



Preliminary Geoenvironmental Investigation

Land east of Knowsley Lane For Hallam Land Management Ltd

Report no: 4405/1C

Date: August 2025



SUMMARY OF GEOENVIRONMENTAL ISSUES

Job No.	4405	Site area/ha	33.75 ha (83.4 acres)
Client:	Hallam Land Management Ltd	NGR:	SJ 436 947
Site:	Land east of Knowsley Lane	Nearest postcode:	L34 0EA

The site is located off Home Farm Road, approximately 10km northeast of Liverpool city centre, and currently comprises arable farmland with pockets of dense woodland with small ponds.

Lithos were commissioned by Hallam Land to provide a preliminary geoenvironmental appraisal of the site. It is understood that the site is to be redeveloped with residential properties; an Illustrative Framework Plan has been prepared.

Lithos' investigation included an inspection of historical and geological maps and information provided by the British Geological Survey, and the Landmark Information Group and QGIS. In addition, a site inspection has been carried out and soakaway testing has been undertaken in 4 trial pits.

A summary of salient geoenvironmental issues is provided in the table below.

Issue	Remarks
Former uses	The site has remained as undeveloped farmland since pre-1850, with the exception of a pond in the west being infilled by 1909. A former pond (footprint c. 600m ²) in the west was infilled over 100 years ago.
Anticipated ground conditions	Topsoil over gravelly clay (Cohesive Glacial Till) to c. 6m, with Chester Formation Sandstone at greater depth.
Anticipated contamination	Likely to be localised in the made ground used to infill the former pond and beneath the track of Home Farm Road. Topsoil is anticipated to be relatively clean and suitable for reuse.
Mining & quarrying	The site is located beyond the CA's defined coalfields. Historic maps refer to 'Knowles' Pits' and 'Howard's Pits', now present as ponds within the central woodland areas (Spookies Woods). It is unclear if any other areas within the site boundary experienced pitting and infilling prior to 1850. With the exception of Akers Pits c. 100m to the east, no other areas adjacent to the site show evidence of mining, quarrying, pitting, or landfilling.
Hazardous gas	The site is in an area where less than 1% of homes are estimated to be above the radon action level. However there are known or suspected areas of land infilling on site (former pond). If significant made ground with a high TOC content is encountered in the former pond, then some gas monitoring will be required. This should be reviewed after in the light of the ground conditions actually encountered during the trial pitting.
Flooding & drainage	The site lies in Flood Zone 1, where the risk of flooding from rivers or the sea is classified as low. Soakaway testing was carried out in 4 pits. However, despite running each test for up to 3 hours, drainage rates were not sufficient to allow calculation of infiltration rates. Consequently, soakaways will not provide a suitable drainage solution for surface water run off and there is likely to be a need for surface water balancing.
Preparatory works	Chasing out of any made ground associated with the pond infill if found to be present. Sitewide vegetation and topsoil strip. It would be prudent to undertake a tree survey of the two woodland areas early in the development process, as these may be protected.
Anticipated foundation solutions	It is anticipated that most (if not all plots) will be founded on traditional strip foundations at a minimum depth of 900mm; founding stratum will be Cohesive Glacial Till. Foundations will require deepening to protect against heave when within the influence of trees.
Recommendations for ground investigation	c. 170 machine dug trial pits across the site at c. 45m grid spacing, with at least 3 targeting the former pond in the west to delineate made ground. Possible need for monitoring well installations with subsequent gas monitoring.

CONTENTS

1	INTRODUCTION.....	1
1.1	THE COMMISSION AND BRIEF	1
1.2	THE PROPOSED DEVELOPMENT	1
1.3	REPORT FORMAT AND LIMITATIONS	1
2	SITE DESCRIPTION	2
2.1	GENERAL.....	2
2.2	SITE FEATURES	2
3	SITE HISTORY	4
4	ENVIRONMENTAL SETTING	5
4.1	GENERAL.....	5
4.2	GROUNDWATER SOURCE PROTECTION ZONES (SPZ)	6
4.3	HAZARDOUS GAS.....	6
4.4	AGRICULTURE.....	7
5	PRELIMINARY CONCEPTUAL SITE MODEL	7
5.1	POTENTIAL CONTAMINANTS	7
5.2	ANTICIPATED GROUND CONDITIONS & POTENTIAL ISSUES	8
6	LAND CONTAMINATION – PART IIA & PLANNING	9
7	GROUND INVESTIGATION DESIGN	10
7.1	GENERAL.....	10
7.2	GROUND INVESTIGATION DESIGN & STRATEGY	10
8	EXPLORATORY GROUND INVESTIGATION (SOAKAWAY TESTING)	12
8.1	SCOPE OF WORKS.....	12
8.2	UK GUIDANCE.....	12
8.3	FIELD TESTS	12
8.4	DISCUSSION & CONCLUSIONS.....	13
9	CONCLUSIONS & RECOMMENDATIONS	14
9.1	GENERAL.....	14
9.2	MINING AND QUARRYING	14
9.3	HAZARDOUS GAS.....	14
9.4	FOUNDATIONS	14
9.5	HIGHWAYS AND EXTERNAL WORKS	15
9.6	SOAKAWAYS & DRAINAGE.....	15
9.7	CONTAMINATION	16
9.8	POTENTIAL DEVELOPMENT CONSTRAINTS	16
9.9	FURTHER INVESTIGATION	16

APPENDICES

Appendix A – General notes

01	Environmental setting
06	Soakaways

Appendix B – Drawings

Drawing	Revision	Title
4405/1	-	Site Location Plan
4405/2	-	Illustrative Framework Plan
4405/3	-	Site Features
4405/4	-	Site Photographs
4405/5	-	Preliminary Conceptual Site Model
4405/6	-	Exploratory Hole Location Plan

Appendix C – Commission

Appendix D – Historical OS plans*

Appendix E – Search responses*

From	Date	Content
Landmark	14 th April 2025	Envirocheck report
BGS	22 nd July 1971	Borehole Log (SJ49SW/8)

Appendix F – Soakaway testing records (Trial Pit Logs and Calculations)

* Some of this data is not included within the paper or PDF copies of this report can be provided on request.

FOREWORD (GEOENVIRONMENTAL APPRAISAL REPORT)

This report has been prepared for the sole internal use and reliance of the Client named on page 1. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Lithos Consulting Limited (Lithos); such authorisation not to be unreasonably withheld. If any unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill.

This report has been reviewed by a Competent Person, as defined in the National Planning Policy Framework. We ensure that all projects are managed by individuals with necessary experience, relevant qualifications, and current membership of a relevant professional organisation. Records of engineers, project managers and reviewers involved in this project are maintained by us. Lithos QA/QC procedures for all our work forms an integral part of our ISO9001 accreditation and as such is regularly audited.

The report presents observations and factual data obtained during our site investigation and provides an assessment of geoenvironmental issues with respect to information provided by the Client regarding the proposed development. Further advice should be sought from Lithos prior to significant revision of the development proposals.

The report should be read in its entirety, including all associated drawings and appendices. Lithos cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context. However, it should be noted that in order to keep the number of pages to a minimum, some information (e.g. full copy of the Landmark/Groundsure Report) is not included in the PDF; by request it can be provided.

The findings and opinions conveyed in this report (including review of any third-party reports) are based on information obtained from a variety of sources as detailed within this report, and which Lithos believes are reliable. Reasonable care and skill has been applied in examining the information obtained. Nevertheless, Lithos cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

Where the report refers to the potential presence of invasive weeds such as Japanese Knotweed, or the presence of asbestos containing materials, it should be noted that the observations are for information only and should be verified by a suitably qualified expert.

Lithos cannot be responsible for the consequences of changing practices, revisions to waste management legislation etc that may affect the viability of proposed remediation options.

The report represents the findings and opinions of experienced geoenvironmental consultants. Lithos does not provide legal advice and the advice of lawyers may also be required.

PRELIMINARY GEOENVIRONMENTAL INVESTIGATION OF LAND EAST OF KNOWSLEY LANE

1 INTRODUCTION

1.1 The commission and brief

- 1.1.1 Lithos Consulting were commissioned by Hallam Land Management Ltd to carry out a Preliminary Geoenvironmental Investigation of land east of Knowsley Lane.
- 1.1.2 This document is a revision of the Preliminary Geoenvironmental Appraisal (Report 4405/1) issued by Lithos in April 2022; Report 4405/1 is now superseded. This document now includes review of "new" search data and the results of soakaway testing undertaken in April 2025, with the only significant revisions to 4405/1 having been made in Sections 8 & 9.
- 1.1.3 Correspondence regarding Lithos' appointment, including the brief for this investigation, is included in Appendix C. The agreed scope of works included:
- A site walkover and inspection
 - An assessment of land use history
 - Determination of the site's environmental setting
 - Assessment of anticipated ground conditions, including potential contaminants
 - Assessment of anticipated foundation and engineering issues associated with redevelopment for a residential end-use
 - Provision of recommendations for an appropriate ground investigation
- 1.1.4 This Preliminary Investigation comprises an inspection of historical and geological maps and information provided by the British Geological Survey, the Landmark Information Group, and QGIS¹. In addition, a site inspection has been carried out by Lithos.
- 1.1.5 Primary aims of this investigation were to identify salient geoenvironmental issues affecting the site to enable design and costing of an appropriate intrusive investigation.

1.2 The proposed development

- 1.2.1 It is understood that consideration is being given to development of the site with domestic dwellings, associated gardens, adoptable roads and sewers (built form, c. 20.6 ha), green infrastructure (c. 10.2 ha). Retained woodland will occupy c. 3.0ha.
- 1.2.2 An Illustrative Framework Plan has been prepared by Stantec (Drawing 0112, dated 1st August 2025), and copied here as Drawing 4405/2.

1.3 Report format and limitations

- 1.3.1 Standard definitions, procedures and guidance are contained within Appendix A, which includes background, generic information on assessment of the site's environmental setting.
- 1.3.2 General notes and limitations relevant to all Lithos preliminary investigations are described in the Foreword and should be read in conjunction with this report. The text of the report draws specific attention to any modification to these procedures and to any other special techniques employed.

¹ An Open Source Geographic Information System used by Lithos to access publicly available Government held digital data.

2 SITE DESCRIPTION

2.1 General

- 2.1.1 The site's location is shown on Drawing 4405/1 presented in Appendix B to this report. Site details are summarised in the table below.

Detail	Remarks
Location	10 km northeast of Liverpool city centre
NGR	SJ 436 947
Area	33.75 ha (83.4 acres)
Known services	Overhead telecom

2.2 Site features

- 2.2.1 Lithos completed a walkover survey of the site on 14th April 2022.
- 2.2.2 The site was visited again on 16th April 2025, with no significant changes noted.
- 2.2.3 Existing salient features, at the time of the walkover are presented on Drawing 4405/3 in Appendix B to this report, and summarised in the table below.

Feature	Remarks
Current access	Off Home Farm Road
Topography	Relatively flat with localised depressions
Approximate areas	180,300m ² grass & overgrown areas 106,000m ² arable farmland 47,600m ² woodland & mature hedgerows 1,200m ² ponds 500m ² gravel track
Nature of boundaries	North – Wooden fencing and mature hedgerows with trees East & south – Brick wall & brambles West – Mature hedgerow
Surrounding land uses	North – Home Farm Road with housing estates and the village of Knowsley beyond East – Former Home Farm (now a business park), woodland, grassed fields with Knowsley Park & Estate beyond South – Woodland and grass fields with Knowsley Estate beyond. West – Knowsley Lane (B5202) with two properties within the woodland, open fields and the M57 beyond

- 2.2.4 A selection of site photographs are included on Drawing 4405/4.
- 2.2.5 The site covers an expansive single parcel of land, split into four irregular shaped fields. The three fields to the east are grassed whilst the western field is partially arable.
- 2.2.6 Two woodland areas are present in the centre of the site, these contain a network of ponds and ditches with thick undergrowth, primarily comprising rhododendron. These woodlands, formerly known as 'Knowles' Pits' and 'Howard's Pits' are now known as Spookies Wood.
- 2.2.7 The site's boundaries are predominantly defined by mature hedgerows, with bramble undergrowth and a miscellany of breeze block or stone walls and post and wire fencing. The breezeblock walls were coated with a black anti-climb paint and warning signs.
- 2.2.8 To the north of the site are residential properties, typically comprising two storey brick-built houses with associated gardens. Within the housing estate is Knowsley Village Primary School (west) and the Ross Close Playing Field (east). Adjacent to the northeastern boundary is Stanley Grange Business Village, formerly Home Farm.

- 2.2.9 Beyond the eastern and southern boundary is Knowsley Estate and Park, formed of opened fields used for livestock farming, mature trees, and a pine forest. To the west is Knowsley Lane (B5202) with woodlands, a couple of private residential properties and the M57.
- 2.2.10 Access can be gained via two points, a large metal gate at the eastern end of Home Farm Road and a second farm gate off Knowsley Lane to the west of the site.
- 2.2.11 A Cadent Gas Network Monitor is noted near the entrance of Home Farm Road. However, utility plans suggest that the pipeline terminates at the end of Home Farm Road and does not enter the site.
- 2.2.12 Despite the woodland areas in the centre of the site being overgrown, evidence suggests that people have camped here - seen by rubbish, sleeping bags and small fire pits. The trees are typically mature and deciduous. The ponds are stagnant with bits of rubbish and a swampy appearance.
- 2.2.13 The open grassed fields in the east, centre and south are relatively flat and firm underfoot, they are used by dog walkers and many paths can be seen crossing the fields. The grassed field to the northeast is undulating with a rise to the northeast and a large depression c. 2m deep to the northwest. Water was not present within the depression.
- 2.2.14 The open arable field at the time of the walkover had a fresh crop just breaking the surface with green shoots. Three depressions can be seen in the landscape of this field, which are soft and damp underfoot. The western depression is related to a former pond, infilled by 1909, however the reasons for the eastern and southwestern depressions in this field remain unknown.

3 SITE HISTORY

- 3.1 In order to investigate the development history and previous land uses at the site and immediate surrounding land, site centred extracts from Ordnance Survey (OS) plans dating back to 1850 have been examined. These plans are presented in Appendix D to this report.
- 3.2 The table below provides a summary of the salient points relating to the history of the site with respect to the proposed end use. It is not the intention of this report to describe in detail all the changes that have occurred on or adjacent to the site. Significant former uses/operations are highlighted in **bold** text for ease of reference.

Date	Site	Surrounding land
1850	Open (likely arable) farmland with two woodlands in the centre south, labelled as ' Knowles Pits ' & ' Howards Pits '. Pond shown in the western portion of the site.	'Ormskirk Lodge' & 'Scotch Row' adjacent to the northeast boundary. Open fields to the east, 'Ash Plantation' and open fields to the south. 'Knowsley Lane', ' Akers Pits ' in a woodland with open fields to the west. 'Maiden's Bower' to the northwest with open fields and 'Sugar Lane' to the north. 'White Stone Farm' adjacent to northwest boundary.
1894	Ponds show within the woodlands of 'Knowles Pits' and 'Howards Pits'.	'Ormskirk Lodge' relabelled as 'Home Farm'. 'Knowsley Cottage' shown adjacent to the southwestern boundary. Ponds shown within the woodland of 'Akers Pits'. Expansion southwards of Knowsley village c. 1000m north.
1909	Track leading east to west from 'Knowsley Lane' to 'Home Farm'. Western pond infilled .	' Gasometers ' labelled on 'Home Farm'. Expansion of 'Home Farm'. Southwards expansion of Knowsley Village.
1928	No significant changes	Expansion of 'Home Farm', west towards site.
1978		Massive expansion of Knowsley Village southwards, with housings estates, parks, and a school adjacent to sites northern boundary. Eastern two thirds of 'Home Farm Road' tarmacked. 'White Stone Farm & Cottages' replaced with a primary school. Construction of the M57 c. 750m west of the site.
2021		No significant changes

- 3.3 'Knowles Pits' & 'Howards Pits' in wooded areas (centre-south of the site) were created prior to 1850 and may have been ponds from that time (appearance on the large scale 1893 plan suggests the pits were ponds; although the word pond first appears on the 1960 plan). It is not clear what was extracted from these former pits; it might have been sand & gravel, or possibly clay for brick making. Alternatively, the pits may have been created to encourage water fowl for game (shooting).
- 3.4 The site has remained undeveloped throughout history with the only significant change being the infilling of the western pond in 1909. The surrounding land, particularly to the north has slowly been redeveloped with the housing of Knowsley village. This comes with associated parks and a primary school which encroach onto the sites northern boundary. The wider area, especially to the east, south and west has remained relatively unchanged since 1978.
- 3.5 The large expansion of Stockbridge village c. 1.2km southwest of the site can be seen on the 1978 OS map, however to date it has remained relatively unchanged.

4 ENVIRONMENTAL SETTING

4.1 General

- 4.1.1 Notes describing how the site's environmental setting has been assessed are included in Appendix A to this report. Reference has been made to publicly available Government held digital data via QGIS (an Open Source Geographic Information System). The responses received from the BGS and extracts from the Landmark Report are presented in Appendix E.

Issue	Data reviewed	Remarks
Geology	1:50,000 BGS map (Sheet 84) 1:10,000 BGS map (Sheet SJ49SW) BGS Logs (SJ49SW8 – 200m SW)	Drift soils – Cohesive Glacial Till (Cobbly, gravelly, sandy clay). Solid (bedrock) – Chester Formation sandstone. Strata Dip – Unknown. Faults – none within 250m of the site's boundary.
Mining	Mining Remediation Authority BGS maps	This site is located beyond the Mining Remediation Authority's defined coalfields.
Quarrying	Historical OS plans	Former Knowles Pits' & 'Howards Pits' in wooded areas and a backfilled pit/pond is present in the west. Akers Pits within 250m of the site (to the west).
Landfills	Envirocheck Report	No known landfills within 250m
Radon	Public Health England	The site lies in an area where <1% of homes are estimated to be above the action level. Therefore, no radon measures required.
Hydrogeology	Environment Agency electronic open data via QGIS	Source Protection Zone – 3. Further details in Section 4.2 below. Aquifer – Secondary Undifferentiated (Drift); Principal (Solid). Groundwater abstractions – United Utilities Water, potable water supply (direct), February 1995 to present, c. 150m southwest. Soil leaching potential – Low. Pollution incidents – None of significance.
Hydrology	Defra Catchment data explorer Envirocheck Report	Nearest watercourse – Fluker's Brook, Tributary of Knowsley Brook (c. 130m southwest). Water quality - Moderate. Pollution incidents – None of significance. Abstractions – None of significance. Discharge consents - United Utilities Water, Sewage pumping station, Storm sewage overflow into Alder Brook, last issued 2003, c 200m north.
Flood risk	Environment Agency electronic open data via QGIS	The site lies in Flood Zone 1, where the risk of flooding from rivers or the sea is classified as low. In accordance with Chapter 14 of the National Planning Policy Framework, a site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency).
UXO	Zetica website	Low Risk

4.2 Groundwater Source Protection Zones (SPZ)

- 4.2.1 The site lies within a groundwater Source Protection Zone (**SPZ 3**) for the Chester Formation Sandstone aquifer. It is likely that the Environment Agency will request more detail (and at an earlier stage) than usual with respect to drainage design and measures to mitigate pollution (interceptors etc). They may require drainage to be kept at shallowest possible depths. They may also require details of mitigation measures to reduce pollution risks during the construction phase.

4.3 Hazardous gas

Methane & carbon dioxide

- 4.3.1 The site might be affected by sources of hazardous gas generation as a former pond, covering approximately 600m² in the west of the site (see Drawing 4405/3) was backfilled in the early 1900s.
- 4.3.2 Whilst the pond is small and was infilled over 100 years ago, if the backfill material contained a high amount of organic matter it may have the potential to produce hazardous gas during decomposition. The nature of the backfill should be investigated (see Section 7), with an assessment of the TOC content of the fill.
- 4.3.3 Gas monitoring may be required.

Radon

- 4.3.4 Requirements with respect to radon measures are set out in Building Regulations Approved Document C. Probability bandings (based on the proportion of properties in a given area that exceed the Action Level; currently 200 Bq.m⁻³) are used to determine whether a property requires no, basic or full measures.
- 4.3.5 At present Approved Document C advocates basic measures for the probability banding 3% to 10% (full measures if >10%). However, the UK Health Security Agency (HSA) would like to see all new build include basic measures.
- 4.3.6 In December 2022, the British Geological Survey (BGS), deployed a revised dataset which increased accuracy and also the number of properties falling within radon affected areas. This revised dataset is now referenced by maps on the HSA website.
- 4.3.7 Information from the HSA website indicates that the site lies in an area where **less than 1%** of homes are estimated to be above the action level.
- 4.3.8 As such, **no** special precautions against radon are required on this site.

4.4 Agriculture

- 4.4.1 Historical plans show that the site has been occupied by arable farmland. Generally farming is not considered likely to have caused significant ground contamination. However, activities such as slurry spreading, the discharge of chemicals to ground, and unregulated burial are known to have occurred on farmland. Potential contaminants associated with farming activity could include any of the following.

Agricultural activity	Potential contaminant
Sewage farming, slurry spreading	Methane, metals, nitrates, oxygen depletion
Plant & animal protection	Pesticides & herbicides
Soil conditioners	Metals, sulphates, PAH
Field sports	Lead shot
Equipment maintenance	Hydrocarbons, metals
Waste burial, land levelling, backfilling ponds/quarries	Methane, metals, PAH etc

- 4.4.2 Whilst it is likely that pesticides have been applied during arable use of the land, these are not likely to include the persistent organochloride pesticides such as Dieldrin, Aldrin, DDT etc. Pesticides routinely used on arable crops the UK (Phenoxy Acetic acid herbicide or PAAH) rapidly degrade in soils or leach via rainwater infiltration to groundwater. It is highly unlikely these would be detected by soil sampling and therefore it is not proposed to undertake analysis of these.
- 4.4.3 The generation of ground gas in quantities with the potential to impact upon the proposed development would only occur with the presence of significant quantities of organic matter. Ground gas monitoring is not considered necessary unless significant quantities of organic matter are identified during the ground investigation.

5 PRELIMINARY CONCEPTUAL SITE MODEL

5.1 Potential contaminants

- 5.1.1 Historical plans show the presence of former pits, now infilled in the west (see Drawing 4405/3) and present as ponds within the pockets of woodland.
- 5.1.2 A preliminary conceptual site model, presented as Drawing 4405/5 in Appendix B, has been prepared after consideration of all the data presented in Sections 2 to 4 of this report.
- 5.1.3 Clearly, the conceptual model will be subject to modification in light of data arising from the proposed intrusive ground investigation.
- 5.1.4 Potential contaminant linkages are shown on the preliminary conceptual site model. These include the migration of hazardous gas from the pond infill, dermal contact or inhalation/ingestion of potentially contaminated topsoil or made ground and volatilisation of any spilt organics from farming related activities.
- 5.1.5 The ponds present on site are receptors for potentially contaminated run-off from the current agricultural land use or the future road drainage.

5.2 Anticipated ground conditions & potential issues

5.2.1 Based on the data reviewed in Section 4 (Environmental Setting), anticipated ground conditions are expected to comprise:

Anticipated condition	Remarks
Made ground	Likely present in the area of the former pond (infilled) and the track of Home Farm Road, crossing the north of the site.
Natural soils	Topsoil, over Cohesive Glacial Till (likely gravelly or sandy clay) to c. 5m depth, with weathered residual soils below.
Bedrock	Chester Formation Sandstone, likely from 6m depth.
Mineworkings	Likely at depth within the sandstone bedrock.
Groundwater	Likely present in the area of the former pond (infilled) and the track of Home Farm Road, crossing the north of the site.

5.2.2 Based on the data above and that in Sections 2 (Site Description) and 3 (History), potential ground-related issues associated with this site are likely to include:

Type of issue	Specific issue	Remarks
Potential on-site contamination sources	1. Reworked topsoil (inorganics, organics) 2. Backfilled ponds/pits	1. Associated with farming 2. Made ground will likely require chasing out
Potential off-site contamination sources	-	-
Potential geotechnical hazards	1. Deeper made ground in the area of the former pond	1. Made ground may require chasing out, or an alternative foundation solution.
Other potential constraints	1. Overhead utilities	1. Utilities will require diversionary works unless they can be accommodated into the site layout.

6 LAND CONTAMINATION – PART IIA & PLANNING

- 6.1 Local Authorities have responsibilities with respect to land contamination in the context both of Part IIA of the Environmental Protection Act 1990, and Planning.
- 6.2 The contaminated land regime in Part IIA was introduced specifically to address the historical legacy of land contamination. It applies where there is unacceptable risk, assessed on the basis of the **current** use and the relevant circumstances of the land. It is not directed to assessing risks in relation to a future use of the land that would require a specific grant of planning permission. This is primarily a task for the planning system, which aims to control development and land use in the **future**.

Planning

- 6.3 The National Planning Policy Framework (NPPF), supported by web-based planning practice guidance, includes the following with respect to contamination and site investigation:

“Where a site is affected by contamination or land stability issues, responsibility for securing safe development rests with the developer and/or landowner”.

- 6.4 Planning policies and decisions should 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
 - Adequate site investigation information, prepared by a competent person, is presented'
- 6.5 Annex 2 of the NPPF states that 'all investigations of land potentially affected by contamination should be carried out in accordance with established procedures (such as BS10175²)'.

This site

- 6.6 The underlying Chester Formation Sandstone is classified as a principal aquifer. The nearest surface watercourse is Fluker's Brook, which flows in a northwestern direction, approximately 130m beyond the site's western boundary. Therefore, the site's environmental setting is considered to be of moderate sensitivity.
- 6.7 With respect to human health, the proposed end use (residential) is also sensitive.
- 6.8 The current and former use of the site is considered unlikely to have given rise to any significant ground and groundwater contamination, therefore, it is considered that the site should be suitable for the proposed use subject to implementation of appropriate preparatory works.

² BS10175 (2011) - Code of practice for the investigation of potentially contaminated sites

7 GROUND INVESTIGATION DESIGN

7.1 General

- 7.1.1 Given the scale of the proposed development and the risk of contamination identified in the preliminary conceptual site model, a ground investigation is considered essential.

7.2 Ground investigation design & strategy

- 7.2.1 The preliminary conceptual site model has been used as a basis for design of an appropriate ground investigation, the scope of which is summarised below.

Exploratory holes	Purpose
170 trial pits (Machine dug)	To determine the general nature of soils underlying the site, including the: - nature, distribution and thickness of shallow soils, including any made ground - suitability of the ground for founding structures and highways
Of which 3 trial pits	To delineate made ground of former pond in the west
Dynamic sampling (mini boreholes) c. 10 no.	To confirm the strength (density) of natural in-situ granular soils via SPTs, if encountered. If significant made ground is found within the former pond, then it would be prudent to install monitoring wells across the site in order to monitor for hazardous gas. The necessity for wells should be reviewed after the trial pitting is complete.

- 7.2.2 Proposed exploratory hole locations should be selected to provide a representative view of the strata beneath the site and to target potential areas of interest identified (most notably the former pond). A nominal 45m grid spacing should be appropriate, with additional exploratory locations scheduled as necessary in light of the ground conditions actually encountered.
- 7.2.3 Representative soil samples of natural and any man-made ground should be taken during the works. The number of soil samples taken should be reflective of the geological complexity actually encountered, but in general about 3 samples should be taken from most exploratory holes.
- 7.2.4 The investigation should be undertaken in general accordance with:
- BS5930:2015 "Code of practice for site investigation"
 - BS10175:2017 "Code of practice for the investigation of potentially contaminated sites"
 - "Technical Aspects of Site Investigation" – EA R&D Technical Report P5-065/TR (2000)
 - "Development of appropriate soil sampling strategies for land contamination" – EA R&D Technical Report P5-066/TR (2001)
- 7.2.5 **Trial pitting** will enable determination of:
- Nature, distribution and thickness of shallow soils
 - Nature of made ground (uppermost 3m to 4m), including:
 - visual/olfactory evidence of potential contamination and the proportion of undesirable elements e.g. biodegradable matter, relict foundations etc
 - the proportion of "oversize", boulder-sized material
 - the location and extent of the former pond
 - Suitability of the ground for soakaways
 - Suitability of the ground for founding structures and highways
- 7.2.6 The in-situ shear strengths of any cohesive soils encountered should be determined by use of a hand-held shear vane.

- 7.2.7 If significant made ground with a high TOC is encountered in the former pond during the pitting, then it may be necessary to advance **mini-boreholes** via dynamic sampling techniques to allow the installation of monitoring wells in c. 10 locations.
- 7.2.8 The generation potential of the potential **gas** source (former pond) is considered likely to be Very Low. Therefore, in accordance with CIRIA Report C665³, it would be prudent to initially allow for 6 visits over a 6 month period. A hazardous gas risk assessment should be issued on completion of monitoring.
- 7.2.9 Routine **geotechnical soils analysis** (moisture content, Atterberg limits, pH, water soluble sulphate) should be scheduled on about 60 samples.
- 7.2.10 Whilst the site does not appear to have been subjected to industrial land uses, the following potential sources of contamination have been identified:
- Agrochemicals potentially used in arable farming.
 - Made ground imported to make up access tracks.
 - Backfill of unknown composition in former ponds.
- 7.2.11 Limited sampling of the topsoil should be undertaken to confirm its suitability for re-use. At least 30 samples should be taken with analysis to include pH, metals, TOC, speciated PAH and asbestos ID.
- 7.2.12 It would also be prudent to analyse about 8 topsoil samples to check compliance with BS3882⁴ requirements, via testing for visible contaminants, sharps and clay/sand/silt content.
- 7.2.13 Appropriate **chemical analyses** based on the findings of this Report should be allowed for. This is likely to comprise 8 samples of made ground taken from the former pond for a suite including heavy metals, asbestos ID, TOC, banded TPH (with supplementary speciation where appropriate), and speciated PAH. In the event that ground contamination is more significant or different to that anticipated, it might be necessary to carry out additional chemical testing.
- 7.2.14 Further sampling should be undertaken if made ground is encountered in the exploratory holes.
- 7.2.15 On completion of the fieldwork and laboratory testing a comprehensive bound, factual and interpretative report should be issued. This should contain detailed engineering records, laboratory test results, copies of all relevant correspondence and drawings of the site. The report should also include qualitative risk assessment with respect to both controlled waters and human health.

³ CIRIA C665: Assessing risks posed by hazardous ground gases to buildings (2007).

⁴ BS3882:2015. Specification for topsoil. Published by BSI Standards Limited.

8 EXPLORATORY GROUND INVESTIGATION (SOAKAWAY TESTING)

8.1 Scope of works

8.1.1 An exploratory phase of ground investigation was undertaken on 16th April 2025 in order to determine the feasibility of soakaways as a solution for the discharge of surface water run-off.

8.1.2 Fieldwork comprised the exploratory holes listed below:

Technique	Exploratory holes	Final depth(s)	Remarks
Trail pitting (machine dug)	SAs 01 to 04	1.8m to 2.2m	Soakaway testing undertaken in each pit

8.1.3 Exploratory hole logs are presented in Appendix F.

8.1.4 Natural ground encountered in all 4 exploratory holes, and typically comprised:

- **Topsoil:** Dark brown slightly gravelly, sandy Clays to a typical depth of 300mm.
- **Cohesive Glacial Deposits:** Stiff, dark reddish brown and grey, slightly sandy Clay. Encountered in all 4 exploratory holes to between 1.1m and 2.0m depth.
- **Granular Glacial Deposits:** Light grey slightly clayey Sand. Encountered in 2 exploratory holes, directly below the cohesive glacial deposits, to greater than 2.2m depth.

8.1.5 Groundwater was not encountered in any exploratory hole.

8.1.6 No visual or olfactory evidence of hydrocarbon contamination was noted in any of the trial pits.

8.2 UK guidance

8.2.1 General notes about soakaways, including their location, design, and Lithos' test methodology are presented in Appendix A.

8.2.2 CIRIA C753⁵ recommends that soakaways should not be constructed 'in ground where the water table reaches a level within 1m below the base of the soakaway at any time of the year'.

8.2.3 BRE DG365⁶ "Soakaway Design" advises that each soakaway pit should be filled and allowed to drain three times to near empty on the same or consecutive days.

8.3 Field tests

8.3.1 Soakaway testing was carried out in 4 pits, in general accordance with BRE DG365 "Soakaway Design". The locations of the soakaways are shown on Drawing 4405/6 in Appendix B.

8.3.2 General notes about soakaways, including their location, design, and Lithos' test methodology are shown in Appendix A.

8.3.3 Infiltration rates are calculated in accordance with BRE Digest 365. This design considers the time of emptying the soakaway pit between 25% and 75% of its effective depth. The effective depth is calculated from the starting water level to the soakaway pit base.

⁵ CIRIA C753. *The SuDS Manual* (2015).

⁶ BRE DG365. *Soakaway Design* (2016).

- 8.3.4 However, despite running each test for up to 3 hours, drainage rates here (summarised in the table below) were not sufficient to allow calculation of infiltration rates for any of the tests undertaken.

Soakaway	Stratum	Infiltration rate (m/s)	Remarks
SA01	Cohesive glacial deposits (0.3-1.1m) Granular glacial deposits (1.1-2.2m)	N/A	Still >95% full after 3.5 hours.
SA02	Cohesive glacial deposits (0.3-1.8m)		Still >95% full after 3 hours.
SA03	Cohesive glacial deposits (0.3-1.8m)		Still 90% full after 3 hours.
SA04	Cohesive glacial deposits (0.3-2.0m) Granular glacial deposits (2.0-2.2m)		Still >95% full after 2.5 hours.

- 8.3.5 Given that the initial testing did not reach 25% effective depth, no subsequent re-fill cycles were undertaken.

8.4 Discussion & Conclusions

- 8.4.1 The low infiltration rates are likely due to the clayey nature of shallow natural soils (Cohesive Glacial Deposits). Where Granular strata were encountered, they were typically silty/clayey.
- 8.4.2 Consequently, soakaways will not provide a suitable drainage solution for the discharge of surface water run-off at the site; and therefore, there will be a need for surface water balancing.

9 CONCLUSIONS & RECOMMENDATIONS

9.1 General

- 9.1.1 The site comprises c. 33.75 hectares of land located in the south of Knowsley about 10km northeast of Liverpool city centre. The site has remained undeveloped and unchanged since pre-1850, with the exception of a pond in the west being infilled by 1909.
- 9.1.2 It is understood that Hallam Land are acting as the land agent and that the site is to be redeveloped with residential properties; an Illustrative Framework Plan has been prepared.
- 9.1.3 The main issues considered in this report, and in particular in Sections 3 & 4 are based on a review of historical maps and available geological/environmental data. This report provides an assessment of geoenvironmental issues and implications associated with the proposed residential redevelopment of the site.

9.2 Mining and quarrying

- 9.2.1 This site is located beyond the CA's defined coalfields.
- 9.2.2 'Knowles Pits' & 'Howards Pits', located in wooded areas (centre-south of the site), were created prior to 1850 and may have been ponds from that time. It is not clear what was extracted from these former pits; it might have been sand & gravel, or possibly clay for brick making. Alternatively, the pits may have been created to encourage water fowl for game (shooting).
- 9.2.3 A former pond has been infilled in the west.
- 9.2.4 With the exception of Akers Pits c. 100m to the east, no other areas adjacent to the site show evidence of mining, quarrying, pitting, or landfilling

9.3 Hazardous gas

- 9.3.1 The site is in an area where less than 1% of homes are estimated to be above the radon action level, however there are known or suspected areas of land infilling on site (former pond).
- 9.3.2 If significant made ground with a high TOC content is encountered in the area of the infilled pond, then the site could be considered to be at potential risk from migrating hazardous gas. Subsequently, wells should then be installed in shallow boreholes to allow subsequent monitoring for hazardous gas in order to determine appropriate gas protection measures for the proposed dwellings.

9.4 Foundations

- 9.4.1 At present, no geotechnical ground investigation data is available and consequently it is only possible to estimate the ground conditions. Before firm foundation recommendations can be given, it will be necessary to undertake an appropriate ground investigation. However, tentative recommendations are provided below.
- 9.4.2 Made ground is not generally considered a suitable founding material and foundations should be taken through it, into underlying natural in-situ strata of adequate bearing capacity.
- 9.4.3 The published geological data suggests that Cohesive Glacial Till (likely firm to stiff gravelly Clay) is present to c. 5m depth. This is underlain by the Chester Formation Sandstone bedrock.

- 9.4.4 Given the anticipated ground conditions, it is likely that most, if not all, plots on the site could be founded on traditional strip foundations typically at a minimum of 900mm depth within the Cohesive Glacial Till. In areas of tree influence these will need to be deepened to overcome heave of the soil.

9.5 Highways and external works

- 9.5.1 Given the relatively level nature of the site, there should be no requirement for retaining walls, underbuild, tanking etc.
- 9.5.2 Cohesive soils (Glacial Till) should yield a CBR of approximately 3%. This value should be verified prior to or during construction.

9.6 Soakaways & drainage

- 9.6.1 Soakaway testing was carried out in 4 pits, in general accordance with BRE DG365 "Soakaway Design". However, despite running each test for up to 3 hours, drainage rates were not sufficient to allow calculation of infiltration rates for any of the tests undertaken.
- 9.6.2 Consequently, soakaways will not provide a viable solution for the disposal of surface water and there may be a need for surface water balancing.
- 9.6.3 Alternative SUDS options (see CIRIA C753⁷ for further details) include:
- Pervious Pavements – provide a surface suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate into subsurface storage, with subsequent infiltration or controlled discharge. Pavement could be porous (water able to infiltrate across entire surface material; e.g. reinforced grass), or permeable (water infiltrates via joints between concrete blocks).
 - Swales – linear grassed features in which surface water can be stored or conveyed.
 - Basins - a ground depression designed to store surface water that is normally dry, except during and immediately following a rainfall event. There are two types:
 - Infiltration – basin designed to store runoff and infiltrate it gradually into the ground.
 - Detention – an outlet restricts flows, so that the basin fills and provides attenuation.
 - Ponds – designed to have permanent pool of water, but with capacity to provide temporary storage-controlled discharge.
- 9.6.4 CIRIA C753 is commonly used guidance for the design of SuDS features (including attenuation assets).
- 9.6.5 With respect to detention basins, which should normally be dry, water table levels should be taken from borehole monitoring wells over 4 consecutive seasons, for at least 3 points in the basin area. The detention basin should be designed to ensure that there is a minimum of 1m of unsaturated soil between the maximum groundwater level and the lowest part of the structure.

⁷ CIRIA C753 (2015) – The SuDS Manual.

9.7 Contamination

- 9.7.1 The site's environmental setting is considered to be of moderate sensitivity. With respect to human health, the proposed end use (residential) is also sensitive.
- 9.7.2 Based on observations made during the site walkover, and given site's former pond, localised made ground is anticipated, and it is considered likely that some (probably minor) ground contamination will be present in shallow soils within its vicinity and beneath the track of Home Farm Road, crossing the north of the site.
- 9.7.3 No other potentially contaminative industrial land uses were identified as having been present on the site. However, arable farming has historically been carried out. The farming activities and made ground associated with possible land infilling and levelling in other areas of the site may have given rise to some limited contamination.
- 9.7.4 Consequently, a ground investigation is required in order to assess the degree and extent of any ground contamination.

9.8 Potential development constraints

- 9.8.1 The site lies within a groundwater Source Protection Zone (**SPZ 3**) for the Sandstone aquifer. It is likely that the Environment Agency will request more detail, and at an earlier stage, than usual with respect to drainage design and measures to mitigate pollution (interceptors etc). They may require drainage to be kept at shallowest possible depths. They may also require details of mitigation measures to reduce pollution risks during the construction phase.
- 9.8.2 The BT overhead presents a potential development constraint unless it can be relocated. Additional enquiries are required to ascertain the feasibility of such diversionary works and the particular easement required by each service undertaker if they remain in-situ.

9.9 Further investigation

- 9.9.1 Whilst the site is considered suitable for its current and proposed use, the proposed change in use will require intrusive investigation.
- 9.9.2 This would include:
- Machine-excavated trial pits to determine near surface ground conditions including depth to bedrock, the presence of obstructions, groundwater and stability
 - Dynamic sampling (mini-boreholes) to allow the installation of shallow gas monitoring wells **if** significant made ground is encountered in the former pond during the pitting.
 - Geotechnical soils analysis to enable foundation recommendations
 - Chemical testing on soil samples to assess the significance of contamination, if any
 - Gas monitoring and risk assessment if significant made ground is encountered in the former pond during the pitting.
- 9.9.3 An appropriate ground investigation strategy is presented in Section 7.2.

Appendix A

General Notes

General

Third party information obtained from the British Geological Survey (BGS), the Coal Authority, the Local Authority etc is presented in the "Search Responses" Appendix of this Geoenvironmental Report.

Geology, mining & quarrying

In order to establish the geological setting of a site, Lithos refer to BGS maps for the area, and the relevant geological memoir. Further information is sourced by reference to current and historical OS plans.

In July 2011, the Coal Authority (CA) formalised their requirements in relation to planning applications and introduced some new terminology. The CA, using its extensive records has prepared plans for all coalfield Local Planning Authorities, which effectively refines the defined coalfield areas into High Risk and Low Risk areas. **High Risk** areas are likely to be affected by a range of legacy issues that pose a risk to surface stability, including: mine entries; shallow coal workings; workable coal seam outcrops; mines gas; and previous surface mining sites. **Low Risk** areas comprise the remainder of the defined coalfield, and are areas where no known defined risks have been recorded; although there may still be unrecorded issues. Where a site lies within either a High or Low Risk area, a mining report is obtained from the CA.

Landfills

Reference is made to publicly available Government held digital data via **QGIS** (an Open Source Geographic Information System), data from Landmark or Groundsure, and sometimes the Environment Agency and the Local Authority with respect to known areas of landfilling within 250m of the proposed development site.

Historical OS plans are also inspected for evidence of backfilled quarries, railway cuttings, colliery spoil tips etc.

Radon

Radon is a colourless, odourless gas, which is radioactive. It is formed in strata that contain uranium and radium (most notably granite), and can move through fissures eventually discharging to atmosphere, or the spaces under and within buildings. Where radon occurs in high concentrations, it can pose a risk to health.

In order to assess potential risks associated with radon gas, Lithos refer to BRE Report BR211¹, and the Public Health England website. Advice on the limitation of exposure of the population to radon in buildings was originally published in 1990 by the National Radiological Protection Board (NRPB), which joined the Health Protection Agency (HPA) in 2005; the HPA updated NRPB advice in July 2010². The HPA became part of Public Health England in 2013.

The HPA recommended that the NRPB radon Action Level for homes be retained, and a new Target Level for radon in homes be introduced. The values of the Action Level and Target Level, expressed as the annual average radon concentration in the home, are 200 Bqm⁻³ and 100 Bqm⁻³ respectively. The Target Level was to provide an objective for remedial action in existing homes and preventive action in new homes.

The term 'radon Affected Area' is defined as those parts of the country with >1% of homes estimated to be above the Action Levels. The NRPB first indicated which parts of the country should be regarded as radon Affected Areas in 1990. A more detailed mapping method was developed by the HPA in conjunction with the British Geological Survey in 2007³. The level of protection needed is site-specific and can be determined by reference to this mapping on the Public Health England website, which indicates the highest radon potential within each 1km grid square. Each 1km grid square is classified on the basis of the percentage of existing homes within that grid square estimated to have radon concentrations above the Action Level. There are 6 'bands': <1%; 1 to 3%; 3 to 5%; 5 to 10%; 10 to 30%; and >30%.

The NRPB advised that action should be taken to reduce radon concentrations in existing homes if the radon concentration exceeded the Action Level of 200 Bqm⁻³ in room air averaged over a year; ten times the average UK domestic radon concentration. NRPB advice informed changes in the requirements for radon protection in new buildings.

- **Basic** preventive measures are required in new buildings, extensions, conversions and refurbishments if the probability of exceeding the Action Level is **>3%** in England and Wales, and >1% in Scotland and Northern Ireland.
- Provision for further preventive (**Full**) measures is required in new buildings if the probability of exceeding the Action Level is **>10%**.

At present Building Regulations Approved Document C advocates basic measures for the probability banding 3% to 10%, and full measures if >10%. However, Public Health England would like to see all new build include basic measures.

Action & Target Levels should also be applied to non-domestic buildings with public occupancy exceeding 2,000 hrs/yr and to all schools.

Hydrogeology

Reference is made to publicly available Government held digital data via QGIS, and Landmark or Groundsure with respect to:

- Groundwater quality
- Recorded pollution incidents
- Licensed groundwater abstractions

From April 2010 the EA's Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply), but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey. The maps are split into two different types of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels
- Bedrock - solid permeable formations e.g. sandstone, chalk and limestone

The maps display the following aquifer designations:

Principal aquifers: These are layers of rock or superficial deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary aquifers: These include a wide range of rock layers or superficial deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into three types:

- **Secondary A** - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
- **Secondary B** - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers
- Secondary undifferentiated - In most cases, this is because the rock type in question has previously been designated as both a minor and non-aquifer in different locations due to the variable characteristics.

¹ BRE Report BR211, 2015: "Radon: guidance on protective measures for new buildings.

² Limitation of Human Exposure to Radon, Documents of the Health Protection Agency - Radiation, Chemical and Environmental Hazards, RCE-15. July 2010.

³ Miles JCH, Appleton JD, Rees DM, Green BMR, Adlam KAM and Myers AH (2007). Indicative Atlas of Radon in England and Wales. Chilton, HPA-RPD-033.

Unproductive strata: These are rock layers or superficial deposits with low permeability that have negligible significance for water supply or river base flow.

The EA maps only display the principal and secondary aquifers as coloured areas. All uncoloured areas on the map will be unproductive strata. However, for uncoloured areas on the superficial (drift) designation map it is not possible to distinguish between areas of unproductive strata and areas where no superficial deposits are present; to do this, it is necessary to consult the published geological survey maps.

For the purposes of the EA's Groundwater Protection Policy the following default position applies, unless there is site specific information to the contrary:

- If no superficial (drift) aquifers are shown, the bedrock designation is adopted
- In areas where the bedrock designation shows unproductive strata (the uncoloured areas) the superficial designation is adopted
- In all other areas, the more sensitive of the two designations is used (e.g. If secondary superficial overlies principal bedrock, an overall designation of principal is assumed)

The EA have also designated groundwater Source Protection Zones, which are based on proximity to a groundwater source (springs, wells and abstraction boreholes). The size of a Source Protection Zone is a function of the aquifer, volume of groundwater abstracted and the effective rainfall, and may vary from tens to several thousand hectares.

Hydrology

Reference is made to publicly available Government held digital data via QGIS, and Landmark or Groundsure with respect to:

- Surface water quality
- Recorded pollution incidents
- Licensed abstractions (groundwater & surface waters)
- Licensed discharge consents
- Site susceptibility to flooding

The EA have set **water quality** targets for all rivers. These targets are known as River Quality Objectives (RQOs). The water quality classification scheme used to set RQO planning targets is known as the River Ecosystem scheme. The scheme comprises five classes (RE1 to RE5) which reflect the chemical quality requirements of communities of plants and animals occurring in our rivers.

General Quality Assessment (GQA) grades reflect actual water quality. They are based on the most recent analytical testing undertaken by the EA. There are 6 GQA grades (denoted A to F) defined by the concentrations of biochemical oxygen demand, total ammonia and dissolved oxygen.

The susceptibility of a site to **flooding** is assessed by reference to a Flood Map on the Environment Agency's website. These maps show natural floodplains - areas potentially at risk of flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas. There are two different kinds of area shown on the Flood Map:

1. Dark blue areas (Flood Zone 3) could be flooded by the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year, or by a river by a flood that has a 1% (1 in 100) or greater chance of happening each year
2. Light blue areas (Flood Zone 2) show the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance of occurring each year

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Where there is no blue shading (Flood Zone 1), there is less than a 0.1% (1 in 1000) chance of flooding occurring each year.

The maps also show all flood defences built in the last five years to protect against river floods with a 1% (1 in 100) chance of happening each year, or floods from the sea with a 0.5% (1 in 200) chance of happening each year, together with some, but not all, older defences and defences which protect against smaller floods.

The Agency's assessment of the likelihood of flooding from rivers and the sea at any location is based on the presence and effect of all flood defences, predicted flood levels, and ground levels.

It should also be noted that as the floodplain shown is the 1 in 100 year, areas outside this may be flooded by more extreme floods (e.g. the 1 in 1000 year flood). Also, parts of the areas shown at risk of flooding will be flooded by lesser floods (e.g. the 1 in 5 year flood). In some places due to the shape of the river valley, the smaller floods will flood a very similar extent to larger floods but to a lesser depth.

If a site falls within a floodplain, it is recommended that a flood survey be undertaken by a specialist who can advise on appropriate mitigating measures; i.e. raising slab levels, provision of storage etc. In accordance with Chapter 10 of the National Planning Policy Framework, a site-specific flood risk assessment is required for: proposals of 1 hectare or greater in Flood Zone 1, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and any new development in Flood Zones 2 and 3.

COMAH & explosive sites

Lithos obtain information from Landmark or Groundsure with respect to Control of Major Accident Hazards (COMAH) or explosive sites within 1km of the proposed development site. Lithos' report refers to any that are present, and recommends that the Client seeks further advice from the HSE.

Areas around COMAH sites (chemical plants etc) are zoned with respect to the implementation of emergency plans. The HSE are a statutory consultee to the local planning authority for all COMAH sites. The COMAH site may have to revise its emergency action plan if development occurs. This might be quite straightforward or could entail significant expenditure. Consequently, the COMAH site may object to a proposed development (although it is the Local Authority who have final say, and they are likely to place more weight on advice from the HSE).

Preliminary conceptual site model

The site's environmental setting (and proposed end use) is used by Lithos to assess the significance of any contamination encountered during the subsequent ground investigation.

Assessment of contaminated land is based on an evaluation of pollutant linkages (source-pathway-receptor). Contaminants within the near surface strata represent a potential source of pollution. The environment (most notably groundwater), site workers and end users are potential receptors.

Potential pollutant linkages are shown on a preliminary conceptual site model (pCSM). A CSM is essentially a cross-section through a site that reflects both the surface topography and underlying geology, and shows surface features of interest. The most significant sources of contamination are then superimposed onto this cross-section together with potential receptors (human health & controlled waters), and plausible pathways between the two. In addition to environmental issues, the CSM should also highlight geotechnical issues.

A pCSM is prepared after consideration of all available "desk study" data, and before design of the ground investigation. Data reviewed should include historical plans (with superimposition on a current-day plan), previous SI reports, geological maps etc. The pCSM, in conjunction with knowledge of site constraints (buildings, services, slopes etc) is used to design the ground investigation.

The revised CSM takes account of data obtained during the ground investigation, including the distribution of made ground, the nature and distribution of contamination etc.

Background

Soakaways have been the traditional way to dispose of stormwater from buildings and paved areas remote from a public sewer or watercourse. In recent years, soakaways have been used within urban, fully-sewered areas to limit the impact on discharge of new upstream building works, and to avoid costs of sewer up-grading outside a development.

Soakaways are increasingly seen as a more widely applicable option alongside other means of stormwater control and disposal. Soakaways must store the immediate stormwater run-off and allow for its efficient infiltration into the adjacent soil. They must discharge their stored water sufficiently quickly to provide the necessary capacity to receive run-off from a subsequent storm. The time taken for discharge depends upon the soakaway shape and size, and the surrounding soil's infiltration characteristics. Soakaways can be constructed in many different forms and from a range of materials.

BRE Digest 365, DG365: 1991 describes design and construction procedures, explains how to calculate rainfall design values and soil infiltration rates, and gives design examples. Further advice is provided in **NHBC Standards Chapter 5.3** (Section 9 & Appendix F), **Building Regulations Section 3** of Approved Document H (Drainage & Waste Disposal), and Chapter 13 of **CIRIA's SUDS Manual (C753:2015)**.

Soakaways should generally be built on land lower than or sloping away from buildings and be sited **at least 5m** from the foundations of a building.

BRE365 states that '**Groundwater should not rise to the level of the base of the soakaway** during annual variations in the water table' this is further reinforced in Chapter 13 of CIRIA C753:2015 which states that: "**A minimum distance of 1m between the base of the infiltration system and the maximum likely groundwater level should always be adopted. This is to minimise the risk of groundwater rising into the infiltration component and reducing the available storage volume, to protect the functionality of the infiltration process by ensuring a sufficient depth of unsaturated material and to protect the groundwater from any contamination in the run-off**". There may be a requirement to install groundwater monitoring wells at a site in order to monitor seasonal variations in groundwater level at least over a wet winter period.

Soakaways should **not be sited on sloping sites**, an assessment should also be made to ensure that infiltrating water will not cause a rise in groundwater levels, waterlogging of downhill areas or springs, and that slopes are not made unstable.

Made ground (and ground within 5m of deep fill) is not generally regarded as suitable for soakaways, due to the potential for inundation settlement and the leaching of contaminants.

Chalk: CIRIA C574:2002 notes that concentrated ingress of water into the chalk can initiate dissolution, particularly in low-density chalk. For this reason, soakaways should be sited well away from foundations for structures, roads or railways:-

- in areas where dissolution features are known to be prevalent, soakaways should be avoided but, if unavoidable, should be sited at least 20m away from foundations etc
- where the chalk is of low density (weak), or where density is not known, soakaways should be sited at least 10m away from foundations
- where the chalk is of medium density, or higher (moderately weak), soakaways should be sited at least 5m away from foundations

Test methodology

Lithos undertake soakaway tests in general accordance with BRE Digest 365 "Soakaway Design". The BRE Digest recommends that each soakaway pit is filled and allowed to drain three times to near empty; the three fillings to be on the same or consecutive days. However, each test can take over 2 hours to complete. Consequently, at site investigation / feasibility stage, testing is usually undertaken in a 'broad sweep', relatively widely spaced; often only 1 or 2 fills. The drainage designer reviews SI data and if soakaways look feasible, commences design with the incorporation of soakaways. Prior to finalising design, the Drainage Engineer will usually recommend further soakaway testing: (a) within 25m of proposed chamber locations; and (b) to include 3 fills.

Whilst in theory 3 fills is fine, in practice it is often not straightforward. Where drainage rates are quick (draining < 1 hour), allowing 3 fills per pit within a day, even larger water bowers (say 2,300 gallon/10,000 litre) will run out of water after testing in two pits. Re-filling can take 2 to 3 hours depending on available water supplies etc. So, it is typically only possible to do fully compliant BRE 365 testing in 4 pits a day.

Where infiltration is moderate (a fill drains in say 2 to 4 hours), soakaways may be considered feasible, but it will not usually be possible to complete 3 fills in a day. Therefore, it becomes necessary to leave pits open overnight (usually with a consequent need for hedges fencing, site security etc, or the use of stone backfill).

Infiltration rates

Infiltration rates for each soakaway test are calculated (where possible) in accordance with BRE Digest 365. This design takes into account the time of emptying the soakaway pit between 25% and 75% of its effective depth. The effective depth is calculated from the starting water level to the soakaway pit base. Where the water level did not fall to 25% effective depth, the data was interpolated in order to obtain a representative infiltration rate.

Soakaway design

Soakaway design should be carried out by a suitably qualified and experienced Drainage Engineer, in accordance with BRE Digest 365 using the infiltration rates calculated from soakaway testing during a ground investigation.

It is generally assumed that soakaways become impracticable on residential developments when:

- A chamber type design requires a square pit with side length in excess of 1.8m, or an effective depth greater than 1.5m.
- A trench type design requires a length greater than about 10m, or an effective depth greater than 1.5m.

Increasing the soakaway effective depth might offer a solution, but consideration should be given to:

- Standing groundwater level
- Depth to base of permeable strata
- Cost of excavation

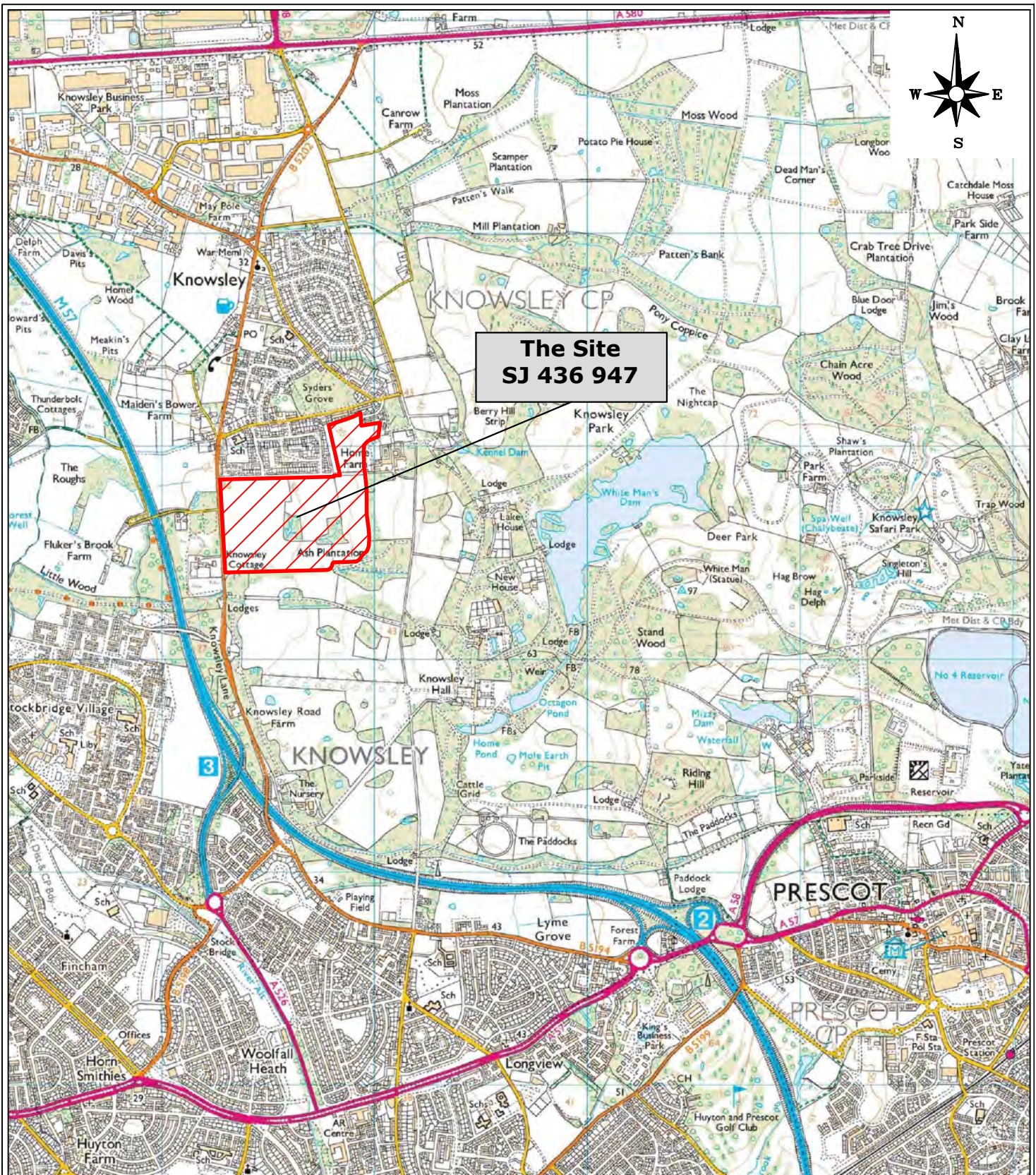
Soakaway percolation in some rock types is predominately via the vertical joints within the rock mass. The relatively small-scale soakaway test pits may not intercept such joints and this can result in variable test results. However, it is likely that the larger surface area of a completed soakaway within the development will intercept such joints.

The drainage designer submits designs for approval to:

- The Lead Local Flood Authority (LLFA), usually part of the Local Authority (e.g. NYCC). The LLFA are a consultee to the planning authority. They review the full technical design to ensure that proposals (both plots & highways) are satisfactory. The LLFA may also set standards for soakaway design (NYCC have, and these now require 3 fills and soakaway testing within 25m of proposed chamber locations).
- Local Authority Highways Dept. The Highways Authority adopt highways drainage, so review drainage design (via approval of a Section 38 submission). They also visit site to inspect construction.
- Building warranty provider (e.g. NHBC, Premier etc), if soakaways are proposed for roof & driveway waters.

Appendix B

Drawings



Reproduced from OS Explorer map 1:25,000 scale by permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office. Crown copyright. All rights reserved. Licence number 100049696.



info@lithos.co.uk
www.lithos.co.uk
Tel 01937 545330

CLIENT

HALLAM LAND
MANAGEMENT
LTD

JOB TITLE

HOME FARM
ROAD,
KNOWSLEY

DRAWING TITLE

SITE LOCATION
PLAN

DRAWN

AP

DATE

08/04/2022

CHECKED

REG

DATE

08/04/22

STATUS

FOR COMMENT ☐

DRAFT ☐

FOR APPROVAL ☐

FINAL ☒

SCALE

1:25,000

SHEET

A4

DRAWING NO.

4405/1

REVISION



NOTES

FROM STANTEC DRAWING 0112,
DATED 01/08/2025

REV.	DESCRIPTION	DATE
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CLIENT

HALLAM LAND
MANAGEMENT
LTD

JOB TITLE

HOME FARM
ROAD,
KNOWSLEY

DRAWING TITLE

ILLUSTRATIVE FRAMEWORK PLAN

DRAWN	WN	DATE	14 08 2025	STATUS	FOR COMMENT ☐
CHECKED	REG	DATE	14 08 2025	FOR APPROVAL	☐
				DRAFT	☐
				FINAL	☒

SCALE	1:3000	SHEET	A3	DRAWING NO.	4405/2	REVISION	
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- NOTES
- ARABLE FARMLAND
 - GRASS & OVERGROWN AREAS
 - WOODLAND & MATURE HEDGEROWS
 - GRAVEL OR HARDCORE SURFACING
 - POND/SURFACE WATER
 - LINE OF BT/TELECOMMS UTILITY
 - APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE



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Tel 01937 545330

CLIENT

HALLAM LAND
MANAGEMENT
LTD

JOB TITLE

HOME FARM
ROAD,
KNOWSLEY

DRAWING TITLE

SITE FEATURES

DRAWN	AP	DATE	19/04/2022	STATUS	FOR COMMENT ☐
CHECKED	REG	DATE	19/04/2022	FOR APPROVAL	☐
				DRAFT	☐
				FINAL	☒

SCALE	1:3000	SHEET	A3	DRAWING NO.	4405/3	REVISION	
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- NOTES
- ARABLE FARMLAND
 - GRASS & OVERGROWN AREAS
 - WOODLAND & MATURE HEDGEROWS
 - GRAVEL OR HARDCORE SURFACING
 - POND/SURFACE WATER
 - LINE OF BT/TELECOMMS UTILITY
 - APPROXIMATE SITE BOUNDARY
 - LOCATION & ORIENTATION OF PHOTOGRAPH

REV.	DESCRIPTION	DATE



info@lithos.co.uk
www.lithos.co.uk
Tel 01937 545330

CLIENT

HALLAM LAND
MANAGEMENT
LTD

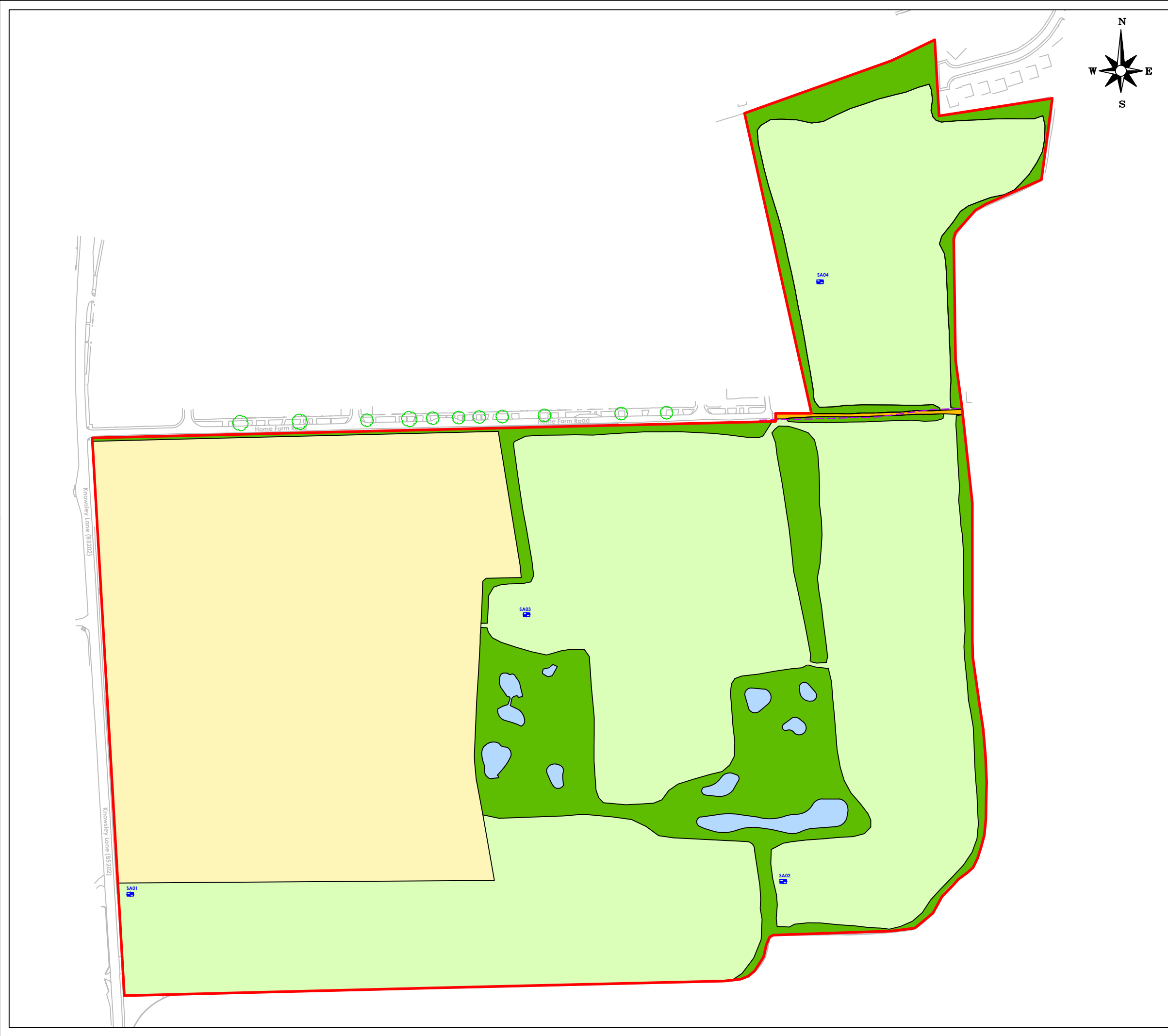
JOB TITLE

HOME FARM
ROAD,
KNOWSLEY

DRAWING TITLE

SITE PHOTOGRAPHS

DRAWN	AP	DATE	19/04/2022	STATUS	FOR COMMENT ☐
CHECKED	REG	DATE	19/04/2022	FOR APPROVAL	☐
				DRAFT	☐
				FINAL	☒
SCALE	NOT TO SCALE	SHEET	A3	DRAWING NO.	4405/4
				REVISION	



NOTES

 SOAKAWAY PIT LOCATION

 APPROXIMATE SITE BOUNDARY

EXPLORATORY HOLE LOCATIONS BASED ON DATA FROM A HAND-HELD GPS (+/- 3M ACCURACY)

REV.	DESCRIPTION	DATE



info@lithos.co.uk
www.lithos.co.uk
Tel 01937 545330

CLIENT

HALLAM LAND
MANAGEMENT
LTD

JOB TITLE

HOME FARM
ROAD,
KNOWSLEY

DRAWING TITLE

EXPLORATORY HOLE LOCATIONS

DRAWN	WN	DATE	17 04 2025	STATUS	FOR COMMENT ☐
CHECKED	REG	DATE	17 04 2025	FOR APPROVAL ☐	DRAFT ☐
				FINAL	☒

SCALE	1:3000	SHEET	A3	DRAWING NO.	4405/6	REVISION	
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Appendix C

Commission

005/4405/REG

24th January 2025



Registered in England 07068066

Mr A Masters
Hallam Land Management Ltd
Tailors Corner
No. 1 Thirsk Row
Leeds
LS1 4DP

Parkhill
Wetherby
West Yorkshire
LS22 5DZ

T 01937 545 330

www.lithos.co.uk

Dear Adam

Home Farm Road, Knowsley Village (soakaways)

Further to your recent enquiry, please find attached our proposal for undertaking soakaway tests and updating the existing Desk Study report.

Brief examination of the relevant geological map suggests the site is underlain by Glacial Till (likely firm, gravelly Clays) to c. 5m depth, with sandstone bedrock at greater depth. Consequently, soakaway tests are considered unlikely to yield satisfactory results, but they would remove any ambiguity with respect to LLFA queries.

It is understood that the site consists of a single parcel of land of approximately 34 hectares and is currently arable farmland.

Fieldwork. We have allowed for the provision of a tractor towed bowser and the excavation of at least 4 trial pits with soakaway testing undertaken in each pit in order to assess suitability of the ground for house and highway surface water drainage. This will provide an 'initial sweep' at very wide spacings and often with only 1 or 2 fills.

We have assumed that it will be possible to excavate the pits and move around site using a wheeled JCB 3CX-type excavator, but this proposal has been put together without a recent site visit. If ground conditions are found to be significantly wet/boggy at the time of the investigation, it may be necessary to hire a tracked 360° excavator (E\O of £***). We will review the need for a tracked machine following a site visit.

We will make every effort to compact arisings and 'sweep' them over each pit. However, you should be aware that on completion of the investigation, "graves" of spoil (each about 3m long by 1m wide) unsuitable for trafficking, will be left up to 400mm proud at each trial pit location. At this stage, no allowance has been made for any further reinstatement such as removal of excess arisings, replacement of turf.

Soakaways will be undertaken in general accordance with BRE DG365 "Soakaway Design" and will be supervised and logged by an experienced geoenvironmental engineer.

It should be noted that if the initial soakaway tests yield satisfactory results, in order to obtain approvals from the LLFA, Highways etc, the drainage designer is likely to require further testing: (a) within 25m of proposed chamber locations; and (b) to include 3 fills. This work could be undertaken during a Phase 2 geoenvironmental appraisal for the site.

Fieldwork will likely take 1 day and, at the time of writing, could be commenced within 3 weeks of receipt of your written instruction to proceed.



Reporting & invoicing. On completion of the fieldwork a letter report will be issued within 5 days. The letter will include detailed engineering records, trial pit logs and infiltration calculation sheets.

Our lump sum fee for undertaking the above work is £*** plus VAT.

You have also suggested update of the existing **Desk Study** report. To do this, we would undertake a 'fresh' site walkover and obtain 'new' environmental search data from Landmark. We can confirm that we are able to do this for a fee of £*** plus VAT and would expect it to be drafted within 3 weeks of your instruction to proceed.

Please note if following instruction of the works outlined in this proposal, it is necessary to subsequently **postpone or cancel**, this should be done at least 3 working days before Lithos are due to commence intrusive investigation on site. We reserve the right to charge a cancellation fee in the event of later notification to cover plant / drill rig costs and abortive consultancy time. The cancellation fee will not exceed £*** plus VAT.

Health, safety & welfare: The works outlined above will be carried out in accordance with Lithos' task- and site- specific Risk Assessments and Method Statements.

Details of welfare will be included within the Method Statements, however, this investigation is expected to be completed within 1 working day and therefore it is not considered reasonably practicable to provide formal welfare facilities, and our proposal makes no allowance for so doing.

Utility plans are required in order to protect operatives from the hazards associated with striking buried services and avoid potentially substantial disruption\repair costs. We will make every effort not to damage any services (including review of utility plans and use of a CAT detector).

Most developers have copies of the necessary utility plans (including electricity, gas, water, drainage & telecom), and it would be appreciated if you could forward these prior to the proposed fieldworks. However, if you do not have the necessary plans, Lithos will obtain them direct from each of the utility companies.

Terms & conditions: Hallam and Lithos have an agreed Appointment document, and this work will be undertaken in accordance with that. However, if the Appointment term expires or remains unsigned, works will be undertaken in accordance with our Standard Terms and Conditions, a copy of which are enclosed.

It is hoped the above is sufficient for your present needs. However, should you require any further information, please contact the undersigned.

Yours sincerely

A handwritten signature in dark ink, appearing to read "Mark Perrin", written in a cursive style.

Mark Perrin
Director

for and on behalf of
LITHOS CONSULTING LIMITED

1 DEFINITIONS AND INTERPRETATION

- 1.1 In this Agreement, unless the context otherwise requires, the following words and expressions have the following meanings:

"Agreement" means these Terms (entitled "Terms and Conditions for the Appointment of Lithos Consulting"), the Proposal, any document recording your unequivocal acceptance of the Proposal and any other documents or parts of other documents expressly referred to in any of the foregoing;

"Documents" means all documents of any kind and includes plans, drawings, reports, programmes, specifications, Bills of Quantities, calculations, letters, e-mails, faxes, memoranda, films and photographs (including negatives), or any other form of record prepared or provided or received by, or on behalf of us, and whether in paper form or stored electronically or on disk, or otherwise;

"Intellectual Property" includes all rights to, and any interests in, any patents, designs, trade marks, copyright, know-how, trade secrets and any other proprietary rights or forms of intellectual property (protectable by registration or not) in respect of any technology, concept, idea, data, programme or other software (including source and object codes), specification, plan, drawing, schedule, minutes, correspondence, scheme, programme, design, system, process logo, mark, style, or other matter or thing, existing or conceived, used, developed or produced by any person;

"Project" means the project described in the Proposal and any enquiry from you on which we have based our Proposal;

"Proposal" means the offer document prepared by us in response to an enquiry or otherwise, in connection with the proposed provision of the Services;

"Services" means the work and services relating to the Project to be provided by us pursuant to the Agreement and as set out in the Proposal and includes any additions or amendments thereto made in accordance with these Terms;

"Terms" means these terms entitled "Lithos Consulting Terms of Appointment" as amended from time to time.

- 1.2 Words importing the singular only shall also include the plural and vice versa, where the context requires.
- 1.3 Words importing persons or parties shall include firms, corporations and any organisation having legal capacity and vice versa, where the context requires; and words importing a particular gender include all genders.
- 1.4 The sub-headings to the clauses of these Terms are for convenience only and shall not affect the construction of the Agreement.
- 1.5 A reference to legislation includes that legislation as from time to time amended, re-enacted or substituted and any Orders in Council, orders, rules, regulations, schemes, warrants, by-laws, directives or codes of practice issued under any such legislation.
- 1.6 In the event of conflict between the documents forming part of the Agreement, the Proposal shall prevail, followed by the Terms.

2 APPOINTMENT

- 2.1 You agree to engage us and we agree to provide the Services in accordance with the provisions of this Agreement.

3 OUR OBLIGATIONS

- 3.1 We shall perform the Services using the reasonable standard of skill and care normally exercised by qualified members of our profession, performing similar services under similar conditions.
- 3.2 We shall use all reasonable endeavours to perform the Services in accordance with relevant environmental and safety legislation.

4 YOUR OBLIGATIONS

- 4.1 Throughout the period of this Agreement you shall afford to us, or procure for our benefit, access to any site where access is required for the performance of the Services.
- 4.2 You accept responsibility for ensuring that we are notified in writing of all special site and/or plant conditions, including without prejudice to the generality of the foregoing, the existence and precise location of all underground services, cables, pipes, drains or underground buildings, constructions or any hazards, which you shall clearly mark on the ground or identify on accurate location plans supplied to us prior to the commencement of the Services. You shall also inform us in writing of any relevant operating procedures including any site safe operating procedures and any other regulations relevant to the carrying out of the Services. You shall indemnify us against all costs, losses, claims, demands and expenses arising as a result of any non-disclosure in this respect, including but not limited to indemnification against any action brought by the owner of the land or otherwise.
- 4.3 If you discover any conflict, defect or other fault in the information or designs provided by us pursuant to the Agreement, you will advise us in writing of such defect, conflict or other fault and we shall have the right to rectify the same or where necessary, to design the solution for rectification of any works carried out by others pursuant to the conflicting, defective or in any other way faulty information or designs.

5 COPYRIGHT

- 5.1 The copyright in all Intellectual Property prepared by or on behalf of us in connection with the Project for delivery to you shall remain vested in us.
- 5.2 You shall have a non-exclusive licence to copy and use such Intellectual Property for purposes directly related to the Project. Such licence shall enable you to copy and use the Intellectual Property but solely for your own purposes in connection with the Project and such use shall not include any licence to reproduce any conceptual designs or professional opinions contained therein nor shall it include any licence to amend any drawing, design or other Intellectual Property produced by us.
- 5.3 Should you wish to use such Intellectual Property in connection with any other works or for any other purpose not directly related to the Project or wish to pass any Intellectual Property to any third party, you must obtain our prior written consent. The giving of such consent shall be at our absolute discretion and shall be upon such terms as we may require. We shall not be liable to you for the use by any person of such Intellectual Property for any purpose other than that for which the same were prepared by or on our behalf.
- 5.4 Ownership of any proposals submitted to you that are not subsequently confirmed as part of the Services to be provided for you remain with us and such proposals must not be used as the basis for any future work undertaken by you or a third party and no liability can be accepted howsoever arising from such proposals.
- 5.5 In the event of you being in default of payment of any fees or other amounts due, we may suspend further use of the licence on giving no less than 2 calendar days' notice of the intention to do so. Use of the licence may be resumed on receipt of the outstanding amounts.

6 CONFIDENTIALITY

- 6.1 Neither you nor we shall at any time disclose to any person any confidential information concerning the business, affairs, customers, clients or suppliers of the other party or of any member of the group of companies to which the other party belongs, except as permitted by clauses 6.2 and 6.4.
- 6.2 Each party may disclose the other party's confidential information:
- (a) to its employees, officers, representatives, contractors, sub-contractors or advisers who need to know such information for the purposes of exercising the party's rights or carrying out its obligations under or in connection with this Agreement. Each party shall ensure that its employees, officers, representatives, contractors, sub-contractors or advisers to whom it discloses the other party's confidential information comply with this paragraph 6; and
- (b) as may be required by law, to a court of competent jurisdiction or any governmental or regulatory authority.
- 6.3 Neither you nor we shall use any other party's confidential information for any purpose other than to exercise our rights or perform our respective obligations under or in connection with this Agreement.
- 6.4 Subject to the above and our privacy policy which can be found on www.lithos.co.uk, we shall be permitted to use information related to the Services we provide in connection with the Project for the purposes of marketing its services and in proposals for work of a similar type.

7 ASSIGNMENT

- 7.1 You may assign the benefit of this Agreement on two occasions with our prior written consent (not to be unreasonably withheld) and any additional assignments shall be with our prior consent.
- 7.2 We may at any time assign, mortgage, charge, subcontract, delegate, declare a trust over or deal in any other manner with any or all of our rights and obligations under this Agreement.

8 INSURANCE

- 8.1 We shall maintain a professional indemnity insurance policy covering our liabilities for negligence under this Agreement, with a limit of indemnity of £5,000,000 (FIVE MILLION POUNDS) any one claim, save for pollution and contamination claims and asbestos claims both of which carry £2,000,000 (TWO MILLION POUNDS) in the aggregate cover. This policy is annually renewable and whilst renewal is not automatic, We shall maintain such insurance at all times until six years from the date of the completion (or termination) of the Services under this Agreement, provided such insurance is available at commercially reasonable rates and terms.
- 8.2 If for any period such insurance is not available at commercially reasonable rates and terms, we shall inform you and shall obtain in respect of such period such reduced level of professional indemnity insurance as is available and as would be fair and reasonable in the circumstances for us to obtain.

9 PAYMENT

- 9.1 Invoices for services rendered will be submitted for payment in accordance with the Proposal.
- 9.2 You shall pay you any VAT properly chargeable on the Services and any amount expressed as payable to us under this Agreement is exclusive of VAT unless stated otherwise.
- 9.3 The due date for payment is the date of the invoice and the final date for payment is 28 days from the date of the invoice.
- 9.4 If you dispute the amount included for payment in an invoice then you must serve a written notice on us no later than 14 calendar days before the final date for payment. If no notice is given within the required timeframe the amount due shall be the amount stated in the invoice.
- 9.5 If you fail to pay any monies in accordance with the foregoing payment provisions, we shall be entitled to charge interest on any monies owed to us, such interest to be at a rate of 4% above the base rate of a clearing bank from time to time calculated from the final date for payment to the date of actual payment on a compound basis. The parties acknowledge that our liability under this clause 10.5 is a substantial remedy for the purposes of section 9(1) of the Late Payment of Commercial Debts (Interest) Act 1998.

10 LIMITATIONS ON LIABILITY

- 10.1 Unless otherwise agreed in writing, our total liability under or in connection with this Agreement whether in contract, tort, negligence, breach of statutory duty or otherwise (other than in respect of personal injury or death) shall be limited to and shall not exceed the lesser of either the level of insurance cover referred to within clause 8.1 above, or 20 times the total value of invoices issued to you for the Services.
- 10.2 No action or proceedings under or in respect of the Agreement whether in contract, tort, negligence, under statute or otherwise shall be commenced against us after the expiry of a period of six years from the date of the completion (or termination) of the Services under this Agreement.
- 10.3 Whilst we usually scan for potential exploratory locations with a Cable Avoidance Tool, we shall not be liable for any damage to underground services, cables, pipes, drains or underground buildings, constructions and the like which were either not marked on site or for which accurate plans were not provided.
- 10.4 We shall not be liable for the cost of rectifying any defect, conflict or other fault in the information or designs provided by us or for the cost of designing a solution for and rectifying any subsequent works carried out by others pursuant to the conflicting, defective or in any other way faulty information or designs, unless we have been advised in writing of the same by you and have been given the opportunity to rectify the same or where necessary, to design the solution for rectification of any subsequent works carried out by others pursuant to the same.

11 DELAY

- We shall comply with any timescale agreed for completion of the Services unless delayed or prevented by circumstances beyond our reasonable control and in the event of any such circumstances arising we undertake to complete the Services within a reasonable period, but will not be liable to you for any delay as a result.

12 TERMINATION

- 12.1 The Agreement may be terminated by either of us in the event of the other making a composition or arrangement with its creditors, becoming bankrupt, or being a company, making a proposal for a voluntary arrangement for a composition of debts, or has a provisional liquidator appointed, or has a winding-up order made, or passes a resolution for voluntary winding-up (except for the purposes of a bona fide scheme of amalgamation or reconstruction), or has an administrator or an administrative receiver appointed to the whole or any part of its assets. Notice of termination must be given to the party which is insolvent by the other party.
- 12.2 If for any reason our Services are suspended for a period in excess of three calendar months then we shall be entitled to terminate our appointment under this Agreement in respect of the Services by no less than seven days written notice to you.
- 12.3 If you fail to pay in full any sum due under the terms of this Agreement by the final date for payment for that sum and no effective pay less notice is issued, we may serve written notice to you demanding payment within 14 days of such notice. If you fail to comply with such notice, we shall be entitled to terminate our employment under this Agreement forthwith.
- 12.4 Any termination of our appointment howsoever caused shall be without prejudice to our rights to require payment for all Services performed up to the date of such termination including but not limited to payment of a fair and reasonable proportion of any figure identified in the Proposal or otherwise for fees in respect of a particular service which Lithos has started, but not completed.

13 THIRD PARTY RIGHTS

- The Agreement shall not confer and shall not purport to confer on any third party any benefit or any right to enforce any term of this Agreement for the purposes of the Contracts (Rights of Third Parties) Act 1999 or otherwise.

14 COLLATERAL WARRANTIES & LETTERS OF RELIANCE

- We shall consider and may consent to a request from you for us to enter into a collateral warranty or letter of reliance with a third party with regard to the Services provided under this Agreement. The giving of such consent shall be at our absolute discretion and providing we agree to our standard form of collateral warranty or letter of reliance (subject to any reasonable changes to be approved by us at our absolute discretion) and in return for payment of a fee (to be notified at the time of the request).

15 NOTICES

- 15.1 Any notice provided for in the Agreement shall be in writing and shall be deemed to be properly given if delivered by hand or sent by pre-paid first class post to the address of the relevant party as may have been notified by each party to the other or, in the absence of notification, to our respective registered office addresses.
- 15.2 Such notice shall be deemed to have been received on the day of delivery if delivered by hand or on the second working day after the day of posting if sent by pre-paid first class post.

16 ENTIRE AGREEMENT

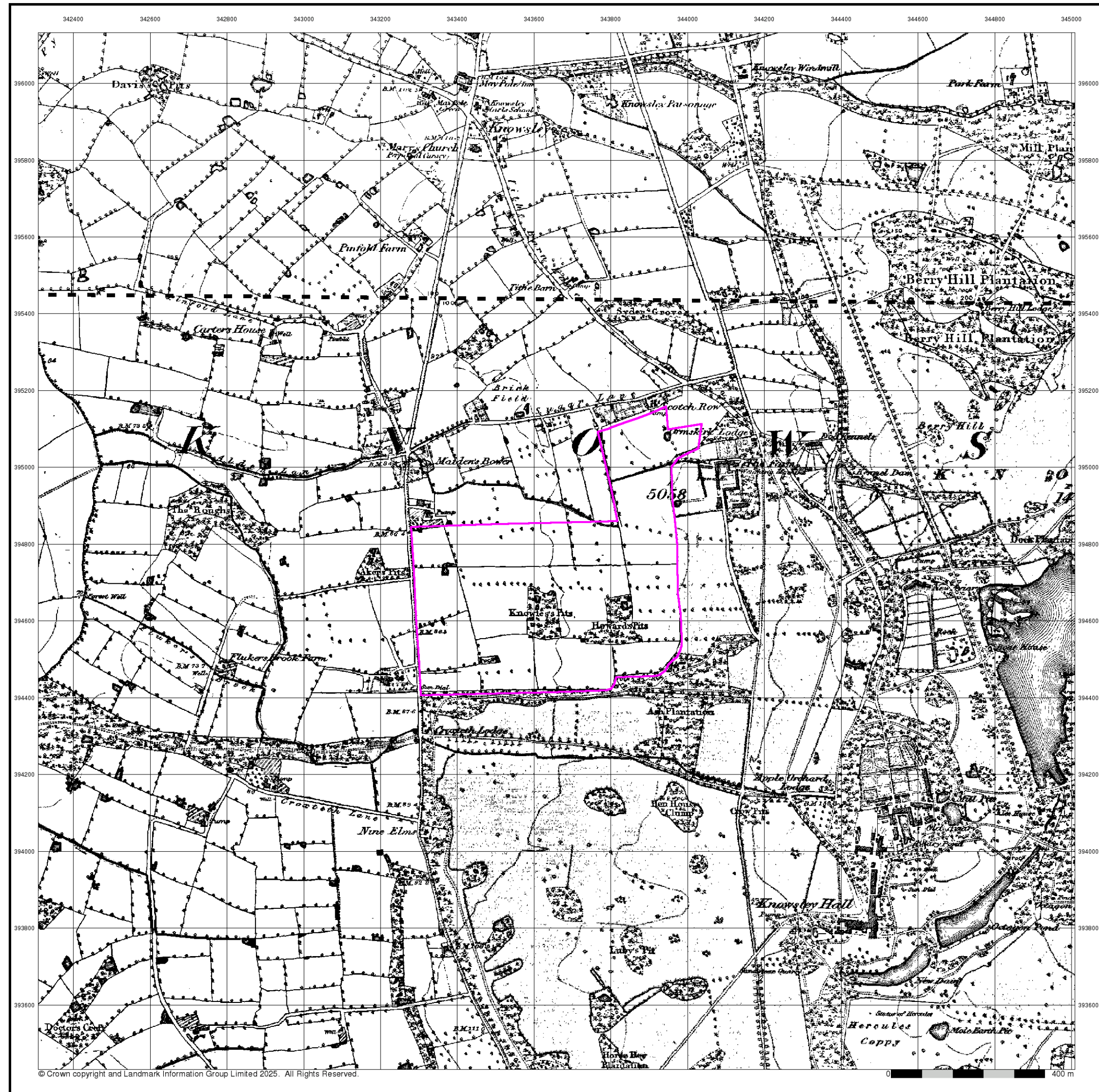
- 16.1 The Agreement constitutes the complete and entire agreement between us with respect to the Services and supersedes any prior oral and/or written warranties, terms, conditions, communications and representations, whether express or implied and any claim against us in respect of the Services can only be made in contract under the provisions of this Agreement and not otherwise under the law or tort or otherwise.
- 16.2 No amendments, modifications or variation of this Agreement shall be valid unless made in writing and agreed to by us; such agreement must be recorded in writing by at least one of us.
- 16.3 We shall not be bound by any standard or printed terms or conditions furnished by you in any of your documents unless we specifically state in writing separately from such documents that we intend such terms and conditions to apply.

17 DISPUTES, JURISDICTION AND GOVERNING LAW

- 17.1 This Agreement shall be governed by and construed in accordance with English law and we irrevocably and unconditionally submit to the jurisdiction of the English Courts.
- 17.2 Where the Housing Grants, Construction and Regeneration Act 1996 applies, any dispute between us may be referred to adjudication in accordance with The Scheme for Construction Contracts Regulations 1998 or any amendment or modification thereof being in force at the time of the dispute, as applicable to England, Wales, Scotland and Northern Ireland.

Appendix D

Historical OS Plans





Lancashire And Furness

Published 1850

Source map scale - 1:10,560

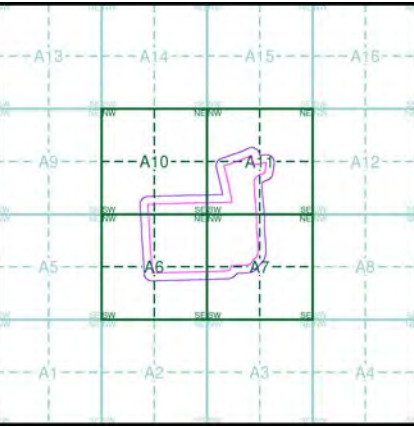
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some 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. 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)

10000
1850
1:10,560

10700
1850
1:10,560

Historical Map - Slice A



Order Details

Order Number:	374582026_1_1
Customer Ref:	PO24041/CH/4405
National Grid Reference:	343680, 394720
Slice:	A
Site Area (Ha):	34.41
Search Buffer (m):	50

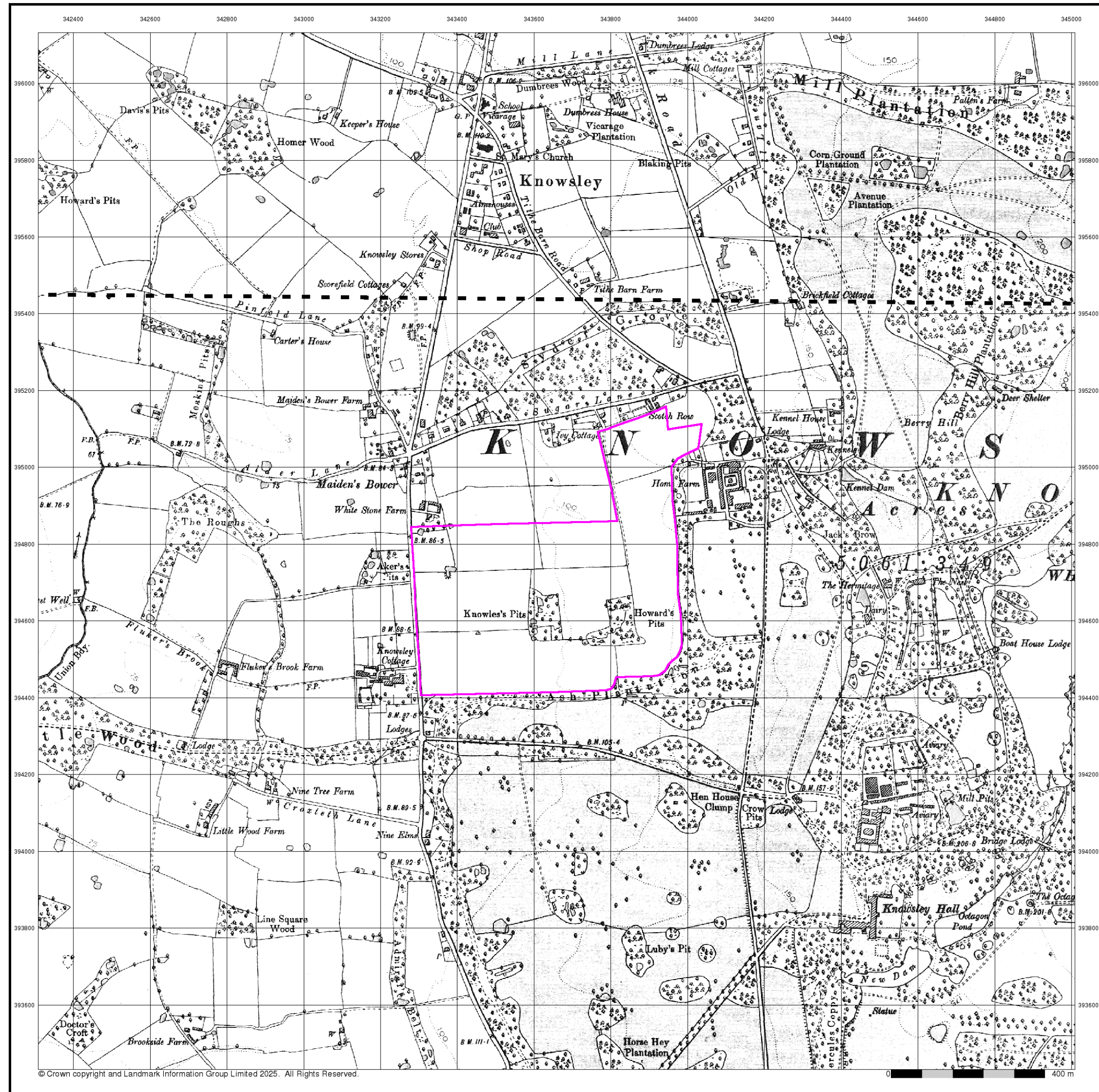
Site Details

Site at 343660, 394770



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

A Landmark Information Group Service v50.0 14-Apr-2025 Page 3 of 20



Lancashire And Furness

Published 1894

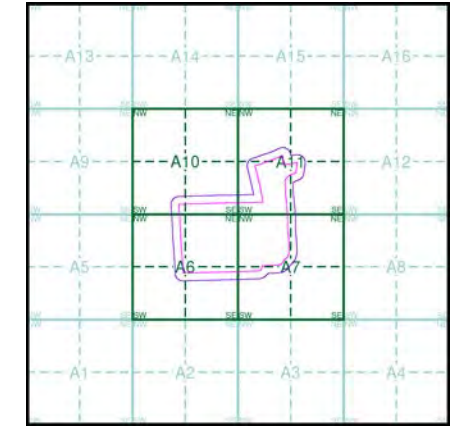
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore 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. 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)

100SW
1894
1:10,560
107NW
1894
1:10,560

Historical Map - Slice A



Order Details

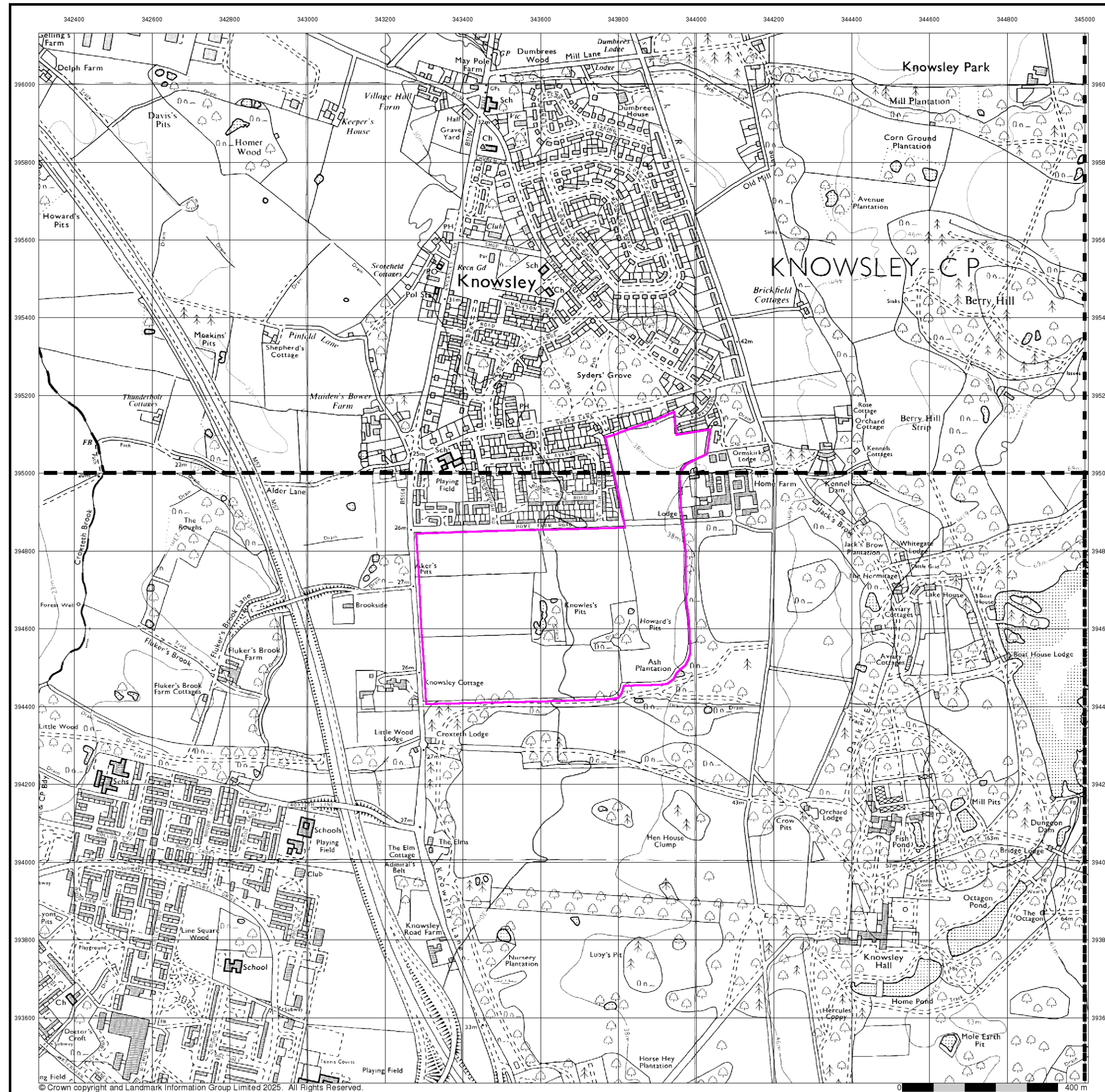
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Customer Ref:	PO24041/CH/4405
National Grid Reference:	343680, 394720
Slice:	A
Site Area (Ha):	34.41
Search Buffer (m):	50

Site Details

Site at 343660, 394770



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



Ordnance Survey Plan

Published 1978

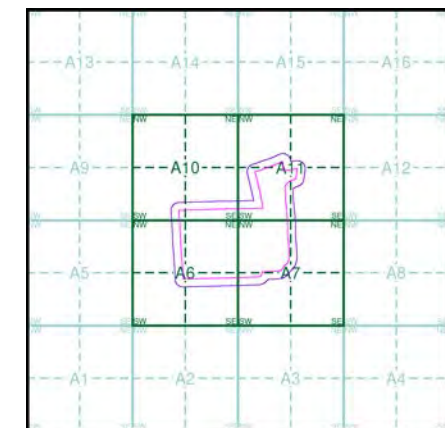
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore 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. 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)

SJ49NW	1978	1:10,000
SJ49SW	1978	1:10,000
SJ49SE	1978	1:10,000

Historical Map - Slice A



Order Details

Order Number: 374582026_1_1
Customer Ref: PO24041/CH/4405
National Grid Reference: 343680, 394720
Slice: A
Site Area (Ha): 34.41
Search Buffer (m): 50

Site Details

Site at 343660, 394770



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VectorMap Local

Published 2024

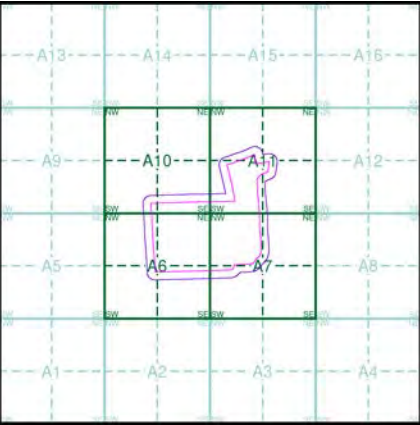
Source map scale - 1:10,000

VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities), 1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)

SJ49NW 2024 Variable	SJ49NE 2024 Variable
SJ49SW 2024 Variable	SJ49SE 2024 Variable

Historical Map - Slice A



Order Details

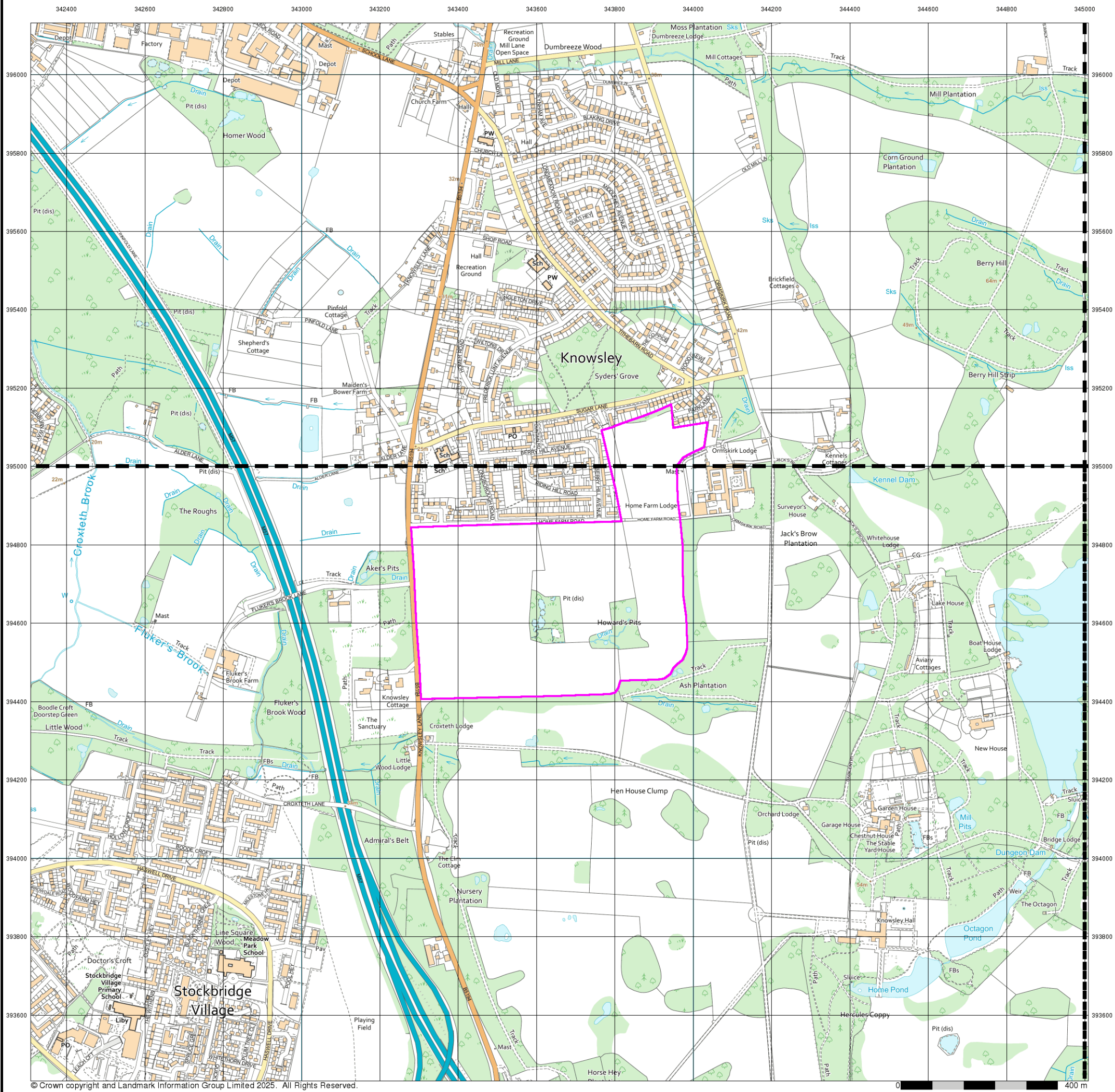
Order Number: 374582026_1_1
Customer Ref: PO24041/CH/4405
National Grid Reference: 343680, 394720
Slice: A
Site Area (Ha): 34.41
Search Buffer (m): 50

Site Details

Site at 343660, 394770



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Appendix E

Search Responses & other Correspondence



Envirocheck[®] Report:

Datasheet

Order Details:

Order Number:

374582026_1_1

Customer Reference:

PO24041/CH/4405

National Grid Reference:

343680, 394720

Slice:

A

Site Area (Ha):

34.41

Search Buffer (m):

50

Site Details:

Site at 343660, 394770

Client Details:

Mr M Perrin
Lithos Consulting Ltd
Parkhill
Walton Road
Wetherby
LS22 5DZ

Report Section	Page Number
Summary	-
Agency & Hydrological	1
Waste	6
Hazardous Substances	-
Geological	7
Industrial Land Use	9
Sensitive Land Use	10
Data Currency	11
Data Suppliers	16
Useful Contacts	17

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 this 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. The probability result is only valid for properties above ground. All basement and cellar areas are considered to be at additional risk from high radon levels. If an underground room such as a cellar or basement makes up part of the living or working accommodation, the property should be tested regardless of Radon Affected Area status.

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Report Version v53.0

Data Type	Page Number	On Site	0 to 50m (*up to 250m)
Agency & Hydrological			
BGS Groundwater Flooding Susceptibility	pg 1	Yes	Yes
Contaminated Land Register Entries and Notices			
Discharge Consents			
Prosecutions			
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		Yes	
Pollution Incidents to Controlled Waters			
Historical Prosecutions			
Registered Radioactive Substances			
Substantiated Pollution Incident Register			
Water Abstractions	pg 2		(*1)
Water Industry Act Referrals			
Groundwater Vulnerability Map	pg 2	Yes	n/a
Groundwater Vulnerability - Soluble Rock Risk			n/a
Groundwater Vulnerability - Local Information			n/a
Bedrock Aquifer Designations	pg 3	Yes	n/a
Superficial Aquifer Designations	pg 3	Yes	n/a
Source Protection Zones	pg 3	1	
Extreme Flooding from Rivers or Sea without Defences			
Flooding from Rivers or Sea without Defences			
Areas Benefiting from Flood Defences			
Flood Water Storage Areas			
Flood Defences			
OS Water Network Lines	pg 3	12	4
Water Framework Directive - Catchment	pg 5	Yes	
Water Framework Directive - Groundwater	pg 5	Yes	
Water Framework Directive - Surface Waters			

Data Type	Page Number	On Site	0 to 50m (*up to 250m)
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 6	2	n/a
Local Authority Recorded Landfill Sites			
Potentially Infilled Land (Non-Water)			
Potentially Infilled Land (Water)	pg 6	2	2
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			

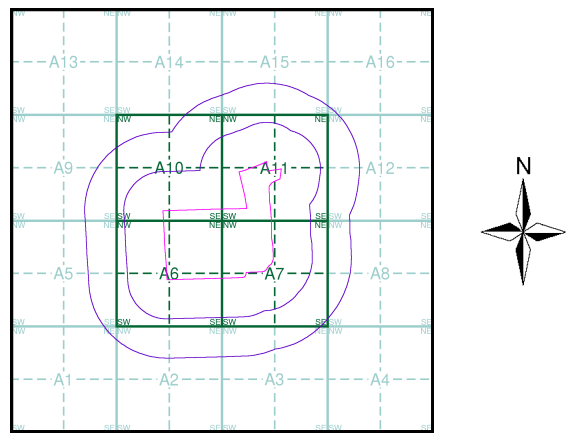
Data Type	Page Number	On Site	0 to 50m (*up to 250m)
Geological			
BGS 1:625,000 Solid Geology	pg 7	Yes	n/a
BGS Estimated Soil Chemistry	pg 7	Yes	
BGS Recorded Mineral Sites			
BGS Urban Soil Chemistry			
BGS Urban Soil Chemistry Averages			
CBSCB Compensation District			n/a
Coal Mining Affected Areas			n/a
Mining Instability	pg 7	Yes	n/a
Man-Made Mining Cavities			
Natural Cavities			
Non Coal Mining Areas of Great Britain			
Potential for Collapsible Ground Stability Hazards	pg 7	Yes	
Potential for Compressible Ground Stability Hazards			
Potential for Ground Dissolution Stability Hazards			
Potential for Landslide Ground Stability Hazards	pg 7	Yes	Yes
Potential for Running Sand Ground Stability Hazards	pg 7	Yes	
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 8	Yes	
Radon Potential - Radon Affected Areas			n/a
Radon Potential - Radon Protection Measures			n/a
Industrial Land Use			
Contemporary Trade Directory Entries			
Fuel Station Entries			
Points of Interest - Commercial Services			
Points of Interest - Education and Health			
Points of Interest - Manufacturing and Production	pg 9	1	
Points of Interest - Public Infrastructure			
Points of Interest - Recreational and Environmental			
Underground Electrical Cables			

Data Type	Page Number	On Site	0 to 50m (*up to 250m)
Sensitive Land Use			
Ancient Woodland			
Areas of Adopted Green Belt	pg 10	1	
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	pg 10	1	
Ramsar Sites			
Sites of Special Scientific Interest			
Special Areas of Conservation			
Special Protection Areas			
World Heritage Sites			



- General**
 - Specified Site
 - Specified Buffer(s)
 - Bearing Reference Point
 - Map ID
 - Several of Type at Location
- Agency and Hydrological**
 - Contaminated Land Register Entry or Notice (Location)
 - Contaminated Land Register Entry or Notice
 - Discharge Consent
 - Enforcement or Prohibition Notice
 - Integrated Pollution Control
 - Integrated Pollution Prevention Control
 - Local Authority Integrated Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control Enforcement
 - Pollution Incident to Controlled Waters
 - Historical Prosecutions
 - Prosecutions
 - Registered Radioactive Substance
 - River Network or Water Feature
 - Substantiated Pollution Incident Register
 - Water Abstraction
 - Water Industry Act Referral
- Waste**
 - BGS Recorded Landfill Site (Location)
 - BGS Recorded Landfill Site
 - EA Historic Landfill (Buffered Point)
 - EA Historic Landfill (Polygon)
 - Integrated Pollution Control Registered Waste Site
 - Licensed Waste Management Facility (Landfill Boundary)
 - Licensed Waste Management Facility (Location)
 - Local Authority Recorded Landfill Site (Location)
 - Local Authority Recorded Landfill Site
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Water)
 - Potentially Infilled Land (Water)
 - Potentially Infilled Land (Water)
 - Potentially Infilled Land (Water)
 - Registered Landfill Site
 - Registered Landfill Site (Point Buffered to 100m)
 - Registered Landfill Site (Point Buffered to 250m)
 - Registered Waste Transfer Site (Location)
 - Registered Waste Transfer Site
 - Registered Waste Treatment or Disposal Site (Location)
 - Registered Waste Treatment or Disposal Site
- Hazardous Substances**
 - COMAH Site
 - Explosive Site
 - NIHHS Site
 - Planning Hazardous Substance Consent
 - Planning Hazardous Substance Enforcement
- Geological**
 - BGS Recorded Mineral Site

Site Sensitivity Map - Slice A

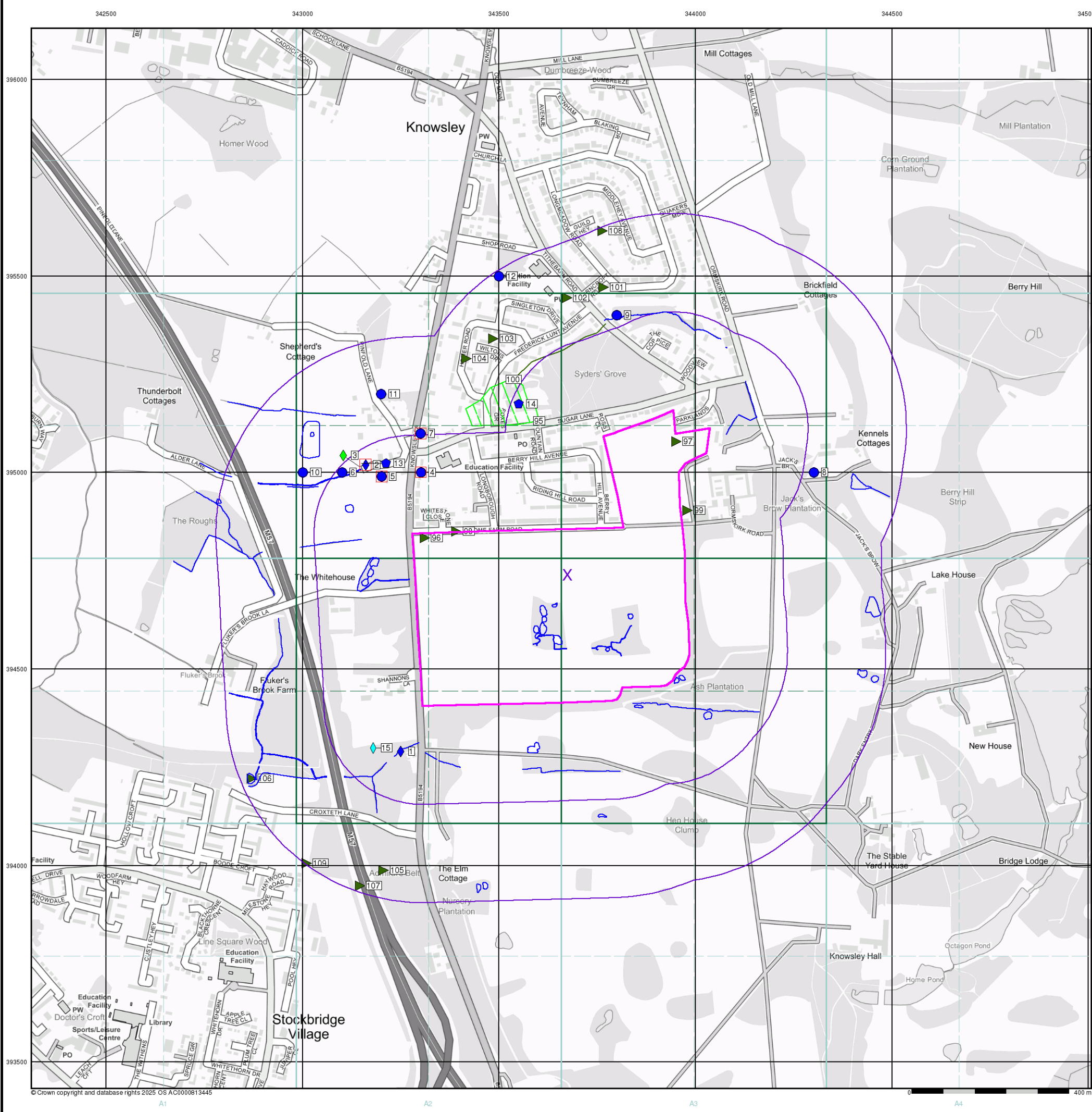


Order Details

Order Number: 376045229_1_1
Customer Ref: PO24041/CH/4405
National Grid Reference: 343680, 394740
Slice: A
Site Area (Ha): 34.41
Search Buffer (m): 500

Site Details

Site at 343660, 394770



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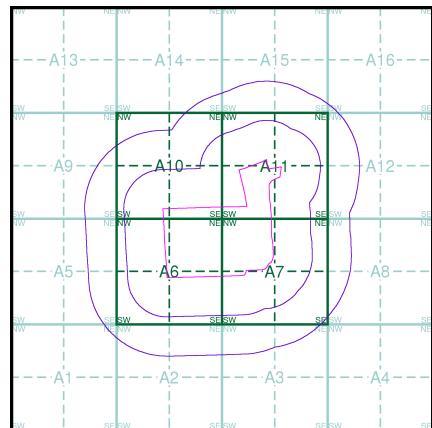
General

- Specified Site
- Specified Buffer(s)
- 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

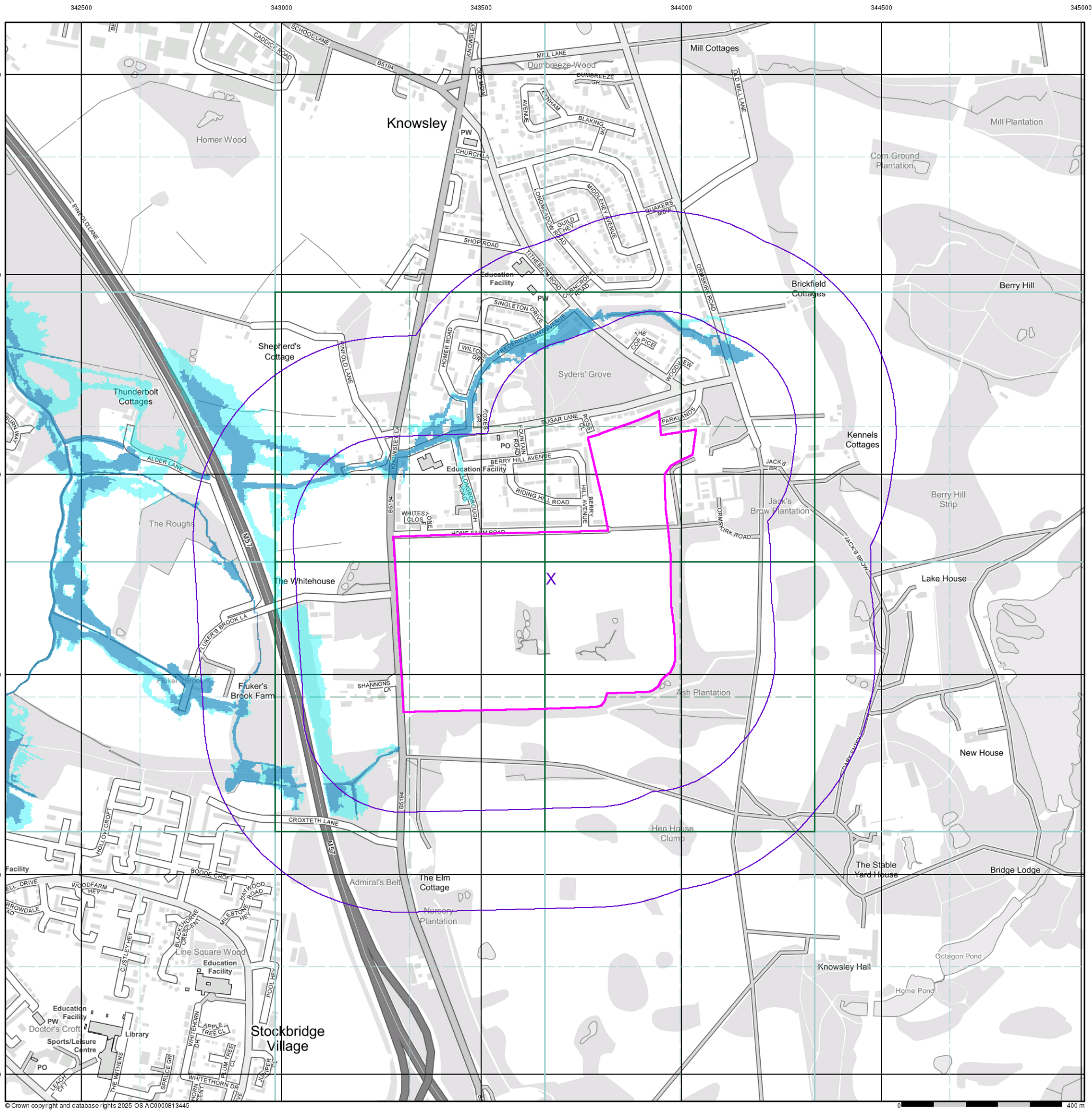
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Customer Ref: PO24041/CH/4405
National Grid Reference: 343680, 394740
Slice: A
Site Area (Ha): 34.41
Search Buffer (m): 500

Site Details

Site at 343660, 394770

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General

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

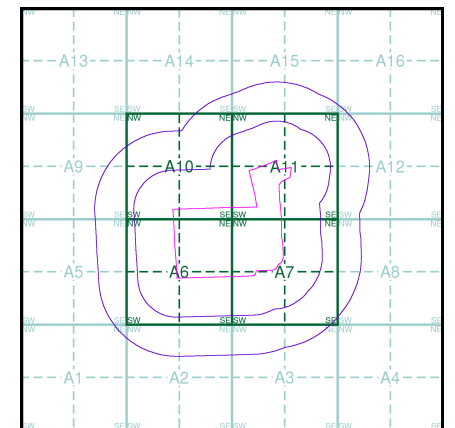
OS Water Network Data

- | | |
|--------------|-------------------------|
| Canal | Drain |
| Reservoir | Other |
| Foreshore | Lake |
| Marsh | Transfer |
| Tidal River | Lock Or Flight Of Locks |
| Inland River | Sea |

Contours (height in meters)

- Standard Contour 105 100 95
- Master Contour
- Spot Height 167.3
- MLW Mean Low Water
- MHW Mean High Water

OS Water Network Map - Slice A



Order Details

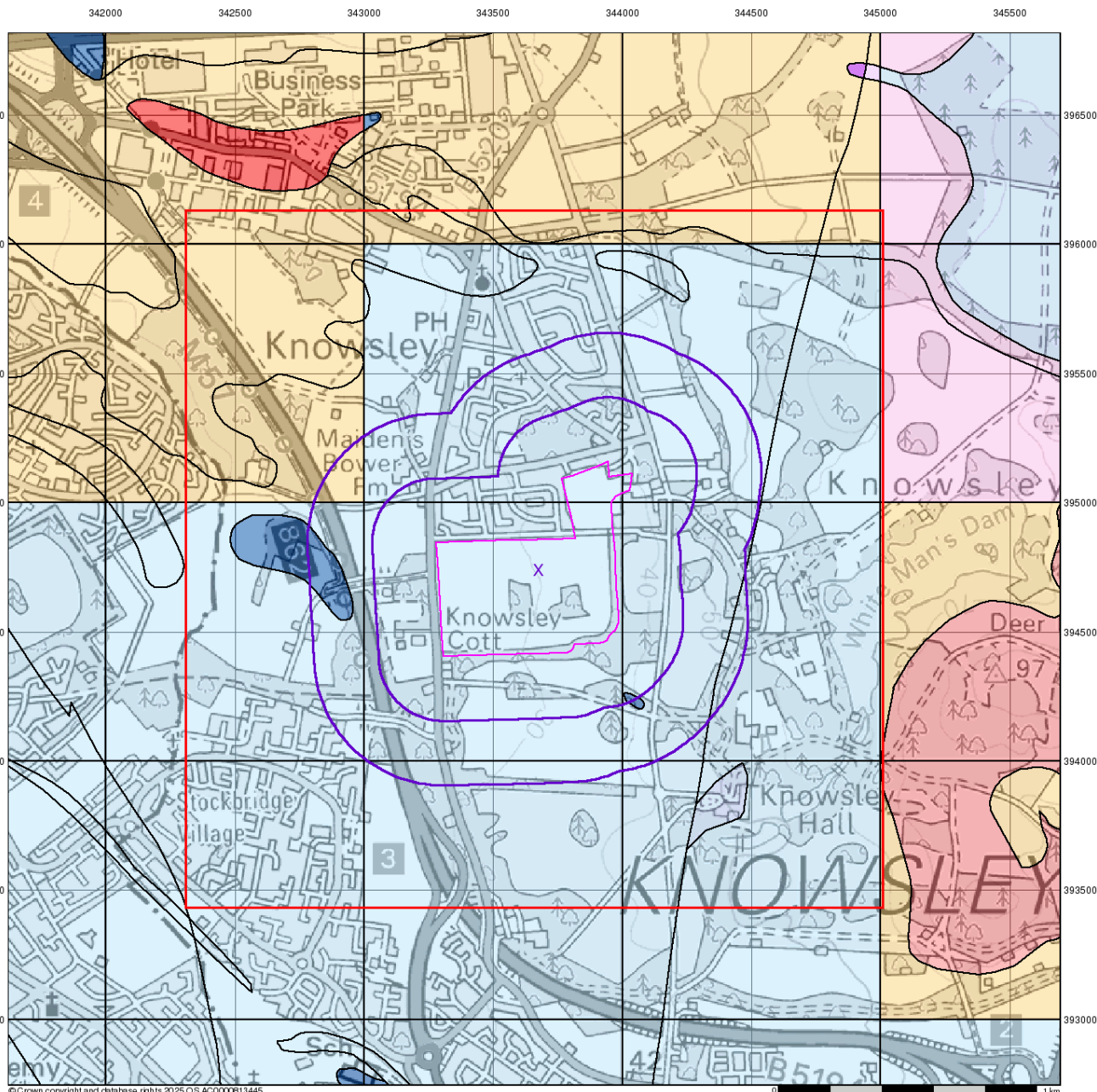
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Customer Ref: PO24041/CH/4405
National Grid Reference: 343680, 394740
Slice: A
Site Area (Ha): 34.41
Search Buffer (m): 500

Site Details

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Groundwater Vulnerability

General

- Specified Site ○ Specified Buffer(s) X Bearing Reference Point
- Slice 8 Map ID

Agency and Hydrological

Bedrock Aquifers

- High Vulnerability, Principal Aquifer
- High Vulnerability, Secondary Aquifer
- Medium Vulnerability, Principal Aquifer
- Medium Vulnerability, Secondary Aquifer
- Low Vulnerability, Principal Aquifer
- Low Vulnerability, Secondary Aquifer

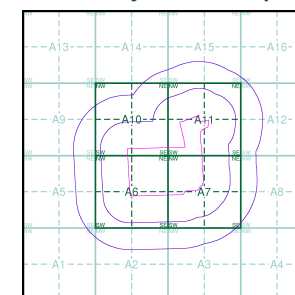
Superficial Aquifers

- High Vulnerability, Principal Aquifer
- High Vulnerability, Secondary Aquifer
- Medium Vulnerability, Principal Aquifer
- Medium Vulnerability, Secondary Aquifer
- Low Vulnerability, Principal Aquifer
- Low Vulnerability, Secondary Aquifer

■ Unproductive Aquifer

⋯ Soluble Rock

Site Sensitivity Context Map - Slice A



Order Details

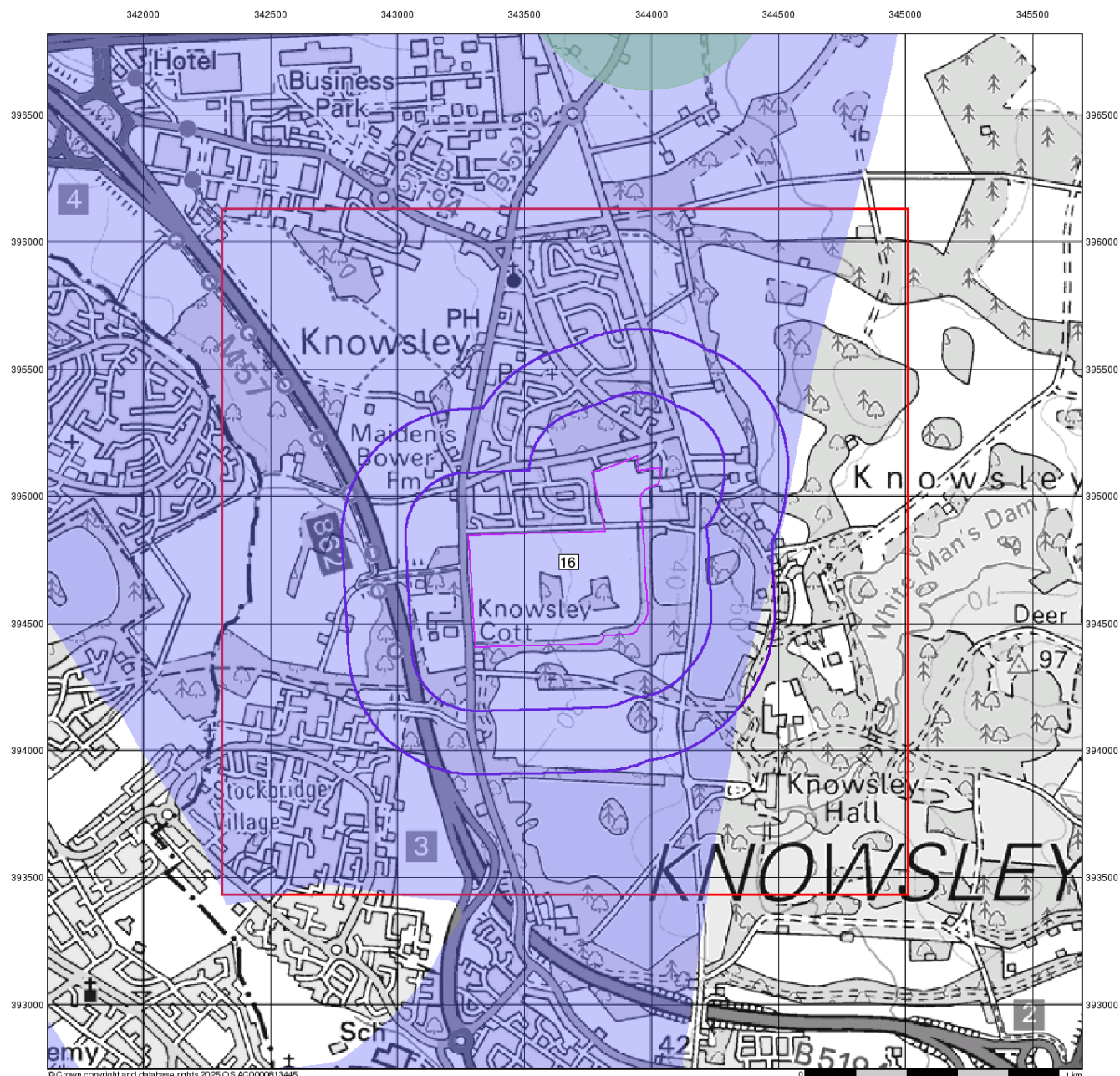
Order Number: 376045229_1_1
 Customer Ref: PO24041/CH/4405
 National Grid Reference: 343680, 394740
 Slice: A
 Site Area (Ha): 34.41
 Search Buffer (m): 500

Site Details

Site at 343660, 394770

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Source Protection Zones

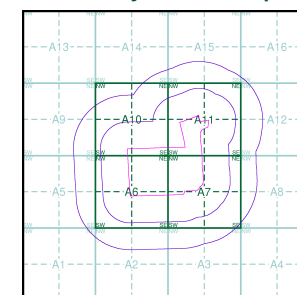
General

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

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 376045229_1_1
 Customer Ref: PO24041/CH/4405
 National Grid Reference: 343680, 394740
 Slice: A
 Site Area (Ha): 34.41
 Search Buffer (m): 500

Site Details

Site at 343660, 394770

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

Notes:

ST 49 SW/8

1. Normally the test pumping should be carried out continuously over a period of 14 days.
2. A description of the strata pierced should be given in the space provided below.
3. This form should be completed in triplicate and signed by the Engineer responsible for the proposed works.
4. The following documents should be enclosed:-

- (a) A tabulated statement showing for the whole duration of the test the quantity of water pumped in each 24 hours, and the level of the water above Ordnance Datum at the end of each day. A note should be included of the reason for and duration of any stoppage which occurred during the test.
- (b) Copies of chemical and bacteriological analyses of water abstracted from the well or borehole. (Information as to the mineral constituents is desirable).
- (c) A six inch Ordnance Map showing (in red) the exact location of the well or borehole.
- (d) A section to scale showing the size of the well or boring, strata pierced, rest level of water etc.

Strata Pierced

Description of Stratum	Thickness		Total depths of top and bottom levels of stratum below the surface				Remarks	
	ft.	in.	Top		Bottom		Thickness	Depth
			ft.	in.	ft.	in.	(Metres)	
Soil	1	6	-	-	1	6	0.46	0.46.
Yellow Sandy clay	10	6	1	6	12	0	3.20	3.66
Brown Boulder clay	6	6	12	0	18	6	1.98	5.64
Soft red sandstone	35	6	18	6	54	0	10.82	16.46
Coarse grey sandstone	16	0	54	0	70	0	4.88	21.34
Grey, red and brown sandstone	50	0	70	0	120	0	15.24	36.58
Red sandstone	12	0	120	0	132	0	3.65	40.23
Brown & red sandstone	10	0	132	0	142	0	3.05	43.28
Coarse grey sandstone	20	0	142	0	162	0	6.10	49.38
Hard black sandstone		3	162	0	162	3	0.07	49.45
Coarse grey sandstone	19	0	162	3	181	3	5.80	55.25
Soft red sandstone	19	9	181	3	201	0	6.02	61.27
Red sandstone	13	0	201	0	214	0	3.96	65.23
Soft red sandstone	50	0	214	0	264	0	15.24	80.47
Red sandstone	56	0	264	0	320	0	17.07	97.54
Hard black sandstone		8	320	0	320	8	0.20	97.74
Coarse red sandstone	30	0	320	8	350	8	9.14	106.88
Hard black sandstone		3	350	8	350	11	0.08	106.96
Red sandstone	20	0	350	11	370	11	6.10	113.06
Hard black sandstone		2	370	11	371	1	0.05	113.11
Red sandstone	6	1	371	1	377	2	1.85	114.96
Hard black sandstone		3	377	2	377	5	0.08	115.04
Red sandstone	49	7	377	5	427	0	15.11	130.15
Hard black sandstone		2	427	0	427	2	0.25	130.20
Red sandstone	31	10	427	2	459	0	9.70	139.90

B. CLAY

DRIFT

BUNTER SANDSTONE

TRASSIC 'BUNTER' SST.

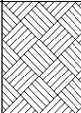
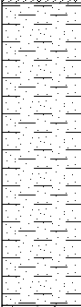
P.P.

W.B. EVANS.

22-7-71.

Appendix F

Soakaway Testing Records (Trial Pit Logs and Calculations)

				Trial Pit Log			Trialpit No SA01 Sheet 1 of 1		
Project Name: Home Farm Road				Project No. 4405		Co-ords: 343311.00 - 394486.00 Level:		Date 16/04/2025	
Location: Knowsley				Dimensions (m):		1.5		Scale 1:20	
Client: Hallam Land Management Ltd				Depth 2.20				Logged WN	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.30			Dark brown slightly gravelly sandy CLAY. Gravel is fine to medium subrounded to rounded of mixed lithology. (TOPSOIL)		
							Dark grey sandy CLAY. (COHESIVE GLACIAL DEPOSITS)		
							Light grey slightly clayey fine to medium SAND. (GRANULAR GLACIAL DEPOSITS)		
							Soakaway testing undertaken.		
				1.10					
				2.20			End of pit at 2.20 m		
1 2 3 4									
Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Trial pit dug using a JCB 3CX excavator. 3. Groundwater was not apparent during excavation. 4. Backfilled with materials arising upon completion. 5. Co-ordinates from hand held GPS, hole not surveyed in. Stability: 1. The sides of the trial pit remained stable during excavation.									
									

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991



Client:	Hallam Land
Engineer	Will Newton
Job Name:	Home Farm Road, Knowsley
Job No.:	4405

Date:	16/04/2025
Trial Pit No.	SA01
Test No.	1

Time	Elapsed Time	Depth to water from ground level	
	(min)	(m)	(mm)
09:49	0	1.09	1090
09:50	1	1.08	1080
09:51	2	1.08	1080
09:52	3	1.09	1090
09:53	4	1.09	1090
09:54	5	1.10	1100
09:59	10	1.10	1100
10:09	20	1.10	1100
10:19	30	1.10	1100
10:49	60	1.10	1100
11:49	120	1.11	1110
12:49	180	1.12	1120
13:19	210	1.12	1120

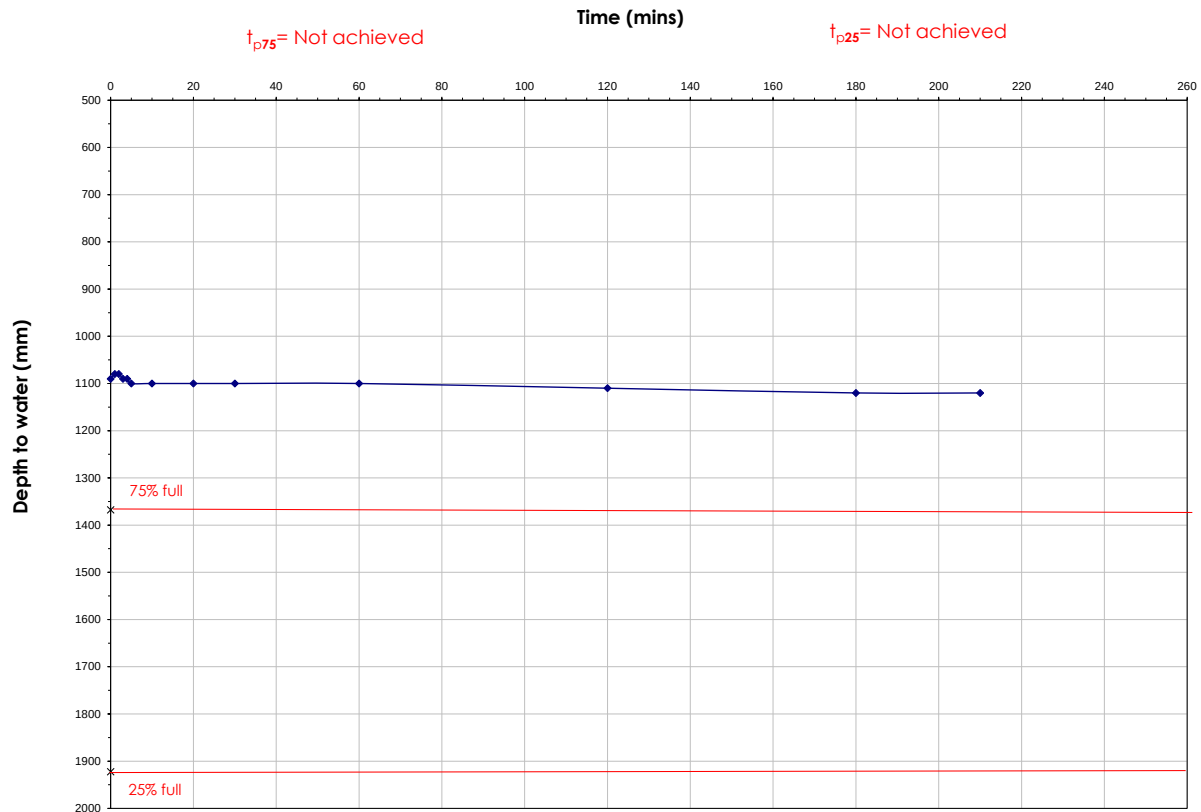
SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	1.50	1500
Width	=	0.60	600
Depth	=	2.20	2200

Effective Depth (% full)		(mm)	(m)
0.25	=	1922.5	1.92
0.50	=	1645	1.65
0.75	=	1367.5	1.37

Depth at start of test (mm)	=	1090
Depth at end of test (mm)	=	1120

Base area of pit	=	0.9
a_{p50} - 50% internal surface area inc. base	=	3.231
V_{p75-25} - Volume 75 - 25%	=	0.4995

Read from the graph:			
t_{p75} (min)	=	n/a	
t_{p25} (min)	=	n/a	



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate



Date:	16/04/2025
Trial Pit No.	SA02
Test No.	1

Time	Elapsed Time	Depth to water from ground level	
	(min)	(m)	(mm)
10:36	0	0.73	730
10:37	1	0.74	740
10:38	2	0.74	740
10:39	3	0.74	740
10:40	4	0.74	740
10:41	5	0.74	740
10:46	10	0.74	740
10:56	20	0.74	740
11:06	30	0.74	740
11:36	60	0.75	750
12:36	120	0.75	750
13:36	180	0.75	750

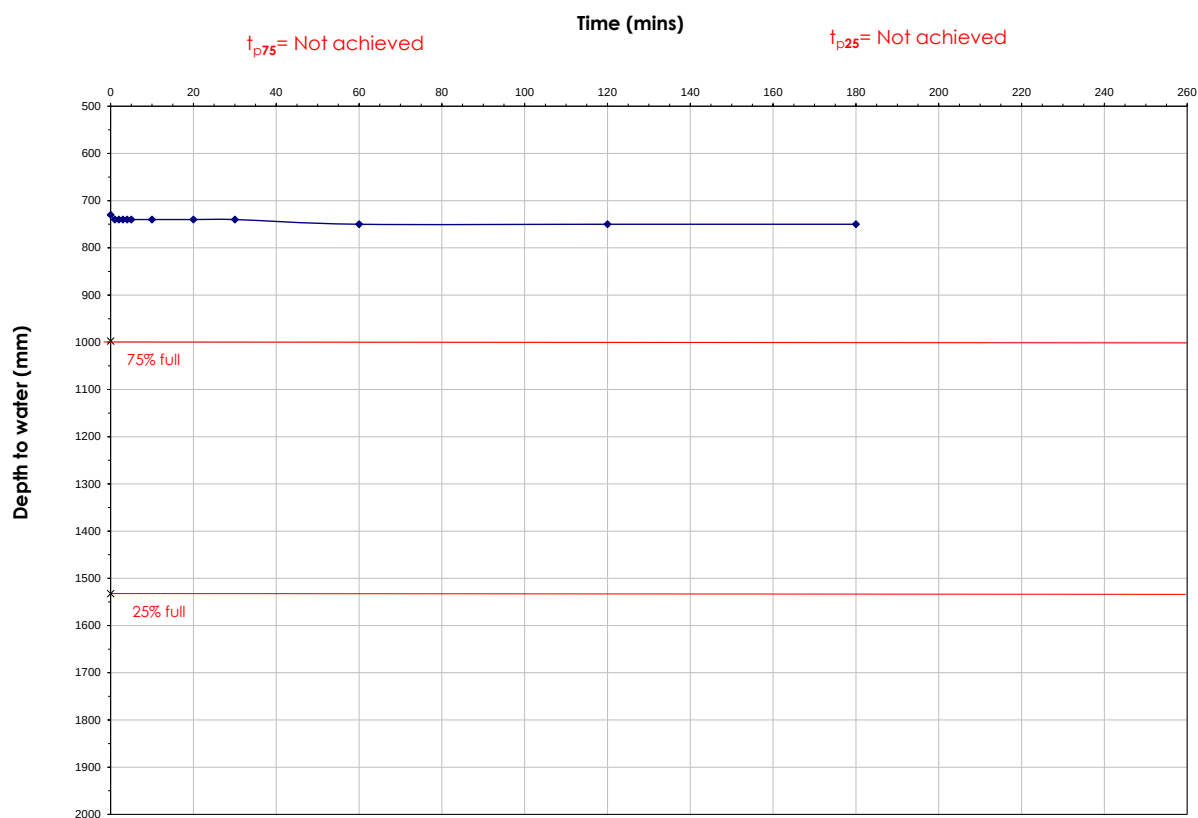
SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	1.50	1500
Width	=	0.60	600
Depth	=	1.80	1800

Effective Depth (% full)		(mm)	(m)
0.25	=	1532.5	1.53
0.50	=	1265	1.27
0.75	=	997.5	1.00

Depth at start of test (mm)	=	730
Depth at end of test (mm)	=	750

Base area of pit	=	0.9
C _{p50} - 50% internal surface area inc. base	=	3.147
V _{p75-25} - Volume 75 - 25%	=	0.4815

Read from the graph:		
$t_{p,75}$ (min)	=	n/a
$t_{n,25}$ (min)	=	n/a



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate



SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991



Client:	Hallam Land
Engineer:	Will Newton
Job Name:	Home Farm Road, Knowsley
Job No.:	4405

Date:	16/04/2025
Trial Pit No.	SA03
Test No.	1

Time	Elapsed Time	Depth to water from ground level	
	(min)	(m)	(mm)
11:10	0	0.73	730
11:11	1	0.74	740
11:12	2	0.74	740
11:13	3	0.74	740
11:14	4	0.75	750
11:15	5	0.75	750
11:20	10	0.75	750
11:30	20	0.76	760
11:40	30	0.78	780
12:10	60	0.82	820
13:10	120	0.87	870
14:10	180	0.89	890

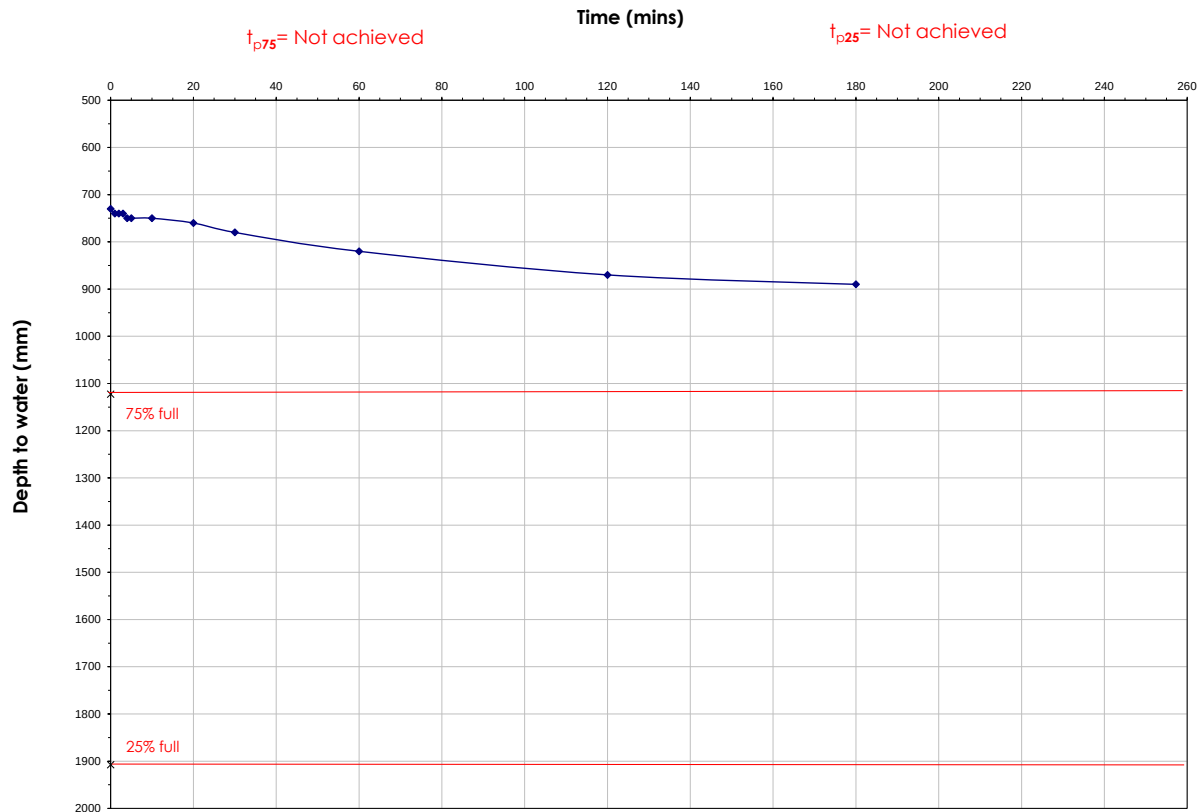
SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	1.50	1500
Width	=	0.60	600
Depth	=	2.30	2300

Effective Depth (% full)		(mm)	(m)
0.25	=	1907.5	1.91
0.50	=	1515	1.52
0.75	=	1122.5	1.12

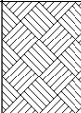
Depth at start of test (mm)	=	730
Depth at end of test (mm)	=	890

Base area of pit	=	0.9
a_{p50} - 50% internal surface area inc. base	=	4.197
V_{p75-25} - Volume 75 - 25%	=	0.7065

Read from the graph:			
t_{p75} (min)	=	n/a	
t_{p25} (min)	=	n/a	



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate

				Trial Pit Log			Trialpit No SA04 Sheet 1 of 1		
Project Name: Home Farm Road				Project No. 4405		Co-ords: 343854.00 - 394968.00 Level:		Date 16/04/2025	
Location: Knowsley				Dimensions (m):		1.5		Scale 1:20	
Client: Hallam Land Management Ltd				Depth 2.20				Logged WN	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.30			Dark brown slightly gravelly sandy CLAY. Gravel is fine to medium subrounded to rounded of mixed lithology. (TOPSOIL)		
							Stiff dark reddish brown slightly sandy CLAY. (COHESIVE GLACIAL DEPOSITS)		
							Soakaway testing undertaken.		
							Light grey slightly clayey fine to medium SAND. (GRANULAR GLACIAL DEPOSITS)		
				2.00			2		
				2.20			End of pit at 2.20 m		
1 2 3 4									
Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Trial pit dug using a JCB 3CX excavator. 3. Groundwater was not apparent during excavation. 4. Backfilled with materials arising upon completion. 5. Co-ordinates from hand held GPS, hole not surveyed in. Stability: 1. The sides of the trial pit remained stable during excavation.									
									

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

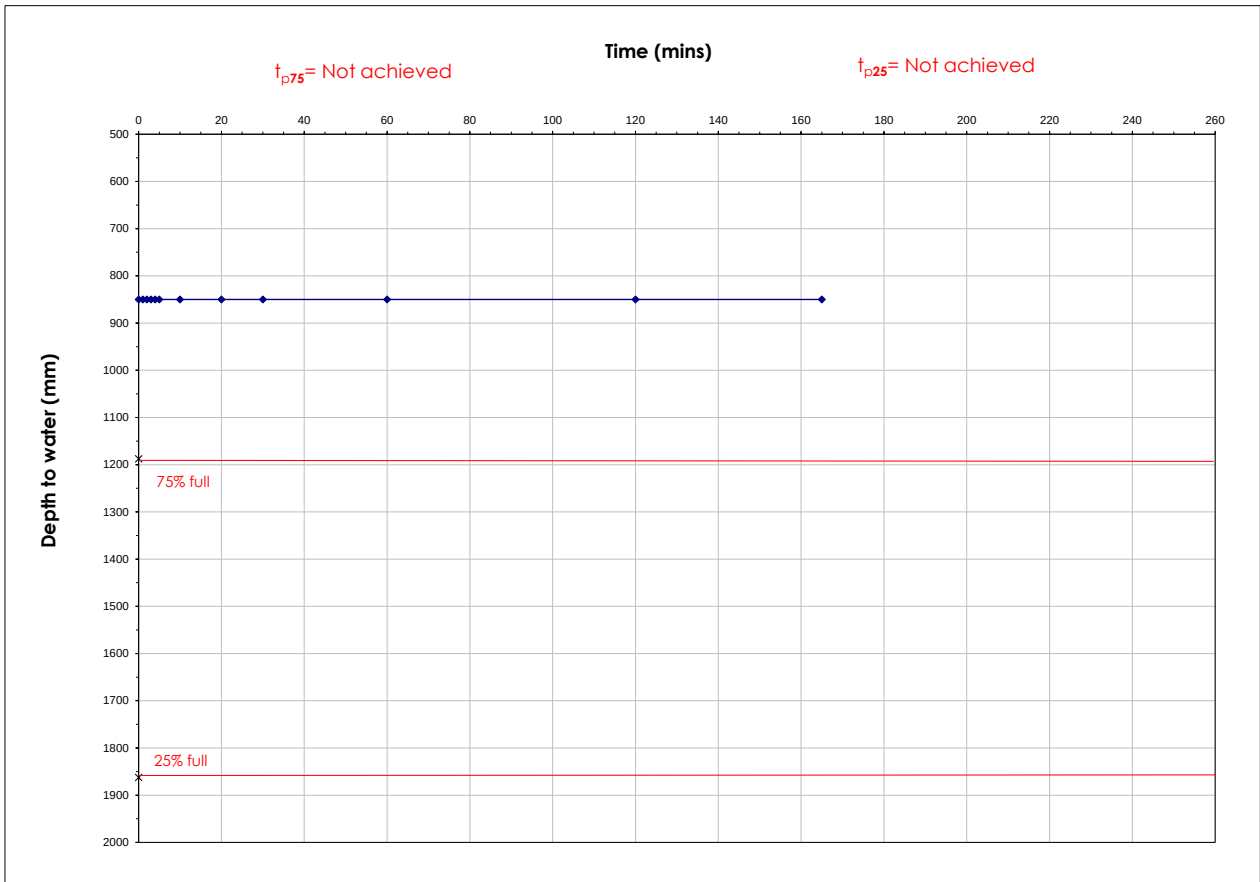


Client:	Hallam Land
Engineer:	Will Newton
Job Name:	Home Farm Road, Knowsley
Job No.:	4405

Date:	16/04/2025
Trial Pit No.	SA04
Test No.	1

Time	Elapsed Time	Depth to water from ground level	
	(min)	(m)	(mm)
11:37	0	0.85	850
11:38	1	0.85	850
11:39	2	0.85	850
11:40	3	0.85	850
11:41	4	0.85	850
11:42	5	0.85	850
11:47	10	0.85	850
11:57	20	0.85	850
12:07	30	0.85	850
12:37	60	0.85	850
13:37	120	0.85	850
14:22	165	0.85	850

SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	1.50	1500
Width	=	0.60	600
Depth	=	2.20	2200
Effective Depth (% full)		(mm)	(m)
0.25	=	1862.5	1.86
0.50	=	1525	1.53
0.75	=	1187.5	1.19
Depth at start of test (mm)		=	850
Depth at end of test (mm)		=	850
Base area of pit		=	0.9
a_{p50} - 50% internal surface area inc. base		=	3.735
V_{p75-25} - Volume 75 - 25%		=	0.6075
Read from the graph:			
t_{p75} (min)	=	n/a	
t_{p25} (min)	=	n/a	



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate