

**Burbage Fields,
Burbage**

Phase 1

**Geo-environmental
Desk Study**

BURBAGE FIELDS, BURBAGE

PHASE 1 GEO-ENVIRONMENTAL DESK STUDY

For

REDROW HOMES LTD.

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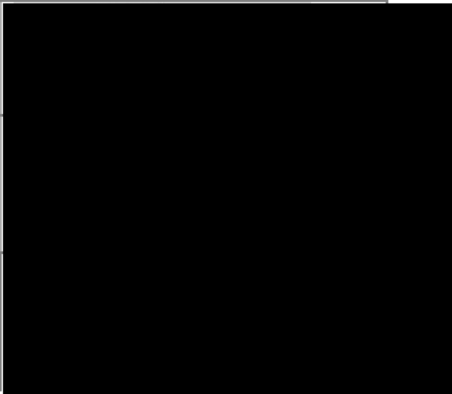
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Executive Summary

This summary presents the salient points of the report and should not be referred to in isolation.

Instruction	In September 2020 Redrow Homes Ltd commissioned Rodgers Leask Environmental (RLE) Ltd to compile a Phase One Desk Study for a site at Burbage Fields, Burbage, Leicestershire.
Site Location and Description	The site is located between the M69 Motorway (to the south) and the village of Burbage (to the north) in Leicestershire. The site comprises 7 No. grass pasture fields which are generally separated by hedgerow, trees and post and rail fencing. A farm and associated barns are present in the south and 2 No. residential properties are in the far northern extremes. A high voltage electricity line crosses the southern extents and a stream/unnamed river crosses the site.
History	The site has generally remained greenfield for much of its history. Burbage Fields Farm has existed in the southern site area from before 1886. Fieldgate Pit existed in the far northern site area, from before 1886 to about the 1920s. Residential properties were constructed by 1938 and remain on this area. Allotment gardens occupied the northern site area from about 1920s to the 1990s. An overhead electricity line was constructed across the southern site extents in the 1930s with additional lines added and subsequently rerouted and or removed in subsequent years. The original line remains to date.
Geology	Superficial deposits – Oadby Member (Glacial Till) beneath majority of the site. Alluvium along the far eastern boundary. Wolston Sand & Gravel Member mapped beneath the northern area. Dunsmore Gravel - Sand & Gravel mapped in the far northern extents. Bedrock comprises the Mercia Mudstone Group.
Hydrogeology	Alluvium and Sand & Gravel Members – Secondary A Aquifers. Oadby Member – Secondary Undifferentiated. Mercia Mudstone Group – Secondary B Aquifer.
Mining	Negligible risk.
Hydrology	Unnamed Inland River recorded crosses the northern half of the site then following the eastern/south eastern boundary.
Ecology and Wildlife	The site is within a SSSI impact assessment zone but is not itself within a SSSI.
Archaeology	Heritage Gateway website indicates that there are medieval records on the site itself with medieval and roman activity in the locality. Early consultation with the Local Authority is recommended to confirm the requirements for surveys.

UXB Risk	Regional Unexploded Bomb Risk maps obtained from Zetica indicates that the site is in a low risk area for Unexploded Bombs (UXB).
Flood Risk	Available information would suggest that there is a low risk of flooding. However, this preliminary risk assessment should be confirmed by carrying out a Flood Risk Assessment (FRA) for the site.
Public Register Information	No records on site and limited records within surrounding area. Site is not classed as contaminated land under the Environmental Protection Act 1990.
Potential Contamination Issues	Moderate/ Low risk to human health receptors. Moderate/ Low risk to controlled waters. Moderate gassing risk associated with Alluvium, Fieldgate Pit and M69 motorway embankment. Ground investigation required to confirm the contamination/gas risk.
Foundations and Geotechnical issues	Intrusive works shall be required in order to identify ground conditions and provide foundation recommendations for the site. The geology suggests that traditional strip/trenchfill foundations are likely to be appropriate across the majority of the site, subject to verification by intrusive investigation. Deepened strip/trenchfill foundations or piled foundations may be required where Alluvium is mapped in the east, and where foundations are within the influence of trees (adjacent trees and hedgerows); a tree survey is recommended. A medium VCP is anticipated for cohesive strata. Instability and groundwater may be encountered within the Alluvium and Sand and Gravel deposits; allowance for shoring and localised dewatering should be made.
Drainage	The geology suggests use of soakaways for surface water drainage may be locally feasible where sand and gravel deposits lie (northern site extents). Generally however, impermeable cohesive soils are anticipated which is likely to make soakaway drainage ineffective and unfeasible. Alternative solutions should be considered, such as on site attenuation and positive discharge to an appropriate outfall (the on site unnamed river may be an option).

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1.0 Introduction

1.1. Terms of Reference

In September 2020, Redrow Homes Ltd commissioned Rodgers Leask Environmental (RLE) Ltd to compile a Phase One Desk Study (DTS) for a site at Burbage Fields, Burbage, Leicestershire LE10 3AS.

1.2. Proposed Development

No specific development plans were available at the time of writing however, It is understood that the site will be redeveloped into a new residential development with associated infrastructure.

1.3. Objectives

The objectives of the investigation were to:

- Obtain desktop study information to assist in the assessment of potential environmental and ground related issues that may have implications for proposed development.
- Produce a conceptual model for the site using the findings of the desktop study.

1.4. Scope

In order to achieve the outlined objectives, the scope of the study encompassed:

- A site walkover survey.
- A study of historical maps.
- Review of geological and mining information.
- An examination of regulatory authority information.
- A screen for unexploded bombs (UXB).
- Production of a conceptual model.

Mineral rights assessment is outside the scope of this study.

1.5. Pernicious Plants

No assessment has been made for the presence of pernicious plant species e.g. Japanese Knotweed, Giant Hogweed, within the remit of this investigation.

1.6. Limitations and Confidentiality

All conclusions and recommendations made within this report are based upon and limited to the factual information obtained as part of this investigation. No responsibility can be taken by RLE Ltd for information obtained by third parties and it has been assumed that all third-party information provided is true and correct.

RLE Ltd has undertaken the work in accordance with our understanding of current best practice at the time of undertaking the report. Further assessment and revision of the report may be required should new information come to light or legislation/changes to best practice be introduced after the date of issue of the report.

RLE Ltd has prepared the report for the sole use and reliance of the Client. The report may not be used or relied upon by any unauthorised third party without the explicit written agreement of RLE Ltd.

The interpretive work undertaken within this report remains the intellectual property of RLE Ltd and must not be divulged to any commercial third-party without prior written agreement of RLE Ltd.

2.0 Site Location and Description

2.1. Site Location

The site is located between the M69 Motorway (to the south) and the village of Burbage (to the north) in Leicestershire, and is approximately centred on National Grid Reference 444031E, 291670N.

The site location and extents plan is given in Appendix A.

The land within the red line boundary will henceforth be referred to as the “site”.

2.2. Site Description

A site walkover was undertaken by RLE on 24th September 2020. The purpose of the site walkover was to provide a general description of the site. Detailed surveys such as wildlife or tree surveys were outside the scope of this report.

The site has an irregular outline and covers an area of approximately 21.8 hectares (ha). The site was accessed from Workhouse Lane to the east and Bullfurlong Lane to the west. Vehicular access is feasible from Bullfurlong Lane but not Workhouse Lane. Site levels generally fall towards the centre, where a ditch and small stream flows approximately northwest to southeast.

The site comprises 7 No. grass pasture fields which are generally separated by hedgerows, trees and post and rail fencing. A farm and associated barns and outbuildings are present in the south of the site at the southern end of Bullfurlong Lane. At the time of the walkover the fields were grazed by a small herd of cattle. 2 No. houses and gardens are also located in the far northern site extents, off Coventry Road.

Pertinent features of the site comprise:

- Overhead electric power cables (assumed 132kV) pass over the site at approximately 20-30m height, trending east to west through the southern site extents.
- Overhead electric power cables (assumed 11kV) pass over the site at approximately 6-10m height, trending east to west through the centre of the site. This cable terminates with a transformer at a wooden pole close to the farm in the south-centre of the site and is assumed to continue underground.
- Several soil and rubble mounds are present in the south of the site, to the east of the farm. Several stockpiles appear recent whilst others are grassed over.

- Farm machinery including trailers, spreaders and cultivators was noted in the southwest of the site adjacent to the farm.
- A public footpath crosses the west of the site from north to south, from Bullfurlong Lane (near to the farm) towards Burbage in the north. Several users of this right of way were noted during the walkover.
- A ditch with a small stream runs from northwest to southeast through the centre of the site. An area of waterlogged ground with reeds was noted in the north of the site close to this stream, possibly indicating a spring.
- A possible animal burrow (likely fox or rabbit) was noted in a hedgerow along the western boundary with Bullfurlong Lane.

Photographs and a site features plan are located in Appendix B.

2.3. Site Boundaries

The site boundaries generally comprise the following:

- Hedgerows to the west (with Bull Furlong Lane beyond) and eastern perimeter.
- Residential fencing/properties to the north leading to Coventry Road.
- Timber post and rail fencing along the southern boundary with the M69 motorway beyond.

2.4. Site Access

Vehicular access to the site is gained from Bullfurlong Lane situated adjacent to the western site boundary. There are however numerous field boundaries across the site, predominantly comprising hedgerows.

2.5. Surrounding Area

The land use beyond the site boundaries consists of:

- M69 motorway to the south with fields/agricultural land beyond.
- Agricultural land to the west, northwest and northeast.
- Residential land to the north and northwest.

3.0 Historical Review

3.1. Ordnance Survey Maps

Historical Ordnance Survey Maps at various scales have been obtained via an Emapsite MapInsight Report in order to review the historical land use on the site. These maps are presented within Appendix C.

A summary of the historical features is as follows:

Map Date	Site Feature	Adjacent Features
1886 1:10,000	Site comprises greenfield land divided by numerous fields. A stream flows ~west to east across the northern extents. Burbage Fields Farm lies to the south. Fieldgate Pit (possibly shown as a pond) in the far northern extents on/adjacent Three Pots Lane. Two footpaths are shown. One runs ~north to south the other ~northwest to south east.	Burbage village is located to the northeast. Surrounding land is predominantly agricultural.
1888 1:2,500	Three small ponds in the western extents.	No significant change.
1901 1:10,00	No significant change.	A hosiery manufactory is located at about 250m to the northeast.
1923 1:10,000	Fieldgate Pit is no longer shown. Allotment gardens occupy the far northern extents.	Allotment gardens to the west of the northern site extents. Three Posts Road has been renamed Coventry Road.
1938 1:10,00 1:2,500	An electricity line (with three pylons) crossing ~west to east. A small building (likely house) is located in the far northern extents (off Coventry road).	An additional hosiery factory is located at about 200m to the west.
1950-55 1:10,000	No significant change.	No significant change.
1959-60 1:1,250	Some small rectangular buildings are shown within the northern area of the site associated with the allotment gardens.	

Map Date	Site Feature	Adjacent Features
1963-68 1:10,000	An additional overhead electricity line is shown in the far southwest extents heading south and connected tangentially to the existing line.	A spring is shown adjacent the site to the east.
1977-79 1:10,000	An additional building (probable house) is shown in the far northern extents. Alterations to the overhead electricity line evident. The electricity pylons appear to have been replaced and now comprise two pylons. The additional electricity line (shown in 1968) is no longer shown. Three additional lines fan out (off site) from the southwest marginally encroaching the far southwest extents.	A cutting associated with the construction of the M69 motorway is shown adjacent the site to the south.
1986 1:2,500	A pond has been constructed within the south eastern site area. Further alterations to the overhead electricity line are evident with the three additional lines (shown in 1977) relocated ~40m south off site.	No significant change.
1993	A pond is shown in the western site area. The allotments are no longer shown and the associated buildings/sheds removed.	No significant change.
2010 1:10,000	No significant change.	No significant change.
2020 1:10,000	The ponds are no longer indicated.	No significant change.

3.2. Summary

The site has generally remained greenfield for much of its history. Burbage Fields Farm has existed in the southern site area from before 1886. Fieldgate Pit existed, in the far northern site area, from before 1886 to about the 1920s. Residential properties were constructed by 1938 and remain on this area. Allotment gardens occupied the northern site area from about 1920s to the 1990s.

An overhead electricity line was constructed across the southern site extents in the 1930s with additional lines added and subsequently rerouted and or removed in subsequent years. The original line remains to date.

The surrounding area has predominantly comprised agricultural land with residential properties to the north. The M69 Motorway was constructed adjacent to the south of the site by about 1980 and included an embankment close to the site boundary. Several off site hosiery works were located within the vicinity of the northern site area from the 1900s.

4.0 Geology, Hydrology, Hydrogeology and Mining

Information regarding the geological and associated conditions at the site has been obtained via a GroundSure Enviro + Geo Insight report, a copy of which has been included within Appendix D.

4.1. Geology and Hydrogeology

Information considered pertinent to the site is presented below.

	Geological Unit	Permeability	Aquifer status
Made Ground	None recorded.	N/A	N/A
Superficial Deposits	Oadby Member - Diamicton – covers majority of the site.	Mixed flow– low to moderate	Secondary Undifferentiated: Assigned where it is not possible to attribute either category A or B to a rock type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
	Wolston Sand & Gravel Member – mapped beneath northern corner of site only.	Intergranular – high to very high	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
	Alluvium – Sand with Clay and Gravel – mapped along far eastern boundary only.	Intergranular – high to very high	Secondary A
	Dunsmore Gravel - Sand & Gravel – mapped in the far northern extents.	Intergranular – very low to high	Secondary A
Bedrock Geology	Mercia Mudstone Group	Fracture flow type- low.	Secondary B: Predominantly lower permeability layers which may store/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.

4.1.1. Structure

No linear bedrock features are mapped on site or within the site vicinity.

4.1.2. BGS Borehole Records

There is 1 No. BGS borehole recorded on site and 4No. within close proximity of the site. All boreholes run on or adjacent to the southern site boundary and are likely associated with the construction of the M69 motorway. These are summarised below and presented in Appendix E:

BGS Borehole Reference	Depth	Strata Encountered	Comments
On site SP49SW32	9.0m	GL-0.3m: Topsoil 0.3-2.4m: Brown silty clayey sand and sandy clay with stones 2.4-4.60m: Gravel and brown silty clayey sand. 4.6-6.0m: Soft grey sandy boulder clay with traces of marl and chalk 6.0-9.0m: Firm grey sandy very silty clay with bands of silty calcareous sand, small stones and traces of chalk.	
Off site SP49SW30 SP49SW31 SP49SW33 SP49SW34	1.0m – 8.5m	Generally initial topsoil 0.2m to 0.45m thick, underlain by Stiff (soft in places) boulder clay with occasional silty/sandy bands.	Generally dry with seepages 2-4m depth.

4.1.3. Groundwater Body

The site lies within the Soar and Tame Anker Mease - Secondary Combined water bodies (GB40402G990600 and GB40402G990800 respectively). These are indicated to have a good chemical rating in 2015.

4.1.4. Groundwater Abstractions

There are 7 No. historical groundwater abstraction licenses between 201m-640m from the site related to general farming and domestic use.

There are 4 No. active licenses between 556m and 661m from the site for spray irrigation storage.

4.1.5. Source Protection Zone

There are no Source Protection Zones within 500m of the site boundary.

4.1.6. Groundwater Vulnerability and Soil Leaching Potential

The underlying superficial Secondary Aquifer is classified as Medium Vulnerability (intermediate between high and low vulnerability).

The underlying bedrock Secondary Aquifer is classified as Low Vulnerability; areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils.

4.1.7. Soluble rock risk

Significant soluble rocks are not recorded on site.

4.2. Hydrology and Flooding

	Summary	
Surface Water Features	On-Site: Unnamed Inland River recorded crossing the northern half of the site then following the eastern/south eastern boundary flowing approximately east across the site and then south along the site boundary. 10No. water features listed as inland river, lake, loch or reservoir are recorded, one of which is recorded as underground. Off-Site: The Unnamed Inland River heads north and south respectively as it leaves the site. 3No. off-site records for water features within 250m of the site boundary are associated with the river.	
Surface Water Body catchment	Soar Brook from Source to Soar water body ID GB104028042590.	
Biological & Chemical Data	No biological or chemical data is available on site. The Soar Brook from Source to Source water body had a good chemical and poor ecological rating in 2016 at 1448m northeast of the site (upstream).	
Surface Water Abstractions	1 No. active record at 983m south east from the site related to spray irrigation storage.	
Flood Risk	<i>Risk of Flooding from Rivers and Seas (RoFRaS)</i>	On-site: No records 0-50m: No records
	<i>Historical Flood Events</i>	No records
	<i>Flood Zones</i>	On-site: No records
	<i>Surface Water Flooding</i>	Highest risk on site: 1 in 30 year, 0.3- 1.0m depth in the northern site extents and along the eastern boundary (associated with the inland river). Highest risk within 50m: 1 in 30 year, 0.3- 1.0m depth

	Summary	
	Groundwater Flooding	Highest risk on site: Moderate associated with Wolston Sand and Gravel in northern extents. Low risk elsewhere. Highest risk within 50m: Moderate

4.3. Radon

The site is not in a radon affected area, as less than 1% of properties are above the action level. Therefore, radon protective measures are not required for new developments.

4.4. Mining and Ground Workings

	Summary
Ground Workings Map	<i>Historical:</i> <i>On-site</i> 8No. records including 4No. ponds (mapped 1938), 2 No. unspecified pits (mapped 1886 and 1901 and likely associated with the Fieldgate Pit) and 2 No. cuttings (mapped 1977 and 1983 associated with the M69 motorway, which are not actually on the site but abut the southern site boundary). <i>Off-site</i> 16No. records within 250m of the site. These include 2 No. cuttings (associated with the M69) and 14 No. ponds.
Underground Workings	No records on site.
Mining and Extraction	No records on site.
Coal Mining	The site is not located within a Coal Mining Area.
Non-Coal Mining / Mineral Extraction	No records on site.
Non-Coal Mining Cavities / Natural Cavities	No records on or within 500m of the site boundary.
Brine / Gypsum Extraction	No records on or within close proximity to the site.
Clay Mining	No records on or within close proximity to the site.

4.5. Potential for Natural Ground Subsidence

Hazard	Hazard Rating	Comments
Shrink -Swell Clays	Low across majority of site. Negligible in the northern extents associated with recorded sand and gravel deposits and very low along the eastern boundary associated with alluvium deposits.	Ground conditions predominantly medium plasticity. Non-plastic where sand and gravel is present. Low plasticity where alluvium is present.
Running Sands	Very low across the vast majority of the site. Low associated with Alluvium along the eastern boundary.	Running sand conditions may be present along the eastern boundary and unlikely elsewhere.
Compressible deposits	Moderate associated with Alluvium along the eastern boundary. Negligible elsewhere.	Compressibility and uneven settlement hazards are probably present associated with the alluvium. Land use should consider specifically the compressibility and variability. Elsewhere, across the majority of the site, compressible strata are not thought to occur.
Collapsible deposits	Negligible across the vast majority of the site. Very low associated with Alluvium along the eastern boundary.	Deposits with potential to collapse when loaded and saturated are believed not to be present over the vast majority of the site and unlikely to be present associated with alluvium deposits along the eastern site boundary.
Landslides	Very low	Slope instability problems are not likely to occur
Ground dissolution of soluble rocks	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.

4.6. Estimated background soil chemistry

The following estimates are provided for the site based upon Rural soil:

Arsenic mg/kg	Cadmium mg/kg	Chromium mg/kg	Nickel mg/kg	Lead mg/kg
15	1.8	60-90	15-30	100

4.7. Railways and Tunnels

4.7.1. Tunnels

No records of tunnels are identified within or within 250m of, the site boundary.

4.7.2. Historical Railways

3 No. records of tunnels are identified 92m northeast of the site.

4.7.3. Active Railways

No records of active railways are identified within the site boundary, or within 250m of the site.

4.7.4. HS2

The site does not lie within 500m of HS2.

4.8. Coal Authority records

The site does not lie within a Coal Authority Reporting area and hence there are no records of coal mining activities for the site.

5.0 Environmental Database records and UXO

5.1. Regulatory data

Data regarding Environment Agency and Local Authority regulatory information has been obtained via an Emapsite Enviro + Geo Insight report, a copy of this is contained within Appendix D.

The EnviroInsight report contains factual information which is produced from a database of records which have been obtained from various sources including; Local Authorities, Environment Agency, National Radiological Protection Board and English Nature. Only the information considered pertinent to the site has been included below.

Category		Summary
Historical Industrial Sites From 1:10,000 Mapping	<i>Potentially contaminative land use within 250m</i>	<i>On-site</i> 4 No. records; 2No. of Unspecified Pits (in the far northern extents) likely associated with the Fieldgate Pit and 2 No. of Cuttings adjacent the southern boundary associated with the M69 motorway. <i>Off-site</i> 20 No. between 67m to 250m of the site. Including, Unspecified Works (closest 67m west) and Factory (closest 113m west), Nursery (closest 90m west), Hosiery Manufactory (closest 106m southwest), Cuttings (closest 126m northeast) and Unspecified Tanks (183m northeast).
	<i>Historical Tank Database</i>	<i>On-site</i> No records. <i>Off-site</i> 7 No. records between 12m to 250m. 6 No. Unspecified Tanks and 1 No. Tank.
	<i>Historical Energy Features</i>	None on or within 250m of the site.
	<i>Potentially infilled Land within 250m</i>	<i>On-site</i> No records. <i>Off-site</i> No records.
Environmental Permits,	<i>Part IIA EPA 1990</i>	The site is not determined as Contaminated Land.

Category		Summary
Incidents and Authorisations	<i>Records of List 1 and 2 Dangerous Substance Inventory Sites</i>	No records within 500m of the site.
	<i>Licensed Discharge Consents</i>	3No. off-site records within 500m of the site; all between 86m and 97m west of the site for Sewage Discharges.
	<i>Pollution Incidents</i>	No records within 500m of the site.
Landfills and other Waste Disposal Sites	<i>EA registered, BGS survey, Local Authority and Historical Mapping</i>	No on-site records. 24 No. waste exemptions within 500m generally related to agriculture.
Current land Use	<i>Current Industrial Sites</i>	3No. on site in the southern extents. 2 No. pylons and 1 No. silo. 7No. off-site between 68m and 250m of the site. These include a Telecom Mast, Medals and Trophies Goods, 2 No. Electrical Features, Business Park, Aviation Engineers and Published Goods.
Designated Environmentally Sensitive Sites	<i>SSSI's, NNR's, AONB's</i>	None on site. 2No. Designated Ancient Woodlands 964m south and 1990m northeast respectively. 1 No. Local Nature Reserve 1989m northeast 1 No. SSSI 1990m northeast 1 No. Greenbelt at 469m southwest named Birmingham. None of the above are considered likely to be unduly impacted by the site.

5.2. Unexploded Bombs (UXB)

Regional Unexploded Bomb Risk maps obtained from Zetica indicates that the site is in a low risk area for Unexploded Bombs (UXB).

Zetica state that low-risk regions are those with a bombing density of up to 15 bombs per 1000 acres or less. These areas are considered to have significant but low UXB risk. In general, further action to mitigate the risk is considered prudent, although not essential. Care is required when assessing the risk for specific sites where the risk may be higher because of local wartime activity.

Given that the site has historically remained greenfield land and that the historical maps do not show any obvious signs of wartime activity within the site locality, the risk of encountering UXB is therefore considered low. No further risk assessment is therefore considered to be required in this regard.

5.3. Archaeology

A preliminary search of the Heritage Gateway archaeological database (www.heritagegateway.org.uk, accessed September 2020) indicates that there are records on the site itself and in the locality, a summary is given below:

HER Ref and location	Details
On site MLE24420 Grid Reference: SP 4397 9134	FARMSTEAD (Late Post-medieval to Modern - 1840 AD to 2050 AD)
On site MLE22160 Grid Reference: SP 4383 9181	DITCH (Unknown date) GULLY (Unknown date)
Off site	Several records to the northwest and northeast of the site relating to medieval and roman archaeology.

6.0 Conceptual Site Model (CSM)

This section provides a qualitative risk assessment of the risk posed from potential on and off-site contamination sources, identified by the information presented in the previous sections.

The conceptual model below has been developed based on the commonly adopted source-pathway-receptor model as recommended within CLR11 Model Procedures for the Management of Land Contamination.'

6.1. Proposed Development

It is proposed to redevelop the site into residential dwellings with gardens, landscaped areas and an area of public open space.

6.2. Potential Sources of Soil Contamination related to the sites past and current use

6.3. On-site

The site has remained almost entirely undeveloped throughout its history with records indicating it has been used for largely agricultural purposes. Other historical and current potential sources of soil contamination identified are as follows:

- The former Fieldgate Pit, located in the far northern tip (adjacent Coventry Road). This pit appears to have been filled in ~1923 with 2No. houses (present today) subsequently built on the locality. Given the predominant geology (Clay) and existence of clay pits in the Hinkley area it is considered most likely that Fieldgate Pit was a clay pit for brick and tile manufacture.
- Burbage Fields Farm located in the southern site extents.
- Any historic electrical transformers associated with the historic electricity lines. Current transformers complying to modern standards are not considered a potential source.
- Soil / rubble mounds identified during the site walkover.
- Although the emap data identifies cuttings (associated with the adjacent M69 motorway to the south) to be on site the site walkover has confirmed that the top of the cutting forms the boundary to the site and does not encroach into the site. Although some localised on-site ground

disturbance/reprofiling may have occurred historically during the construction of the embankment.

Based on the above the following potential contaminants have been identified:

Locality/Source	Inorganic Contaminants	Organic Contaminants
Site wide agricultural land	Heavy metals	PAH, Fuel/Oils, Pesticides
Burbage Fields Farm	Heavy metals	PAH, Fuel/Oils, Pesticides, Asbestos
Former pylon locations where transformers may have been located.		PCB's
Former Fieldgate Pit	Heavy metals	PAH, Fuel/Oils, Asbestos
Any made ground materials placed during the M69 motorway embankment construction along with soil / rubble mounds to the west of Burbage Fields Farm.	Heavy metals	PAH, Fuel/Oils, Asbestos

6.4. Off-site

The surrounding area has predominantly been used for agriculture along with residential use. Some historical industrial uses have been identified however they are not considered likely to have impacted the site with any additional contaminants not already being considered for site wide agricultural use.

6.5. Ground Gassing

The following potential sources of soil gas have been identified:

Source	Distance from Site	Source Generation Potential
Alluvium	On-site	Generally low (dependant on nature and organic content within Alluvium)
Any made ground used to fill in the former Fieldgate Pit.	On-site	Dependant on the content of organic material used.
Any made ground used to raise ground levels associated with the M69 motorway embankment.	Adjacent to and possibly on site	Dependant on the content of organic material used. Generally low however as construction was relatively recent and good practices are likely to have been adopted.

6.6. Potential Pathways

With regard to the assessment of risk to human health, the following pathways are considered to be potential exposure routes based on residential end-use, in accordance with the CLEA Documentation:

- Dermal contact.
- Direct ingestion of soil.
- Inhalation and ingestion of soil dust.
- Inhalation of gases.
- Ingestion of contaminated water via plastic pipes.

With regard to Controlled Waters, the following pathways are considered applicable:

- Overland flow into unnamed river.
- Downward infiltration through soils and bedrock
- Lateral migration through soils and bedrock towards the nearest surface feature
- Newly created preferential pathways associated with the redevelopment of the site e.g. deep boreholes/piles/sewers.

6.7. Potential Receptors

The following are considered to be potential receptors for contamination:

Receptor		Additional information
Human Health	Site end users Construction/maintenance workers	A female child will be regarded as the critical receptor.
Controlled Waters	Secondary Aquifers	Low sensitivity with respect to groundwater
	Unnamed River on site.	Moderate sensitivity to surface waters.
Other	Neighbouring buildings	Residential properties adjacent the site to the north. Overhead power lines cross southern site area.
	Underground structures	
	Flora and fauna	

6.8. Pollutant linkages

Based on the information above, the following potential pollutant linkages are considered applicable to the site. The risk classification has been qualitatively derived in accordance with CLR 11 Model Procedures for the Management of Land Contamination. The terminology used is taken from CLR 11, and a summary of the principal terms are provided in Appendix F.

Pollutant Linkage	Source	Pathway	Receptor	Probability	Consequence	Risk
1	Contaminated Soils	Ingestion of soil, dermal contact, inhalation of dust	Site end users Construction workers; maintenance workers	Low likelihood	Medium	Moderate/low
2	Contaminated Soils	Inhalation of soil dust	Members of the public adjacent to the site during construction	Low likelihood	Medium	Moderate/low
3	Contaminated Water Supplies	Ingestion of water, Migration of organic contaminants via plastic pipes	Humans – Site End Users	Low likelihood	Medium	Moderate/low
4	Contaminated Soils and Groundwater	Overland flow Leaching and groundwater flow to surface water	Unnamed River on site.	Low likelihood	Medium	Moderate/low
5	Contaminated Soils and Groundwater	Downward migration into groundwater.	Secondary Aquifers	Unlikely	Medium	Low
6	Contaminated Soils and Groundwater	Leaching of sulphate and corrosive contaminants	Buried concrete structures and services	Low likelihood	Mild	Low
7	Ground gasses from potential infilled land associated with Fieldgate Pit and M69 motorway embankment and natural Alluvial deposits.	Migration of asphyxiant and explosive gasses into confined spaces	Site end users, construction/ maintenance workers in trenches.	Low likelihood	Severe	Moderate

7.0 Conclusions and Recommendations

7.1. Site Setting and Historical Development

The site largely comprises agricultural farmland/fields segregated by hedgerows within a semi-rural setting. A farm and high voltage electricity line occupy the southern extents with 2No. residential properties located in the far northern extents.

The majority of the site has remained greenfield throughout its history with the exception of the far northern extents where a pit (likely clay pit) is documented.

The surrounding area has predominantly comprised agricultural land with residential properties to the north and the M69 Motorway to the south.

The site is underlain predominantly by the Oadby Member (Glacial Till). Alluvium is mapped in the eastern extents with sand and gravel in the northern extents. The bedrock geology underlying the site is the Mercia Mudstone Group.

7.2. Planning/Enabling Works Considerations

Any clearance of existing hedgerows and trees required to facilitate some of the development should be undertaken outside of bird nesting season.

A survey should be undertaken prior to removal of any trees/hedges in order to enable foundation design with respect to tree influence should new structures be proposed. The survey should include boundary vegetation and extend beyond the site boundary to cover any trees that may influence the foundations of proposed structures.

Ecological surveys are likely to be required given the undeveloped nature of the site.

There are overhead powerlines across the southern corner of the site; a development standoff zone is likely to be required. Safe passing points will need to be established for plant.

It is anticipated that the main access to the site will be via the strip of land abutting Coventry Road to the north. Demolition of the existing houses will be required if this is the case.

Records indicate that the existing farm may be of archaeological interest and Roman finds have also been identified close to the site.

A pre-demolition asbestos survey is recommended for buildings to be demolished/renovated on the site.

7.3. Flood Risk

The site is not located on a flood zone nor are there records of 'Risk of Flooding from Rivers and Seas' on site. The highest risk on site from surface water flooding is a 1 in 30 year event with flood levels 0.3 - 1.0m depth. The highest risk on site for groundwater flooding is moderate.

As such, available information would suggest that there is a low risk of flooding. However, this preliminary risk assessment should be confirmed by carrying out a Flood Risk Assessment (FRA) for the site.

7.4. Access

Vehicular access to the site is currently gained from Workhouse Lane.

7.5. Qualitative Contamination Risk Assessment

The site is predominantly agricultural land of greenfield status. The main sources of contamination are likely to be associated with farming activities and the risk of contamination is generally considered to be low. Pesticides may have also been used and PAHs may be resultant from the burning of crops. In addition, small areas of potentially infilled/disturbed ground have been identified associated with a probable clay pit in the north and construction of the M69 motorway immediately to the south. Localised surface soil/rubble mounds have also been identified and a farmyard with outbuildings are present.

It is therefore considered there is a low to moderate risk of contamination existing from the past land use and taking into account the surrounding area. This should be confirmed through testing of soils at the ground investigation stage prior to construction.

The risk to Controlled Waters from on-site soils and groundwater is considered low to moderate on the basis of current information and given the presence of a watercourse on site. Should contaminants be present within soils, the risk that they will affect groundwater and subsequent surface waters shall be related to the mobility of the contaminants, the permeability of strata and distance to receptor. The sensitivity of the site with respect to the identified controlled water receptors is considered Low to moderate at this stage.

7.6. Ground Gas

The CSM has indicated the on-site gas generation potential is generally considered to be very low, with potential on site sources limited to naturally occurring alluvium and localised areas of potentially disturbed/filled ground.

The sensitivity of the proposed development in accordance with CIRIA C665 is considered to be high given the intended residential end use and would equate to building type 'A' in accordance with British Standard BS8485:2015+A1:2019.

Based on the findings of the conceptual model, it is generally considered unlikely that gas protection measures will be required however a moderate risk is attributable to the localised potential made ground identified, which increases the likelihood of some gas protection measures being required. This should be confirmed by an appropriate intrusive investigation.

During construction works, entry into deep trenches should be avoided, gas may accumulate within the confined space created. Permit to work systems and personal gas monitors may be required for such works.

No radon protection measures are necessary for new structures.

7.7. Surface Water Drainage

The geology suggests use of soakaways for surface water drainage may be locally feasible where sand and gravel deposits lie (northern site extents). Generally however, impermeable cohesive soils are anticipated which is likely to make soakaway drainage ineffective and unfeasible. Alternative solutions should be considered, such as on-site attenuation and positive discharge to an appropriate outfall (the on-site unnamed river may be an option).

Infiltration testing should be undertaken across the site to confirm the viability of soakaways if proposed.

7.8. Foundation Design and Geotechnical Issues for Construction

Intrusive works shall be required in order to identify ground conditions and provide foundation recommendations for the site.

The BGS have indicated the majority of the site to be considered negligible to very low hazard ratings for natural subsidence. There is a moderate risk of compressible deposits associated with Alluvium along the eastern extents; this may affect the foundation solution within this area of the site elsewhere the rating is negligible.

Overall, geology suggests that traditional strip/trenchfill foundations are likely to be appropriate, subject to verification by intrusive investigation. The near surface strength of the Glacial Till will dictate foundation depths together with proposed levels, soil volume change potential (VCP) and tree influence.

A tree survey may be required which extends beyond the site boundaries for use in foundation design; Trees and hedges are currently indicated around the perimeter of the site and forming field boundaries within the site. Plots proposed within the influence of these trees/hedges may require deepening or piled foundations. Medium plasticity is indicated for cohesive strata by the BGS.

Significant problems with groundwater are not anticipated across the majority of the site. However, where granular deposits are expected within the northern extents. Shoring and localised pumping may be required. Instability may also be possible with the Alluvium in the east.

7.9. Mining and Geological Issues

There are no known mining issues within the site.

7.10. Radon

No radon protection measures are required.

7.11. Ecology and Wildlife Issues

The site is within a SSSI impact assessment zone but is not itself within a SSSI.

7.12. Archaeological Issues

A preliminary search of the Heritage Gateway archaeological database (www.heritagegateway.org.uk, accessed September 2020) indicates that there are medieval records on the site itself with medieval and roman activity in the locality.

It is recommended that the Local Authority is consulted at an early stage to confirm the requirements for any archaeological surveys.

7.13. UXB

Regional Unexploded Bomb Risk maps obtained from Zetica indicates that the site is in a low risk area for Unexploded Bombs (UXB). Given that the site has historically remained undeveloped, and that the historical maps do not show any obvious signs of wartime activity within the site locality, the risk of encountering UXB is therefore considered low. No further risk assessment is therefore considered to be required in that regard.

7.14. Geo-environmental Abnormal Risk Register

The following table presents a summary of the main risks identified by the CSM. The table should be read in conjunction with the main body of the report and not in isolation.

Hazard/ Risk	Cause	Risk Rating	Recommendations
Soil & groundwater contamination	Agricultural land and potentially infilled land	Moderate/Low	Intrusive ground investigation required.
Asbestos	Demolition of existing and former structures/sub-structures. Buried waste	Moderate/Low	Intrusive ground investigation required. Ensure removal of asbestos in accordance with Control of Asbestos Regulations (2012).
Soil Gas	Potential infilled land associated with Fieldgate Pit and M69 motorway embankment and natural Alluvial deposits.	Moderate	Intrusive ground investigation required. Low level (e.g. CS-2/Amber 1) gas protection may be required in some areas.
UXO	WWII	Low	No further action considered necessary.
Archaeology	Preliminary screen suggests medieval activity on the site and roman activity to the north	Moderate/Low	Consult with LA with regards requirements for surveys.
Flooding	Not within flood zone. No records of RoFRaS	Low	Undertake Flood Risk Assessment. Minimum FFLs may be stipulated by planning.
Foundation Design / Geotechnical issues	Medium plasticity Tree influence on site. Softening of clays near surface Instability where Alluvium/sand and gravel mapped.	Moderate/Low	Intrusive ground investigation required Deepening of foundations due to soft ground and /or tree influence. Possible Piled foundations required in close proximity to trees/hedgerows. Allow for shoring/localised dewatering.
Surplus topsoil	Site is field.	Low	Characterise topsoil. Re-use of topsoil on-site where possible under Materials Management Plan (MMP).

Hazard/ Risk	Cause	Risk Rating	Recommendations
Earthworks	Unsuitable materials may require stabilisation to ensure geotechnically suitable for use.	Low	Intrusive investigation required. Importation of material may be required to meet minimum FFLs. Place fill material in accordance with an Engineers Specification.
Drainage	Impermeable cohesive strata covering the majority of the site. Soakaway drainage generally unlikely feasible.	Moderate	Intrusive investigation required. Drainage assessment required.

7.15. Recommendations for Site Investigation Works

The following works are recommended as part of an intrusive investigation:

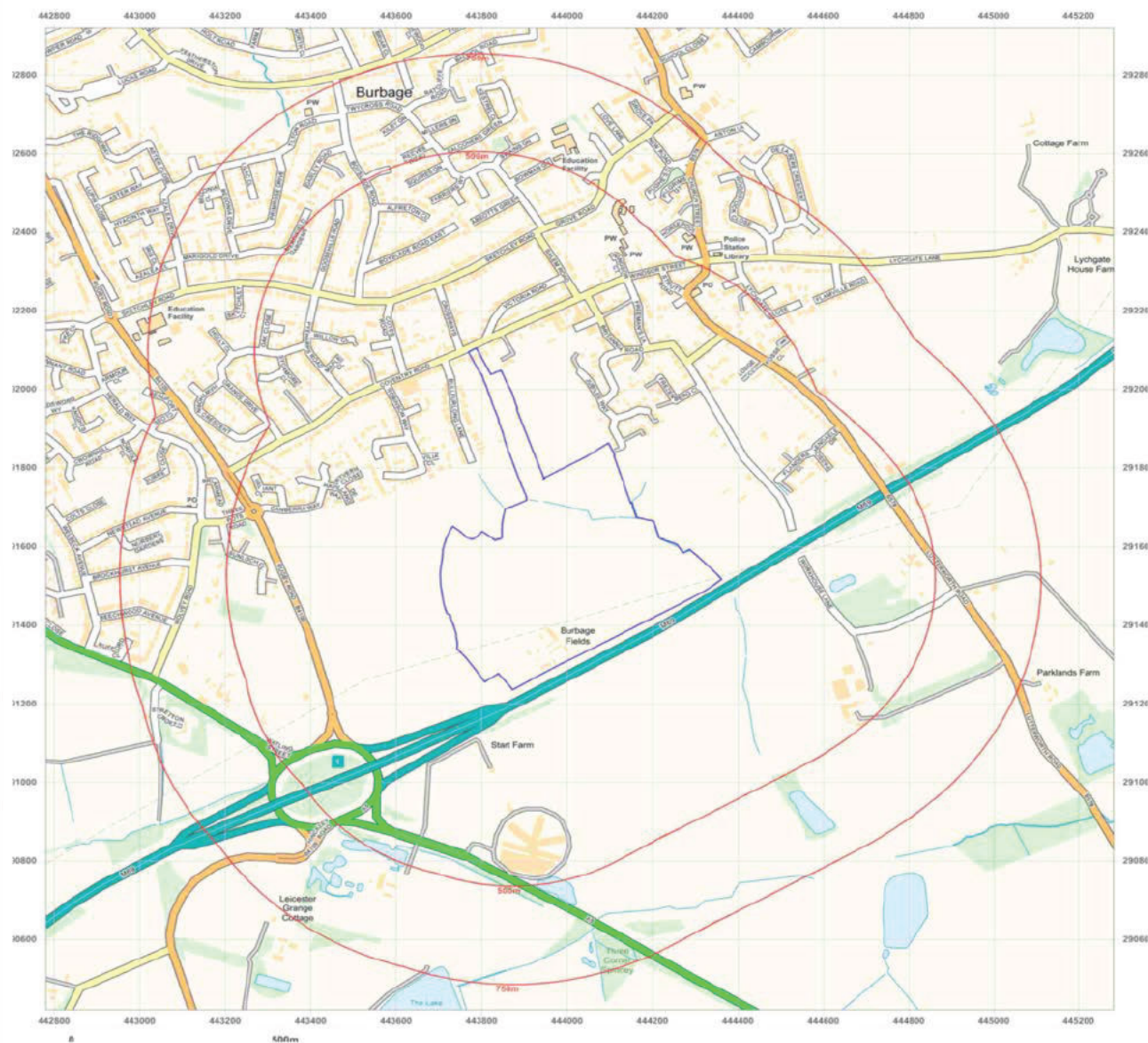
- Trial pits across the site to provide a visual appreciation of the ground conditions and to assess stability of excavations.
- Boreholes with in-situ testing to determine the strength and settlement characteristics of the underlying soil profile to assist with foundation design.
- Chemical laboratory testing of soils samples for contaminants identified within the CSM to enable a contamination risk assessment for the site.
- Geotechnical laboratory testing to determine geotechnical soil properties. This should include plasticity index tests to determine the volume change potential, particularly where foundations are proposed within proximity to trees/hedgerows. Where significant earthworks are proposed, moisture content and compaction testing should be undertaken to assess the suitability of soils for re-use in earthworks.
- It would be prudent to undertake soil gas monitoring to determine the soil gas regime. Alluvium deposit and any deep made ground identified should be targeted.
- Infiltration testing to determine surface water drainage solutions.

References

1. British Standards Institution. BS 5930:2015. Code of practice for ground investigations. 2015.
2. British Standards Institution. BS 10175:2015. Investigation of potentially contaminated sites – Code of practice. 2015.
3. CL:AIRE Industry Profile 'Ceramics, cement and asphalt manufacturing works'
4. British Standards Institution. BS 8485:2015+A1:2019. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.
5. Construction Industry Research and Information Association. 2008. Assessing the risk posed by hazardous gases to buildings. C665.

Appendices

Appendix A: Site Extents Plan



Project No.	P20-291	Title	Site Location and Extents Plan	Drawn	AT	
Client	Redrow Homes			Checked	IB	
Project	Burbage Fields	Scale	N/A	Approved	SF	
		Revision	0			

Appendix B: Site Walkover Photos



Project No.	P20-291				Title	Walkover Photographs	Drawn	AT
Client	Redrow Homes						Checked	JB
Project	Burbage Fields					Photo 1	Approved	SF
Page No.	1	of	11		Scale	N/A		
					Revision	0		







Project No.	P20-291				Title	Walkover Photographs	Drawn	AT	
Client	Redrow Homes						Checked	JB	
Project	Burbage Fields					Photo 2	Approved	SF	
Page No.	2	of	11		Scale	N/A			
					Revision	0			



Project No.	P20-291				Title	Walkover Photographs	Drawn	AT	
Client	Redrow Homes						Checked	JB	
Project	Burbage Fields					Photo 3	Approved	SF	
Page No.	3	of	11		Scale	N/A			
					Revision	0			



Project No.	P20-291				Title	Walkover Photographs	Drawn	AT	
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Page No.	4	of	11		Scale	N/A			
					Revision	0			



Project No.	P20-291				Title	Walkover Photographs	Drawn	AT
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Project	Burbage Fields					Photo 5	Approved	SF
Page No.	5	of	11		Scale	N/A		
					Revision	0		





Project No.	P20-291				Title	Walkover Photographs	Drawn	AT	
Client	Redrow Homes						Checked	JB	
Project	Burbage Fields					Photo 6	Approved	SF	
Page No.	6	of	11		Scale	N/A			
					Revision	0			





Project No.	P20-291				Title	Walkover Photographs	Drawn	AT
Client	Redrow Homes						Checked	JB
Project	Burbage Fields					Photo 7	Approved	SF
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RLRE



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RLRE



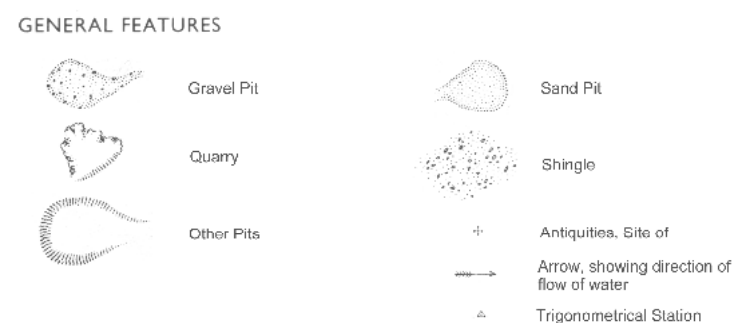
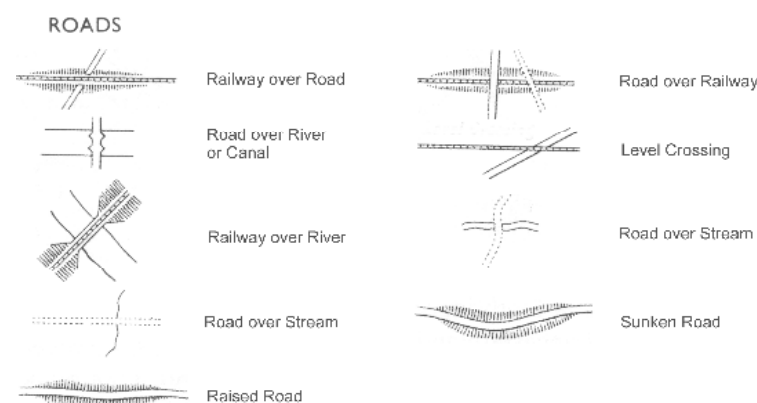
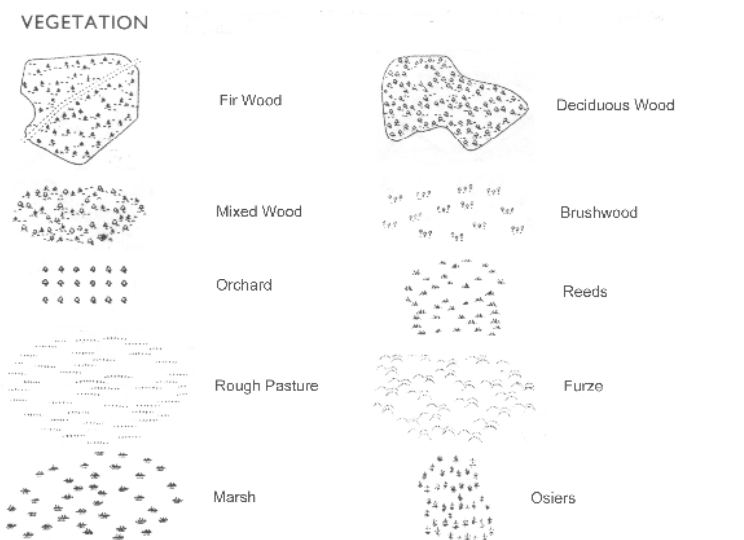
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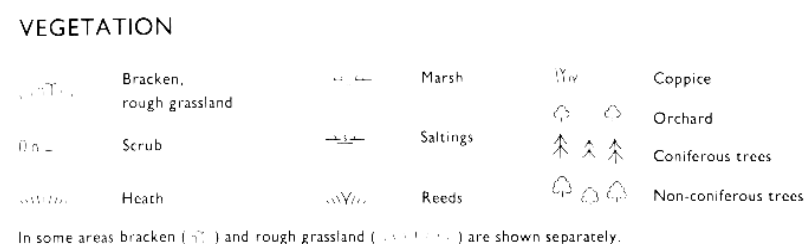
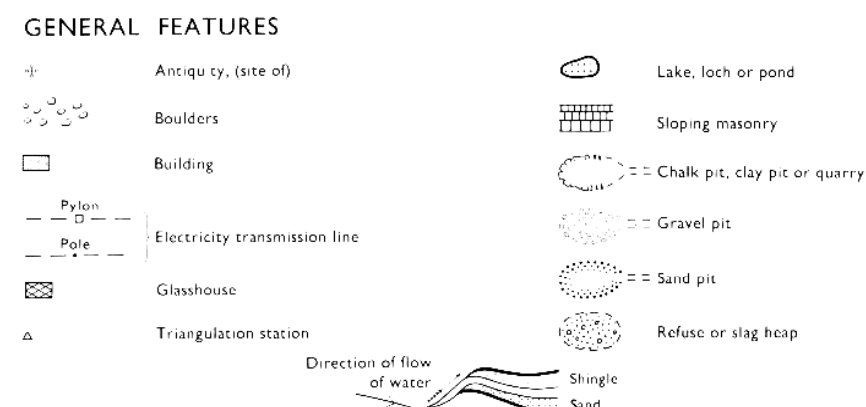
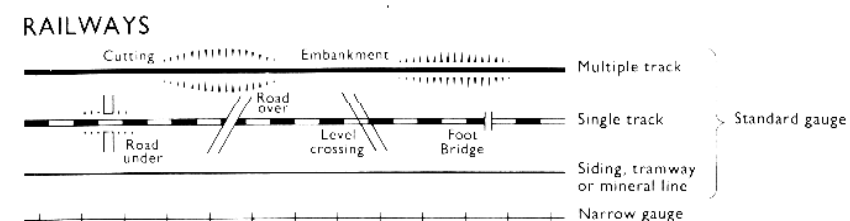
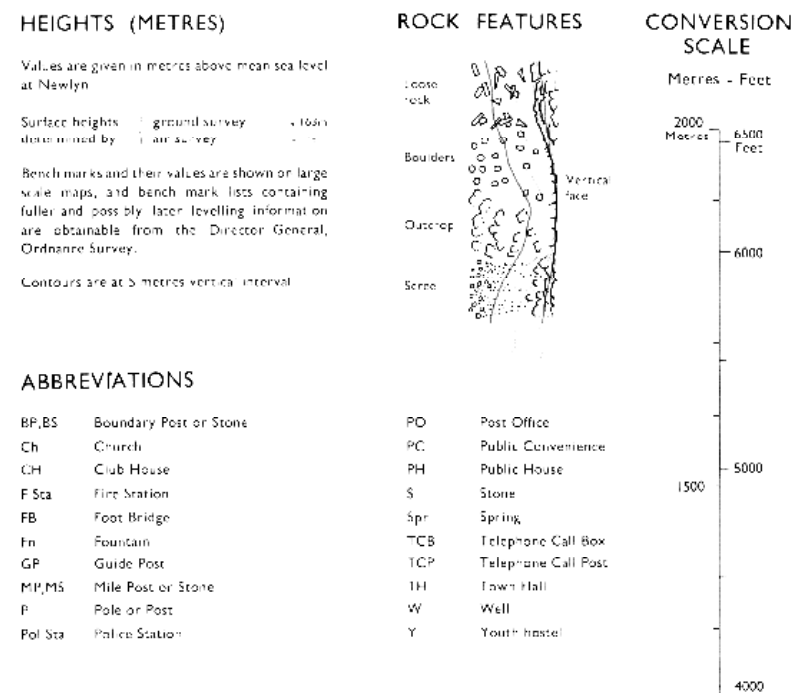


Appendix C: OS Historic Maps

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National Grid 1:10,000 scale



Historical Map Pack Legend

County Series & National Grid

1:10,560 scale

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County Series 1:2,500 scale

**National Grid 1:2,500 / 1:1,250
scale**



Historical Map Pack Legend

County Series

1:1,250 scale

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1:1,250 scale
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County Series & National Grid

1:2,500 scale

1:2,500 scale

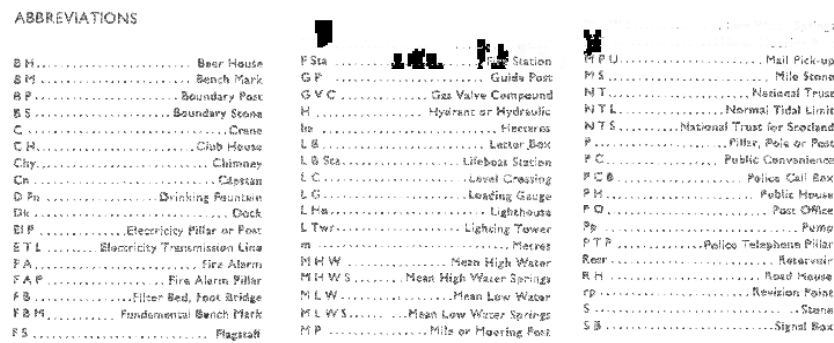
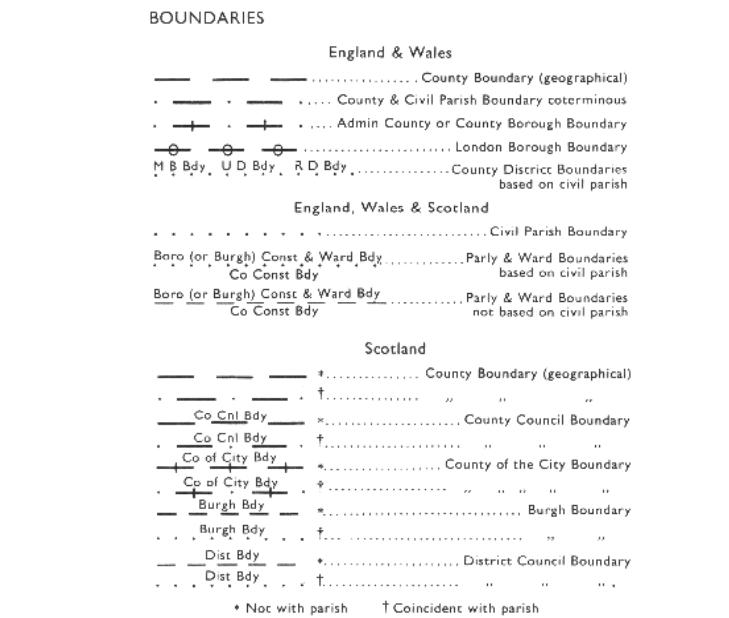
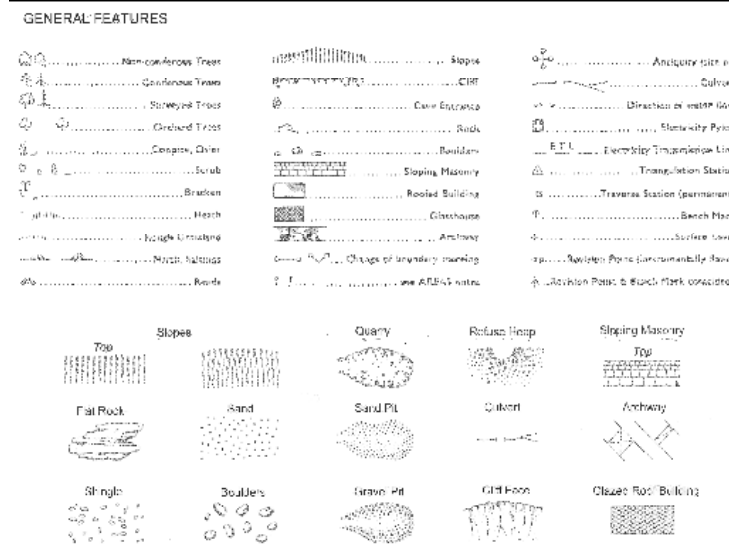
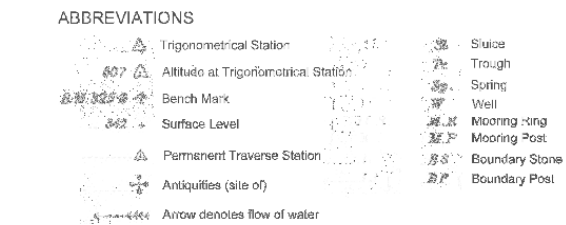
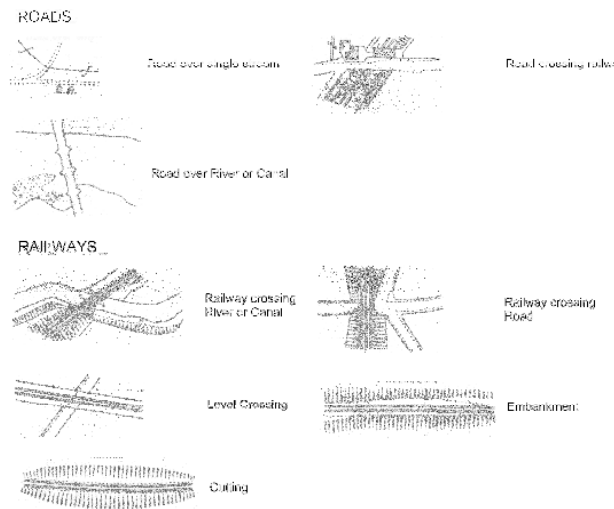
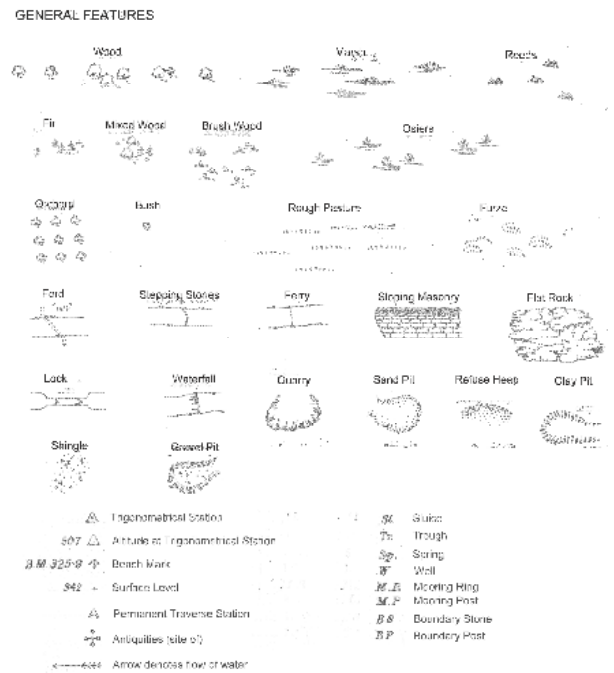
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Site Details:

Burbage Field
Farm, Burbage, Leicestershire, LE
10 2EX

Client Ref: EMS_632820_841667
Report Ref: EMS-632820_841667
Grid Ref: 444031, 291670

Map Name: County Series

Map date: 1886

Scale: 1:10,560

Printed at: 1:10,560



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Revised 1886
Edition N/A
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Report Ref: EMS-632820_841667
Grid Ref: 444031, 291670

Map Name: County Series

Map date: 1901-1904

Scale: 1:10,560

Printed at: 1:10,560



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Revised 1904
Edition N/A
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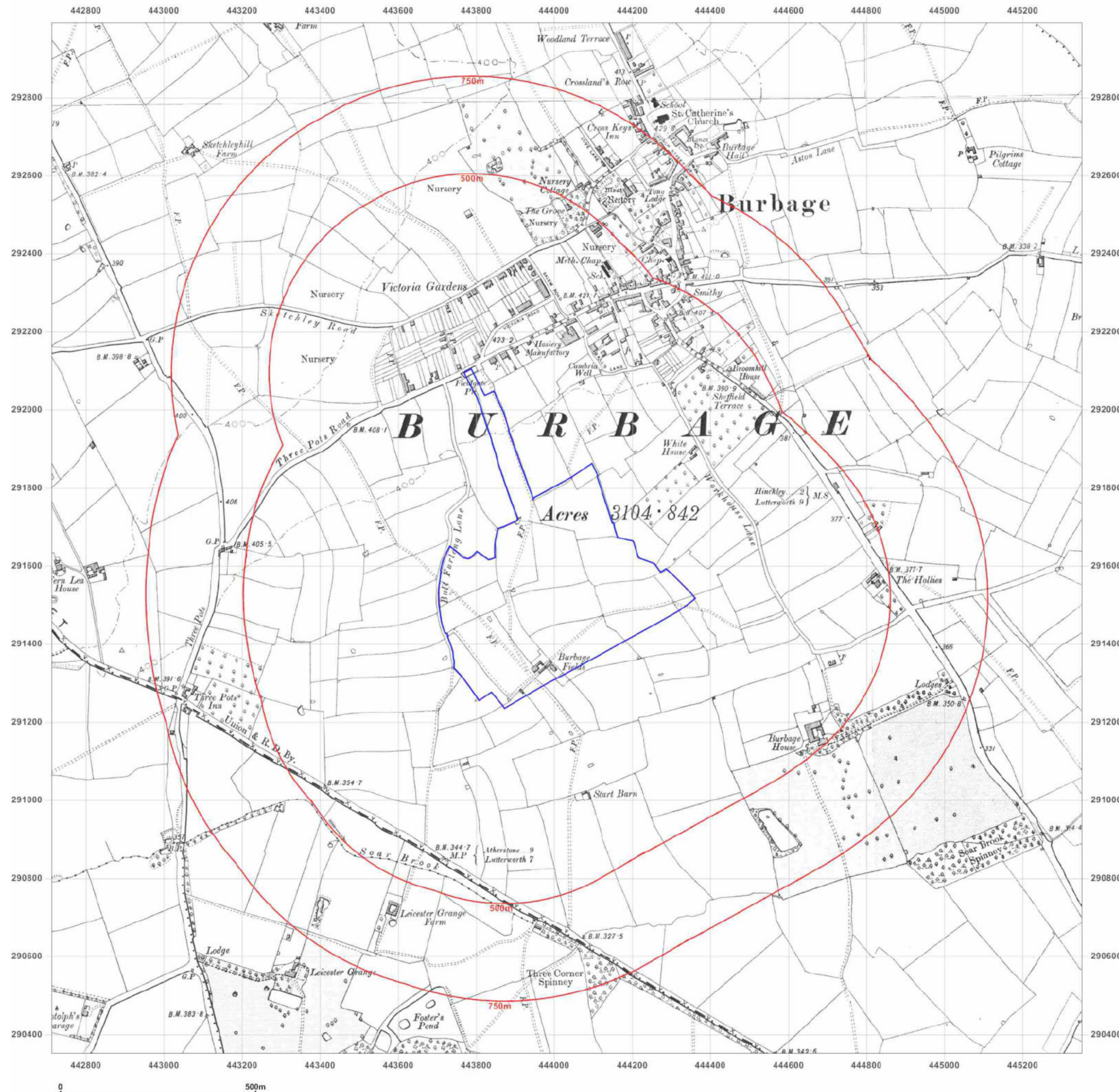


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Map Name: County Series

Map date: 1923

Scale: 1:10,560

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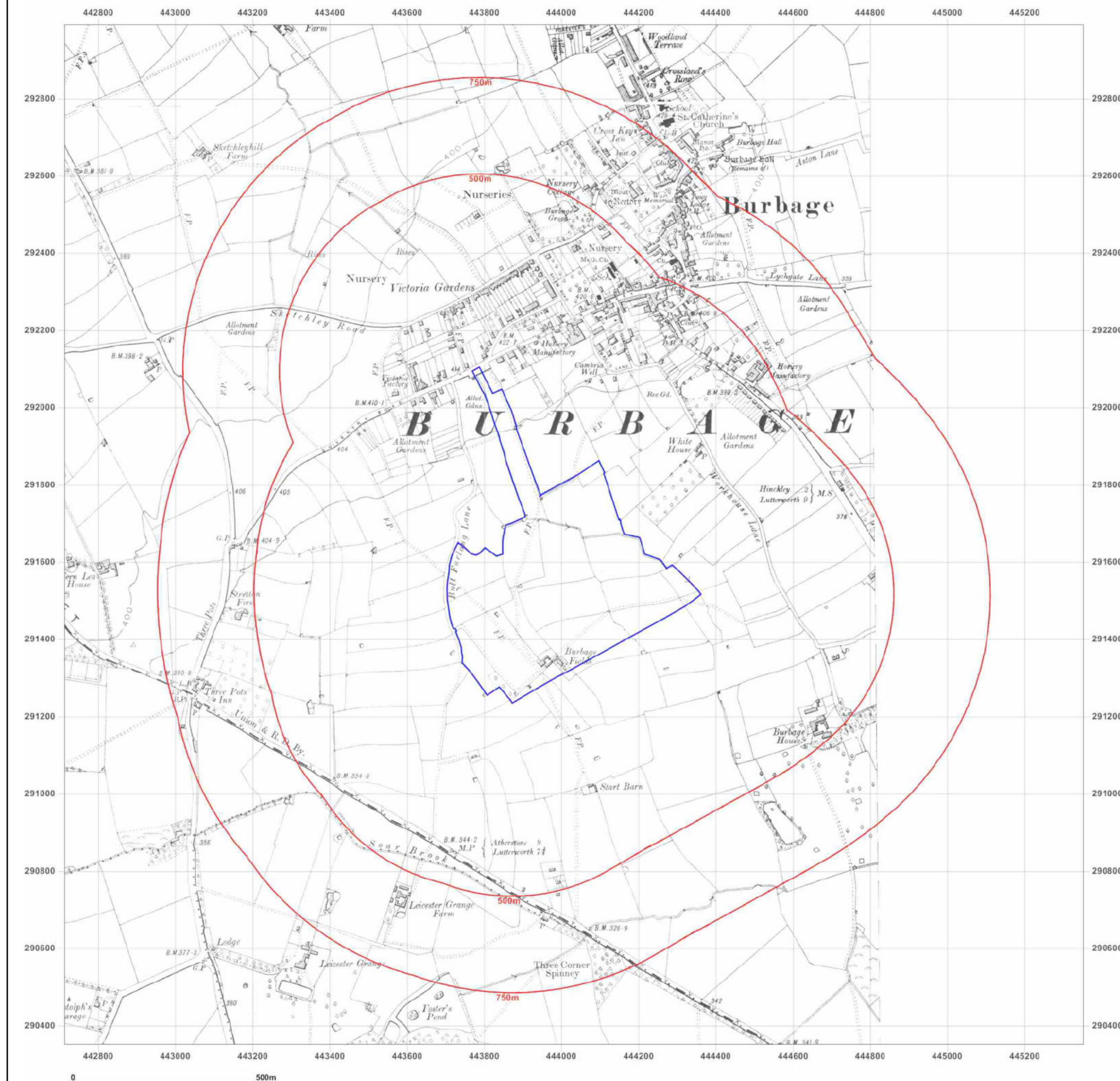


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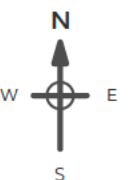
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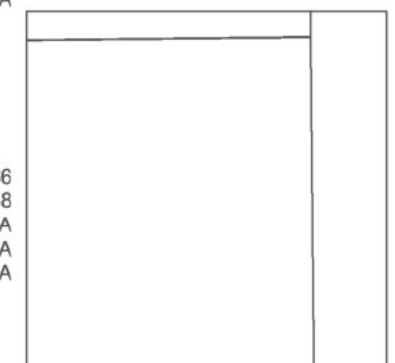
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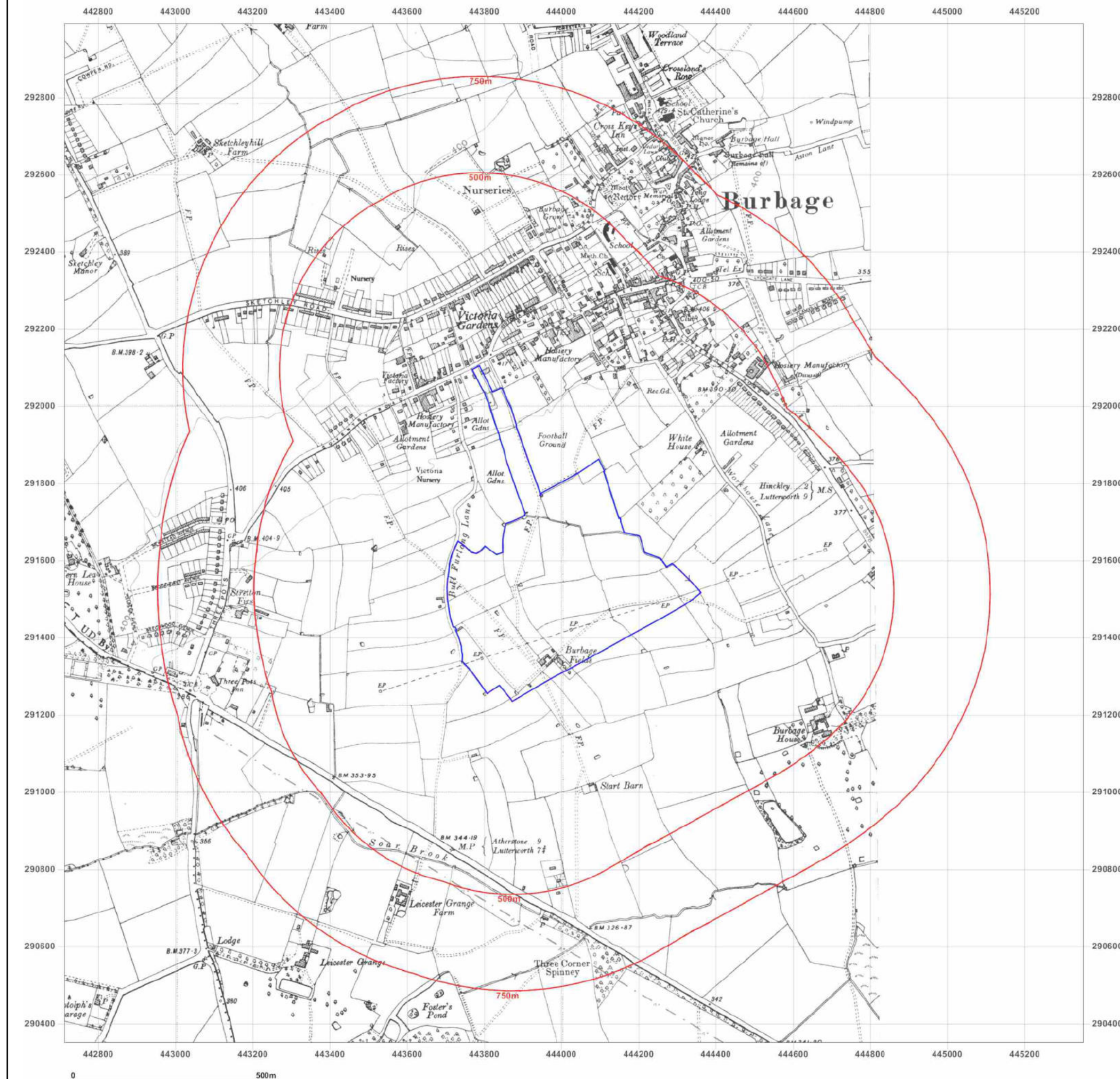


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Surveyed N/A
Revised 1954
Edition 1955
Copyright N/A
Levelled N/A



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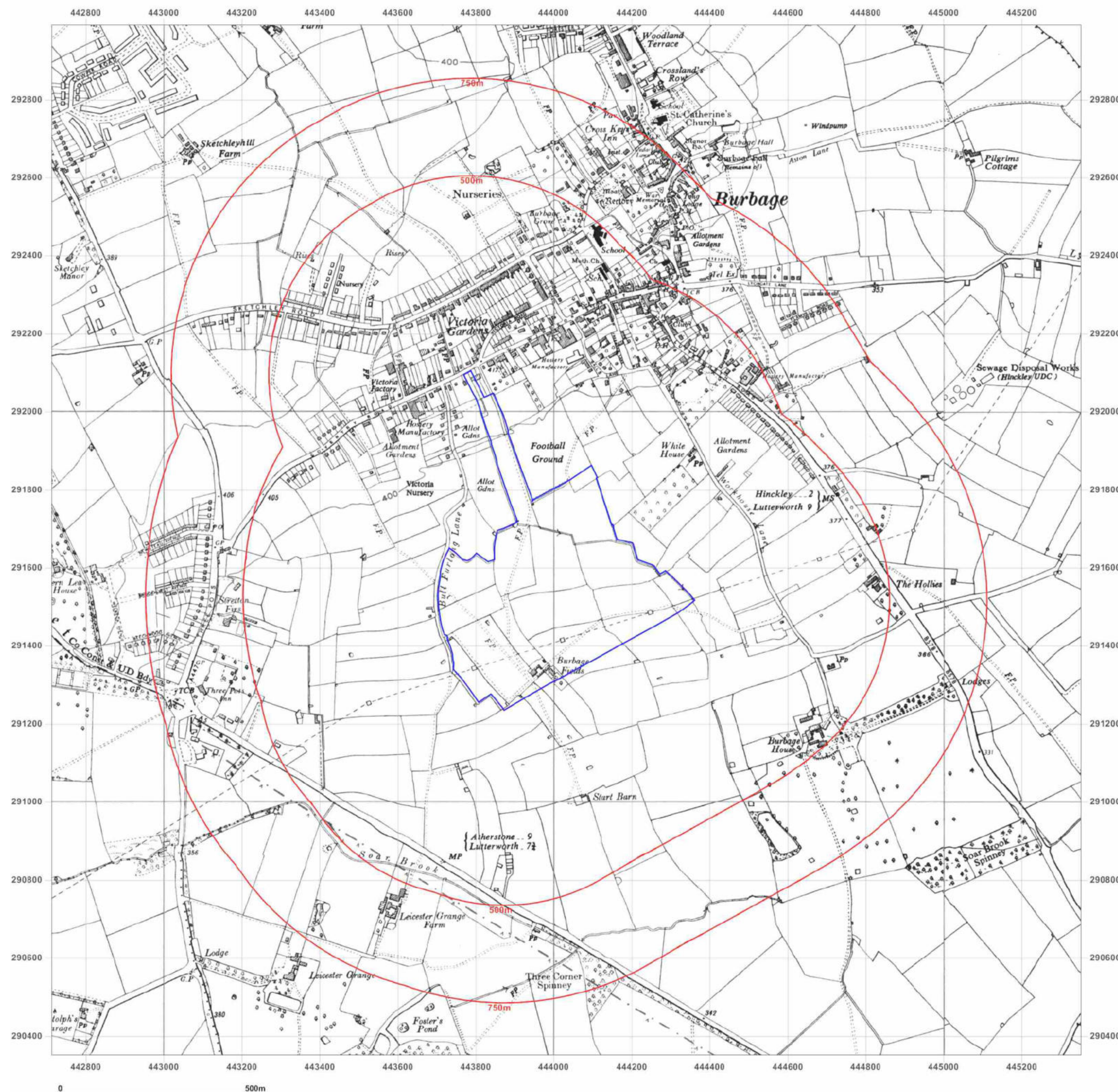


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Site Details:

Burbage Field
Farm, Burbage, Leicestershire, LE
10 2EX

Client Ref: EMS_632820_841667
Report Ref: EMS-632820_841667
Grid Ref: 444031, 291670

Map Name: Provisional

Map date: 1968

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1968
Revised 1968
Edition N/A
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Surveyed 1968
Revised 1968
Edition N/A
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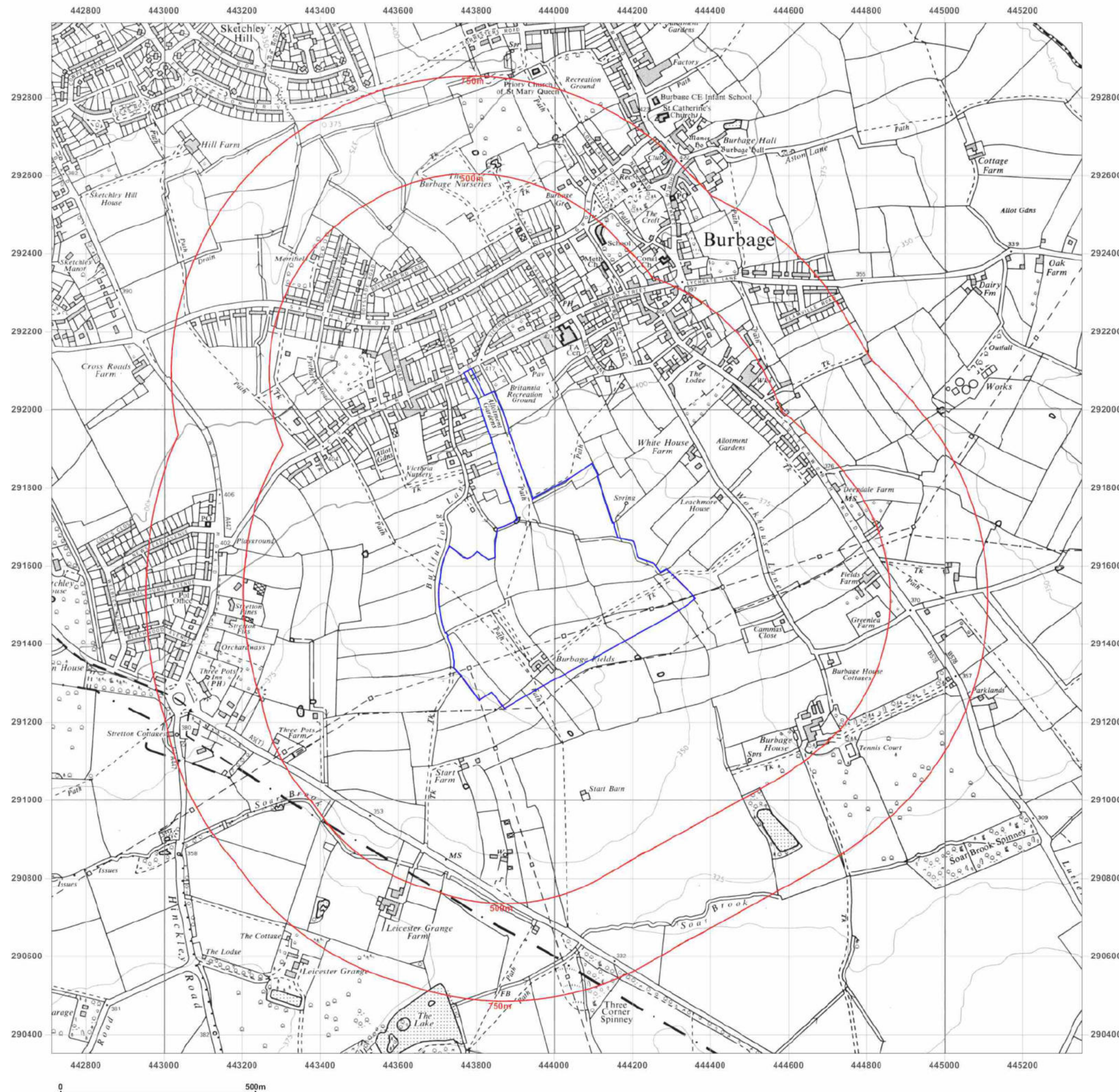


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Site Details:

Burbage Field
Farm, Burbage, Leicestershire, LE
10 2EX

Client Ref: EMS_632820_841667
Report Ref: EMS-632820_841667
Grid Ref: 444031, 291670

Map Name: National Grid

Map date: 1977-1979

Scale: 1:10,000

Printed at: 1:10,000



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Revised 1977
Edition N/A
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Levelled 1965

Surveyed 1976
Revised 1979
Edition N/A
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Levelled 1965



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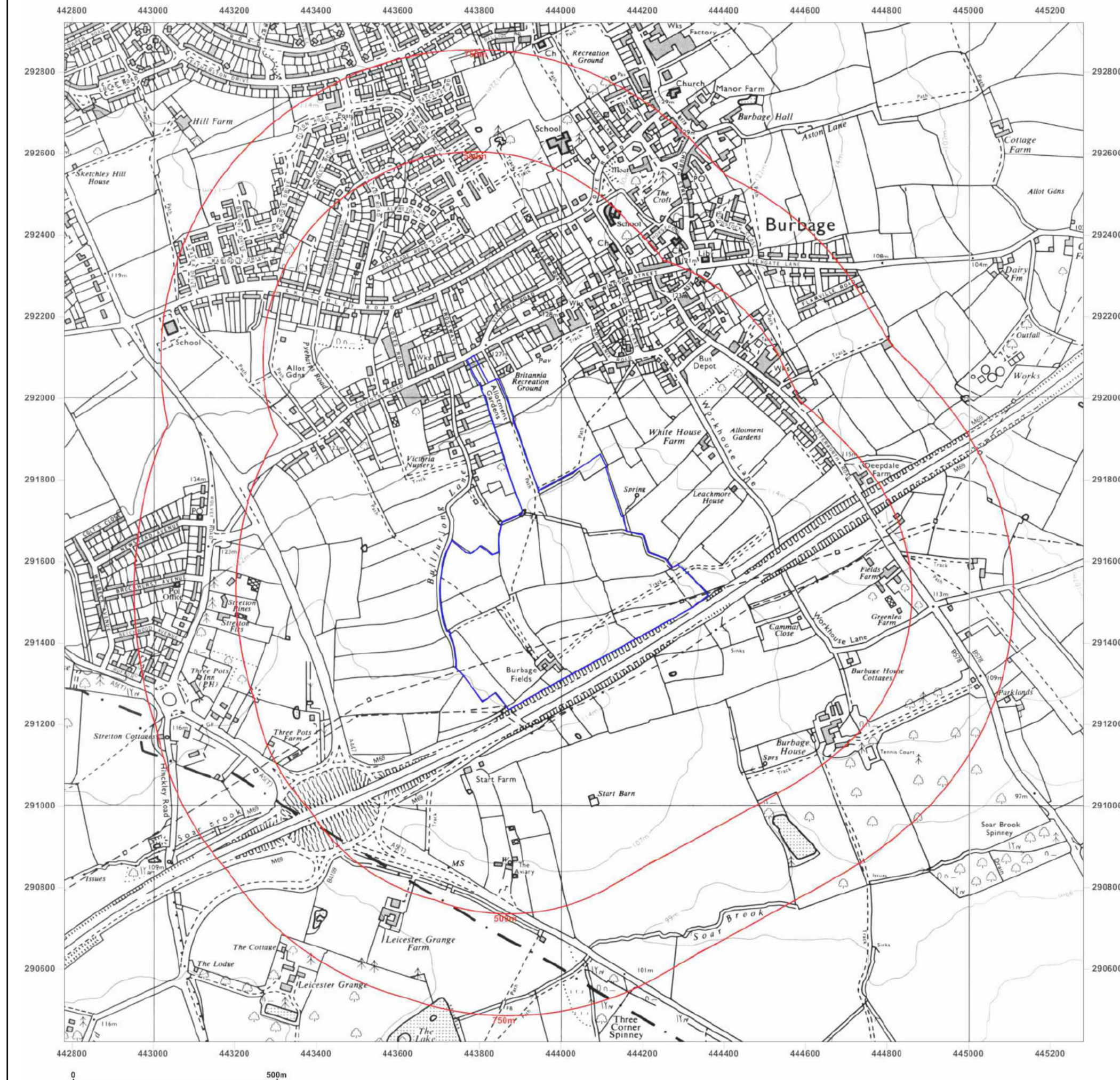


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Site Details:

Burbage Field
Farm, Burbage, Leicestershire, LE
10 2EX

Client Ref: EMS_632820_841667
Report Ref: EMS-632820_841667
Grid Ref: 444031, 291670

Map Name: National Grid

Map date: 1983

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1982
Revised 1983
Edition N/A
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