



# Land south of Longsight Road, Langho For Hallam Land Management Limited

Report no: 5200/1A

Date: February 2025



## LONGSIGHT ROAD, LANGHO SUMMARY OF GEOENVIRONMENTAL ISSUES

<b>Job No.</b>	5200	<b>Site area/ha</b>	20.01 ha
<b>Client:</b>	Hallam Land Management Limited	<b>NGR:</b>	SD 702 344
<b>Site:</b>	Longsight Road, Langho	<b>Nearest postcode:</b>	BB6 8EZ

The site is located off Longsight Road, approximately 6.5km northeast of Blackburn, and currently comprises a series of agricultural fields, with trees/hedgerows. Two watercourses flow north through the centre and along the eastern boundary.

Lithos were commissioned by Hallam to provide a preliminary geoenvironmental appraisal of the site. It is understood that the site is to be redeveloped with housing; a proposed layout has been prepared.

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

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

Issue	Remarks
Former uses	The site has been greenfield throughout history and is currently used for agricultural farming (crops and livestock).
Anticipated ground conditions	Topsoil over Glacial Till (likely firm, gravelly Clay). Bowland Shale Formation (mudstone) bedrock is anticipated from around 4m depth. Made Ground is not anticipated but localised areas may exist.
Anticipated contamination	Significant contamination or made ground is not anticipated. However, testing of topsoil is required to confirm suitability for re-use.
Mining & quarrying	The site lies beyond the CA defined coalfields. There are no known quarries or evidence of quarries on historical OS plans within 250m of site.
Hazardous gas	The BGS radon report indicates that the site is in an area where between 1% and 3% of homes are estimated to be above the action level. Consequently, basic radon protection measures are not required. However, in light of HSA advice, the Developer should consider providing all new dwellings with basic radon protection measures. There are no known or suspected areas of landfilling within 250m, and the site is not in area considered susceptible to mines gas, nor is it underlain by shallow mineworkings. As such, no additional special precautions against carbon dioxide and methane are required on this site.
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 5 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	<ul style="list-style-type: none"> <li>• Site clearance of surface materials and vegetation</li> <li>• Topsoil strip &amp; stockpile</li> <li>• Earthworks regrade to create site development levels</li> <li>• Protection of watercourses throughout the construction phase.</li> </ul>
Anticipated foundation solutions	If drift deposits are of medium strength (considered reasonably likely), they should provide sufficient bearing capacity to enable the adoption of strip footings for two storey housing. Foundations for commercial buildings will depend on specific line and column loads. Possible requirement for alternative foundation solutions (piles) if any low strength soils (e.g. alluvium) are identified during a site investigation.
Recommendations for ground investigation	<ul style="list-style-type: none"> <li>• Machine-excavated trial pits to determine near surface ground conditions including depth to bedrock, the presence of obstructions, groundwater and stability.</li> <li>• Geotechnical soils analysis to inform the design of appropriate cut &amp; fill earthworks, and to enable foundation recommendations.</li> <li>• Chemical testing of topsoil samples to confirm suitability for re-use.</li> <li>• Cable percussion boreholes to install groundwater monitoring wells in the areas of proposed SUDS.</li> </ul>

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## APPENDICES

### Appendix A – General notes

01	Environmental setting
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### Appendix B – Drawings

Drawing	Revision	Title
5200/1	-	Site Location Plan
5200/2	-	Illustrative masterplan and parameter
5200/3	-	Site Features
5200/4	-	Site Photographs
5200/5	-	Preliminary Conceptual Site Model

### Appendix C - Blank

### Appendix D – Historical OS plans\*

### Appendix E – Search responses\*

From	Date	Content
Landmark	10/10/2024	Envirocheck report
BGS	29/10/2024	Radon Report
BGS	11/08/2015	BGS BH SD73NW184

### Appendix F – Soakaway testing (letter report, dated 18<sup>th</sup> Nov. 2024)

\* 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 SOUTH OF LONGSIGHT ROAD, LANGHO

## 1 INTRODUCTION

### 1.1 The commission and brief

- 1.1.1 Lithos Consulting were commissioned by Hallam Land Management Limited to carry out a Preliminary Geoenvironmental Investigation of land south of Longsight Road, Langho.
- 1.1.2 This Preliminary Investigation comprises an inspection of historical and geological maps and information provided by the British Geological Survey, the Landmark Information Group, QGIS<sup>1</sup>, and the Environment Agency. In addition, a site inspection has been carried out by Lithos.
- 1.1.3 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 redevelopment of the site for residential uses and a car park serving users of Langho Train Station.
- 1.2.2 An illustrative masterplan and parameter plan has been prepared by Stantec (Drawing 0104, Rev D) which is reproduced as Drawing No. 5200/2 in Appendix B to this report.

### 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.

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<sup>1</sup> 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 5200/1 presented in Appendix B to this report. Site details are summarised in the table below.

Detail	Remarks
Location	6.5 km northeast of Blackburn town centre
NGR	SD 702 344
Area	20.01 ha (49.5 acres)
Known services	Underground water and sewer. Overhead electric.

### 2.2 Site features

2.2.1 Lithos completed a walkover survey of the site on 25<sup>th</sup> October 2024.

2.2.2 Existing salient features, at the time of the walkover are presented on Drawing 5200/3 in Appendix B to this report, and summarised in the table below.

Feature	Remarks
Current access	Off Longsight Road, and via existing PROW from Langho station
Topography	Relatively flat
Approximate areas	190,000 m <sup>2</sup> grass 11,000 m <sup>2</sup> woodland
Nature of boundaries	North – Hedgerow and Longsight Road (A59) West – Hedgerow, mature trees and Whitehalgh Lane East – Un-named stream and Green Nook Wood South – Fencing
Surrounding land uses	North – Open fields West – Open fields East – Residential estate & woodland South – Railway Line with Langho village beyond

2.2.3 The site is a rectangular shape and divided into around 4 separate agricultural **fields** by un-named **streams** and wooden post and barbed wire fencing as labelled on Drawing 5200/3.

2.2.4 Typically, land falls from the southern boundary (between 102mAOD in the southwest and 96mAOD in the southeast) to the north (between 79mAOD in the northwest and 77mAOD in the northeast) at an average gradient of 1 in 17.

2.2.5 Fields 1 & 2 in the west are currently occupied by grass or silage cropped fields and parts of the field were recorded as soft and wet underfoot during the walkover. Access to these fields is through a metal gate off Whitehalgh Lane. A small pond/bog is present in the northeast of the site adjacent to Field 3.

2.2.6 Field 3 is in centre of the site and comprises a grassed field (presumably used historically for livestock). Access to this field is through a gate from Field 2, or from the residential property to the northeast. Parts of this field were noted to have reed type plants indicating wet areas and the far north was to be boggy/wet underfoot.

2.2.7 Field 4 is in the east of the site and comprises another grassed field. A steep sided un-named watercourse (flowing north) separates Field 3 & 4 and a further watercourse is present on the eastern boundary of Field 4. These watercourses confluence into Bushburn Brook around 500m to the north of the site.

- 2.2.8 Access to Field 4 is via a gate off the A59, or pedestrian access can be gained in the far southeast from the railway underpass and the new residential estate. To the northeast of Field 4 a mature **woodland** is present on the east side of the un-named watercourse
- 2.2.9 Dry drainage ditches were present throughout Fields 3 & 4. Various pond-like dry **depressions** were present in the north of Field 3. A concrete block and steel girder **bridge** provides access across the un-named watercourse.
- 2.2.10 At the time of the walkover, horses were present in the far southeast of Field 4.
- 2.2.11 A **sewer** is present in the south running roughly parallel to the southern boundary, crossing the watercourse in the centre of the site. Overhead **electric** cables on wooden poles run northwest to southeast through Field 4. It is understood that private water supply pipes run through Fields 3 & 4.
- 2.2.12 Mature trees are present on the boundary of Field 2 & 3 and throughout Fields 3 & 4. Some evidence of **Himalayan Balsam** was noted adjacent to the watercourse in the centre of the site.
- 2.2.13 A selection of site photographs are included on Drawing 5200/4.

### 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 1893 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.

Dates	Site	Surrounding land
1893	Site is occupied by open fields with un-named stream through the centre and on the eastern boundary. <b>Footpath</b> running northwest to southeast through the east of site Green Nook Wood in the northeast corner and small woodland in the centre of site. <b>Pond</b> in the centre west.	Roads/tracks immediately to the north and west of site. Bolton, Blackburn & Hellifield <b>Railway</b> Line immediately south Wade Plat, Wildmans and Wildfold (farms) 20m to the northeast of site. Green Nook (farm) 50m to the north. Wyvillstead (residential house) 80m to the northwest. Langho Station 80m to the southeast with Langho village adjacent. Lower Whitehalghfield (farm) 80m to the southwest. Spring <b>Mill</b> (cotton) 110m to the south
1912	Pond in the centre west no longer shown.	Wyvillstead relabelled Langholme.
1931	Allotment gardens in the southeast corner.	Spring & Pump labelled adjacent to Wildmans and Wade Plat farm 20m to northwest. St Mary's School 200m to the east Roads labelled Longsight Road and Whitehalgh Lane.
1955 to 1956	No significant changes.	Whitehalghfield farm no longer shown. Langho railway station no longer shown.
1968 to 1973	<b>Sinks</b> labelled in the far west. <b>Issues</b> labelled in the far east and on southern boundary associated with un-named streams.	Langho village expanded 30m to the south. Wildfold farm no longer shown. Green Nook relabelled Monks Barton.
1973 to 1976	No significant changes	Longsight Road labelled A59 and roundabout constructed 300m to the northeast.
1982		Playing field labelled 30m to the south in Langho.
2001	" <b>Pipeline</b> " (sewer) noted near southern border of site crossing the un-named stream	Langho Station labelled (re-opened in 1994)
2024	Current site fencing shown. Subway in southeast corner labelled.	Residential estate constructed immediately east.

## 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 Environment Agency, the Coal Authority, the BGS and extracts from the Landmark Report are presented in Appendix E.

Issue	Data reviewed	Remarks
Geology	1:10,000 BGS map (Sheet SD73SW) 1:50,000 BHS map (Sheet 68) BGS Log SD73NW174	Drift soils – Glacial Till. Solid (bedrock) – Bowland Shale Formation (mudstone). Strata Dip – between 17° to 30° degrees to the southeast. BGS borehole 500m to the north indicates that Mudstone (Bowland Shale) is present from 3.6m depth.
Mining	Coal Authority	This site is located beyond the Coal Authority's defined coalfields.
Quarrying	Historical OS plans	No evidence of quarrying on historical plans
Landfills	Envirocheck Report	No known landfills within 250m
Radon	BGS Radon Report	The site lies in an area where between 1% and 3% of homes are estimated to be above the action level. Consequently, basic radon protection measures are not required. However, in light of HSA advice, the Developer should consider providing all new dwellings with basic radon protection measures.
Hydrogeology	Environment Agency electronic open data via QGIS	Source Protection Zone – None recorded Aquifers: Secondary Undifferentiated (Drift & Solid) Groundwater abstractions – None recorded. Pollution incidents – None recorded. Soil leaching potential – Low.
Hydrology	Defra Catchment data explorer Envirocheck Report	Nearest watercourse(s) – Un-named watercourses flow north through centre of site and along eastern boundary confluence into Bushburn Brook off site 500m to the north. Water quality – The site lies in the river catchment for the Calder – Pendle Water to confluence with Ribble which was rated ecologically moderate. Reasons for not achieving good status were sewage discharge, physical modification and poor livestock management. Pollution incidents – Nearest is on site in 2011 for crude sewage into un-named stream on eastern boundary and was rated a Category 2 – Significant incident. Abstractions – Nearest is 1.7km to the southeast for Untied Utilities potable water supply. Discharge consents – Nearest is 350m to the west for sewage discharge by private individual into tributary Bushburn Brook.
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 Hazardous gas

### Methane & carbon dioxide

4.2.1 The site is not believed to be affected by sources of hazardous gas generation as it is:

- Not located within 250m of a known former or current landfill site or significant backfilled feature (e.g. quarry, pond, canal etc)
- Neither underlain by shallow mineworkings nor located in an area considered susceptible to mines gas emissions
- Not underlain by a significant thickness of made ground
- Not underlain by peat or shallow chalk deposits

### Radon

4.2.2 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<sup>-3</sup>) are used to determine whether a property requires no, basic or full measures.

4.2.3 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.

4.2.4 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.

4.2.5 However, the HSA website provides a preliminary indication of the measures required for a particular site, based on the highest geological radon potential within 1km grid squares – a relatively 'low resolution'. Radon potential often varies considerably within a given grid square and, a 'higher resolution' site-specific report (based on 25m grid squares) has been obtained from BGS (copy is included in Appendix E).

4.2.6 The BGS radon report indicates that the site is in an area where between **1% and 3%** of homes are estimated to be above the action level.

4.2.7 Consequently, basic radon protection measures are not required. However, in light of HSA advice, the Developer should consider providing all new dwellings with basic radon protection measures.

### 4.3 Agriculture

4.3.1 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
Slurry pits, manure heaps, septic tanks	Methane, metals, nitrates, oxygen depletion
Sewage farming, slurry spreading	Methane, metals, nitrates, oxygen depletion
Tracks (if built up with crushed demolition rubble etc)	Metals, asbestos, hydrocarbons
Soil conditioners	Metals, sulphates, PAH
Equipment maintenance	Hydrocarbons, metals
Waste burial, land levelling, backfilling ponds/quarries	Methane, metals, PAH etc
Naturally occurring contaminants	Arsenic, metals
Sheepfolds	Arsenic

4.3.2 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.

4.3.3 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 The site is essentially greenfield, although farming activities may have given rise to some (likely minor) contamination; see Section 4.3.

5.1.2 A preliminary conceptual site model, presented as Drawing 5200/5 in Appendix B, has been prepared after consideration of all the data presented in Sections 2 to 4 inclusive of this report.

5.1.3 Potential contaminant linkages are shown on the preliminary conceptual site model.

5.1.4 The most significant potential contaminant **pathways** include:

- Ingestion
- Dermal contact
- Inhalation of contaminated particulates
- Downward infiltration of leachable/mobile contaminants to groundwater

5.1.5 The most significant potential contaminant **receptors** include:

- The environment – Un-named watercourses and bedrock aquifer
- End users of the site (residents)

5.1.6 Clearly, the conceptual model will be subject to modification in light of data arising from the proposed intrusive ground investigation.

## 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
Natural soils	Topsoil over Glacial Till (likely firm, gravelly Clays) to around 4m depth.
Bedrock	Bowland Shale Formation (mudstone) anticipated from around 4m depth
Groundwater	Possible drift groundwater body within any granular beds/pockets of Glacial Till Likely bedrock groundwater at significant depth in Mudstone/Shale.

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	<ol style="list-style-type: none"> <li>1. Reworked topsoil (inorganics, organics)</li> <li>2. Spillage/leakage</li> </ol>	<ol style="list-style-type: none"> <li>1. Associated with farming &amp; agricultural use</li> <li>2. Farming machinery</li> </ol>
Potential off-site contamination sources	<ol style="list-style-type: none"> <li>1. None identified at desk study stage</li> </ol>	
Potential geotechnical hazards	<ol style="list-style-type: none"> <li>1. Glacial features (kettle holes/hollows)</li> <li>2. Alluvial deposits associated with watercourses</li> </ol>	<ol style="list-style-type: none"> <li>1. Likely requirement for deepening/alternative foundations (piles)</li> <li>2. Likely requirement for deepening/alternative foundations (piles)</li> </ol>
Other potential constraints	<ol style="list-style-type: none"> <li>1. Underground and/or overhead utilities</li> <li>2. Watercourses</li> </ol>	<ol style="list-style-type: none"> <li>1. Likely to require diversion or an easement prior to development</li> <li>2. Will likely require protection during construction phases and incorporating into development layout.</li> </ol>

## 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 BS10175<sup>2</sup>)'.

### This site

6.6 The underlying Glacial Drift and Mudstone bedrock are classified as Secondary Undifferentiated aquifers. The nearest surface watercourses are the two un-named watercourses in the centre of the site and on the eastern boundary, which flow in a northerly direction. Therefore, the site's environmental setting is considered to be of high sensitivity.

6.7 With respect to human health, the proposed end use (residential) is sensitive.

6.8 Current and previous uses of the site are considered unlikely to have given rise to any significant ground and groundwater contamination.

6.9 However, it is considered that the site should be suitable for the proposed use subject to implementation of appropriate preparatory works.

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<sup>2</sup> BS10175 (2011) - Code of practice for the investigation of potentially contaminated sites

## 7 GROUND INVESTIGATION DESIGN

### 7.1 General

7.1.1 Given the size of this site, a phased ground investigation might be commissioned, with an initial, 'exploratory' phase of very widely spaced exploratory holes across the entire site, followed by appropriate supplementary investigation(s). Alternatively, it might be more appropriate to commission more comprehensive investigation of each discrete parcel of proposed development on a rolling programme as development proceeds.

### 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
c. 100 trial pits	To determine the nature, distribution and thickness of shallow natural soils, including suitability of the ground for founding structures and highways.
	To determine the general nature of any localised areas of made ground soils To determine the nature, distribution and thickness of shallow natural soils, including suitability of the ground for founding structures and highways.
c. 10 Boreholes	To install monitoring wells in areas of proposed SUDS in order to determine groundwater levels.

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 in Section 5.2 above. 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 Parts of the site were noted to be wet and soft during the site walkover. If ground investigation is not undertaken during drier summer months, it may be necessary to use a tracked excavator.

7.2.4 There may be ecological constraints (e.g. nesting birds), and it is recommended that Hallam consult a qualified ecologist to confirm the absence of any protected plant or animal life prior to commencement of trial pitting.

7.2.5 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.

7.2.6 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)

7.2.7 **Trial pitting** will enable determination of:

- Nature, distribution and thickness of shallow soils
- Nature of any localised made ground
- Suitability of the ground for founding structures and highways

7.2.8 The in-situ shear strengths of any cohesive soils encountered should be determined by use of a hand-held shear vane.

7.2.9 Routine **geotechnical soils analysis** (moisture content, Atterberg limits, pH, water soluble sulphate) should be scheduled on about 35 samples with some compaction testing on samples of natural soils to assess suitability for use in earthworks to create development levels.

7.2.10 The site has not been the subject of a past potentially contaminative industrial land use. However, historical mapping suggests arable farming has been carried out on the site. Sampling of the **topsoil** should be undertaken to confirm its suitability for re-use. At least 25 samples should be taken with analysis to include pH, metals, TOC, speciated PAH and asbestos ID.

7.2.11 It would also be prudent to analyse about 9 topsoil samples to check compliance with BS3882<sup>3</sup> requirements, via testing for visible contaminants, sharps and clay/sand/silt content.

7.2.12 Around 10 **cable percussion boreholes** could be advanced to depths of around 5m in order to allow the installation of groundwater monitoring wells in areas of proposed SUDS (drainage attenuation features etc.). This would allow a period of groundwater monitoring to establish seasonal groundwater levels.

7.2.13 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.

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<sup>3</sup> 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 31<sup>st</sup> October 2024 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
Trial pitting (machine dug)	SAs 01 to 05	1.6m to 2.8m	Soakaway testing undertaken in each pit

8.1.3 Exploratory hole logs are provided within a letter report included in Appendix F.

8.1.4 Natural ground was encountered in all 5 exploratory holes, and typically comprised:

- **Topsoil:** Dark brown slightly sandy, silty Clays. Encountered in all exploratory holes across the site to a typical depth of 300mm.
- **Cohesive Glacial Deposits (gravelly Clay):** Firm, orangish brown becoming dark grey, slightly sandy, silty Clays with gravels of sandstone and mudstone and a low to high cobble content. Encountered in all exploratory holes across the site to 0.5m depth (SA05), 2.1m depth (SA01) and the base of the hole elsewhere (SAs 2 to 4)
- **Granular Glacial Deposits (silty Sand):** Brown, very silty, fine to medium Sand. Encountered at the base of SA01 between 2.1m and >2.3mbgl.
- **Cohesive Residual Soil (Weathered Bowland Shale):** Firm, orangish brown becoming grey, sandy, silty Clay, with gravels of lithorelicts. Encountered between 0.5m and 1.9m depth in SA05.
- **Granular Residual Soil (Weathered Bowland Shale):** Dark grey, very clayey, sandy angular and subangular fine to coarse lithorelict Gravel. Encountered at the base of SA05 between 1.9m and >2.3 depth.

8.1.5 **Groundwater** was encountered in SA01 and SA05 at 2.1m and 1.9m depth respectively with running sands also recorded in SA01 at 2.1m depth.

8.1.6 No visual or olfactory evidence of fuel 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 C753<sup>4</sup> 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 DG365<sup>5</sup> "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.

<sup>4</sup> CIRIA C753. *The SuDS Manual (2015)*.

<sup>5</sup> BRE DG365. *Soakaway Design (2016)*.

### 8.3 Field tests

- 8.3.1 Soakaway testing was carried out in 5 pits, in general accordance with BRE DG365 "Soakaway Design". The locations of the soakaways are shown on Drawing 5200/6 which is appended to this letter report.
- 8.3.2 General notes about soakaways, including their location, design, and Lithos' test methodology are appended.
- 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.
- 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.

#### Summary of soakaway infiltration rates

Soakaway	Stratum	Infiltration rate (m/s)	Remarks
SA01	Cohesive glacial deposits (0.3-2.1m) Granular glacial deposits (2.1-2.3m)	N/A	Still >80% full after 3 hours. Initial drainage likely due to encountering land drain.
SA02	Cohesive glacial deposits (0.3-2.5m)		Still >80% full after 3 hours. Initial drainage likely due to encountering land drain.
SA03	Cohesive glacial deposits (0.3-1.6m)		Still >95% full after 3 hours
SA04	Cohesive glacial deposits (0.3-2.8m)		Still >95% full after 25 minutes upon side wall collapse of pit
SA05	Cohesive glacial deposits (0.3-2.5m) Weathered bedrock (1.9-2.3m)		Still >95% full after 3 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 Clay nature of shallow natural soils (Cohesive Glacial Deposits & Cohesive Residual Soils). Where Granular strata were encountered, it was typically silty/clayey and contained groundwater (i.e. saturated) suggesting a relatively shallow groundwater table.
- 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. 20.01 hectares of land located in Langho about 6.5 km northeast of Blackburn town centre. The site has been essentially a greenfield throughout history. The site is currently used for agricultural farming (crops & livestock).
- 9.1.2 It is understood Hallam will shortly be submitting an outline planning application for residential development with all matters reserved except for access to, but not within, the site.
- 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 & commercial redevelopment of the site.

### 9.2 Mining & quarrying

- 9.2.1 The site lies beyond the Coal Authority's defined coalfields.
- 9.2.2 There are no known quarries or evidence of quarrying from historical OS plans within 250m of the site boundaries.

### 9.3 Hazardous gas

- 9.3.1 The site lies in an area where between 1% and 3% of homes are estimated to be above the action level.
- 9.3.2 Consequently, basic radon protection measures are not required. However, in light of HSA advice, the Developer should consider providing all new dwellings with basic radon protection measures.
- 9.3.3 There are no known or suspected areas of landfilling within 250m, and the site is not in an area considered susceptible to mines gas, nor is it underlain by shallow mineworkings.
- 9.3.4 As such, no additional special precautions against carbon dioxide and methane are required on this site.

### 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 (including BGS logs) suggests that the site is underlain by Glacial Till (likely firm, gravelly clays to around 4m depth over Bowland Shale Formation (mudstone) bedrock).
- 9.4.4 Drift deposits (Glacial Till) and/or weathered bedrock of medium strength should provide sufficient bearing capacity to enable the adoption of strip footings for two storey housing. Reinforcement, as a precaution against differential settlement, is recommended only where foundation excavations encounter significant lateral and vertical variations in strata.

- 9.4.5 Foundation solutions for commercial buildings will depend on design column and line loads.
- 9.4.6 If rock is encountered at shallow depth, foundations should be placed entirely on rock and not partially on rock and partially on residual soil. This may, depending on surface gradient, necessitate significant over deepening of foundations.
- 9.4.7 Given the presence of the watercourses on the site, it is possible (although considered unlikely) that localised unmapped alluvium (comprising soft clays or loose sands) may be encountered. Depending on the depth of these alluvial deposits, alternative foundations such as piles may be required.
- 9.4.8 Additionally, given the presence of Glacial Drift deposits, glacial features such as kettle holes could be encountered at the site. These features are often backfilled with soft unconsolidated sediments such as alluvial clays and/or peat.

## 9.5 Highways and external works

- 9.5.1 Given the sloping nature of the site, there may be the requirement for localised retaining walls, underbuild, tanking etc.
- 9.5.2 Natural Glacial Soils should yield a CBR of at least 3%. This value should be verified prior to or during construction.

## 9.6 Soakaways & drainage

- 9.6.1 Soakaway testing was carried out in 5 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 C753<sup>6</sup> 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.

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<sup>6</sup> CIRIA C753 (2015) – The SuDS Manual.

## 9.7 Contamination

- 9.7.1 The site's environmental setting is considered to be of high sensitivity due to the presence of watercourses. With respect to human health, the proposed end use (residential) is sensitive.
- 9.7.2 No potentially contaminative industrial land uses have been identified. However, arable farming has historically been carried out. The farming activities may have given rise to some (likely minor) contamination.
- 9.7.3 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 Given existing topography (much of the site is sloping, with gradients of up to 1 in 17), some earthworks regrade is anticipated, with the need for underbuild and retaining walls.
- 9.8.2 The overhead electric, sewer and water pipes present a potential development constraint unless they 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.
- 9.8.3 United Utilities may seek to restrict changes in site level if the depth of cover above their sewer were adversely affected by any development proposals. This aspect requires further clarification.
- 9.8.4 Given the presence of watercourses through the site, it would be prudent to prepare both a silt and surface water management plan (SWMP) and a Construction Environmental Management Strategy (CEMS) report prior to commencement of construction activities.

## 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, groundwater and stability.
  - Geotechnical soils analysis with grading and compaction testing to inform the design of appropriate cut & fill earthworks, and to enable foundation recommendations.
  - Chemical testing of topsoil samples to confirm its suitability for re-use.
  - Cable percussion boreholes to install groundwater monitoring wells in the areas of proposed SUDS.
- 9.9.3 An appropriate ground investigation strategy is presented in Section 7.

**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 BR211<sup>1</sup>, and the UK Health Protection Agency (HPA) website. 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.

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 HPA in 2005; the HPA updated NRPB advice in July 2010<sup>2</sup>.

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<sup>-3</sup> and 100 Bqm<sup>-3</sup> 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 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<sup>-3</sup> 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, HPA 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.

<sup>1</sup> BRE Report BR211, 2023: "Radon: guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)".

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

**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.

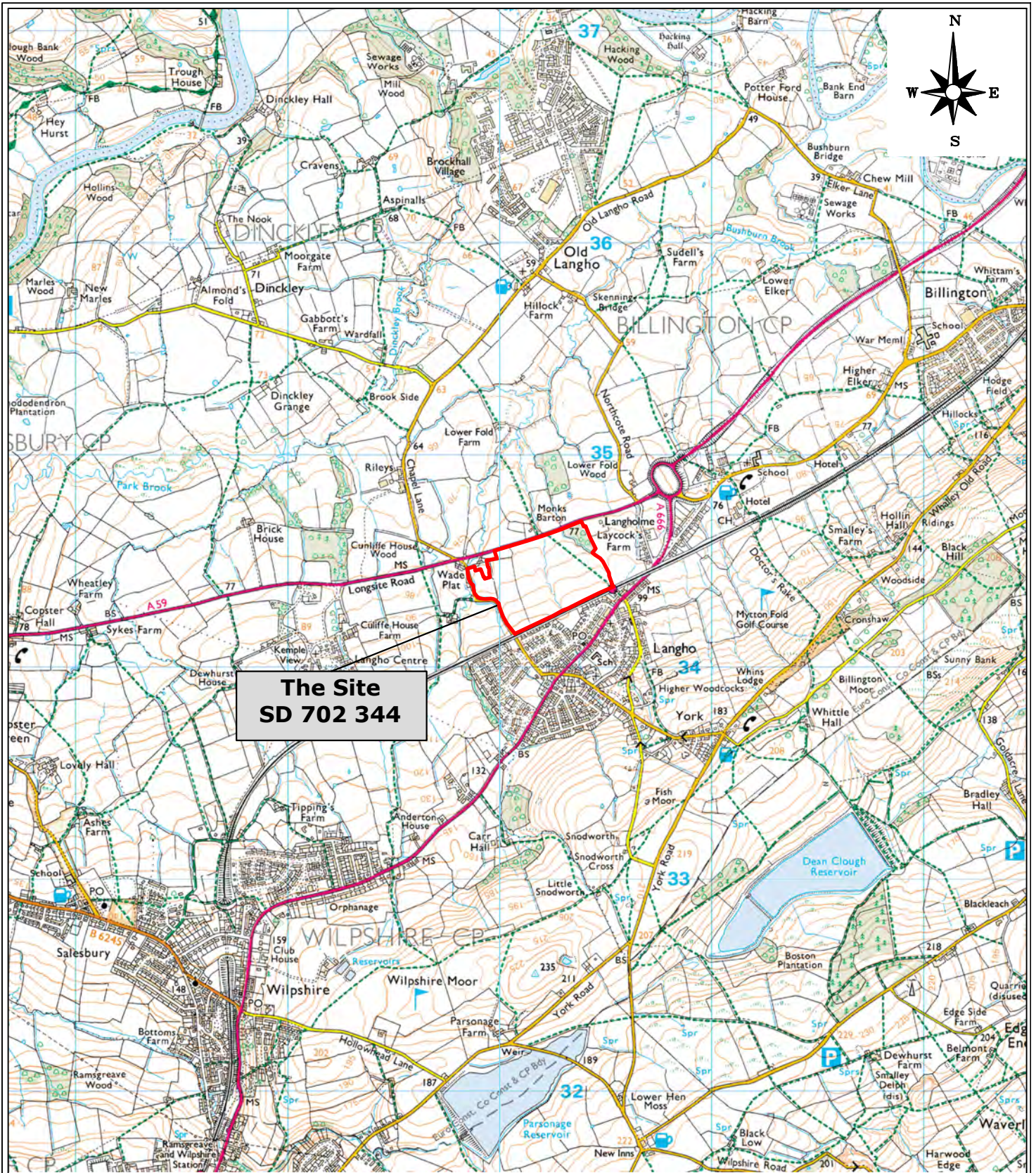
Assessment of contaminated land is based on an evaluation of pollutant linkages (source-pathway-receptor). Contaminants within the near surface strata represent a potential source of pollution. The environment (most notably groundwater), site workers and end users are potential receptors.

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.

**Appendix B**  
**Drawings**



**The Site  
SD 702 344**

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info@lithos.co.uk  
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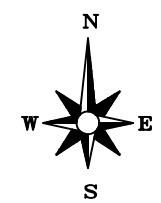
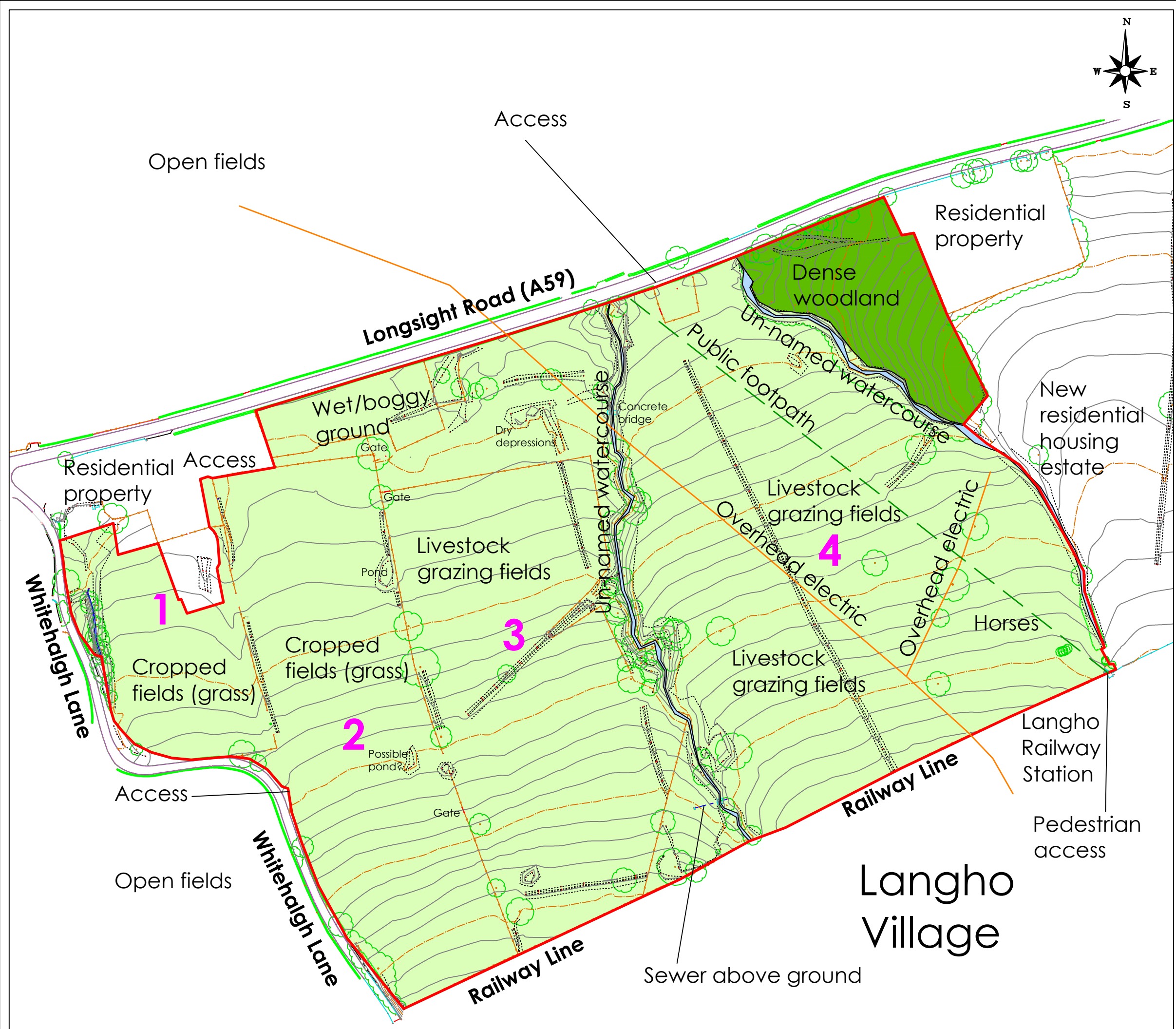
CLIENT  
**HALLAM LAND  
MANAGEMENT**

JOB TITLE  
**LONGSIGHT  
ROAD, LANGHO**

DRAWING TITLE  
**SITE LOCATION  
PLAN**

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		DRAWING NO.	5200/1
		REVISION	





NOTES

- GRASS & OVERGROWN AREAS
- MATURE WOODLAND
- UN-NAMED WATERCOURSE
- PUBLIC FOOTPATH
- LINE OF OVERHEAD ELECTRIC
- APPROXIMATE SITE BOUNDARY
- 2 FIELD NUMBER

REV.	DESCRIPTION	DATE



info@lithos.co.uk  
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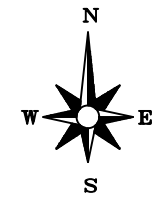
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MANAGEMENT

LONGSIGHT  
ROAD, LANGHO

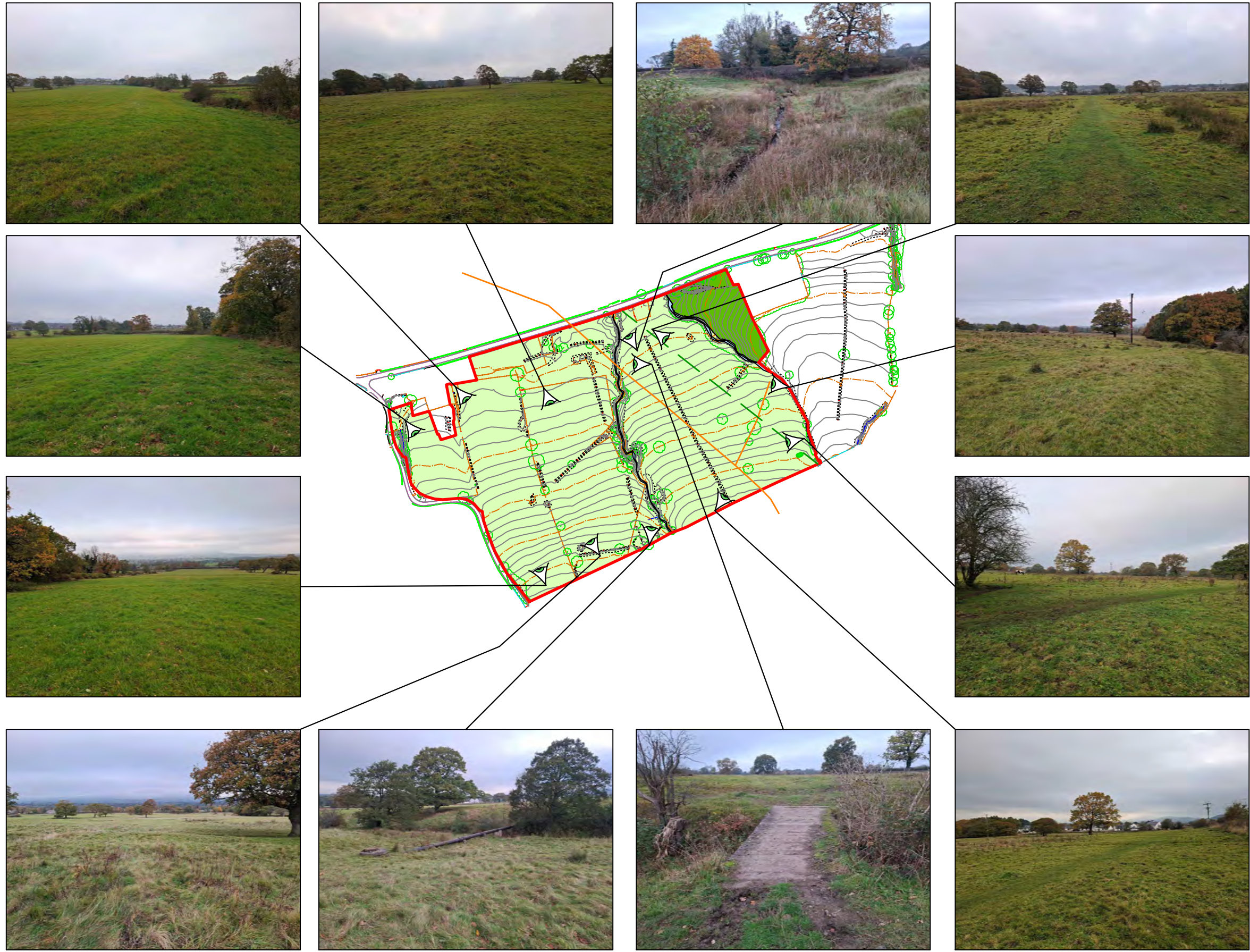
SITE FEATURES

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				FINAL	<input checked="" type="checkbox"/>

SCALE	1:2,500	SHEET	A3	DRAWING NO.	5200/3	REVISION	
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- NOTES
- GRASS & OVERGROWN AREAS
  - MATURE WOODLAND
  - UN-NAMED WATERCOURSE
  - PUBLIC FOOTPATH
  - LINE OF OVERHEAD ELECTRIC
  - APPROXIMATE SITE BOUNDARY
  - LOCATION & ORIENTATION OF PHOTOGRAPH



REV.	DESCRIPTION	DATE



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CLIENT

HALLAM LAND MANAGEMENT

JOB TITLE

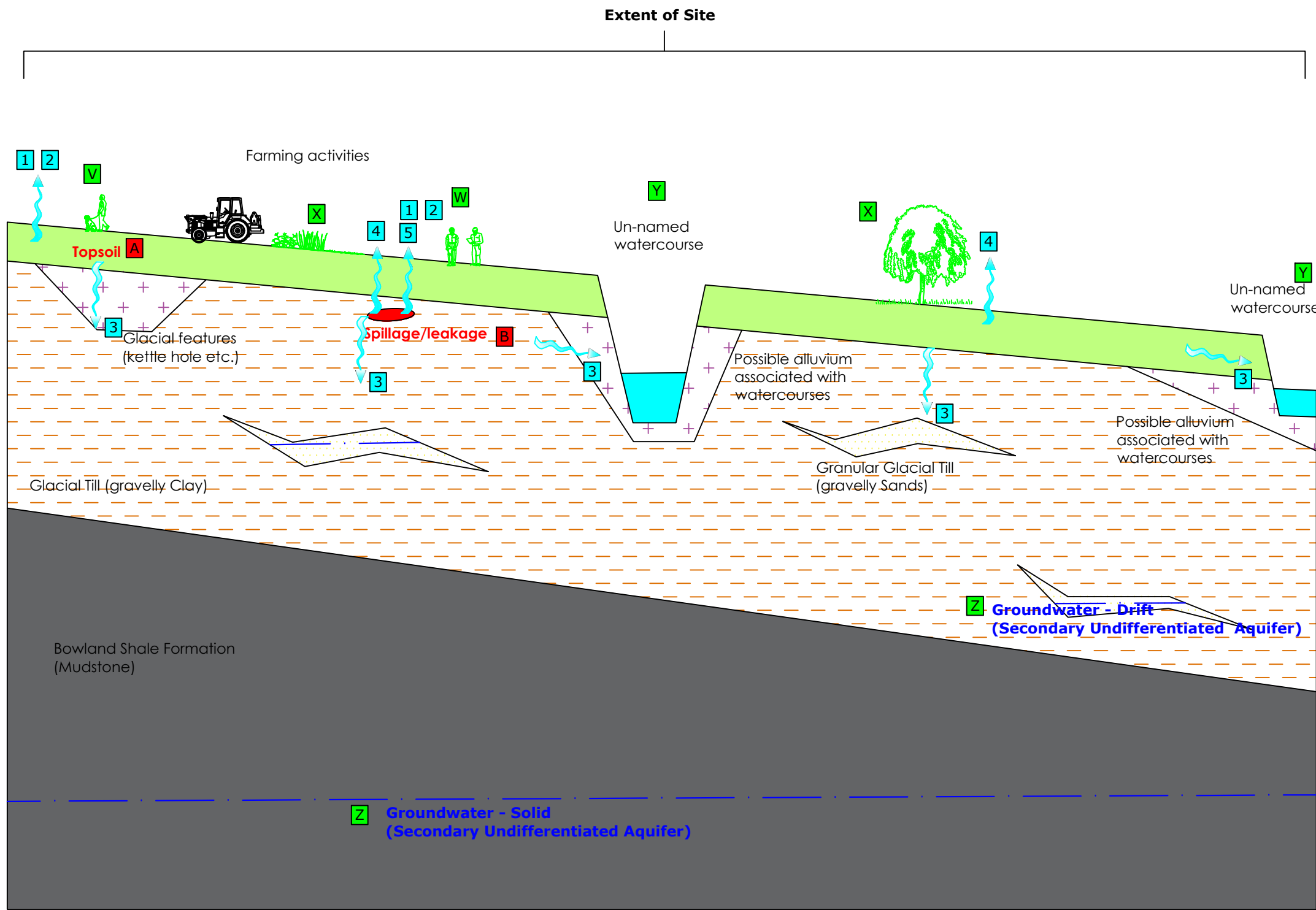
LONGSIGHT ROAD, LANGHO

DRAWING TITLE

SITE PHOTOGRAPHS

DRAWN	JBR	DATE	28/10/2024	STATUS	FOR COMMENT <input type="checkbox"/>
CHECKED	REG	DATE	28/10/2024	FOR APPROVAL <input type="checkbox"/>	DRAFT <input type="checkbox"/>
				FINAL	<input checked="" type="checkbox"/>

SCALE	NOT TO SCALE	SHEET	A3	DRAWING NO.	5200/4	REVISION	
-------	--------------	-------	----	-------------	--------	----------	--



NOTES

REV.	DESCRIPTION	DATE



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

CLIENT  
**HALLAM LAND MANAGEMENT**

JOB TITLE  
**LONGSIGHT ROAD, LANGHO**

DRAWING TITLE  
**PRELIMINARY CONCEPTUAL SITE MODEL**

SOURCES	
<b>A</b>	<b>TOPSOIL (INORGANICS)</b>
<b>B</b>	<b>SPILLAGE/LEAKAGE (ORGANICS)</b>

PATHWAYS	
<b>1</b>	<b>DERMAL CONTACT</b>
<b>2</b>	<b>INGESTION/INHALATION</b>
<b>3</b>	<b>LEACHING OF CONTAMINANTS</b>
<b>4</b>	<b>UPTAKE BY PLANTS</b>
<b>5</b>	<b>VOLATILISATION</b>

RECEPTORS	
<b>V</b>	<b>END USERS (RESIDENTS)</b>
<b>W</b>	<b>SITE WORKERS</b>
<b>X</b>	<b>VEGETATION</b>
<b>Y</b>	<b>SURFACE WATERS</b>
<b>Z</b>	<b>GROUNDWATER</b>

DRAWN JBR	DATE 29/10/24	STATUS FOR COMMENT <input type="checkbox"/>
CHECKED REG	DATE 29/10/24	FOR APPROVAL DRAFT <input type="checkbox"/>
		FINAL <input checked="" type="checkbox"/>

SCALE Not to scale	SHEET A3	DRAWING NO. 5200/5	REVISION
-----------------------	-------------	-----------------------	----------

## Appendix C

**Appendix D**  
**Historical OS Plans**



### Lancashire And Furness

Published 1895

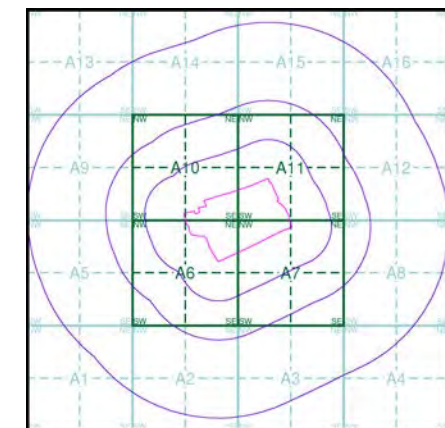
Source map scale - 1:10,560

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)

054SE 1895 1:10,560	055SW 1895 1:10,560
062NE 1895 1:10,560	063NW 1895 1:10,560

### Historical Map - Slice A



### Order Details

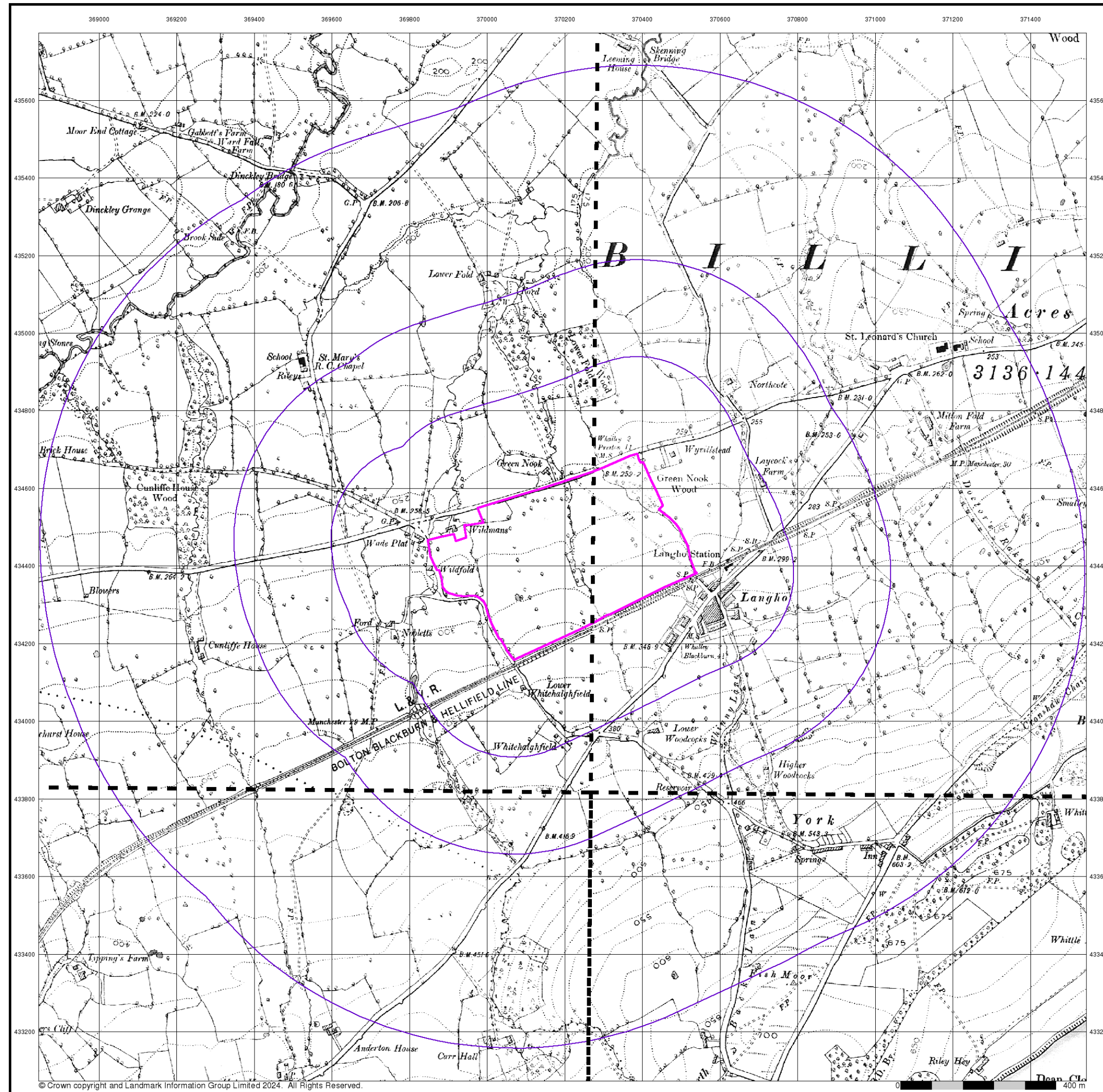
Order Number: 360509774\_1\_1  
 Customer Ref: PO23192/5200/DW  
 National Grid Reference: 370200, 434430  
 Slice: A  
 Site Area (Ha): 20.33  
 Search Buffer (m): 1000

### Site Details

Longsight Road, Langho



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





### Ordnance Survey Plan

Published 1955 - 1956

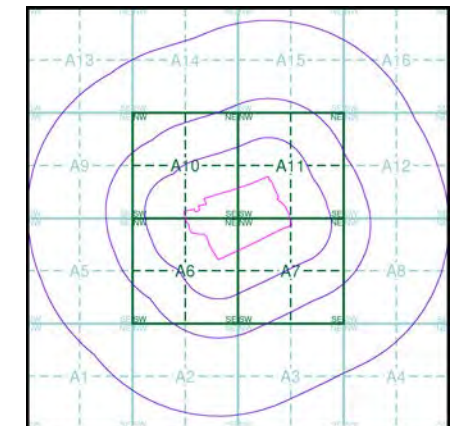
Source map scale - 1:10,000

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)

SD63NE	SD73NW
1956	1955
1:10,560	1:10,560
SD63SE	SD73SW
1956	1955
1:10,560	1:10,560

### Historical Map - Slice A



### Order Details

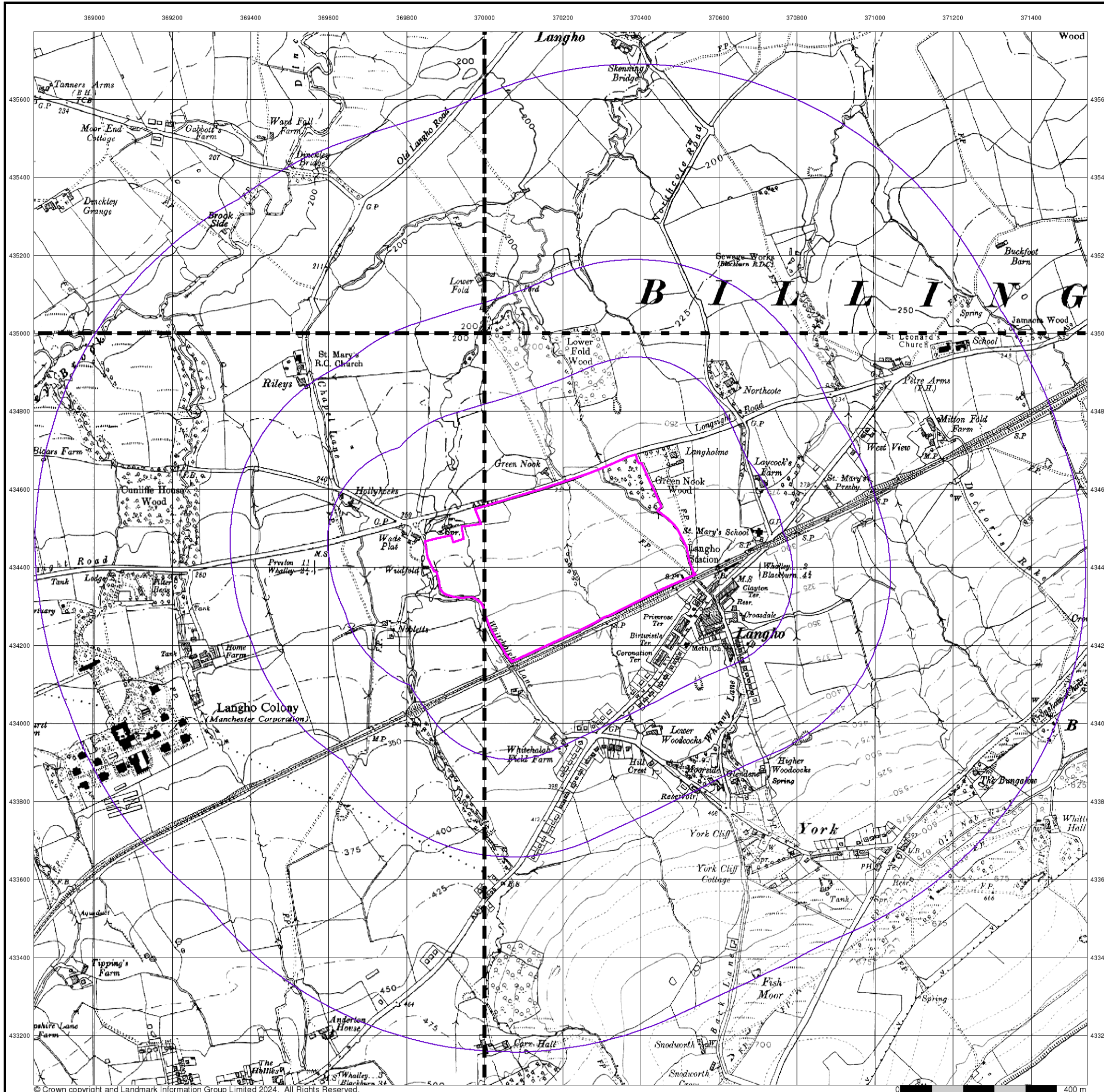
Order Number: 360509774\_1\_1  
 Customer Ref: PO23192/5200/DW  
 National Grid Reference: 370200, 434430  
 Slice: A  
 Site Area (Ha): 20.33  
 Search Buffer (m): 1000

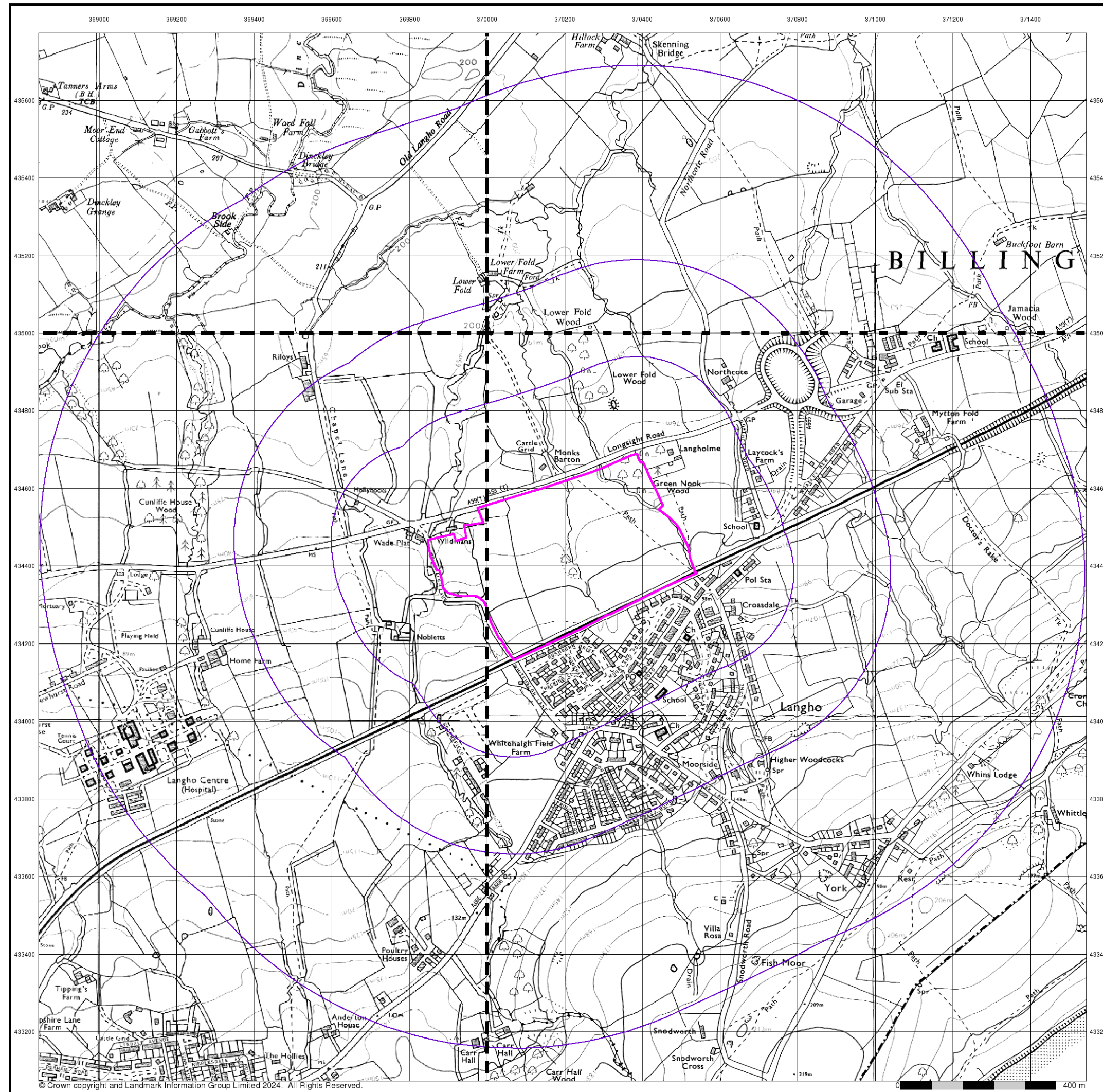
### Site Details

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 Web: www.envirocheck.co.uk





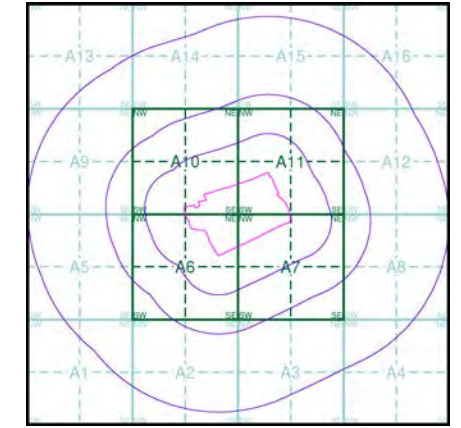
**Ordnance Survey Plan**  
**Published 1970 - 1978**  
**Source map scale - 1:10,000**

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)**

SD63NE	SD73NW
1970	1970
1:10,560	1:10,560
SD63SE	SD73SW
1978	1973
1:10,000	1:10,000

**Historical Map - Slice A**



**Order Details**

Order Number: 360509774\_1\_1  
 Customer Ref: PO23192/5200/DW  
 National Grid Reference: 370200, 434430  
 Slice: A  
 Site Area (Ha): 20.33  
 Search Buffer (m): 1000

**Site Details**

Longsight Road, Langho



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



10k Raster Mapping

Published 2006

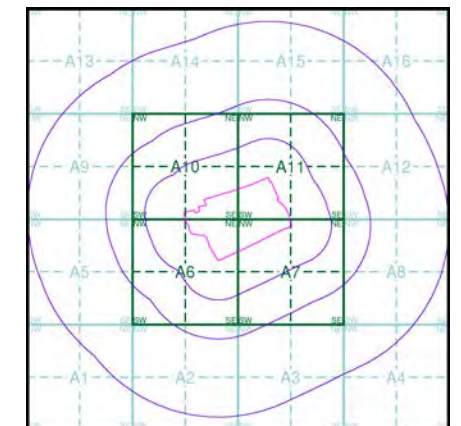
Source map scale - 1:10,000

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

Map Name(s) and Date(s)

SD63NE	SD73NW
2006	2006
1:10,000	1:10,000
SD63SE	SD73SW
2006	2006
1:10,000	1:10,000

Historical Map - Slice A



Order Details

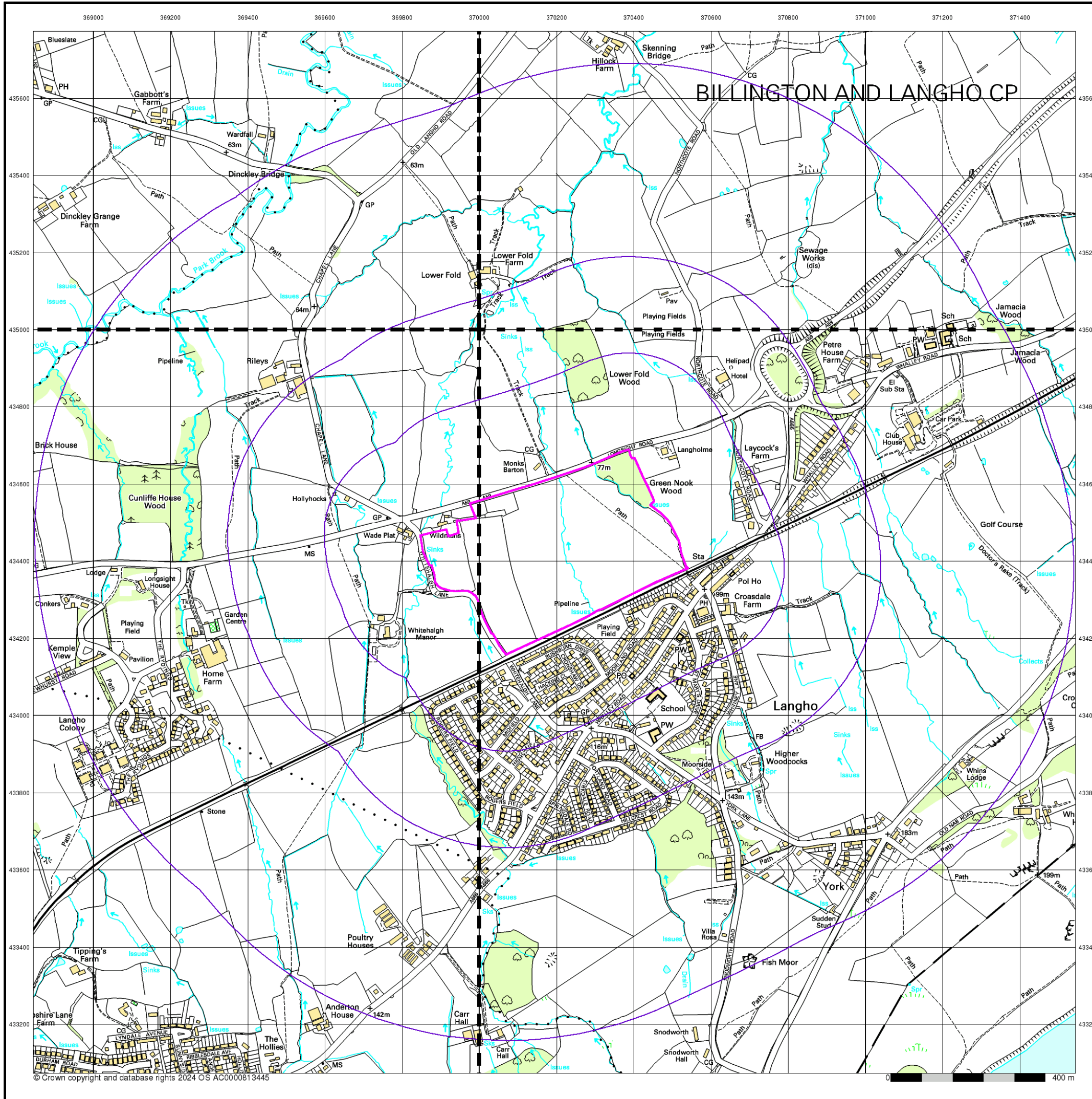
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 Customer Ref: PO23192/5200/DW  
 National Grid Reference: 370200, 434430  
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 Site Area (Ha): 20.33  
 Search Buffer (m): 1000

Site Details

Longsight Road, Langho



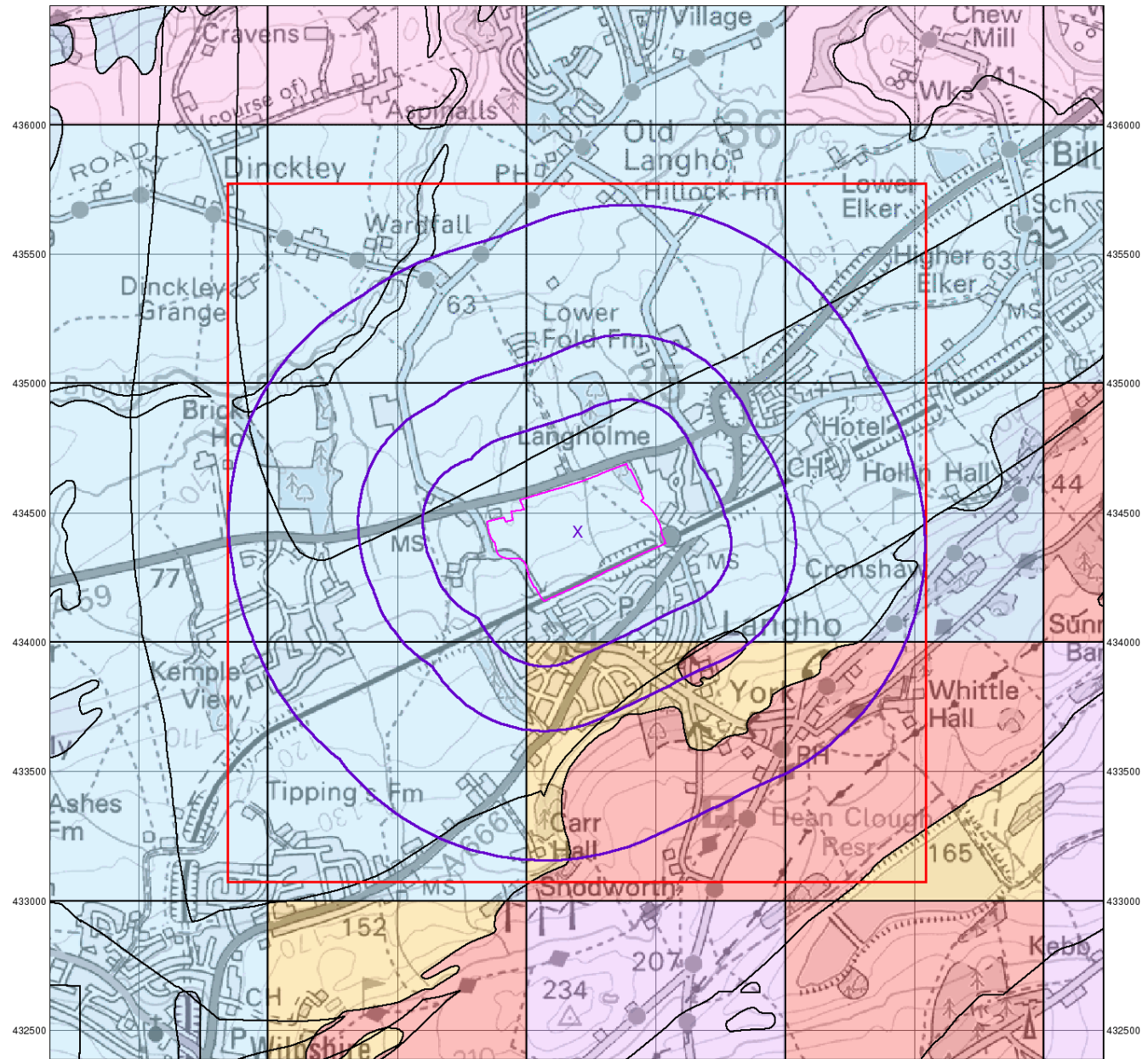
Tel: 0844 844 9952  
 Fax: 0844 844 9951  
 Web: www.envirocheck.co.uk



## **Appendix E**

### **Search Responses & other Correspondence**

368500 369000 369500 370000 370500 371000 371500 372000



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0 1 km



## Groundwater Vulnerability

### General

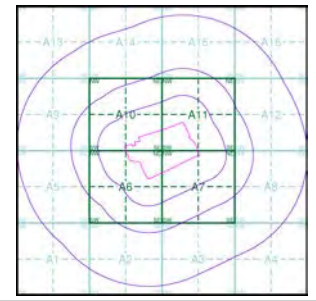
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

### Agency and Hydrological

Bedrock Aquifers	Superficial Aquifers
High Vulnerability, Principal Aquifer	High Vulnerability, Principal Aquifer
High Vulnerability, Secondary Aquifer	High Vulnerability, Secondary Aquifer
Medium Vulnerability, Principal Aquifer	Medium Vulnerability, Principal Aquifer
Medium Vulnerability, Secondary Aquifer	Medium Vulnerability, Secondary Aquifer
Low Vulnerability, Principal Aquifer	Low Vulnerability, Principal Aquifer
Low Vulnerability, Secondary Aquifer	Low Vulnerability, Secondary Aquifer

- Unproductive Aquifer
- Soluble Rock

### Site Sensitivity Context Map - Slice A



### Order Details

Order Number: 360509774\_1\_1  
 Customer Ref: PO23192/5200/DW  
 National Grid Reference: 370200, 434430  
 Slice: A  
 Site Area (Ha): 20.33  
 Search Buffer (m): 1000

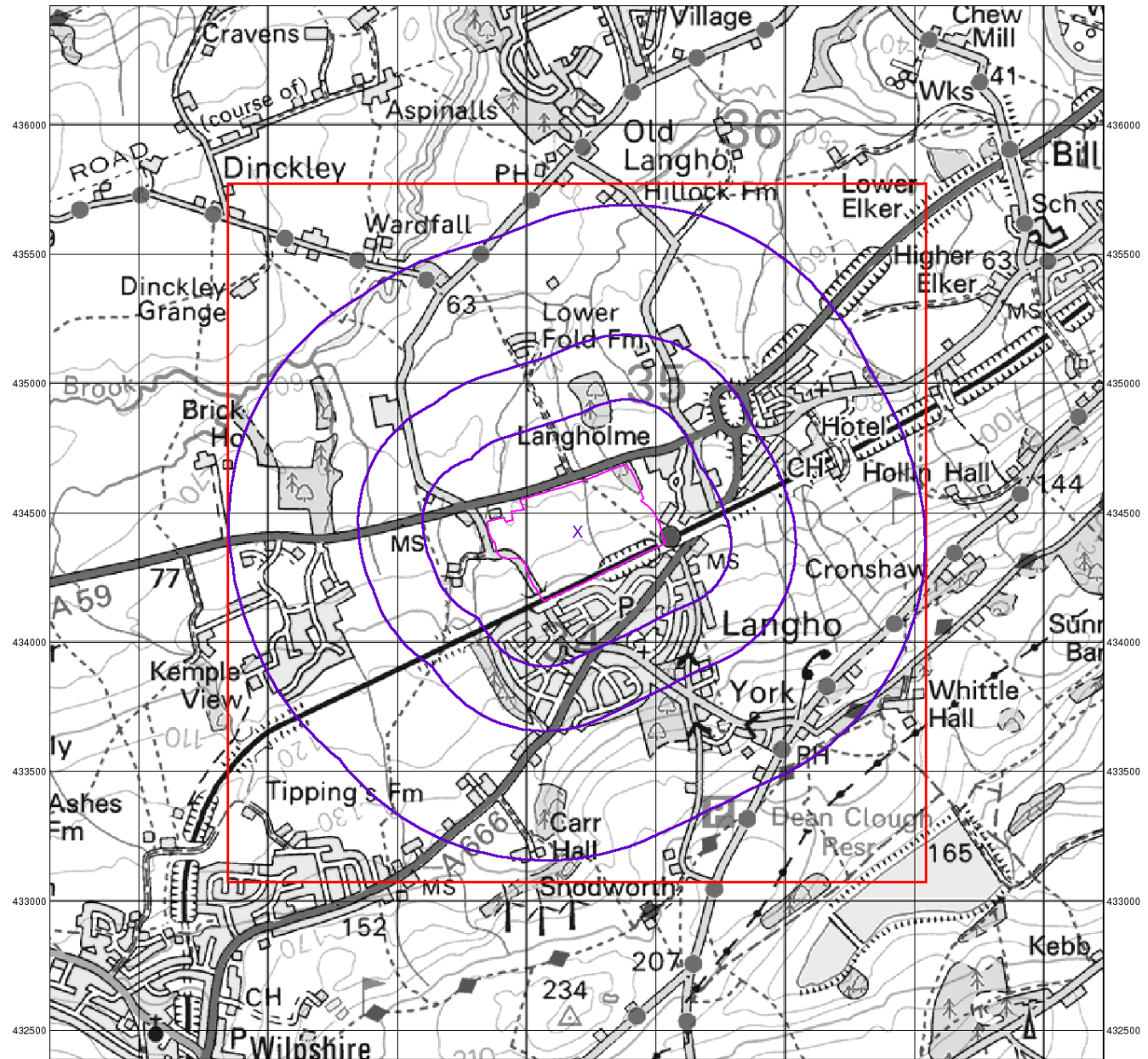
### Site Details

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 Fax: 0844 844 9951  
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368500 369000 369500 370000 370500 371000 371500 372000



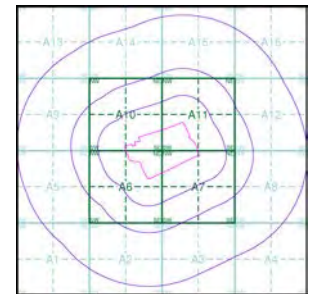
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### Source Protection Zones

- 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: 360509774\_1\_1  
 Customer Ref: PO23192/5200/DW  
 National Grid Reference: 370200, 434430  
 Slice: A  
 Site Area (Ha): 20.33  
 Search Buffer (m): 1000

### Site Details

Longsight Road, Langho

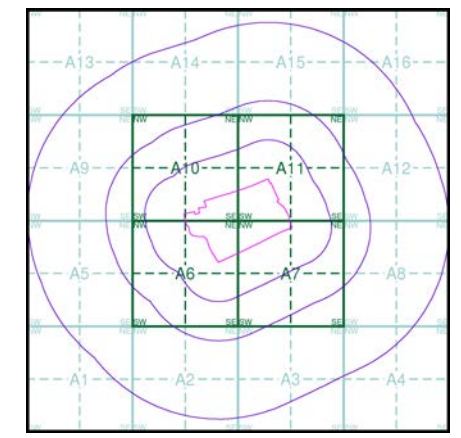


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 Fax: 0844 844 9951  
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- General**
- Specified Site
  - Specified Buffer(s)
  - Bearing Reference Point
  - Map ID
- Agency and Hydrological**
- Contaminated Land Register Entry or Notice (Location)
  - 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
  - Prosecution Relating to Authorised Processes
  - Prosecution Relating to Controlled Waters
  - Registered Radioactive Substance
  - River Network or Water Feature
  - River Quality Sampling Point
  - 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)
  - 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
  - NIHS Site
  - Planning Hazardous Substance Consent
  - Planning Hazardous Substance Enforcement
- Geological**
- BGS Recorded Mineral Site

### Site Sensitivity Map - Slice A



### Order Details

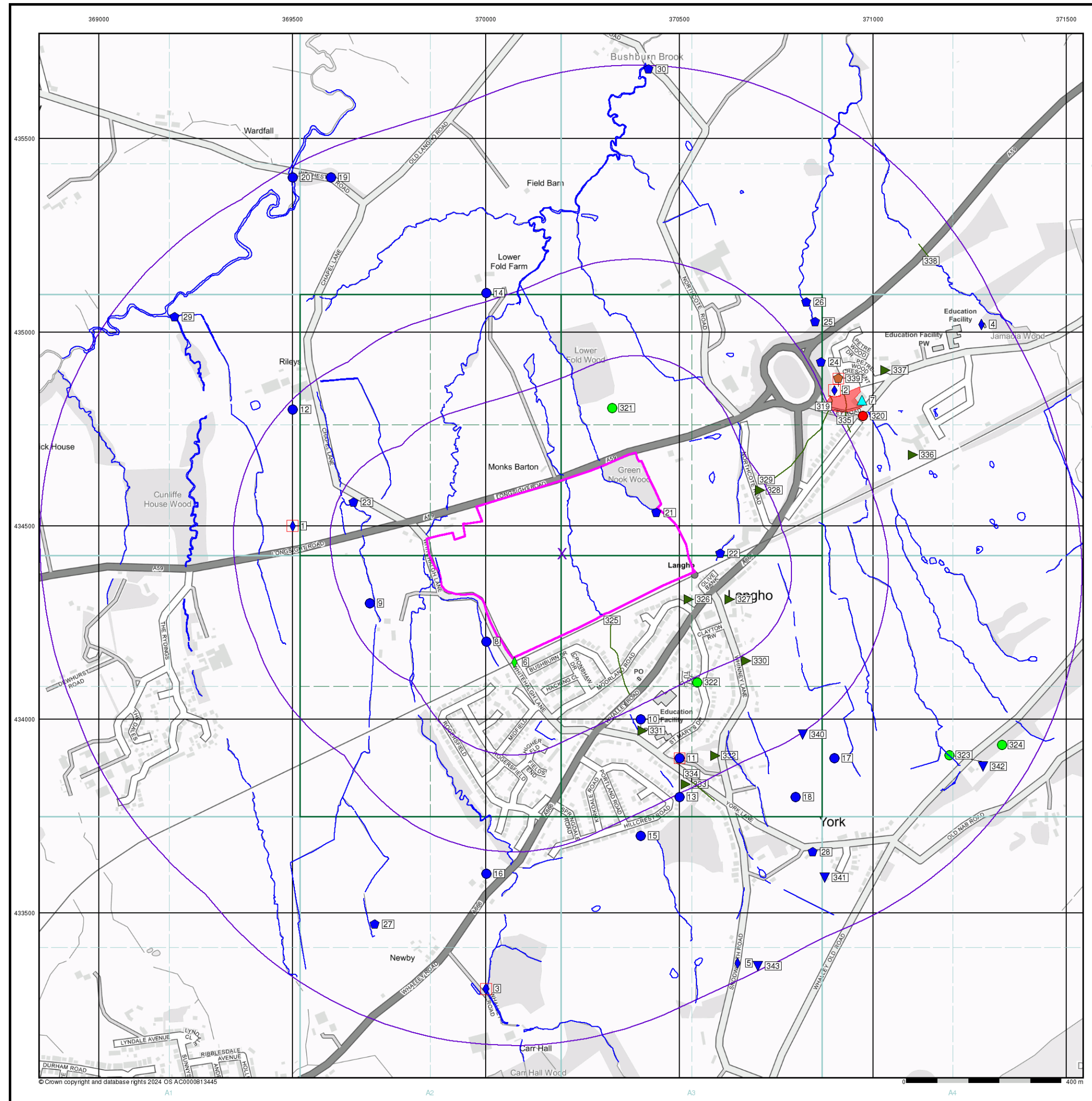
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 Customer Ref: PO23192/5200/DW  
 National Grid Reference: 370200, 434430  
 Slice: A  
 Site Area (Ha): 20.33  
 Search Buffer (m): 1000

### Site Details

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### General

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

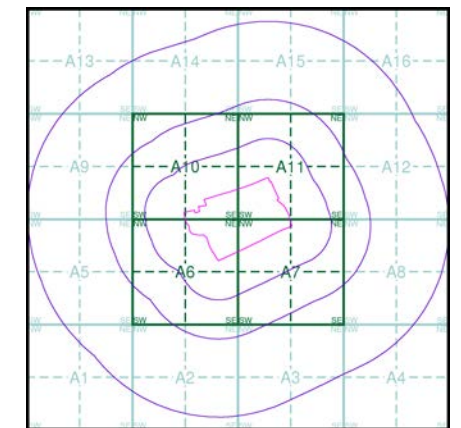
### OS Water Network Data

- |              |                         |
|--------------|-------------------------|
| 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 MLW Mean Low Water
- Master Contour 100 MHW Mean High Water
- Spot Height 167.3

### OS Water Network Map - Slice A



### Order Details

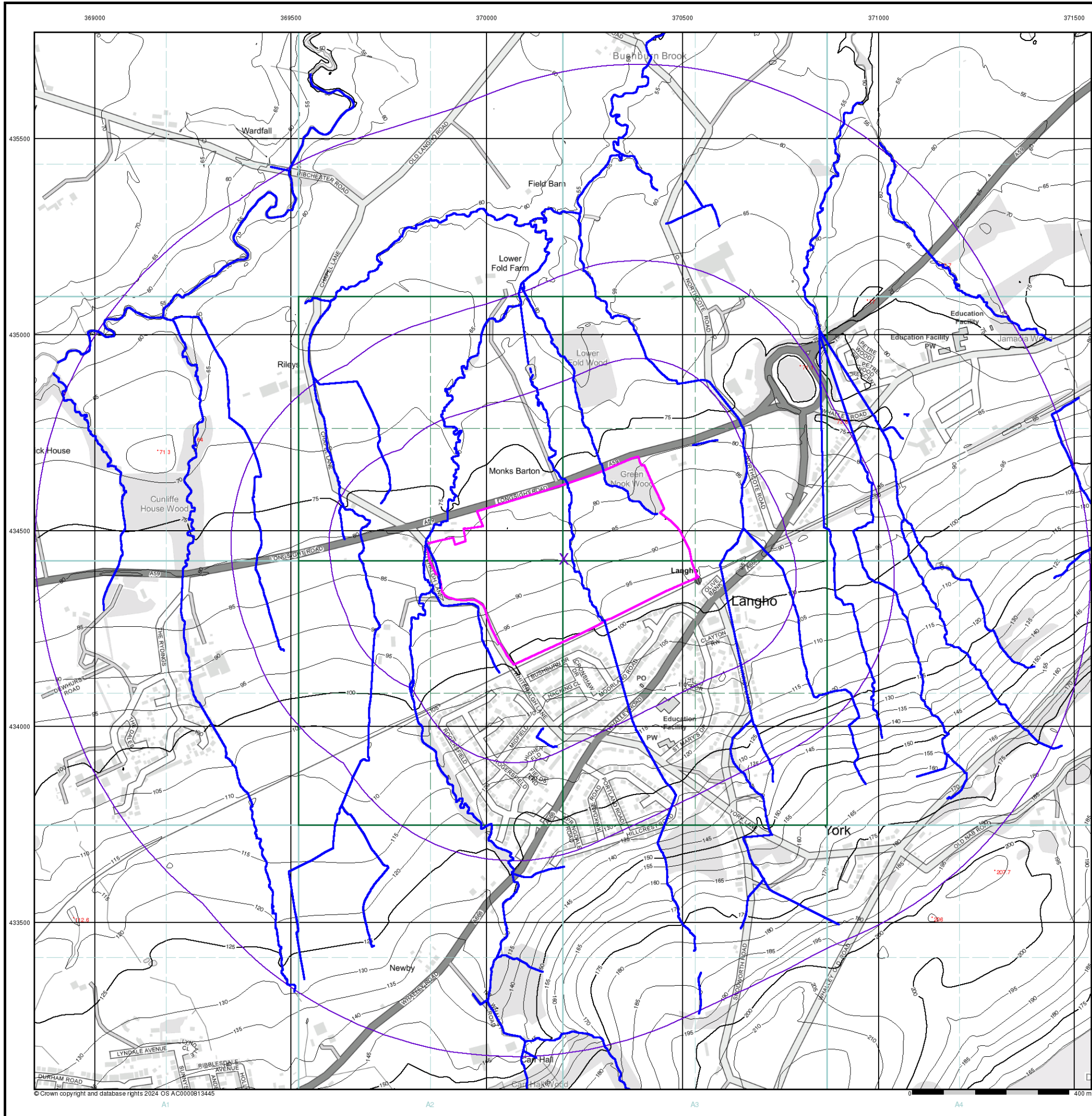
Order Number: 360509774\_1\_1  
 Customer Ref: PO23192/5200/DW  
 National Grid Reference: 370200, 434430  
 Slice: A  
 Site Area (Ha): 20.33  
 Search Buffer (m): 1000

### Site Details

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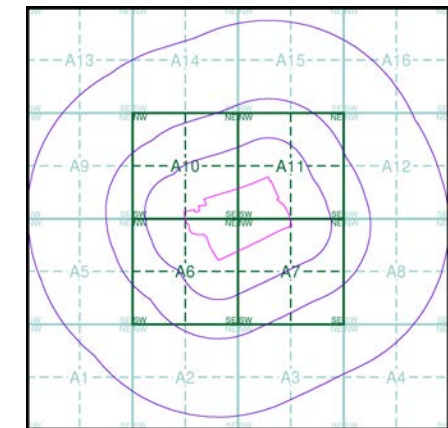
**General**

- 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**

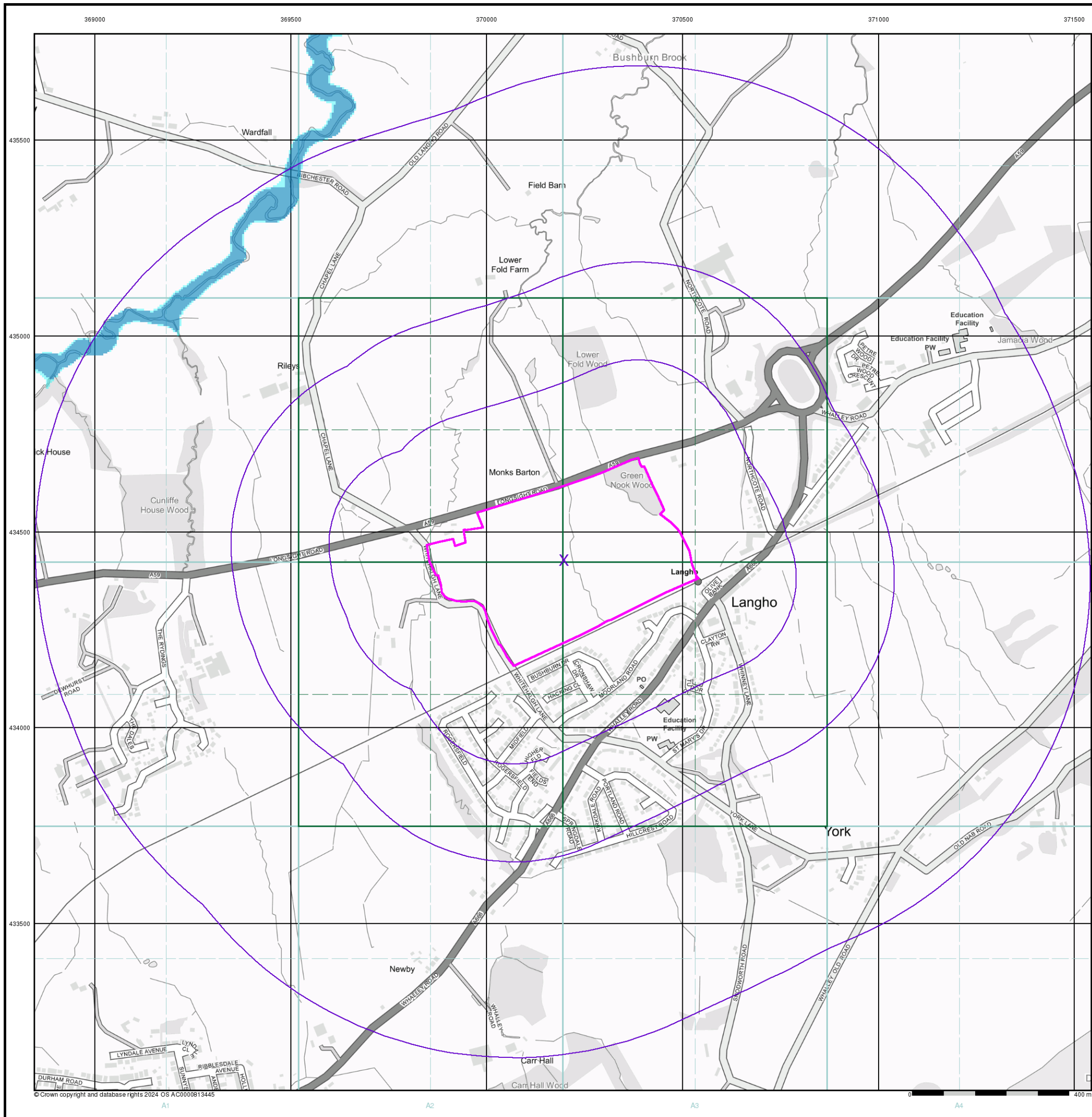
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 Customer Ref: PO23192/5200/DW  
 National Grid Reference: 370200, 434430  
 Slice: A  
 Site Area (Ha): 20.33  
 Search Buffer (m): 1000

**Site Details**

Longsight Road, Langho



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 Fax: 0844 844 9951  
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CLAIRE HANDLEY  
LITHOS CONSULTING LTD  
PARKHILL  
WALTON ROAD  
WETHERBY  
LS22 5DZ  
UNITED KINGDOM

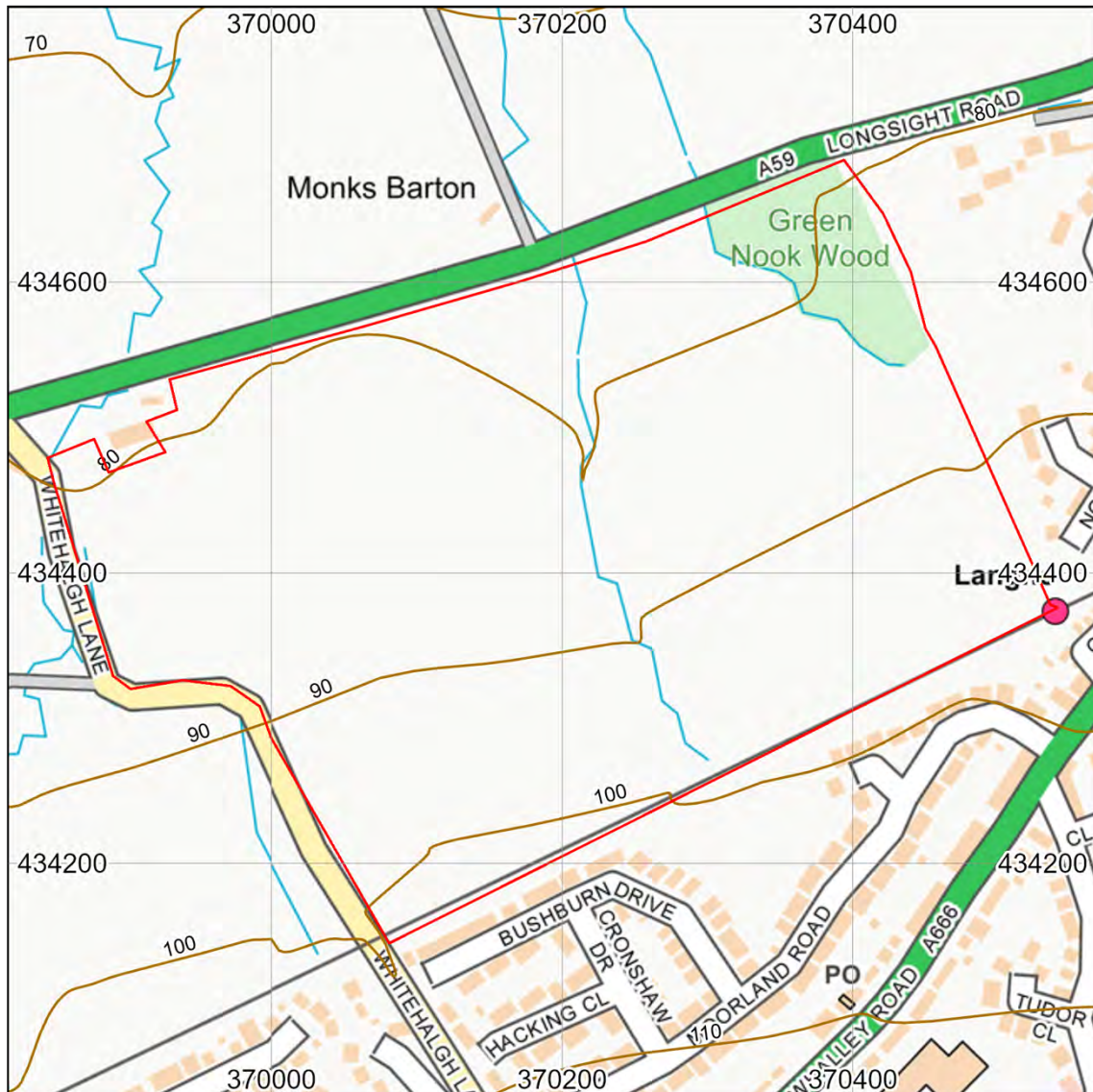
## Radon Report

Advisory report on the requirement for radon protective measures in new buildings, conversions and extensions to existing buildings. The report also indicates whether a site is located within a radon Affected Area

Report Id: *BGS\_340557/57353*

Client reference: PO23276/CH/5200

## Search location



Contains OS data © Crown Copyright and database right 2024. OS OpenMap Local: Scale: 1:5 000 (1cm = 50 m)

**Search location indicated in red**

*This report describes a site located at National Grid Reference 370194, 434414. Note that for sites of irregular shape, this point may lie outside the site boundary. Where the client has submitted a site plan the assessment will be based on the area given.*

## Radon Report: UK

When extensions are made to existing buildings in high radon areas, or new buildings are constructed in these areas, the Building Regulations for England, Wales, Scotland and Northern Ireland require that protective measures are taken against radon entering the building.

This report provides information on whether radon protective measures are required. Depending on the probability of buildings having high radon levels, the Regulations may require either:

1. No protective measures
2. Basic protective measures
3. Full protective measures

This is an advisory report on the requirement for radon protective measures in new buildings, conversions and extensions. The report also indicates whether a site is located within a radon Affected Area

### Requirement for radon protective measures

The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2023 edition)*, which also provides guidance on what to do if the result indicates that protective measures are required.

**Is the property in an area where radon protective measures are required for new buildings or extensions to existing ones as described in publication BR211 (2023 edition) Radon: Guidance on protective measures for new buildings?**

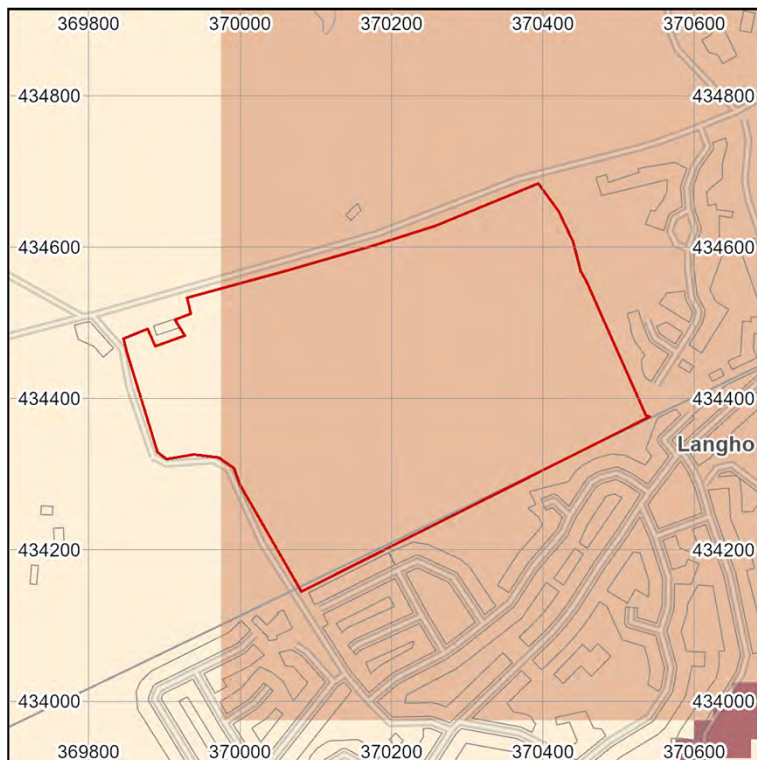
**NO RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.**

More details of the protective measures required are available in *BR211 Radon: Guidance on protective measures for new buildings (2023 Edition)*.

Whether or not the radon level in a building is above or below the radon Action Level can only be established by having the building tested. The UKHSA provides a radon testing service which can be accessed at [www.ukradon.org](http://www.ukradon.org) or by telephone (01235 822622).

If you require further information or guidance, you should contact your local authority building control officer or approved inspector.

## Radon Affected Area



% Homes estimated to be at or above the action level
0-1%
1-3%
3-5%
5-10%
10-30%
30-100%

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 Scale: 1:10 000 (1cm = 100 m)  
**Search area indicated in red**

**Is the property in a radon Affected Area as defined by the UK Health Security Agency (UKHSA) and if so what percentage of homes are estimated to be at or above the Action Level? YES**

### Additional Information

**THE PROPERTY IS IN A RADON AFFECTED AREAS WHERE 1 TO 3% OF HOMES ARE ESTIMATED TO BE AT OR ABOVE THE ACTION LEVEL.**

The UKHSA recommends a radon 'Action Level' of 200 Becquerels per cubic metre of air ( $\text{Bq m}^{-3}$ ) for the annual average of the radon gas concentration in a home. Where 1% or more of homes are estimated to be at or above the Action Level the area should be regarded as a radon Affected Area.

This report informs you whether the property is in a radon Affected Area and the percentage of homes that are estimated to be at or above the radon Action Level at this location. Being in an Affected Area does not necessarily mean there is a high radon level within the property; the only way to determine the radon level is to carry out a radon measurement.

The UKHSA advises that radon gas should be measured in all properties within radon Affected Areas and that homes with radon levels at or above the Action Level (200 Bq m<sup>-3</sup>) should be remediated. Householders with levels between the Target Level (100 Bq m<sup>-3</sup>) and Action Level should seriously consider reducing their radon level, especially if they are at greater risk, such as if they are current or ex smokers. Whether or not a home is in fact above or below the Action Level or Target Level can only be established by having the building tested. The UKHSA provides a validated radon testing service which can be accessed at [www.ukradon.org](http://www.ukradon.org).

The information in this report provides an answer to one of the standard legal enquiries on house purchase in England and Wales, known as Law Society CON29 Enquiries of the Local Authority (2016); 3.14 Radon Gas: Do records indicate that the property is in a “Radon Affected Area” as identified by the UKHSA. The data can also be used to advise house buyers and sellers in Scotland and Northern Ireland.

If you are buying a new build property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

If you are buying a currently occupied property in a radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were at or above the radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and if the results of re-testing confirmed the effectiveness of the measures.

Further information on radon is available from the UKHSA at [www.ukradon.org](http://www.ukradon.org).

## What is radon?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters enclosed spaces such as some buildings (particularly basements), caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre ( $\text{Bq m}^{-3}$ ). The Government advises householders that, where the radon level is at or above the Action Level, measures should be taken to reduce the concentration.

## Radon in workplaces

The Ionising Radiation Regulations 2017 require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace**. BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: [bookshop@bre.co.uk](mailto:bookshop@bre.co.uk) website: [www.brebookshop.com](http://www.brebookshop.com)



SD73/116



British Geological Survey  
NATURAL ENVIRONMENT RESEARCH COUNCIL

## INFORMATION MANAGEMENT PROGRAMME

### A SITE DETAILS

Borehole drilled for: MR. N. HAWORTH & MR. C.J. BANCROFT, NORTHOTE LEISURE GROUP LTD,  
 Location: NORTHOTE, NORTHOTE ROAD, LANGHO, BLACKBURN, LANCS. BB6 8BE  
 NGR (8 figures): SD 704351  
 Ground Level (if known): \_\_\_\_\_ Please attach site plan  
 Drilling Company: NATIONAL WATER WELL ENGINEERS  
 Date of Drilling: Commenced 11/08/2015 Completed / /

### B CONSTRUCTION DETAILS

Borehole Datum (if not ground level) GROUND LEVEL above \_\_\_\_\_ m below GL  
 (point from which all measurements of depth are taken e.g. flange, edge of chamber, etc.)

Borehole drilled diameter \_\_\_\_\_  
200 mm from 0 to 12.192 m/depth  
150 mm from 12.192 to 42.672 m/depth  
 mm from \_\_\_\_\_ to \_\_\_\_\_ m/depth

Casing material PLASTIC diameter \_\_\_\_\_  
 and type (e.g. if plain steel, plastic slotted) 150 mm from 0 to 12.192 m/depth

Casing material PLASTIC diameter \_\_\_\_\_  
100 mm from 0 to 42.672 m/depth

Casing material \_\_\_\_\_ diameter \_\_\_\_\_ mm from \_\_\_\_\_ to \_\_\_\_\_ m/depth

Casing material \_\_\_\_\_ diameter \_\_\_\_\_ mm from \_\_\_\_\_ to \_\_\_\_\_ m/depth

Grouting details \_\_\_\_\_

Water struck at \_\_\_\_\_  
21 m (depth below datum - mbd)  
 \_\_\_\_\_ m (depth below datum - mbd)

Rest water level on completion 4.572 mbd

### C TEST PUMPING SUMMARY (Please supply full details on Forms WR-39)

Test Pumping Datum (if different from borehole datum) \_\_\_\_\_ m above \_\_\_\_\_ below borehole datum (mbd)

Pump Suction depth \_\_\_\_\_ mbd

Water Level (Start of Test) \_\_\_\_\_ mbd

Water Level (End of Test) \_\_\_\_\_ mbd

Pumping rate \_\_\_\_\_ m<sup>3</sup>/d:l/s  
 for \_\_\_\_\_ days/hours

Recovery to (from end of pumping) \_\_\_\_\_ mbd in \_\_\_\_\_ mins: hrs: days

Date(s) of measurements \_\_\_\_\_

Please supply chemical Analysis if available

**D STRATA LOG**

Geological Classification (BGS only)	Description of strata	Thickness	Depth
		m	m
	HARDGRE	1.2192	1.2192
	CLAY	1.8288	3.048
	GRAVEL	0.6096	3.6576
	MUDSTONE	6.096	9.7536
	COAL MEASURES	6.096	15.8496
	GRITSTONE	1.8288	17.6784
	COAL MEASURES	1.524,	19.2024
	GRITSTONE	3.048	22.2504
	COAL MEASURES	9.144	31.3944
	GRITSTONE	4.572	35.9664
	COAL MEASURES	2.1336	38.1
	GRITSTONE	1.8288	39.9288
	COAL MEASURES.	2.7432	42.672.
	(continue on separate page if necessary)		
	Other comments (e.g. gas encountered, saline water intercepted, etc.)		
<b>FOR OFFICIAL USE ONLY</b>			
FILE	CONSENT NO	NGS REF NO:	
LIC NO:	PURPOSE:	EA REF NO:	
DATE REC:	COPY TO:	ENTERED BY:	

**Appendix F**  
**Soakaway test results**

008/5200/REG/dw

18<sup>th</sup> November 2024



Registered in England 07068066

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LS1 4DP

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Dear Adam

## Longsight Road, Langho – soakaway results

### Introduction

Further to recent completion of fieldwork at the above site, please find enclosed a summary of our findings.

It is understood that consideration is being given to redevelopment of the site with commercial office units, two and three storey domestic dwellings, associated gardens, POS and adoptable roads and sewers.

Lithos have already issued a Preliminary Investigation Report (Ref: 5200/1, dated November 2024).

### Fieldwork and ground conditions

Fieldwork was supervised by Lithos on 31<sup>st</sup> October 2024 and comprised the exploratory holes listed below:

Technique	Exploratory holes	Final depth(s)	Remarks
Trial pitting (machine dug)	SAs 01 to 05	1.6m to 2.8m	Soakaway testing undertaken in each pit

Exploratory hole logs a summary table of ground conditions are appended to this letter report. These logs include the details of the:

- Descriptions of the solid strata, and any groundwater encountered
- Results of in situ testing

Natural ground was encountered in all 5 exploratory holes, and typically comprised:

- **Topsoil:** Dark brown slightly sandy, silty Clays. Encountered in all exploratory holes across the site to a typical depth of 300mm.
- **Cohesive Glacial Deposits (gravelly Clay):** Firm, orangish brown becoming dark grey, slightly sandy, silty Clays with gravels of sandstone and mudstone and a low to high cobble content. Encountered in all exploratory holes across the site to 0.5m depth (SA05), 2.1m depth (SA01) and the base of the hole elsewhere (SAs 2 to 4)
- **Granular Glacial Deposits (silty Sand):** Brown, very silty, fine to medium Sand. Encountered at the base of SA01 between 2.1m and >2.3mbgl.
- **Cohesive Residual Soil (Weathered Bowland Shale):** Firm, orangish brown becoming grey, sandy, silty Clay, with gravels of lithorelicts. Encountered between 0.5m and 1.9m depth in SA05.



- **Granular Residual Soil (Weathered Bowland Shale):** Dark grey, very clayey, sandy angular and subangular fine to coarse lithorelict Gravel. Encountered at the base of SA05 between 1.9m and >2.3 depth.

A c. 1.2m diameter sandstone boulder was encountered at 1.6m in SA03,

Ground conditions appear consistent with those anticipated from BGS plans and the Lithos' Preliminary Investigation Report, with SAs 1 to 4 encountering Cohesive Glacial Deposits, and SA05 encountering Weathered Bowland Shale Formation.

Groundwater was encountered in SA01 and SA05 at 2.1m and 1.9m depth respectively with running sands also recorded in SA01 at 2.1m depth.

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

### Soakaway testing

Soakaway testing was carried out in 5 pits, in general accordance with BRE DG365 "Soakaway Design". The locations of the soakaways are shown on Drawing 5200/6 which is appended to this letter report.

General notes about soakaways, including their location, design, and Lithos' test methodology are appended.

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.

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.

### Summary of soakaway infiltration rates

Soakaway	Stratum	Infiltration rate (m/s)	Remarks
SA01	Cohesive glacial deposits (0.3-2.1m) Granular glacial deposits (2.1-2.3m)	N/A	Still >80% full after 3 hours. Initial drainage likely due to encountering land drain.
SA02	Cohesive glacial deposits (0.3-2.5m)	N/A	Still >80% full after 3 hours. Initial drainage likely due to encountering land drain.
SA03	Cohesive glacial deposits (0.3-1.6m)	N/A	Still >95% full after 3 hours
SA04	Cohesive glacial deposits (0.3-2.8m)	N/A	Still >95% full after 25 minutes upon side wall collapse of pit
SA05	Cohesive glacial deposits (0.3-2.5m) Weathered bedrock (1.9-2.3m)	N/A	Still >95% full after 3 hours

Copies of the field data are appended to this letter report. Given that the initial testing did not reach 25% effective depth no subsequent re-fill cycles were undertaken.

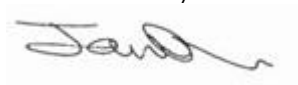
### Discussion & Conclusions

The low infiltration rates are likely due to the Clay nature of shallow natural soils (Cohesive Glacial Deposits & Cohesive Residual Soils). Where Granular strata was encountered, it was typically silty/clayey and contained groundwater (i.e. saturated) suggesting a relatively shallow groundwater table.

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.

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

Yours sincerely



Senior Engineer  
**for and on behalf of**  
**LITHOS CONSULTING LIMITED**

*enc*

Summary of Ground Conditions  
General Note 06 – Soakaways  
Drawing 5200/6 – Exploratory Hole Location Plan  
Exploratory Hole Records  
Soakaway Test Results

## Summary of ground conditions:

Hole ID	Final Depth	Depth to Base (mbgl)				
		Topsoil	Cohesive Glacial Deposits	Granular Glacial Deposits	Cohesive Residual Soil	Granular Residual Soil
SA01	2.3	0.3	2.1	>2.3	-	-
SA02	2.5	0.3	>2.5	-	-	-
SA03	1.6	0.3	>1.6	-	-	-
SA04	2.8	0.3	>2.8	-	-	-
SA05	2.3	0.3	0.5	-	1.9	>2.3

## 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 bowsers (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 herras 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.

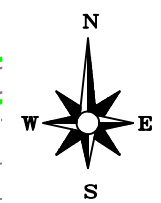
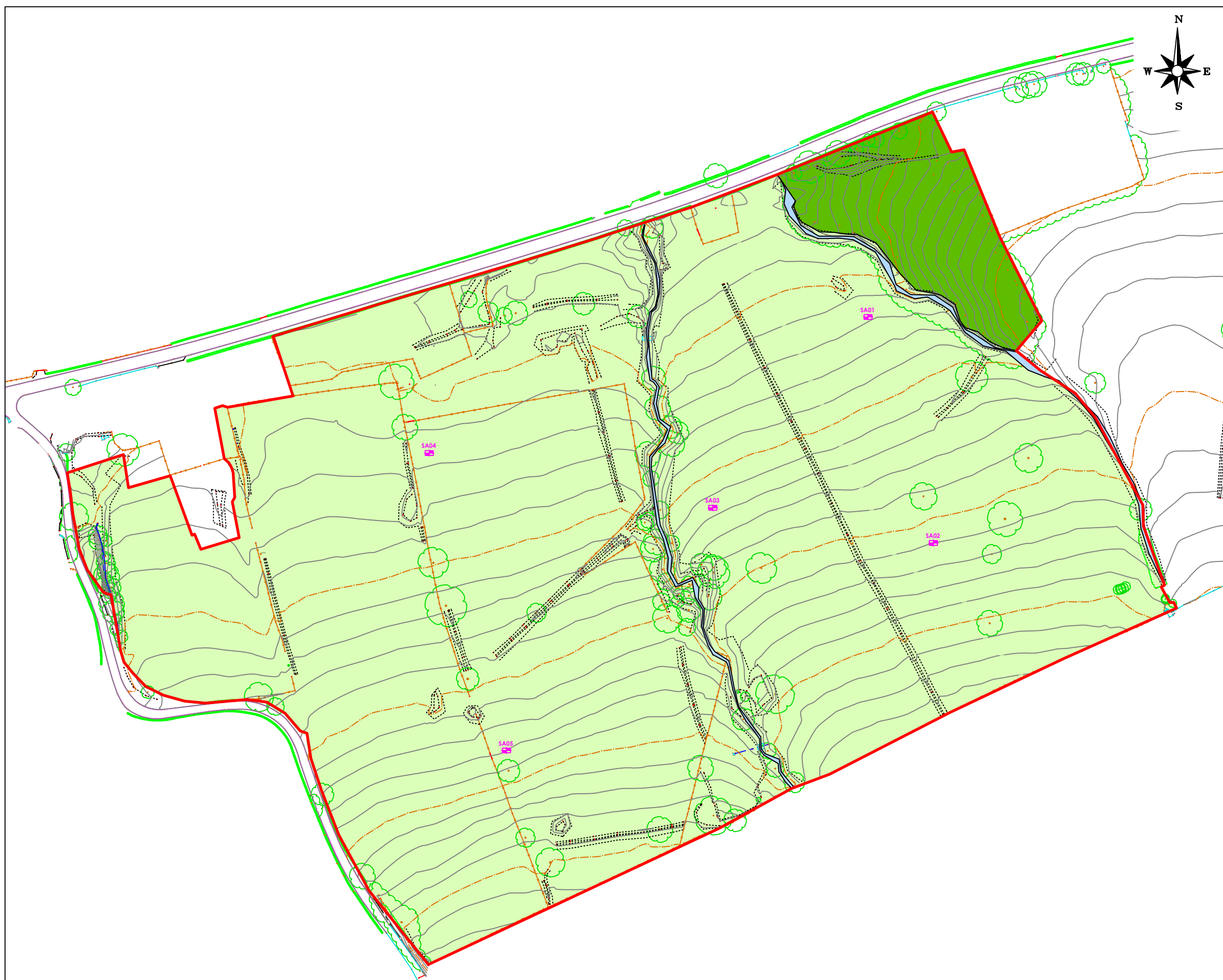
Increasing the soakaway effective depth might offer a solution, but consideration should be given to:

- 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.



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

JOB TITLE

LONGSIGHT ROAD, LANGHO

DRAWING TITLE

EXPLORATORY HOLE LOCATIONS

DRAWN	JBR	DATE	01/11/2024	STATUS	FOR COMMENT <input type="checkbox"/>
CHECKED	REG	DATE	01/11/2024	FOR APPROVAL	<input type="checkbox"/>
				DRAFT	<input type="checkbox"/>
				FINAL	<input checked="" type="checkbox"/>

SCALE	1:2500	SHEET	A3	DRAWING NO.	5200/6	REVISION	
-------	--------	-------	----	-------------	--------	----------	--

Project Name: Longsight Road, Langho      Project No. 5200      Co-ords: 370347.00 - 434561.00      Date 31/10/2024

Location: Langho      Dimensions (m): 2.3      Scale 1:20

Client: Hallam Land      Depth 2.30      Logged JB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼			HVP=68	0.30			Dark brown slightly sandy silty CLAY. (TOPSOIL)
				0.90			Firm light brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse sandstone mudstone and coal. (COHESIVE GLACIAL DEPOSITS)
				2.10			Firm to stiff dark grey slightly sandy slightly gravelly silty CLAY with a low cobble content. Gravel is subangular to rounded fine to coarse sandstone mudstone and coal. (COHESIVE GLACIAL DEPOSITS) <i>At 1.0m, land drain, groundwater seepage.</i>
				2.30			Brown very silty fine to medium SAND. (GRANULAR GLACIAL DEPOSITS) <i>From 2.1m to 2.3m, running sands.</i> <i>At 2.3m, groundwater seepage.</i> End of pit at 2.30 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater encountered at 2.3m during excavation. 3. Backfilled with materials arising upon completion. 4. Co-ordinates from hand held GPS, hole not surveyed in.

Stability: 1. The sides of the trial pit were unstable between 2.1m and 2.3m depth during excavation.



Project Name: Longsight Road, Langho	Project No. 5200	Co-ords: 370388.00 - 434421.00 Level:	Date 31/10/2024
Location: Langho	Dimensions (m): Depth 2.50		Scale 1:20 Logged JB
Client: Hallam Land		2.6	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			Dark brown slightly sandy silty CLAY. (TOPSOIL)
				0.70			Firm light brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse sandstone and mudstone. (COHESIVE GLACIAL DEPOSITS)
				1.40			Stiff dark grey slightly sandy slightly gravelly silty CLAY with a low sandstone cobble content. Gravel is subangular to subrounded fine to coarse sandstone and mudstone. (COHESIVE GLACIAL DEPOSITS)
		HVP=92					At 1.3m, land drain, dry.
				2.50			Stiff dark grey slightly sandy gravelly CLAY with a high sandstone cobble content. Gravel is subangular to rounded fine to coarse sandstone and mudstone. (COHESIVE GLACIAL DEPOSITS)
							End of pit at 2.50 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Co-ordinates from hand held GPS, hole not surveyed in.

Stability: 1. The sides of the trial pit remained stable during excavation with slight overbreak due to cobbles.



Project Name: Longsight Road, Langho	Project No. 5200	Co-ords: 370250.00 - 434443.00 Level:	Date 31/10/2024
Location: Langho	Dimensions (m): Depth 1.60		Scale 1:20 Logged JB
Client: Hallam Land	2.6		

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			Dark brown slightly sandy silty CLAY. (TOPSOIL)
				1.00			Firm light brown mottled grey slightly sandy slightly gravelly silty CLAY. With a low rounded sandstone cobble content. Gravel is subangular to rounded fine to coarse sandstone and mudstone. (COHESIVE GLACIAL DEPOSITS)
			HVP=61	1.60			Firm brownish grey slightly sandy slightly gravelly silty CLAY with a high cobble content. Gravel is subangular to subrounded fine to coarse sandstone and mudstone. (COHESIVE GLACIAL DEPOSITS) <i>From 1.0m, hard excavation due to cobbles.</i>
							End of pit at 1.60 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Co-ordinates from hand held GPS, hole not surveyed in.

Stability: 1. The sides of the trial pit remained stable during excavation with slight overbreak due to cobbles.



Project Name: Longsight Road, Langho	Project No. 5200	Co-ords: 370074.00 - 434477.00 Level:	Date 31/10/2024
Location: Langho	Dimensions (m): Depth 2.80		Scale 1:20 Logged JB
Client: Hallam Land		2.5	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
			HVP=85	0.30			Dark brown slightly sandy silty CLAY. (TOPSOIL)	
				1.00			Firm brown sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse sandstone. (COHESIVE GLACIAL DEPOSITS)	1
				1.20			Firm reddish brown slightly gravelly silty CLAY. Gravel is subangular to rounded fine to coarse sandstone. (COHESIVE GLACIAL DEPOSITS)	
				2.00			Stiff dark grey slightly sandy gravelly CLAY with a low to medium cobble content. Gravel is subangular to subrounded fine to coarse sandstone and mudstone. (COHESIVE GLACIAL DEPOSITS)	
				2.50			Greyish brown sandy SILT. (COHESIVE GLACIAL DEPOSITS)	2
				2.80			Siff dark grey gravelly CLAY with a low cobble content. Gravel is subangular to subrounded fine to coarse sandstone and mudstone. (COHESIVE GLACIAL DEPOSITS)	
							End of pit at 2.80 m	3
								4

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Co-ordinates from hand held GPS, hole not surveyed in.

Stability: 1. The sides of the trial pit remained stable during excavation.



Project Name: Longsight Road, Langho	Project No. 5200	Co-ords: 370122.00 - 434292.00 Level:	Date 31/10/2024
Location: Langho	Dimensions (m): Depth 2.30		Scale 1:20 Logged JB
Client: Hallam Land	2.6		

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				0.30			Dark brown slightly sandy silty CLAY. (TOPSOIL)
				0.50			Light grey sandy CLAY. (COHESIVE GLACIAL DEPOSITS)
			HVP=48	1.10			Firm orangish brown sandy slightly gravelly silty CLAY. Gravelly is angular to subangular fine to medium sandstone and siltstone lithorelicts. (COHESIVE RESIDUAL SOIL)
			HVP=52	1.90			Firm grey slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine mudstone lithorelicts. (COHESIVE RESIDUAL SOIL)
				2.30			Dark grey very clayey sandy angular and subangular fine to coarse lithorelict GRAVEL of shale and mudstone. (GRANULAR RESIDUAL SOIL) <u>At 1.9m, groundwater seepage.</u>
							End of pit at 2.30 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater encountered at 1.9m during excavation. 3. Backfilled with materials arising upon completion. 4. Co-ordinates from hand held GPS, hole not surveyed in.

Stability: 1. The sides of the trial pit remained stable during excavation.











