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Wates Development Ltd

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Project Number

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WIXAMS END, BEDFORDSHIRE

PHASE 1 PRELIMINARY RISK ASSESSMENT

RAMBOLL

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Checked/Approved by:

[redacted]

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Revision	Date	Made by	Checked by	Approved by	Description
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CONTENTS

LIST OF TABLES

FIGURES

APPENDICES

1. INTRODUCTION

1.1 Background

This report presents the objectives, scope, findings and conclusions of a Phase I Preliminary Risk Assessment (PRA) undertaken at Wixams End, Bedfordshire (the "site") with respect to contaminated land. The review was undertaken to support the promotion of the site and planning application for development of the site at the appropriate time.

This report was prepared by Ramboll UK Limited ("Ramboll") on behalf of Wates Development Limited (the "client").

This assessment has been undertaken assuming the site will be developed for a residential land use with the potential for private gardens.

1.2 Objectives

The main objective of the review was to assess the potential for soil and groundwater contamination, both at and in the vicinity of the site, and their likely implications in a residential land use scenario. No sampling or analysis of soils, waters or other materials was undertaken as part of the review. Review of compliance with environmental legislation is outside the scope of this review.

The qualitative risk assessment has been undertaken in relation to a residential site with the potential for plant uptake in private gardens (the most sensitive land use currently proposed).

1.3 Scope of Works

The scope of the Phase I PRA has included the following:

i. examination of historical, recent and current Ordnance Survey plans to identify activities which might have led to contamination of soil or groundwater (for example, from agricultural processes, from storage activities or waste disposal practices) both on the subject site and on adjacent sites;
ii. examination of published records and plans relating to the shallow and deep geology and hydrogeology of the site to assess the vulnerability and sensitivity of groundwater and surface water resources to contamination, if present, and the possible direction of movement of contaminants in groundwater, if mobile;
iii. search of a proprietary database of environmental permits, records and incidents at the site and surrounding area;
iv. enquiries of the Local Authority Planning and Environmental Health Departments to obtain information on environmental conditions, incidents and known contamination risks and enquiries relating to the Local Authority's Contaminated Land Strategy;
v. enquiries of the Petroleum Enforcement Authority to determine if records exist of above ground or below ground licensed (petrol) storage facilities; and
vi. a site walk-over visit.

1.3.1 Scope of Works Notable Exceptions and Restrictions

No sampling or analysis of soils, waters or other materials has been carried out as part of the Phase I Environmental Site Assessment.

The assessment did not include an audit of operational environmental compliance issues or environmental compliance requirements associated with existing agricultural land and operations at the site.

The assessment did not include a detailed assessment as to the presence and condition of asbestos or asbestiform containing materials at the site.

There are no known previous contaminated land risk assessment documents relating to the site.

1.4 The Proposed Development

The Developer is promoting the site through the local planning process with the aim of allocation in the Local Plan and subsequent submission of a planning application for circa 415 homes, some of which may include private gardens. The proposed development would occupy the northern half of the site (an area of 11.87 hectares out of a total of 23.74 hectares).

The southern half of the site (11.87 hectares, remaining under legal control of the client) is not currently proposed for development, however, is considered by the client to have potential future uses including; a country park, a wooded area supporting Forest of Marston Vale policy, a Biodiversity Sink or a future allocation area for residential development. The existing agricultural buildings in the south of the site are considered by the client to have potential for redevelopment for commercial uses or commercial infrastructure.

1.5 General Limitations and Reliance

This report has been prepared by Ramboll exclusively for the intended use by the client in accordance with the agreement email dated 27 July 2021 between Ramboll and the client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended or any other services provided by Ramboll.

In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate, complete and available to Ramboll within the reporting schedule.

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/or compliance. This report and accompanying documents are initial and intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

Ramboll's scope of services for this assignment did not include collecting samples of any environmental media. Ramboll cannot rule out the existence of conditions, including, but not limited to, contamination not identified and defined by the data and information available to and/or obtained by Ramboll. Specifically, this assessment must not be considered as an asbestos survey (whether in built structures, waste, soils, etc.), even though the subject of asbestos-containing materials may have been discussed in the report.

2. SITE VISIT

The following information was derived from a site visit undertaken on 16 August 2021 by a Ramboll consultant. The site visit was undertaken with an escort from the landowner, who provided anecdotal information of the site history. The purpose of the site visit was to assess whether there is potential for contamination from current and recent activities.

Figures showing the location of the site and layout of the site are presented as Figure 1 and Figure 2 respectively. A plan of potential contaminative features on the site and surrounding area are presented as Figure 3. Photographs taken during the site visit are presented in Appendix A.

2.1 Site Setting

The site is located immediately south of the village of Wixams and west of the village of Wilstead, approximately 2.7 km south of the town of Bedford, at TL 06166 42810. Access to the site is via the A6 trunk road opposite Luton Road, at the southern portion of the site.

The site has a total site area of approximately 56.3 hectares (Ha), and is located at an elevation ranging from approximately 39 m Above Ordnance Datum (AOD) to approximately 46 m AOD. The site is divided into two parts – an irregularly shaped parcel of land of approximately 54.6 Ha to the west of the A6 trunk road, and a triangular area of land of approximately 1.7 Ha to the west of the A6 trunk road. The highest points on the site are located in the centre of the site, at the farmyard in the southern half of the site and at the southern corner of the site. Gentle downward slopes are present toward the north, south, east and west from these points with localised steeper slopes in places. Localised elevated slopes also exist along the embankment of the A6 trunk road (sloping upward towards the east).

The site is located within an area of predominantly agricultural and residential land use, with limited industrial/commercial properties nearby (primarily comprising farms). Adjacent and surrounding land uses are detailed in Table 2.1 below.

Table 2.1: Adjacent and Surrounding Land Uses

Direction	Distance	Occupant	Activities	Notes
North	Adjacent	Terraced and detached houses, Bedford Road	Residential properties, road	None
South	Adjacent	Agricultural fields	Agricultural land	None
East	Adjacent	A6 trunk road, residential properties and agricultural land opposite	Road, residential properties, agricultural land	None
West	Adjacent	Allotment gardens, residential properties, agricultural land	Allotment gardens, residential properties, agricultural land	Additional residential development under construction to west.

2.2 Site Layout and Activities

The site is predominantly occupied by undeveloped agricultural land, with a number of hedgerows separating fields on the site. The larger parcel of land is separated approximately in half by a drain which runs parallel with the western site boundary from the south before crossing through the centre of the site from southwest to northeast. An additional drain is located within the northern boundary of the site running in approximately the same direction. Overhead power lines cross the northern half of the site running southeast to northwest, and cross the southern half of the site running northeast to southwest. A farmyard is located in the eastern side of the southern portion of the larger parcel of land, occupied by four large steel A-frame barns, and two smaller

single pitch style sheds to the west of these. A telecommunications mast is located on permeable gravel hardstanding in the western end of the farmyard. The uses of the buildings are identified in Table 2.2 as follows:

Table 2.2: Summary of Farmyard Building Uses

Building No. (See Figure 2& 3)	Description	Nature of Use
1	Single pitch shed with corrugated steel cladding	Hay bale storage. Ground surface not visible, presence of hardstanding not confirmed.
2	Single pitch shed with corrugated cement cladding	Hay bale storage. Ground surface not visible, presence of hardstanding not confirmed.
3	Steel A-frame barn with corrugated cement cladding	Cattle pen, limited storage of fertiliser noted. Located on concrete hardstanding covered in hay and mud – condition of hardstanding could not be confirmed.
4	Steel A-frame barn with corrugated cement cladding	Cattle pen. Located on concrete hardstanding covered in hay and mud – condition of hardstanding could not be confirmed.
5	Steel A-frame barn with corrugated cement cladding	Cattle pen. Located on concrete hardstanding covered in hay and mud – condition of hardstanding could not be confirmed.
6	Steel A-frame barn with corrugated cement cladding	Tractor storage and maintenance workshop. Located on concrete hardstanding, which was noted to contain wide gaps (5-10 mm) between concrete slabs.

The triangular parcel of land to the east of the A6 trunk road comprises a single agricultural field surrounded by hedgerows and a pond located approximately in the centre of the field. The northern half of the larger parcel of land is used for arable farming (with barley crops present during the site walkover) while the southern half of the larger parcel of land and the triangular parcel of land to the east are used for cattle grazing (though previously may have been used for crop production).

Based on anecdotal evidence, the area of farmyard buildings is understood to have been first developed in the 1940s as part of an accommodation block for a military ordnance factory located 500 m to the northwest of the site, however the accommodation block was never completed or occupied. The remains of the accommodation block structure were demolished in the 1980s at which time, the existing buildings were constructed. An additional brick and concrete foundation (approximately 2 m by 5 m in area) and a brick and concrete chamber (approximately 0.3 m by 0.6 m in area and approximately 0.5 m deep according to the landowner) were located to the south of the farmyard which had been intended as a shower block and part of a gravity-fed drainage system to support the military accommodation respectively. According to the landowner the shower block was never constructed, and the chamber was filled in with concrete rubble. As both structures are of a small size and were never used for their intended purpose, they are not considered to be significant with respect to ground contamination.

A number of piles of discarded brick and concrete rubble are located to the west and to the northwest of the farmyard, understood to have originated from a residential development adjacent to the north of the site. A pile of aggregate material and tarmacadam fragments is located adjacent to the east of the farmyard, which is understood to have been placed during the construction of the A6 trunk road to the east of the site. An additional pile of manure from the

cattle pens located to the northwest of the farmyard is intended to be spread on the fields in the northern half of the site.

2.3 Storage of Chemicals and Hazardous Substances

2.3.1 Underground Storage Tanks (USTs)

No USTs are known to have ever been located on the site.

2.3.2 Above Ground Storage Tanks (ASTs)

A 1,000L diesel AST for refuelling of vehicles had previously been located on concrete hardstanding adjacent to the east of Building 3 in the farmyard; the date of removal of the tank is unknown, however the landowner advised that no historical leaks or spillages of diesel have occurred on the site. The concrete hardstanding on which the tank had been located was approximately 1 m higher than undeveloped ground to the east, supported by a brick retaining wall. No evidence of historical below-ground pipework or bunding was visible. No evidence of staining was observed on the concrete hardstanding.

Two corroded and punctured metal-skinned rectangular tanks were observed by Ramboll to have been discarded adjacent to the east of Building 2 (1000L tank) and to the northwest of the farmyard (approximately 4,000L tank). The landowner advised that these are scrapped water tanks and, as such, are not considered further.

2.3.3 Other Bulk Storage

Limited small-scale storage of chemicals (205 L or less) was observed on the farmyard on site and are summarised in Table 2.3 as follows.

Table 2.3: Summary of Other Bulk Storage On Site

Item	Location	Containment and other comments
20L metal cans and plastic containers	Building 6	Several 20L metal cans and plastic containers were observed on concrete hardstanding in Building 6. These included tractor oil, engine oil (two to three metal cans), engine grease (one plastic container), sodium hydroxide (one plastic containers) and hypochlorite solution (two plastic containers) and paint (one plastic container). These containers were generally noted to be old and with some evidence of leakage (particularly engine grease).
Two 205L oil drums	Building 2 and east of Building 3.	A 205L oil drum was noted to be propping up the roof of Building 2, and a second oil drum was located on the concrete hardstanding east of Building 3 (the location of the historical diesel tank) serving as an ad-hoc cattle barrier. The landowner advised that the oil drums have never contained oil on site.
Nine 600kg fertiliser bags	Building 3	Fertiliser bags were noted to be present on the concrete hardstanding in Building 3, and were due to be spread on the site at a later date.
Pesticide sprayer	East of Building 6	A discarded pesticide sprayer was observed to be located on soft landscaping adjacent to Building 6. The landowner advised that the sprayer has never been used on site as spraying of the site with pesticides is undertaken by an external contractor.

A tractor was observed in Building 6 and an excavator on undeveloped ground to the east of the farmyard during the site walkover. The landowner advised that no fuel leaks or spillages from farm machinery have occurred on the site. Various other pieces of farm machinery such as trailers or ploughs were located within the farmyard and elsewhere on the southern half of the site, but were not observed to contain fuel or chemicals.

2.4 Waste Storage and Disposal

Waste generated on site predominantly comprises manure from the cattle pens. The landowner advised that this manure is placed in a pile on undeveloped ground to the northwest of the farmyard before being spread on the fields in the northern half of the site.

No visual evidence of staining or leaching from waste storage areas onto unsurfaced ground was noted. A review of waste documentation was outside the scope of this review.

2.5 Water, Wastewater and Drainage

A drainage drawing for the site was not available for review by Ramboll during the site visit. The landowner advised that the farmyard was supplied by the mains water supply from Wilstead to the east of the site. The landowner also noted that a mains water supply had been discovered to a number of troughs to the northwest of the farmyard, however this was in the process of being decommissioned and broken out by the landowner.

The landowner advised that no foul water drainage system or oil-water interceptors were present on the farmyard and all surface water runoff from the farmyard drains to undeveloped ground surrounding the farmyard. Surface water runoff on the wider site drains to the drains through the north and centre of the site and along the eastern site boundary. The landowner advised that he had never seen running water in the drains on site, and the Ramboll observed that the drains were too heavily vegetated to observe running water during the site walkover.

2.6 Deleterious Materials

2.6.1 Asbestos Containing Materials (ACM)

No ACMs were observed to be present in the surface of the brick and rubble piles located in the southern half of the site. ACMs may be present in the existing farmyard buildings, in particular the cement cladding of buildings 2 to 6. An asbestos survey would be required to confirm the presence or absence of ACM in building fabric at the site, and should ACM be present these would need to be effectively managed under Control of Asbestos Regulations (2012) during any refurbishment or demolition works.

2.6.2 Polychlorinated Biphenyls (PCB)

No potential PCB-containing equipment was identified during the site visit.

Under the Polychlorinated Biphenyls Regulations 2000, the holder of equipment that contains PCBs must ensure it is decontaminated to less than 0.05% unless within an electrical transformer, which requires annual registration with the regulatory authorities.

2.7 Other Issues

There have been no known complaints, enforcements or other regulatory actions regarding the site or immediate surrounding properties related to environmental conditions, and there have been no known fire, spill or flooding events at the site.

At least one historical pond on site (adjacent to the eastern boundary of the larger parcel of land) was filled in during the construction of the A6 trunk road. The nature of the infill material is unknown, however this may form a potential source of ground gas.

No evidence of invasive species was observed during the site walkover, although this did not constitute an ecological assessment.

2.8 Potential for Ground Contamination from Current Uses

2.8.1 Potential On-site Contamination Sources

A number of potential on-site contaminant point sources were identified at the site; as follows:

i. Historical 1,000L diesel tank east of Building 3, and associated refuelling activities;

ii. Potential ACMs in the ground, e.g. waste stockpiles;

iii. Vehicle maintenance activities in Building 6, including storage of associated chemicals;

iv. Storage of fertiliser in Building 3 (and spreading of fertiliser and pesticides on fields in north of site). However, given the agricultural setting of the wider area and diffuse nature of such contamination, these contaminants are not likely to pose a significant risk in relation to the proposed end use of the site and are therefore not considered further;

v. Storage of manure from cattle pens in a pile northwest of the farmyard; and

vi. Infilled ponds across the larger parcel of land.

The potential contaminant point sources identified at the site are noted to be of a very small scale and are concentrated in the southern half of the site, which is not currently proposed for development. As such, the risk from potential contaminant point sources to the proposed residential end users at the site is anticipated to be low. Diffuse applications of plant protection products (fertilisers, pesticides and herbicides) are however likely to have taken place across the northern part of the site, along with applications across a much wider area – given the agricultural setting these potential contaminants are not considered to represent a significant risks in relation to the proposed end use of the site.

2.8.2 Potential Off-site Contamination Sources

Potential off-site contaminant sources in the vicinity of the site were generally limited to additional agricultural land and the construction site for a residential development immediately to the north. The risk of contaminant migration from these sources is not anticipated to be significantly higher than the risk of contaminant presence at the site, and as such these will not be considered further.

3. HISTORICAL & REGULATORY INFORMATION

3.1 Map History

Ramboll has undertaken a review of historical mapping and aerial imagery (where available) obtained from a proprietary environmental database which is summarised below. Selected historical maps are presented in Appendix B.

3.1.1 The Site

The earliest available historical maps (dated 1882) indicate that the site was undeveloped, with the existing hedgerows and drains present in their approximate contemporary layout. A number of small ponds were shown on the site in the triangular parcel of land and within the northern site area of the site, adjacent to the south of the drain in the centre, and near the southern corner of the larger parcel of the site. A footpath ran through the southern portion of the larger parcel from northeast to southwest. In 1948, a series of additional footpaths and an unidentified building were located in the approximate location of the current farmyard. By 1980 the ponds in the northern portion of the larger parcel of the site were no longer recorded. No further significant changes were recorded until 2001 when the existing barns and sheds were shown on site (these are understood to have been constructed in the 1980s) and overhead power lines were located in the north of the site (running from southeast to northwest) and south of the site (running from northeast to southwest). Historical photography between 2002 and 2021 indicate the presence of three mounds located to the northwest, west and southwest of the farm buildings (these were identified as piles of rubble and manure from the cattle pens during the site walkover).

3.1.2 The Surrounding Area

The earliest available historical maps showed the area surrounding the site to be predominantly agricultural. Duckend Farm and Church Farm were located approximately 250 m east of the site. A brick field and kilns were located 500 m to the north of the site and Chapel End Farm was located 750 m southwest of the site. By 1900 a brickworks was present 180 m northwest of the site and Wilstead village was developing 250 m to the east. In 1924 allotment gardens were present 100 m to the east and 300 m north of the site.

By 1948 a military installation, Royal Ordnance Factory (ROF) Elstow was located approximately 500 m northwest of the site, with unidentified structures anticipated to be associated with ROF Elstow located 380 m west at their closest point; given this distance, it is not likely to have affected the site. By 1980 this had been replaced by an area of unidentified works, depots and pumping stations which extended within 300 m northwest of the site (later identified as Wilstead Industrial Estate). Between 1975 and 1978 the A6 trunk road was constructed adjacent to the eastern boundary of the site (west of the smaller parcel of the site). By 1980, Horton Turn Farm was located adjacent to the northwest of the site, which included a tank and kennels. A garage was located 175 m northwest of the site. Briar Bank Caravan Park was constructed approximately 200 m east of site. An unidentified works was constructed 200 m east of the site and another unidentified works was constructed 600 m to the northeast, both in Wilstead. By 2001 an additional works was located 450 m east in Wilstead. By 2010 the works 200 m east had been replaced by residential housing. A large residential development was constructed approximately adjacent to the north of the site between 2006 and 2016, including a drainage ditch connecting to the ditch along the western boundary of the site. An allotment garden was constructed adjacent to the northern extent of the eastern boundary by 2016.

Between 2016 and 2020, additional land to the northwest of the site was shown to be undergoing development works.

A plan of potentially contaminative features on the site and surrounding area is presented as Figure 3.

3.2 Environmental Database Records

The information presented in Table 3.1 has been obtained from a review of a proprietary environmental database (dated 02 August 2021) procured by Ramboll relating to the site and surrounding land. A plan of potentially contaminative features on the site and surrounding area is presented as Figure 3.

Table 3.1: Summary of Key Environmental Database Information

Data Type	Distance			Relevant records within 250m of the site
	On Site	<250m	250m-500m	
Contaminated Land Register enquiries	0	0	0	None within 250m
Historical industrial land uses	0	8	N/R	Nearest records relate to a garage 90 m northwest of site, brickworks, unspecified pits and ground workings 150 m northwest and 180 m west of site, and unspecified commercial and industrial works 160 m northeast and 210 m northwest of site.
Historical tanks	0	0	2	Nearest records relate to unspecified tanks 280 m northeast and 380 m east of site.
Historical energy features	0	0	3	Nearest records relate to electricity substations 280 m northwest, 380 m east and 390 m northeast.
Historical garages	0	1	2	Nearest records relate to garages 90 m northwest, 420 m east and 490 m northeast.
Historical military land	0	1	0	Nearest record relates to ROF Elstow (filling and packaging munitions during the second World War (WW2) and storage of surplus munitions and machine tools after WW2.
Recorded landfill sites	0	0	0	None
Waste Exemptions	0	9	15	Nearest records relate to Duck End Farm 200 m east, including deposit of dredging waste, burning waste, composting and treatment of waste, screening and blending of waste and spreading waste on agricultural land. Waste exemptions for Chapel End Farm 230 m southeast relate to storage of sludge.
Recent industrial land uses	0	4	N/R	Nearest off-site features relate to a pumping station 80 m west and electricity substations 130 m northeast, 180 m west and 200 m east.
Gas pipelines	0	1	1	Nearest records relate to 900mm pipelines from Peterborough to Whitwell (110 m east) and Huntingdon to Steppingley (300 m southeast) owned by National Grid.

Data Type	Distance			Relevant records within 250m of the site
	On Site	<250m	250m-500m	
Licensed discharges to controlled waters	0	0	2	Nearest records relate to storm overflow tank 250 m east at Duck End, Wilstead, and unspecified agricultural discharge 325 m east at Duck End Farm.
Pollution incidents	0	0	2	Records both relate to Category 3 (Minor) spillages of crude sewage 490 m east of site in August and September 2003.
Mining and ground workings	0	21	1	One record relates to Dane Oak Brick Works 253 m west of site, a ceased surface mineral working extracting clay and shale. Other records between 0 and 250 m of site relate to ponds (2 m east to 220 m east), brickworks 150 m northwest and unspecified pits and ground workings 180 m west.
Registered radioactive substances	0	0	0	Information on certain radioactive substance authorisations is not publicly accessible

The site is not located in a "Radon Affected Area" as defined by Public Health England (i.e. less than 1% of residential properties are projected to contain radon above the residential action threshold). Under Health and Safety legislation, employers have a duty to manage workplace risks including the potential for radon exposure. Health and Safety Executive guidance recommends radon monitoring for workplaces located in radon Affected Areas. If the workplace radon threshold is exceeded, the Ionising Radiations Regulations 1999 require employers to take action to reduce risks.

According to BRE Report BR211 (2015) Radon: Protective Measures for New Buildings, radon protection measures are not required under building regulations for new buildings at this location.

The LinesearchbeforeUdig (LSBUD) database, which lists pipelines distributing crude oil and refined hydrocarbon products owned and/or operated by a number of UK pipeline operators indicates that assets belonging to Exolum Pipeline Systems and the Defence Infrastructure Organisation (DIO) relating to pipelines abandoned by the Ministry of Defence (MOD) are located in the vicinity of the site. No plans have been provided by Exolum or the DIO. The LSBUD database also indicates the presence of National Grid gas pipelines and assets owned by UK Power Networks (UKPN) in the vicinity of the site. No plans were provided by National Grid or UKPN.

3.3 Regulatory Authority Enquiries

3.3.1 Local Authority Environmental Health Department

Ramboll has requested information from the Environmental Health Department of the Local Authority (Bedford Borough Council (BBC)) and this is awaited.

3.3.2 Local Authority Planning Department

Ramboll has undertaken a search for the planning history of the site from the Planning Department of the Local Authority, however no planning applications relevant to the site were identified.

3.3.3 Environment Agency

Ramboll has requested information from the Environment Agency and this is awaited.

3.3.4 Petroleum Enforcement Authority

Ramboll has submitted an enquiry for petroleum storage records to the Trading Standards Officer at BBC in order to establish if the site is currently or has previously been licensed for the bulk storage of petroleum products. This information is awaited.

3.4 Historical Potential for Ground Contamination

3.4.1 The Site

Potentially contaminative historical features on the site generally relate to the agricultural use of the site and the infill of historical ponds on the site. The site has been used as agricultural land since the earliest dated historical map (1882) and while limited historical use of the site by ROF Elstow is understood to have taken place (construction of foundations and a drainage chamber for the accommodation block) this construction is understood to have been left incomplete, and the potential for historical ground contamination as a result of this construction is considered to be low.

3.4.2 The Surrounding Area

The following potentially contaminative activities have been identified as having taken place in the surrounding area:

i. Duckend Farm, Church Farm and Chapel End Farm 200 m to 250 m east and southeast of site (1882 to present). Given distance from the site, these are not considered to be of concern;

ii. ROF Elstow 500 m to the northwest of the site (and 380 m to the west at its closest point) from 1940 to 1980 (later Wilstead Industrial Estate including unidentified works, depots and pumping stations. Given distance from the site, these are not considered to be of concern;

iii. A brickworks 180 m northwest of the site (1900 to approximately 1960) at which excavations may have been infilled;

iv. Allotment gardens 100 m east of site (1900 to present). Given distance from the site, these are not considered to be of concern;

v. Horton Turn Farm (including tank) adjacent to northwest (1980 to present);

vi. Garage 90 m northwest of site (recorded in 1980 only); and

vii. Unidentified works in Wilstead 200 m east of site (1980 to 2010). Given distance from the site, these are not considered to be of concern.

The above activities represent potential off-site sources of contamination that (if present) could potentially migrate beneath the site. While ROF Wilstead is likely the most contaminative historical feature in the surrounding area, it is located a significant distance from the site and as such is considered unlikely to form a source of potential contaminant migration.

The potential for off-site contamination (if present) to migrate beneath the site would be dependent on the underlying geological conditions, which are discussed in Section 4.

4. ENVIRONMENTAL SETTING

Desk-based research of the local geology, hydrogeology and hydrology was carried out in order to establish the potential for migration of contamination onto or away from the site, and to assess the sensitivity and vulnerability of the site's setting with respect to surface water, groundwater and ecological resources.

Information was obtained from a number of sources, including:

i. examination of published geological maps produced by the British Geological Survey (BGS);
ii. the proprietary environmental database procured by Ramboll; and
iii. Regulatory Authority websites including the Environment Agency (EA).

4.1 Geology and Hydrogeology

According to BGS 1:50,000 mapping of the area, the site geology and hydrogeology is presented in Table 4.1. No records of historical borehole logs were available in the vicinity of the site, however the thickness of anticipated geological units were estimated from the BGS 1:50,000 scale mapping sheet (203) for Bedford, where recorded.

Table 4.1: Summary of Geology and Hydrogeology

Formation	Description	Thickness	EA Aquifer Designation	Hydrogeological Significance
Head Deposits (centre of site only)	Clay, silt, sand and gravel	Thickness not recorded	Secondary (undifferentiated)	Variable permeability, with potential to support small or localised abstractions.
Stewartby Member and Weymouth Member (undifferentiated)	Mudstone	Less than 10 m thick	Unproductive Strata	Low permeability, with negligible significance for water supply.
Peterborough Member	Mudstone	Approximately 30 m thick	Unproductive Strata	Low permeability, with negligible significance for water supply.
Great Oolite Group	Limestone and argillaceous rocks	17 to 33 m thick	Secondary B	Lower permeability, which may store and yield limited amounts of groundwater.

The site is not located within a groundwater body classified by the EA under the Water Framework Directive (WFD) classification scheme. The nearest classified groundwater body is the Upper Bedford Ouse Woburn Sands approximately 900 m to the southeast, which the EA currently classifies as being of 'good' chemical status and of 'poor' quantitative status with a 'poor' overall status under the WFD classification scheme as of 2019.

According to EA information provided by a commercial environmental regulatory database provider, there are no licensed groundwater abstractions within a 2km radius of the site.

The site is not situated within an EA designated groundwater Source Protection Zone (SPZ). The nearest SPZ is located approximately 900 m to the southeast, likely associated with the Upper Bedford Ouse Woburn Sands.

There may also be private (unlicensed) abstractions (that are generally of smaller scale); this information has been requested from the Environmental Health Department and is awaited.

4.2 Hydrology

The nearest identified surface water bodies are the un-named drains and ponds on the site; further ponds are located to the north and west of the site. The nearest identified watercourses are Cople Brook 550 m east of the site and Harrowden Brook 1.1 km to the north of the site. Cople Brook is currently classified by the EA as being of 'good' ecological status and 'failing' chemical status with a 'moderate' overall status under the WFD classification scheme as of 2019. Harrowden Brook is currently classified by the EA as being of 'bad' ecological status and 'failing' chemical status with a 'bad' overall status under the WFD classification scheme as of 2019. The reasons for Cople Brook not achieving good status are not recorded by the Environment Agency. The reasons for Harrowden Brook not achieving good status are attributed by the EA to phosphate concentrations and combined macrophyte and phytobenthos populations, arising from poor nutrient management, poor livestock management, urban development and land drainage. While Cople Brook is the closest watercourse to the site, the EA Catchment Data Explorer indicates the site to be located entirely within the catchment of Harrowden Brook, and the topography in the vicinity of the site indicates surface water at the site is likely to flow generally towards Harrowden Brook. As such, Harrowden Brook is considered to be the most sensitive surface water receptor in relation to the site. Ordnance survey maps indicate that the drain through the centre of the site converges with Harrowden Brook approximately 2 km to the north of the site, however no running water was observed in the drains during the site walkover. As such it is considered unlikely that any contaminants entering the drain would migrate a sufficient distance to present a risk to Harrowden Brook, except for under exceptional high flow conditions.

According to an independent, third party environmental database, there are eight licensed surface water abstractions within a 2km radius of the site, all of which are related to spray irrigation, as detailed in Table 4.2 below.

Table 4.2: Licensed Surface Water Abstractions within 2km of the Site

Licence Holder	Distance from Site	Abstraction source	Purpose of Abstraction
H. Maskell and Son (two records)	450 m NW	Stream at Wilstead	Spray irrigation – direct (historical) Spray irrigation – storage (historical)
Clark	1.35 km N	Watercourse at Elstow	Spray irrigation – direct (historical)
M K H Farming	1.4 km N	Watercourse at Elstow	Spray irrigation – direct (active)
F J Hall and Sons (two records)	1.6 km NE	Watercourse at Elscotts	Spray irrigation – direct (historical) Spray irrigation – direct (active)
F J Hall and Sons (two records)	1.91 km NE	Watercourse at Elscotts	Spray irrigation – direct (historical) Spray irrigation – direct (active)

4.3 Ecology

There are no statutory designated ecologically sensitive sites located within 2 km of the site. The site is located within a Nitrate Vulnerable Zone (NVZ).

4.4 Environmental Sensitivity and Vulnerability

The site is considered to be situated in an area of moderate sensitivity with respect to groundwater due to the site being underlain by a Secondary (Undifferentiated) Aquifer in relation to the Head Deposits located in the centre of the site only. Elsewhere, a significant thickness of Unproductive Strata in relation to the Stewartby Member and Weymouth Member (undifferentiated) and Peterborough Member is present, and groundwater is considered to be of low sensitivity and vulnerability.

The sensitivity of Harrowden Brook can be considered as moderate to low as it is located 1.1 km to the north of the site, however the drains located on site converge with Harrowden Brook 2 km to the north of the site.

5. QUALITATIVE RISK ASSESSMENT

5.1 Legislative Framework

The regime for contaminated land was set out in Part 2A (ss.78A-78YC) of the Environmental Protection Act 1990 (EPA), as inserted by S.57 of The Environment Act 1995 and came into effect in England on 1st April 2000 as The Contaminated Land (England) Regulations 2000 (SI 2000/227). These regulations were subsequently revoked with the provision of The Contaminated Land (England) Regulations 2006 (SI 2006/1380) (as amended), which came into force in August 2006, and consolidated the previous regulations and amendments. Revised statutory guidance ("the Guidance") for local authorities on how to implement the regime, including the decision-making process on whether land is contaminated land in the legal sense, has been published by Defra and entered into force in April 2012.

Under Part 2A of the EPA Section 78A(2), "contaminated land" is defined as "land which appears… to be in such a condition, by reason of substances in, on or under the land, that:

a) significant harm is being caused or there is a significant possibility of such harm being caused[1]; or
b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused".

The pollution of controlled waters is defined in Section 78A(9) of the Act as "the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter".

5.2 Risk Assessment Framework

"Significant harm" or "significant pollution of controlled waters" is defined in the Guidance on risk-based criteria and must be the result of one or more relevant 'contaminant linkages' relating to the land.

The presence of a contaminant linkage relies on the Source-Pathway-Receptor (SPR) concept, where all three factors must be present and potentially or actually linked for a potential risk to exist. For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

i. A source - a substance that is capable of causing pollution or harm;
ii. A receptor - something which could be adversely affected by the contaminant; and
iii. A pathway - a route by which the contaminant can reach the receptor.

If one of these elements is absent there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard.

[1] Water Act 2003 (Commencement No. 11) Order 2012

Table 5.1: Classification of Risk (after NHBC/EA 2008)

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	**Very high**	High	Moderate	Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/ Low	Low	Very low
	Unlikely	Moderate/ Low	Low	Very low	Very low

The qualitative risk assessment has been undertaken in relation to a residential site with the potential for plant uptake in private gardens (the most sensitive land use currently proposed). In the event that changes are made to the proposed development, further assessment of potential SPR linkages at the site may be required.

5.3 Conceptual Site Model

The information presented in the previous section of this report has been collated and evaluated to develop an initial conceptual site model for the site.

5.3.1 Potential Sources

The potential contamination sources are summarised in Table 5.2.

Table 5.2 Summary of potential sources

Source	Key Potential Contaminants
On-site	
Historical diesel tank, vehicle maintenance in Building 6, infilled ponds, stockpiles.	Metals, asbestos, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), ground gas/vapours
Off-site	
Historical brickworks 180 m from the site	Ground gases from infill material (if any)
Tank at Horton Turn Farm adjacent to the site	TPH
Historical garage 90 m from the site	Metals, TPH, PAH

5.3.2 Potential Receptors

The specific receptors that could potentially be affected by the contamination hazards are summarised in Table 5.3.

Table 5.3 Summary of potential receptors

Receptors	Comments
On-site	
Future site users	Future users of the proposed residential development in the northern half of the site. Future users of residential and/or commercial development (Community Centre, Farm Shop or Visitor Information Centre) in the southern half of the site.

Receptors	Comments
Construction and maintenance workers	Workers involved in redevelopment construction and future maintenance workers
Internal building spaces (ground level)	Internal spaces of the proposed residential properties.
Buildings and structures (construction materials)	Building materials used below ground (e.g. foundations, drainage structures, water supply pipes). May be impacted by aggressive ground conditions and water supply may be impacted by TPH contaminated soils or groundwater.
Flora and fauna	Ornamental plants in areas of communal soft landscaping. Use of the site for future ecological enhancement e.g. woodland or biodiversity sink.
Secondary (undifferentiated) Aquifer	Head deposits anticipated to be present beneath the site (centre of site only). May form a source for unlicensed water supplies in the area of the site (however this is unlikely given the extent of the Head Deposits).
Surface water courses	Unnamed drains running through the centre and north of the site and along the eastern boundary. These are anticipated to drain to Harrowden Brook approximately 2 km north of the site.
Off-site	
Adjacent site users	Neighbouring residential properties to the north and east of the site.
Surface water courses	Harrowden Brook, 1.1 km to the north of the site.

5.3.3 Potential Pathways

In order for potential contaminants to pose a risk to the identified receptors, there must be a viable pathway for the contaminant. The potential pathways are summarised in Table 5.4.

Table 5.4 Summary of potential pathways

Receptor	Pathway	Comments
Human health	Direct contact/ingestion/inhalation of contaminated soils	Future site users may have the potential to come into contact with contaminated soil in communal soft land scaping and private gardens forming part of the development. In the event that non-residential land use is developed in the south of the site, then potential contaminant risks to users of this land may exist. The risk to these land users would be generally lower than risks to residential land users, and would be covered by the level of risk assessment appropriate to the currently proposed development (this applies to all other potential pathways to human health discussed below). Construction workers have the potential to come into contact with contaminants in soil and groundwater during site enabling works and construction activities.
Human health	Inhalation and ingestion of dusts/fibres (including asbestos) and inhalation of gas and vapours	Future site users of the proposed residential development may have the potential to come into contact with dust/fibres arising from contaminated soil in communal soft land scaping and private gardens forming part of the development. Construction and future maintenance workers and adjacent site users may be subject to accidental ingestion and inhalation of dust, fibres, vapour and ground gases. There may be some potential for adjacent site users to be impacted by dust/fibres arising from contaminated soil during site enabling works and construction activities.
Human health	Accumulation of asphyxiating/ explosive gases in confined spaces	Confined spaces on the site are anticipated to be limited to the proposed residential properties. Accumulation of ground gases in residential properties may present a risk to future site users. Construction and future maintenance workers may be exposed to accumulation of harmful vapour and ground gases if working in confined spaces such as excavations or utility spaces. There may be some potential for ground gases and vapours to migrate off-site and impact adjacent site users.

Receptor	Pathway	Comments
		It is noted that based on the potential contaminant sources identified at the site, the potential for ground gas generation is anticipated to be limited to potentially infilled historical ponds at the site or migration of gas from infilled workings at former brickworks, and as such the risk from ground gas to human health is expected to be limited.
Human health	Permeation of contaminants into drinking water pipes and subsequent human consumption	Soils at the site have the potential to contain organic contaminants such as hydrocarbons which may have the potential to impact water supply pipes placed in the affected ground. It is noted that potential hydrocarbon sources on site are limited to the historical diesel tank and vehicle maintenance at the farmyard in the southern half of the site. Given that the site is directly underlain by Unproductive Strata at all site boundaries, the potential for migration of organic contaminants from off-site sources is anticipated to be negligible.
Human health/flora and fauna	Root uptake of contaminants Human consumption of homegrown plants in private residential gardens	Elevated concentrations of contaminants in soil may have the potential to be taken up by the roots of plants (however given the historical use of the site for arable farming, this is considered unlikely). Elevated concentrations of phytotoxic contaminants (copper, nickel, lead, zinc) in soil may have the potential to cause vegetation die-back in ornamental soft landscaping. Aerial photography of the site and observations during the site walkover did not identify significant areas of vegetation die-back in grass or barley crops on the site, suggesting that phytotoxic contaminants are unlikely to be present in phytotoxic concentrations on site.
Flora and fauna – future ecological areas in south of site	Leaching to water	Should water features be introduced for ecological enhancements (e.g. biodiversity sink), consideration will need to be given to the potential for leaching of e.g. fertilisers and plant protection products local to the area of the proposed water feature. Given that the southern area of the site has not been used for agriculture recently, such risks are considered to be low.
Buildings and Structures (construction materials)	Damage to building materials or services through direct contact with contaminated soil/groundwater	Aggressive ground conditions or organic contaminants such as hydrocarbons may affect subsurface construction materials such as foundations or drainage structures.
Secondary Aquifers	Leaching and vertical migration of contaminants to groundwater	Topsoil/Made Ground at the site is directly underlain by the Secondary (undifferentiated) aquifer of the Head Deposits in the centre of the site. The Head Deposits (and topsoil around the boundaries of the site) are directly underlain by a significant thickness of Unproductive Strata of the Stewartby Member and Weymouth Member (undifferentiated) and Peterborough Member. As such, the potential for lateral or vertical migration of contaminants in groundwater to potentially sensitive receptors is considered to be low. As the site currently comprises agricultural fields with the exception of the farmyard, the proposed development is anticipated to result in an overall reduction of the potential for contaminant leaching via infiltration of rain. There may be localised preferential pathways to the Great Oolite Group aquifer via vertical migration of contaminants in the event that piled foundations form part of the proposed development. Given that the proposed development comprises residential houses and the significant thickness of Unproductive Strata underlying the site, it is unlikely that piled foundations will be undertaken to sufficient depth to result in preferential pathways of significance.
Water environment	Migration of contaminants via surface runoff and within groundwater to surface water courses	Harrowden Brook is located a significant distance (1.1 km) from the site at its closest point. with agricultural land, residential development and the historical ROF Elstow in the intervening distance. The drain through the centre of the converges with Harrowden Brook approximately 2 km north of the site, however running water was not observed in the drain and surface water flow in the drain is anticipated to be limited and infrequent. As such, the risk to Harrowden Brook from contaminant migration in groundwater is considered to be low, while the risk to Harrowden Brook from surface runoff is considered to be moderate/low.

5.4 Qualitative Risk Assessment

Potential pollutant linkages are identified using the source-pathway-receptor framework detailed in Section 5.1. An assessment of the potential significance of each linkage is then made by consideration of the likely magnitude and mobility of the source, the sensitivity of the receptor and nature of the migration/exposure pathways between them.

This qualitative hazard assessment has been undertaken in accordance with NHBC and EA[2]. Further details of which are provided in Section 5.1 including definition of risk categories.

The pollutant linkages and risk ratings associated with the proposed development as assessed following interpretation of the results of the ground investigation are summarised in Table 5.5 below.

[2] National House Building Council (NHBC) and Environment Agency (2008) Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D Publication 66

Table 5.5 Preliminary conceptual site model

Hazard	Pathway	Potential Receptor	Potential Consequence	Probability of Risk	Level of Risk
On-site source –Historical diesel tank, vehicle maintenance in Building 6, infilled ponds. Potential contaminants– Metals, asbestos, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), ground gas/vapours	Dermal contact/ingestion of soil/dust/inhalation of dusts	Future site users	Medium	Low likelihood	Moderate/low
		Construction/maintenance workers	Mild	Low likelihood	Low
		Adjacent site users	Mild	Unlikely	Very low
	Inhalation of asbestos fibres	Future site users	Medium	Unlikely	Low
		Construction/maintenance workers	Medium	Low likelihood	Moderate/low*
		Adjacent site users	Medium	Unlikely	Low
	Accumulation and inhalation of gas/ vapours in confined spaces	Future site users	Medium	Unlikely	Low
		Construction/maintenance workers	Mild	Unlikely	Very low
		On-site buildings	Mild	Low likelihood	Low
		Adjacent site users	Medium	Unlikely	Low
	Permeation of contaminants into drinking water supply pipes	Future site users	Medium	Low likelihood	Moderate/low
		Buildings and structures	Mild	Unlikely	Very low
	Root uptake of contaminants and subsequent human consumption	Future site users (residential only)	Medium	Unlikely	Low
		Flora and fauna	Mild	Unlikely	Very low
	Leaching and vertical migration of contaminants in groundwater	Secondary (undifferentiated) Aquifer (Head Deposits)	Mild	Low likelihood	Low
		Surface water courses (drains)	Mild	Low likelihood	Low
		Surface water courses (Harrowden Brook)	Mild	Low likelihood	Low
		Surface water courses (drains)	Mild	Low likelihood	Low

Hazard	Pathway	Potential Receptor	Potential Consequence	Probability of Risk	Level of Risk
	Contaminant migration via surface runoff	Surface water courses (Harrowden Brook)	Medium	Low likelihood	Moderate/low
	Migration of contaminants via preferential pathways (e.g. piled foundations or service trenches)	Secondary Aquifers	Mild	Unlikely	Very low
	Leaching of contaminants, entry to newly constructed water features / wetlands	Flora and fauna – future ecological areas in south of site	Medium	Low likelihood	Moderate/low
Off-site sources – Historical brickworks, tank at Horton Turn Farm, historical garage Potential contaminants – Vapours from migration of TPH. Ground gases	Leaching and vertical migration of contaminants onto site via groundwater. Accumulation and inhalation of gas and vapours / ground gases in confined spaces	Future site users	Medium	Unlikely	Low
		Construction/maintenance workers	Mild	Unlikely	Very low
		Buildings	Mild	Unlikely	Very low

Notes

Assessment completed assuming proposed end use of the site. Should site levels be significantly altered during development, a reassessment would be required

Assessment completed assuming no remediation/mitigation in place

Should the development proposals alter significantly, a review of this assessment may be required.

*Given the use of appropriate personal protective equipment (PPE) and on-site health and safety precautions, risk to site development workers would be reduced to low.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of Key Findings

The site has been occupied by agricultural land for its entire history. Development of the site was limited to a historical foundation and partially constructed accommodation block in the southern part of the site. The foundation for the accommodation block is currently occupied by a farmyard and telecommunications mast. Overhead power lines also cross the northern and southern halves of the site running northeast to southwest (southern lines) and southeast to northwest (northern lines). Potential contaminant sources include:

i. On site - application of fertiliser and/or plant protection products on the agricultural land, infilled ponds on parts of the site, and a historical diesel tank, potential ACMs in buildings and stockpiles and vehicle maintenance in Building 6.
ii. Off-site sources - historical brickworks, tank at Horton Turn Farm, and historical garage.

The site is underlain by a Secondary (undifferentiated) Aquifer (Head Deposits) in the centre of the site only, with the Head Deposits and the site boundary directly underlain by a significant thickness (more than 30 m) of Unproductive Strata beneath which is a further Secondary Aquifer. Unnamed drains are present on site. The nearest surface water receptor (Harrowden Brook) is over a kilometre distant from the site, to the north, however the drains on site converge with Harrowden Brook 2 km to the north of the site. As such the potential for migration of contaminants to sensitive surface water receptors is considered to be moderate to low.

Potential contaminants that could impact the site include metals, asbestos, TPH, PAH and ground gas/vapours. Based on the current proposed development (residential properties with the potential for plant uptake in private gardens in the northern half of the site, with consideration given to the potential future development of either residential properties, commercial properties or ecological sites in the southern half of the site), increased risk was identified to the following receptors:

i. Moderate to low risk to future residential site users from direct contact, ingestion and inhalation of contaminated soil and from inhalation of dust and fibres, relating to potentially infilled ponds and soils within stockpiles at the site;
ii. Moderate to low risk to construction/maintenance workers from inhalation of asbestos fibres (given the use of appropriate PPE and on-site health and safety precautions both risks would be reduced to low) relating to potentially infilled ponds and soils within stockpiles at the site;
iii. Moderate to low risk to future site users from permeation of buried plastic water supply pipes by hydrocarbons (in particular at the farmyard, which may be subsequently developed for commercial use and for which water supply may become necessary);
iv. Moderate to low risk to future ecological sites in the southern part of the site as a result of leaching of contaminants from shallow soils, which may affect in particular newly constructed water features; and
v. Moderate to low risk to Harrowden Brook from lateral migration of contaminants via surface water in drains on site.

6.2 Recommendations for Further Work

From a review of all available sources, it is evident that there are limited potential contaminants sources at the site with viable pathways to potentially sensitive receptors. Where potential SPR linkages have been identified these are isolated to a small proportion of the site (farmyard, stockpiles, infilled ponds). As such, the following investigation is recommended to be undertaken to assess potential risks from contaminant sources:

i. A watching brief to be undertaken during enabling works in the event that the farmyard in the south of the site is redeveloped/refurbished, in order to identify visual/olfactory

evidence of potential contaminants arising from the farmyard (e.g. hydrocarbon leakage, asbestos fibres or ACMs in soil);

ii. In the event that visual/olfactory evidence of contamination is identified during enabling works at the farmyard, localised ground investigation to be undertaken to delineate and quantify impact of contamination and recommend potential further works;

iii. Limited ground investigation (comprising shallow trial pits and chemical testing of soil samples) to be undertaken in areas proposed for ecological water features.

Precautionary mitigation measures during the enabling works and construction phase of the development may be required to prevent impact from sediment runoff to the drains on site. Appropriate PPE and construction health and safety environmental best practices should be implemented during the enabling works and construction phase.

FIGURES

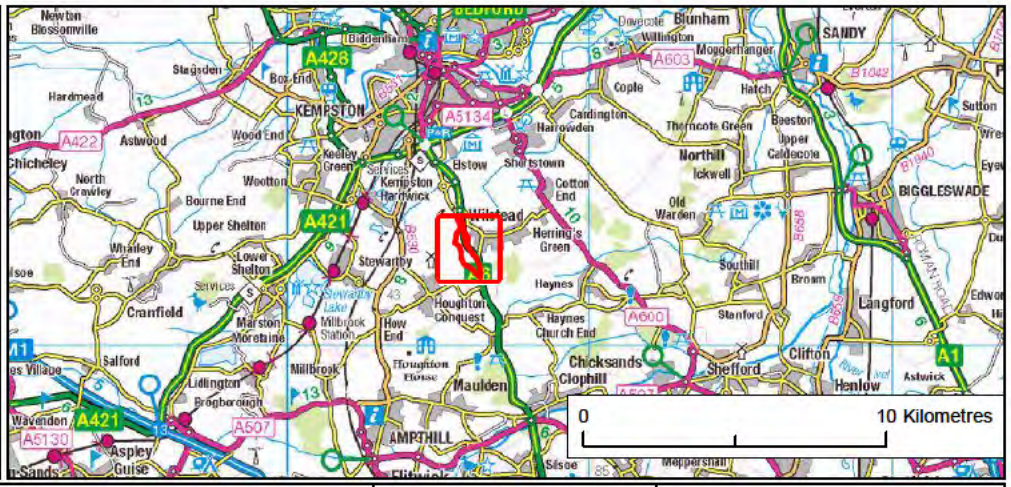

Figure Title: Figure 1: Site Location	Project Name: Wixams End, Bedfordshire	Date: August 2021	
		Scale: As shown	
Project Number: 1620011691	Client: Wates Development Ltd	Issue: 1	Prepared By: BK

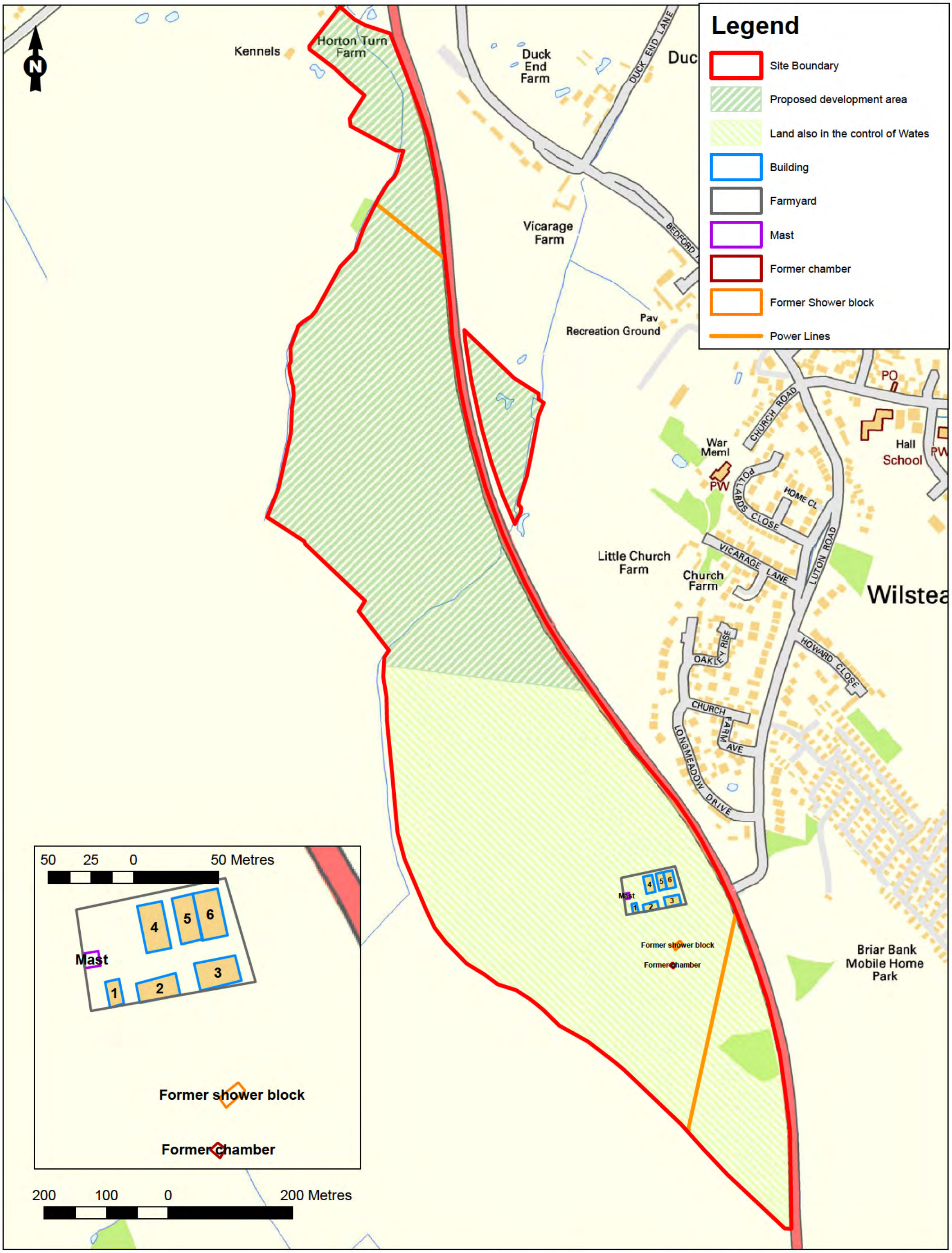

Figure Title: Site Layout Plan	Project Number: 1620011691	Figure No.: 2	Client: Wates Development Ltd
Project Name: Wixams End, Bedfordshire	Date: August 2021	Prepared By: BK	RAMBOLL
	Scale: 1:5,500 @A3	Issue: 1	

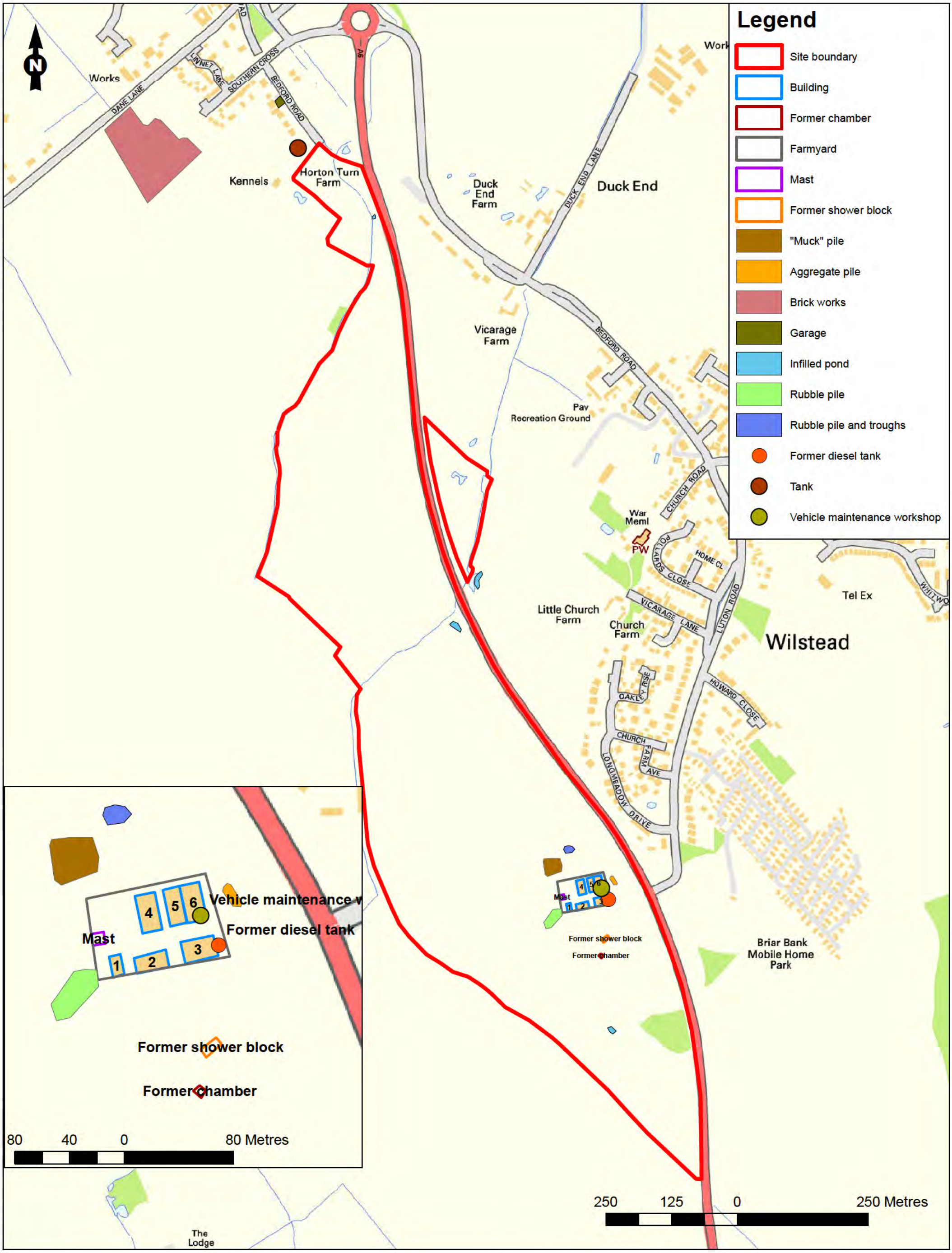

Figure Title: Potential Contaminative Features	Project Number: 1620011691	Figure No.: 3	Client: Wates Development Ltd
Project Name: Wixams End, Bedfordshire	Date: August 2021	Prepared By: BK	RAMBOLL
	Scale: 1:6,500 @A3	Issue: 1	

APPENDIX 1
PHOTOGRAPHIC LOG

Photo 1. Building 1, photo facing west. Lean-to shed with corrugated steel cladding, used for hay bale storage (see Figure 2 for location).

Photo 2. Building 2, photo facing south. Lean-to shed with corrugated cement cladding, used for hay bale storage. Empty oil drum used as support. (see Figure 2 for location).

Title: Photographic Log	**Client:** Wates Development Ltd
Site: Wixams End, Bedfordshire	**Date:** 16 August 2021

Photo 3. Between Buildings 2 and 3, photo facing south. Scrap water tank visible against wall in right of photo (see Figure 2 for location).

Photo 4. Building 3, photo facing east. Steel A frame shed with corrugated cement cladding, used as cattle pen and fertiliser storage (blue bags) (see Figure 2 for location).

Title: Photographic Log	**Client:** Wates Development Ltd
Site: Wixams End, Bedfordshire	**Date:** 16 August 2021

Photo 5. Building 4, photo facing north. Steel A frame shed with corrugated cement cladding, used as cattle pen (see Figure 2 for location).

Photo 6. Building 6, photo facing east. Vehicle maintenance workshop. Located on concrete flooring with occasional wide (5-10 mm) gaps – nearest gap out of frame to left. (see Figure 2 for location).

Title:	Photographic Log	**Client:**	Wates Development Ltd
Site:	Wixams End, Bedfordshire	**Date:**	16 August 2021

Photo 7. Telecommunications mast in west of farmyard (see Figure 2 for location).

Photo 8. Location of former diesel tank east of Building 3, photo facing south. Brick retaining wall below concrete hardstanding. Empty oil drum and stack of corrugated cement sheeting in centre of photo (see Figure 3 for location).

Title: Photographic Log	**Client:** Wates Development Ltd
Site: Wixams End, Bedfordshire	**Date:** 16 August 2021

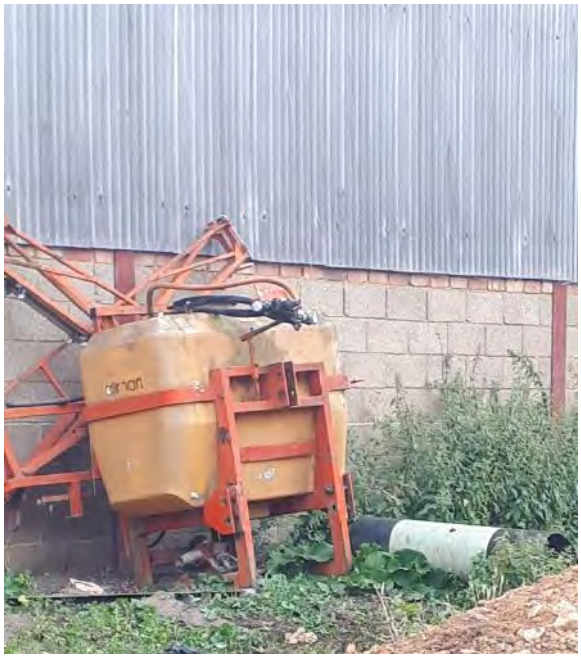

Photo 9. Empty pesticide sprayer against eastern wall of Building 6. Aggregate pile immediately to right of photo (visible in bottom right corner) (see Figure 2 / 3 for location).

Photo 10. Rubble pile to southwest of farmyard, photo facing west (see Figure 3 for location).

Title:	Photographic Log	**Client:**	Wates Development Ltd
Site:	Wixams End, Bedfordshire	**Date:**	16 August 2021

Photo 11. Abandoned foundation of ‘shower block’ located to south of farmyard (see Figure 2 for location).

Photo 12. Abandoned drainage chamber filled in with rubble, located to south of farmyard (see Figure 2 for location).

Title: Photographic Log	**Client:** Wates Development Ltd
Site: Wixams End, Bedfordshire	**Date:** 16 August 2021

Photo 13. Rubble pile and troughs to north of farmyard, photo facing north. Scrapped water tank visible in left rear ground, sitting in hole left by landowner while decommissioning mains water supply to troughs (see Figure 3 for location).

Photo 14. Muck pile to northwest of farmyard, photo facing west (see Figure 3 for location)

Title: Photographic Log	**Client:** Wates Development Ltd
Site: Wixams End, Bedfordshire	**Date:** 16 August 2021

Photo 15. Farm machinery (no fuel or chemicals) located immediately to north of muck pile (see Figure 3 for approximate location).

Photo 16. Overview of northern half of site, facing north from hedgerow immediately north of muck pile. Barley crop visible in middle distance, recent residential development in left background (see Figure 3 for approximate location).

Title: Photographic Log	**Client:** Wates Development Ltd
Site: Wixams End, Bedfordshire	**Date:** 16 August 2021

Photo 17. Pond located in centre of triangular parcel of site east of A6 road (see Figure 2 for location).

Photo 18. Unnamed drain running through centre of site, photo facing west (see Figure 2 for location).

Title: Photographic Log	**Client:** Wates Development Ltd
Site: Wixams End, Bedfordshire	**Date:** 16 August 2021

APPENDIX 2
SELECTED HISTORICAL MAPS

Groundsure INSIGHTS

Site Details:

Wixams - Land west of A6;
WIXAMS, MK42 6DH

Client Ref: 1620042479
Report Ref: HMD-33-8090950_SS_1_2
Grid Ref: 505949, 244491

Map Name: County Series
Map date: **1882**
Scale: 1:10,560
Printed at: 1:10,560

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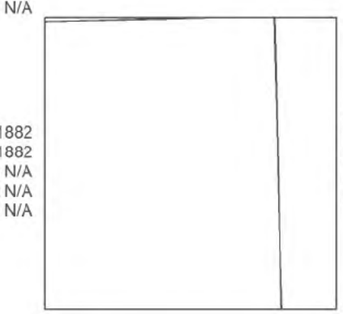
Surveyed 1882
Revised 1882
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1882
Revised 1882
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1882
Revised 1882
Edition N/A
Copyright N/A
Levelled N/A

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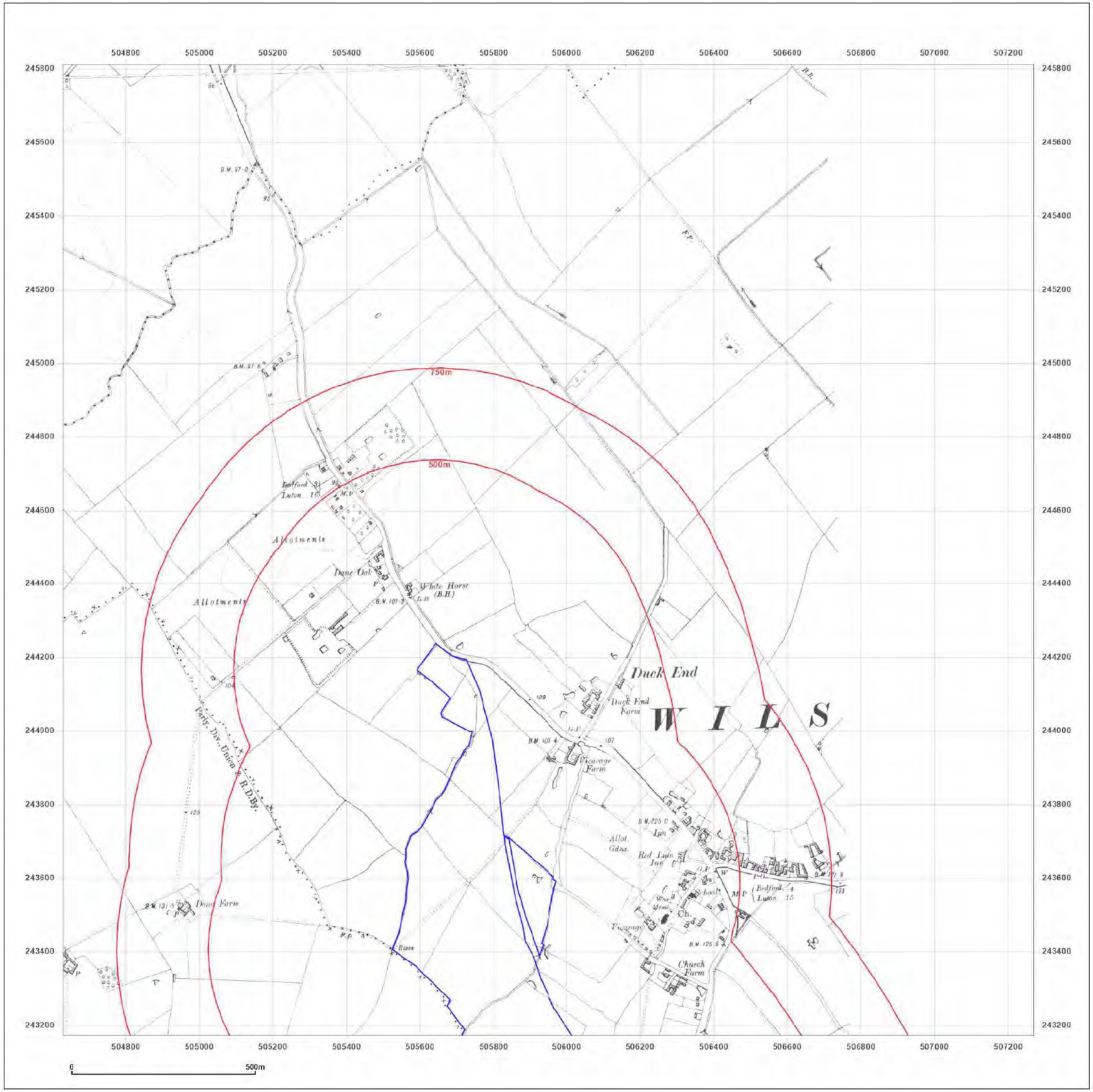
Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

Production date: 02 August 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Wixams - Land west of A6;
WIXAMS, MK42 6DH

Client Ref: 1620042479
Report Ref: HMD-33-8090950_SS_1_2
Grid Ref: 505949, 244491

Map Name: County Series
Map date: **1924**
Scale: 1:10,560
Printed at: 1:10,560

N
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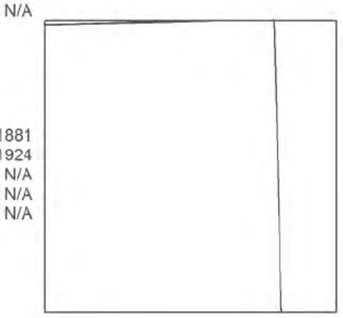
Surveyed 1882
Revised 1924
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1881
Revised 1924
Edition N/A
Copyright N/A
Levelled N/A



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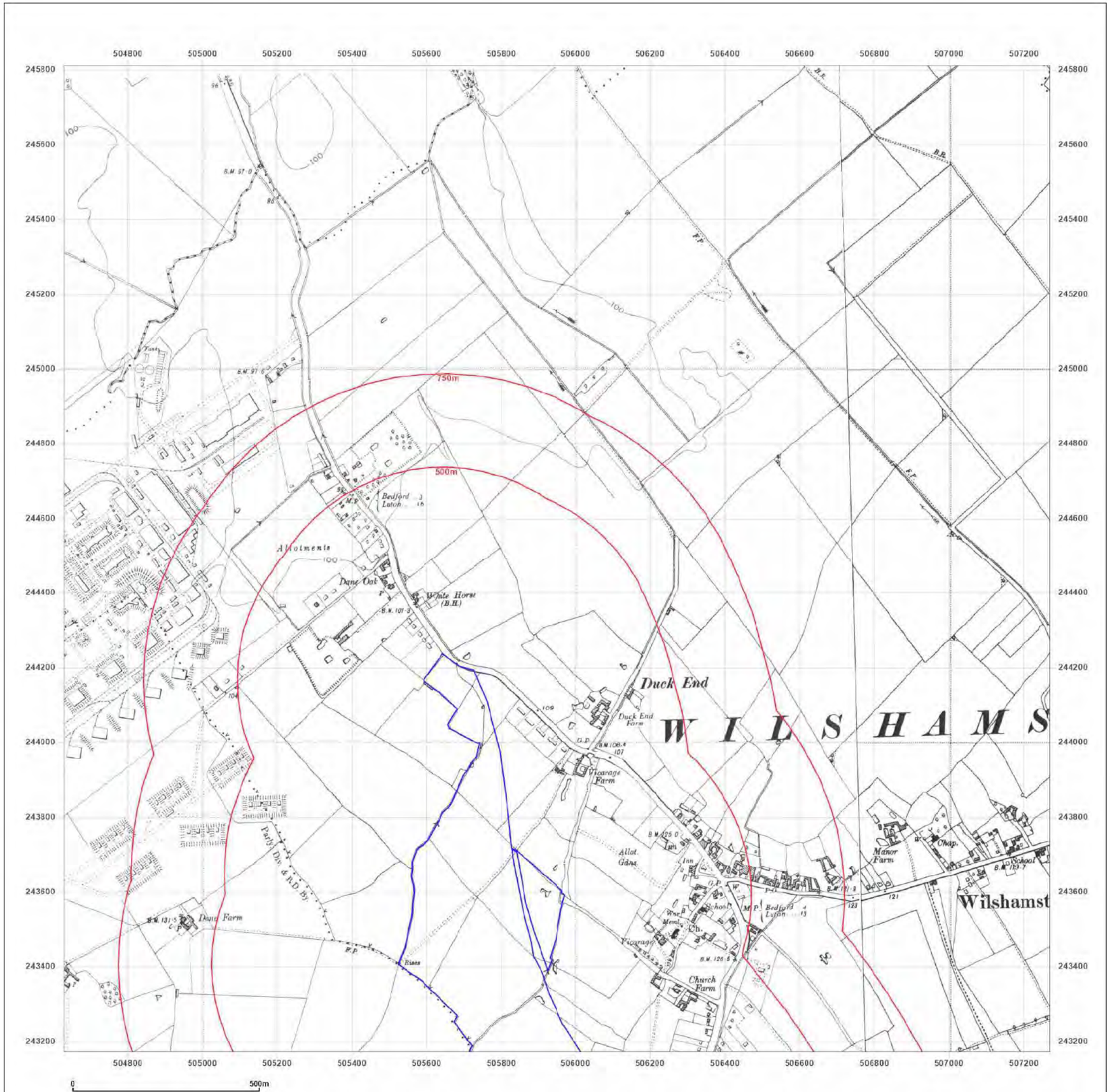
Production date: 02 August 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Wixams - Land west of A6;
WIXAMS, MK42 6DH

Client Ref: 1620042479
Report Ref: HMD-33-8090950_SS_1_2
Grid Ref: 505949, 244491

Map Name: County Series
Map date: **1948**
Scale: 1:10,560
Printed at: 1:10,560

N
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Surveyed 1881
Revised 1948
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1881
Revised 1948
Edition 1948
Copyright N/A
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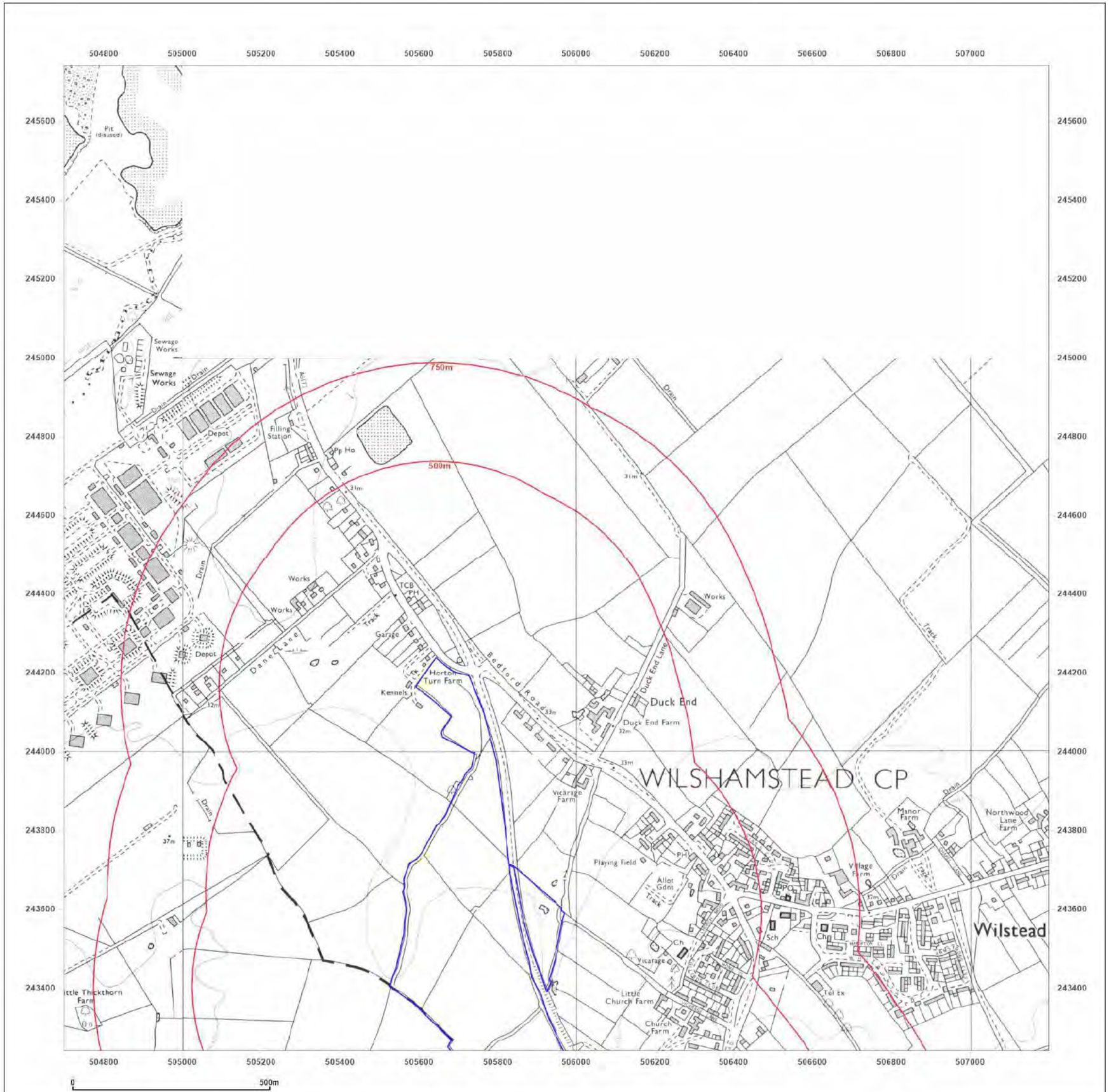
Production date: 02 August 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Wixams - Land west of A6;
WIXAMS, MK42 6DH

Client Ref: 1620042479
Report Ref: HMD-33-8090950_SS_1_2
Grid Ref: 505949, 244491

Map Name: National Grid
Map date: **1980**
Scale: 1:10,000
Printed at: 1:10,000

N
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Surveyed 1977
Revised 1980
Edition N/A
Copyright 1980
Levelled 1971

Surveyed 1977
Revised 1980
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1974
Revised 1980
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 02 August 2021

Map legend available at:
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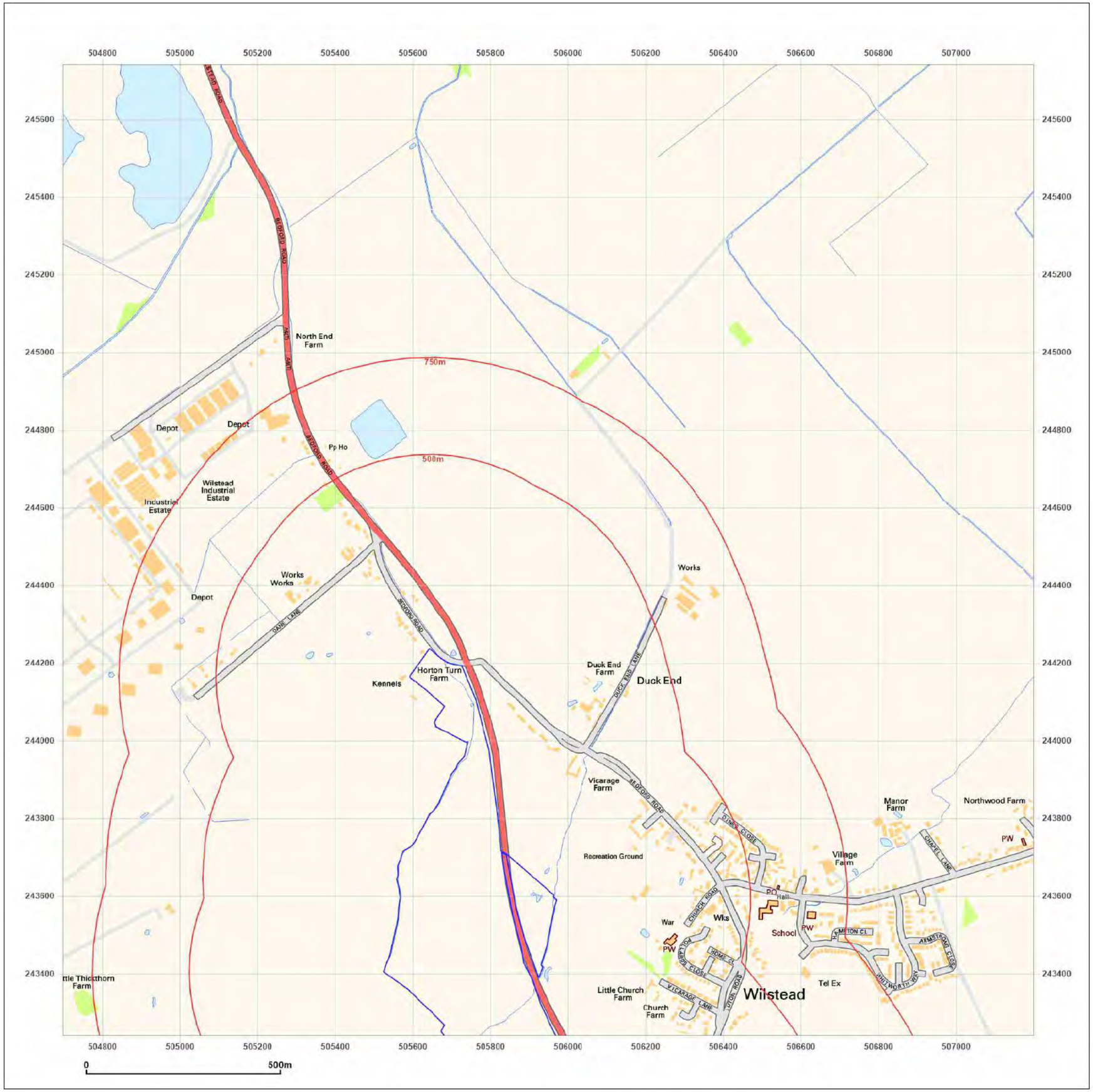

Groundsure INSIGHTS

Site Details:

Wixams - Land west of A6;
WIXAMS, MK42 6DH

Client Ref: 1620042479
Report Ref: HMD-33-8090950_SS_1_2
Grid Ref: 505949, 244491

Map Name: National Grid
Map date: 2001
Scale: 1:10,000
Printed at: 1:10,000

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2001

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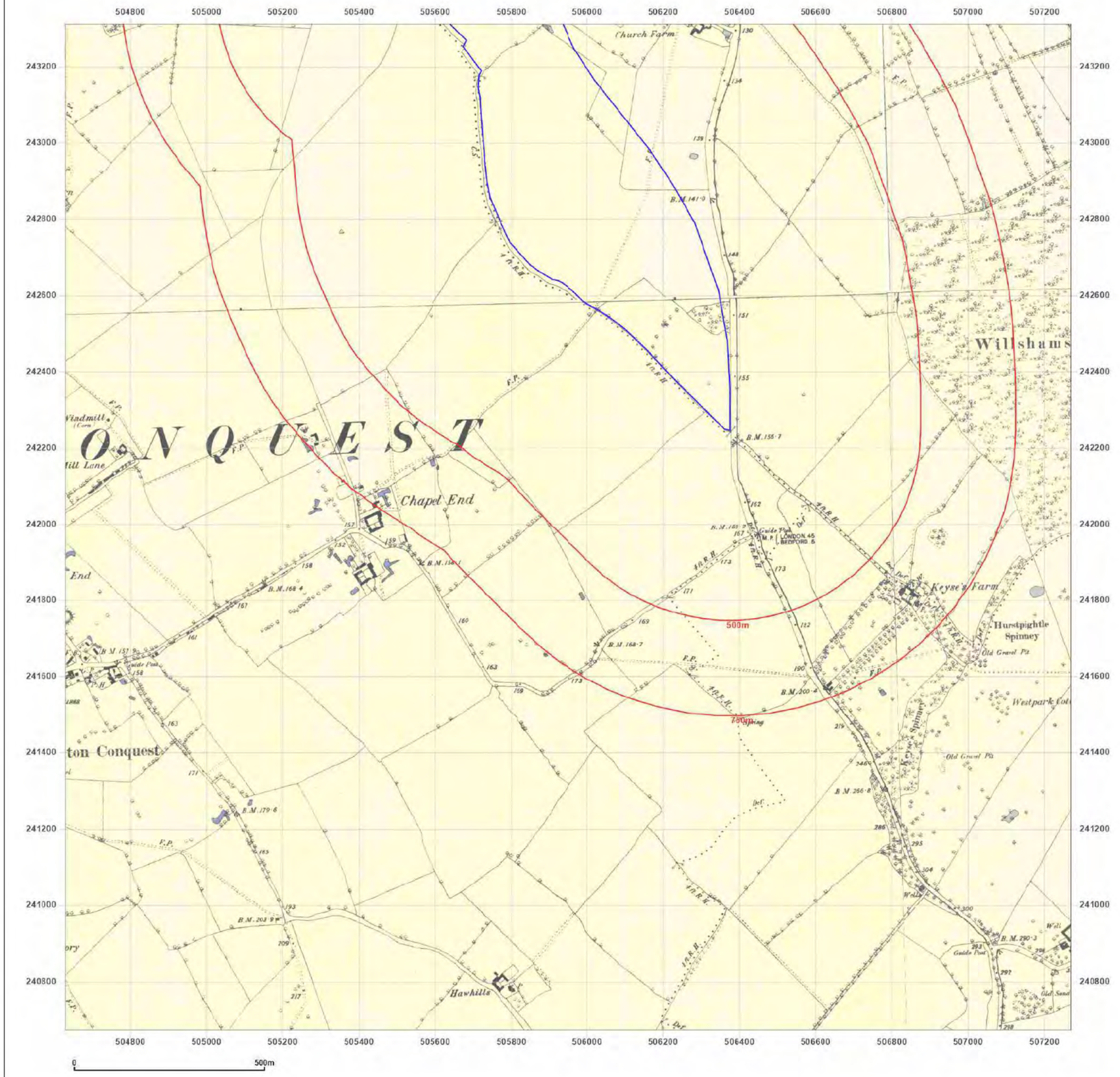
W: www.groundsure.com

Production date: 02 August 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Wixams - Land west of A6;
WIXAMS, MK42 6DH

Client Ref: 1620042479
Report Ref: HMD-33-8090950_SS_1_1
Grid Ref: 505949, 241991

Map Name: County Series
Map date: **1882**
Scale: 1:10,560
Printed at: 1:10,560

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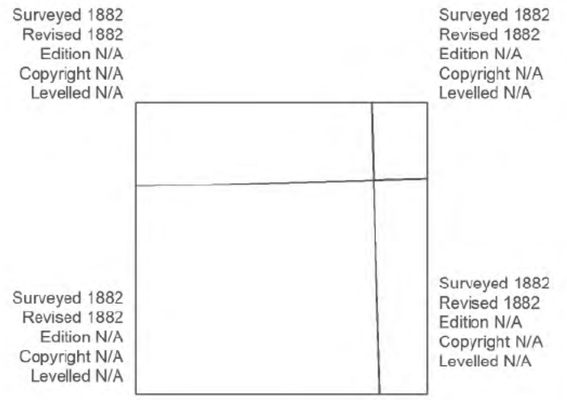

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Production date: 02 August 2021

Map legend available at:
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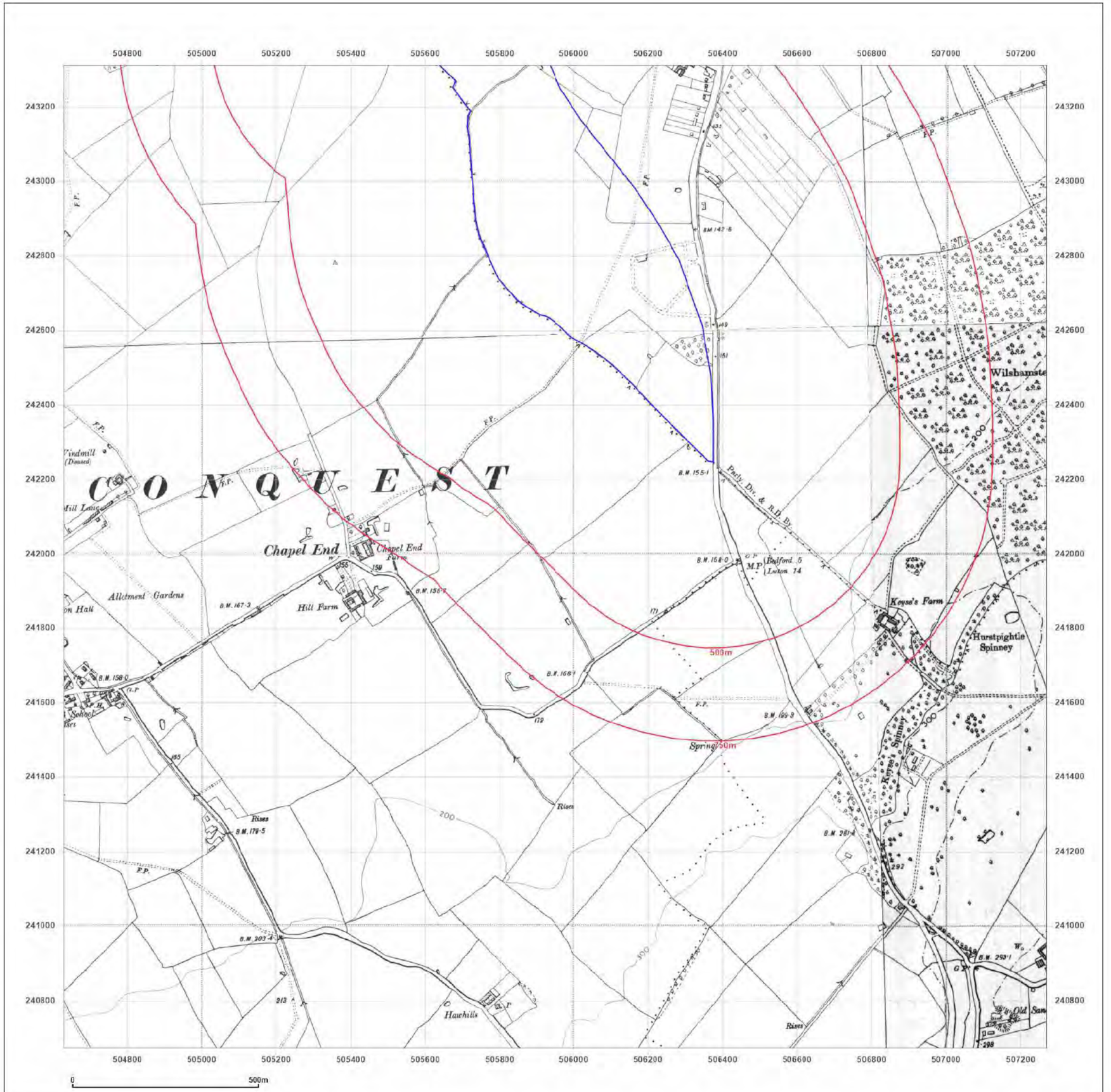

Groundsure INSIGHTS

Site Details:

Wixams - Land west of A6;
WIXAMS, MK42 6DH

Client Ref: 1620042479
Report Ref: HMD-33-8090950_SS_1_1
Grid Ref: 505949, 241991

Map Name: County Series
Map date: **1948**
Scale: 1:10,560
Printed at: 1:10,560

N
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Surveyed 1881
Revised 1948
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1881
Revised 1948
Edition 1948
Copyright N/A
Levelled N/A

Surveyed 1881
Revised 1948
Edition 1948
Copyright N/A
Levelled N/A

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Revised N/A
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Production date: 02 August 2021

Map legend available at:
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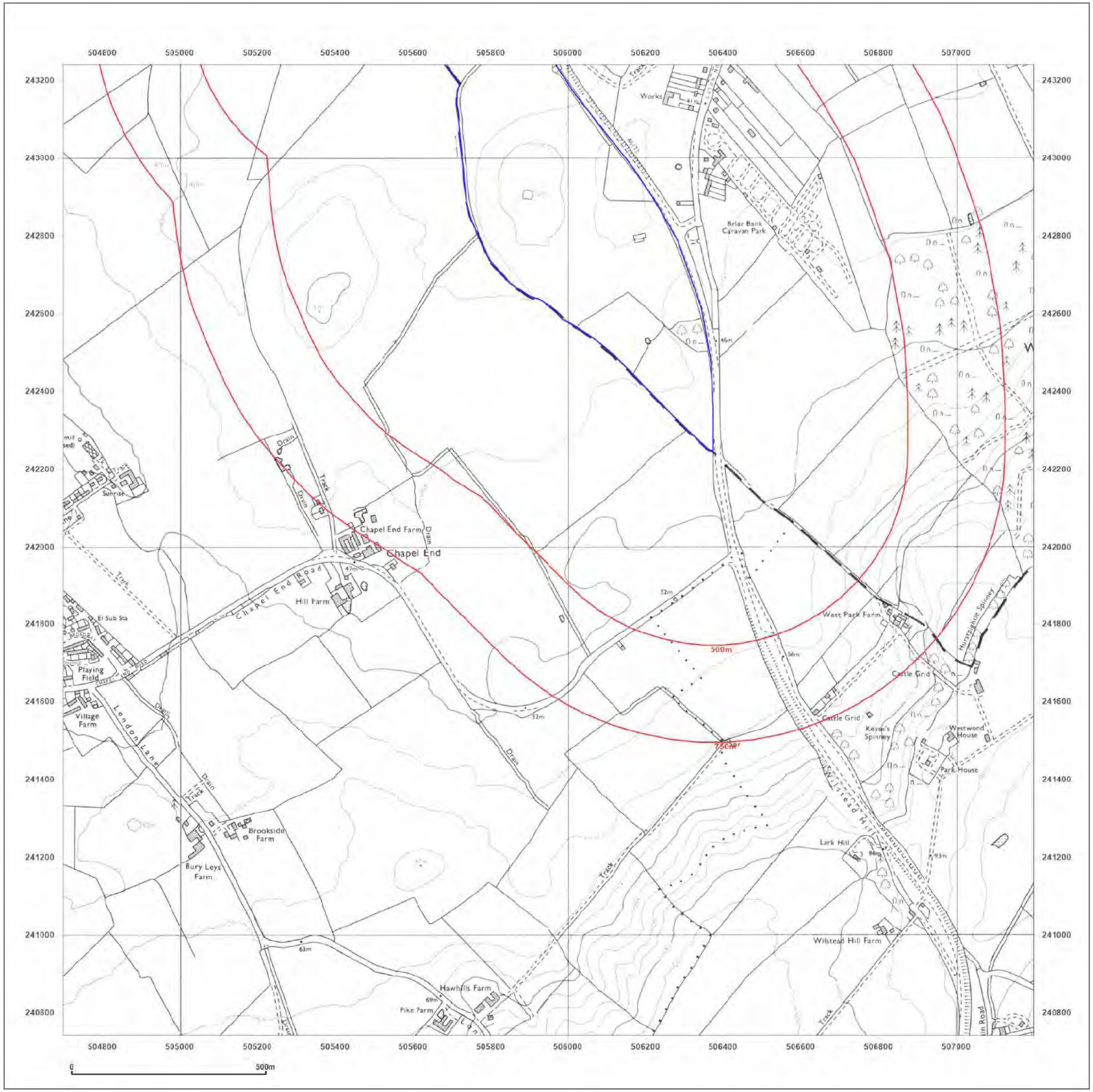

Groundsure INSIGHTS

Site Details:

Wixams - Land west of A6;
WIXAMS, MK42 6DH

Client Ref: 1620042479
Report Ref: HMD-33-8090950_SS_1_1
Grid Ref: 505949, 241991

Map Name: National Grid

Map date: **1980**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1977
Revised 1980
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1974
Revised 1980
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 02 August 2021

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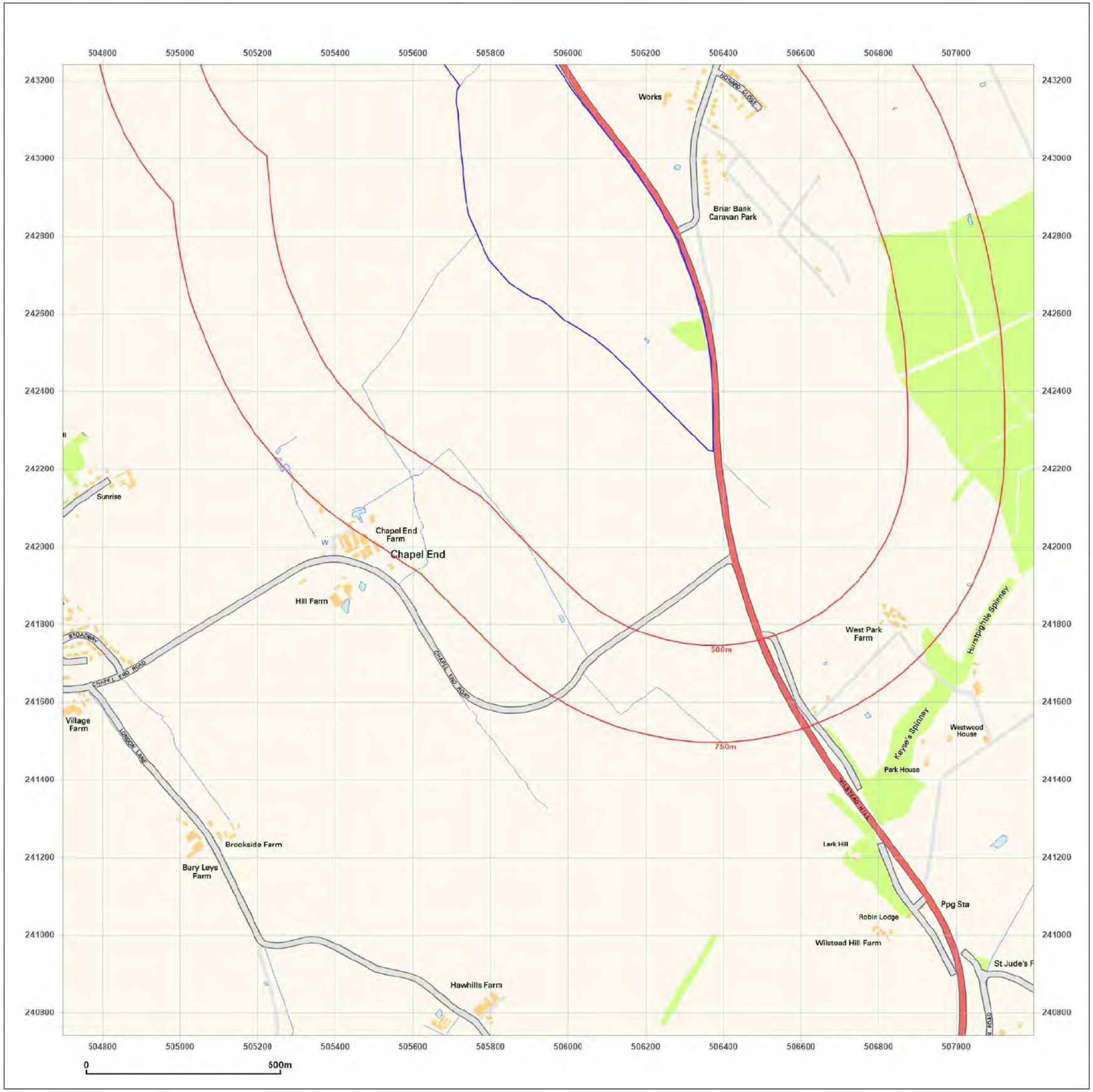

Site Details:

Wixams - Land west of A6;
WIXAMS, MK42 6DH

Client Ref: 1620042479
Report Ref: HMD-33-8090950_SS_1_1
Grid Ref: 505949, 241991

Map Name: National Grid
Map date: 2001
Scale: 1:10,000
Printed at: 1:10,000

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2001

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Production date: 02 August 2021

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Groundsure INSIGHTS

Site Details:

Wixams - Land west of A6;
WIXAMS, MK42 6DH

Client Ref: 1620042479
Report Ref: HMD-33-8090950_SS_1_1
Grid Ref: 505949, 241991

Map Name: National Grid
Map date: 2010
Scale: 1:10,000
Printed at: 1:10,000

N
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2010

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E: info@groundsure.com
W: www.groundsure.com

Production date: 02 August 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf