date 13th AUGUST, 1984
C/B Size 6¾ × 4 Length 19·9M
Bit No 154125 (1431121)
Size 8½ × 4 Type C22
Previous footage on bit RE-RUN
This core 6·5M
Total footage on bit
Bit Cond. Before
After
Pump Pressure 680 Liner Size 5½ × 8½ Strokes 100 Hole Angle

Rotating time 2¾ R.O.P.
Interval Cored – Finish 1861·5
– Start 1855
Footage Cored 6·5M
Core Recovery 0
% Recovery 0
Comments:-



No. METRE CORE	[illegible]	[illegible]	[illegible]	TIME	PENETRATION RATE MINUTES PER	OPERATING CONDITIONS				TORQUE
						PSI	WEIGHT	ROTATING RPM	FLUID GPM	
0	0	0	1855	1240		680	5000	60	250	
0.25	0.2	1	1856	1300		700	18,000	60	250	
0.50	0.4	2	1857	1316						
0.75	0.6	3	1858	1326						
1.00	0.8	4	1859	1340						
1.25	1.0	5	1860	1405						
1.50	1.2	6	1861	1431						
1.75	1.4	7	1861·5	1526						
2.00	1.6	8								
	1.8	9								
[illegible]	2.0	10								
2.75	2.2	11								
3.00	2.4	12								
3.25	2.6	13								
3.50	2.8	14								
3.75	3.0	15								
4.00	3.2	16								
4.25	3.4	17								
4.50	3.6	18								
4.75	3.8	19								
5.00	4.0	20								
5.25	4.2	21								
5.50	4.4	22								
5.75	4.6	23								
6.00	4.8	24								
6.25	5.0	25								
6.50	5.2	26								
6.75	5.4	27								
7.00	5.6	28								
7.25	5.8	29								
7.50	6.0	30								
7.75	6.2	31								
8.00	6.4	32								
8.25	6.6	33								
	6.6	34								
[illegible]	7.0	35								
9.00	7.2	36								
9.25	7.4	37								
9.50	7.6	38								
9.75	7.8	39								
10.00	8.0	40								
10.25	8.2	41								
10.50	8.4	42								
10.75	8.6	43								
11.00	8.8	44								
11.25	9.0	45								
11.50	9.2	46								
11.75	9.4	47								
12.00	9.6	48								
12.25	9.8	49								
12.50	10.0	50								
12.75	10.2	51								
13.00	10.4	52								
13.25	10.6	53								
13.50	10.8	54								
13.75	11.0	55								
14.00	11.2	56								
14.25	11.4	57								
14.50	11.6	58								
14.75	11.8	59								
15.00	12.0	60								

P.O.O.H. DUE TO
SLOW R.O.P. (MUDSTONE)

CORE WAS CONTAINED IN
BARREL BUT BROKE CORE
30cm HIGH BP REP
INSISTED ON GOING BACK
FOR SAME WITH W.O.B
+ ROTARY. CORE-CATCHER
SNAPPED + LOST CORE.
THIS WAS AGAINST
MY RECOMMENDATIONS

Tom Greig

PERFORATION RECORD

RUN Nº	DATE	INTERVAL PERFORATED (m)	METRES PERF.	Nº OF GUNS	TIME TAKEN (hours)	REMARKS
5A	3/9/84	1845.3 - 1845.0	0.3	1(4 shots)	2.25	CCL changed out due to weak response while RIH.
6B	5/9/84	1860.9 - 1856.33	4.57	1	1.25	Select fire switch failure - bottom gun only fired.
6B	5/9/84	1856.33 - 1854.2	2.13	1	2.0	/

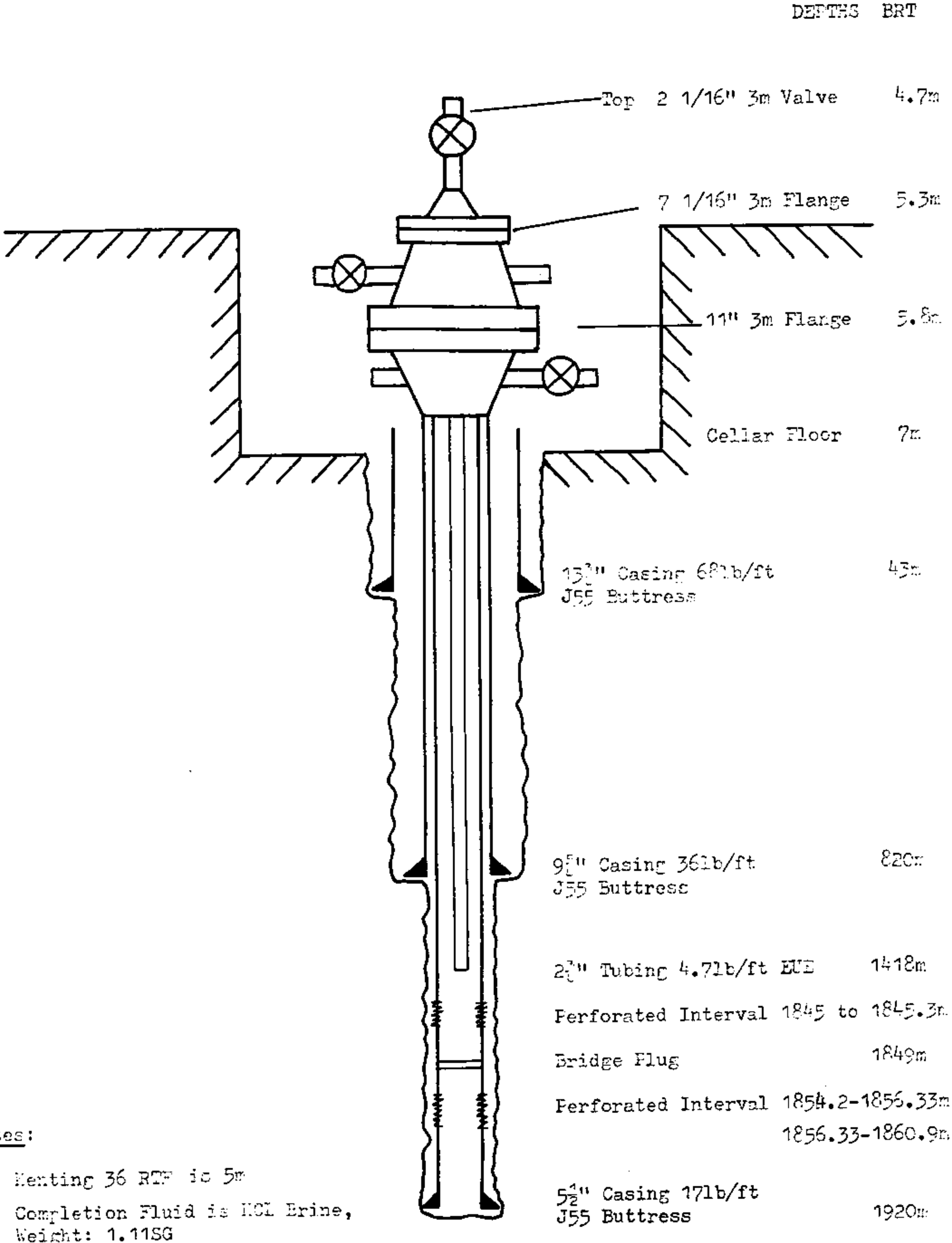
XV Wireline Logs

WIRELINES LOGS

Run No.	Date	Log	Depth Interval	BHT	Comments
					Welex Logs
1A	23/07/84	BHC-SONIC/GR	Surface to 813.5m	93°F	Sonic 28.0
1A	24/07/84	X-Y-CAL-DRIFT SURVEY	28.0 to 813.5m	93°F	Welex Log
					Gearhart
2B	04/08/84	DIL/BHC-SONIC/ GR/CAL	795.0 to 1580	117°F	Caliper reading 0.1" high, tool handing up 1011m to 1437m
3A	17/08/84	DLL/MSFL/GR	810 to 1919.5	118°F	Overpull 1420m 1450 bbls
3A	17/08/84	CNL/CD/GR	800 to 1917.5	120°F	
3C	17/08/84	BHC-SONIC/GR	810 to 1914.5	118°F	
3A	17/08/84	FE-DIPMETER/GR	810 to 1914.0	119°F	Due to bad hole conditions pad #1 was broken at 1397m (2000 lbs overpull). Capiler was closed very often at washouts (1000 lbs overpull).
					Tesel Log
4B	18/08/84	6 ARM-DIPMETER	821.5 to 1918.3	131°F	Temp. at 1910/m

XVI Well Diagrams

BROUGHTON B-1 SUSPENSION DIAGRAM



Notes:

1. Kenting 36 RTF is 5m
2. Completion Fluid is KCL Brine, Weight: 1.11SG

XVII Summarised Well Log

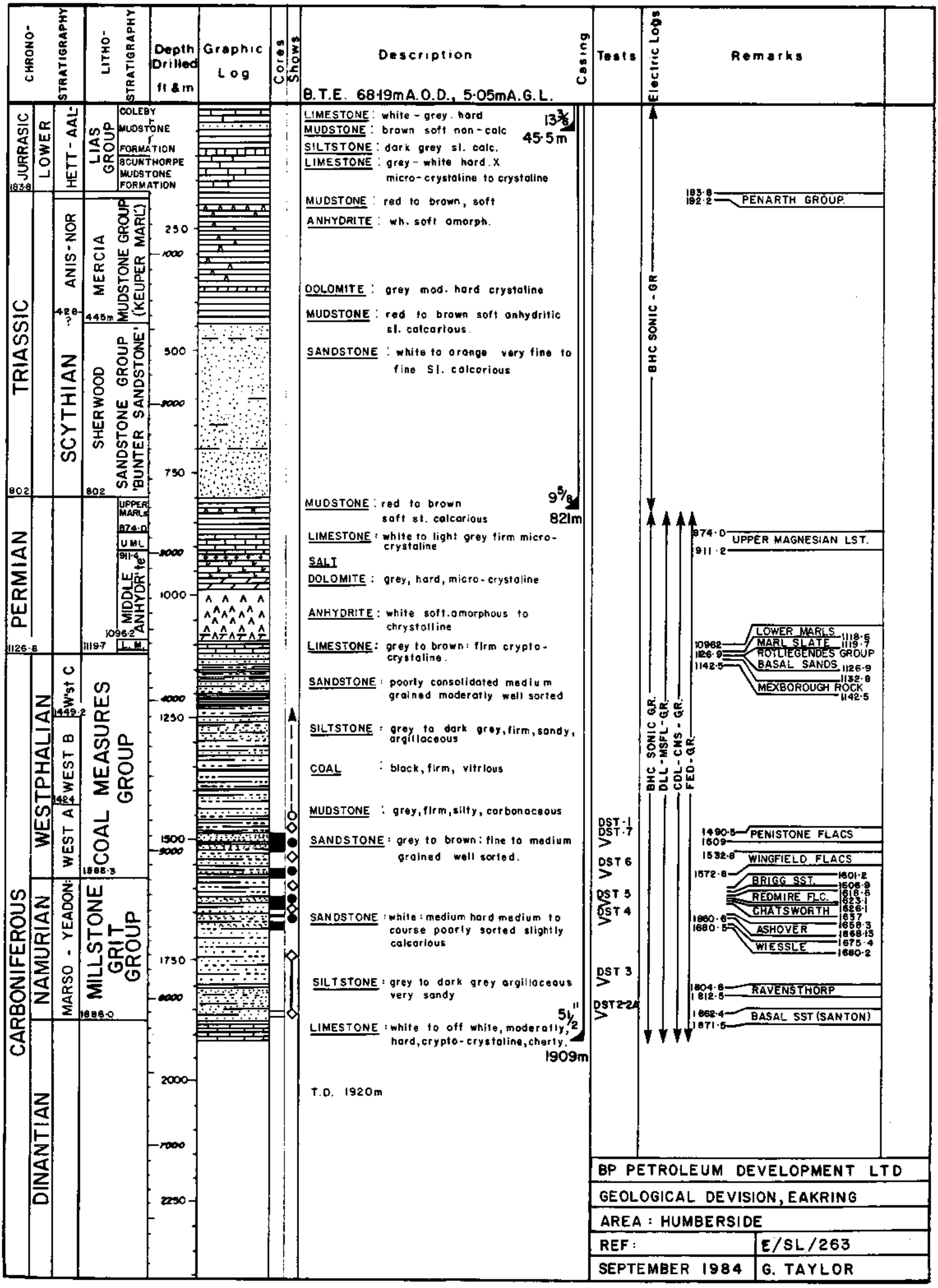
BROUGHTON - B1

UK LAND (PL 185)

SUMMARISED WELL LOG

SCALE 1 10,000

LOCATION SE 94627 10760



B.T.E. 68·19mA.O.D., 5·05mA.G.L.

LIMESTONE: white - grey. hard

MUDSTONE: brown soft non-calc

SILTSTONE: dark grey sl. calc.

LIMESTONE: grey - white hard. X micro-crystaline to crystaline

MUDSTONE: red to brown, soft

ANHYDRITE: wh. soft amorph.

DOLOMITE: grey mod. hard crystaline

MUDSTONE: red to brown soft anhydritic sl. calcarious.

SANDSTONE: white to orange very fine to fine Sl. calcarious

MUDSTONE: red to brown soft sl. calcarious

LIMESTONE: white to light grey firm micro-crystaline

SALT

DOLOMITE: grey, hard, micro-crystaline

ANHYDRITE: white soft.amorphous to chrystalline

LIMESTONE: grey to brown: firm crypto-crystaline.

SANDSTONE: poorly consolidated medium grained moderatly well sorted

SILTSTONE: grey to dark grey, firm, sandy, argillaceous

COAL: black, firm, vitrious

MUDSTONE: grey, firm, silty, carbonaceous

SANDSTONE: grey to brown: fine to medium grained well sorted.

SANDSTONE: white: medium hard medium to course poorly sorted slightly calcarious

SILTSTONE: grey to dark grey argillaceous very sandy

LIMESTONE: white to off white, moderatly, hard, crypto-crystaline, cherty.

T.D. 1920m

BP PETROLEUM DEVELOPMENT LTD

GEOLOGICAL DEVISION, EAKRING

AREA : HUMBERSIDE

REF:	E/SL/263
SEPTEMBER 1984	G. TAYLOR

XVIII Pressure Information/RFT Results

Broughton B1 Pressure Information:

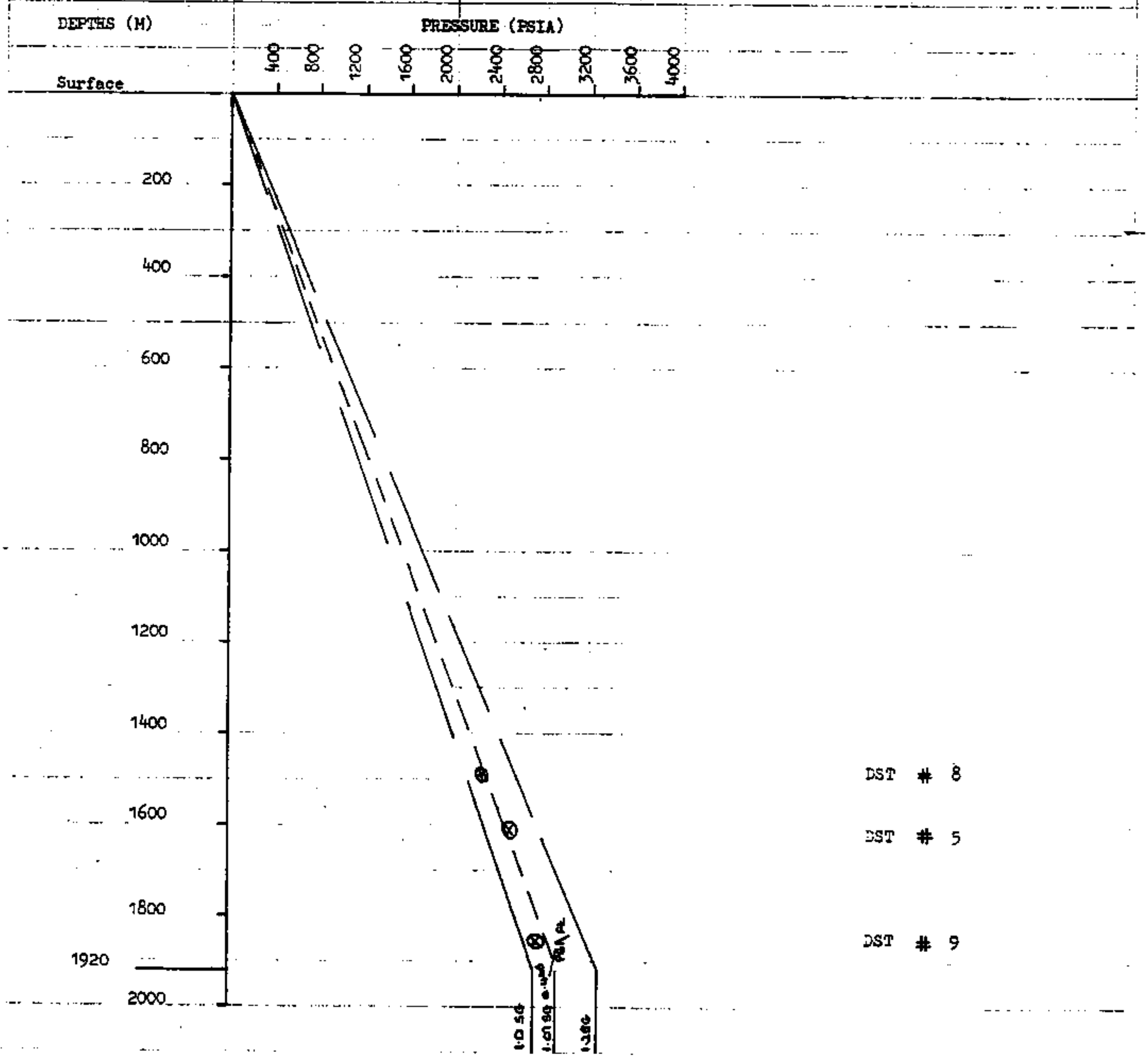
All pressure information obtained from Broughton was obtained from DST results which are as follows:-

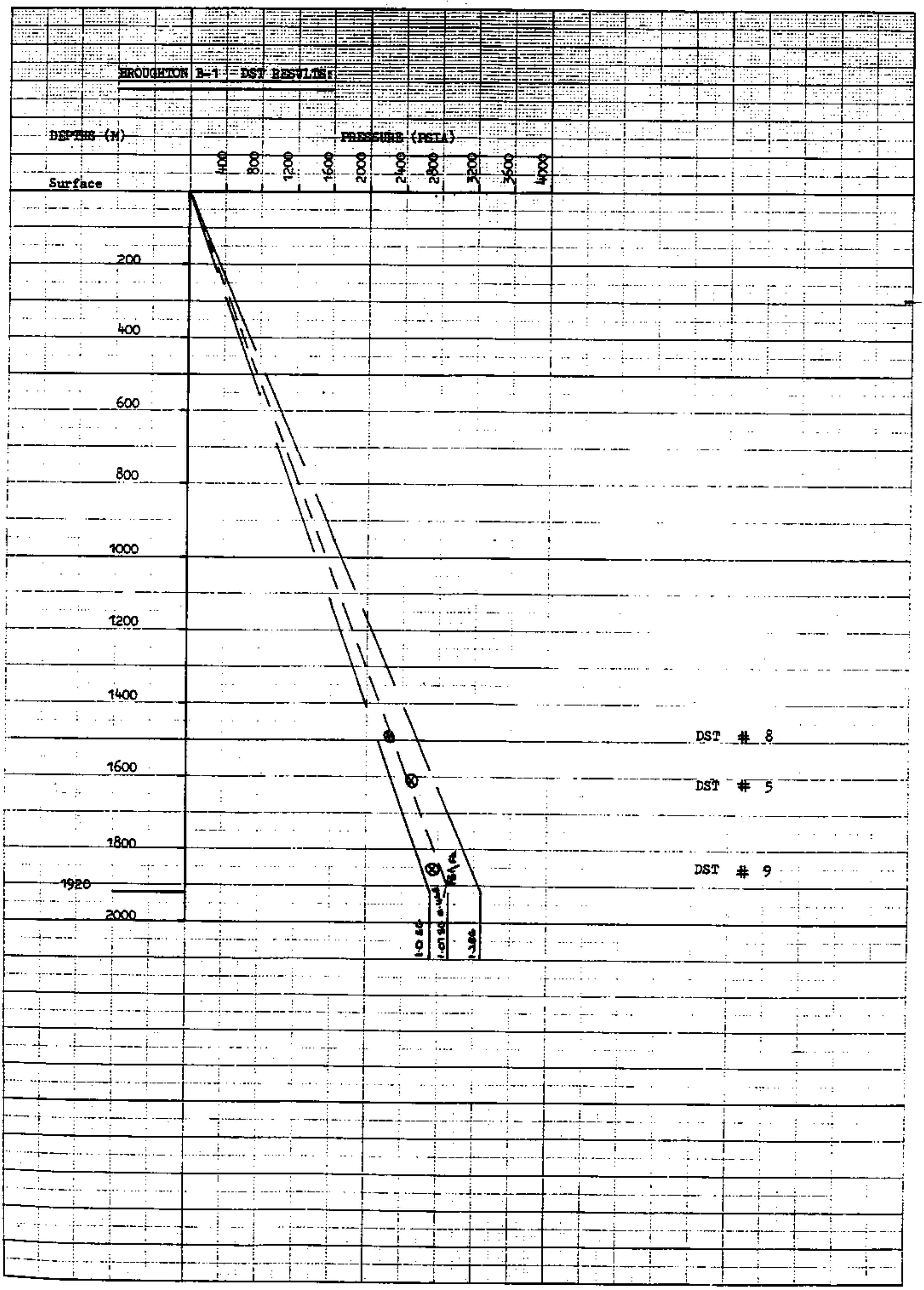
DST No.	Interval Tested m BRT	Final Pressure Recorded (psia)	Gauge Depth (m BRT)
1	1490.0 - 1517.6	2227	1492.7
2	1865.0 - 1874.1	TOOL FAILED	-
3	1803.0 - 1812.1	TOOL FAILED	1805.9
4	1865 - 1876.6	HMSV OPEN THROUGHOUT TEST	1867.9
5	1658.0 - 1669.5	2502	1660.9
6	1615.2 - 1636	PACKER SEAT FAILURE	1619.1
7	1566 - 1578.0	2344	1569.4
8	1490 - 1512.7	2215	1492.9
9	1860.9 - 1854.2	2485	1838.0

Only three DST's were concerned to yield worthwhile information; the tentatively calculated figures are as follows:-

DST	P* (psia)
5	2511
8	2258
9	2748

BROUGHTON B-1 DST RESULTS:





BROUGHTON B-1 - DST RESULTS:

UK/WF/BROU B1

MH
~~[illegible]~~ 22/4
~~AHF~~
Pet. Eng. Library
(D. McCauley)

BP PETROLEUM DEVELOPMENT LIMITED

EXPLORATION AND PRODUCTION

Petroleum Engineering Factual Report
Broughton B1

by

J.U. Keir

Eakring
October 1984 Broughton B1/W48

DOCUMENT ID. 566103

BROUGHTON B1

OVERVIEW OF OPERATIONS

The well was spudded by Kenting Rig 36 on July 19th 1984.

After running a standard 12-1/4" hole logging suite, 8-1/2" hole was drilled to 1478 m brt. Three cores were then cut to a depth of 1578 m brt and after running an acoustic log a drill stem test, DST 1, was conducted over the Penistone Flags.

Drilling and coring of the 8-1/2" hole continued until T.D. was reached at 1920 m brt. A full T.D. logging suite was run and seven open hole drill stem tests performed over all the potential pay zones. Of these, DST 2 and DST 4A were mechanically unsuccessful although some fluid samples were obtained from the latter.

The 5-1/2" casing was run and cemented and two cased hole tests, both testing the same interval of the Santon Sandstone, were conducted.

The open hole test results indicated the Penistone Flags to be oil bearing. All other zones produced formation water although a trace of oil was observed in samples collected from the Wingfield Flags.

The results of the cased hole tests were inconclusive with respect to the nature of the formation fluids.

A bridge plug was set at 1849 m brt, the well suspended and the rig released on September 9th 1984.

WIRELINE LOGS RUN

RUN No.	DATE	LOG	DEPTH INTERVAL (MBRT)	HOLE SIZE (ins)	B.H. TEMP. (°C)	TIME TAKEN (hours)	LOST TIME (hours)	REMARKS
		WELEX						
1A	23.7.84	AVL/GR	811.5 - 37.5 (GR to surface)	12¼	33.9	3.0	-	Mud losses occurred when R.I.H. Tool pulled out LCM pumped in and logging continued.
1A	24.7.84	DRIFT SURVEY/CAL	812.5 - 28.0	12¼	32.2	2.5	-	
2B	4.8.84	DIGL/AVL/GR/CAL	1578.0 - 792.0	8½	47.2	5.5	1.75	Lost time due to software problems SP loses sensitivity above 950 m. Saturation of resistivity curves from 1075-1025 MBRT. Sticky sections at 1169 MBRT and 1437.5 MBRT
		GEARHART						
3A	17..8.84	DLL/MSFL/SP/GR/CAL	1919.5 - 814.0	8½	47.8	4.75	-	General increase in logging
3A	17.8.84	CDL/CNS/GR/CAL	1917.5 - 800.0	8½	48.9	3.75	-	time due to washouts
3C	17.8.84	BHCS/GR	1912.0 - 810.0	8½	48.3	3.5	-	throughout borehole.
3A	17.8.84	FED/GR	1913.7 - 810.0	8½	-	4.75	1	Lost time due to washout. Overpull caused damage to caliper arm, resistivity trace lost.
		TESEL						
4B	18.8.84	D F D	1917.3 - 821.5	8½	55.0	16.75	12	Lost time due to hole conditions Wiper trip conducted. Pad No.2 damaged during survey.
		WELEX						
5A	2.9.84	CBL/MSG/GR/CCL	1897.0 - 800.0	5½" CSG	N.A.	4.5	-	Poor bonding indicated over majority of hole.

CORE ANALYSIS RECORD

Core No.	Top	Bottom	Recovery %	Core Analysis Available								
				RESIDUAL Fluid Saturation % OIL/WATER	Corr Klinkenburg Horizontal Permeability M.D	Corr Klinkenburg Vertical Permeability M.D	Helium Porosity %	Grain Density G/CC	Core * Gamma Ray	Photography *		Slabbed
										White Light	Ultra Violet	
1	1492.5	1508.25	100	13.5/37.0	3.26	1.52	12.8	2.685	Yes	Yes	No	Yes
2	1511.0	1528.0	100	1.5/56.0	0.47	0.17	11.6	2.71	"	"	"	"
3	1568.56	1574.75	94	7.3/49.1	1.26	0.46	12.0	2.69	"	"	"	"
4	1629.5	1635.75	99	7.9/34.8	33.5	18.1	14.0	2.655	"	"	"	"
5	1657.0	1658.0	95	7.3/59.9	0.15	0.07	9.1	2.74	"	"	"	"
6	1667.5	1685.7	100	5.3/42.9	1.1	0.87	6.8	2.68	"	"	"	"
7	1855.0	1861.5	0	-	-	-	-	-	-	-	-	-

* Refer W45 report for details.

N.B. - All results are arithmetic averages over each core interval.

Core Analysis Carried Out By - Redwood Corex

DRILL STEM TEST SUMMARY

WELL NO: BROUGHTON B1 RIG: KENTING 36 RTE: 68.27 mamsl

TEST NO: 1 FORMATION: PENISTONE FLAGS

DATE: 4-6th August 1984.

PERFORATED INTERVAL/DENSITY: OPEN HOLE TEST

TEST INTERVAL: 1491.3 - 1509.4 mbrt

PACKER DEPTH(S): 1490.0, 1512.6 mbrt

FLUID CUSHION - Type/Height/Drawdown None / m / psi

TOTAL NUMBER OF DOWNHOLE GAUGES 4 x Pressure 2 x Temperature

SURFACE MEASUREMENTS

Flow/Shut In Period	INITIAL FLOW	INITIAL S/I	MAIN FLOW	MAIN S/I
Duration - Mins.	12	64	546	798
Total Flow Time - Mins.	12	-	558	-
Final W/H Flowing Pressure - p.s.i.g.	-	-	6	-
Final W/H Flowing Temperature - °F	-	-	-	-
Choke Size at End of Flow - Inches	-	-	-	-
Gas Flowrate ~~Average/~~Final SCF/D	-	-	9,840	-
Oil Flowrate Average/~~Final~~ STBPD	-	-	39.6	-
Water Flowrate Average/~~Final~~ B/D MUD	109	-	9.7	-
Total Oil Produced STB			15	
Total Water Produced BBL MUD	0.91	-	3.7	-

DOWNHOLE MEASUREMENTS

	KUSTER K3		DMR 314	
Gauge Number/Owner	17725	17734	1296	1253
Gauge Depths mBRT Sensor Point	1482.0	1492.7	1492.7	1492.7
mTVDss	1413.7	1424.4	1424.4	1424.4
Initial Hydrostatic Pressure, psia	2469	2496	2499	2496
Initial Flow Period - Final BHFP, psia	N.A.	N.A	107	109
Initial S.I. Period - Final BHCIP, psia	2148	2169	2191	2189
Main Flow Period - Initial BHFP, psia	122	143	139	136
Main Flow Period - Final BHFP, psia	564	575	591	587
Main Flow Period - Final BHFT, °C	-	-	50.7	50.3
Main S.I. Period - Final BHCIP, psia	2193	2209	2226	2227
Main S.I. Period - Final BHCIT, °C	-	-	52.1	51.7
Final Hydrostatic Pressure, psia	2463	2480	2485	2485

PRODUCED FLUIDS DATA: No laboratory analyses performed, refer DST 8A

Gauge Tank Oil S.G./API Gravity N/A/ At °F

Produced Water Chlorides N/Appm

Produced H_2S 0 ppm

BS & W N/A %

N.B. PRESSURE DATA USED TO CALCULATE INITIAL FLOW FLUID PRODUCTION.

DRILL STEM TEST SUMMARY

WELL NO: BROUGHTON B1 RIG: KENTING 36 RTE: 68.27 mamsl
TEST NO: 3 FORMATION: Ravensthorpe Sandstone.
DATE: 20-21st August 1984
PERFORATED INTERVAL/DENSITY: OPEN HOLE TEST
TEST INTERVAL: 1805.3 mbrt - 1812.7 mbrt
PACKER DEPTH(S): 1803.0 mbrt : 1812.1 mbrt
FLUID CUSHION - Type/Height/Drawdown None / m / psi
TOTAL NUMBER OF DOWNHOLE GAUGES 4 x Pressure 2 x Temperature

SURFACE MEASUREMENTS

	INITIAL	INITIAL	MAIN	MAIN
Flow/Shut In Period	FLOW	S/I	FLOW	S/I
Duration - Mins.	5	65	668	723
Total Flow Time - Mins.	5	-	673	-
Final W/H Flowing Pressure - p.s.i.g.	-	-	2	-
Final W/H Flowing Temperature - °F	-	-	-	-
Choke Size at End of Flow - Inches	-	-	-	-
Gas Flowrate Average/Final SCF/D	-	-	200	-
Oil Flowrate Average/Final STBPD	-	-	0	-
Water Flowrate Average/Final B/D	-	-	149.8	-
Total Oil Produced STB	-	-	0	-
Total Water Produced BBL	-	-	70	-

DOWNHOLE MEASUREMENTS

	KUSTER K3		DMR 314	
Gauge Number/Owner	17725	17734	1253	1296
Gauge Depths mBRT Sensor Point mTVDss	1794.5 1726.2	1805.5 1737.2	1805.5 1737.2	1805.5 1737.2
Initial Hydrostatic Pressure, psia	3075	3094	3094	3088
Initial Flow Period - Final BHFP, psia	N/A	N/A	284 +	303
Initial S.I. Period - Final BHCIP, psia	2654	2679	2694	2689
Main Flow Period - Initial BHFP, psia	314	337	367	387
Main Flow Period - Final BHFP, psia	~2500	~2524	2541	2531
Main Flow Period - Final BHFT, °C	-	-	62.4	63.3
Main S.I. Period - Final BHCIP, psia	2652	2672	2685	2676
Main S.I. Period - Final BHCIT, °C	-	-	61.9	62.9
Final Hydrostatic Pressure, psia	3067	3088	3092	3083

PRODUCED FLUIDS DATA:

Gauge Tank Oil S.G./API Gravity 0 / At °F
Produced Water Chlorides 66,210 ppm
Produced H_2S 0 ppm
BS & W 100 % FORMATION WATER : 1.078 SG

N/B TOTAL FLUID PRODUCTION IS THAT FROM INITIAL AND MAIN FLOW PERIODS.

DRILL STEM TEST SUMMARY

WELL NO: BROUGHTON B1 RIG: KENTING 36 RTE: 68.27 mamsl

TEST NO: 4A FORMATION: SANTON SANDSTONE

DATE: 22nd August 1984.

PERFORATED INTERVAL/DENSITY: OPEN HOLE TEST

TEST INTERVAL: 1854.2 - 1871.8

PACKER DEPTH(S): 1865.0 mbrt : 1876.5 mbrt

FLUID CUSHION - Type/Height/Drawdown NONE / m / psi

TOTAL NUMBER OF DOWNHOLE GAUGES 4 x Pressure 2 x Temperature

SURFACE MEASUREMENTS

STATUS OF TEST TOOL THROUGHOUT TEST INCONCLUSIVE.
DATA GIVEN ASSUMES TOOL OPEN FOR DURATION OF TEST.

Flow/Shut In Period	INITIAL FLOW			
Duration - Mins.	185			
Total Flow Time - Mins.	185			
Final W/H Flowing Pressure - p.s.i.g.	10 max			
Final W/H Flowing Temperature - °F	-			
Choke Size at End of Flow - Inches	-			
Gas Flowrate Average/Final MMSCF/D	-			
Oil Flowrate Average/Final STBPD	-			
Water Flowrate Average/Final B/D	623 *			
Total Oil Produced STB	-			
Total Water Produced BBL	80			

DOWNHOLE MEASUREMENTS

	KUSTER K3		DMR 314	
Gauge Number/Owner	17725	17734	1253	1296
Gauge Depths mBRT SENSOR POINT	1855.6	1867.9	1867.9	1867.9
mTVDss	1787.3	1799.6	1799.6	1799.6
Initial Hydrostatic Pressure, psia	3162	3183	3175	3176
Initial Flow Period - Final BHFP, psia	2813	2828	2825	2824
Initial S.I. Period - Final BHCIP, psia	N/A	N/A	N/A	N/A
Main Flow Period - Initial BHFP, psia	N/A	N/A	N/A	N/A
Main Flow Period - Final BHFP, psia	N/A	N/A	N/A	N/A
Main Flow Period - Final BHFT, °C Initial Flow	-	-	64.3	65.4
Main S.I. Period - Final BHCIP, psia	N/A	N/A	N/A	N/A
Main S.I. Period - Final BHCIT, °C	-	-	N/A	N/A
Final Hydrostatic Pressure, psia	3211	3230	3247	3247

PRODUCED FLUIDS DATA:

Gauge Tank Oil S.G./API Gravity 0 / At °F

Produced Water Chlorides 64, 790 ppm

Produced H_2S 0 ppm

BS & W 100 % FORMATION WATER; 1.077 SG

* RATE ASSUMES TOOL OPEN THROUGHOUT TEST.

DRILL STEM TEST SUMMARY

WELL NO: BROUGHTON B1 RIG: KENTING 36 RTE: 68,27 mamsl

TEST NO: 5 FORMATION: ASHOVER SANDSTONE.

DATE: 22nd-24th August 1984.

PERFORATED INTERVAL/DENSITY: OPEN HOLE TEST

TEST INTERVAL: 1658.9 - 1668.4 mbrt

PACKER DEPTH(S): 1658.0 : 1669.55

FLUID CUSHION - Type/Height/Drawdown NONE / m / psi

TOTAL NUMBER OF DOWNHOLE GAUGES 4 x Pressure 2 x Temperature

SURFACE MEASUREMENTS

	INITIAL	INITIAL	MAIN	MAIN
Flow/Shut In Period	FLOW	S/I	FLOW	S/I
Duration - Mins.	5	63	723	759
Total Flow Time - Mins.	5	-	728	-
Final W/H Flowing Pressure - p.s.i.g.	-	-	2	-
Final W/H Flowing Temperature - °F	-	-	-	-
Choke Size at End of Flow - Inches	-	-	-	-
Gas Flowrate ~~Average~~/Final SCF/D	-	-	720	-
Oil Flowrate Average/Final STBPD	-	-	0	-
Water Flowrate Average/Final B/D	-	-	132.5	-
Total Oil Produced STB	-	-	0	-
Total Water Produced BBL	-	-	67	-

DOWNHOLE MEASUREMENTS

	KUSTER K3		DMR 314	
Gauge Number/Owner	17725	17734	1253	1296
Gauge Depths mBRT SENSOR POINT	1649.5	1660.5	1660.5	1660.5
mTVDss	1581.2	1592.2	1592.2	1592.2
Initial Hydrostatic Pressure, psia	2870	2890	2891	2890
Initial Flow Period - Final BHFP, psia	N/A	N/A	368 +	422
Initial S.I. Period - Final BHCIP, psia	2458	2474	2494	2496
Main Flow Period - Initial BHFP, psia	523	540	538	523
Main Flow Period - Final BHFP, psia	2446	2462	2483	2482
Main Flow Period - Final BHFT, °C	-	-	57.4	58.2
Main S.I. Period - Final BHCIP, psia	2470	2484	2502	2500
Main S.I. Period - Final BHCIT, °C	-	-	57.4	58.3
Final Hydrostatic Pressure, psia	2869	2884	2891	2889

PRODUCED FLUIDS DATA:

Gauge Tank Oil S.G./API Gravity 0 / At °F

Produced Water Chlorides 107,390 ppm

Produced H_2S 0 ppm

BS & W 100 % FORMATION WATER : 1.124 SG

N/B TOTAL FLUID PRODUCTION IS THAT FROM INITIAL AND MAIN FLOW PERIODS.

DRILL STEM TEST SUMMARY

WELL NO: BROUGHTON B1 RIG: KENTING 36 RTE: 68.27 mamsl

TEST NO: 6 FORMATION: CHATSWORTH SANDSTONE.

DATE: 25th - 27th August 1984

PERFORATED INTERVAL/DENSITY: OPEN HOLE TEST

TEST INTERVAL: 1627.0 - 1637.1 mbrt

PACKER DEPTH(S): 1615.2 mbrt, 1636.0 mbrt

FLUID CUSHION - Type/Height/Drawdown NONE / m / psi

TOTAL NUMBER OF DOWNHOLE GAUGES 4 x Pressure 2x Temperature

SURFACE MEASUREMENTS - TWO INITIAL FLOW PERIODS PRIOR TO MAIN FLOW.

Flow/Shut In Period	INITIAL FLOW	INITIAL S/I	MAIN FLOW	MAIN S/I
Duration - Mins.	16/4	7/66	702	715
Total Flow Time - Mins.	20	-	722	-
Final W/H Flowing Pressure - p.s.i.g.	-/3	-	2	-
Final W/H Flowing Temperature - °F	-	-	-	-
Choke Size at End of Flow - Inches	-	-	-	-
Gas Flowrate ~~Average~~/Final SCF/D	- / -	-	216	-
Oil Flowrate Average/Final STBPD	-	-	0	-
Water Flowrate Average/Final B/D	-	-	138	-
Total Oil Produced STB	-	-	0	-
Total Water Produced BBL	-	-	69	-

DOWNHOLE MEASUREMENTS

	KUSTER K3		DMR 314	
Gauge Number/Owner	17725	17734	1253	1296
Gauge Depths mBRT SENSOR POINT mTVDss	1607.0 1538.7	1618.0 1549.7	1618.0 1549.7	1618.0 1549.7
Initial Hydrostatic Pressure, psia	2781	2797	2797	2799
SECOND Initial Flow Period - Final BHFP, psia	N/A	N/A	478	506
SECOND Initial S.I. Period - Final BHCIP, psia	2400	2416	2433	2433
Main Flow Period - Initial BHFP, psia	547	579	574	666
Main Flow Period - Final BHFP, psia	2388	2409	2425	2423
Main Flow Period - Final BHFT, °C	-	-	54.9	55.8
Main S.I. Period - Final BHCIP, psia	PACKER	SEAT	LOST	
Main S.I. Period - Final BHCIT, °C	-	-	54.6	55.6
Final Hydrostatic Pressure, psia	2784	2795	2804	2803

PRODUCED FLUIDS DATA:

Gauge Tank Oil S.G./API Gravity -/ At °F

Produced Water Chlorides 92, 300 ppm

Produced H_2S 0 ppm

BS & W 100% FORMATION WATER : 1.109 SG

N/B TOTAL FLUID PRODUCTION IS THAT FROM INITIAL AND MAIN FLOW PERIODS.

DRILL STEM TEST SUMMARY

WELL NO: BROUGHTON B1 RIG: KENTING 36 RTE: 68.27 mamsl

TEST NO: 7 FORMATION: WINGFIELD FLAGS

DATE: 27th - 28th August 1984.

PERFORATED INTERVAL/DENSITY: OPEN HOLE TEST

TEST INTERVAL: 1566.5 - 1573.0 mbrt

PACKER DEPTH(S): 1566.5, 1577.4 mbrt

FLUID CUSHION - Type/Height/Drawdown NONE / m / psi

TOTAL NUMBER OF DOWNHOLE GAUGES 4 x Pressure 2 x Temperature

SURFACE MEASUREMENTS

	INITIAL	INIITIAL	MAIN	MAIN
Flow/Shut In Period	FLOW	S/I	FLOW	S/I
Duration - Mins.	8	62	641	764
Total Flow Time - Mins.	8	-	649	-
Final W/H Flowing Pressure - p.s.i.g.	-	-	1	-
Final W/H Flowing Temperature - °F	-	-	-	-
Choke Size at End of Flow - Inches	-	-	-	-
Gas Flowrate ~~Average~~/Final SCF/D			864	
Oil Flowrate Average/Final STBPD	-	-	TRACE	-
Water Flowrate Average/Final B/D	-	-	144	-
Total Oil Produced STB	-	-	TRACE	-
Total Water Produced BBL	-	-	65	-

DOWNHOLE MEASUREMENTS

	KUSTER K3		DMR 314	
Gauge Number/Owner	17725	17734	1253	1296
Gauge Depths mBRT SENSOR POINT mTVDss	1558.3 1490.0	1569.3 1501.0	1569.3 1501.0	1569.3 1501.0
Initial Hydrostatic Pressure, psia	2642	2666	2665	2664
Initial Flow Period - Final BHFP, psia	N/A	N/A	207	221
Initial S.I. Period - Final BHCIP, psia	2315	2342	2349	2346
Main Flow Period - Initial BHFP, psia	271	276	301	315
Main Flow Period - Final BHFP, psia	CLOCK STOP	2223	2227	2225
Main Flow Period - Final BHFT, °C	-	-	54.2	55.2
Main S.I. Period - Final BHCIP, psia	2322	2340	2344	2342
Main S.I. Period - Final BHCIT, °C	-	-	53.3	54.2
Final Hydrostatic Pressure, psia	2636	2664	2659	2658

PRODUCED FLUIDS DATA:

Gauge Tank Oil S.G./API Gravity N/A / At °F

Produced Water Chlorides 114, 670 ppm

Produced H_2S 0 ppm

BS & W 100 % FORMATION WATER (SG=1.134) AND TRACE OIL.

N/B TOTAL FLUID PRODUCTION IS THAT FROM INITIAL AND MAIN FLOW PERIODS.

DRILL STEM TEST SUMMARY

WELL NO: BROUGHTON B1 RIG: KENTING 36 RTE: 68.27 mamsl

TEST NO: 8A FORMATION: PENISTONE FLAGS

DATE: 28th - 29th August 1984.

PERFORATED INTERVAL/DENSITY: OPEN HOLE TEST

TEST INTERVAL: 1491.3 - 1509.4 mbrt

PACKER DEPTH(S): 1490.0, 1512.8 mbrt

FLUID CUSHION - Type/Height/Drawdown NONE / m / psi

TOTAL NUMBER OF DOWNHOLE GAUGES 4 x Pressure 2 x Temperature

SURFACE MEASUREMENTS

	INITIAL	INITIAL	MAIN	MAIN
Flow/Shut In Period	FLOW	S/I	FLOW	S/I
Duration - Mins.	5	64	582	700
Total Flow Time - Mins.	5	-	587	-
Final W/H Flowing Pressure - p.s.i.g.	-	-	4	-
Final W/H Flowing Temperature - °F	-	-	-	-
Choke Size at End of Flow - Inches	-	-	-	-
Gas Flowrate Average/Final SCF/D	-	-	4,320	-
Oil Flowrate Average/~~Final~~ STBPD	-	-	22.7	-
Water Flowrate Average/~~Final~~ B/D	-	-	14.7	-
Total Oil Produced STB	-	-	9.25	-
Total Water Produced BBL MUD	-	-	6	-

DOWNHOLE MEASUREMENTS

	KUSTER K3		DMR 314	
Gauge Number/Owner	17725	17734	1253	1296
Gauge Depths mBRT SENSOR POINT mTVDss	1481.8 1413.5	1492.8 1424.5	1492.8 1424.5	1492.8 1424.5
Initial Hydrostatic Pressure, psia	2481	2502	2496	2496
Initial Flow Period - Final BHFP, psia	N/A	N/A	172	93
Initial S.I. Period - Final BHCIP, psia	2145	2168	2189	2190
Main Flow Period - Initial BHFP, psia	111	118	122	111
Main Flow Period - Final BHFP, psia	452	462	468	467
Main Flow Period - Final BHFT, °C	-	-	50.2	50.8
Main S.I. Period - Final BHCIP, psia	2187	2207	2215	2214
Main S.I. Period - Final BHCIT, °C	-	-	51.3	51.9
Final Hydrostatic Pressure, psia	2474	2493	2494	2493

PRODUCED FLUIDS DATA: RESULTS FROM ANALYSIS OF OIL SAMPLE

Gauge Tank Oil S.G./API Gravity	0.853 / 34.4 At 60 °F
Produced Water Chlorides	430 ppm
Produced H_2S	0 ppm
BS & W	12 % Vol.

DRILL STEM TEST SUMMARY

WELL NO: BROUGHTON B1 RIG: KENTING 36 RTE: 68.27 mamsl

TEST NO: 9 (CASED HOLE) FORMATION: SANTON SANDSTONE.

DATE: 5th - 6th September 1984.

PERFORATED INTERVAL/DENSITY: 1860.9 - 1854.2 mbrt @ 4 shots/ft

TEST INTERVAL: 1871.8 - 1854.2 mbrt

PACKER DEPTH(S): 1849.0 mbrt

FLUID CUSHION - Type/Height/Drawdown / m / psi

TOTAL NUMBER OF DOWNHOLE GAUGES 3 x Pressure 1 x Temperature

SURFACE MEASUREMENTS

	INITIAL	INITIAL	MAIN	MAIN
Flow/Shut In Period	FLOW	S/I	FLOW	S/I
Duration - Mins.	11	65	334	343
Total Flow Time - Mins.	11	-	345	-
Final W/H Flowing Pressure - p.s.i.g.	-	-	0	-
Final W/H Flowing Temperature - °F	-	-	-	-
Choke Size at End of Flow - Inches	-	-	-	-
Gas Flowrate ~~Average~~/Final SCF/D	-	-	30	-
Oil Flowrate Average/Final STBPD	0	-	0	-
Water Flowrate Average/Final B/D	-	-	9.6	-
Total Oil Produced STB	0	-	0	-
Total Water Produced BBL MUD	-	-	2.3	-

DOWNHOLE MEASUREMENTS

	HALLIBURTON - BOURDON TUBE GAUGES			
Gauge Number/Owner	4542	1286	2534	TE - 45
Gauge Depths mBRT	1843.2	1844.7	1859.1	FAILURE
mTVDss	1774.9	1776.4	1790.8	
Initial Hydrostatic Pressure, psia	2874	2863	2900	
Initial Flow Period - Final BHFP, psia	78	94	119	
Initial S.I. Period - Final BHCIP, psia	2601	2592	2630	
Main Flow Period - Initial BHFP, psia	127	134	175	
Main Flow Period - Final BHFP, psia	495	499	530	
Main Flow Period - Final BHFT, °C	N/A	N/A	N/A	
Main S.I. Period - Final BHCIP, psia	2483	2495	2527	
Main S.I. Period - Final BHCIT, °C	N/A	N/A	N/A	
Final Hydrostatic Pressure, psia	2853	2866	2904	

PRODUCED FLUIDS DATA: NO LABORATORY ANALYSIS PERFORMED, BEST ESTIMATES GIVEN.

Gauge Tank Oil S.G./API Gravity NA / At °F

Produced Water Chlorides Approx 35, 000 ppm

Produced H_2S 0 ppm

BS & W 100 % MUD FILTRATE

N/B TOTAL FLUID PRODUCTION IS THAT FROM INITIAL AND MAIN FLOW PERIODS.

DRILL STEM TEST SUMMARY

WELL NO: BROUGHTON B1 RIG: KENTING 36 RTE: 68.27 mamsl

TEST NO: 10A (CASED HOLE) FORMATION: SANTON SANDSTONE

DATE: 6th - 7th September 1984.

PERFORATED INTERVAL/DENSITY: 1860.9 - 1854.2 mbrt @ 4 shots/ft

TEST INTERVAL: 1871.8 - 1854.2 mbrt

PACKER DEPTH(S): 1849.0 mbrt

FLUID CUSHION - Type/Height/Drawdown - / m / psi

TOTAL NUMBER OF DOWNHOLE GAUGES 3 x Pressure 0 x Temperature

SURFACE MEASUREMENTS MAIN FLOW ONLY

	MAIN FLOW			
Flow/Shut In Period				
Duration - Mins.	744			
Total Flow Time - Mins.	744			
Final W/H Flowing Pressure - p.s.i.g.	0			
Final W/H Flowing Temperature - °F	-			
Choke Size at End of Flow - Inches	-			
Gas Flowrate ~~Average~~/Final SCF/D	30			
Oil Flowrate Average/Final STBPD	0			
Water Flowrate Average/~~Final~~ B/D	8.1			
Total Oil Produced STB	0			
Total Water Produced BBL	4.2			

DOWNHOLE MEASUREMENTS

HALLIBURTON - BOURDON TUBE GAUGES

Gauge Number/Owner	4542	1286	2534	
Gauge Depths mBRT	1843.2	1844.7	1859.1	
mTVDss	1774.9	1776.4	1790.8	
Initial Hydrostatic Pressure, psia	2887	2872	2906	
Initial Flow Period - Final BHFP, psia	N/A	N/A	N/A	
Initial S.I. Period - Final BHCIP, psia	N/A	N/A	N/A	
Main Flow Period - Initial BHFP, psia	102	118	139	
Main Flow Period - Final BHFP, psia	695	695	708	
Main Flow Period - Final BHFT, °C	N/A	N/A	N/A	
Main S.I. Period - Final BHCIP, psia	N/A	N/A	N/A	
Main S.I. Period - Final BHCIT, °C	N/A	N/A	N/A	
Final Hydrostatic Pressure, psia	2899	2872	2909	

PRODUCED FLUIDS DATA: NO LABORATORY ANALYSIS PERFORMED, BEST ESTIMATES GIVEN.

Gauge Tank Oil S.G./API Gravity N/A At °F

Produced Water Chlorides Average 54,000 ppm Max. 88, 000

Produced H_2S 0 ppm

BS & W 100 %

WELL NUMBER: BROUGHTON B1 - OPEN HOLE TESTS **FLUID SAMPLE RECORD**

TEST NO.	DATE/TIME SAMPLED	TYPE	SAMPLING POINT	TEMP/PRESS oC/psig	SAMPLE NUMBER	VOLUME	CONTAINER NUMBER	DESPATCHED TO	ANALYSIS REQUESTED	DATE ANALYSIS RECEIVED
DST 3	21/8/84 1600 hrs	FORMATION WATER	CHOKE MANIFOLD	AMBIENT	-	5 litres	-	Caleb Brett	10 ION ANALYSIS	21/9/84
DST 4A	22/8/84 1630 hrs	FORMATION WATER	"	"	-	"	-	"	"	"
DST 5	24/8/84 0815 hrs	FORMATION WATER	"	"	-	"	-	"	"	"
DST 6	26/8/84 2200 hrs	FORMATION WATER	"	"	-	"	-	"	"	"
DST 7	28/8/84 0945 hrs	FORMATION WATER	"	"	-	"	-	"	"	"
DST 8	29/8/84 2100 hrs	OIL	"	"	-	"	-	MOORE, BARRETT AND REDWOOD	OIL ASSY.	16/10/84 Preliminary

PERFORATION RECORD

RUN NO.	DATE	INTERVAL PERFORATED (m)	METRES PERF.	NO. OF GUNS	TIME TAKEN (hours)	REMARKS
5A	3/9/84	1845.3-1845.0	0.3	1(4 shots)	2.25	Perforated interval for dry test. CCL changed out due to weak response while R.I.H.
6B	5/9/84	1860.9-1856.33	4.57	1	1.25	Select fire switch failure - bottom gun only fired.
6B	5/9/84	1856.33-1854.2	2.13	1	2.0	

GAUGE SPECIFICATIONS SUMARY.

GAUGE NAME		LYNES KUSTER K3 *	LYNES DMR 314 *	HALLIBURTON BT **	HALLIBURTON BT
GAUGE NUMBER		17725 17734	1253 1296	4542 (1) 1286 (1) 2534 (2)	TE 45
TYPE OF GAUGE		BOURDON TUBE	QUARTZ CRYSTAL	BOURDON TUBE	BOURDON TUBE
Pressure	Resolution	Not Available	± 0.5 psi	Not Available	Not Applicable
	Accuracy	± 7.5 psi	± 2.5 psi	± 7.5 psi (1) ± 12.5 psi (2)	Not Applicable
Temperature	Resolution	Not Applicable	0.14°C	Not Applicable	Not Available
	Accuracy	Not Applicable	1.0°C	Not Applicable	Not Available
Sampling Rate		Not Applicable	4 minutes (set using a 2 minute stagger)	Not Applicable	Not Applicable

* Used in open hole testing only.

** Used in cased hole testing only.

(1) 3000 psig FSD

(2) 5000 psig FSD

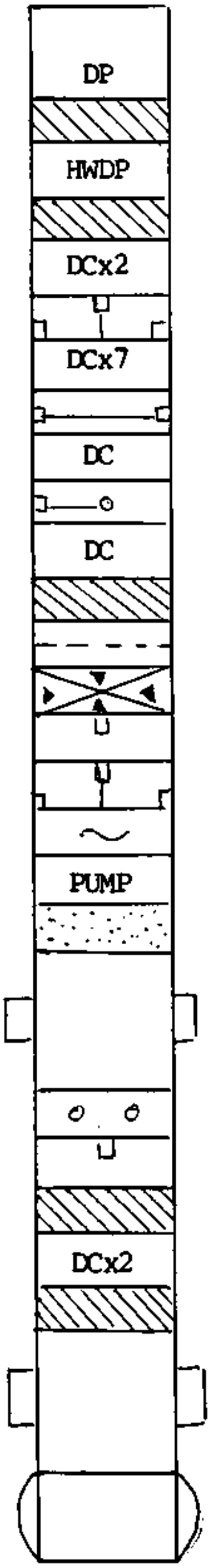
DST 1

PENISTONE FLAGS

BROUGHTON B1

STRING DIAGRAM

Stick-up of 3.46 m

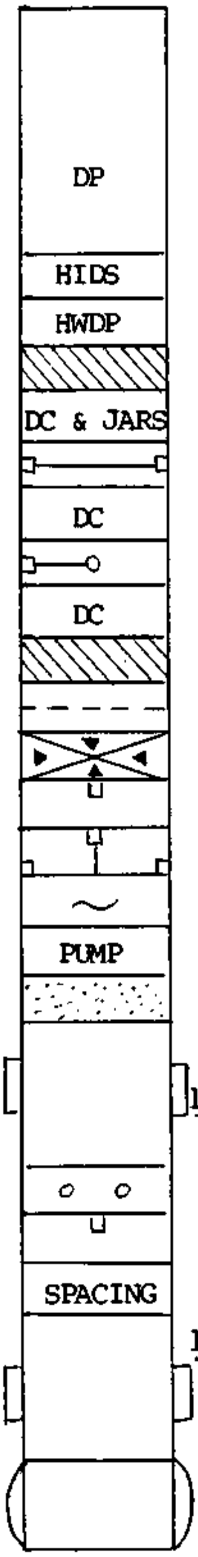


Depth m BRT	Length m	ID inches	Volume ft^3	Cum Length m	Cum Volume ft^3
	1255.46	3.826	328.69	1255.46	328.69
	0.39	2.625	0.05	1255.85	328.74
	111.39	3.0	17.94	1367.24	346.68
	0.79	2.25	0.07	1368.03	346.75
	19.06	2.813	2.70	1387.09	349.45
	10.75	2.688	1.39	1397.84	350.84
	65.66	2.813	9.30	1463.50	360.14
	0.30	2.5	0.03	1463.80	360.17
	9.01	2.813	1.28	1472.81	361.45
	0.31	3.0	0.05	1473.12	361.50
	9.01	2.813	1.28	1482.13	362.78
	0.31	2.785	0.04	1482.44	362.82
	0.20	4	0.06	1482.64	362.88
	1.49	1.0	0.03	1484.13	362.91
	1.37	1.0	0.02	1485.50	362.93
	1.94	1.5	0.08	1487.44	363.01
	0.66	2.25	0.06	1488.10	363.07
	2.38	1.0	0.04	1490.48	363.11
	1.16	1.0	0.02	1491.64	363.13
	0.46	1.0	0.01	1492.10	363.14
1490.0	1.36	1.0	0.02	1493.46	363.16
	0.46	1.0	0.01	1493.92	363.17
	0.31	1.0	0.01	1494.23	363.18
	2.06	1.25	0.01	1496.29	363.19
	0.31	2.785	0.04	1496.60	363.23
	18.66	2.375	1.88	1515.26	365.11
	0.31	2.375	0.03	1515.57	365.14
1512.57	0.46	1.0	0.01	1516.03	365.15
	1.36	1.0	0.02	1517.39	365.17
	0.58	1.0	0.01	1517.97	365.18
	2.01	2.5	0.22	1519.98	365.40

BROUGHTON B1 **DST 3**

STRING DIAGRAM **RAVENSTHORPE SANDSTONE**

Stick-up of 4.21 m



Depth m BRT	Length m	ID inches	Volume ft^3	Cum Length m	Cum Volume ft^3
	1529.27	3.826	400.38	1529.27	400.38
	0.39	3.0	0.06	1529.66	400.44
	111.43	3.0	17.95	1641.09	418.39
	0.79	2.25	0.07	1641.88	418.46
	134.41	2.813	19.03	1776.29	437.49
	0.30	3.0	0.05	1776.59	437.54
	9.40	2.813	1.33	1785.99	438.87
	0.31	3.0	0.05	1786.30	438.92
	9.38	2.813	1.33	1795.68	440.25
	0.31	2.785	0.04	1795.99	440.29
	0.20	4.0	0.06	1796.19	440.35
	1.49	1.0	0.03	1797.68	440.38
	1.37	1.0	0.02	1799.05	440.40
	2.14	1.5	0.01	1801.19	440.41
	0.66	2.25	0.06	1801.85	440.47
	2.38	1.0	0.04	1804.23	440.51
	1.16	1.0	0.02	1805.39	440.53
	0.46	1.0	0.01	1805.85	440.54
1803.00	1.36	1.0	0.02	1807.21	440.56
	0.46	1.0	0.01	1807.67	440.57
	0.31	1.0	0.01	1807.98	440.58
	2.06	1.25	0.06	1810.04	440.64
	5.49	2.0	0.39	1815.53	441.03
1812.11	0.79	1.0	0.01	1816.32	441.04
	1.36	1.0	0.02	1817.68	441.06
	0.58	1.0	0.01	1818.26	441.07
	2.01	2.5	0.22	1820.27	441.29

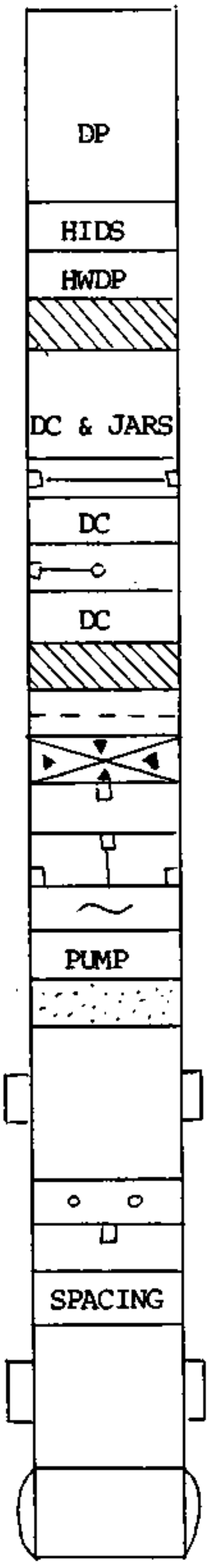
BROUGHTON B1

STRING DIAGRAM

DST 4A

SANTON SANDSTONE

Stick-up of 3.40 m



Depth m BRT	Length m	ID inches	Volume ft^3	Cum Length m	Cum Volume ft^3
	1592.49	3.826	416.93	1592.49	416.93
	0.39	3.0	0.06	1592.88	416.99
	111.43	3.0	17.95	1704.31	434.94
	0.79	2.25	0.07	1705.10	495.01
	132.38	2.813	18.74	1837.48	453.75
	0.30	3.0	0.05	1837.78	453.80
	9.40	2.813	1.33	1847.18	455.13
	0.31	3.0	0.05	1847.49	455.18
	9.38	2.813	1.33	1856.87	456.51
	0.31	2.785	0.04	1857.18	456.55
	0.20	4.0	0.06	1857.38	456.61
	1.49	1.0	0.03	1858.87	456.64
	1.37	1.0	0.02	1860.24	456.66
	2.14	1.5	0.01	1862.38	456.67
	0.66	2.25	0.06	1863.04	456.73
	2.38	1.0	0.04	1865.42	456.77
	1.16	1.0	0.02	1866.58	456.79
	0.46	1.0	0.01	1867.04	456.80
1865.00	1.36	1.0	0.02	1868.40	456.82
	0.46	1.0	0.01	1868.86	456.83
	0.31	1.0	0.01	1869.17	456.84
	2.06	1.25	0.06	1871.23	456.90
	7.93	2.0	0.57	1879.16	457.47
1876.55	0.79	1.0	0.01	1879.95	457.48
	1.36	1.0	0.02	1881.31	457.50
	0.58	1.0	0.01	1881.89	457.51
	2.01	2.5	0.22	1883.90	457.73

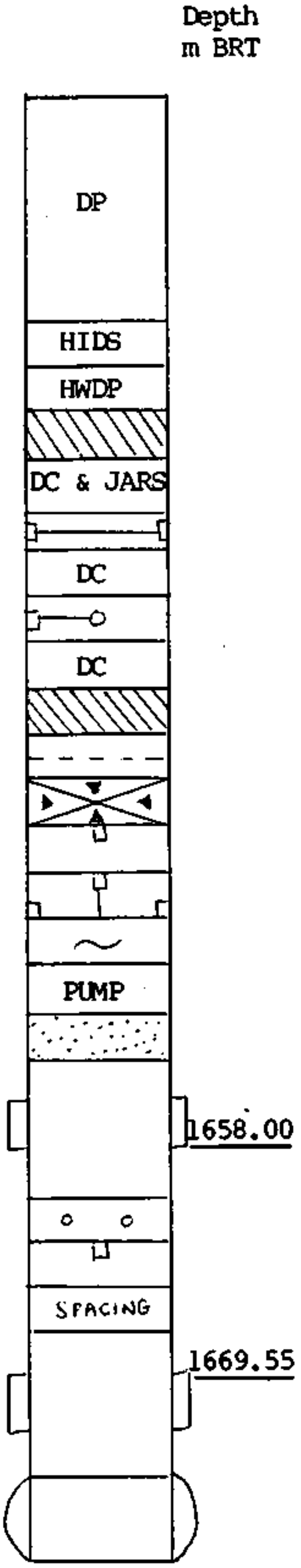
BROUGHTON B1

STRING DIAGRAM

DST 5

ASHOVER SANDSTONE

Stick-up of 3.32 m

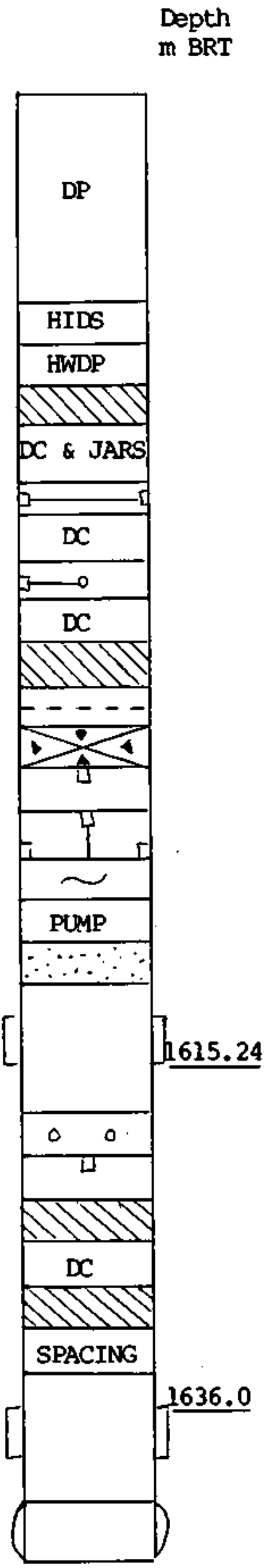


Length m	ID inches	Volume ft^3	Cum Length m	Cum Volume ft^3
1385.41	3.826	362.72	1385.41	362.72
0.39	3.0	0.06	1385.80	362.78
111.43	3.0	17.95	1497.23	380.73
0.79	2.25	0.07	1498.02	380.80
132.38	2.813	18.74	1630.40	399.54
0.30	3.0	0.05	1630.70	399.59
9.40	2.813	1.33	1640.10	400.92
0.31	3.0	0.05	1640.41	400.97
9.38	2.813	1.33	1649.79	402.30
0.31	2.785	0.04	1650.10	402.34
0.20	4.0	0.06	1650.30	402.40
1.49	1.0	0.03	1651.79	402.43
1.37	1.0	0.02	1653.16	402.45
2.14	1.5	0.01	1655.30	402.46
0.66	2.25	0.06	1655.96	402.52
2.38	1.0	0.04	1658.34	402.56
1.16	1.0	0.02	1659.50	402.58
0.46	1.0	0.01	1659.96	402.59
1.36	1.0	0.02	1661.32	402.61
0.46	1.0	0.01	1661.78	402.62
0.31	1.0	0.01	1662.09	402.63
2.06	1.25	0.06	1664.15	402.69
7.93	2.0	0.57	1672.08	403.26
0.79	1.0	0.01	1672.87	403.27
1.36	1.0	0.02	1674.23	403.29
0.58	1.0	0.01	1674.81	403.30
2.01	2.5	0.22	1676.82	403.52

BROUGHTON B1 **DST 6**

STRING DIAGRAM **CHATSWORTH SANDSTONE**

Stick-up of 3.52 m

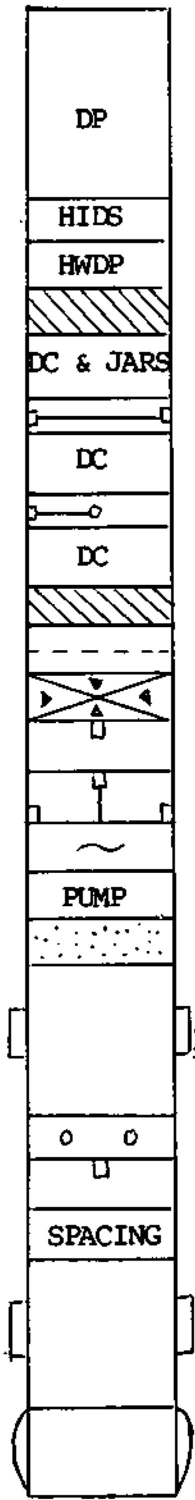


Length m	ID inches	Volume ft^3	Cum Length m	Cum Volume ft^3
1352.05	3.826	353.98	1352.05	353.98
0.39	3.0	0.06	1352.44	354.04
111.43	3.0	17.95	1463.87	371.99
0.79	2.25	0.07	1464.66	372.06
123.18	2.813	17.44	1587.84	389.50
0.30	3.0	0.05	1588.14	389.55
9.40	2.813	1.33	1597.54	390.88
0.31	3.0	0.05	1597.85	390.93
9.38	2.813	1.33	1607.23	392.26
0.31	2.785	0.04	1607.54	392.30
0.20	4.0	0.06	1607.74	392.36
1.49	1.0	0.03	1609.23	392.39
1.37	1.0	0.02	1610.60	392.41
2.14	1.5	0.01	1612.74	392.42
0.66	2.25	0.06	1613.40	392.48
2.38	1.0	0.04	1615.78	392.52
1.16	1.0	0.02	1616.94	392.54
0.46	1.0	0.01	1617.40	392.55
1.36	1.0	0.02	1618.76	392.57
0.46	1.0	0.01	1619.22	392.58
0.31	1.0	0.01	1619.53	392.59
2.06	1.25	0.06	1621.59	392.65
0.31	2.875	0.05	1621.90	392.70
9.20	2.813	1.30	1631.10	394.00
0.31	2.875	0.05	1631.41	394.05
7.32	2.0	0.52	1638.73	394.57
0.79	1.0	0.01	1639.52	394.58
1.36	1.0	0.02	1640.88	394.60
0.58	1.0	0.01	1641.46	394.61
2.01	2.5	0.22	1643.47	394.83

BROUGHTON B1 DST 7

STRING DIAGRAM WINGFIELD FLAGS

Stick-up of 3.21 m

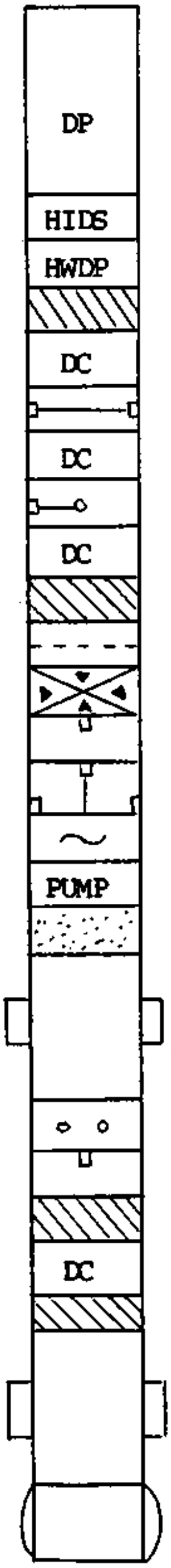


Depth m BRT	Length m	ID inches	Volume ft^3	Cum Length m	Cum Volume ft^3
	1293.80	3.826	338.73	1293.80	338.73
	0.39	3.0	0.06	1294.19	338.79
	111.43	3.0	17.95	1405.62	356.74
	0.79	2.25	0.07	1406.41	356.81
	132.38	2.813	17.44	1538.79	374.25
	0.30	3.0	0.05	1539.09	374.30
	9.40	2.813	1.33	1548.49	375.63
	0.31	3.0	0.05	1548.80	375.68
	9.38	2.813	1.33	1558.18	377.01
	0.31	2.785	0.04	1558.49	377.05
	0.20	4.0	0.06	1558.69	377.11
	1.49	1.0	0.03	1560.18	377.14
	1.37	1.0	0.02	1561.55	377.16
	2.14	1.5	0.01	1563.69	377.17
	0.66	2.25	0.06	1564.35	377.23
	2.38	1.0	0.04	1566.73	377.27
	1.16	1.0	0.02	1567.89	377.29
	0.46	1.0	0.01	1568.35	377.30
1566.50	1.36	1.0	0.02	1569.71	377.32
	0.46	1.0	0.01	1570.17	377.33
	0.31	1.0	0.01	1570.48	377.34
	2.06	1.25	0.06	1572.54	377.40
	7.32	2.0	0.52	1579.86	377.92
1577.44	0.79	1.0	0.01	1580.65	377.93
	1.36	1.0	0.02	1582.01	377.95
	0.58	1.0	0.01	1582.59	377.96
	2.01	2.5	0.22	1584.60	378.18

BROUGHTON B1 — DST 8 A

STRING DIAGRAM — PENISTONE FLAGS

Stick-up of 3.38 m



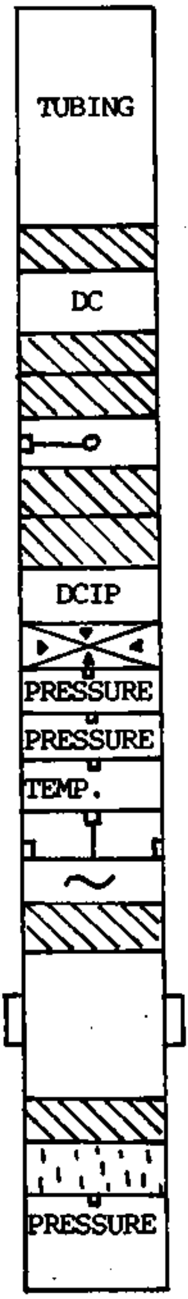
Depth m BRT	Length m	ID inches	Volume ft^3	Cum Length m	Cum Volume ft^3
	1236.04	3.826	323.61	1236.04	323.61
	0.39	3.0	0.06	1236.43	323.67
	111.43	3.0	17.95	1347.86	341.62
	0.79	2.25	0.07	1348.65	341.69
	113.81	2.813	17.44	1462.46	359.13
	0.30	3.0	0.05	1462.76	359.18
	9.40	2.813	1.33	1472.16	360.51
	0.31	3.0	0.05	1472.47	360.56
	9.38	2.813	1.33	1481.85	361.89
	0.31	2.785	0.04	1482.16	361.93
	0.2	4.0	0.06	1482.36	361.99
	1.49	1.0	0.03	1483.85	362.02
	1.37	1.0	0.02	1485.22	362.04
	2.14	1.5	0.01	1487.36	362.05
	0.66	2.25	0.06	1488.02	362.11
	2.38	1.0	0.04	1490.40	362.15
	1.16	1.0	0.02	1491.56	362.17
	0.46	1.0	0.01	1492.02	362.18
1490.00	1.36	1.0	0.02	1493.38	362.20
	0.46	1.0	0.01	1493.84	362.21
	0.31	1.0	0.01	1494.15	362.22
	2.06	1.25	0.06	1496.21	362.28
	0.31	2.0	0.02	1496.52	362.30
	18.57	2.813	2.63	1515.09	364.93
	0.31	2.0	0.02	1515.40	364.95
1512.81	0.79	1.0	0.01	1516.19	364.96
	1.36	1.0	0.02	1517.55	364.98
	0.58	1.0	0.01	1518.13	364.99
	2.01	2.5	0.22	1520.14	365.21

BROUGHTON B1 **DST 9 AND 10A (CASED HOLE)**

STRING DIAGRAM **SANTON SANDSTONE**

Stick-up of 1.13 m

Perforated Interval 1860.9 - 1854.2 m BRT



Depth m BRT	Length m	ID inches	Volume ft^3	Cum Length m	Cum Volume ft^3
	1650.05	1.995	117.52	1650.05	1650.05
	0.44	1.0	0.01	1650.49	1650.06
	187.83	1.0	3.36	1838.32	1653.42
	0.30	1.0	0.01	1838.62	1653.43
	0.18	2.375	0.02	1838.80	1653.45
	0.43	1.75	0.02	1839.23	1653.47
	0.20	2.75	0.03	1839.43	1653.50
	0.12	2.25	-	1839.55	1653.50
	1.46	0.625	0.01	1841.01	1653.51
	1.76	0.625	0.01	1842.77	1653.52
	1.51	0.625	0.01	1844.28	1653.53
	1.40	0.625	0.01	1845.68	1653.54
	1.40	0.625	0.01	1847.08	1653.55
	1.54	1.25	0.04	1848.62	1653.59
	0.78	0.75	0.01	1849.40	1653.60
	0.17	2.0	0.01	1849.57	1653.61
1849.0	0.56	1.90	0.04	1850.13	1653.65
	0.15	1.90	0.01	1850.28	1653.66
	0.65	1.90	0.04	1850.93	1653.70
	0.17	1.75	0.01	1851.10	1653.71
	7.62	1.75	0.42	1858.72	1654.13
	1.27	0.625	0.01	1859.99	1654.14

BROUGHTON B1

Surface Easting:	494627	Datum for MD:	RT	
Surface Northing:	410760		(f)	(m)
Deviated:	N	Elevation Datum:	224	68.2
Original Depth Units:	metres	Elevation GL:	207	63.1
Surface Formation:	Upper Lias			

Top	MD (f)	MD (m)	TVDSS (f)	TVDSS (m)	TWT (s)	Detail
Upper Lias	17	5.1	-207	-63.1	-	-
Middle Lias	90	27.5	-134	-40.7	-	-
Lower Lias	330	100.5	106	32.2	0.031	-
Triassic	603	183.8	379	115.6	0.100	-
Penarth Group (Rhaetic)	603	183.8	379	115.6	0.100	-
Mercia Mudst (Keuper)	631	192.2	407	124.0	0.107	-
Muschelkalk	1460	445.0	1236	376.8	0.283	-
Zechstein (U.Permian)	2630	801.5	2406	733.3	0.522	-
L. Permian Marl/Shale	3597	1096.2	3373	1028.0	0.643	-
Rotliegendes/Leman SS	3674	1119.8	3450	1051.6	0.654	-
Westphalian C & D	3697	1126.8	3473	1058.6	0.659	-
Westphalian B	4099	1249.2	3875	1181.0	0.731	-
Westphalian A	4672	1424.0	4448	1355.8	0.835	-
Namurian	5211	1588.3	4987	1520.1	0.923	-
Dinantian	6188	1886.0	5964	1817.8	1.067	-
TD	6300	1920.0	6076	1851.8	1.078	Dinantian

Comments: -

ON B1

BP PETROLEUM DEVELOPMENT LIMITED

L46/13-3

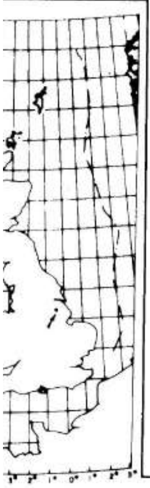
BROUGHTON B–1

WELL RECORD CENTRE
29 MAY 1985
DEPARTMENT OF ENERGY

DRILLED DEPTH

Humbs

NATIONAL GRID REFERENCE:
SURFACE LOCATION SE494627410760 0 34 13.493W 53 35 04.694
TOP RESERVOIR LOCATION ———
BOTTOM HOLE LOCATION ———
R.T.E. 68·2 m A.O.D. 5·1 m A.G.L. G.L.E. 63·1 m A.O.D.
RIG KENTING–36 SPUDDED 18th. JULY, 1984 COMPLETED DRILLING 17th. AUG, '84
TOTAL DEPTH DRILLED 1920·0 m B.R.T. TOTAL DEPTH (T.V.D.) — m B.R.T. — m S.S.
AVERAGE ANGLE OF DEVIATION THROUGH RESERVOIR 1·25° MAXIMUM DEVIATION 2°
WELL STATUS SUSPENDED OIL WELL



LITHOLOGICAL

- Limestone
- Dolomite
- Misc Carbonate
- Dolomitic Limestone
- Calcareous Dolomite
- Clay, Mudstone, Shale (LT 70)
- Siltstone
- Sandstone, Sand
- Conglomerate, Gravel
- Siliceous Rock
- Coal, Lignite & other Carbonaceous Rock
- Anhydrite, Gypsum
- Halite
- Miscellaneous Chlorides and Sulphates
- Iron, Manganese, Phosphate and other Misc. Mins.
- Chert
- Extrusive Igneous
- Tuff
- Intrusive Igneous
- Metamorphic
- Cement (LT 110)
- No Samples

LITHOLOGICAL QUALIFIERS

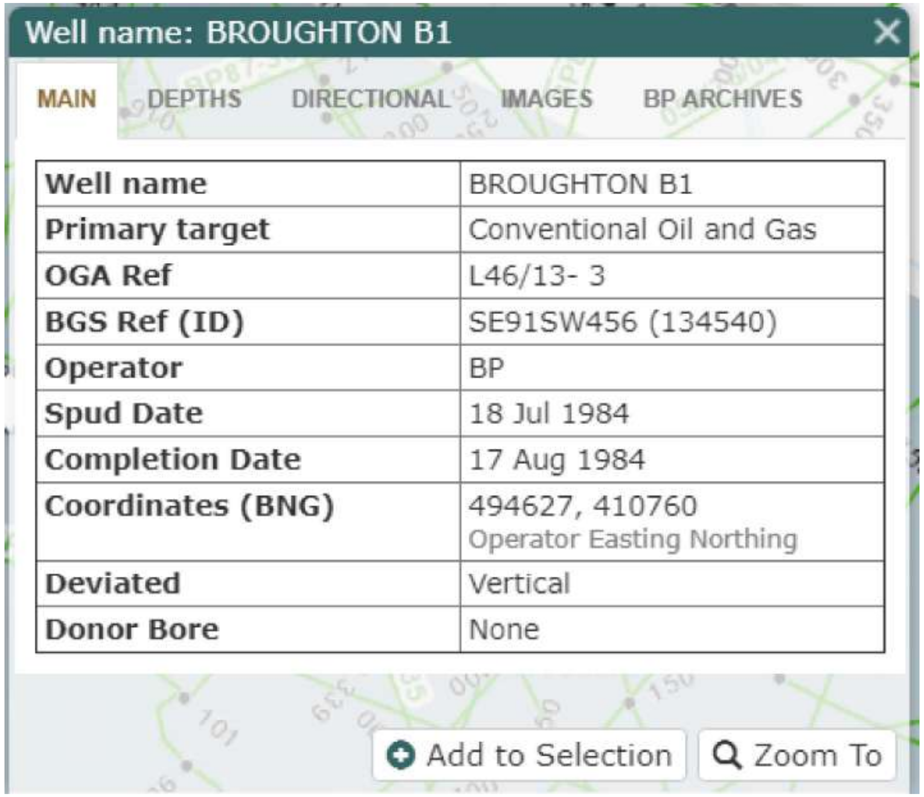
- Clayey
- Sandy
- Silty
- Gravelly
- Calcareous
- Dolomitic
- G Significant Glauconite
- Significant Carb Frags
- Phosphatic, Ferruginous Manganiferous
- Bituminous
- Tuffaceous

GRA FOSSILIFERO

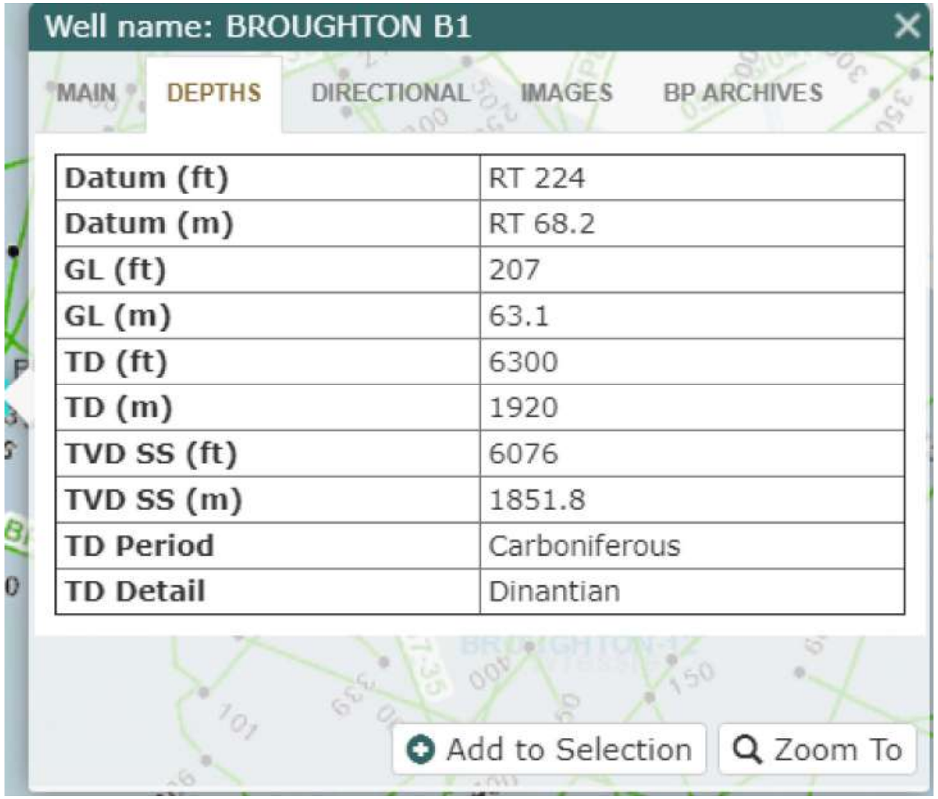
- Ben
- Plan
- Ben
- Plan
- Plan

WELL SYMBOLS

- Water Flow
- Loss to Formation
- Gas Trace
- Gas Show
- Oil Show
- Gas & Condensate Show
- Oil and Gas Show
- Hydrocarbon Fluorescence
- Cored Interval
- Sidewall Core
- No Recovery
- Formation Interval Test
- Drill Ste
- Perforated
- Casing S
- Liner Hang



Well name	BROUGHTON B1
Primary target	Conventional Oil and Gas
OGA Ref	L46/13- 3
BGS Ref (ID)	SE91SW456 (134540)
Operator	BP
Spud Date	18 Jul 1984
Completion Date	17 Aug 1984
Coordinates (BNG)	494627, 410760 Operator Easting Northing
Deviated	Vertical
Donor Bore	None



Datum (ft)	RT 224
Datum (m)	RT 68.2
GL (ft)	207
GL (m)	63.1
TD (ft)	6300
TD (m)	1920
TVD SS (ft)	6076
TVD SS (m)	1851.8
TD Period	Carboniferous
TD Detail	Dinantian

Former Oil Well compound entrance and general view

Concrete slab assumed capping decommissioned well

Vegetated bund surround