



Geotechnical &
Environmental
Consultants

Old Main Road
Fleet Hargate

**Combined Phase I Desk Study
& Phase II Exploratory Investigation
For
Seagate Homes**



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Project No: D37124		Date: 31 th October 2017	
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Comments			

EXECUTIVE SUMMARY

Ground Conditions	Topsoil with an average thickness of approximately 0.40m. Beneath the topsoil, typically firm SILT and/or CLAY with varying amounts of Sand was encountered to depths of between 1.00m and 3.30m begl, where penetrated. Underlying the near surface cohesive soils, loose to medium dense very silty organic SAND was encountered to depths of 9.30m and 12.70m begl. The Sand was underlain by firm and stiff sandy gravelly CLAY or dense very sandy GRAVEL to depths of up to 13.60m begl. These deposits are considered to be typically representative of the Fenland Formation. The cable percussive boreholes encountered stiff sandy gravelly CLAY to depths of 17.00m begl and is considered to be typically representative of the Ampthill Clay Formation.
Foundation Design	<p>The natural near surface Clay and Silt soils underlying the site at shallow depth appear suitable to support a nett allowable ground bearing pressure of up to 75kN/m². This is based on typical 0.60m wide strip foundations founded at a depth less than 1m below existing ground levels to ensure settlements are within a 25mm tolerance. Foundations for the proposed development are likely to comprise Engineer designed strip foundations to suit the loading characteristics of the proposed structures. Rafts may be considered as an alternative shallow foundation solution, where higher loads from the proposed buildings are present or where foundations are affected by trees. Rafts should be designed adopting an allowable ground bearing pressure of 50kN/m². The use of piles may also be considered where excessive loads from buildings are present and shallow foundations are not deemed appropriate.</p> <p>It is recommended that foundations should be advanced to a minimum founding depth of 0.75m and founded within undisturbed suitably competent natural soils.</p> <p>Softening of the soils was observed across the majority of the site at depths generally in excess of 1.65m begl. It is important to ensure that all foundation excavations are kept as shallow as possible to avoid potential decreases in soil strength from affecting foundation integrity.</p>
Floor Slab Design & Ground Gas Precautions	The site falls into characteristic situation CS2 based on the gas monitoring visits undertaken to date.
Building Near Trees	Foundations should be adjusted in full accordance with NHBC Standards Chapter 4.2 ' <i>Building near trees</i> ' where building near existing, proposed or recently removed trees. It is recommended that cohesive soils of a low volume change potential should be assumed for design purposes.
Radon	No radon precautions are required.
Water	Shallow excavations for foundations may require localised dewatering. Dewatering is anticipated for any deeper excavations at the site.
Excavations / Stability	Deeper excavations (circa 2.60m) are likely to require trench support for stability and health and safety reasons. The assessment of excavations and provision of support will be the responsibility of the contractor on site.
Sulphate Classification	Design Class DS-1/ACEC Class AC-1. (BRE Spec. Digest 1:2005).
Coal Mining	No specific investigation or mitigation measures in relation to coal mining issues are considered to be necessary at the site.
CBRs	A CBR value of <2% to 3% may be anticipated within the shallow Natural Strata, subject to confirmation by in-situ testing.
Surface Water Drainage	The use of soakaways is unlikely to be suitable and it may be prudent to investigate alternative methods for draining the site, at this stage.
Contamination Assessment	The soils may be considered uncontaminated for the proposed end-use.
Remediation Proposals	No specific remediation required.
Off Site Disposal	If off-site disposal is required a new contamination assessment may be required to include bespoke leachate analysis (i.e. WAC testing).
Flood Risk	The site is revealed to lie within an area identified as being at risk of flooding. It is recommended that advice be sought from a Drainage Consultant with respect to this matter.
Construction Workers	No contamination has been identified that requires specific PPE.
Utilities	Prior to development of the site, we would recommend that a copy of this report is supplied to utility companies, and that their recommendations relating to appropriate supply pipes are adhered to.
Unforeseen Circumstances	Should any areas of potentially contaminated soil be encountered during site construction works we would recommend consultation with GeoDyne Limited to ensure that our recommendations continue to apply.
Licenses, Permits etc.	The Contractor/Developer is responsible for, and must ensure that, all necessary licenses, permits, plans, registrations and approvals are in place prior to commencing with the earthworks at the site.
Further Works	The current scope of works included 3No. gas monitoring visits. Liaison with the Local Planning Authority should be carried out to ascertain whether the current site characterisation is acceptable or whether additional confirmatory monitoring of the existing gas monitoring wells is necessary.

1.0 INTRODUCTION

1.1 Introduction

GeoDyne Limited has been appointed by Studio 11 Architecture Ltd on behalf of the Client, Seagate Homes, to undertake a Combined Phase I Desk Study and Phase II Exploratory Investigation on a parcel of land located to the north of Old Main Road, Fleet Hargate, Lincolnshire.

1.2 Scope of Works

The scope of the Phase I Desk Study included the following:

- Detailed site walkover.
- Review of historical and contemporary Ordnance Survey publications.
- Review of the sites geology, hydrology and hydrogeology (including a visit to the British Geological Survey in Keyworth).
- Review of commissioned Landmark geological maps.
- Review of the sites coal mining status.
- Review of the sites radon status.
- Review of a commissioned Landmark Envirocheck report.

Phase II Exploratory Investigation works comprised:

- A sub-contracted utility avoidance scan of proposed exploratory hole locations.
- A series of trial pits and cable percussive boreholes across the site.
- A programme of in-situ soakaway testing.
- Geotechnical and environmental soils testing.
- A programme of ground gas and water monitoring.

1.3 Project Understanding

We understand that it is proposed to develop the site for a low-rise residential end-use incorporating private gardens. This understanding has formed the basis of our report.

For the purposes of the assessments detailed herein, we have adopted a residential with plant uptake end-use (where applicable) for the proposed development. If our understanding is incorrect (for example if a commercial/industrial end-use was proposed), it would be necessary to review our report to ensure it continues to apply.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made based on the findings of the investigation. Where comments are made based on information obtained from third parties, GeoDyne Limited assumes that all third party information is true and correct. No independent action has been undertaken to validate the findings of third parties, unless specifically stated.

This report has been prepared in accordance with our understanding of current good practice. However changes to good practice, guidance or legislation may necessitate revision of this report after the date of issue.

We would note that the scope of laboratory testing and our assessment of the chemical soil test results have been primarily focussed on potential risks to human health. Our scope of chemical testing and assessment has not been specifically designed to fulfil any landfill or waste disposal company's requirements to suitably characterise any waste soil arising during future redevelopment of the site, or accurately determine disposal costs for any waste soil, although it will assist in such an assessment.

GeoDyne Limited has prepared this report for the sole use and reliance of the Client, Seagate Homes, in accordance with our Standard Conditions and Limitations (included in Appendix XII). This report may not be used or relied upon by any unauthorised third party without the explicit written agreement of GeoDyne Limited.

1.5 Confidentiality

The risk assessment herein remains the intellectual property and trade secret of GeoDyne Limited. The information contained within this report must not be disclosed or divulged to any commercial Consultant or other third party without the prior written agreement of GeoDyne Limited.

2.0 SITE DESCRIPTION & HISTORY

2.1 Site Description

The site comprises an irregular shaped parcel of land located to the north of Old Main Road, Fleet Hargate, Lincolnshire. The site may be located centred around approximate Ordnance Survey National Grid Reference 539510E 325070N. A site location plan (Figure No. D37124/01) is included in Appendix I. The site covers an area of approximately 0.43 hectares.

At the time of our works (September 2017), the site effectively comprised an irregular shaped grassed field adjoined to a small part of an additional grassed field in the north. The fields were separated by a drainage ditch that had been partially culverted to form a connecting walkway.

The site was bound by wooden fences in the east, a hedgerow and Old Main Road in the south, a driveway to a residential property and mature trees in the west and a drainage ditch with mature trees in the north.

The surrounding area typically comprised residential properties.

The Annotated Site Plan in Appendix II of this report (Figure No. D37124/02) shows the main features of the site and immediate surrounding area. General views of the site are included on the plan in Appendix III of this report (Figure No. D37124/03).

2.2 Site History

The historical and contemporary Ordnance Survey publications included within the Landmark Envirocheck report have been reviewed by GeoDyne to establish the history of the site and its environmental setting. The historical Ordnance Survey maps are included as Appendix IX of this report.

It should be noted that the site boundaries marked on the historical sheets within the Envirocheck report appears to 'shift' on several of the maps. This is due to Envirocheck transposition and scaling algorithm inaccuracies.

The key findings of the historical search are summarised in Table 1.

TABLE 1 – HISTORICAL PUBLICATION DATA		
Date	Features on Site	Features off Site
1880s	<ul style="list-style-type: none"> The site is located in the centre of Fleet Hargate village and comprises parts of two undeveloped open fields and part of what appears to be a pond in the north. A row of trees adjacent to a drainage ditch is present along the northern site boundary. 	<ul style="list-style-type: none"> A row of trees and a road is present to the immediate south of the site. A 'Smithy' is present approximately 60m to the west of the site. A pond is present approximately 210m to the southeast of the site and three ponds are present between approximately 230m and 240m to the west of the site. A series of drainage ditches are present in the surrounding area.
1890s	<ul style="list-style-type: none"> No maps available for viewing. 	<ul style="list-style-type: none"> No maps available for viewing.
1900s	<ul style="list-style-type: none"> The shape of the apparent pond feature in the north has changed slightly and it has reduced in size. 	<ul style="list-style-type: none"> The surrounding area remains essentially unchanged.
1910s &	<ul style="list-style-type: none"> No maps available for viewing. 	<ul style="list-style-type: none"> No maps available for viewing.

TABLE 1 – HISTORICAL PUBLICATION DATA		
Date	Features on Site	Features off Site
1920s		
1930s	<ul style="list-style-type: none"> The site remains essentially unchanged. 	<ul style="list-style-type: none"> The smithy is no longer labelled. A pond approximately 240m to the west is no longer present (presumed infilled).
1940s	<ul style="list-style-type: none"> No maps available for viewing. 	<ul style="list-style-type: none"> No maps available for viewing.
1950s	<ul style="list-style-type: none"> The site remains essentially unchanged. 	<ul style="list-style-type: none"> Additional small residential structures are present to east, west and north of the site.
1960s	<ul style="list-style-type: none"> No maps available for viewing. 	<ul style="list-style-type: none"> A depot is present approximately 50m to the southwest of the site. Extensive residential development has taken place to the south of the site. The pond to the southeast is no longer present (presumed infilled).
1970s	<ul style="list-style-type: none"> The feature in the north of the site is labelled as 'Pond' on a 1974 map. On the following 1976 map, the feature is no longer shown (presumed infilled) and the drainage ditch in the north appears to have been partially culverted to form a walkway. The field boundary bisecting the site is no longer present. 	<ul style="list-style-type: none"> Additional small residential structures are present to the east, west and south of the site. A garage is present approximately 50m to the west of the site. The A17 main road has been constructed approximately 60m to the north of the site and as a result, drainage ditches in its vicinity are no longer present.
1980s	<ul style="list-style-type: none"> No maps available for viewing. 	<ul style="list-style-type: none"> Extensive residential development has taken place to the south of the site. As a result, drainage ditches in the vicinity are no longer present (presumed infilled).
1990s	<ul style="list-style-type: none"> The site remains essentially unchanged. 	<ul style="list-style-type: none"> Residential development has taken place to the south of the site. As a result, drainage ditches in the vicinity are no longer present (presumed infilled). A pond to the west is no longer present (presumed infilled).
2000s	<ul style="list-style-type: none"> The site remains essentially unchanged. 	<ul style="list-style-type: none"> The surrounding area remains essentially unchanged.
2006	<ul style="list-style-type: none"> The site remains essentially unchanged. 	<ul style="list-style-type: none"> Additional small residential structures are present to the north of the site.
2017	<ul style="list-style-type: none"> The site remains essentially unchanged. 	<ul style="list-style-type: none"> The surrounding area remains essentially unchanged.

3.0 GEOLOGY & ENVIRONMENTAL SETTING

3.1 Geological References

The following geological publications were referred to:

- BGS 1:50000 Series Sheet 144 '*Spalding*' (1992).
- BGS Online Publication '*East Anglia and adjoining areas*' (2017).
- BGS publication, British Regional Geology '*Eastern England*' Second Edition (1961).
- The Coal Authority and The Law Society Publication '*Coal Mining and Brine Subsidence Claim Searches - Directory and Guidance*', Sixth Edition (2006).
- Environment Agency website: www.environment-agency.gov.uk.
- British Geological Survey website: www.bgs.ac.uk.

3.2 Geology

Superficial Drift Deposits

The site and immediate surrounding area are indicated to be underlain by Terrington Beds which date from the Quaternary. The 1:50000 scale map describes Terrington Beds as '*sandy silt, sand and clay*'.

The Terrington Beds in the area of the site are revealed to overlie the Barroway Drove Beds. Barroway Drove Beds are described by the online BGS information to comprise '*soft grey clays and silty clays...[and] thin mats of rotted, drifted stems of reeds and sedges are common at many levels*'. The Terrington Beds and the Barroway Drove Beds form part of the Fenland Formation.

Drift deposits have the potential to alter rapidly in character and geotechnical properties both laterally and vertically over relatively short distances and may also be water bearing.

Bedrock Geology

The Drift deposits at the site and in the immediate surrounding area are indicated to be underlain by the Ampthill Clay, dating from the Jurassic.

Online BGS information describes the West Walton Formation as '*mudstone, mainly smooth or slightly silty, pale to medium grey with...limestone (cementstone) nodules*'.

3.3 Faults

No faults are indicated beneath the site or within the general vicinity of the site.

3.4 Man-Made Deposits

No man-made deposits (i.e. Made Ground, Worked Ground or Infilled Ground) are indicated on the reviewed geological map publications on the site.

We would note that the historical publications revealed the presence of a pond and drainage ditch in the north of the site. The pond feature is no longer present and the drainage ditch appears to have been partially culverted on 1970s historical maps. Historical publications revealed the presence of additional drainage ditches within 250m of the site that are considered likely to have been infilled/culverted. Any infill materials within these features would represent Made Ground at the site.

3.5 Coal Mining

The site does not lie within an area requiring the commission of a coal mining report in accordance with The Coal Authority and The Law Society publication '*Coal Mining and Brine Subsidence Claim Searches - Directory and Guidance*', Sixth Edition (2006).

No specific investigation or mitigation in relation to historical coal mining issues is therefore considered to be necessary at the site.

3.6 Landmark Envirocheck Report

A Landmark Envirocheck report was commissioned to assist in ascertaining the environmental setting of the site. The full Envirocheck report is presented in Appendix X and has revealed the following relevant information (details are only listed where they are within potential influencing distance, i.e. 250m, of the site).

3.6.1 Agency & Hydrological

Aquifer Status

The superficial deposits comprising the Fenland Formation and the underlying bedrock geology comprising Ampthill Clay Formation are designated as Unproductive Strata.

Aquifer Descriptions

The Environment Agency describes Unproductive Strata as '*...rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow*'.

Source Protection Zones

The Envirocheck report indicates that the site does not lie within a Source Protection Zone (SPZ), as designated by the Environment Agency. SPZs relate to the protection of groundwater used for public drinking water supply.

Surface Water

The closest surface water features are indicated to be the drainage ditch in the north of the site. Additional ditches are present within 250m around the site. The Envirocheck report classifies these features as inland rivers.

Flood Risk

The site area and surrounding areas are identified to be at risk from flooding and extreme flooding from rivers or sea without defences.

3.6.2 Waste

There are no sites associated with waste (e.g. historic landfills, transfer stations etc.) identified within 250m of the site.

However, the historical publications show the presence of a pond and drainage ditch in the north of the site and a series of drainage ditches within 250m of the site that are considered likely to have been infilled/culverted. The Envirocheck report lists an entry for Potentially Infilled Land (Water) approximately 187m to the west of the site and appears to relate to a pond.

3.6.3 Hazardous Substances

There are no sites associated with hazardous substances (e.g. explosives) identified within 250m of the site.

3.6.4 Geological & Radon

Geological Hazards

The site has been given a Hazard Potential ranking of 'Moderate' with regards to Potential for Compressible Ground Stability Hazards and Potential for Running Sand Ground Stability Hazards.

No other potentially significant onerous geological issues have been identified within the Envirocheck report which relate to the site.

BGS Estimated Soil Chemistry Data Maps

The BGS has prepared estimated soil concentration maps for several metals (including arsenic, lead, nickel, chromium and cadmium), which are extrapolated from records available for use within their assessments.

Whilst potentially useful for the inference of Natural Metal Enrichment (NME) of the natural soils in a general locale, the data should not be used to inform any detailed decisions with regards to the chemistry of a particular site as it does not allow for anthropogenic effects.

BGS estimates of the soil chemistry at the site indicate anticipated concentrations of arsenic of 15-25mg/kg, cadmium of <1.8mg/kg, chromium of 60-90mg/kg, lead of <100mg/kg and nickel of 15-30mg/kg.

Based on the information supplied within the Envirocheck report, the site is not shown to be located within an area where Natural Metal Enrichment of the underlying natural soils is likely to be present. However, this is only applicable to the specific determinands listed above.

Radon

The Envirocheck report states that '*The property is in a lower probability radon area, as less than 1% of homes are above the action level...No radon protective measures are necessary in the construction of new dwellings or extensions.*' No specific mitigation in relation to radon issues are therefore required at the site.

3.6.5 Industrial Land Use

Contemporary Trade Directory Entries

There is one contemporary trade directory entry recorded within 250m of the site which refers to an active road haulage service 13m to the southwest of the site.

Points of Interest – Commercial Services

There is one contemporary trade directory entry recorded within 250m of the site which refers to a distribution and haulage service 17m to the southwest of the site.

3.6.6 Sensitive Land Use

No sensitive land uses are recorded at the site.

3.7 Land Use Assessment

As part of the land use assessment, reference has been made to the '*Desk Reference Guide to potentially Contaminative Land Uses*' produced by Mr P Syms and published jointly by the ISVA (The Professional Society for Valuers and Auctioneers) in association with The Royal Institution of Chartered Surveyors and the Chartered Institute of Environmental Health.

We have also made reference to the Department for Environment, Food and Rural Affairs and the Environment Agency Contaminated Land Report CLR8 '*Potential Contaminants for the Assessment of Land*' (March 2002). This document identifies key contaminants which may potentially be present at a site as a result of a given historical land use, and whilst formally withdrawn is still considered to be a useful desk based reference guide.

3.7.1 On Site Assessment

At the time of our works (September 2017), the site effectively comprised an irregular shaped grassed field adjoined to a small part of an additional grassed field in the north. The site has remained undeveloped since earliest recorded historical maps.

The site is not identified in any of the land-use categories detailed within the publications referenced in Section 3.7. Based on the information obtained from the desk study and our walkover of the site, potential contamination that may be present could include:

- Metals or metalloids associated with any Made Ground.
- Polycyclic Aromatic Hydrocarbons (PAHs) from any ashy inclusions and/or carbonaceous inclusions in the near surface soils.
- Hazardous ground gases (i.e. methane and carbon dioxide) associated with any infill materials to the drainage ditch/pond in the north of the site in addition to any peat/organic deposits beneath the site.

3.7.2 Off Site Assessment

Based on the information obtained from the desk study, the following source of potentially hazardous ground gas (i.e. carbon dioxide and methane) has been identified within potential influencing distance (i.e. <250m) of the site:

- Any Made Ground associated with infill materials to the former drainage ditches/ponds around the site.

4.0 GROUND INVESTIGATION

4.1 Introduction

Sub-Surface Utility Avoidance Scan

Prior to the commencement of our intrusive works at the site a sub-contracted sub-surface utility scan of proposed exploratory hole locations was undertaken to attempt to avoid buried services. Based on the results of the service scan, the exploratory holes were positioned in order to maximise the amount of information obtained during our site works, whilst avoiding known utilities.

Trial Pits

A total of seven trial pits (TP1 to TP7) were excavated at the site on 20th September 2017 and three soakaway pits (SA1 to SA3) were excavated at the site on 27th September 2017. The pits were excavated to depths of up to 3.20m below existing ground level (begl).

Cable Percussive Boreholes

Three cable percussive boreholes (BH1 to BH3) were advanced at the site between 20th and 22nd September 2017 to depths of 4.00m begl or 17.00m begl. Upon completion, all three boreholes were installed with ground gas monitoring points to a depth of 4m or 5m begl to facilitate a programme of ground gas monitoring.

Exploratory Hole Locations/Logs

The approximate locations of the exploratory holes are shown on the plan presented in Appendix IV (Figure No. D37124/04). The exploratory hole logs are presented in Appendix VI of this report.

Access into the northernmost part of the site was not possible at the time of the works due to numerous trees, a footpath and a culverted drain.

4.2 Ground Conditions

Topsoil

Topsoil was encountered at the surface of all exploratory holes to depths of between 0.20m and 0.60m begl with an average thickness of approximately 0.40m.

The depth to the base of the topsoil is indicated on the plan presented in Appendix V (Figure No. D37124/05).

Natural Strata

Beneath the topsoil an initial layer of firm SILT and/or CLAY (locally soft to stiff) with varying amounts of Sand was encountered to depths of between 1.00m and 3.30m begl, where penetrated.

Underlying the near surface cohesive soils, loose to medium dense very silty organic SAND was encountered. The cable percussive boreholes revealed the organic Sand to depths of 9.30m and 12.70m begl, which was then underlain by firm and stiff sandy gravelly CLAY (BH1) to 13.60m begl and dense very sandy GRAVEL (BH2) to 13.10m begl. These deposits are considered to be typically representative of the Fenland Formation.

The cable percussive boreholes encountered stiff sandy gravelly CLAY, with gravel predominantly comprising chalk, to depths of 17.00m begl and is considered to be typically representative of the Ampthill Clay Formation.

We would note that no obvious visual or olfactory evidence of significant soil contamination was identified during the course of the site works.

4.3 Water

Water was absent from the majority of exploratory holes during the site investigation works. Localised slight water seepages were observed in the near surface soils at 1.90m and 3.00m begl. Water seepages were also observed at 4.00m and 5.20m begl within granular soils within cable percussive boreholes

4.4 Stability

The sides of the majority of trial pits remained relatively stable at shallow depths, but were found to be locally unstable during excavation resulting in partial or full pit collapses below approximately 2.60m begl within the silt and sand soils. Deeper boreholes were cased to depths of 13.50m and 14.00m begl to prevent borehole collapses during advancement.

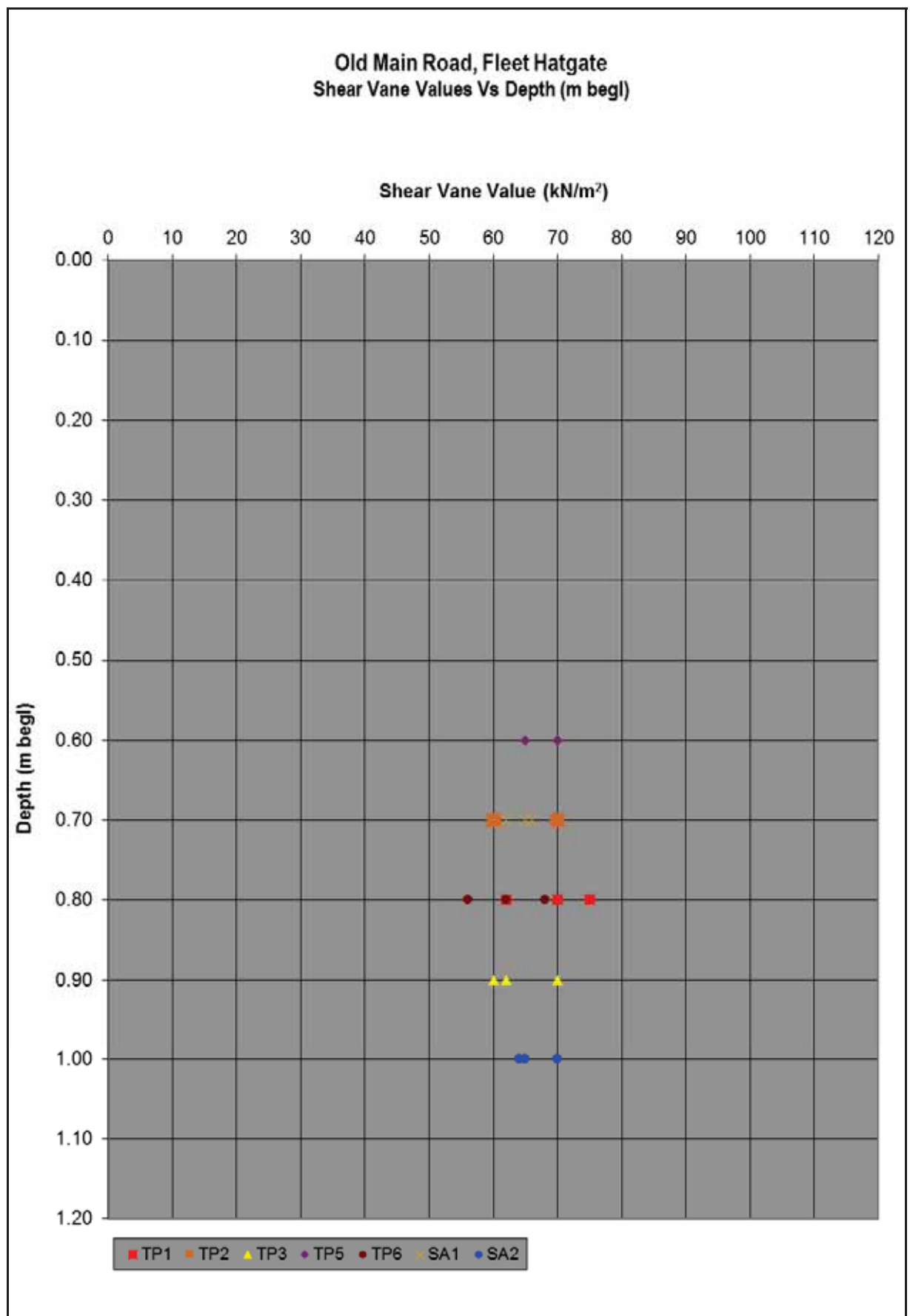
4.5 Plates

A photographic record of the exploratory investigation was obtained during the intrusive works. Selected photographs are presented in the Plates included in Appendix XI of this report (Plate Nos. 1 to 11).

4.6 Shear Vane Values

Shear vane testing was undertaken within the predominantly clay soils within the trial pits and soakaway pits. The results typically revealed soil shear strength values of typically between 56N/m² and 75kN/m² at depths of between 0.60m and 1.00m begl.

The chart below presents the shear vane values in relation to depth recorded in the trial pits and soakaway pits excavated at the site. Individual shear vane results are provided on the exploratory hole logs included in Appendix VI of this report.



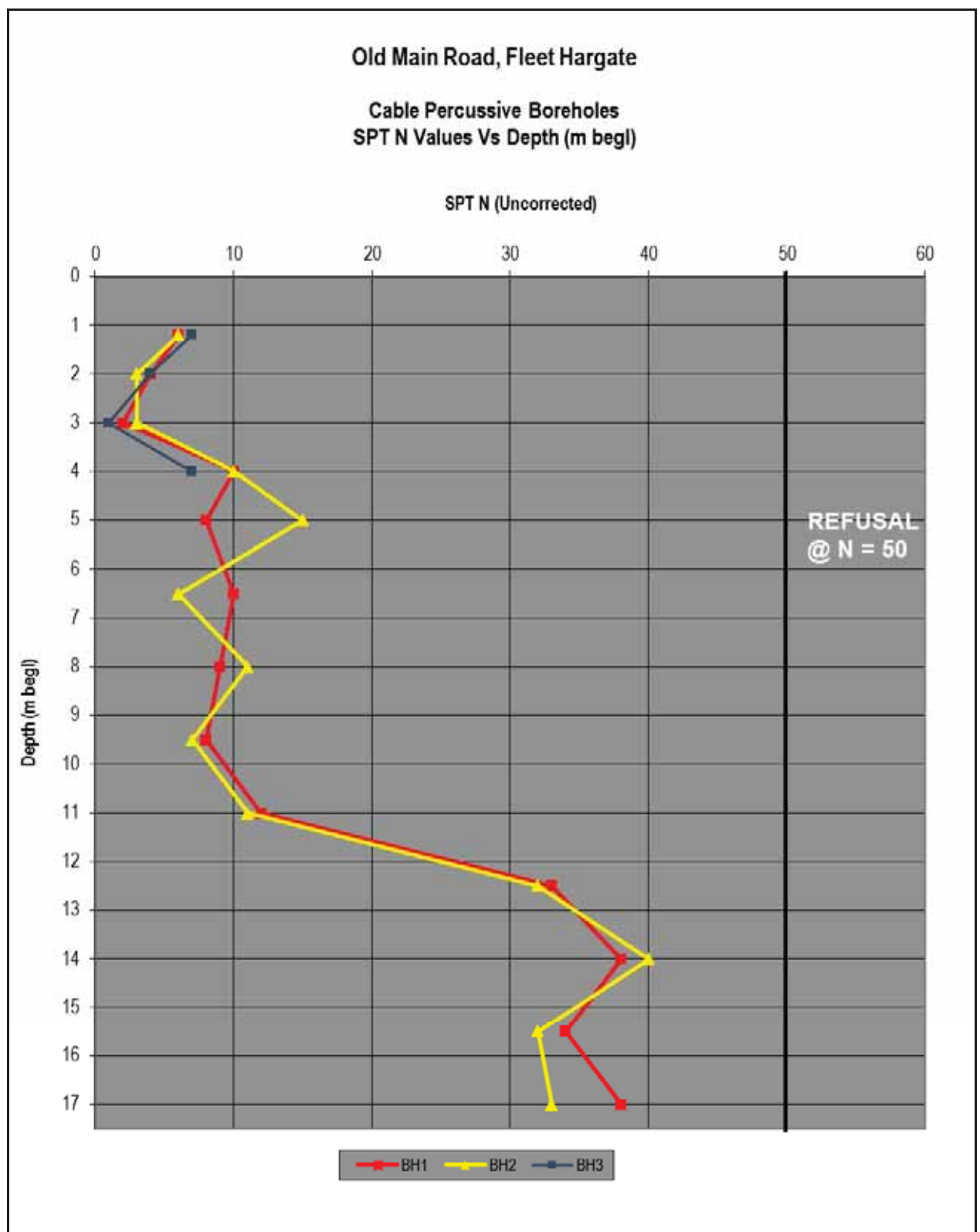
4.7 Standard Penetration Test (SPT) Data

In order to establish a strength/depth profile of the soils beneath the site, in-situ Standard Penetration Testing (SPT) was undertaken at intervals of typically 1m to 1.5m within the cable percussive boreholes.

Within the near surface Drift Deposits comprising Silt or Clay at depths of 1.20m, uncorrected SPT 'N' values of 6 or 7 were achieved, reducing to values of 4 or 3 at around 2.00m depth. Within the underlying Drift Deposits to depths of between 3.00m and 7.50m, uncorrected SPT 'N' values typically ranged between 1 and 33.

Uncorrected SPT 'N' values within the underlying Ampthill Clay Formation at depths of between 9.00m and 17.00m begl, uncorrected SPT 'N' values typically ranged between 32 and 40.

A Chart showing the SPT results in relation to depth is provided below for information, with SPT results for each of the boreholes provided on the logs included in Appendix VI.



4.8 Soakaway Testing

The results from soakaway testing within soakaway test pits (2No. pits excavated to depths of 1.80m and 1.95m begl and 1No. pit excavated to a depth 1.00m begl) did not reveal any significant drop in water level for the duration of the testing. Therefore, the use of soakaways is unlikely to be suitable and it may be prudent to investigate alternative methods for draining the site, at this stage.

5.0 GROUND GAS & WATER MONITORING RESULTS

5.1 Introduction

Based on the findings of the Desk Study works, it was considered necessary to install a series of monitoring points to facilitate a programme of ground gas monitoring at the site.

5.2 Monitoring Installations

Upon completion, all three of the cable percussive boreholes were installed with combined ground gas and water monitoring standpipes to depths of 4.00m or 5.00m begl to facilitate a programme of monitoring.

The full set of ground gas and water monitoring data is presented in Appendix VII of this report.

5.3 Results of the Ground Gas Monitoring

A total of three monitoring visits over a six week period have been undertaken at the site as part of our works. The ground gas monitoring results are summarised in Table 2 below.

TABLE 2 – SUMMARY OF GROUND GAS MONITORING DATA		
Parameter	Minimum % by volume (v/v)	Maximum % by volume (v/v)
Methane	0.0	0.0
Carbon Dioxide	2.5	5.4
Oxygen	7.0	19.0
Flow (l/h)	0.0	0.0

- Atmospheric pressure ranged between 1007mb and 1016mb during the monitoring programme.
- Water was recorded at depths ranging between 1.35m to 2.00m begl within the borehole installations during the course of the monitoring programme.

5.4 Appropriate Guidance

5.4.1 British Standard & CIRIA

The results of the gas monitoring have been reviewed with reference to the following documentation:

- British Standard BS 8485 '*Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*' (2015).
- CIRIA Report C665 '*Assessing risks posed by hazardous ground gases to buildings*' (2007).

BS 8485:2015 and CIRIA Report C665 recommend a risk-based methodology to ground gas assessment, which includes the calculation of a site-specific Gas Screening Value (GSV). The GSV of a particular ground gas regime equates to:

- $GSV (L/h) = (\text{maximum borehole flow rate (L/h)} \times \text{maximum gas concentration})/100.$

The GSV should be calculated for both methane and carbon dioxide to determine a site-specific Characteristic Situation for each gas. The higher the calculated GSV, the greater the risk posed by the presence of ground gas. The CIRIA guidance document notes that ‘...the GSV is a guideline value and not an absolute threshold’.

Table 2 of BS 8485:2015 (reproduced below) presents a total of six Characteristic Situations (CS) to assist in classification of the site, based on the calculated GSVs for methane and carbon dioxide.

Table 2 CS by site characteristic GSV

CS	Hazard potential	Site characteristic GSV ^{A)} L/h	Additional factors
CS1	Very low	<0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)
CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

NOTE The CS is equivalent to the characteristic GSV in CIRIA C665 [6].

In accordance with BS 8485:2015, the CS classification for the site should be considered in conjunction with the proposed Building Type to determine the appropriate level of ground gas protection measures that should be installed to mitigate the risk posed by ground gases, based on the gas protection score for the site.

BS 8485:2015 notes ‘The Building Type is determined based the proposed construction and use of the building, together with the control of future structural changes to the building and its maintenance (the building’s management) should be assessed, since potential risks posed by ground gases are strongly influenced by these factors’. Subject to the development proposals, each building may be categorised as a whole, or for each different part of the building.

The Building Types are presented in Table 3 of BS 8485:2015, reproduced below.

Table 3 Building types

	Type A	Type B	Type C	Type D
Ownership	Private	Private or commercial/ public, possible multiple	Commercial/ public	Commercial/ industrial
Control (change of use, structural alterations, ventilation)	None	Some but not all	Full	Full
Room sizes	Small	Small/ medium	Small to large	Large industrial/ retail park style

Summary of Building Types (taken from BS 8485:2015)

Type A Buildings	Examples include private housing and some retail premises.
Type B Buildings	Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres) and parts of hotels.
Type C Buildings	Examples include offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres and parts of hotels).
Type D Buildings	Examples are retail park sales buildings, factory shop floor areas, warehouses. (Small rooms within these style buildings should be separately categorized as Type B or Type C).

Table 4 of BS 8485:2015, reproduced below, should be used to derive the minimum level of gas protection applicable to the Building Type, based on the CS determined from the calculated GSV.

Table 4 Gas protection score by CS and type of building

CS	Minimum gas protection score (points)			
	High risk	Medium risk		Low risk
	Type A building	Type B building	Type C building	Type D building
1	0	0	0	0
2	3.5	3.5	2.5	1.5
3	4.5	4	3	2.5
4	6.5 ^{A)}	5.5 ^{A)}	4.5	3.5
5	— ^{B)}	6.5 ^{A)}	5.5	4.5
6	— ^{B)}	— ^{B)}	7.5	6.5

^{A)} Residential buildings should not be built on CS4 or higher sites unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.

^{B)} The gas hazard is too high for this empirical method to be used to define the gas protection measures.

The appropriate level of precautions, to be designed in accordance with the point scoring system of BS 8485:2015 should therefore be applied for the proposed development. These should include a combination of the following three types of protection measures, which should be used to achieve the required score:

- The structural barrier of the floor slab, or of the basement slab and walls if a basement is present;
- Ventilation measures; and
- Gas resistant membrane.

The points achieved for each element of the ground gas precautions are summarised in Tables 5, 6 and 7 of the British Standard. These tables are reproduced below.

Table 5 Gas protection scores for the structural barrier

Floor and substructure design (see Annex A)	Score ^{A)}
Precast suspended segmental subfloor (i.e. beam and block)	0
Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement)	0.5
Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations	1 or 1.5 ^{B)}
Basement floor and walls conforming to BS 8102:2009, Grade 2 waterproofing ^{C)}	2
Basement floor and walls conforming to BS 8102:2009, Grade 3 waterproofing ^{C)}	2.5

^{A)} The scores are conditional on breaches of floor slabs, etc., being effectively sealed.

^{B)} To achieve a score of 1.5 the raft or suspended slab should be well reinforced to control cracking and have minimal penetrations cast in (see A.2.2.2).

^{C)} The score is conditional on the waterproofing not being based on the use of a geosynthetic clay liner waterproofing product (see C.3, Note 4).

Table 6 Gas protection scores for ventilation protection measures

Protection element/system	Score	Comments
(a) Pressure relief pathway (usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building)	0.5	Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems. If the layer has a low permeability and/or is not terminated in a venting trench (or similar), then the score is zero.
(b) Passive sub floor dispersal layer: Very good performance: Good performance: Media used to provide the dispersal layer are: <ul style="list-style-type: none"> • Clear void • Polystyrene void former blanket • Geocomposite void former blanket • No-fines gravel layer with gas drains • No-fines gravel layer 	2.5 1.5	Performance criteria for methane and carbon dioxide are shown in Figure B.6 and Figure B.7, respectively. The ventilation effectiveness of different media depends on a number of different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. The selected score should be assigned taking into account the recommendations in Annex B. Passive ventilation should be designed to meet at least "good performance", see Annex B.
(c) Active dispersal layer, usually comprising fans with active abstraction (suction) from a subfloor dilution layer, with roof level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers	1.5 to 2.5	This system relies on continued serviceability of the pumps, therefore alarm and response systems should be in place. There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents. Active ventilation should always be designed to meet at least "good performance", as described in Annex B.
(d) Active positive pressurization by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket	1.5 to 2.5	This system relies on continued operation of the pumps, therefore alarm and response systems should be in place. The score assigned should be based on the efficient "coverage" of the building footprint and the redundancy of the system. Active ventilation should always be designed to meet at least "good performance".
(e) Ventilated car park (floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park)	4	Assumes that the car park is vented to deal with car exhaust fumes, designed to <i>Buildings Regulations 2000, Approved Document F</i> [9].

Table 7 Gas protection score for the gas resistant membrane

Protection element/system	Score	Comments
<p>Gas resistant membrane meeting all of the following criteria:</p> <ul style="list-style-type: none"> sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/m²/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method); sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab); sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools, etc); capable, after installation, of providing a complete barrier to the entry of the relevant gas; and verified in accordance with CIRIA C735 [N1] 	2	<p>The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints.</p> <p>For example, a minimum 0.4 mm thickness (equivalent to 370 g/m² for polyethylene) reinforced membrane (virgin polymer) meets the performance criteria in Table 7 (see C.3).</p> <p>If a membrane is installed that does not meet all the criteria in column 1 then the score is zero.</p>

5.5 Ground Gas Analysis

5.5.1 Gas Screening Value & Site Classification

The ground gas monitoring undertaken to date has identified no methane and a maximum carbon dioxide concentration of 5.4% v/v. Measurable flow rates were not recorded during the monitoring visits. In the absence of a measurable flow rate, the limit of detection of the gas monitoring instrument (0.1 l/h) should be utilised.

The GSV for carbon dioxide at the site may be calculated as follows:

- $0.1(5.4/100) = 0.0054 \text{ l/h}$

Therefore, with a GSV of 0.0054 l/h and a maximum carbon dioxide concentration of 5.4% v/v, the site may be classified as '**CS2**' with respect to carbon dioxide, in accordance with Table 2 of BS 8485 and based on the visits undertaken to date.

5.5.2 Building Type

We understand that it is proposed to develop the site with low-rise residential dwellings. In accordance with Table 3 of BS 8485, **Building Type A** is considered to be the most appropriate classification.

5.5.3 Gas Protection Score

On the basis of Characteristic Situation (CS2) and the development proposals with buildings that may be designated as Building Type A and in accordance with Table 4 of BS 8485:2015, the minimum gas protection score for the site is **3.5 points**.

5.5.4 Gas Mitigation Measures

On the basis of the points scoring system within BS 8485:2015, 4.5 points would be achieved by implementation of these protection measures, summarised as follows:

- Provision of a clear ventilated void (Very Good Performance – 2.5 Points)

- Suspended beam and block floor (0 Points)
- Provision of a well installed and verified gas resistant membrane (2 Points)

Therefore a maximum of 4.5 points can be achieved adopting standard construction practices when assessed against BS 8485: 2015.

On this basis, a suspended beam and block floor may be used at the site, where Type A buildings (i.e. low rise residential dwellings) are proposed and this, together with the membrane, should be sufficient to satisfy the requirements of CS2 (BS 8485:2015).

However, alternative floor slab and gas mitigation measures may be adopted provided that they can be demonstrated to achieve the required level of protection in accordance with BS8485:2015.

5.5.5 Membrane Validation

We would note that in accordance with Table 7 (BS 8485:2015) where a gas resistant membrane is proposed, the membrane should be installed and inspected in accordance with the requirements of CIRIA C735 '*Good practice on the testing and verification of protection systems for buildings against hazardous ground gas*' (2014), for the gas protection points associated with installation of a gas resistant membrane to apply.

Verification of the membrane should include a third party visual inspection of the installed membrane, as a minimum, and may require integrity testing such as air lancing of the joints, dependent on the qualifications of the installer and the characteristic situation of the site. Otherwise a score of zero is awarded for the membrane and therefore the installed solution would fail to comply with BS 8485.

5.5.5 Comments

The current gas assessment is based on 3No. monitoring visits and therefore is subject to confirmation by additional monitoring of the site. Typically, a minimum of 6No. visits is required to fully characterise the gas regime, with at least one visit being undertaken with an atmospheric pressure of less than 1000mb.

However, the current assessment of CD2 is considered typically for a site of the nature and additional monitoring is considered unlikely to change this site characterisation. Therefore, the Local Planning Authority may be consulted to confirm their requirements before undertaking additional monitoring.

6.0 LABORATORY TESTING & CONTAMINATION ASSESSMENT

6.1 Introduction

The following environmental soil testing was carried out on visually representative samples recovered from the exploratory holes:

- 8No. Standard contamination suites (including metals, speciated PAH and TOC).

Geotechnical soil testing comprised the following:

- 5No. Water soluble sulphate tests.
- 6No. pH tests.
- 2No. Plasticity Index (PI) tests.
- 2No. Particle Size Distribution (PSD) tests.

All laboratory soil test results are included in Appendix VIII of this report.

6.2 Geotechnical Soil Test Results

Water Soluble Sulphate/pH

Water soluble sulphate testing was undertaken on 3No. samples of the Natural Strata during the site works. The results revealed water soluble sulphate concentrations of <0.01g/l SO₄. The pH values of the Natural Strata analysed ranged between 8.57 and 8.60.

In accordance with the Building Research Establishment publication Special Digest 1 '*Concrete in Aggressive Ground*' (2005) the highest measured sulphate concentration should be used to indicate the Design Sulphate Class (i.e. 0.01g/l SO₄), together with the lowest measured pH result (8.57).

Therefore, in accordance with Special Digest 1:2005 the site falls into Design Sulfate Class DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1.

This classification has been made based on the assumption of natural ground conditions and the presence of potentially mobile groundwater conditions beneath the site.

Plasticity Index (PI) Testing

A total of 2No. Plasticity Index tests have been undertaken on selected samples of the near surface Natural Strata obtained during the site works from across the site. In accordance with NHBC standards Chapter 4.2 '*Building Near Trees*' and BRE Digest 240 '*Low-rise buildings on shrinkable clay soils: Part 1*' (1993) the reported PI values may be modified based on the portion of the sample passing the 425µm sieve.

The result of the PI analysis is summarised in Table 3.

TABLE 3 – SUMMARY OF PLASTICITY INDEX (PI) DATA				
Sample Reference & Location	Reported PI Value (%)	Portion Passing 425µm Sieve (%)	Modified PI Value (%)	Volume Change Potential
TP2, 0.6-1.1m (SILT)	NP	NP	NP	NP
TP5, 0.7-1.2m (CLAY)	10	100	10	Low

In accordance with NHBC Guidance, Table 3 reveals that the cohesive soils analysed (i.e. Clay) at the site may be regarded as being of low volume change potential.

The PI analysis has revealed that the sample visually comprising Silt (TP2, 0.6-0.1.1m) may be regarded as non-plastic in accordance with NHBC guidance.

Particle Size Distribution

Confirmatory particle size distribution (PSD) analysis was undertaken on two samples of the near surface strata. The test results confirmed the visual description of the soils.

6.3 Contamination Assessment Rationale

We understand that it is proposed to develop the site for a low-rise residential end-use incorporating private gardens.

Based on the development proposals, we have adopted a residential with plant uptake end-use scenario for the purposes of the contamination assessment.

6.4 Appropriate Guidance

Reference has been made to documents reflecting current good practice, including (but not limited to) the following:

- Environment Agency Contaminated Land Report 11 '*Model Procedures for the Management of Land Contamination*', September 2004, ISBN: 1844322955.
- British Standard BS10175:2011+A1:2013, '*Investigation of potentially contaminated sites. Code of practice*', March 2011.
- Nathanail, C.P., McCaffrey, C. Gillett, A.G. Ogden, R.C. and Nathanail, J.F 2015. '*The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham. "Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3026. All rights reserved."*'
- DEFRA publication '*SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*', Final Project Report (Revision 2), dated 24th September 2014 and Erratum dated December 2014.
- DEFRA publication '*SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*' – Policy Companion Document, dated December 2014.
- EIC/AGS/CL:AIRE publication '*Soil Generic Assessment Criteria for Human Health Risk Assessment*', January 2010, ISBN 978-1-905046-20-1.
- Department of Environment, Food and Rural Affairs (DEFRA) and the Environment Agency publication – '*Contaminated Land Exposure Assessment (CLEA) model*' (March 2002).
- Environment Agency Science Report, '*Using Soil Guideline Values*', SC050021/SGV, March 2009.
- R & D Draft Technical Report P5-079/TR1 '*Review of the Fate and Transport of Selected Contaminants in the Soil Environment*' dated 2003.
- CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*' (May 2008).

- Environment Agency Science Report SC050021/SR7 '*Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values*', dated November 2008, ISBN 978-84432-964-9.
- Environment Agency Science Report Final SC050021/SR2 '*Human health toxicological assessment of contaminants in soil*', dated January 2009, ISBN 978-84432-858-1.
- Environment Agency Science Report SC050021/SR3 '*Updated technical background to the CLEA model*', dated January 2009, ISBN 978-84432-856-7.
- Environment Agency Science Report SC050021/SR4 '*CLEA Software (Version 1.05) Handbook*', dated September 2009, ISBN 978-1-84911-105-8.

6.4.1 Selection of Appropriate Tier 1 Screening Values

Generic Assessment Criteria (GAC)

The assessment of contaminated land in the UK was historically undertaken with reference to ICRL Guidance Note 59/83 together with successive versions of the CLEA model (inc. CLEA2002 (2002), CLEA UK (2005), CLEA V1.03 beta (2008), CLEA V1.04 (January 2009), CLEA V1.05 (September 2009) and CLEA V1.06 (October 2009)).

The CLEA V1.06 model is a deterministic quantitative risk assessment (QRA) model, which has historically been utilised by the Environment Agency to produce Soil Guideline Values (SGVs) for several contaminants, and has been used and modified by the authors of the LQM/CIEH S4UL publication and the authors of the DEFRA SP1010 series of documents in the derivation of their respective human health screening values.

Of key importance is the basis on which these two differing sets of commercially available screening criteria have been created, with the SP1010 values reflective of a '*Low Level of Toxicological Concern*' (LLTC) and the Suitable 4 Use Level (S4UL) values based on a '*Minimal Risk Level*' (MRL).

Based on our understanding of current good practice within the contaminated land field, we have adopted the S4UL values (representing a compatible approach to risk assessments undertaken since the initial derivation of the CLEA model, and based on an established and fully justifiable methodology) as our initial Generic Assessment Criteria (GAC) values for human health. In the absence of a suitable S4UL value (such as lead), reference has been made to the relevant C4SL, and these have been adopted where considered justifiable and as appropriate (further consideration of their use is provided below).

We would additionally note that other GAC values are commercially available, such as the Atkins ATRISKSOIL values (to which GeoDyne subscribe) and the EIC/AGS/CL:AIRE values for organic substances; and these have been referred to where relevant to the site.

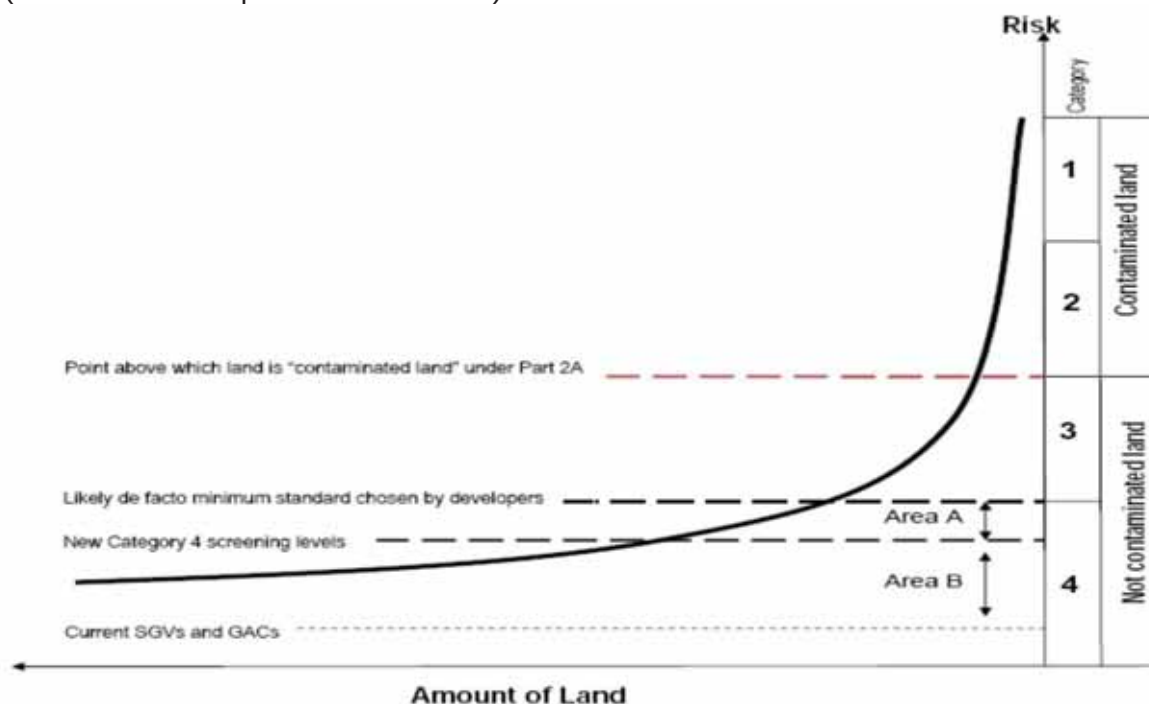
Category 4 Screening Levels

Revised Statutory guidance for the assessment of land under Part 2A of the Environmental Protection Act 1990 was published by the Department for Environment, Food and Rural Affairs (Defra) in April 2012. The guidance introduced a new four-part category system for classifying land under Part 2A; Section 4.17 of the Guidance states:

'In deciding whether or not land is contaminated land on grounds of significant possibility of significant harm to human health, the local authority should use the

categorisations described in paragraphs 4.19 – 4.30...Categories 1 and 2 would encompass land which is capable of being determined as contaminated land on the grounds of significant possibility of harm to human health. Categories 3 and 4 would encompass land which is not capable of being determined on such grounds'.

The foregoing categories are depicted in diagrammatical form in the following graph (taken from Defra publication SP1010):



Defra has subsequently commissioned the production of Category 4 Screening Levels (C4SLs) for a total of six substances (cadmium, benzo(a)pyrene, benzene, arsenic, lead and chromium VI), which are detailed within the SP1010 document titled '*Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*', dated March 2014. The C4SL values represent a level below which a contaminant concentration is considered to have a 'Low' risk to human health. The C4SL values are stated within the SP1010 document (page 7) as still remaining '*strongly precautionary*' and represent a more pragmatic approach to contaminated land risk assessment than the minimal risk values represented by the SGV/GAC levels.

In addition to the use of C4SLs in contaminated land risk assessment, the SP1010 document states the following with respect to background levels of contaminants:

'The outputs of Defra-funded research to determine 'normal' background concentrations of various contaminants in England and Wales and the outputs of this research project to develop new screening levels for contaminants in soil, are both designed as tools to be used by contaminated land risk assessors to inform decisions about whether or not it is necessary to proceed to a Detailed Quantitative Risk Assessment (DQRA) on a particular site taking into account the broad aims of the regime as set out in Section 1 of the Statutory Guidance. Questions have been raised about how these tools relate and interact.'

41. Ultimately, it is up to individual risk assessors to make the most appropriate decisions on a site-by-site basis and to use the most appropriate tools in each case. However, with reference to the Part 2A Statutory Guidance, which states that 'normal' background concentrations should not be considered to cause a site to be determined as contaminated under Part 2A unless there is a reason to consider otherwise, it is envisaged that, where available, Category 4 Screening Levels should be the initial value against which site concentrations can be compared. Where a value on a particular site exceeds the Category 4 Screening Level for that substance, reference can then be made to the normal background concentration for that contaminant in that area.

If concentrations are higher than the relevant Category 4 Screening Level but within 'normal' background concentrations for that area, it is not envisaged that a site would be determined as contaminated under Part 2A (unless there was a reason to consider otherwise).

42. The British Geological Survey has derived 'normal' background concentrations for lead for England and Wales. In England, the 'normal' background concentrations of lead are 180 mg/kg for the 'principal' domain, 2,400 mg/kg for the 'mineralisation' domain and 820 mg/kg for the 'urban' domain (Defra, 2012) (see table below). In Wales the 'normal' background concentrations are 230 mg/kg for the 'principal' domain, 280 mg/kg for the 'mineralisation' domain and 890 - 1300 mg/kg for the 'urban' domain (Defra, 2013). Current advances in our understanding of the toxicology of lead have resulted in Category 4 Screening Levels for Residential, Allotments and Public Open Space 1 that are lower than the 'normal' background concentration of lead in **urban** areas. This was also the case for the (now withdrawn) Soil Guideline Value for lead of 450 mg/kg.

43. The report identifies other relevant considerations that may have a bearing on the final choice of Category 4 Screening Levels and the background level in soil is one of these. A pragmatic approach for lead would be to recommend the use of the 'normal' background concentration when the land use and domain permit (for example, providing other site and contaminant specific characteristics such as chemical form, bioavailability, soil depth, site use, etc. are comparable between the background and the site under investigation) so as not to disproportionately target land where there is widespread diffuse pollution of lead.

Normal background concentrations of contaminants in England

Substance	Principal domain	Urban domain	Mineralisation domain 1	Mineralisation domain 2	Ironstone	Chalk South
Arsenic	32 mg/kg		290 mg/kg		220 mg/kg	
Benzo-a-pyrene	0.5 mg/kg	3.6 mg/kg				
Cadmium	1.0 mg/kg	2.1 mg/kg	17 mg/kg	2.9 mg/kg		2.5 mg/kg
Lead	180 mg/kg	820 mg/kg	2400 mg/kg			

Where a valid Soil Guideline Value exists for a contaminant where a Category 4 Screening Level has also been derived, it is anticipated that risk assessors will use the Category 4 Screening Level in line with the Part 2A Statutory Guidance. In the absence of a suitable C4SL, risk assessors should identify and select appropriate generic assessment criteria in accordance with established good practice....'

The general approach indicated in the SP1010 document has been adopted in this report (as appropriate), although the C4SL values have been used as a second tier of risk assessment, due to the difference in the level of 'acceptable' risk between the various GACs (which we will adopt as the first tier of risk assessment) and the C4SLs.

National Planning Policy Framework (NPPF)

In relation to the requirements of a contaminated land risk assessment, the Department for Communities and Local Government publication titled '*National Planning Policy Framework*' (NPPF), dated March 2012, provides the following commentary:

'121. Planning policies and decisions should also ensure that:

- *the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;*
- *after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*
- *adequate site investigation information, prepared by a competent person, is presented.'*

The Defra SP1010 document states: '***The Part 2A Statutory Guidance and accompanying Impact Assessment were developed on the basis that Category 4 Screening Levels could be used under the planning regime, as they would be in Part 2A investigations directly***' [GeoDyne emphasis added].

Summary

Taking account of the foregoing, we consider that industry good practice is currently best represented by GAC (variously LQM/CIEH, Atkins ATRISKSOIL or EIC/AGS/CL:AIRE) that adopt a MRL as the foundation for its derivation. In the case of Lead (which is modelled on blood lead concentrations rather than typical exposure scenarios applicable to other contaminants), the relevant C4SL value has been adopted, as this incorporates the most up-to-date toxicological information in the derivation of the various end-use specific screening criteria.

In relation to the remaining C4SL values, these have been adopted as a second tier of generic assessment criteria, and will be utilised where the GAC has been exceeded at a Tier 1 generic level and where justified in a site-specific context. Whilst representing a LLTC, the C4SL values are considered to represent a suitably conservative assessment tool, given that they fall comfortably within Category 4.

In the following sections, screening criteria have collectively been referred to as Generic Assessment Criteria (GAC). The C4SL values have been referenced as such. The GAC/C4SL adopted herein, i.e. residential with plant uptake, are included in the table in Section 6.8.

6.4.2 Selection of Soil Organic Matter (SOM) Content

The SOM content and soil type are used to provide an assessment of the applicability of the Tier 1 GAC adopted (the GAC are typically based upon SOM of 1%, 2.5% and 6%, as applicable, with Defra C4SL based on the default assumption of a UK Sandy Loam soil with 6% SOM).

Determinands have in the first instance, been compared to GAC adopting a conservative SOM of 1%, or, in the absence of one of the former, a relevant C4SL value. Where the determinand exceeds the relevant GAC at 1% SOM, a site specific SOM may be adopted as appropriate to derive new GAC and the dataset reassessed.

6.4.3 Assessment Methodology

Taking account of the foregoing, an initial qualitative Tier 1 Soil Assessment has been undertaken to assess the soils at the site. We have adopted a policy whereby determinands within the dataset are individually compared to the relevant screening values.

Where determinands within the dataset are less than the appropriate Tier 1 GAC value the determinand is considered to be present at an acceptable concentration and no further assessment is required. However, where a determinand exceeds the relevant Tier 1 GAC value on at least one occasion further assessment is required and will be undertaken in accordance with CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*'.

Further assessment will comprise a quantitative Tier 1 assessment to examine the contamination data set in more detail. The methodology for undertaking the statistical assessment is provided in Section 6.5 below.

6.5 Statistical Considerations

Statistical tests relating to contaminated land, typically referred to as a Mean and Maximum Value Tests, were detailed in Department for Environment, Food and Rural Affairs and The Environment Agency publication CLR 7 '*Assessment of Risks to Human Health From Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research*', dated 2002, ISBN 1-857-05732-5.

This guidance was superseded by publication of CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*' dated May 2008.

6.5.1 Null and Alternative Hypothesis

In consideration of statistical guidance jointly published by CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*', statistical convention requires consideration of the Null Hypothesis (expressed as H_0) or an Alternative Hypothesis (expressed as H_1). Appropriate statistical tests are then applied to the data to assess whether the strength of evidence favours the Null or the Alternative Hypothesis.

For the purpose of the following contamination assessments and in accordance with the CL:AIRE/CIEH guidance the key question for the site is as follows.

Question - '*Is there sufficient evidence that the true mean concentration of a contaminant in soil (μ) is less than some critical concentration (C_c)?*'

The Null and Alternative hypotheses are therefore defined as follows.

The Null Hypothesis (H_0)

$\mu \geq C_c$ (i.e. Tier 1 or 2 Assessment Criteria).

The Alternative Hypothesis (H_1) (the question the selected statistical test is designed to answer)

$\mu < C_c$ (i.e. Tier 1 or 2 Assessment Criteria).

6.5.2 95th Percentile Upper Confidence Level Mean Values

The selected relevant statistical assessment undertaken to evaluate the Null and Alternative Hypotheses requires consideration of the 95th Percentile Upper Confidence Level Mean value (this is abbreviated as the UCL).

The UCL value takes account the number of samples tested, the data set mean and the standard deviation of the data set and applies a correction factor to take account of the uncertainty of the data set.

CL:AIRE/CIEH guidance states that '*...since the 95% UCL is at most times greater than the true population mean, it follows that if the 95% UCL is less than Cc, the assessor will know (with a defined high level of confidence) that the true population mean (μ , the value which is not known) is also likely to be less than Cc*'.

6.5.3 Considerations for Appropriate Dataset(s)

The CL:AIRE/CIEH statistical guidance requires consideration of the appropriateness of the dataset being subjected to the statistical testing and notes the following three key elements to be considered.

- Consideration of any non-detects within the dataset.
- Consideration of potential outliers within the dataset.
- Consideration of the statistical distribution of the data (i.e. normality/non normality).

6.5.4 Consideration of Normality of Dataset

CL:AIRE/CIEH statistical guidance notes that the choice of statistical test to be applied to the dataset will depend on the assumptions about the distribution of the data being tested. The assumptions of the statistical test adopted therefore must be appropriate to the distribution assumptions of the data being considered.

The CL:AIRE/CIEH statistical guidance details the following two key statistical tests.

- **The one-sample t test** - assumes the data being assessed is approximately normally distributed.
- **The one-sided Chebychev Theorem** - assumes the data being assessed does not demonstrate normality (method makes no assumption about the shape of the distribution).

CL:AIRE/CIEH statistical guidance, however notes '*...with large datasets, minor deviations from normality may be flagged as statistically significant even though small deviations from a normal distribution will not affect the reliability of the one sample t-test*'. The guidance goes on to note '*Conversely, datasets with a small sample size more easily pass normality tests. **Failing, however to detect non-normality in a small dataset is unlikely to compromise the validity of the one sample t-test***' [GeoDyne emphasis added].

CL:AIRE/CIEH statistical guidance further notes '*When considering which of the two tests to use, however, assessors should bear in mind that, in general, the one-sample t-test is more powerful than the method based on the Chebychev Theorem... **Given that the one sample t-test is also not sensitive to moderate departures from normality, it is recommended that assessors use the t-test unless there is good evidence that the dataset departs significantly from normality***' [GeoDyne emphasis added].

On the basis of the above, an assumption of data normality has been made and the one-sample t-test adopted accordingly.

6.5.5 Consideration of Non-Detects within the Dataset

The dataset may reveal the presence of non-detects for a number of the determinands tested. Where this occurs, we have adopted the LOD (i.e. 1.0LOD) as the chemical concentration, which provides a suitably conservative approach. However, please note that GACs have only been used for determinands where they are present at concentrations in excess of the LOD on at least one occasion.

6.5.6 Consideration of Outliers

The CL:AIRE/CIEH statistical guidance advises that *'...if outliers are identified, assessors have to decide whether they represent genuine soil concentrations or are the result of an error'*.

The guidance further notes that outliers should only be excluded from a dataset where they *'...are obviously and demonstrably the result of an error that can be identified and explained'* or *'...clearly indicate that more than one soil population exists within the dataset and this can be justified by (or informs the further development of) the conceptual model- in which case the different population expressed by the outlier(s) should be explored in more detail'*.

Taking account of the foregoing, we have adopted a policy of interrogating the relevant dataset to calculate the UCL and to ascertain the possible presence of statistical outliers (where relevant). At this point the possible relevance of statistical outliers to the interpretation of the data is considered, in accordance with the following matrix.

TABLE 5 – OUTLIER DECISION MATRIX		
	UCL < GAC	UCL > GAC
Outlier Test reveals No Hotspot(s)	Determinand present at acceptable concentrations.	Pervasive contamination present in soil at unacceptable concentrations.
Outlier Test reveals Hotspot(s)	Determinand present at acceptable concentrations. Possible second population identified. Only of potential concern where outlier is at an individual concentration in excess of the Tier 1 GAC.	Pervasive contamination present in soil at unacceptable concentrations with possible hotspots of contamination identified.

6.5.7 CLEA Averaging Area

The CLEA Model requires consideration of an averaging area, i.e. an area within which the UCL is calculated and compared to the Tier 1 GAC. Within our assessments (where appropriate) the entire site has been adopted as the averaging area, in the first instance.

6.6 Sampling Strategy

Our sampling strategy is based on a review of the historical, geological and environmental information obtained as part of our Phase I Desk Study, together with the current site setting and the ground conditions encountered during our Phase II exploratory works, taking account of the proposed end-use.

No specific areas of concern were identified at the site with respect to ground contamination, other than the potential for contamination of the near surface soils from the use of pesticides associated with the growing of crops.

Therefore, it was considered appropriate to position the exploratory holes to provide general site coverage.

Table 6 summarises the reasoning behind the exploratory hole positions.

TABLE 6 – REASONING FOR EXPLORATORY HOLE LOCATION	
Exploratory Hole Reference	Reasoning Behind Location
TP1 – TP7, SA1 – SA3, BH1 – BH3	General site coverage
TP3	Targeted to the vicinity of the infilled drainage ditch/pond
Key TP – Trial Pit SA – Soakaway Pit BH – Cable Percussive Boreholes	

The ground conditions encountered during our Phase II works revealed the presence of two distinct types of material i) Topsoil and ii) the underlying Natural Strata.

Representative samples were obtained during our Phase II works and subjected to chemical analysis for a suite of contaminants deemed appropriate based on the land use assessment.

6.7 Contamination Analysis

A total of 5No. standard chemical contamination tests (including speciated PAH and TOC) were carried out on selected soil samples obtained during the site works, which comprised 3No. tests of the topsoil and 2No. tests of the underlying Natural Strata.

For initial assessment purposes, we have combined the results into a single dataset, for individual comparison of the reported determinand concentrations against appropriate Tier 1 GAC.

6.8 Contamination Soil Test Results

6.8.1 Combined Dataset

The contamination assessment for the soils analysed at the site is summarised in Table 7.

TABLE 7 – SUMMARY OF TIER 1 GENERIC ACCEPTANCE CRITERIA DATA ASSESSMENT (RESIDENTIAL WITH PLANT UPTAKE END-USE)						
Contaminants – Potentially Harmful to Human Health	No. of Samples Tested	Concentration Range (mg/kg)	Tier 1 GAC (mg/kg)	C4SL (mg/kg)	UCL (mg/kg)	Tier 1 GAC Exceeded (Yes/No)
Metals						
Arsenic	5	2 – 5	37 S4UL	37	NA	No
Copper	5	3 – 24	2400 S4UL	-	NA	No
Chromium III	5	12 – 16	910 S4UL	-	NA	No
Lead	5	10 – 55	200 C4SL	200	NA	No
Mercury	5	<0.17 – 0.24	40 S4UL	-	NA	No
Nickel	5	12 – 14	130 S4UL	-	NA	No
Selenium	5	<1 – 2	250 S4UL	-	NA	No
Zinc	5	28 – 66	3700 S4UL	-	NA	No
PAHs						
Benzo(a)anthracene	5	<0.1 – 0.4	7.2 S4UL	-	NA	No
Benzo(a)pyrene	5	<0.1 – 0.4	2.2 S4UL	-	NA	No
Benzo(b)fluoranthene	5	<0.1 – 0.4	2.6 S4UL	-	NA	No
Benzo(ghi)perylene	5	<0.1 – 0.2	320 S4UL	-	NA	No
Benzo(k)fluoranthene	5	<0.1 – 0.1	77 S4UL	-	NA	No
Chrysene	5	<0.1 – 0.4	15 S4UL	-	NA	No
Fluoranthene	5	<0.1 – 0.5	280 S4UL	-	NA	No
Indeno(123-cd)pyrene	5	<0.1 – 0.2	27 S4UL	-	NA	No
Phenanthrene	5	<0.1 – 0.2	95 S4UL	-	NA	No
Pyrene	5	<0.1 – 0.5	620 S4UL	-	NA	No
Key S4UL – CIEH/LQM Suitable 4 Use Levels (2015). Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3026. All rights reserved. C4SL –value for Lead taken from DEFRA publication SP1010 and based on a residential (with home-grown produce) end-use. NA – UCL not applicable as all individual concentrations are present at concentrations individually below the GAC.						

All of the determinands assessed were present either at individual concentrations below the Limit of Detection of the method of analysis adopted by the laboratory or below the appropriate Tier 1 GAC based on a residential with plant uptake end-use.

6.9 Contamination Assessment Summary

Contamination testing was carried out on selected samples of the topsoil and the underlying Natural Strata. It was considered appropriate to base our sampling and investigation strategy on the potential contamination issues identified within our land use assessment taking into account the proposed end-use and the historical and existing use of the site.

On the basis of the chemical contamination assessment undertaken, the soils may be considered to be uncontaminated for the proposed residential with plant uptake end-use (i.e. in relation to human health).

We would additionally note that no visual or olfactory evidence of significant contamination was identified during the course of the exploratory investigation works.

Given the low contaminant concentrations revealed by the testing, together with the generally low groundwater sensitivity of the area, there are considered to be no specific risks posed to Controlled Waters by the findings of the laboratory analysis undertaken.

7.0 CONCEPTUAL SITE MODEL

7.1 General

The DEFRA publication 'Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance' (dated April 2012) states the following with regards to the production of a Conceptual Site Model (CSM) for a site:

'The process of risk assessment involves understanding the risks presented by land, and the associated uncertainties. In practice, this understanding is usually developed and communicated in the form of a "conceptual model"'. The development of a CSM is typically undertaken in an iterative process, reflecting the changes in understanding as more detailed site information becomes available.

In developing a CSM, and specifically in the context of land contamination, consideration needs to be given to three essential elements; which form the basis of any risk present. The statutory guidance sections 3.8 and 3.9 (April 2012) states the following with respect to Part 2A.

'Under Part 2A, for a relevant risk to exist there needs to be one or more contaminant-pathway-receptor [CPR] linkages – "contaminant linkage" – by which a relevant receptor might be affected by the contaminants in question. In other words, for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters. For the purposes of this guidance:

- (a) A "contaminant" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.*
- (b) A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters. The various types of receptors that are relevant under the Part 2A regime are explained in later sections.*
- (c) A "pathway" is a route by which a receptor is or might be affected by a contaminant.*

The term "contaminant linkage" means the relationship between a contaminant, a pathway and a receptor. All three elements of a contaminant linkage must exist in relation to a particular land before the land can be considered potentially to be contaminated land under Part 2A, including evidence of the actual presence of contaminants. The term "significant contaminant linkage", as used in this Guidance, means a contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land. The term "significant contaminant" means the contaminant which forms part of a significant contaminant linkage.'

With respect to the presence of background levels of contaminants, section 3.21 to 3.23 states *'The Part 2A regime was introduced to help identify and deal with land which poses unacceptable levels of risk. It was not intended to apply to land with levels of contaminants in soil that are commonplace and widespread throughout England or parts of it, and for which in the very large majority of cases there is no reason to consider that there is an unacceptable risk.*

Normal levels of contaminants in soil should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise. Therefore, if it is established that land is at or close to normal levels of particular contaminants, it should usually not be considered further in relation to the Part 2A regime...

For the purpose of this Guidance, “normal” levels of contaminants in soil may result from:

- (a) The natural presence of contaminants (e.g. caused by soil formation processes and underlying geology) at levels that might reasonably be considered typical in a given area and have not been shown to pose an unacceptable risk to health or the environment.*
- (b) The presence of contaminants caused by low level diffuse pollution, and common human activity other than specific industrial processes. For example, this would include diffuse pollution caused by historic use of leaded petrol and the presence of benzo(a)pyrene from vehicle exhausts, and the spreading of domestic ash in gardens at levels that might reasonably be considered typical.'*

In selecting appropriate generic assessment criteria Section 3.27 of the Guidance states:

'It is common practice in contaminated land risk assessment to use “generic assessment criteria” (GACs) as screening tools in generic quantitative human health risk assessment to help assessors decide when land can be excluded from the need for further inspection and assessment, or when further work would be warranted'.

With respect to assessing contaminated land, section 4.17 of the Guidance states:

'In deciding whether or not land is contaminated land on grounds of significant possibility of significant harm to human health, the local authority should use the categorisations described in paragraphs 4.19 – 4.30 below. Categories 1 and 2 would encompass land which is capable of being determined as contaminated land on the grounds of significant possibility of harm to human health. Categories 3 and 4 would encompass land which is not capable of being determined on such grounds.'

In relation to the use of GAC values in the assessment of contaminated land, section 3.29 of the Guidance states:

'GACs relating to human health risk assessment represent cautious estimates of levels of contaminants in soil at which there is considered to be no risk to health or, at most, a minimal risk to health. With regards to such GACs:

- (a) They may be used to indicate when land is very unlikely to pose a significant possibility of significant harm to human health. This is on the basis that they are designed to estimate levels of contamination at which risks are likely to be negligible or minimal and far from posing a significant possibility of significant harm to human health.*
- (b) They should not be used as direct indicators of whether a significant possibility of significant harm to human health may exist. Also, the local authority should not view the degree by which the GACs are exceeded (in itself) as being particularly relevant to this consideration, given that the degree of risk posed by land would normally depend on many factors other than simply the amount of contaminants in soil.*

- (c) *They should not be seen as screening levels which describe the boundary between Categories 3 and 4 in terms of Section 4 (i.e. the two Categories in which land would not be contaminated land on grounds of risk to human health). In the very large majority of cases, these SGVs/GACs describe levels of contamination from which risks should be considered to be comfortably within Category 4.*
- (d) *They should not be viewed as indicators of levels of contamination above which detailed risk assessment would automatically be required under Part 2A.*
- (e) *They should not be used as generic remediation targets under the Part 2A regime. Nor should they be used in this way under the planning system, for example in relation to ensuring that land affected by contamination does not meet the Part 2A definition of contaminated land after it has been developed.'*

In undertaking a risk assessment and deriving a CSM for the purposes of the redevelopment of a site (i.e. planning and development control) reference has been made to both the Model Procedures for the Management of Land Contamination, as well as the National Planning Policy Framework (NPPF, dated March 2012). Reference has also been made to the Contaminated Land Statutory Guidance (referenced above), although this is primarily concerned with Local Government determinations of Statutory 'Contaminated Land', which is separate to planning framework requirements.

7.2 Contaminant-Pathway-Receptor [CPR] Considerations

The following CPR assessment has been undertaken based on the assumption of a residential with plant uptake end-use for the proposed development.

7.3 Consideration of Potential Sources of Contamination [C]

Based on the findings of our works, the potential key sources of contamination at the site are considered to be the following:

- Metals or metalloids associated with any Made Ground.
- Polycyclic Aromatic Hydrocarbons (PAHs) from any ashy inclusions and/or carbonaceous inclusions in the near surface soils.
- Pesticides associated with the growing of crops.
- Hazardous ground gases (i.e. methane and carbon dioxide) associated with any Peat/organic deposits beneath the site and any Made Ground associated with infill materials to the former drainage ditch in the north of the site.

In addition, consideration has also been given to the following:

- Radon.
- Sulphate/Acid conditions (mainly for constructional reasons).

7.4 Consideration of Potential Pathways [P]

The potential pathways at the site are primarily:

- Direct ingestion of soil.
- Inhalation of dust and vapours.
- Direct skin contact with the ground.
- Direct ground contact with building materials.
- Direct ingestion of home-grown produce.
- Vertical and lateral migration of contamination.
- Vertical and lateral migration of potentially hazardous ground gases/vapours.

7.5 Consideration of Potential Receptors [R]

The potential receptors at the site are:

- The construction personnel (i.e. site workers) involved with the development of the site (typically short term (acute) exposure).
- The final end users (i.e. residents - typically long term (chronic) exposure or site visitors (typically acute exposure).
- Controlled Waters (i.e. underlying groundwater, open drainage ditches).
- Neighbouring properties (off-site receptors).
- Buildings/construction materials (including buried utilities).

7.6 Summary

GeoDyne Limited's conceptual site model of possible CPR pollutant linkages, applicable to the proposed site usage and based on the information currently available, is summarised in Table 8.

TABLE 8 – SUMMARY OF CPR ASSESSMENT						
Contaminant	Pathway	Receptor	Comments	Plausible Pollutant Linkage	Possible Mitigation	Possible Statutory 'Contaminated Land' following mitigation
Contaminated Soils	<i>Direct Ingestion / Direct Contact</i>	<i>Site Workers</i>	The soils may be regarded as uncontaminated, based on a residential with plant uptake end-use and the testing undertaken.	No	No contamination has been identified that requires specific PPE.	No
Contaminated Soils	<i>Inhalation of Dust and Vapours</i>	<i>Site Workers</i>	The soils may be regarded as uncontaminated, based on a residential with plant uptake end-use and the testing undertaken.	No	No contamination has been identified that requires specific PPE.	No
Contaminated Soils	<i>Direct Ingestion / Direct Contact</i>	<i>End Users (Residents & Site Visitors)</i>	The soils may be regarded as uncontaminated, based on a residential with plant uptake end-use and the testing undertaken.	No	None required.	No
Contaminated Soils	<i>Inhalation of Dust and Vapours</i>	<i>End Users (Residents & Site Visitors)</i>	The soils may be regarded as uncontaminated, based on a residential with plant uptake end-use and the testing undertaken. Following development, generation of significant levels of dust on a chronic basis unlikely.	No	None required.	No
Contaminated Soils	<i>Vertical and Lateral Migration</i>	<i>Neighbouring properties (off site receptors)</i>	No sources of potentially mobile contamination have been identified.	No	None required.	No
Contaminated Soils	<i>Vertical and Lateral Migration</i>	<i>Controlled Waters</i>	The site is underlain by unproductive strata and does not lie within a designated SPZ. Surface watercourses (drains) are present around the majority of the site.	No	No specific mitigation required, based on the findings of the works undertaken.	No

TABLE 8 – SUMMARY OF CPR ASSESSMENT						
Contaminant	Pathway	Receptor	Comments	Plausible Pollutant Linkage	Possible Mitigation	Possible Statutory 'Contaminated Land' following mitigation
			The concentrations of determinands detected are considered unlikely to represent a significant risk to controlled waters.			
Water Soluble Sulphate/Acid Contaminated Soils	<i>Direct Contact</i>	<i>Building Materials</i>	Design Class DS-1/ACEC Class AC-1. (BRE Spec. Digest 1:2005).	No	Adopt appropriate concrete mix for all concrete in contact with the ground.	No
Radon	<i>Vertical and Lateral Migration</i>	<i>Site Users & Building Envelope</i>	Based on the Desk Study works, the site does not lie within an area affected by radon.	No	No specific precautions required in proposed dwellings.	No
Ground Gases	<i>Vertical and Lateral Migration</i>	<i>Site Users & Building Envelope</i>	Characteristic Situation 'CS2' based on the gas monitoring programme to date.	Yes	Adopt appropriate ground gas precaution measures within proposed dwellings.	No
<p>KEY</p> <p>Where text is in <i>Bold Italic</i> item is potentially present. Where normal text is used item is not present/plausible.</p> <p>No - Pollutant linkage not plausible.</p> <p>Yes - Pollutant linkage plausible, mitigation required.</p> <p>? - Insufficient information, further work necessary.</p> <p>The requirement for mitigation is subject to review and confirmation by the appropriate regulatory authority.</p>						

In the foregoing CPR assessment, determinands identified by chemical analysis are only considered to be contaminated with respect to generic guidance where the determinand is present at concentrations above the respective screening criteria.

8.0 CONCLUSIONS & RECOMMENDATIONS

8.1 Site Summary

At the time of our works (September 2017), the site effectively comprised an irregular shaped grassed field adjoined to a small part of an additional grassed field.

8.2 Site History

Based on the reviewed historical information, the site has essentially remained an undeveloped field. A former pond was indicated in the northernmost part of the site, apparently being backfilled in the 1970's along with several ditches in the general vicinity of the site.

8.3 Site Geology

The site is indicated to be initially underlain by a series of superficial deposits comprising the Fenland Formation and underlain at depth by the Ampthill Clay Formation.

8.4 Ground Conditions

Topsoil was encountered at the surface of all exploratory holes to depths of between 0.20m and 0.60m begl with an average thickness of approximately 0.40m.

Beneath the topsoil, typically firm SILT and/or CLAY with varying amounts of Sand was encountered to depths of between 1.00m and 3.30m begl, where penetrated.

Underlying the near surface cohesive soils, loose to medium dense very silty organic SAND was encountered to depths of 9.30m and 12.70m begl. The Sand was underlain by firm and stiff sandy gravelly CLAY or dense very sandy GRAVEL to depths of up to 13.60m begl. These deposits are considered to be typically representative of the Fenland Formation.

The cable percussive boreholes encountered stiff sandy gravelly CLAY to depths of 17.00m begl and is considered to be typically representative of the Ampthill Clay Formation.

8.5 Foundation Design

The natural near surface Clay and Silt soils underlying the site at shallow depth appear suitable to support a nett allowable ground bearing pressure of up to 75kN/m². This is based on typical 0.60m wide strip foundations founded at a depth less than 1m below existing ground levels to ensure settlements are within a 25mm tolerance. Foundations for the proposed development are likely to comprise Engineer designed strip foundations to suit the loading characteristics of the proposed structures. Rafts may be considered as an alternative shallow foundation solution, where higher loads from the proposed buildings are present or where foundations are affected by trees. Rafts should be designed adopting an allowable ground bearing pressure of 50kN/m². The use of piles may also be considered where excessive loads from buildings are present and shallow foundations are not deemed appropriate.

Based on the results of the geotechnical laboratory analysis, the soils may be considered to be of low volume change potential for design purposes. We would note that the more localised Silt strata has been found to exhibit both non-plastic and plastic characteristics, however it is considered that soils of low volume change potential should be assumed across the entire site area in the first instance. On this basis, it is recommended that foundations should be advanced to a minimum founding depth of 0.75m and founded within undisturbed suitably competent natural soils.

We would note that softening of the soils was observed across the majority of the site at depths generally in excess of 1.65m begl. On the basis of the foregoing, it is important to ensure that all foundation excavations are kept as shallow as possible to avoid potential decreases in soil strength from affecting foundation integrity.

Some foundations may require deepening in accordance with NHBC Standards due to the effects of trees (see Section 8.7). To avoid excessive deepening into the geotechnically less competent soils at depth, it is anticipated that arboreally affected foundations are likely to comprise rafts rather than strips. Similarly, should any Made Ground or soft spots be encountered at founding depth, rafts (rather than strips) are anticipated to comprise the more likely foundation solution.

A further consideration as an alternative to strips/rafts may be the use of ground improvement by vibro stone columns. Advice from a specialist contractor should be sought to confirm the feasibility of ground improvement at the site, if necessary.

Based on the supplied Studio 11 Architecture plan (entitled '*Proposed residential development at Land off Old Main Road, Fleet Hargate*', referenced 356.PL.01 and dated 29.03.2017), no structures are proposed in the northernmost area of the site (to the north of the footpath and culverted watercourse). Based on historical records, this area comprises a backfilled pond and therefore if any structures are proposed for this area, further works are recommended and the use of piled foundations is likely to be necessary.

8.6 Floor Slab Design & Ground Gas Precautions

Based on the results of the ground gas monitoring undertaken to date and the development proposals that may be assumed at this stage, the site falls into Characteristic Situation CS2, in accordance with Table 4 of BS 8485:2015. The minimum gas protection score for the site is 3.5 points.

Typically, the following mitigation measures are considered appropriate for the site to achieve the required level of protection to dwellings:

- Suspended floors with a clear ventilated void (i.e. beam and block).
- Provision of periscopic air-brick ventilation on two sides of each dwelling. The recommended minimum area of ventilation for a sub-floor void is 1500mm² per metre run of wall or 500mm² per square metre of floor area, whichever gives the greater area of opening.

- Low-permeability well installed proprietary gas membrane. The membrane should be suitably lapped and taped and should be extended across wall cavities and lapped with cavity trays to effectively exclude ground gases from the footprint of the proposed buildings. Service penetrations through the membrane should be kept to a minimum and should be suitably sealed to the membrane. The membrane should be inspected by third party in accordance with the requirements of CIRIA C735 '*Good practice on the testing and verification of protection systems for buildings against hazardous ground gas*' (2014). The membrane must be suitably robust to withstand the construction process and should be suitably protected following installation and inspection to minimise damage during construction.

The foregoing precautions would score 4.5 points in accordance with BS 8485:2015 and are therefore considered appropriate for the site, based on the requirements for a minimum protection level of 3.5 points. Alternative floor slab design and gas protection measures that give a minimum protection level of 3.5 points may be considered in accordance with BS8485 '*Code of practice for the characterization and remediation from ground gas in affected developments*' (2007) and subject to Local Authority approval.

8.7 Building Near Trees

The geotechnical laboratory test results have revealed the presence of predominantly cohesive (i.e. Clay) soils across the site.

Foundation designs will need to be adjusted in full accordance with NHBC Standards Chapter 4.2 '*Building near trees*' where building near existing, proposed or recently removed trees. It is recommended that cohesive soils of a low volume change potential should be assumed for design purposes.

At this stage, it is recommended that a qualified Arborist undertakes a tree survey of the sites immediate surrounds prior to development, to assist with the foundation design.

8.8 Radon

No radon precautions are required at the site.

8.9 Water

Water was absent from the majority of exploratory holes during the site investigation works. Localised slight water seepages were observed in the near surface soils at 1.90m and 3.00m begl. Water seepages were also observed at 4.00m and 5.20m begl within granular soils within cable percussive boreholes. During the monitoring programme, water was recorded at depths ranging between 1.35m to 2.00m begl within the borehole installations. This may be a result of surface water run-off standing within the installations, rather than a true indication of groundwater levels.

It is anticipated that shallow excavations for foundations may require localised dewatering. This may involve minor sump pumping techniques, in the first instance, particularly where excavations are left open for a significant period of time. Dewatering is anticipated for any deeper excavations at the site.

Excavations may be susceptible to standing water following periods of wet weather. It should be noted that groundwater levels may vary due to seasonal or other effects.

8.10 Excavations / Stability

The sides of the majority of trial pits remained relatively stable at shallow depths, but were found to be locally unstable during excavation resulting in partial or full pit collapses below approximately 2.60m begl within the silt and sand soils. Deeper boreholes were cased to depths of 13.50m and 14.00m begl to prevent borehole collapses during advancement.

Therefore, foundation excavations are unlikely to require trench support. Deeper excavations (i.e. for sewers) may require trench support for health and safety reasons. The assessment of excavations and provision of support will be the responsibility of the contractor on site.

The natural cohesive soils may be subject to deterioration and softening if excavations are left open and exposed to wet weather. Any softened soils should be removed from excavations prior to the pouring of concrete (where applicable).

8.11 Sulphate Classification

In accordance with BRE Special Digest 1:2005 the site falls into Design Sulfate Class DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1, based on the assumption of either brownfield or natural ground conditions, and the presence of potentially mobile groundwater conditions beneath the site.

Therefore, an appropriate concrete mix should be adopted in accordance with BRE Special Digest 1 for all buried concrete in contact with the ground.

8.12 Coal Mining

No specific investigation or mitigation measures in relation to coal mining issues are considered to be necessary at the site.

8.13 California Bearing Ratios (CBRs)

A CBR value of <2% to 3% may be anticipated within the shallow Natural Strata, subject to confirmation by in-situ testing.

8.14 Surface Water Drainage

The results from soakaway testing within soakaway test pits (2No. pits excavated to depths of 1.80m and 1.95m begl and 1No. pit excavated to a depth 1.00m begl) did not reveal any significant drop in water level for the duration of the testing. Therefore, the use of soakaways is unlikely to be suitable and it may be prudent to investigate alternative methods for draining the site, at this stage.

8.15 Contamination Assessment

Contamination testing was carried out on selected samples of the Topsoil and the underlying Natural Strata. It was considered appropriate to base our sampling and investigation strategy on the potential contamination issues identified within our land use assessment taking into account the proposed end-use and the historical and existing use of the site.

On the basis of the chemical contamination assessment undertaken, the soils may be considered to be uncontaminated for the proposed residential with plant uptake end-use (i.e. in relation to human health).

We would additionally note that no visual or olfactory evidence of significant contamination was identified during the course of the exploratory investigation works.

Given the low contaminant concentrations revealed by the testing, together with the low groundwater sensitivity of the area, there are considered to be no specific risks posed to Controlled Waters by the findings of the laboratory analysis undertaken to date.

8.16 Remediation Proposals

8.16.1 Proposed Garden Areas

It is considered that taking account of the current setting of the site and development proposals, human health is the principle driver for any remediation works based on the proposed residential end-use of the site.

The chemical analysis undertaken to date has revealed the site to be uncontaminated with respect to the determinands tested, based on a residential with plant uptake end-use. Therefore, no remediation works will be required.

8.16.2 Proposed Areas of Hard Standing

Specific remedial measures are considered not necessary within areas of proposed hard standing at the site (i.e. external hard standing areas and beneath the floor slabs to the proposed dwellings).

8.16.3 Re-use of Existing Topsoil and Natural Strata

The existing topsoil is considered suitable for re-use within the proposed development based on the testing undertaken during these works. We would recommend that the existing topsoil is stripped and appropriately stockpiled prior to commencement of the development.

Furthermore, where there is an excess volume of topsoil, consideration should be given to re-use on other developments (subject to regulatory approval) rather than off-site disposal. Similarly, the Natural Strata may be regarded as suitable for re-use within proposed gardens as subsoil (to raise levels, as appropriate) or for landscaping/capping on alternative developments (subject to regulatory approval) where surplus arisings are generated from the site. Please note that further sampling and analysis may be required in due course where these options are to be investigated and a Materials Management Plan (MMP) prepared accordingly.

8.16.4 Off Site Disposal & Waste Acceptance Criteria Testing

If off-site disposal is required the chemical testing regime can be different to the chemical testing required to assess the suitability of the soils for retention on site and the risks to human health. Therefore, a new contamination assessment may be required to include bespoke leachate analysis (i.e. Waste Acceptance Criteria [WAC] testing) to classify the soils for off-site disposal with testing criteria to assess whether the soil is hazardous, non-hazardous or inert waste. However, the existing chemical test data will assist this process.

If disposal is necessary then the environmental laboratory test results (included within Appendix VIII) should be provided to several landfill operators for consideration and cost provision in the first instance, prior to the material being removed from the site.

8.17 Flood Risk

The Landmark Envirocheck report has revealed the site to lie within an area identified as being at risk of flooding. It is recommended that advice be sought from a Drainage Consultant with respect to this matter and a detailed Flood Risk Assessment (FRA) is carried out.

8.18 Construction Workers

No contamination has been identified that requires specific PPE. However, it is recommended that construction personnel involved with direct contact with the soils at the site use appropriate PPE equipment (i.e. boots, gloves and overalls) together with hygiene facilities in accordance with general health and safety guidelines.

A copy of this report should be included in the site health and safety file, and site workers should be made fully aware of the sites setting.

8.19 Utilities

Prior to development of the site, we would recommend that a copy of this report is supplied to utility companies, and that their recommendations relating to appropriate supply pipes are adhered to.

8.20 Unforeseen Circumstances

Should any areas of potentially contaminated soil be encountered during site construction works we would recommend consultation with GeoDyne Limited to ensure that our recommendations continue to apply. Any potentially contaminated soils should be left in-situ and subjected to further assessment, to potentially include further chemical testing and risk assessment.

The following procedure should be adhered to if any areas of previously unidentified suspected contamination are encountered during the development of the site:

- i. Suspected contaminated material will remain in-situ.
- ii. GeoDyne Limited to be notified. We will then undertake a visual assessment of the possible contamination, followed by appropriate sampling/testing (as necessary).
- iii. If necessary, an appropriate strategy to remove/remediate the contamination will be submitted to the Local Authority.

8.21 Licences, Permits, Registrations, Plans & Approvals

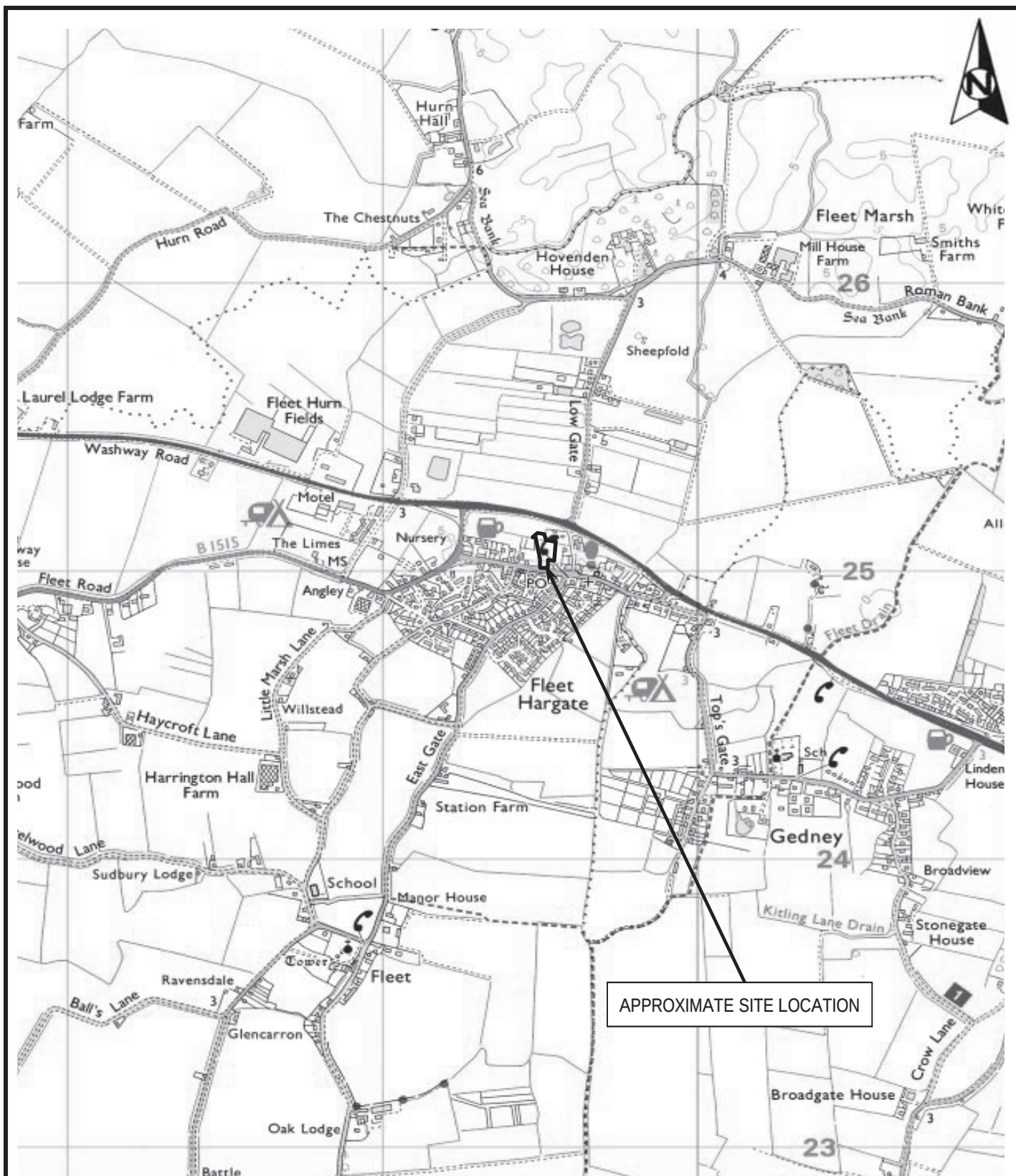
The Contractor/Developer is responsible for, and must ensure that, all necessary licenses, permits, plans, registrations and approvals are in place prior to commencing with the earthworks at the site. These will include any Mobile Treatment Licenses (MTLs), Materials Management Plans (MMPs), Site Waste Management Plans (SWMPs) and/or Environmental Permits as necessary to enable the completion of the proposed works.

8.22 Further Works

The current scope of works included 3No. gas monitoring visits. Liaison with the Local Planning Authority should be carried out to ascertain whether the current site characterisation is acceptable or whether additional confirmatory monitoring of the existing gas monitoring wells is necessary.

APPENDIX I

**Site Location Plan
(Figure No. D37124/01)**



Do Not Scale

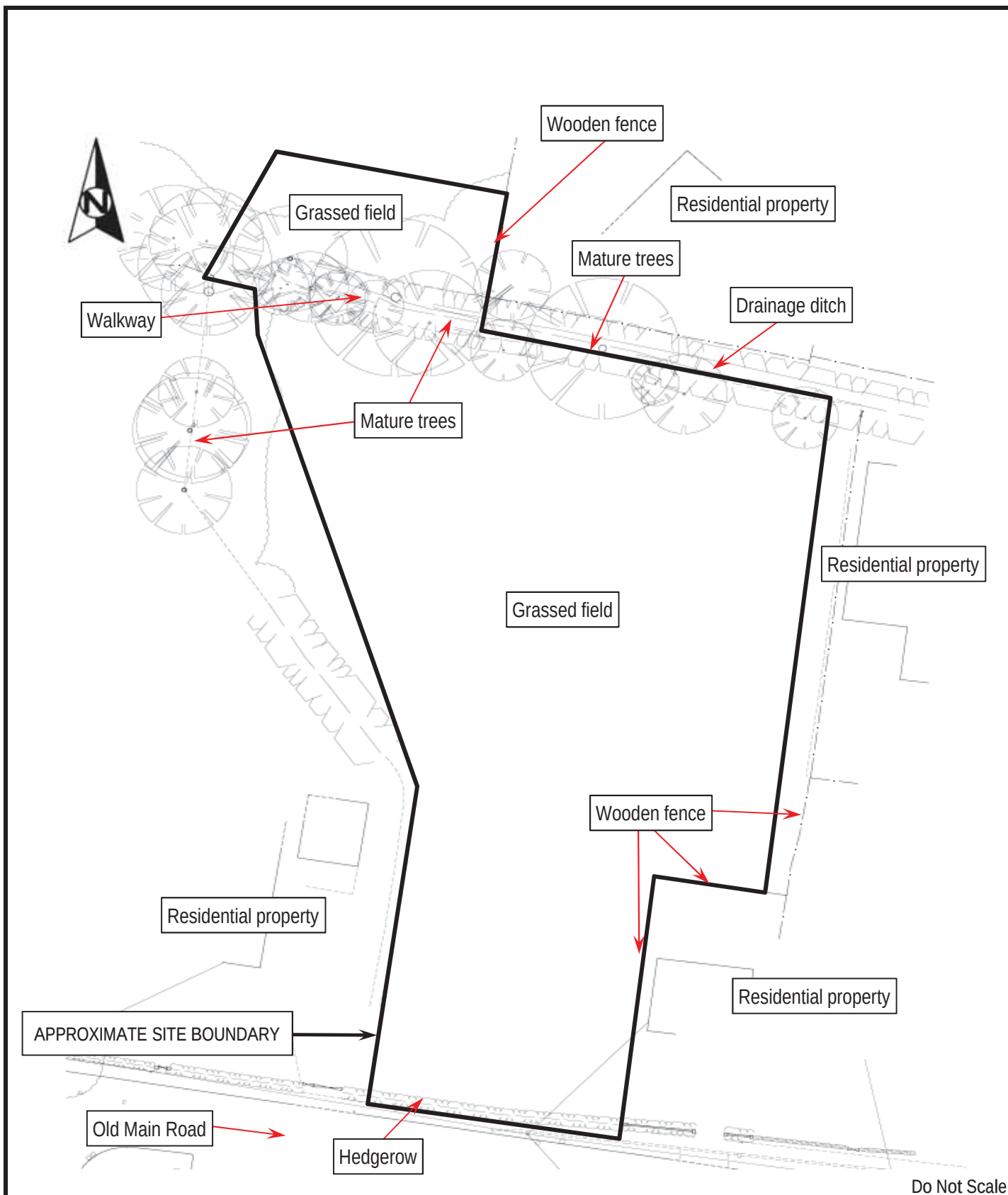
REPRODUCED FROM THE ORDNANCE SURVEY MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. CROWN COPYRIGHT RESERVED. LICENCE NO. LAN 1001274

Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
Project	Old Main Road Fleet Hargate	Approved	RS
		Scale	NTS
		Date Drawn	20/10/2017
Title	Site Location Plan	Rev.	
		Figure No.	D37124/01



APPENDIX II

**Annotated Site Plan
(Figure No. D37124/02)**



Do Not Scale

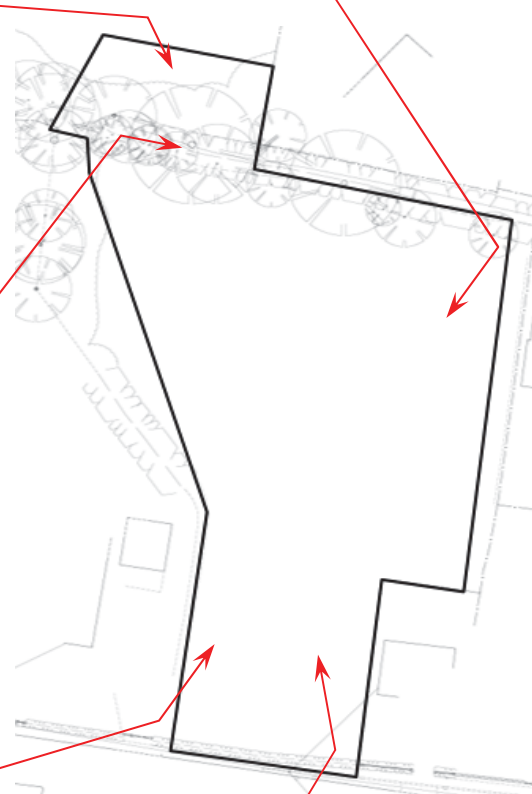
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REPRODUCED AND EDITED WITH THE PERMISSION OF THE CLIENT.

Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
Project	Old Main Road Fleet Hargate	Approved	RS
		Scale	NTS
		Date Drawn	25/10/2017
Title	Annotated Site Plan	Rev.	
		Figure No.	D37124/02



APPENDIX III

**Site Plan Showing General Site Views
(Figure No. D37124/03)**



Do Not Scale

REPRODUCED FROM THE DRAWING ENTITLED 'SITE LAYOUT AND LOCATION PLAN'. PRODUCED BY STUDIO 11 ARCHITECTURE LTD, DRAWING REF 356.PL.01, DATED 29.03.2017.
REPRODUCED AND EDITED WITH THE PERMISSION OF THE CLIENT.

Project No.	D37124	Drawn	CB	
Client	Seagate Homes	Checked	RS	
Project	Old Main Road Fleet Hargate	Approved	RS	
		Scale	NTS	
		Date Drawn	25/10/2017	
Title	Site Plan Showing General Site Views	Rev.		
		Figure No.	D37124/03	

APPENDIX IV

**Exploratory Hole Location Plan
(Figure No. D37124/04)**

KEY



Location of cable percussive borehole (BH)



Location of trial pit (TP)

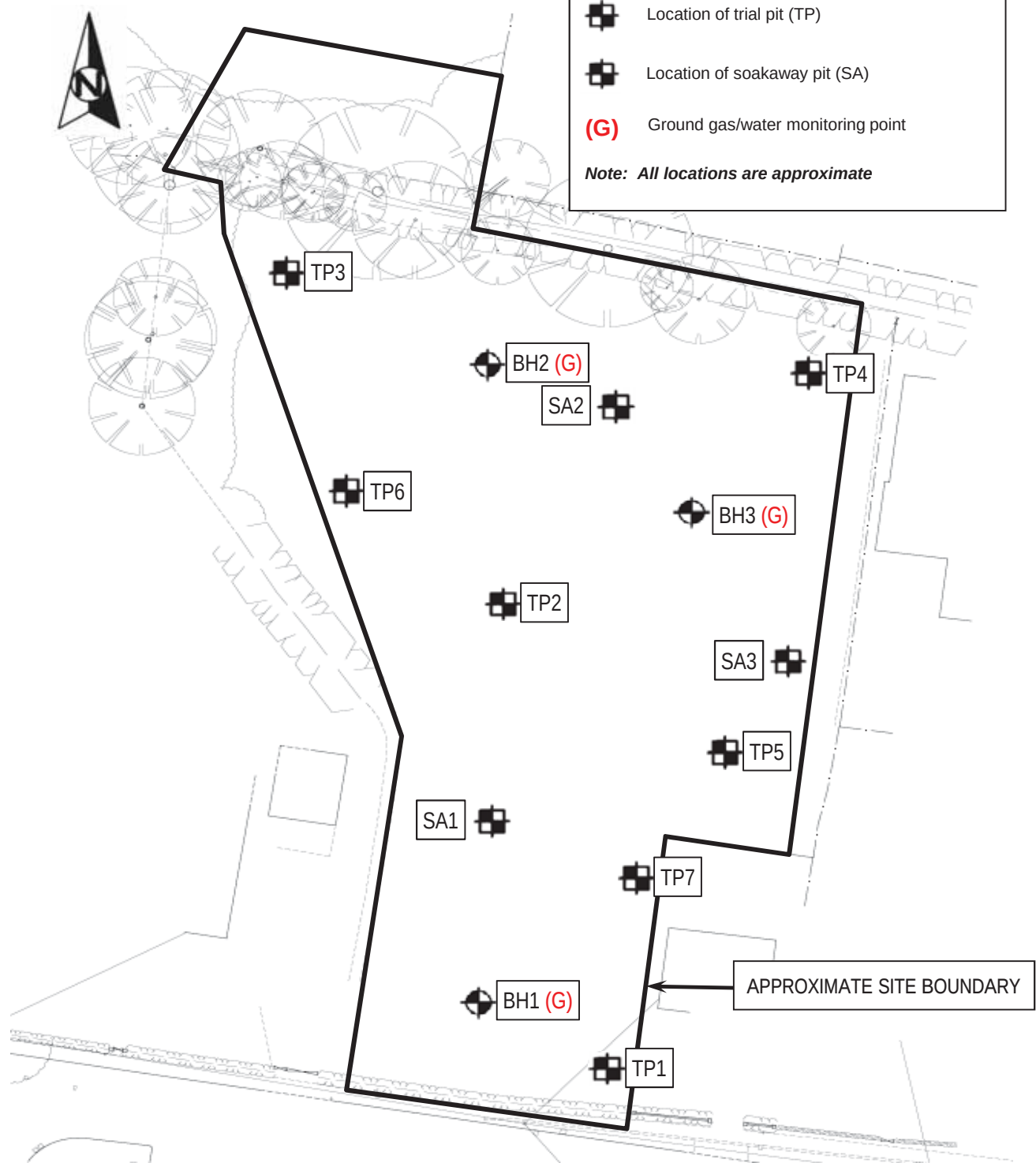


Location of soakaway pit (SA)

(G)

Ground gas/water monitoring point

Note: All locations are approximate



Do Not Scale

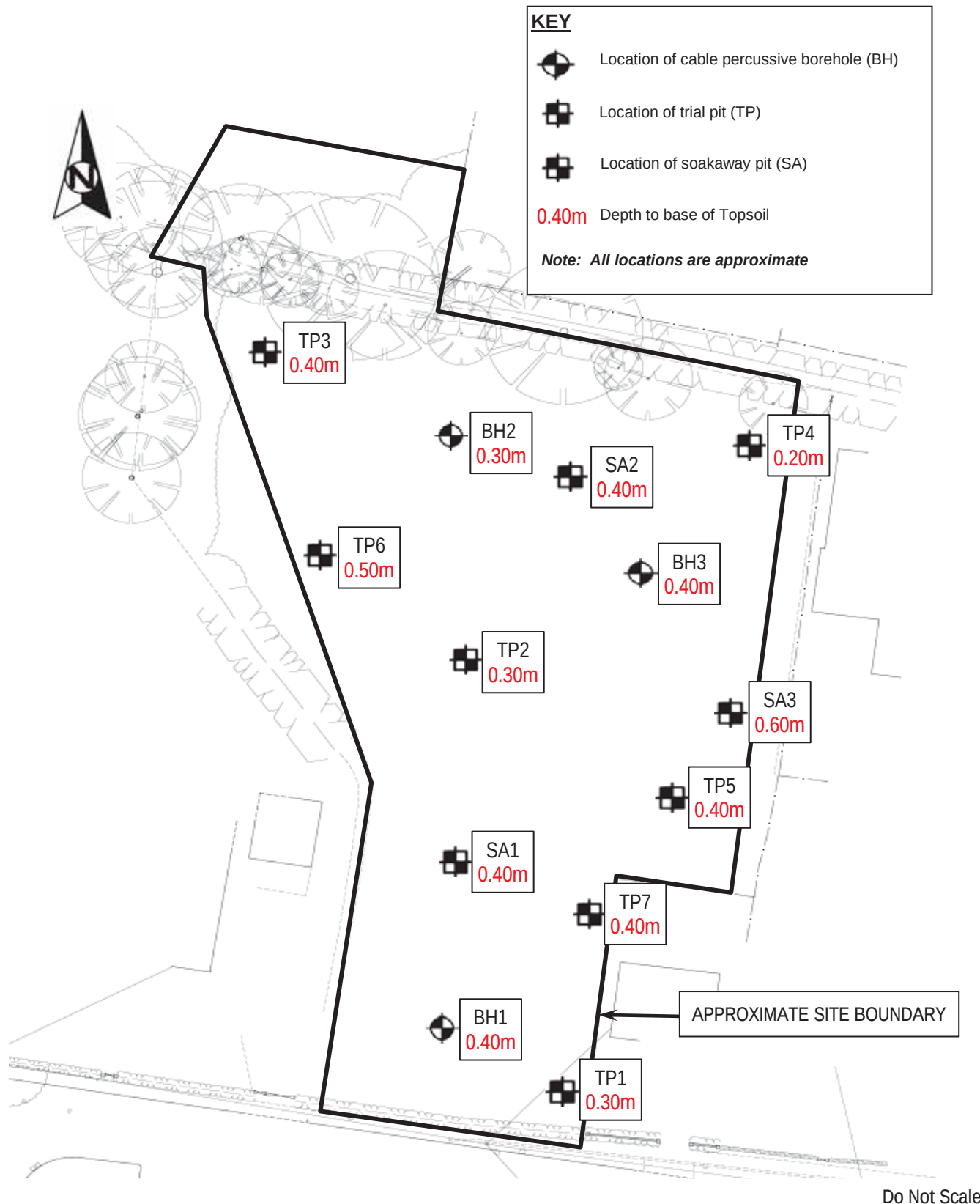
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REPRODUCED AND EDITED WITH THE PERMISSION OF THE CLIENT.

Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
Project	Old Main Road Fleet Hargate	Approved	RS
		Scale	NTS
		Date Drawn	25/10/2017
Title	Exploratory Hole Location Plan	Rev.	
		Figure No.	D37124/04



APPENDIX V

**Plan Showing Depth to Base of Topsoil
(Figure No. D37124/05)**



REPRODUCED FROM THE DRAWING ENTITLED 'SITE LAYOUT AND LOCATION PLAN'. PRODUCED BY STUDIO 11 ARCHITECTURE LTD, DRAWING REF 356.PL.01, DATED 29.03.2017.
REPRODUCED AND EDITED WITH THE PERMISSION OF THE CLIENT.

Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
Project	Old Main Road Fleet Hargate	Approved	RS
		Scale	NTS
		Date Drawn	25/10/2017
Title	Plan Showing Depth to Base of Topsoil	Rev.	
		Figure No.	D37124/05



APPENDIX VI

**Exploratory Hole Logs
(TP1 – TP7, SA1 – SA3, BH1 – BH3)**

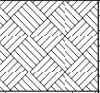
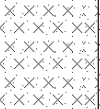
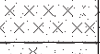
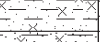


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email: info@geodyne.co.uk

TP1

Project No: D37124

Sheet 1 of 1

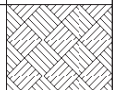
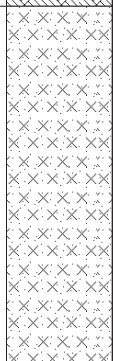
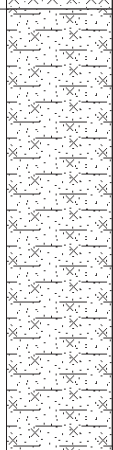
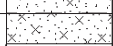
Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		0.20	T1	D	In-Situ SV	62 70 75	
Firm light brown sandy SILT (FENLAND FORMATION)		0.30	T2	D			
...occassional coarse subangular sandstone gravel and cobbles from 0.70m		0.50					
Firm brown mottled orange slightly sandy very silty CLAY (FENLAND FORMATION)		0.80					
...becoming more silty with depth		0.80					
Firm light brown slightly clayey very sandy SILT (FENLAND FORMATION)		1.20					
End of Trial Pit at 2.80m		2.80					

Remarks:

- Sides generally stable.
- No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m²) P = Penetrometer (kN/m²)
J = Jar Sample V = Vial Sample = Water Strike (m) = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate			Client: Seagate Homes	
Logged: CB	Checked: RS	Field Book Ref: CB17/01	Plant: JCB 3CX	Drawing No. TP1
Date: 20/09/2017	Approved: RS		Scale: 1:25	

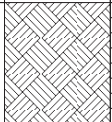
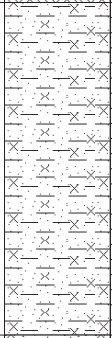
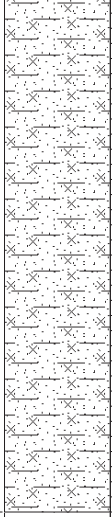
Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		0.10	T3	D	In-Situ SV	60 60 70	
Firm light brown mottled orange sandy clayey SILT (FENLAND FORMATION)		0.30	B1	B			
...very clayey between 0.70m and 0.85m		0.60 - 1.10 0.70					
Firm light brown slightly clayey very sandy SILT (FENLAND FORMATION)		1.50 1.60	T4	D			
Medium dense grey very silty organic fine to medium SAND (FENLAND FORMATION)		3.00 3.10 3.10	T5	D			
End of Trial Pit at 3.10m							

Remarks:

1. East side collapsing when excavating below approximately 2.60m.
2. Slight water seepage encountered at 3.00m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m²) P = Penetrometer (kN/m²)
J = Jar Sample V = Vial Sample  = Water Strike (m)  = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate			Client: Seagate Homes	
Logged: CB	Checked: RS	Field Book Ref: CB17/01	Plant: JCB 3CX	Drawing No. TP2
Date: 20/09/2017	Approved: RS		Scale: 1:25	

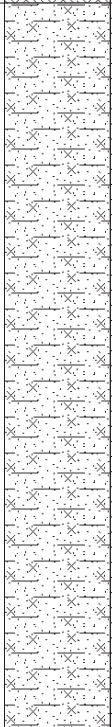
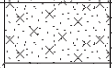
Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		0.40					
Firm brown mottled orange sandy silty CLAY (FENLAND FORMATION)		0.60	T6	D			
		0.80 - 1.30	B2	B	In-Situ SV	60 62 70	
		0.90					
Firm grey mottled brown clayey sandy SILT (FENLAND FORMATION)		1.50					
...becoming less clayey/silty and more sandy with depth							
End of Trial Pit at 3.20m		3.20					

Remarks:

- Pit sides collapsing when excavating below approximately 2.80m.
- No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m²) P = Penetrometer (kN/m²)
J = Jar Sample V = Vial Sample  = Water Strike (m)  = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate			Client: Seagate Homes	
Logged: CB	Checked: RS	Field Book Ref: CB17/01	Plant: JCB 3CX	Drawing No. TP3
Date: 20/09/2017	Approved: RS		Scale: 1:25	

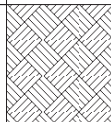
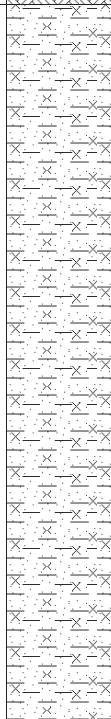
Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		0.10 0.20	T7	D			
Soft to firm brown mottled orange slightly clayey sandy SILT (FENLAND FORMATION)		1.00 - 1.50	B3	B			
...becoming firm and more sandy and less clayey/silty with depth		1.50	T8	D			
Medium dense grey very silty organic fine to medium SAND (FENLAND FORMATION)		2.60 2.80					
End of Trial Pit at 2.80m							

Remarks:

- Pit sides collapsed when excavating approximately below 2.60m.
- No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m²) P = Penetrometer (kN/m²)
J = Jar Sample V = Vial Sample  = Water Strike (m)  = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate			Client: Seagate Homes	
Logged: CB	Checked: RS	Field Book Ref: CB17/01	Plant: JCB 3CX	Drawing No. TP4
Date: 20/09/2017	Approved: RS		Scale: 1:25	

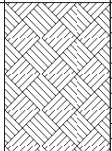
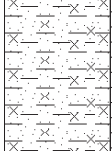
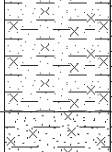
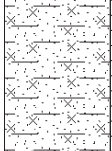
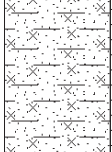
Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		0.10	T9	D	In-Situ SV	65 70 70	
Firm light brown mottled orange slightly sandy slightly silty CLAY (FENLAND FORMATION)		0.40					
		0.60					
		0.70 - 1.20	B4	B			
		0.90	T10	D			
End of Trial Pit at 2.80m		2.80					

Remarks:

- West pit side collapsing when excavating below 2.60m.
- No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m²) P = Penetrometer (kN/m²)
J = Jar Sample V = Vial Sample  = Water Strike (m)  = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate			Client: Seagate Homes	
Logged: CB	Checked: RS	Field Book Ref: CB17/01	Plant: JCB 3CX	Drawing No. TP5
Date: 20/09/2017	Approved: RS		Scale: 1:25	

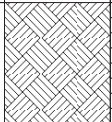
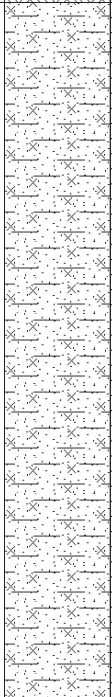
Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		0.50					
Firm light brown slightly sandy silty CLAY (FENLAND FORMATION)		0.80			In-Situ SV	56 62 68	
...becoming more silty and sandy with depth		1.40					
Firm grey mottled brown clayey sandy SILT (FENLAND FORMATION)		2.80					
...becoming sandy and less mottled with depth							
End of Trial Pit at 2.80m							

Remarks:

- Pit sides collapsing when excavating below approximately 2.70m.
- No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m²) P = Penetrometer (kN/m²)
J = Jar Sample V = Vial Sample  = Water Strike (m)  = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate			Client: Seagate Homes	
Logged: CB	Checked: RS	Field Book Ref: CB17/01	Plant: JCB 3CX	Drawing No. TP6
Date: 20/09/2017	Approved: RS		Scale: 1:25	

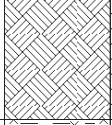
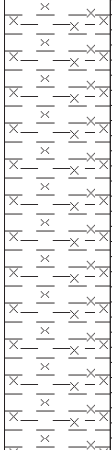
Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		0.20	T11	D			
Firm brown mottled orange slightly clayey sandy SILT (FENLAND FORMATION)		0.40					
		0.70 - 1.20	B5	B			
...organic layers around 1.50m and 1.70m		1.50	T12	D			
End of Trial Pit at 2.70m		2.70					

Remarks:

- Pit sides collapsing when excavating below approximately 2.60m.
- No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m²) P = Penetrometer (kN/m²)
J = Jar Sample V = Vial Sample  = Water Strike (m)  = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate			Client: Seagate Homes	
Logged: CB	Checked: RS	Field Book Ref: CB17/01	Plant: JCB 3CX	Drawing No. TP7
Date: 20/09/2017	Approved: RS		Scale: 1:25	

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		0.40					
Firm brown mottled orange very silty CLAY (FENLAND FORMATION)		0.70			In-Situ SV	62 65 66	
End of Trial Pit at 1.95m		1.95					

Remarks:

- Sides generally stable.
- Slight water seepage encountered at 1.90m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m²) P = Penetrometer (kN/m²)
J = Jar Sample V = Vial Sample  = Water Strike (m)  = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate			Client: Seagate Homes	
Logged: CB	Checked: RS	Field Book Ref: CB17/01	Plant: JCB 3CX	Drawing No. SA1
Date: 27/09/2017	Approved: RS		Scale: 1:25	



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SA2

Project No: D37124

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		0.40			In-Situ SV	64 65 70	
Firm light brown very silty CLAY (FENLAND FORMATION)		1.00					
...becoming sandy from 0.80m and mottled orange		1.20					
Firm grey mottled brown slightly clayey very sandy SILT (FENLAND FORMATION)		1.80					
End of Trial Pit at 1.80m							

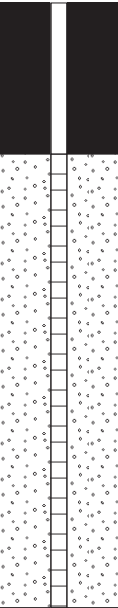
Remarks:

- Sides generally stable.
- No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m²) P = Penetrometer (kN/m²)
J = Jar Sample V = Vial Sample = Water Strike (m) = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate			Client: Seagate Homes	
Logged: CB	Checked: RS	Field Book Ref: CB17/01	Plant: JCB 3CX	Drawing No. SA2
Date: 27/09/2017	Approved: RS		Scale: 1:25	

SA3

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
1.20 - 1.65	C		6	Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		(0.40)			
				Firm light brown sandy SILT (FENLAND FORMATION)		0.40 (0.50)			
				Firm light brown slightly clayey very sandy SILT (FENLAND FORMATION)		0.90			
2.00 - 2.45	C		4			(3.00)			
3.00 - 3.45	C		2						
4.00 - 4.45	C		10						
5.00 - 5.45	C		8	Loose to medium dense grey very silty organic fine to medium SAND (FENLAND FORMATION)		3.90			
6.50 - 6.95	S		10			(5.40)			
8.00 - 8.45	C		9						
9.50 - 9.95	S		8						
				Firm grey silty sandy gravelly CLAY. Gravel is fine to coarse subrounded to subangular quartzite (FENLAND FORMATION)		9.30			
				Stiff grey-brown sandy gravelly CLAY. Gravel is fine to coarse subrounded to subangular quartzite (FENLAND FORMATION)		9.50			

Remarks

1.Sides generally stable.
2.Water encountered at 4.00m which rose to 3.90m after 20mins.
3.Plain pipe installed from ground level to 1.00m with a bentonite surround. Slotted pipe installed from 1.00m to 4.00m.
4.Bung, valve and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
 = Water Strike (m)
 = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate

Client: Seagate Homes

Logged: CB

Checked: RS

Field Book Ref: CB17/01

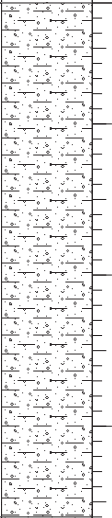
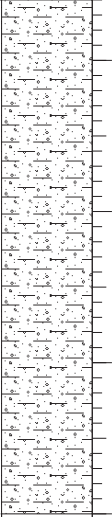
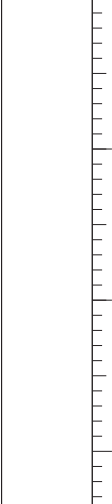
Plant: Competitor Rig

Drawing Ref: BH1

Date: 22/09/2017

Approved: RS

Scale: 1:50

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
11.00 - 11.45	S		12	Stiff grey-brown sandy gravelly CLAY. Gravel is fine to coarse subrounded to subangular quartzite (FENLAND FORMATION)		(4.10)			
12.50 - 12.95	S		33						
14.00 - 14.45	S		38	Stiff grey-brown slightly sandy gravelly CLAY. Gravel is fine to coarse subrounded to subangular chalk (AMPTHILL CLAY FORMATION)		13.60	14.00		
15.50 - 15.95	S		34						
17.00 - 17.45	S		38	End of Borehole at 17.00m		17.00			

Remarks

1.Sides generally stable.
2.Water encountered at 4.00m which rose to 3.90m after 20mins.
3.Plain pipe installed from ground level to 1.00m with a bentonite surround. Slotted pipe installed from 1.00m to 4.00m.
4.Bung, valve and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
 = Water Strike (m)
 = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate

Client: Seagate Homes

Logged: CB

Checked: RS

Field Book Ref: CB17/01

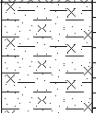
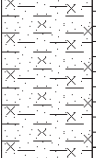
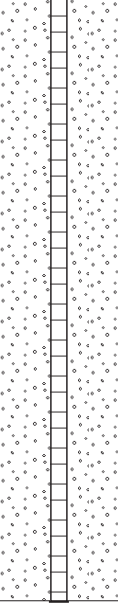
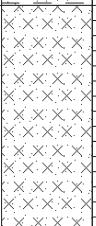
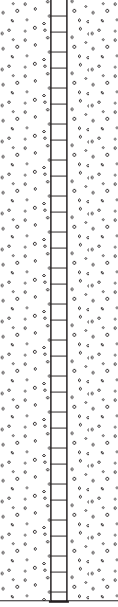
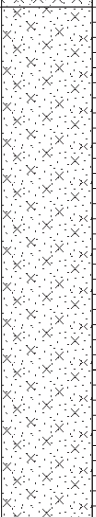
Plant: Competitor Rig

Drawing Ref: BH1

Date: 22/09/2017

Approved: RS

Scale: 1:50

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
1.20 - 1.65	S		6	Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		(0.30)			
				Firm light brown sandy very silty CLAY (FENLAND FORMATION)		0.30			
2.00 - 2.45	S		3	Firm brown slightly clayey very sandy SILT (FENLAND FORMATION)		(1.80)			
3.00 - 3.45	S		3			2.10			
4.00 - 4.45	S		10	Loose to medium dense grey very silty organic fine to medium SAND (FENLAND FORMATION)		(1.50)			
				...peat band from 4.70m to 4.90m		3.60			
5.00 - 5.45	S		15	...occasional shells from 6.10m					
6.50 - 6.95	S		6			(9.10)			
8.00 - 8.45	S		11						
9.50 - 9.95	S		7						

Remarks

1.Sides generally stable.
2.Water encountered at 5.20m which rose to 3.10m after 20minutes.
3.Plain pipe installed from ground level to 1.00m with a bentonite surround. Slotted pipe installed from 1.00m to 5.00m.
4.Bung, valve and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
 = Water Strike (m)
 = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate

Client: Seagate Homes

Logged: CB

Checked: RS

Field Book Ref: CB17/01

Plant: Competitor Rig

Drawing Ref: BH2

Date: 21/09/2017

Approved: RS

Scale: 1:50

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
11.00 - 11.45	S		11						
12.50 - 12.95	S		32	...occasional fine to coarse subrounded to subangular gravel from 12.10m					
				Dense brown very sandy fine to coarse subrounded to subangular quartzite GRAVEL with occasional limestone quartzite cobbles (FENLAND FORMATION)		12.70 (0.40)			
				Stiff grey-brown slightly sandy gravelly CLAY. Gravel is fine to coarse subrounded to subangular chalk (AMPTHILL CLAY FORMATION)		13.10	13.50		
14.00 - 14.45	S		40						
						(3.90)			
15.50 - 15.95	S		32						
17.00 - 17.45	S		33	End of Borehole at 17.00m		17.00			

Remarks

1.Sides generally stable.
2.Water encountered at 5.20m which rose to 3.10m after 20minutes.
3.Plain pipe installed from ground level to 1.00m with a bentonite surround. Slotted pipe installed from 1.00m to 5.00m.
4.Bung, valve and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample

S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate

Client: Seagate Homes

Logged: CB

Checked: RS

Field Book Ref: CB17/01

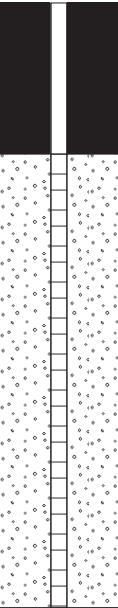
Plant: Competitor Rig

Drawing Ref: BH2

Date: 21/09/2017

Approved: RS

Scale: 1:50

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
1.20 - 1.65	C		7	Dark brown slightly sandy clayey very silty topsoil (TOPSOIL)		(0.40) 0.40			
2.00 - 2.45	C		4	Firm brown mottled orange slightly clayey sandy SILT (FENLAND FORMATION)		(2.90)			
3.00 - 3.45	C		1			3.30			
4.00 - 4.45	S		7	Loose grey very silty organic fine SAND (FENLAND FORMATION)		(0.70) 4.00	4.00		
				End of Borehole at 4.00m					

Remarks

1.Sides generally stable.
2.No water encountered.
3.Plain pipe installed from ground level to 1.00m with a bentonite surround. Slotted pipe installed from 1.00m to 4.00m.
4.Bung, valve and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
 = Water Strike (m)
 = Steady Water Level (m)

Project: Old Main Road, Fleet Hargate

Client: Seagate Homes

Logged: CB

Checked: RS

Field Book Ref: CB17/01

Plant: Competitor Rig

Drawing Ref: BH3

Date: 20/09/2017

Approved: RS

Scale: 1:50

APPENDIX VII

Ground Gas & Water Monitoring Results



9 Brunel Parkway
Pride Park
Derby
DE24 8HR

Tel: 01332 290 798

Project No.	D37124
Client	Seagate Homes
Site Location	Old Main Road, Fleet Hargate
Date	02/10/2017
Weather	Windy & cloudy
Atmospheric Pressure Range (mb)	1007
Equipment	GEO11 (DERBY) & dipmeter
Operator	CB

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665							
Borehole No.	Peak	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Gas Flow (l/h)	Depth to Groundwater (mbgl)	Time to steady reading (secs)
BH1	Peak	0.0	2.7	17.1	0.0	1.98	NA
	Steady	0.0	2.7	17.1	0.0		Monitored for 130 seconds
BH2	Peak	0.0	3.5	18.9	0.0	1.45	Monitored for 170 seconds
	Steady	0.0	3.5	18.9	0.0		
BH3	Peak	0.0	5.4	12.8	0.0	1.35	Monitored for 150 seconds
	Steady	0.0	5.4	12.8	0.0		
Ambient		0.0	0.0	20.9	N/A	N/A	N/A

Notes

Cell is highlighted in the following conditions

- 1. Where Methane exceeds 1% v/v (after BR212)
- 2. Where Carbon Dioxide exceeds 5% v/v (after BR212)

N/A - Not Applicable/ Not Available

ND - Not Determined

NGW - No groundwater encountered



9 Brunel Parkway
Pride Park
Derby
DE24 8HR

Tel: 01332 290 798

Project No.	D37124
Client	Seagate Homes
Site Location	Old Main Road, Fleet Hargate
Date	12/10/2017
Weather	Overcast & windy
Atmospheric Pressure Range (mb)	1016
Equipment	GEO09 (NOTTINGHAM) & dipmeter
Operator	HW

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665							
Borehole No.	Peak	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Gas Flow (l/h)	Depth to Groundwater (mbgl)	Time to steady reading (secs)
BH1	Steady	0.0	2.5	17.2	0.0	2.00	50
	Peak	0.0	2.5	17.2	0.0		
BH2	Steady	0.0	3.7	19.0	0.0	1.52	45
	Peak	0.0	3.7	19.0	0.0		
BH3	Steady	0.0	4.9	13.4	0.0	1.42	50
	Peak	0.0	4.9	13.4	0.0		
Ambient		0.0	0.0	20.9	N/A	N/A	N/A
Other Issues i.e. odour, condition of installation, etc							
Monitored for 120 seconds							
Monitored for 120 seconds							
Monitored for 120 seconds							

Notes

- Cell is highlighted in the following conditions
- 1. Where Methane exceeds 1% v/v (after BR212)
 - 2. Where Carbon Dioxide exceeds 5% v/v (after BR212)
- N/A - Not Applicable/ Not Available
ND - Not Determined
NGW - No groundwater encountered



9 Brunel Parkway
Pride Park
Derby
DE24 8HR

Tel: 01332 290 798

Project No.	D37124
Client	Seagate Homes
Site Location	Old Main Road, Fleet Hargate
Date	16/10/2017
Weather	Overcast & windy
Atmospheric Pressure Range (mb)	1012
Equipment	GEO09 (NOTTINGHAM) & dipmeter
Operator	HW

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.	Peak	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Gas Flow (l/h)	Depth to Groundwater (mbgl)	Time to steady reading (secs)	Other issues i.e. odour, condition of installation, etc
BH1	Peak	0.0	2.6	17.2	0.0	2.00	50	Monitored for 120 seconds
	Steady	0.0	2.6	17.2	0.0			
BH2	Peak	0.0	5.3	7.0	0.0	1.54	40	Monitored for 120 seconds
	Steady	0.0	5.3	7.0	0.0			
BH3	Peak	0.0	4.6	13.7	0.0	1.54	45	Monitored for 120 seconds
	Steady	0.0	4.6	13.7	0.0			
Ambient		0.0	0.0	20.9	N/A	N/A	N/A	

Notes

Cell is highlighted in the following conditions

- Where Methane exceeds 1% v/v (after BR212)
- Where Carbon Dioxide exceeds 5% v/v (after BR212)

N/A - Not Applicable/ Not Available

ND - Not Determined

NGW - No groundwater encountered

APPENDIX VIII

Laboratory Soil Test Results



LABORATORY REPORT REPORT



4043

Contract Number: PSL17/4821

Report Date: 10 October 2017
Client's Reference: D37124
Client Name: GeoDyne Derby
9 Brunel Parkway
Pride Park
Derby
DE24 8HR

For the attention of: Chris Bowley

Contract Title: Old Main Road, Fleet Hargate
Date Received: 4/10/2017
Date Commenced: 4/10/2017
Date Completed: 10/10/2017

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

A Watkins
(Director)

R Berriman
(Quality Manager)

L Knight
(Senior Technician)

C Marshall
(Laboratory Manager)

A Fry
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
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fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

 UKAS TESTING 4043	 PSL Professional Soils Laboratory	Contract No:
		PSL 17/4821
		Client Ref:
		D37124
Old Main Road, Fleet Hargate		

(BS1377 : PART 2 : 1990)

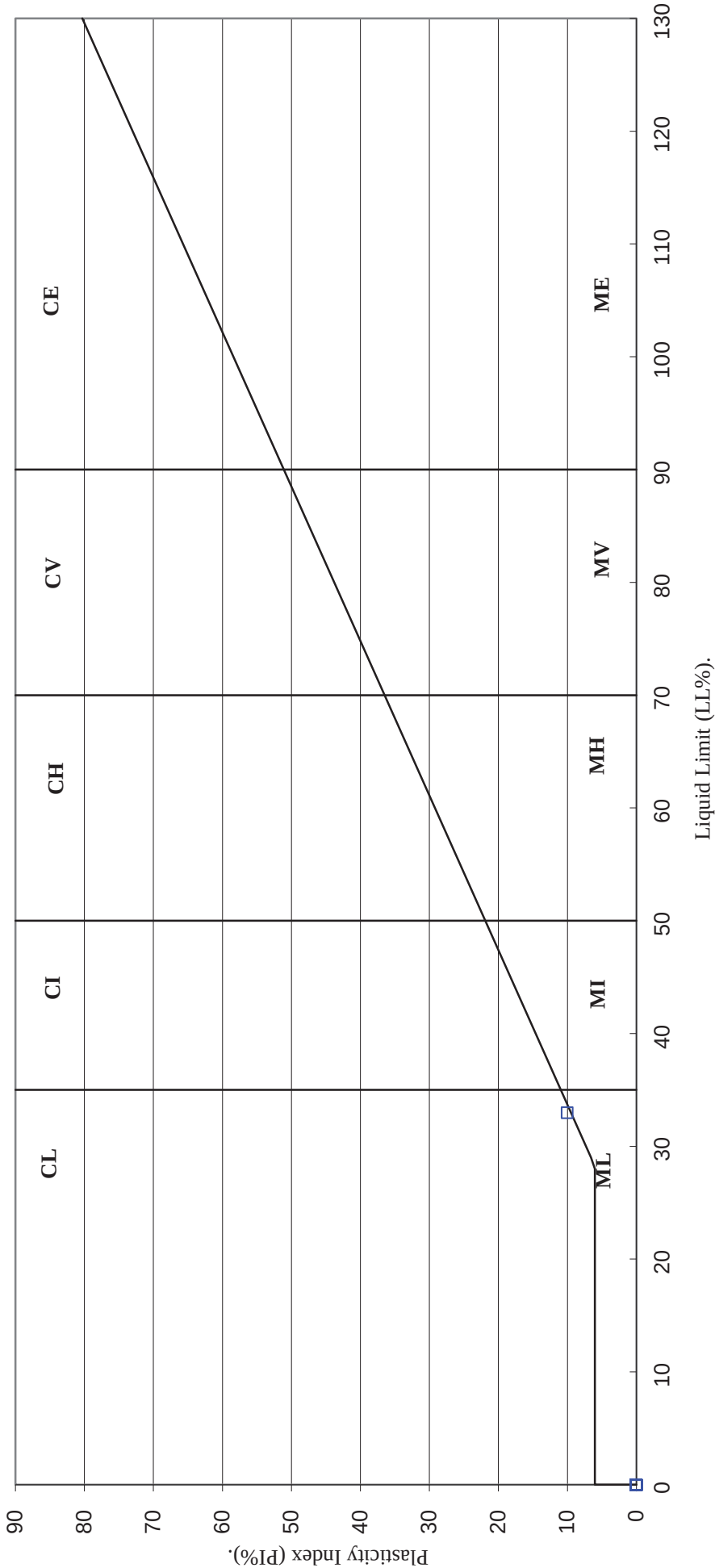
SYMBOLS: NP : Non Plastic

***: Liquid Limit and Plastic Limit Wet Sieved.**

<div> <div>Old Main Road, Fleet Hargate</div> </div>	Contract No:
	PSL17/4821
	Client Ref:
	D37124

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(BS5930 :2015)



Old Main Road, Fleet Hargate		Contract No:
		PSL17/4821
		Client Ref:
		D37124

PARTICLE SIZE DISTRIBUTION TEST

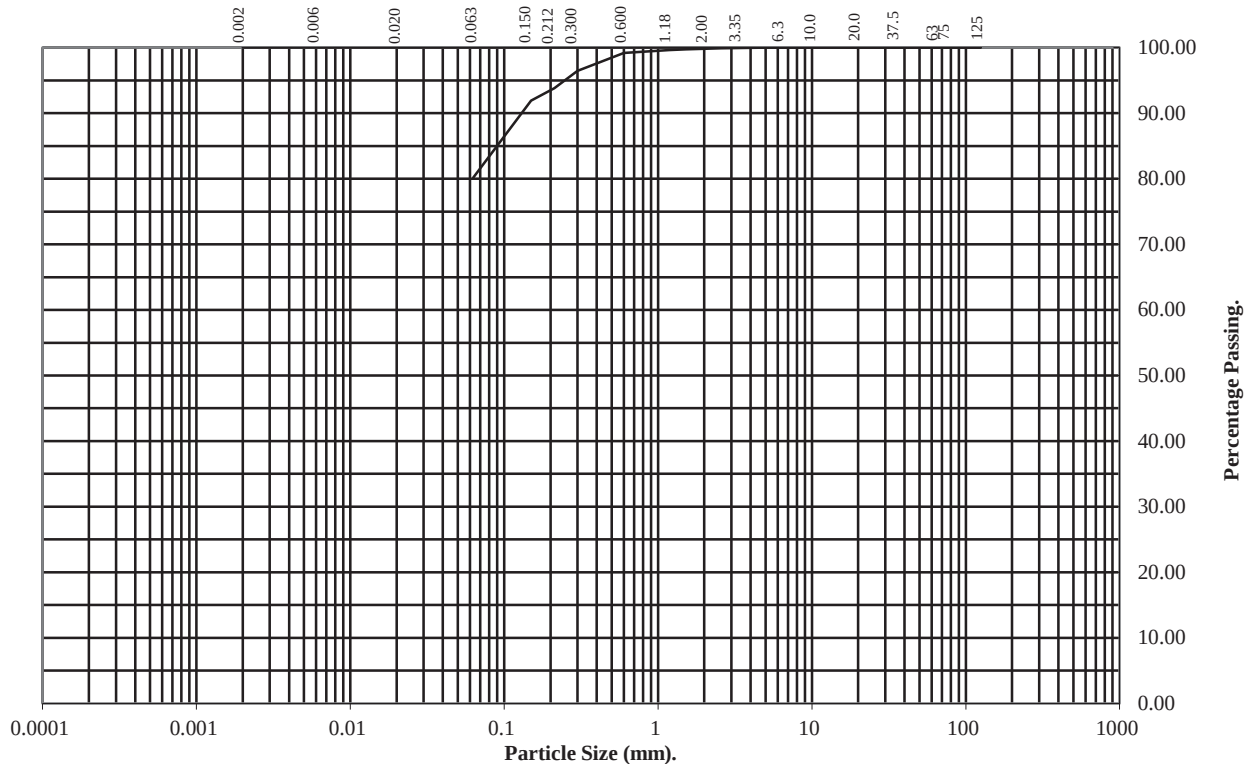
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP3 Top Depth (m): 0.80

Sample Number: 2 Base Depth(m): 1.30

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	99
0.3	96
0.212	94
0.15	92
0.063	80

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	20
Silt/Clay	80

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Old Main Road, Fleet Hargate

Contract No:

PSL17/4821

Client Ref:

D37124

PARTICLE SIZE DISTRIBUTION TEST

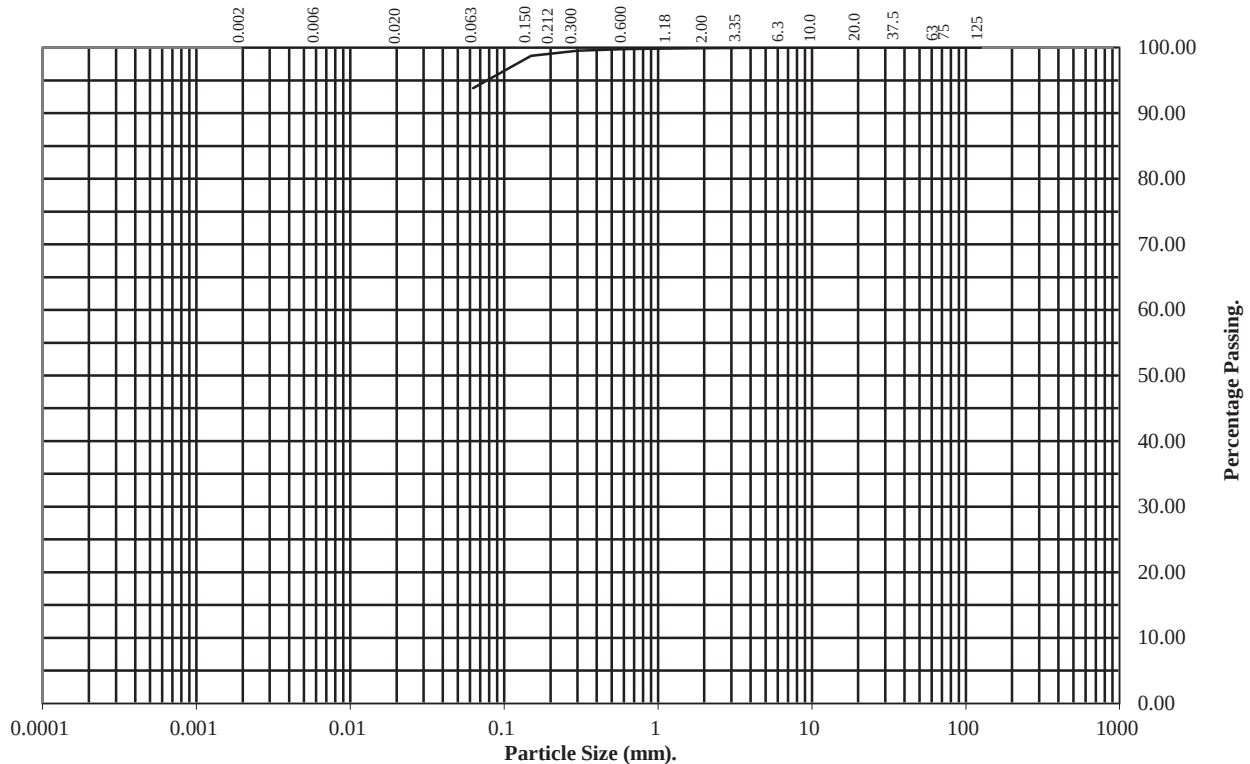
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP4 Top Depth (m): 1.00

Sample Number: 3 Base Depth(m): 1.50

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	100
0.3	100
0.212	99
0.15	99
0.063	94

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	6
Silt/Clay	94

Remarks:

See Summary of Soil Descriptions



Old Main Road, Fleet Hargate

Contract No:

PSL17/4821

Client Ref:

D37124

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 17/06758
Issue Number: 1

Date: 11 October, 2017

Client: GeoDyne (Derby)
9 Brunel Parkway
Pride Park
Derby
Derbyshire
UK
DE24 8HR

Project Manager: Chris Bowley
Project Name: Old Main Road, Fleet Hargate
Project Ref: D37124
Order No: D37124
Date Samples Received: 03/10/17
Date Instructions Received: 04/10/17
Date Analysis Completed: 11/10/17

Prepared by:

A stylized, pixelated signature of Richard Wong.

Richard Wong
Client Manager

Approved by:

A handwritten signature of Georgia King.

Georgia King
Admins & Client Services Supervisor



Envirolab Job Number: 17/06758

Client Project Name: Old Main Road, Fleet Hargate

Client Project Ref: D37124

Lab Sample ID	17/06758/3	17/06758/4	17/06758/6	17/06758/7	17/06758/10	17/06758/11			Units	Method ref
Client Sample No	T3	T4	T6	T7	T10	T11				
Client Sample ID	TP2	TP2	TP3	TP4	TP5	TP7				
Depth to Top	0.10	1.60	0.60	0.10	0.90	0.20				
Depth To Bottom										
Date Sampled	20-Sep-17	20-Sep-17	20-Sep-17	20-Sep-17	27-Sep-17	27-Sep-17				
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D				
Sample Matrix Code	6E	5	5	6E	5	6E				
% Stones >10mm _A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			% w/w	A-T-044
pH _D ^{M#}	7.32	8.66	8.61	7.27	8.57	7.57			pH	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	-	<0.01	<0.01	-	<0.01	-			g/l	A-T-026s
Total Organic Carbon _D ^{M#}	1.64	-	0.49	1.30	0.27	1.38			% w/w	A-T-032s
Arsenic _D ^{M#}	3	-	2	5	4	4			mg/kg	A-T-024s
Cadmium _D ^{M#}	<0.5	-	<0.5	<0.5	<0.5	<0.5			mg/kg	A-T-024s
Copper _D ^{M#}	18	-	5	13	3	24			mg/kg	A-T-024s
Chromium _D ^{M#}	15	-	16	14	12	15			mg/kg	A-T-024s
Chromium (hexavalent) _D	<1	-	<1	<1	<1	<1			mg/kg	A-T-040s
Chromium (trivalent)	15	-	16	14	12	15			mg/kg	Calc
Lead _D ^{M#}	42	-	13	38	10	55			mg/kg	A-T-024s
Mercury _D	<0.17	-	<0.17	<0.17	<0.17	0.24			mg/kg	A-T-024s
Nickel _D ^{M#}	14	-	14	13	12	14			mg/kg	A-T-024s
Selenium _D ^{M#}	2	-	<1	2	1	2			mg/kg	A-T-024s
Zinc _D ^{M#}	63	-	34	48	28	66			mg/kg	A-T-024s

Envirolab Job Number: 17/06758

Client Project Name: Old Main Road, Fleet Hargate

Client Project Ref: D37124

Lab Sample ID	17/06758/3	17/06758/4	17/06758/6	17/06758/7	17/06758/10	17/06758/11			Units	Method ref
Client Sample No	T3	T4	T6	T7	T10	T11				
Client Sample ID	TP2	TP2	TP3	TP4	TP5	TP7				
Depth to Top	0.10	1.60	0.60	0.10	0.90	0.20				
Depth To Bottom										
Date Sampled	20-Sep-17	20-Sep-17	20-Sep-17	20-Sep-17	27-Sep-17	27-Sep-17				
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D				
Sample Matrix Code	6E	5	5	6E	5	6E				
PAH 16										
Acenaphthene _A ^{M#}	<0.1	-	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-019s
Acenaphthylene _A ^{M#}	<0.1	-	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-019s
Anthracene _A ^{M#}	<0.1	-	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.1	-	<0.1	<0.1	<0.1	0.4			mg/kg	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.1	-	<0.1	0.1	<0.1	0.4			mg/kg	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.3	-	<0.1	0.1	<0.1	0.4			mg/kg	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.1	-	<0.1	<0.1	<0.1	0.2			mg/kg	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.1	-	<0.1	<0.1	<0.1	0.1			mg/kg	A-T-019s
Chrysene _A ^{M#}	0.1	-	<0.1	0.1	<0.1	0.4			mg/kg	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.1	-	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-019s
Fluoranthene _A ^{M#}	0.3	-	<0.1	0.3	<0.1	0.5			mg/kg	A-T-019s
Fluorene _A ^{M#}	<0.1	-	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.1	-	<0.1	<0.1	<0.1	0.2			mg/kg	A-T-019s
Naphthalene _A ^{M#}	<0.1	-	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-019s
Phenanthrene _A ^{M#}	<0.1	-	<0.1	<0.1	<0.1	0.2			mg/kg	A-T-019s
Pyrene _A ^{M#}	0.3	-	<0.1	0.1	<0.1	0.5			mg/kg	A-T-019s
PAH (total 16) _A ^{M#}	1.6	-	<0.1	1.3	<0.1	3.4			mg/kg	A-T-019s

REPORT NOTES

General:

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Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure and there is insufficient sample to repeat the analysis. These are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

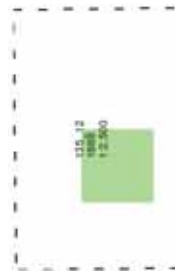
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

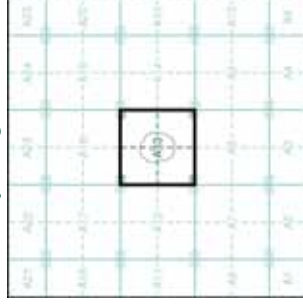
APPENDIX IX
Historical Plans

The historical maps shown were reproduced from maps predominantly held at a 1:2,500 scale, adopted for England, Wales and Scotland in the 1840s. The 1:2,500 scale maps were produced by the Ordnance Survey, which was created in 1841. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

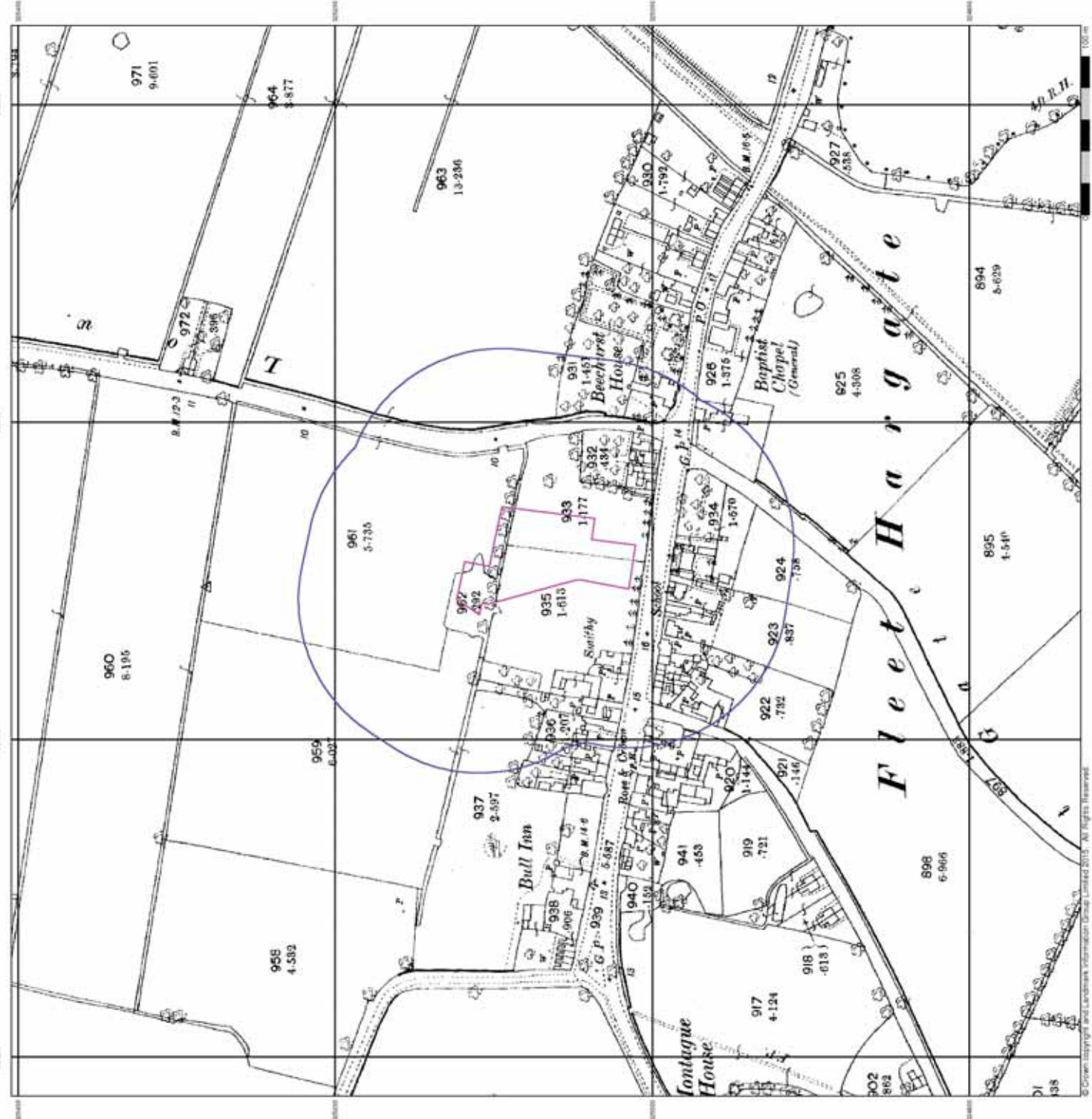


Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 100

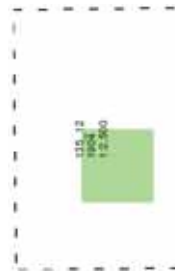
Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

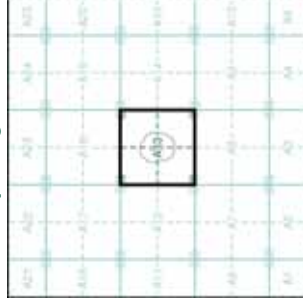


The historical maps shown were reproduced from maps predominantly held at the Ordnance Survey, which were adopted for England, Wales and Scotland in the 1840s. In 1854 the Ordnance Survey was created by an Act of Parliament and the maps were then transferred to the Ordnance Survey. The published date given below is often some years later than the surveyed date. Before 1938 all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

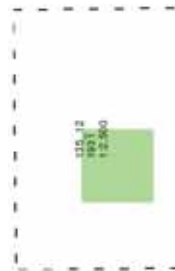
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Customer Ref: D37124
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Slice: A
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Search Buffer (m): 100

Site Details

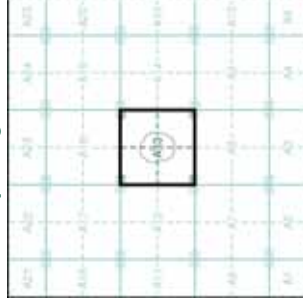
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

The historical maps shown were reproduced from maps predominantly held at the Ordnance Survey, which were adopted for England, Wales and Scotland in the 1840s. In 1854 the Ordnance Survey was created by an Act of Parliament and the maps were then transferred to the Ordnance Survey. The published date given below is often some years later than the surveyed date. Before 1938 all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

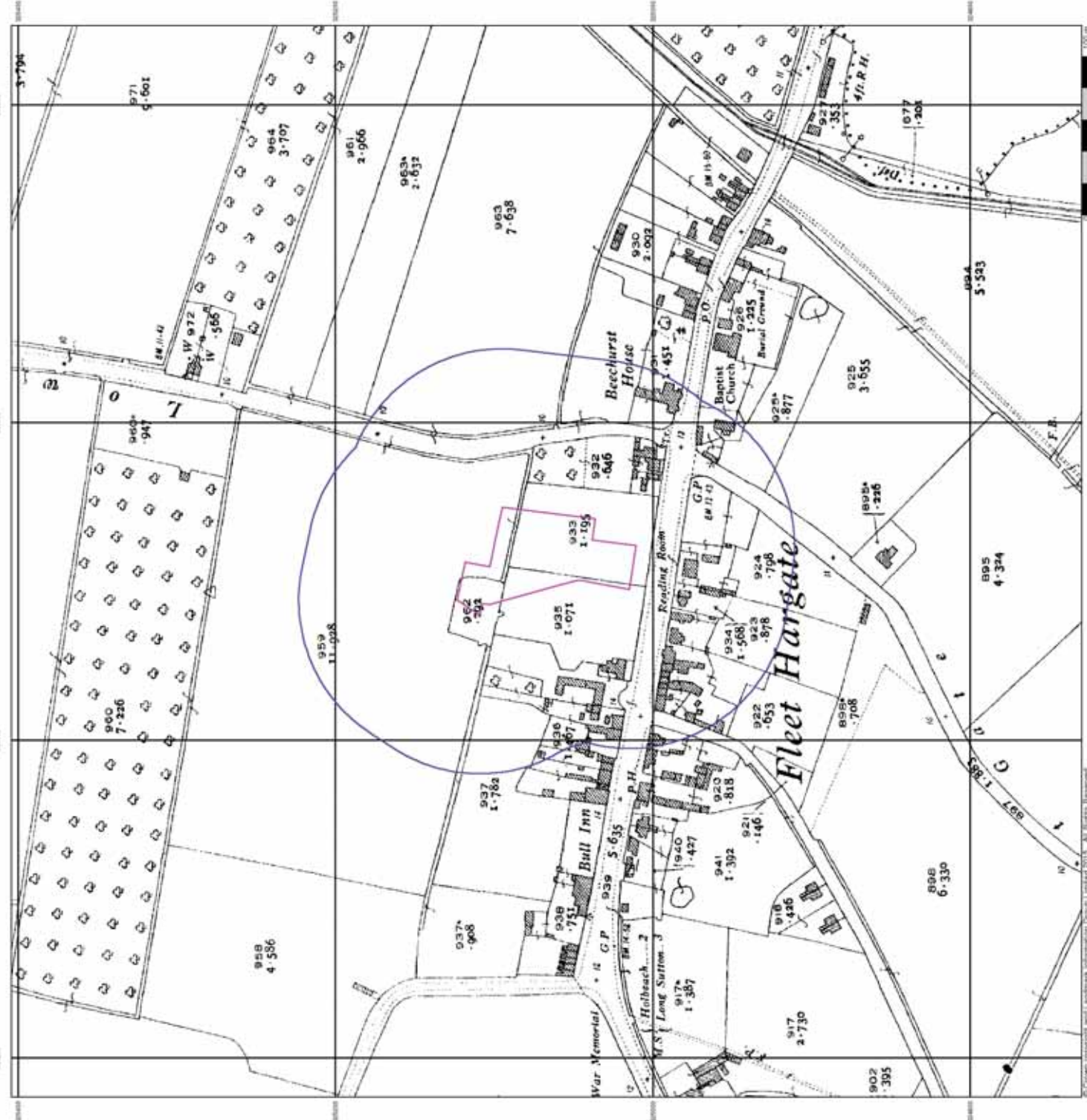


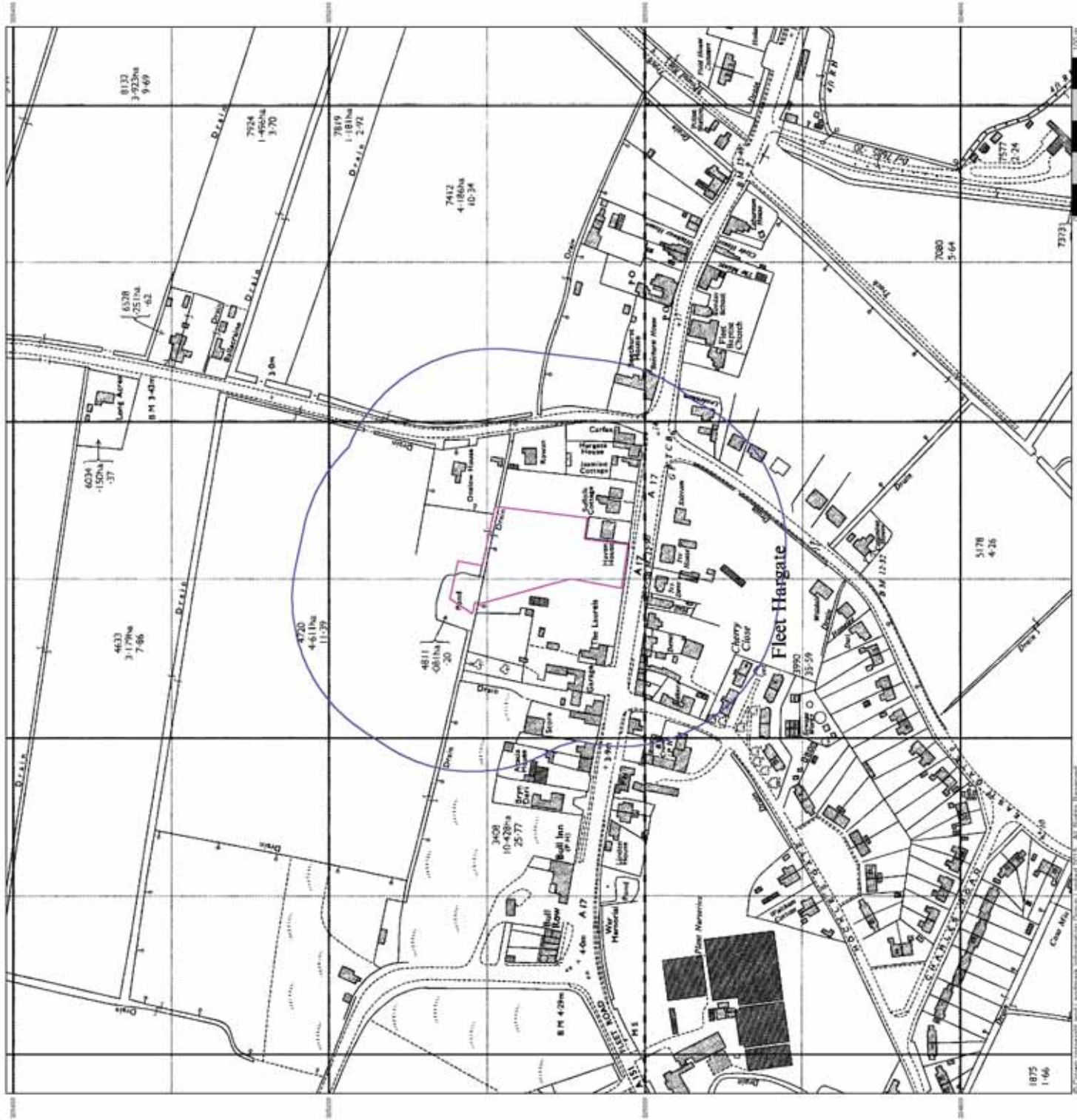
Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 100

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ







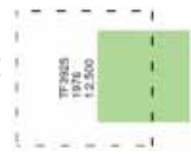
Supply of Unpublished Survey Information

Published 1976

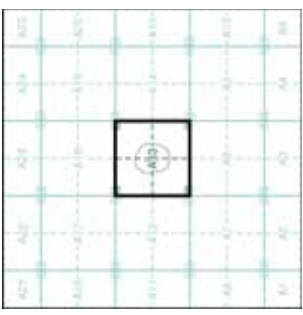
Source map scale - 1:2,500

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a 'work-in-progress' plan as they showed updates of individual areas in a map. These maps were unpublished and therefore do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 100

Site Details

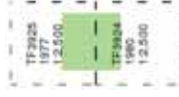
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



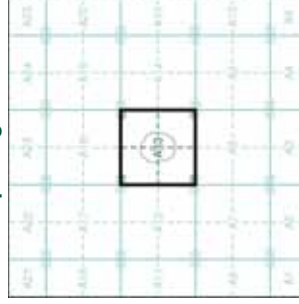
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further minor editions of mapping which were produced and published in 1977. The SIM cards contain information on buildings, roads and land use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13

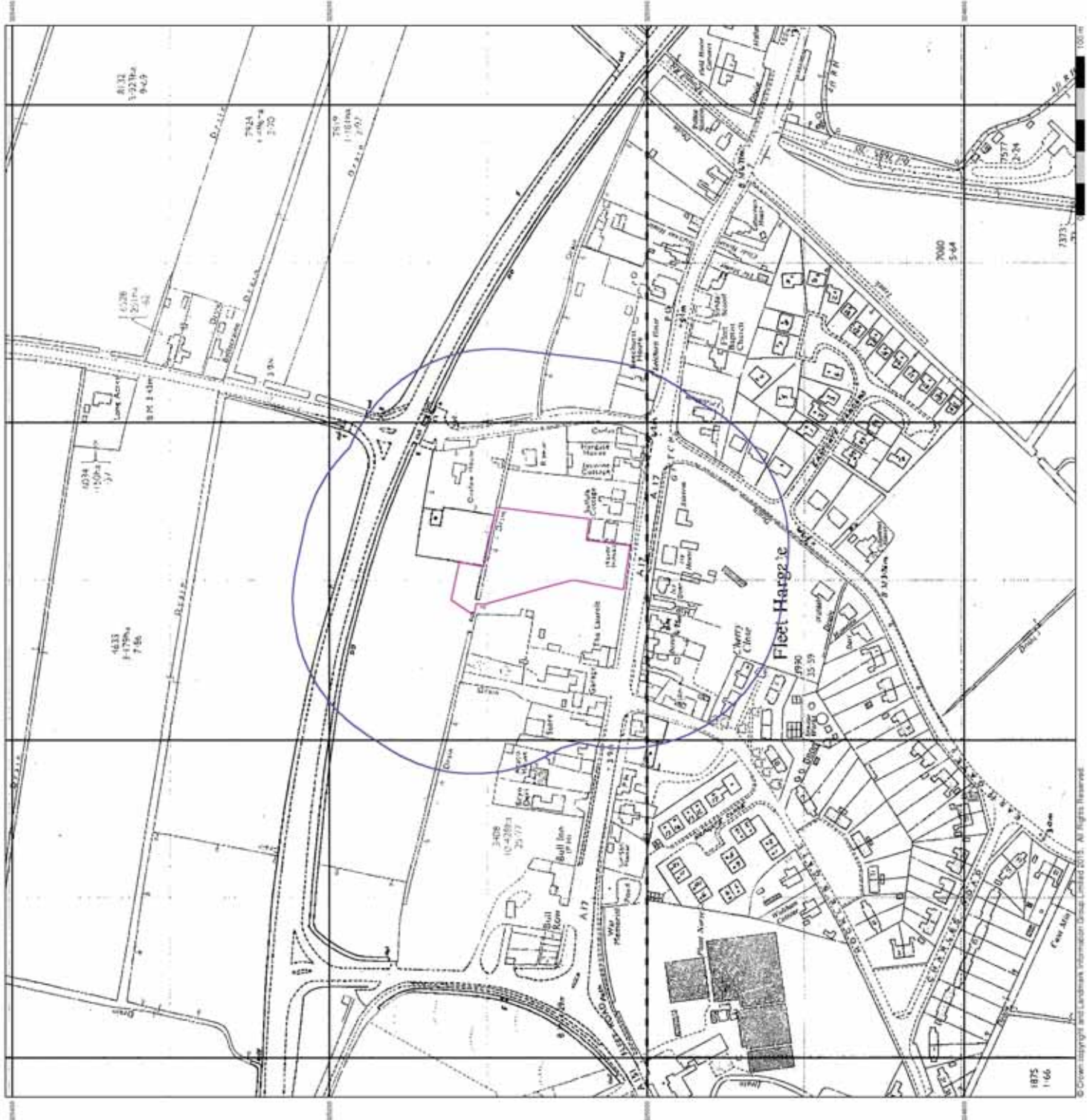


Order Details

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 National Grid Reference: 539510, 325070
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Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ





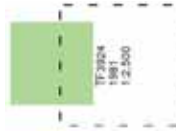
Additional SIMs

Published 1981

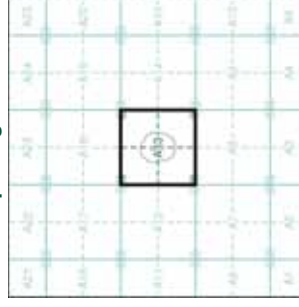
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are for editorial use only. They were produced and published in 1981, based on the main edition of the Survey of Information on Microfilm from 1947 to 1994, and contain detailed information on buildings, roads and land use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 100

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



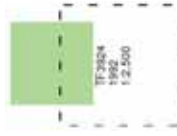
Additional SIMs

Published 1992

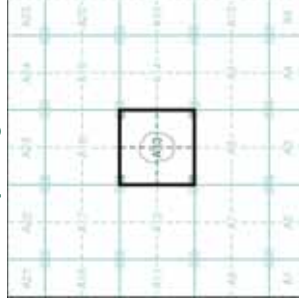
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are for other minor editions of mapping which were produced and published in between the main editions of the Survey of Information on Microfilm from 1947 to 1994, and contain detailed information on buildings, roads and land use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 100

Site Details

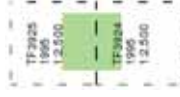
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



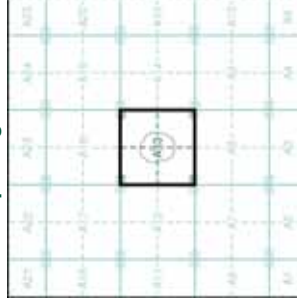
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Large Scale National Grid Data superseded SIM cards (Ordnance Survey's Survey Information on Microfilm) in 1992, and continued to be produced until 1999. These maps were produced from aerial photography and provide detailed information on houses and other built features, but less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 100

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



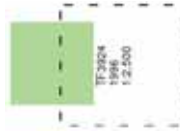
Large-Scale National Grid Data

Published 1996

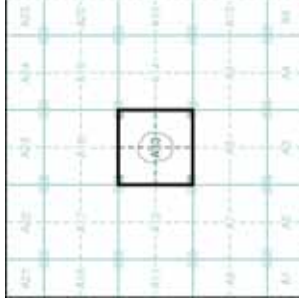
Source map scale - 1:2,500

Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's Survey of Information on Microfilm) in 1992, and continued to be produced until 1999. These maps were the original digital mapping at a scale of 1:2,500. They provide detailed information on houses and roads, but lack the less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 100

Site Details

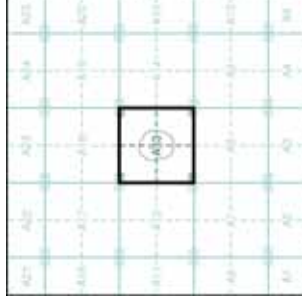
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Historical Aerial Photography - Segment A13



Order Details

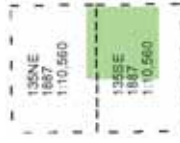
Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 100

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

The historical maps shown were reproduced from maps predominantly held at 1:25,000 scale adopted for England, Wales and Scotland in the 1840's. In 1854, Ordnance Survey maps were published at 1:50,000 scale. These maps are used to update the 1:10,560 maps. The published data is then the data often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

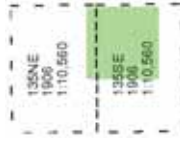
Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

The historical maps shown were reproduced from maps predominantly held at 1:25,000 scale adopted for England, Wales and Scotland in the 1840's. In 1854 the Ordnance Survey published the first 1:25,000 scale maps. These maps are used to update the 1:10,560 maps. The published data is then then the maps are often some years later than the surveyed data. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys in a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

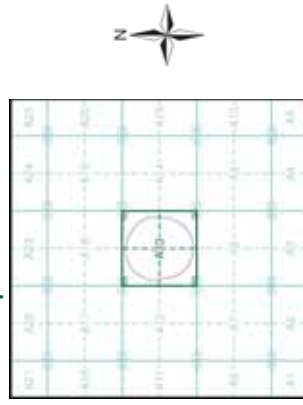
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

The historical maps shown were reproduced from maps predominantly held at 1:25,000 adopted for England, Wales and Scotland in the 1840's. In 1854 the Ordnance Survey (OS) introduced the 1:50,000 scale maps. These maps are used to update the 1:10,560 maps. The published data then the maps are often some years later than the surveyed data. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

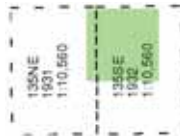
Order Number: 138720587_1_1
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National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

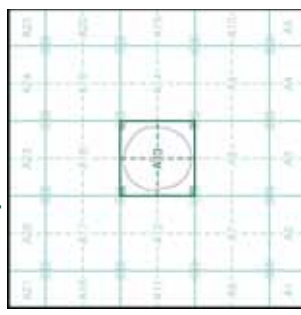
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

The historical maps shown were reproduced from maps predominantly held at 1:2500 adopted for England, Wales and Scotland in the 1840's. In 1854 the Ordnance Survey published the first 1:2500 map. These maps are used to update the 1:10,560 maps. The published data from the maps are often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

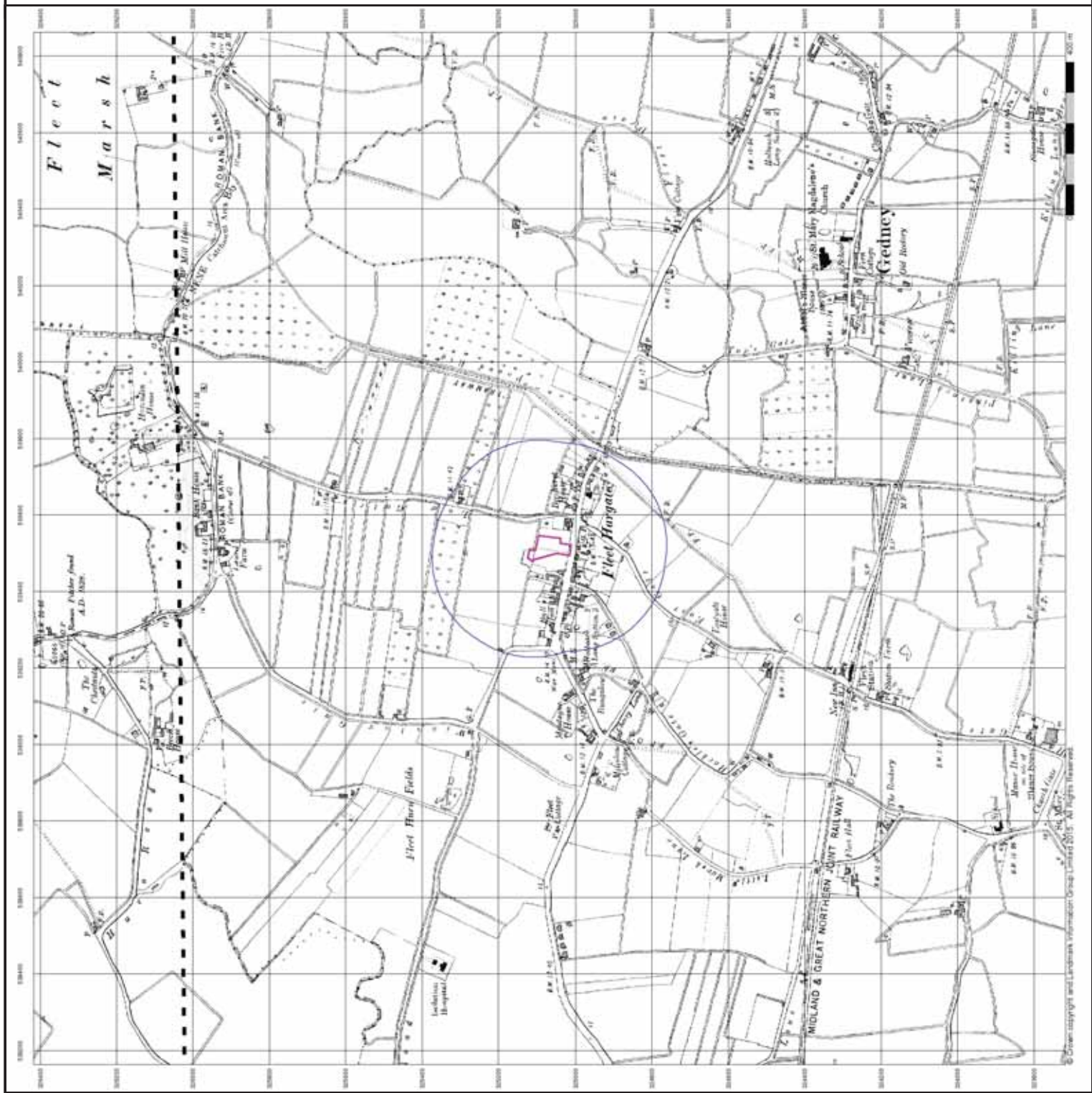


Order Details

Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



135NE
1931
1:10.560

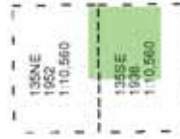
Order Details

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Customer Ref:	D37124
National Grid Reference:	539510, 325070
Slice:	A
Site Area (Ha):	0.43
Search Buffer (m):	250

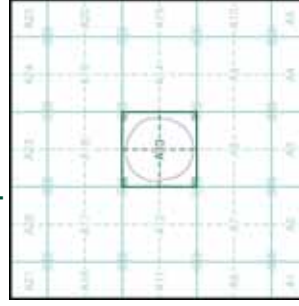
Site Details
Old Main Road, Fleet Hargate, Holbeach, Spalding, PE12 8LJ

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1640's, in 1854 the 1:250,000 scale was employed for mapping urban areas, these maps were often used to update the 1:50,000 maps. The first historical maps that were created to update the 1:50,000 maps were those published before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in rallying areas. In the late 1940's, a Provisional Edition of the Ordnance Survey maps was produced from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1970, the first 1:100,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Details

Order Number:	138720587_1_1
Customer Ref:	D37124
National Grid Reference:	539510, 325070
Slice:	A
Site Area (Ha):	0.43
Search Buffer (m):	250

Site Details

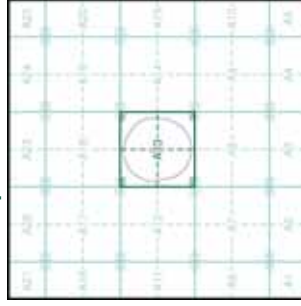
Site Details
Old Main Road, Fleet Hargate, Holbeach, Spalding, PE12 8LJ

The historical maps shown were reproduced from maps predominantly held at 1:25,000 scale adopted for England, Wales and Scotland in the 1840's. In 1854 the Ordnance Survey published the first 1:25,000 scale maps. These maps are used to update the 1:10,560 maps. The published data is then then the maps are often some years later than the surveyed data. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys in outlying county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
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Site Details

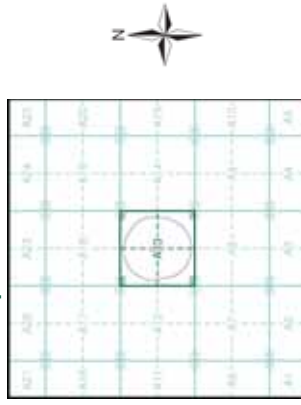
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

The historical maps shown were reproduced from maps predominantly held at 1:25,000 scale for England, Wales and Scotland in the 1840's. In 1854 the Ordnance Survey adopted the Transverse Mercator Projection. The maps are used to update the 1:10,000 maps. The published data is then the maps often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys in a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

TF32NE	1956	1:10,560
TF42NW	1956	1:10,560
TF32SE	1959	1:10,560
TF42SW	1959	1:10,560

Historical Map - Slice A

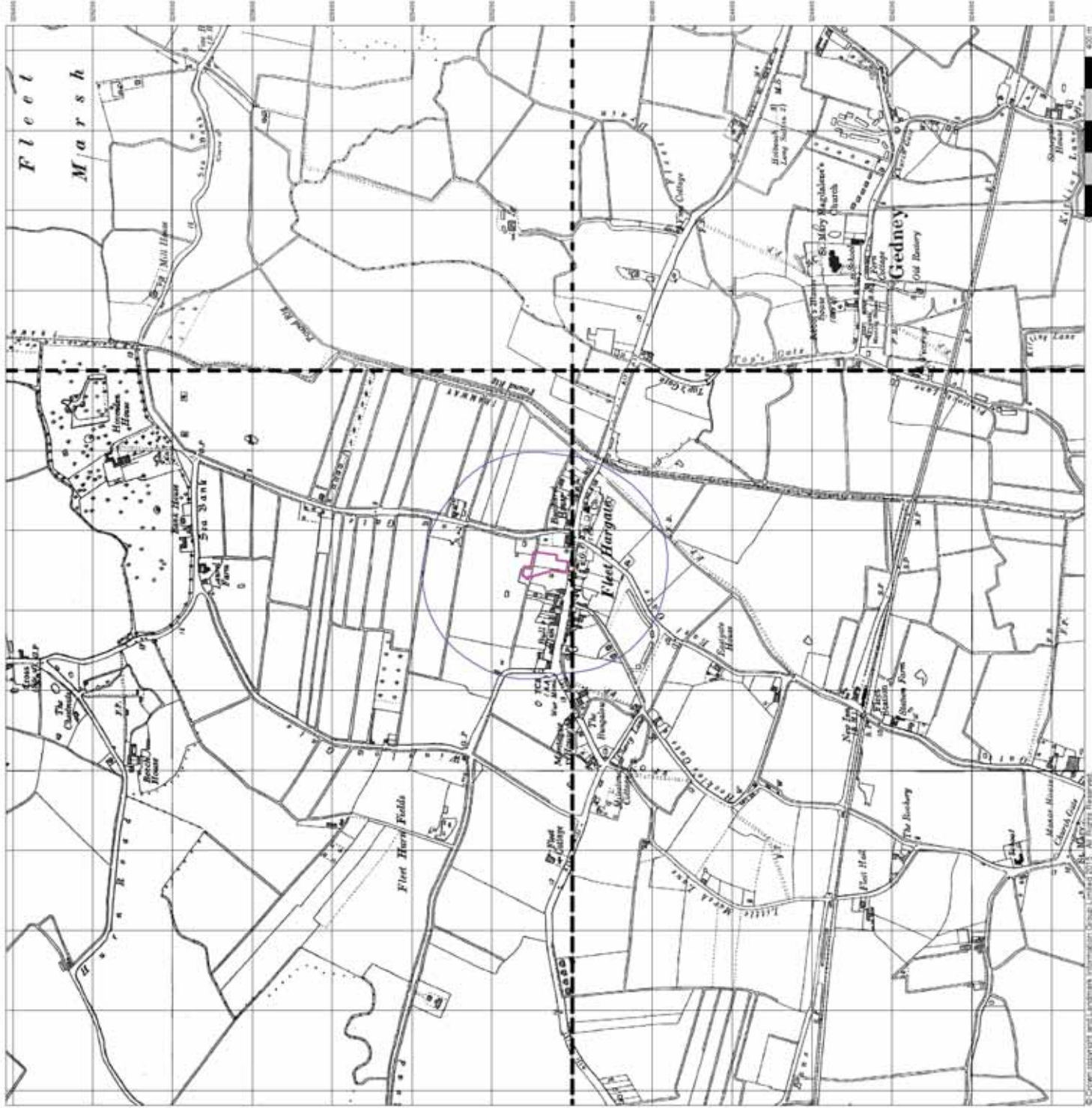


Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



GeoDyne

Ordnance Survey Plan

Published 1970 - 1978

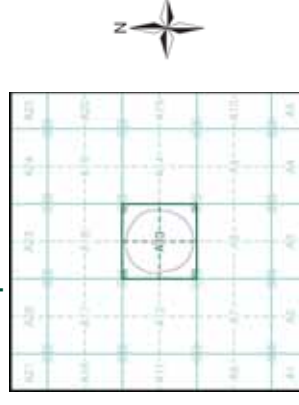
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at 1:25,000 scale adopted for England, Wales and Scotland in the 1840's. In 1854 the Ordnance Survey introduced the 1:10,000 scale maps. These maps are used to update the 1:10,000 maps. The published data is then the data of the year or years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

TF32NE	TF42NW
1977	1978
1:10,000	1:10,000
TF32SE	TF42SW
1970	1975
1:10,000	1:10,000

Historical Map - Slice A



Order Details

Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

Landmark
INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

GeoDyne

Ordnance Survey Plan

Published 1991 - 1992

Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the time adopted for England, Wales and Scotland in the 1840's. In 1854 a 1:2500 scale map was produced for the Ordnance Survey. These maps are used to update the 1:10,000 maps. The published data is then the result of some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

GeoDyne

10k Raster Mapping

Published 2000

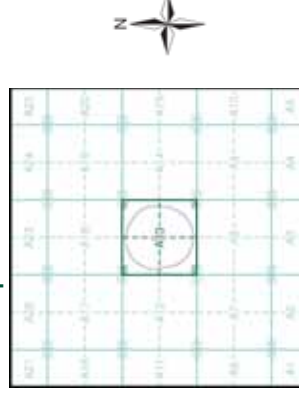
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster map. These maps are updated from the data which was used to produce the 1:10,000 maps in 1970. The data is highly detailed showing buildings, roads, and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

TF32NE	TF42NW
2000	2000
1:10,000	1:10,000
TF32SE	TF42SW
2000	2000
1:10,000	1:10,000

Historical Map - Slice A



Order Details

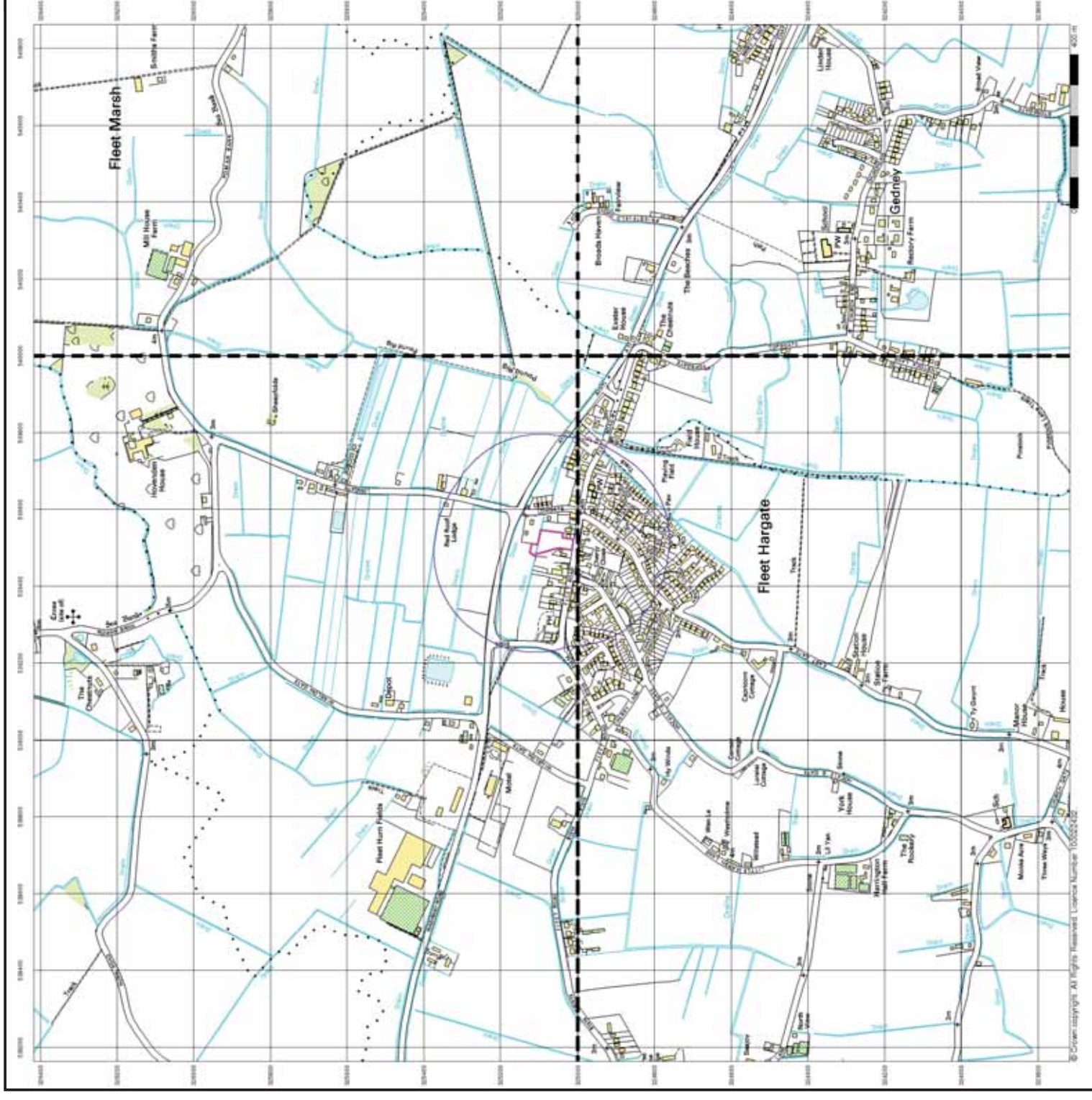
Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



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 Fax: 0844 844 9951
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GeoDyne

10k Raster Mapping

Published 2006

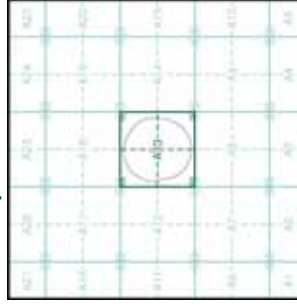
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster map. These maps are based on data from the 1970s and 1980s. The maps are published at a scale of 1:10,000. The data is highly detailed showing buildings, roads, and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

TF32NE	TF42NW
2006	2006
1:10,000	1:10,000
TF32SE	TF42SW
2006	2006
1:10,000	1:10,000

Historical Map - Slice A



Order Details

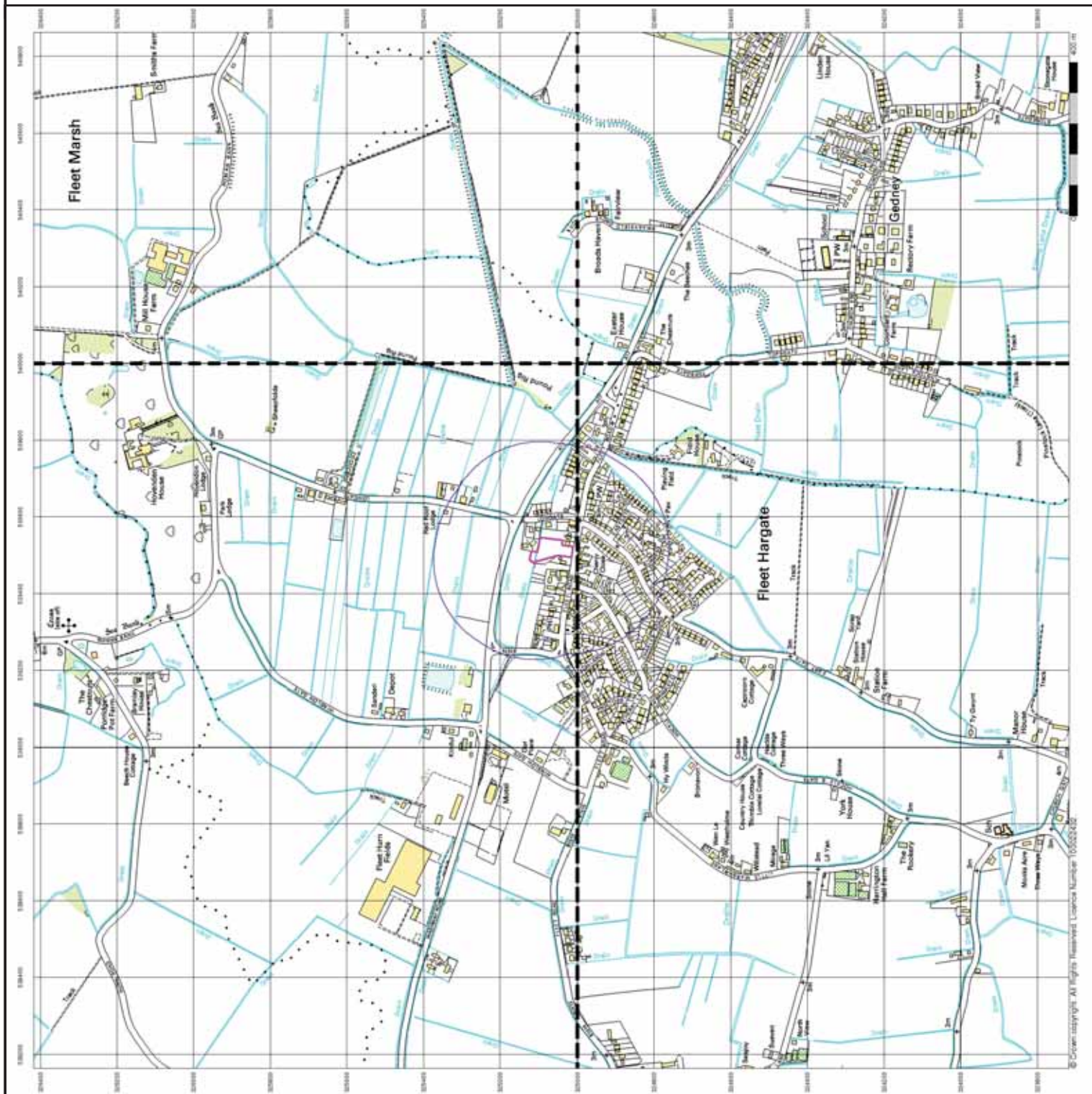
Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



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TF32NE	TF42NW
2017	2017
Variable	Variable
TF32SE	TF42SW
2017	2017
Variable	Variable

Order Details

Order Number:	138720587_1_1
Customer Ref:	D37124
National Grid Reference:	539510, 325070
Slice:	A
Site Area (Ha):	0.43
Search Buffer (m):	250

Site Details
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

APPENDIX X

Landmark Envirocheck Report

Envirocheck[®] Report:

Datasheet

Order Details:

Order Number:

138720587_1_1

Customer Reference:

D37124

National Grid Reference:

539510, 325070

Slice:

A

Site Area (Ha):

0.43

Search Buffer (m):

250

Site Details:

Old Main Road

Fleet Hargate

Holbeach

SPALDING

PE12 8LJ

Client Details:

Mr R Spencer

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Unit 2.2 Clarendon House

Clarendon Business Park

Clumber Avenue

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NG5 1AH

Report Section	Page Number
Summary	-
Agency & Hydrological	1
Waste	5
Hazardous Substances	-
Geological	6
Industrial Land Use	8
Sensitive Land Use	-
Data Currency	9
Data Suppliers	13
Useful Contacts	14

Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination. For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.

In the attached datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

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Radon Potential dataset Copyright Notice

Information supplied from a joint dataset compiled by The British Geological Survey and Public Health England.

Report Version v53.0

Data Type	Page Number	On Site	0 to 250m (*up to 1000m)
Agency & Hydrological			
BGS Groundwater Flooding Susceptibility			
Contaminated Land Register Entries and Notices			
Discharge Consents	pg 1		2
Prosecutions Relating to Controlled Waters			n/a
Enforcement and Prohibition Notices			
Integrated Pollution Controls			
Integrated Pollution Prevention And Control			
Local Authority Integrated Pollution Prevention And Control			
Local Authority Pollution Prevention and Controls			
Local Authority Pollution Prevention and Control Enforcements			
Nearest Surface Water Feature	pg 1	Yes	
Pollution Incidents to Controlled Waters			
Prosecutions Relating to Authorised Processes			
Registered Radioactive Substances			
River Quality			
River Quality Biology Sampling Points			
River Quality Chemistry Sampling Points			
Substantiated Pollution Incident Register			
Water Abstractions			
Water Industry Act Referrals			
Groundwater Vulnerability	pg 1	Yes	n/a
Drift Deposits			n/a
Bedrock Aquifer Designations	pg 1	Yes	n/a
Superficial Aquifer Designations	pg 1	Yes	n/a
Source Protection Zones			
Extreme Flooding from Rivers or Sea without Defences	pg 1	Yes	Yes
Flooding from Rivers or Sea without Defences	pg 2	Yes	Yes
Areas Benefiting from Flood Defences			
Flood Water Storage Areas			
Flood Defences			
OS Water Network Lines	pg 2	1	17

Data Type	Page Number	On Site	0 to 250m (*up to 1000m)
Waste			
BGS Recorded Landfill Sites			
Historical Landfill Sites			
Integrated Pollution Control Registered Waste Sites			
Licensed Waste Management Facilities (Landfill Boundaries)			
Licensed Waste Management Facilities (Locations)			
Local Authority Landfill Coverage	pg 5	2	n/a
Local Authority Recorded Landfill Sites			
Potentially Infilled Land (Non-Water)			
Potentially Infilled Land (Water)	pg 5		1
Registered Landfill Sites			
Registered Waste Transfer Sites			
Registered Waste Treatment or Disposal Sites			
Hazardous Substances			
Control of Major Accident Hazards Sites (COMAH)			
Explosive Sites			
Notification of Installations Handling Hazardous Substances (NIHHS)			
Planning Hazardous Substance Consents			
Planning Hazardous Substance Enforcements			

Data Type	Page Number	On Site	0 to 250m (*up to 1000m)
Geological			
BGS 1:625,000 Solid Geology	pg 6	Yes	n/a
BGS Estimated Soil Chemistry	pg 6	Yes	
BGS Recorded Mineral Sites			
BGS Urban Soil Chemistry			
BGS Urban Soil Chemistry Averages			
CBSCB Compensation District			n/a
Coal Mining Affected Areas			n/a
Mining Instability			n/a
Man-Made Mining Cavities			
Natural Cavities			
Non Coal Mining Areas of Great Britain			
Potential for Collapsible Ground Stability Hazards			
Potential for Compressible Ground Stability Hazards	pg 6	Yes	Yes
Potential for Ground Dissolution Stability Hazards			
Potential for Landslide Ground Stability Hazards	pg 6	Yes	Yes
Potential for Running Sand Ground Stability Hazards	pg 6	Yes	Yes
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 6	Yes	Yes
Radon Potential - Radon Affected Areas			n/a
Radon Potential - Radon Protection Measures			n/a
Industrial Land Use			
Contemporary Trade Directory Entries	pg 8		1
Fuel Station Entries			
Points of Interest - Commercial Services	pg 8		1
Points of Interest - Education and Health			
Points of Interest - Manufacturing and Production			
Points of Interest - Public Infrastructure			
Points of Interest - Recreational and Environmental			
Gas Pipelines			
Underground Electrical Cables			

Data Type	Page Number	On Site	0 to 250m (*up to 1000m)
Sensitive Land Use			
Ancient Woodland			
Areas of Adopted Green Belt			
Areas of Unadopted Green Belt			
Areas of Outstanding Natural Beauty			
Environmentally Sensitive Areas			
Forest Parks			
Local Nature Reserves			
Marine Nature Reserves			
National Nature Reserves			
National Parks			
Nitrate Sensitive Areas			
Nitrate Vulnerable Zones			
Ramsar Sites			
Sites of Special Scientific Interest			
Special Areas of Conservation			
Special Protection Areas			
World Heritage Sites			

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	Discharge Consents Operator: The Secretary Property Type: Domestic Property (Multiple) Location: Lowgate Houses Holbeach, Spalding, Lincs, Pe12 8lj Authority: Environment Agency, Anglian Region Catchment Area: Not Supplied Reference: Pr5lf3289 Permit Version: 1 Effective Date: 22nd December 1975 Issued Date: 22nd December 1975 Revocation Date: 1st October 1996 Discharge Type: Unknown Discharge: Onto Land Environment: Receiving Water: Land Status: Pre National Rivers Authority Legislation where issue date < 01/09/1989 Positional Accuracy: Located by supplier to within 10m	A13NE (E)	74	2	539620 325100
2	Discharge Consents Operator: Mr G J Dudley Property Type: Domestic Property (Single) Location: Fairhaven Old Main Road, Holbeach, Spalding, Lincs, Pe12 8ll Authority: Environment Agency, Anglian Region Catchment Area: Not Supplied Reference: Prnlf02011 Permit Version: 1 Effective Date: 8th December 1989 Issued Date: 8th December 1989 Revocation Date: 16th July 1997 Discharge Type: Unknown Discharge: Onto Land Environment: Receiving Water: Land Status: Post National Rivers Authority Legislation where issue date > 31/08/1989 Positional Accuracy: Located by supplier to within 10m	A13SE (SE)	121	2	539620 324940
	Nearest Surface Water Feature	A13NE (N)	0	-	539517 325101
	Groundwater Vulnerability Soil Classification: Not classified Map Sheet: Sheet 24 North Northamptonshire Scale: 1:100,000	A13NW (SE)	0	2	539510 325068
	Drift Deposits None				
	Bedrock Aquifer Designations Aquifer Designation: Unproductive Strata	A13NW (SE)	0	1	539510 325068
	Superficial Aquifer Designations Aquifer Designation: Unproductive Strata	A13NW (SE)	0	1	539510 325068
	Extreme Flooding from Rivers or Sea without Defences Type: Extent of Extreme Flooding from Rivers or Sea without Defences Flood Plain Type: Tidal Models Boundary Accuracy: As Supplied	A13NW (SE)	0	2	539510 325068
	Extreme Flooding from Rivers or Sea without Defences Type: Extent of Extreme Flooding from Rivers or Sea without Defences Flood Plain Type: Fluvial/Tidal Models Boundary Accuracy: As Supplied	A13NE (NE)	42	2	539585 325110
	Extreme Flooding from Rivers or Sea without Defences Type: Extent of Extreme Flooding from Rivers or Sea without Defences Flood Plain Type: Fluvial/Tidal Models Boundary Accuracy: As Supplied	A13NW (NW)	59	2	539420 325110
	Extreme Flooding from Rivers or Sea without Defences Type: Extent of Extreme Flooding from Rivers or Sea without Defences Flood Plain Type: Fluvial/Tidal Models Boundary Accuracy: As Supplied	A13NE (N)	72	2	539550 325180
	Extreme Flooding from Rivers or Sea without Defences Type: Extent of Extreme Flooding from Rivers or Sea without Defences Flood Plain Type: Fluvial/Tidal Models Boundary Accuracy: As Supplied	A13SE (SE)	155	2	539650 324920

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Extreme Flooding from Rivers or Sea without Defences Type: Extent of Extreme Flooding from Rivers or Sea without Defences Flood Plain Type: Tidal Models Boundary Accuracy: As Supplied	A13NW (N)	177	2	539510 325300
	Flooding from Rivers or Sea without Defences Type: Extent of Flooding from Rivers or Sea without Defences Flood Plain Type: Tidal Models Boundary Accuracy: As Supplied	A13NW (SE)	0	2	539510 325068
	Flooding from Rivers or Sea without Defences Type: Extent of Flooding from Rivers or Sea without Defences Flood Plain Type: Tidal Models Boundary Accuracy: As Supplied	A13SW (S)	65	2	539510 324946
	Flooding from Rivers or Sea without Defences Type: Extent of Flooding from Rivers or Sea without Defences Flood Plain Type: Fluvial/Tidal Models Boundary Accuracy: As Supplied	A13SE (SE)	209	2	539685 324880
	Areas Benefiting from Flood Defences None				
	Flood Water Storage Areas None				
	Flood Defences None				
3	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 103.0 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13NE (N)	0	3	539517 325102
4	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 176.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13NW (NW)	12	3	539468 325113
5	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 364.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13NE (N)	53	3	539543 325163
6	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 5.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 0	A13NE (NE)	71	3	539598 325143
7	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 274.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13NE (NE)	75	3	539607 325138
8	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 33.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13SE (E)	96	3	539639 325065

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
9	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 47.9 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13NE (NE)	102	3	539607 325176
10	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 465.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13NE (NE)	112	3	539596 325194
11	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 36.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13SE (E)	130	3	539672 325054
12	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 22.9 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 0	A13NE (NE)	154	3	539621 325229
13	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 88.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13SE (E)	171	3	539712 325044
14	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 441.5 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13NE (NE)	187	3	539628 325264
15	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 44.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13NE (NE)	203	3	539631 325282
16	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 199.5 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13SE (SE)	216	3	539701 324885
17	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 35.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13NE (NE)	216	3	539674 325269

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
18	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 49.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 2	A13NE (NE)	236	3	539638 325317
19	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 164.9 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 0	A13NW (W)	239	3	539240 325112
20	OS Water Network Lines Watercourse Form: Inland river Watercourse Length: 2.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Nene Primacy: 0	A13NE (NE)	250	3	539685 325303

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Local Authority Landfill Coverage Name: South Holland District Council - Has no landfill data to supply		0	5	539510 325068
	Local Authority Landfill Coverage Name: Lincolnshire County Council - Had landfill data but passed it to the relevant environment agency		0	4	539510 325068
21	Potentially Infilled Land (Water) Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1959	A13SW (W)	187	-	539310 324992

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: West Walton Formation, Ampthill Clay Formation And Kimmeridge Clay Formation (Undifferentiated)	A13NW (SE)	0	1	539510 325068
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A13NW (SE)	0	1	539510 325068
	BGS Measured Urban Soil Chemistry No data available				
	BGS Urban Soil Chemistry Averages No data available				
	Coal Mining Affected Areas In an area that might not be affected by coal mining				
	Non Coal Mining Areas of Great Britain No Hazard				
	Potential for Collapsible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SE)	0	1	539510 325068
	Potential for Collapsible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	11	1	539510 325000
	Potential for Compressible Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13NW (SE)	0	1	539510 325068
	Potential for Compressible Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	11	1	539510 325000
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SE)	0	1	539510 325068
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	11	1	539510 325000
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (SE)	0	1	539510 325068
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	11	1	539510 325000
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13NW (SE)	0	1	539510 325068
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	11	1	539510 325000
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (SE)	0	1	539510 325068
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	11	1	539510 325000
	Radon Potential - Radon Affected Areas Affected Area: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Source: British Geological Survey, National Geoscience Information Service	A13NW (SE)	0	1	539510 325068

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13NW (SE)	0	1	539510 325068

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
22	Contemporary Trade Directory Entries Name: Temple Transport Location: Old Main Road, Fleet Hargate, Holbeach, Spalding, Lincolnshire, PE12 8LJ Classification: Road Haulage Services Status: Active Positional Accuracy: Manually positioned to the road within the address or location	A13SW (SW)	13	-	539484 325008
	Contemporary Trade Directory Entries Name: Patriotic Roadways Location: Winslow Gate, Fleet/Holbeach, Spalding, Lincolnshire, PE12 8LS Classification: Road Haulage Services Status: Inactive Positional Accuracy: Manually positioned to the road within the address or location	A17SE (NW)	561	-	539066 325492
	Contemporary Trade Directory Entries Name: Gb Blinds Location: York House, Hocklesgate, Holbeach, Spalding, Lincolnshire, PE12 8NF Classification: Blinds, Awnings & Canopies Status: Inactive Positional Accuracy: Automatically positioned to the address	A7SE (SW)	912	-	538897 324327
	Contemporary Trade Directory Entries Name: Leisure Grow Products Location: Washway Road, Holbeach, Spalding, Lincolnshire, PE12 8LT Classification: Distribution Services Status: Inactive Positional Accuracy: Automatically positioned to the address	A17SW (W)	964	-	538568 325422
23	Points of Interest - Commercial Services Name: Temple Transport Location: Suffolk House, Old Main Road, Holbeach, Spalding, PE12 8LJ Category: Transport, Storage and Delivery Class Code: Distribution and Haulage Positional Accuracy: Positioned to address or location	A13SE (SE)	17	6	539546 325021

Agency & Hydrological	Version	Update Cycle
Contaminated Land Register Entries and Notices South Holland District Council - Environmental Services	October 2013	Annual Rolling Update
Discharge Consents Environment Agency - Anglian Region	July 2017	Quarterly
Enforcement and Prohibition Notices Environment Agency - Anglian Region	March 2013	As notified
Integrated Pollution Controls Environment Agency - Anglian Region	October 2008	Not Applicable
Integrated Pollution Prevention And Control Environment Agency - Anglian Region	July 2017	Quarterly
Local Authority Integrated Pollution Prevention And Control South Holland District Council - Environmental Services	October 2014	Annual Rolling Update
Local Authority Pollution Prevention and Controls South Holland District Council - Environmental Services	October 2014	Annual Rolling Update
Local Authority Pollution Prevention and Control Enforcements South Holland District Council - Environmental Services	October 2014	Annual Rolling Update
Nearest Surface Water Feature Ordnance Survey	May 2017	
Pollution Incidents to Controlled Waters Environment Agency - Anglian Region	September 1999	Not Applicable
Prosecutions Relating to Authorised Processes Environment Agency - Anglian Region	March 2013	As notified
Prosecutions Relating to Controlled Waters Environment Agency - Anglian Region	March 2013	As notified
Registered Radioactive Substances Environment Agency - Anglian Region	January 2015	
River Quality Environment Agency - Head Office	November 2001	Not Applicable
River Quality Biology Sampling Points Environment Agency - Head Office	July 2012	Annually
River Quality Chemistry Sampling Points Environment Agency - Head Office	July 2012	Annually
Substantiated Pollution Incident Register Environment Agency - Anglian Region - Northern Area	July 2017	Quarterly
Water Abstractions Environment Agency - Anglian Region	April 2017	Quarterly
Water Industry Act Referrals Environment Agency - Anglian Region	July 2017	Quarterly
Groundwater Vulnerability Environment Agency - Head Office	April 2015	Not Applicable
Drift Deposits Environment Agency - Head Office	January 1999	Not Applicable
Bedrock Aquifer Designations British Geological Survey - National Geoscience Information Service	August 2015	As notified
Superficial Aquifer Designations British Geological Survey - National Geoscience Information Service	August 2015	As notified
Source Protection Zones Environment Agency - Head Office	July 2017	Quarterly
Extreme Flooding from Rivers or Sea without Defences Environment Agency - Head Office	August 2017	Quarterly

Agency & Hydrological	Version	Update Cycle
Flooding from Rivers or Sea without Defences Environment Agency - Head Office	August 2017	Quarterly
Areas Benefiting from Flood Defences Environment Agency - Head Office	August 2017	Quarterly
Flood Water Storage Areas Environment Agency - Head Office	August 2017	Quarterly
Flood Defences Environment Agency - Head Office	August 2017	Quarterly
OS Water Network Lines Ordnance Survey	April 2017	6 Weekly
Surface Water 1 in 30 year Flood Extent Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 100 year Flood Extent Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 1000 year Flood Extent Environment Agency - Head Office	October 2013	As notified
Surface Water Suitability Environment Agency - Head Office	October 2013	As notified
BGS Groundwater Flooding Susceptibility British Geological Survey - National Geoscience Information Service	May 2013	Annually
Waste	Version	Update Cycle
BGS Recorded Landfill Sites British Geological Survey - National Geoscience Information Service	June 1996	Not Applicable
Historical Landfill Sites Environment Agency - Head Office	May 2017	Quarterly
Integrated Pollution Control Registered Waste Sites Environment Agency - Anglian Region	October 2008	Not Applicable
Licensed Waste Management Facilities (Landfill Boundaries) Environment Agency - Anglian Region - Northern Area	May 2017	Quarterly
Licensed Waste Management Facilities (Locations) Environment Agency - Anglian Region - Northern Area	July 2017	Quarterly
Local Authority Landfill Coverage Lincolnshire County Council South Holland District Council - Environmental Services	May 2000 May 2000	Not Applicable Not Applicable
Local Authority Recorded Landfill Sites Lincolnshire County Council South Holland District Council - Environmental Services	May 2000 May 2000	Not Applicable Not Applicable
Potentially Infilled Land (Non-Water) Landmark Information Group Limited	December 1999	Not Applicable
Potentially Infilled Land (Water) Landmark Information Group Limited	December 1999	Not Applicable
Registered Landfill Sites Environment Agency - Anglian Region - Northern Area	March 2003	Not Applicable
Registered Waste Transfer Sites Environment Agency - Anglian Region - Northern Area	March 2003	Not Applicable
Registered Waste Treatment or Disposal Sites Environment Agency - Anglian Region - Northern Area	March 2003	Not Applicable

Hazardous Substances	Version	Update Cycle
Control of Major Accident Hazards Sites (COMAH) Health and Safety Executive	March 2017	Bi-Annually
Explosive Sites Health and Safety Executive	March 2017	Bi-Annually
Notification of Installations Handling Hazardous Substances (NIHHS) Health and Safety Executive	November 2000	Not Applicable
Planning Hazardous Substance Enforcements South Holland District Council Lincolnshire County Council - Highways and Planning Department	January 2016 June 2010	Annual Rolling Update Annual Rolling Update
Planning Hazardous Substance Consents Lincolnshire County Council - Highways and Planning Department South Holland District Council	August 2007 January 2016	Annual Rolling Update Annual Rolling Update
Geological	Version	Update Cycle
BGS 1:625,000 Solid Geology British Geological Survey - National Geoscience Information Service	January 2009	Not Applicable
BGS Estimated Soil Chemistry British Geological Survey - National Geoscience Information Service	October 2015	As notified
BGS Recorded Mineral Sites British Geological Survey - National Geoscience Information Service	April 2017	Bi-Annually
CBSCB Compensation District Cheshire Brine Subsidence Compensation Board (CBSCB)	August 2011	Not Applicable
Coal Mining Affected Areas The Coal Authority - Property Searches	March 2014	As notified
Mining Instability Ove Arup & Partners	October 2000	Not Applicable
Non Coal Mining Areas of Great Britain British Geological Survey - National Geoscience Information Service	May 2015	Not Applicable
Potential for Collapsible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Potential for Compressible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Potential for Ground Dissolution Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Potential for Landslide Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Potential for Running Sand Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Potential for Shrinking or Swelling Clay Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Radon Potential - Radon Affected Areas British Geological Survey - National Geoscience Information Service	July 2011	As notified
Radon Potential - Radon Protection Measures British Geological Survey - National Geoscience Information Service	July 2011	As notified

Industrial Land Use	Version	Update Cycle
Contemporary Trade Directory Entries Thomson Directories	June 2017	Quarterly
Fuel Station Entries Catalist Ltd - Experian	August 2017	Quarterly
Gas Pipelines National Grid	July 2014	Quarterly
Points of Interest - Commercial Services PointX	December 2016	Quarterly
Points of Interest - Education and Health PointX	September 2017	Quarterly
Points of Interest - Manufacturing and Production PointX	December 2016	Quarterly
Points of Interest - Public Infrastructure PointX	September 2017	Quarterly
Points of Interest - Recreational and Environmental PointX	September 2017	Quarterly
Underground Electrical Cables National Grid	December 2015	Bi-Annually
Sensitive Land Use	Version	Update Cycle
Ancient Woodland Natural England	May 2017	Bi-Annually
Areas of Outstanding Natural Beauty Natural England	August 2017	Bi-Annually
Environmentally Sensitive Areas Natural England	January 2017	Annually
Forest Parks Forestry Commission	April 1997	Not Applicable
Local Nature Reserves Natural England	August 2017	Bi-Annually
Marine Nature Reserves Natural England	August 2017	Bi-Annually
National Nature Reserves Natural England	August 2017	Bi-Annually
National Parks Natural England	August 2017	Bi-Annually
Nitrate Vulnerable Zones Environment Agency - Head Office Department for Environment, Food and Rural Affairs (DEFRA - formerly FRCA)	June 2017 October 2015	Bi-Annually Annually
Ramsar Sites Natural England	August 2017	Bi-Annually
Sites of Special Scientific Interest Natural England	August 2017	Bi-Annually
Special Areas of Conservation Natural England	August 2017	Bi-Annually
Special Protection Areas Natural England	August 2017	Bi-Annually

A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	
Environment Agency	
Scottish Environment Protection Agency	
The Coal Authority	
British Geological Survey	 British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL
Centre for Ecology and Hydrology	 Centre for Ecology & Hydrology NATURAL ENVIRONMENT RESEARCH COUNCIL
Natural Resources Wales	
Scottish Natural Heritage	
Natural England	
Public Health England	
Ove Arup	
Peter Brett Associates	

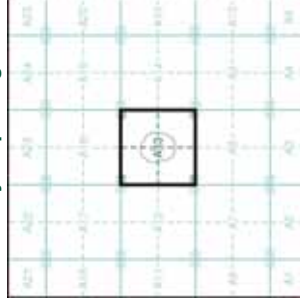
Contact	Name and Address	Contact Details
1	British Geological Survey - Enquiry Service British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
2	Environment Agency - National Customer Contact Centre (NCCC) PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 03708 506 506 Email: enquiries@environment-agency.gov.uk
3	Ordnance Survey Adanac Drive, Southampton, Hampshire, SO16 0AS	Telephone: 023 8079 2000 Email: customerservices@ordnancesurvey.co.uk Website: www.ordnancesurvey.gov.uk
4	Lincolnshire County Council 4th Floor, City Hall, Lincoln, Lincolnshire, LN1 1DN	Telephone: 01522 552222 Fax: 01522 552288 Email: PublicRelations@lincolnshire.gov.uk Website: www.lincolnshire.gov.uk
5	South Holland District Council - Environmental Services Council Offices, Priory Road, Spalding, Lincolnshire, PE11 2XE	Website: www.sholland.gov.uk
6	PointX 7 Abbey Court, Eagle Way, Sowton, Exeter, Devon, EX2 7HY	Website: www.pointx.co.uk
7	Environment Agency - Head Office Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, Avon, BS32 4UD	Telephone: 01454 624400 Fax: 01454 624409
-	Public Health England - Radon Survey, Centre for Radiation, Chemical and Environmental Hazards Chilton, Didcot, Oxfordshire, OX11 0RQ	Telephone: 01235 822622 Fax: 01235 833891 Email: radon@phe.gov.uk Website: www.ukradon.org
-	Landmark Information Group Limited Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

Please note that the Environment Agency / Natural Resources Wales / SEPA have a charging policy in place for enquiries.



- [illegible]

Site Sensitivity Map - Segment A13



Order Details

Order Details

Order Number:	138720587_1_1
Customer Ref:	D37124
National Grid Reference:	539510, 325070
Sllice:	A
Site Area (Ha):	0.43
Plot Buffer (m):	100

Site Details

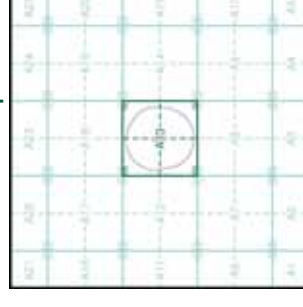
Site Details
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



Site Details

Site Details
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12
8LJ

Industrial Land Use Map - Slice A



Order Details

Order Details

Order Number:	138720587_1_1
Customer Ref:	D37124
National Grid Reference:	539510, 325070
Slice:	A
Site Area (Ha):	0.43
Search Buffer (m):	250

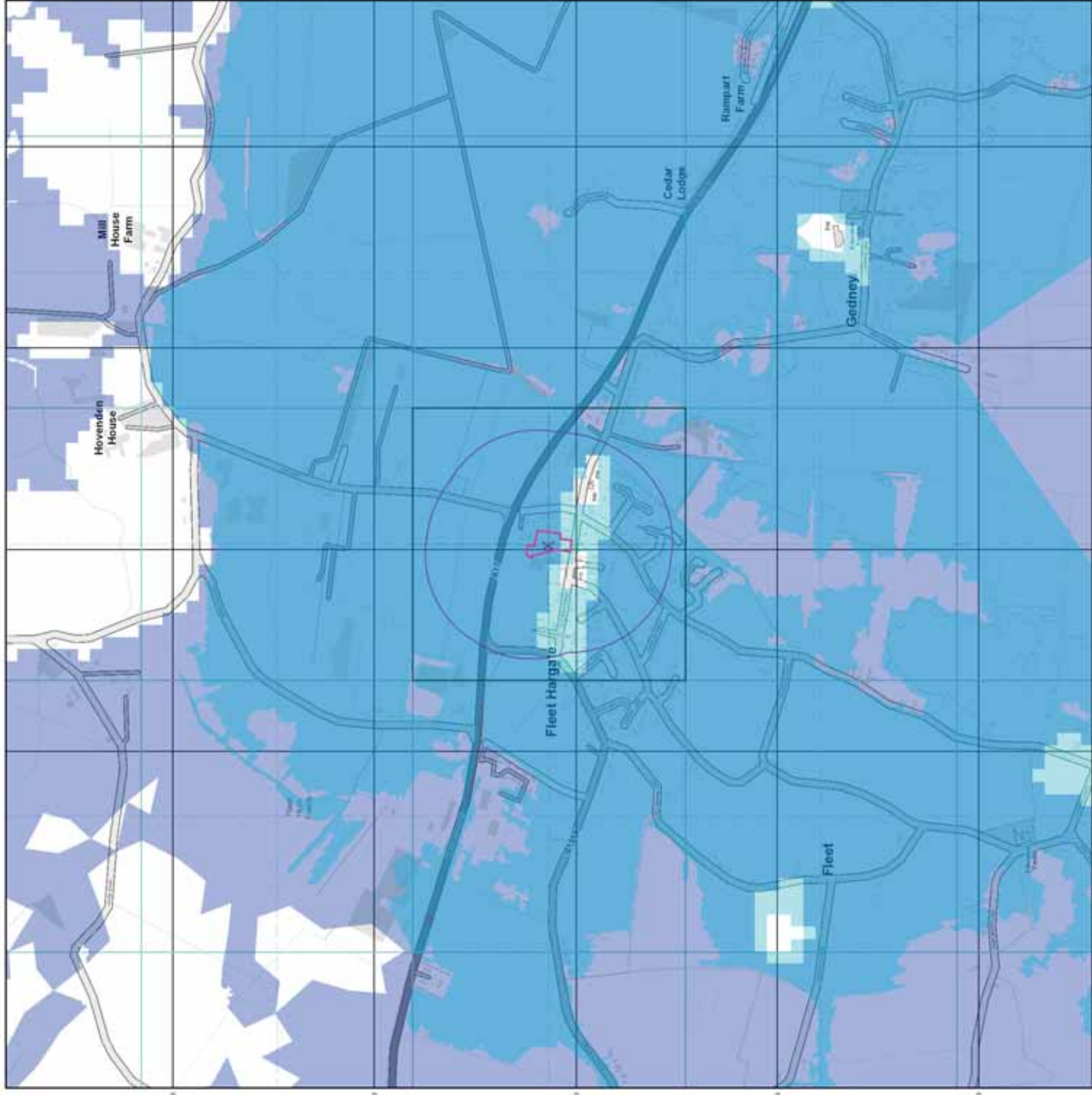
Site Details

Site Details
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

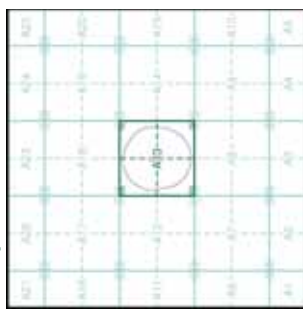
- General**
- Specified Site
 - Specified Buffer (1)
 - Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence



Flood Map - Slice A



Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

- General**
- Specified Site
 - Specified Buffer (1)
 - Bearing Reference Point
 - Map ID
 - General of Type at Location

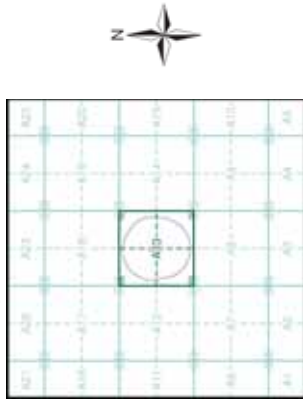
Agency and Hydrological (Boreholes)

- 505 Borehole Depth 0 - 10m
- 505 Borehole Depth 10 - 20m
- 505 Borehole Depth 20m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A



Order Details

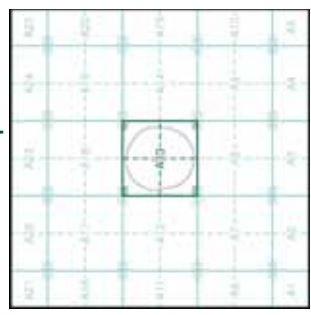
Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

- General**
- Specified Site
 - Specified Buffer(s)
 - X Bearing Reference Point
- OS Water Network Data**
- Canal
 - Reservoir
 - Foreshore
 - Marsh
 - Tidal River
 - Inland River
 - Drain
 - Other
 - Lake
 - Transfer
 - Lock Or Flight Of Locks
 - Sea
- Contours (height in meters)**
- Standard Contour
 - Master Contour
 - Spot Height
 - Mean Low Water
 - Mean High Water

OS Water Network Map - Slice A

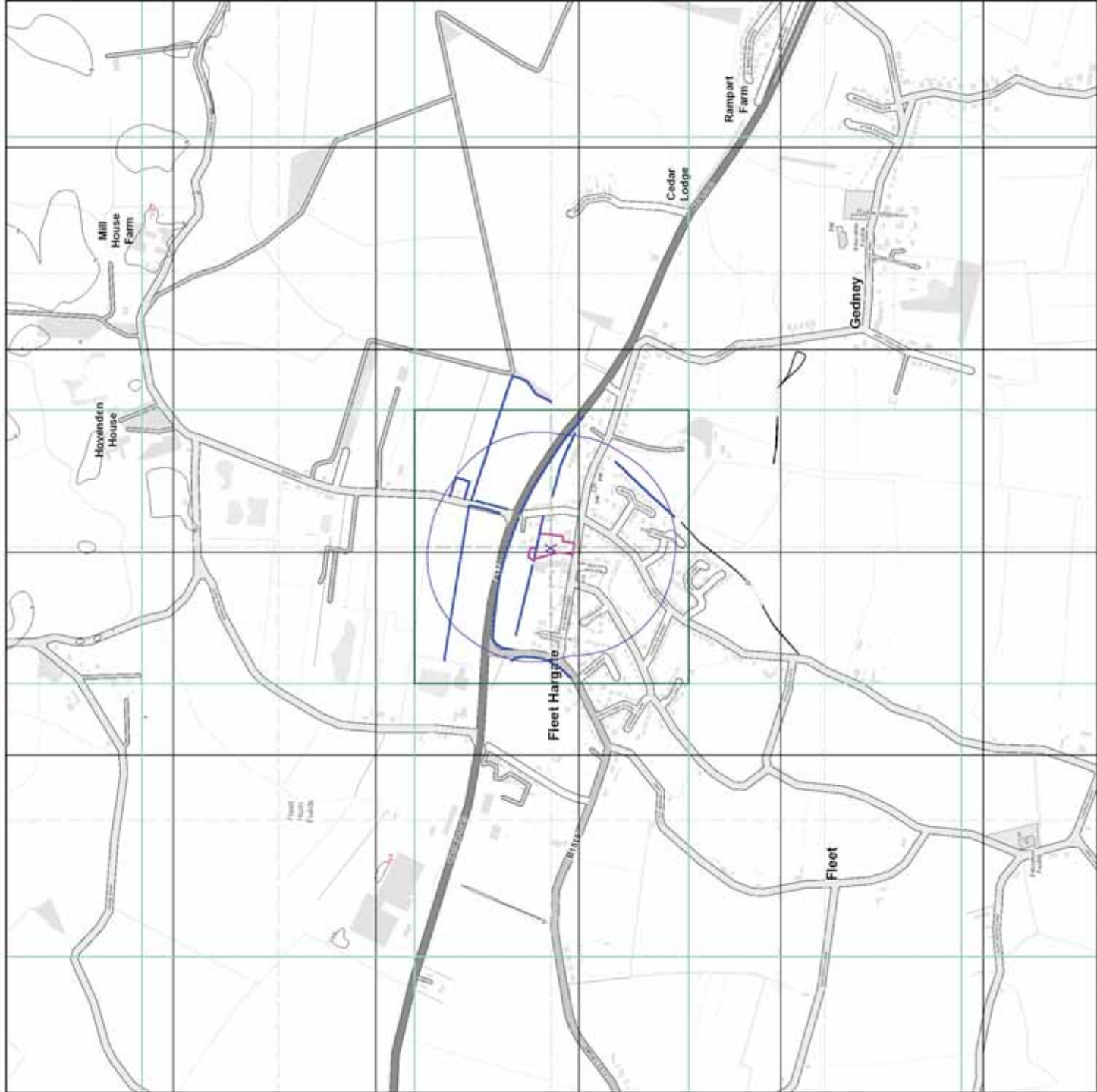


Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



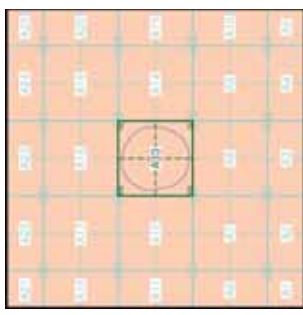
- General**
- Specified Site
 - Specified Surface (1)
 - Flowing Reference Point

Risk of Flooding from Surface Water

- High - 30 Year Return
- Medium - 100 Year Return
- Low - 1000 Year Return

- Suitability**
- See the suitability map below
- National to county
 - County to town
 - Town to street
 - Street to parcel of land
 - Property

EANRW Suitability Map - Slice A

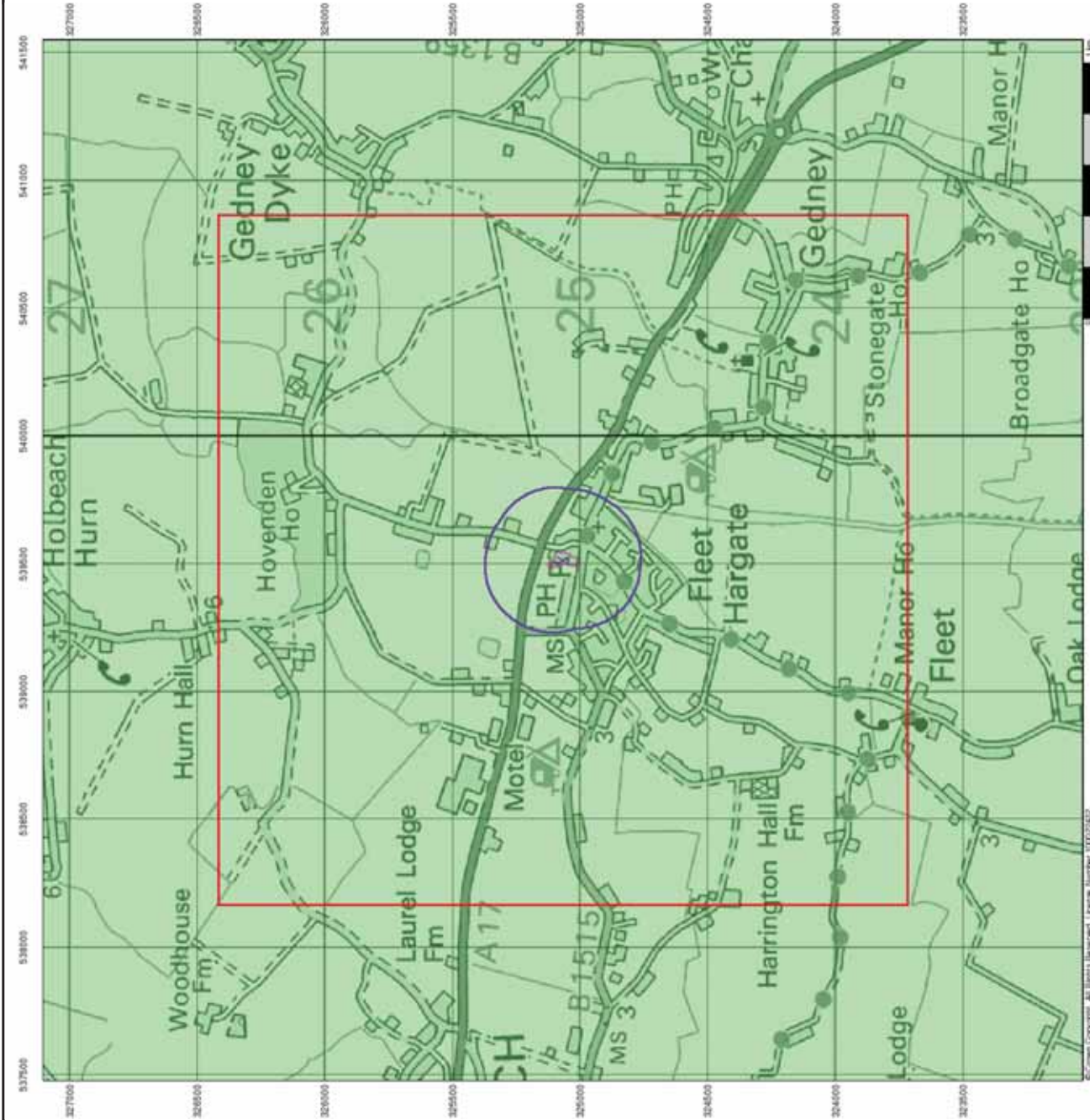


Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



General

- Specified Site
- Specified Buffer(s)
- Map ID
- Bearing Reference Point

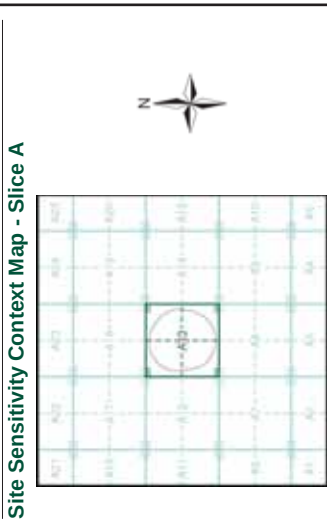
Agency and Hydrological

Geological Classes

- Major Aquifer (Highly Permeable)
- Minor Aquifer (Variably Permeable)
- Non Aquifer (Highly Permeable)
- Water or Sea
- Drift Deposit

Soil Classes

- High (H) 1, 2, 3, U
- Intermediate (I) 1, 2
- Low
- High (H) 1, 2, 3, U
- Intermediate (I) 1, 2
- Low

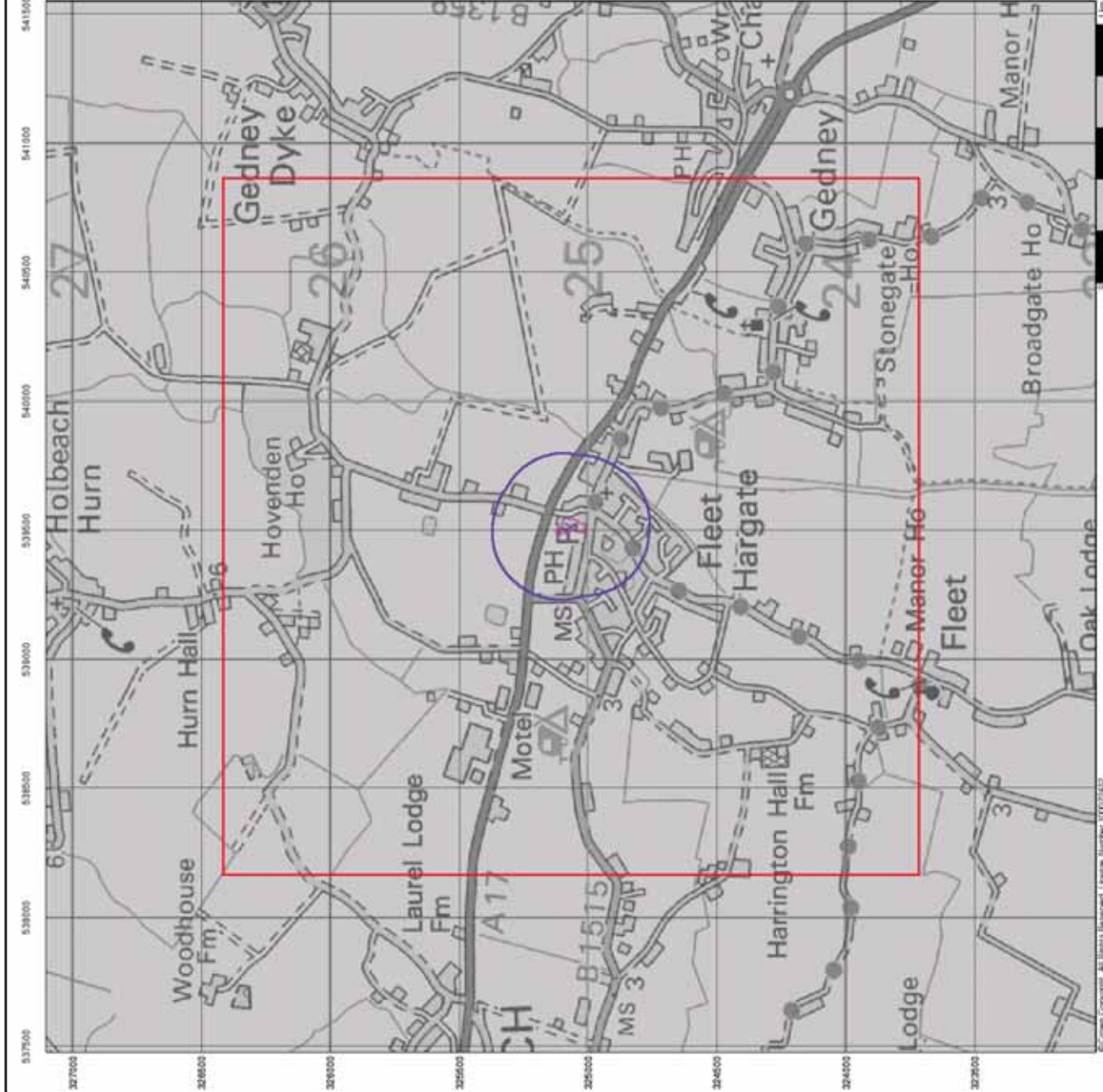


Order Details

Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



 Specified site

 Specified Buffer(s)

 Bearing Reference Point

 Site

 Map ID

Agency and Hydrological

 Principal Aquifer

 Secondary A Aquifer

 Secondary B Aquifer

 Secondary Undifferentiated

 Unproductive Strata

 Unknown

 Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

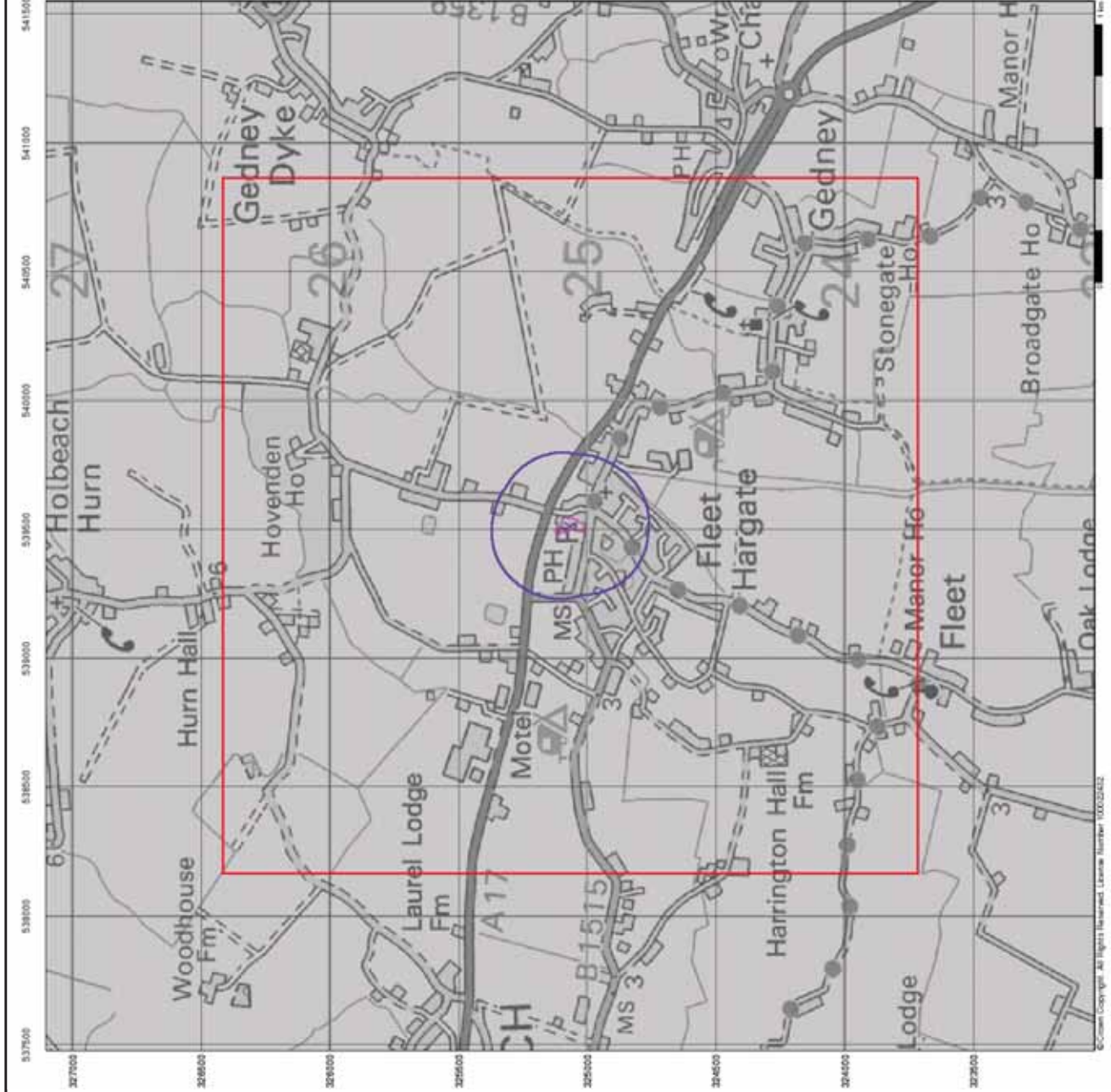
Order Details	
Order Number:	138720587_1_1
Customer Ref:	D37124
National Grid Reference:	539510, 325070
Slice:	A
Site Area (Ha):	0.43
Search Buffer (m):	250
Site Details	
Old Main Road, Fleet Hargate, Holbeach, SP12 8LJ	



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Fax: 0844 844 9951
Web: www.envirocheck.co.uk

A Landmark Information Group Service v15.0 08-Sep-2017

Page 2 of 6



GeoDyne

Superficial Aquifer Designation

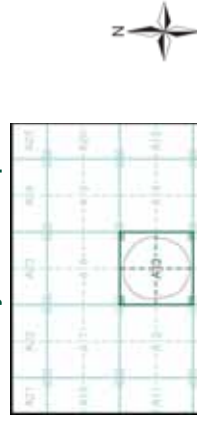
General

- Specified site
- Specified Buffer (m)
- Site
- Map ID
- Beating Reference Point

Geological and Hydrological

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SP12 8LJ

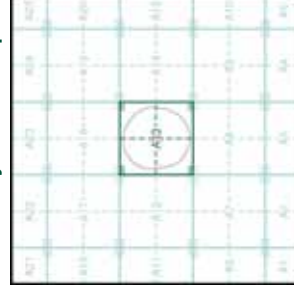


Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Source Protection Zones



Site Sensitivity Context Map - Slice A



Order Details

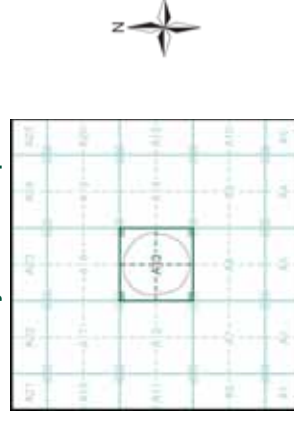
Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SP12 8LJ



Site Sensitivity Context Map - Slice A

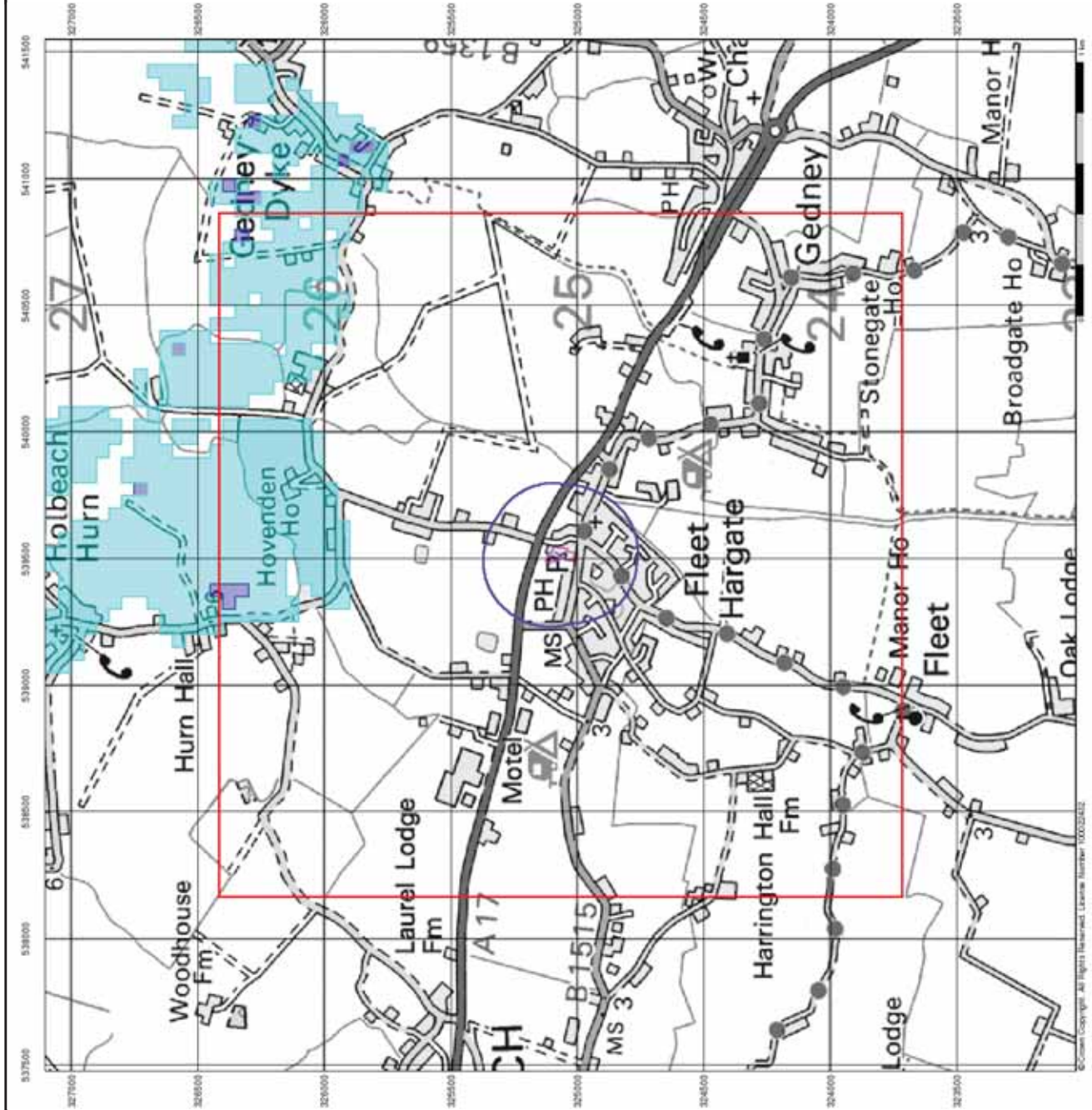


Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SP12 8LJ



GeoDyne
BGS Flood GFS Data

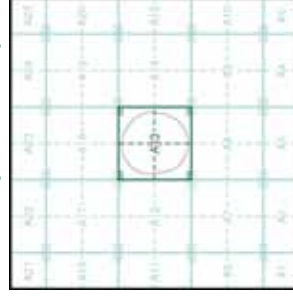
General

- Specified Site
- Specified Buffer(m)
- Specified Reference Point
- Site

Agency and Hydrological (Flood)

- Unlimited Potential for Groundwater Flooding to Occur
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 138720587_1_1
 Customer Ref: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SP12 8LJ



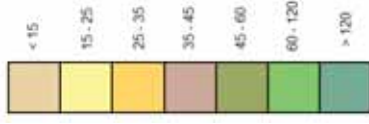
Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk

General

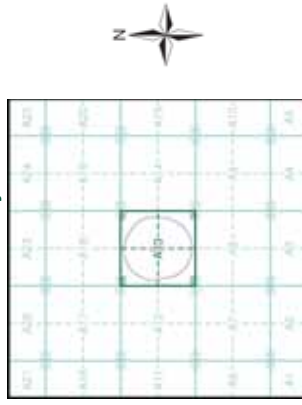
☒ Specified Site ☒ Specified Buffer(s) ☒ Specified Reference Point

Estimated Soil Chemistry Arsenic

Arsenic Concentrations mg/kg



Estimated Soil Chemistry Arsenic - Slice A



Order Details

Order Details: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

General

Specified Site Specified Buffer(s) Existing Reference Point

Estimated Soil Chemistry Cadmium

Cadmium Concentrations mg/kg



Estimated Soil Chemistry Cadmium - Slice A



Order Details

Order Details: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

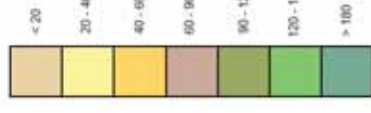
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

General

☒ Specimen Site
☐ Specimen Buffer (C)
☒ Bearing Reference Point

Estimated Soil Chemistry Chromium

Chromium Concentrations mg/kg



Estimated Soil Chemistry Chromium - Slice A



Order Details

Order Details: 138720587_1_1
Customer Ref: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

General

☒ Specified Site

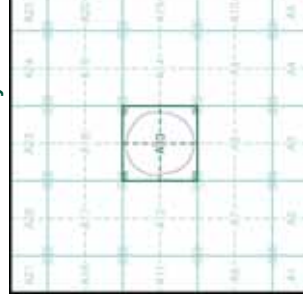
☒ Specified Buffer (m)

Estimated Soil Chemistry Lead

Lead Concentrations mg/kg



Estimated Soil Chemistry Lead - Slice A



Order Details

Order Details:
Customer Ref: 138720587_1_1
National Grid Reference: D37124
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

General

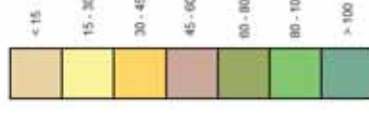
Specimen Site

Specimen Buffer (m)

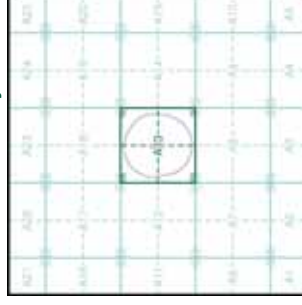
Survey Reference Point

Estimated Soil Chemistry Nickel

Nickel Concentrations mg/kg



Estimated Soil Chemistry Nickel - Slice A



Order Details

Order Details:
138720587_1_1
Customer Ref:
D37124
National Grid Reference: 539510, 325070
Slice:
A
Site Area (Ha):
0.43
Search Buffer (m):
250

Site Details

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Holocene - Holocene

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	TFD	Tidal Flat Deposits	Clay and Silt	Holocene - Holocene

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	AMC	Amphill Clay Formation	Mudstone	Oxfordian - Oxfordian



Geology 1:50,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.

The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	1
Map Sheet No:	144
Map Name:	Spalding
Map Date:	1992
Bedrock Geology:	Available
Superficial Geology:	Available
Artificial Geology:	Available
Faults:	Not Supplied
Landslip:	Not Available
Rock Segments:	Not Supplied

Geology 1:50,000 Maps - Slice A



Order Details:

Order Number: 138720587_1_1
Customer Reference: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details:

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Artificial Ground and Landslip

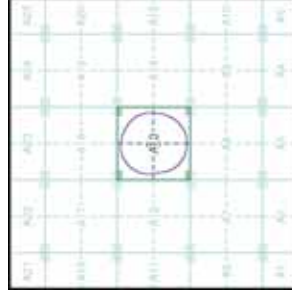
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- In-filled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes founded strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A

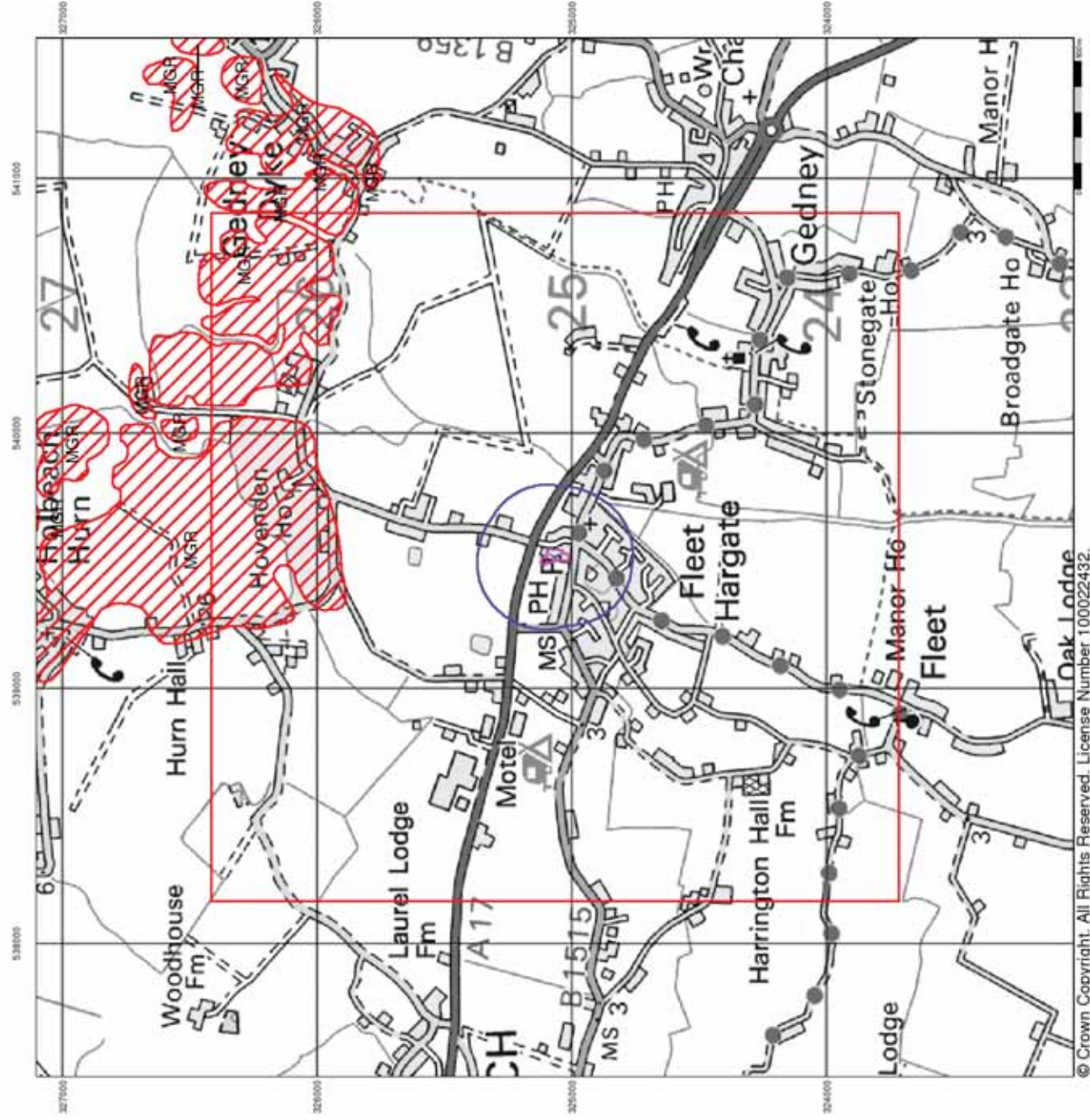


Order Details:

Order Number: 138720587_1_1
 Customer Reference: D37124
 National Grid Reference: 539510, 325070
 Slice: A
 Site Area (Ha): 0.43
 Search Buffer (m): 250

Site Details:

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ





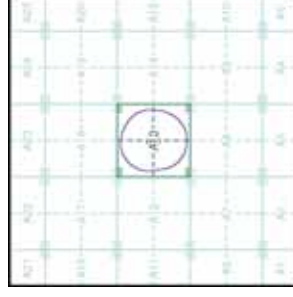
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A

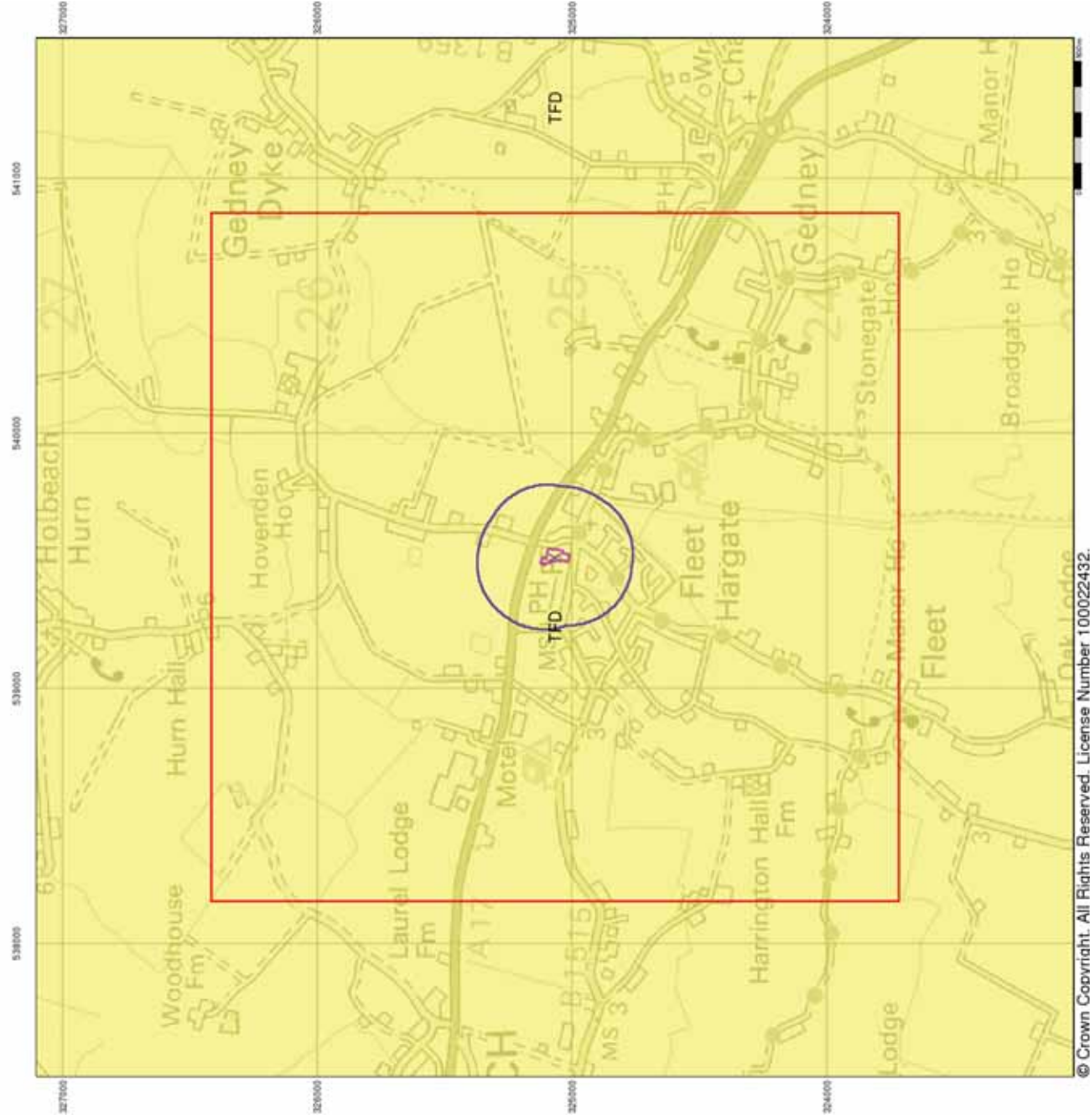


Order Details:

Order Number: 138720587_1_1
Customer Reference: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details:

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



Bedrock and Faults

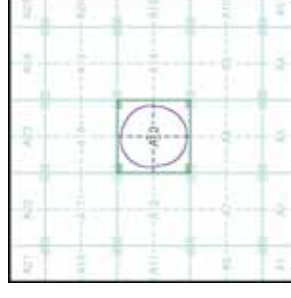
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A

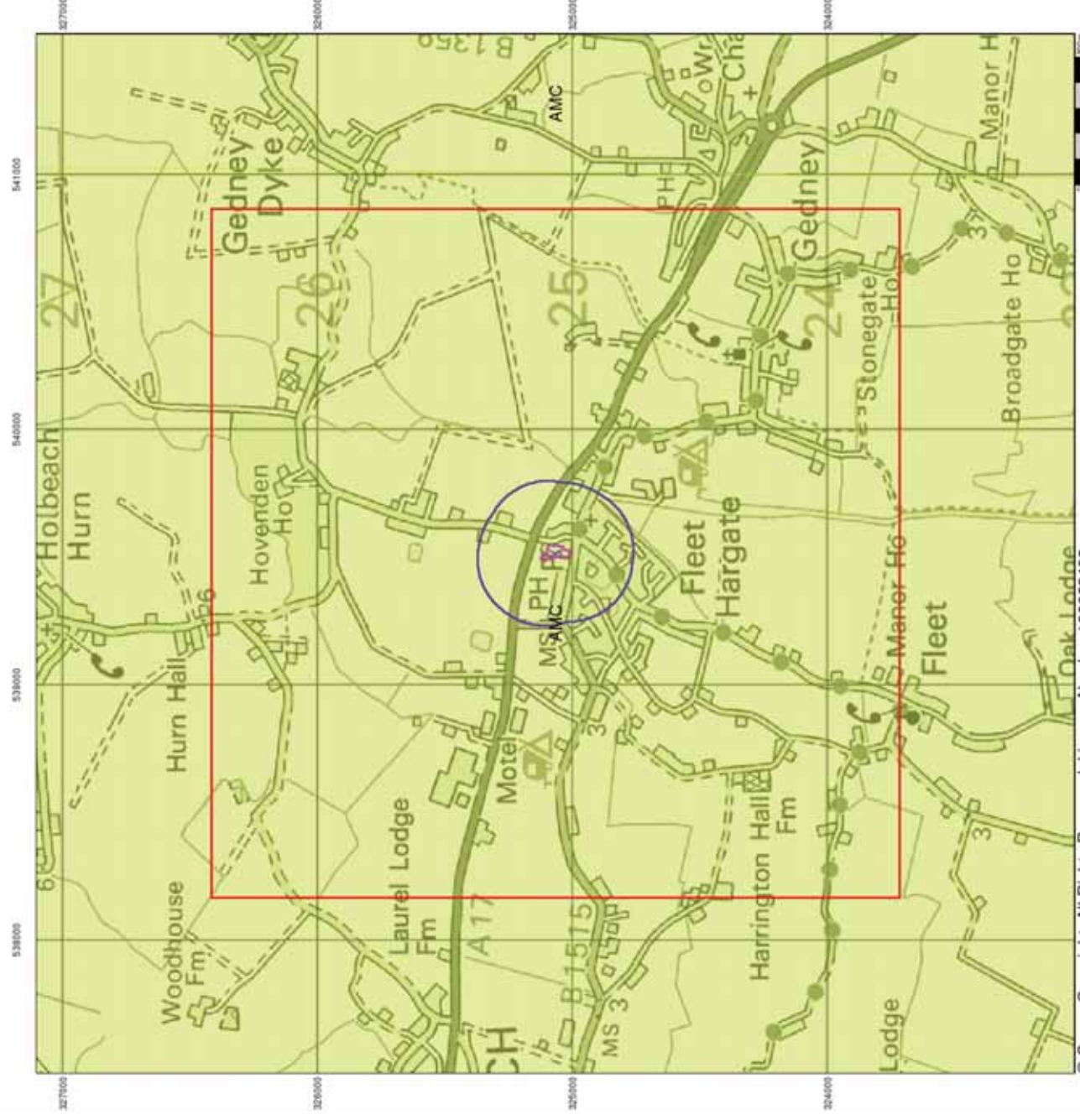


Order Details:

Order Number:	138720587_1_1
Customer Reference:	D37124
National Grid Reference:	539510, 325070
Slice:	A
Site Area (Ha):	0.43
Search Buffer (m):	250

Site Details:

SITE DETAILS.
Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ



Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

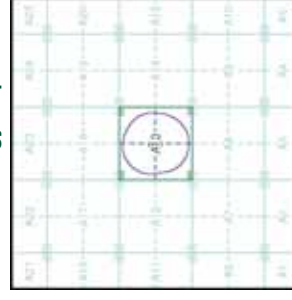
Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



Order Details:

Order Number: 138720587_1_1
Customer Reference: D37124
National Grid Reference: 539510, 325070
Slice: A
Site Area (Ha): 0.43
Search Buffer (m): 250

Site Details:

Old Main Road, Fleet Hargate, Holbeach, SPALDING, PE12 8LJ

APPENDIX XI

Plates



Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	30/10/2017
		Rev.	
Title	TP1 - completed excavation	Plate No.	1



Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	30/10/2017
		Rev.	
Title	TP2 - completed excavation	Plate No.	2





Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	30/10/2017
		Rev.	
Title	TP3 - completed excavation	Plate No.	3





Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	30/10/2017
		Rev.	
Title	TP4 - completed excavation	Plate No. 4	





Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	30/10/2017
		Rev.	
Title	TP5 - completed excavation	Plate No.	5





Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	30/10/2017
		Rev.	
Title	TP6 - pit collapsing around excavator arm during excavation	Plate No.	6





Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	30/10/2017
		Rev.	
Title	TP7- completed excavation	Plate No.	7





Slight water
seepage at 1.90m

Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	30/10/2017
		Rev.	
Title	SA1 - before filling with water	Plate No. 8	





Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	30/10/2017
Title	SA2 - during filling with water	Rev.	
		Plate No.	9





Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	30/10/2017
		Rev.	
Title	SA3 - during filling with water	Plate No. 10	





Project No.	D37124	Drawn	CB
Client	Seagate Homes	Checked	RS
		Approved	RS
Project	Old Main Road Fleet Hargate	Scale	NTS
		Date Drawn	25/10/2017
Title	BH1 - during advancement	Rev.	
		Plate No.	11



APPENDIX XII

Conditions & Limitations

Conditions & Limitations

Phase I Desk Studies

1. Works undertaken to provide the basis of the Phase I Desk Study report comprise a review of information available from a number of sources/parties (potentially also including the Client) together with a walk over of the site (where applicable and included within the quotation). The opinions given in the Phase I Desk Study are based on the information available from third parties/sources that has been obtained within the available timeframe. GeoDyne Limited assumes all third party information to be true and correct and therefore cannot accept liability for the accuracy of such information supplied.
2. Should additional information become available that may affect the comments and opinions made within the Phase I Desk Study, GeoDyne Limited reserves the right to review such information and make modifications to comments/opinions as appropriate.
3. It should be borne in mind that a Phase I Desk Study collates available information to generate a conceptual model of the site. The actual geotechnical and environmental considerations can only be fully quantified by intrusive investigation works to confirm the accuracy of the conceptual site model.

Phase II Intrusive Investigations

1. Our quotation assumes that access to the site will be arranged by others at no cost to ourselves.
2. We have assumed that free access is available throughout to the entire site and that works can be undertaken during a single mobilisation. Where restricted access is encountered, or where additional unscheduled mobilisations are required, additional costs may be incurred to the client.
3. We have assumed that all available information relating to buried services will be supplied by the Client at no cost to ourselves. No responsibility will be accepted for damage to underground services that have not been brought to our prior attention by the Client.
4. All excavations/boreholes will be backfilled with compacted arisings upon completion, with any excess arisings left proud of ground levels. Excess arisings will not be removed from the site unless specifically requested by the Client. Where we are requested to remove excess arisings, all associated costs will be passed to the Client.
5. We will attempt to leave the site in a clean and tidy state, however, it must be understood that some disturbance of the site is unavoidable during intrusive works.
6. Exploratory holes are positioned approximately on site by GeoDyne Limited. Should the client require precise locations of all exploratory points, additional fees will be incurred. It must be borne in mind that backfilled trial pits can create 'soft spots', therefore, should the Client wish to designate 'no dig' zones, for example under the footprint of proposed structures, these must be brought to our attention prior to commencement of works.
7. Groundwater observations relate to conditions encountered at the time of investigation. It must be understood that groundwater levels may vary as a result of recent climatic conditions or seasonal variation.
8. Trial pits and boreholes examine only a small proportion of the total site area. No liability can be accepted for conditions not revealed in exploratory holes, particularly between positions. All extrapolations of available data are given in good faith.

Payment

1. Payment terms are strictly 28 days from the invoice date.
2. Prior to commencement of works, we require receipt of formal written instruction from the party accepting full financial responsibility for the work. In the absence of such an instruction, we would expect the instructing Consulting Engineers/Architects to accept full financial responsibility for the works.
3. Receipt of instruction to commence work shall be taken as acceptance and compliance of the foregoing conditions.

Liability

1. GeoDyne Limited offer £5,000,000.00 Professional Indemnity Insurance (in aggregate over the year). This shall be the limit of our liability for works undertaken. No individual liability shall be implied to, or accepted by, any employee for works undertaken for and on the behalf of GeoDyne Limited.