



# Watling Street, Park Street, St Albans

## Phase 1 Desk Study

*For M Scott Properties Ltd; Ms T Sutton; Ms  
T Good; Mr W Hughes and Mr J Hughes.*

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# Executive Summary

<i>SITE INFORMATION AND SETTING</i>	
Objectives	The objective of the Phase 1 Desk Study is to formulate a preliminary Ground Model and an Initial Conceptual Model of the site to identify and make a preliminary assessment of key geo-environmental and geotechnical risks to the proposed development.
Client	M Scott Properties Ltd; Ms T Sutton; Ms T Good; Mr W Hughes and Mr J Hughes.
Site name and location	Land west of Watling Street, Watling Street, St Albans, Hertfordshire. The site is located between the A5183 and the North Orbital Road, 2km south of St Albans city centre. The National Grid Reference of the approximate centre of the site is 514581E, 204553N.
Proposed development	The site development proposals are understood to comprise residential units and associated landscaping, infrastructure and car parking.
<i>GROUND MODEL</i>	
Desk study summary	<p>The site currently comprises of an arable field with surrounding woodland and an area of scrub ground/swathe to the south of the site.</p> <p>The site is elongate and irregular in shape and has an area of approximately 4.3 ha. and occupies ground that runs parallel to the A5183 and drops from approximately 84m Ordnance Datum (OD) in the east of the site to approximately 73m OD in the west of the site. The northern portion of the site is flat between approximately 75m and 76m OD.</p> <p>Review of historical Ordnance Survey mapping indicates:</p> <ul style="list-style-type: none"> <li>● The site has remained open land since 1872 with no significant change.</li> <li>● The surrounding area has gone through notable changes; <ul style="list-style-type: none"> <li>○ In 1893 the construction of a sewage works adjacent to the site.</li> <li>○ In 1924 the sewer works expands to abut the entire western edge of the site</li> <li>○ Between 1933 and 1966 the sewage works became a landfill.</li> </ul> </li> <li>● Additionally, there has been an increase in urbanisation of the area</li> <li>● A non-specialist UXO assessment indicates a low bomb risk.</li> </ul> <p>The geology at the site consists of River Terrace deposits between, overlying the Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated). Localised Made Ground is likely to be present as a result of overspill from the landfill as well as flytipping and general agricultural land uses.</p> <p>Solution features are present in the vicinity of the site, however there is no record of solution features within the site boundary.</p> <p>The superficial deposits comprise a Secondary A aquifer and the Chalk is a Principal Aquifer. The site is within a Zone 2 Source Protection Zone and there are 2 active licensed groundwater abstractions within 1000m of the site.</p> <p>The River Ver flows from north to south in a valley approximately 400m southeast of the site, at an elevation approximately 13m lower than the site.</p>
<i>GEOTECHNICAL CONCLUSIONS</i>	
Conclusions of geotechnical assessment	<p>The following plausible geotechnical risks are identified.</p> <ul style="list-style-type: none"> <li>● Variable Made Ground - settlement or differential settlement of foundations, floor slabs, roads and infrastructure elements.</li> <li>● Low strength, compressible ground – risk of shear failure and excessive settlement of foundations, roads and infrastructure elements.</li> </ul>

	<ul style="list-style-type: none"> <li>• Attack of buried concrete by aggressive ground conditions – the development site may contain Made Ground and potentially sulfate bearing soils.</li> <li>• Shrinkage/swelling of clay – settlement/heave of foundations, especially where located within the influence of trees and vegetation.</li> <li>• Loose Made Ground, leading to difficulty with excavation due to trench instability.</li> <li>• Earthworks – Low bearing capacity or settlement of new fill and impact on foundations, floor slabs, roads and infrastructure and construction plant.</li> <li>• Earthworks – Slope stability - Impact on retaining walls and integrity of foundations.</li> <li>• Potential for unforeseen ground conditions and the risks associated with limited data.</li> </ul>
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**GEO-ENVIRONMENTAL CONCLUSIONS**

Conclusions of contamination	<ul style="list-style-type: none"> <li>• It is unlikely that the site would be classified as Contaminated Land under Part 2A of the EPA 1990.</li> </ul>
Generic risk assessment	<ul style="list-style-type: none"> <li>• The overall risk from land contamination at the site is considered to be Medium to Low for the current development, as it remains as agricultural land, however this is dependent on the geo-environmental findings of a ground investigation and further investigation of the historic landfill adjacent to the site.</li> </ul>

This Executive Summary forms part of Hydrock Consultants Limited report number 20880-HYD-XX-XX-GE-1000 and should not be used as a separate document.



## 1. INTRODUCTION

### 1.1 Terms of reference

In September 2021, Hydrock Consultants Limited (Hydrock) was commissioned by M Scott Properties Ltd; Ms T Sutton; Ms T Good; Mr W Hughes and Mr J Hughes. (the Client) to undertake site investigation, comprising a Phase 1 desk study at land west of Watling Street, St Albans.

The site is currently an arable field.

The proposed development is to comprise residential housing and associated landscaping, infrastructure and car parking. A proposed development layout (M Scott Properties Ltd; Ms T Sutton; Ms T Good; Mr W Hughes and Mr J Hughes. Drawing MP01), is presented in **Appendix A**

The works have been undertaken in accordance with Hydrock's fee proposal referenced (29th July) and the Client's instructions to proceed (Refer to email from Graham McCormick on the 16th August 2021).

### 1.2 Objectives

The works have been commissioned to support the outline application and to assist with the design of the development.

The objective of the Phase 1 Desk Study is to formulate a preliminary Ground Model and an Initial Conceptual Model of the site to identify and make a preliminary assessment of key geo-environmental and geotechnical risks to the proposed development.

### 1.3 Scope

The site investigation includes a Phase 1 Desk Study.

The scope of the Phase 1 Desk Study comprises:

- a field reconnaissance (walkover) to determine the nature of the site and its surroundings including current and former land uses, topography and hydrology;
- acquisition and review of:
  - » historical Ordnance Survey maps, to identify former potentially contaminative uses shown at the site and immediately surrounding it, and an assessment of the associated contamination risks;
  - » a third-party environmental report to identify flooding warning areas, local landfills, pollution incidents, abstractions, environmental permits etc. which may have had the potential to have environmental impact on the site;
  - » topographical, geological and hydrogeological maps;
  - » British Geological Survey (BGS) archive records;
  - » regional UXB risk maps;
  - » a site-specific Natural Chalk Cavities and Mining Database Search;
- development of a preliminary Ground Model representing ground conditions at the site;
- development of an outline Conceptual Model (oCM), including identification of potential pollution linkages;
- a qualitative assessment of any geo-environmental risks identified; and

- identification of plausible geotechnical hazards.

#### 1.4 Available information

The following documents, have been provided to Hydrock by M Scott Properties Ltd; Ms T Sutton; Ms T Good; Mr W Hughes and Mr J Hughes. for use in the preparation of this report:

- Landmark Sitecheck (combined). February 2017. 'Land at Watling Street', Ref: 115447426\_1831040124#195103072;
- Landmark Utilities Report. March 2017. 'Site off Watling Street', Ref: 115451633\_1;
- City of St Albans, Park Street FW Sewerage Easement plan. Date unknown. Plan #1828/12

The Client has commissioned or obtained assignment of the above documents and Hydrock and Hydrock is entitled to full reliance upon their contents.



## 2. PHASE 1 STUDY (DESK STUDY AND FIELD RECONNAISSANCE)

### 2.1 Data

A number of desk study sources have been used to assemble the following information. These are presented in Appendix D and include:

- Third-party environmental report (Groundsure report, reference GS-8175189);
- Historical Ordnance Survey mapping;
- BGS Archive Records;
- Zetica UXB Risk Maps (<https://zeticauxo.com/downloads-and-resources/risk-maps/>);
- Natural Chalk Cavities and Mining Database Search (Reference: 3325//CBH/CNE/FBI).

### 2.2 Site referencing

The site is referenced in Table 2.1 and the location is indicated in Figure 2.1 and Figure 2.2.

Table 2.1: Site referencing information

Item	Brief Description
Site name	Land west of Watling Street, St Albans.
Site address	Land west of Watling Street, Watling Street, St Albans, Hertfordshire. The nearest postcode is AL2 2NW.
Site location and grid reference	The site is located between the A5183 and the North Orbital Road, 2km south of St Albans city centre. The National Grid Reference of the approximate centre of the site is 514581E, 204553N.



Figure 2.1: Site location  
(Reproduced with permission from Groundsure)



Figure 2.2: Extract from the Ordnance Survey Map.  
(OS licence 100023353).

A site location plan (Hydrock Drawing 20880-HYD-XX-XX-DR-AL-1000) is presented in Appendix A

## 2.3 Site description and field reconnaissance survey

A field reconnaissance survey was undertaken on 6th of September 2021 to visually assess potential geotechnical hazards, contaminant sources and receptors. The weather during the field reconnaissance survey was clear, warm, and dry. Access to the site was permitted via Watling Street.

A basic site description is presented in Table 2.2 and selected photographs are presented in Figure 2.3 to Figure 2.6. Additional photographs are presented in Appendix B.

Table 2.2: Site description

Item	Brief Description
Site access	The site was accessed from Watling Street.
Site area	The site is elongate and irregular in shape and has an area of approximately 4.3 ha.
Elevation, topography and any geomorphic features	The site occupies ground that runs parallel to the A5183 and drops from approximately 84m Ordnance Datum (OD) in the east of the site to approximately 73m OD in the west of the site. The northern portion of the site is flat between approximately 75m and 76m OD. A berm runs along the western boundary of the site between the site area and the historic landfill / sewage works from the west.
Present land use	The site is currently arable agricultural land with access to the site via an access track for agricultural vehicles from fields to the west. On site there are a number of manholes and inspection pits running along the southwestern boundary of the site (Figure 2.6). On the west of the site earthworks and drainage runs remain from the historic landfill / sewage works from the west.  The sewer plan (Appendix D) shows the sewer line running along the south western boundary and branching half way up the site (running south to north), with one branch running to the east at a 90-degree angle from the existing run and the second branch leaving the field at a 45-degree angle, both on to Watling Street.  A 33KV transforming substation is located on land directly west of the site boundary, on the area of historic landfill, a cable runs through the site, west to east, towards Watling Street.  There are no public rights of way across the site, however as the area is readily accessible from Watling Street with numerous unauthorised access points, the area is frequently used by dog walkers. Evidence of fly tipping is also readily apparent on the Eastern site boundary along the tree line and in the centre of the field.  There is also visible construction and household landfill waste on the western edge of the berm running along the western edge of the site.
Vegetation	Surrounding the site there are numerous mature coniferous and deciduous trees, on every boundary. On historical maps from 1922, some mature Scots pines on the western boundary are documented (this should be confirmed by an arboricultural specialist'). The site boundaries range from partially to densely vegetated with an area of swathe between the site's eastern edge and Watling Street. The site is primarily arable agricultural land with the majority of surface cover being corn stover (Figure 2.3), however, there are also manhole covers and inspection pits for the sewerage pipe and an area of swathe waste ground to the south of the site. The western boundary of the site has numerous stands of Giants Hogweed (Figure 2.5).
General site sensitivity	The site is rural but directly abuts a residential neighbourhood of roughly 200 homes. There is a small copse of trees on the eastern boundary. The site is within a generally residential area with houses directly abutting the site boundary and is within a SSSI impact risk zone and within the green belt area.
Site boundaries and	The northern boundary of the site tapers to a point between the western and eastern boundaries. There is a detached residential property directly to the north of the site on an access road leading to a caravan park on the west of the site.



Item	Brief Description
surrounding land	<p>The northeastern boundary of the site is vegetated and borders directly onto Watling Street with a shallow drainage run on the field side of the boundary. There are numerous on foot access points along the boundary until you reach the south-eastern edge. The south-eastern boundary is comprised of the gardens of a number of semi detached homes, the rear fences of which often have access gates into the field. There is also a copse of denser vegetation and old trees half way along the Eastern boundary.</p> <p>The southern boundary is vegetated with roughly 30m of scrubland between the site boundary and a residential area.</p> <p>The southwestern boundary of the site is heavily vegetated with a low berm running between the field and the woodland. This berm continues the length of the boundary becoming more prominent in the North (Figure 2.4).</p> <p>In the north-west of the site boundary there is a caravan park with roughly 10 units 80m from the site. As well as an electricity substation between the caravan park and the western site edge.</p>



Figure 2.3: Looking north from the middle of the site, drop in elevation visible



Figure 2.4: Berm running along the western site boundary



Figure 2.5: Evidence of Giant Hogweed along western site boundary.



Figure 2.6: Manhole and inspection pit for sewer line running across the site.

## 2.4 Site history

A study of historical Ordnance Survey maps (Appendix C) has been undertaken to identify any former land uses at the site and surrounding areas which may have geotechnical or geo-environmental implications for the proposed development. The key findings are summarised in Table 2.3.

Table 2.3: Site history review

Reference	Key features on site	Key features off-site
OS Map <sup>1</sup> 1872 - 1880: 1:2,500 and OS Map 1872 – 1983 1:10,560	The site is agricultural subdivided into two fields along the Watling Street roman road.	The London Northwestern railway runs southwest to northeast tangentially coming within 100m of the south eastern site boundary. St Julian's wood (Designated Ancient woodland) is noted 500m Northwest of the site.
OS Map <sup>1</sup> 1898 - 1924: 1:2,500 and OS Map 1897 – 1922 1:10,560	The site is no longer subdivided and consists of a single field.	1893- St Albans sewage works are established less than 100m northwest of the site Park Street and Frogmore station have been constructed 100m southeast of the site. 1924 - St Albans sewage works have extended to encompass the entire western edge of the site (<100m) with septic tanks, filter beds and sewage channels. As well, a row of semi-detached houses with gardens facing the site have been build along the southeastern boundary.
OS Map <sup>1</sup> 1937 – 1966 1:2,500 and OS Map 1938 – 1965 1:10,560	No significant change on site	1937 - St Albans sewage works has further expanded and comprises 13 filter beds and numerous septic tanks. Numerous residential housing developments have been constructed to the south and east of the site. Watling street has been widened and the A405 (present day A414 and North Orbital Road) has been constructed running northwest to southeast tangentially coming within 100m of the northern site boundary. 1938 - 300m southeast of the site Radlett Aerodrome is established. 1966 - the St Albans sewage works has been decommissioned with existing infrastructure, drains and earthworks remaining in place. It is at this point the Sewage works became a landfill as well as the St Albans caravan park being established and electricity transformer substations. A petrol station opens on the northeastern site boundary (>40m).
OS Map <sup>1</sup> 1970 – 1992 1:10,000	No significant change on site	A noted increase in urbanisation in the surrounding areas
OS Map <sup>1</sup> 1992 – 2021 1: 10,000	No significant change on site	A noted increase in urbanisation in the surrounding areas

<sup>1</sup> Ordnance Survey Historical Map Information provided by Groundsure

## 2.5 Geology

The general geology of the site area is shown on the British Geological Survey (BGS) 1:50,000 geological map of St Albans (EW239\_hertford\_v4) and is summarised in Table 2.4. Extracts from the map are shown in Figure 2.7 and Figure 2.8.

Table 2.4: Geology

Ref. for Figures	Location	Stratigraphic Name	Description
Superficial Deposits (Figure 2.7)			
1	On site	River Terrace Deposits	Sand and gravel, locally with lenses of silt, clay or peat
2	300m East	Alluvium	Soft silts and clays with local beds of sands and gravels
3	450m West	Kesgrave Catchment Subgroup	Cross-bedded and massive, moderately sorted sand and gravel.
Solid Geology (Figure 2.8)			
1	On site.	Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated)	White chalk with occasional flints.



Figure 2.7: Superficial deposits.  
(Reproduced with permission from Groundsure)



Figure 2.8: Solid geology.  
(Reproduced with permission from Groundsure)

A number of borehole logs from the BGS archive have been reviewed as part of this desk study. The closest borehole log record is summarised below:

- TL10NW29, located 540m to the north-east of the site on the A414 at the Park Lane roundabout (NGR 514270E, 205110N), drilled to a depth of 7.6m and recorded:
  - » Topsoil (coarsening downwards) between ground level and 0.9m below ground level (bgl);
  - » Stiff brown clay with flint cobbles between 0.6m and 2.0m bgl (probable River terrace deposits);

- » Hard chalk with flint cobbles between 0.9 m and 1.98m bgl (probable Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated)); and
- » Firm chalk with some hard and soft layers between 1.98m and 7.6m bgl (probable Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated)).

## 2.6 Hydrogeology

### 2.6.1 Aquifer designations

Based on the inferred geological sequence presented in Section 2.5 and the Environment Agency's interactive aquifer designation map, the aquifer system presented in Table 2.5 applies. Additional information on the hydraulic characteristics of the geological units has been abstracted from Allen et al (1997) and Jones et al (2000).

Table 2.5: Aquifer system

Stratum	Aquifer Designation	Comments
Made Ground (Imported Fill - Landfill)	Unclassified/unproductive	Artificial ground not included in the classification system. Likely to be moderate to high porosity because of unconsolidated nature, but permeability is likely to be constrained to low, or low to moderate because of poor sorting and clay content.
Superficial Deposits		
River Terrace Deposits	Secondary A Aquifer	Intergranular permeability. Dominated by moderate to high permeability layers of sand and occasional gravel, sporadically interbedded with low permeability clay. Groundwater flow is likely to be variable and discontinuous as water migrates around low permeability areas, but generally high as intergranular flow dominates.
Solid Geology		
Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated)	Principal aquifer	Generally high porosity primary permeability, and with high secondary permeability from fracturing at the top of the chalk. Large water storage capacity due to its high porosity.

### 2.6.2 Groundwater abstraction

There are 2 active licensed groundwater abstractions within 1000m of the site.

They are listed in Table 2.6 and shown in Figure 2.9.

Table 2.6: Groundwater abstractions

Location Relative to Site	Purpose of Abstraction	Strata	Figure 2.9 reference
207m SE	Agricultural	River Terrace Deposits	2
281m SE	Agricultural	River Terrace Deposits	3



### 2.6.3 Groundwater source protection zones and groundwater vulnerability

The site is within a groundwater Source Protection Zone 2 (Outer) (SPZ 2), see Figure 2.9, and has both a Secondary Superficial aquifer of high vulnerability (Beige) and a Principal Bedrock aquifer (Red), see Figure 2.10.

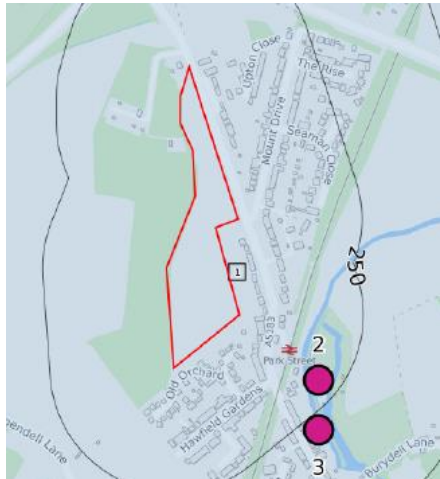


Figure 2.9: Groundwater abstraction zones with active groundwater abstractions  
(Reproduced with permission from Groundsure)



Figure 2.10 Groundwater vulnerability zones  
(Reproduced with permission from Groundsure)

### 2.6.4 Groundwater levels, recharge, and flow

Information from the BGS Hydrogeological Maps and supporting data from BGS historical boreholes indicate groundwater levels in the Chalk are likely to be deep across the site. The groundwater within the Chalk, is likely to be unconfined by the overlying River Terrace Gravels.

Shallow groundwater is likely to be present within the River Terrace Gravels, with a deeper groundwater body in the Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated).

Recharge to the River Terrace Gravels would be expected to take place locally and to be limited by its permeability.

In addition to recharge from superficial deposits on the north, east and west sides of the site. The Lewes Chalk is in direct contact with the superficial deposits which is a potentially significant contamination issue because it provides a means by which leachate can reach the chalk aquifer.

Groundwater was recorded at 18.6m bgl in available BGS borehole data (for a borehole located 435m to the southeast of the site at Burydell Lane) however as the BGS record lacks elevation data for this borehole, this depth may not be representative of on-site conditions.

### 2.6.5 Groundwater quality

The groundwater body beneath the site (Mid-Chilterns Chalk) is currently (2019 Cycle 2) classified under the Water Framework Directive as 'poor'.

The water body is currently given a 'poor' status due to 'Chemical Drinking Water Protected Area' conditions. The objective is for the groundwater body status to be 'good' by 2027. The objective

remains ‘poor’ by 2021 due to Unfavourable balance of costs and benefits and disproportionate burdens on the waterbody.

### 2.6.6 Groundwater flooding

The environmental data report indicates a low to negligible risk of groundwater flooding with a low risk within 50m of the site

## 2.7 Hydrology

### 2.7.1 Surface water system and drainage

The surface water features in the vicinity of the site are listed in Table 2.7 and in Appendix A.

Table 2.7: Surface water features

Feature	Location Relative to Site
Drainage ditch	123m NW
River Ver	150m E- SE

### 2.7.2 Surface water abstractions and discharges

There are no active licensed surface water abstractions within 1km of the site.

There are no active licensed surface water discharges within 1km of the site.

There are three historic discharges within 1km. They are listed in Table 2.8.

Table 2.8: Surface water discharges

Location Relative to Site	Purpose of Abstraction	Receiving water
348m SE	Industrial	River Ver
407m SE	Industrial	Unnamed Tributary of the River Ver
499m SE	Industrial	River Ver Mill Race

### 2.7.3 Surface water quality

Reference to the Environment Agency web site shows the site is located within the catchment of the Colne River Basin District, with the specific river water body being the River Ver- source to conf River Colne. The current (2019 cycle 2) overall status under the Water Framework Directive is ‘Moderate’.

The water body is currently ‘Moderate’ status due to Priority hazardous substance levels, namely; Polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS), Benzo(b)fluoranthene, and Benzo(g-h-i)perylene. The objective is for Priority hazardous substance levels to be ‘good’ by 2027.

### 2.7.4 Surface water flooding

The desk study information indicates that the majority of the proposed development is in Flood Zone 1 (with a low probability of flooding from rivers or the sea) however land along the northeastern boundary of the site, where the site is flat, has a high flood risk probability (a chance of flooding of greater than 1 in 30 (3.3%)), at a depth of between 0.1m and 0.3m.

The highest risk within 50m of the site is 1 in 30 years (3.3%), at a depth of between 0.3m and 1.0m.

As the site slopes from East to West it can be expected that surface water will drain in this direction.

No further consideration of flood risk is undertaken in this report.

Specialist flood risk advice has been sought from Hydrock with regard to flood risk assessment, drainage and surface water and is detailed in Hydrock document 20880-HYD-XX-XX-RP-D-5600-P01.

## 2.8 Mining and mineral extraction

The site is not within an area of recorded mining. However, sporadic underground mining of restricted extent is possible to have occurred.

The Lewes Nodular Chalk Formation and Seaford Chalk Formation, as part of the larger White Chalk subgroup has historically been extensively quarried.

482m south-east of the site a closed britpit or Denehole called 'Berry Dell' is present. While there is little evidence of other mining within 500m of the site boundaries, it is plausible that unrecorded mining may have occurred based on the abundance of Deneholes and the frequency of which this strata was mined.

967m Northwest of the site underground mining is known to have occurred, or considered likely to have occurred and potential for difficult ground conditions should be considered.

Furthermore, significant surface earthworks are shown to have occurred on the grounds of Park Lane Sewage works from 1878 to 1987, this includes the construction of multiple ponds, sewage workings, and 'unspecified heaps'. This encompasses both the time as a sewage works and a landfill.

The site is within an area defined by the Coal Authority (CA) as a Development Low Risk Area.

As such, a Coal Mining Risk Assessment does not need to be submitted to the Planning Authority as part of any planning application.

### 2.8.1.1 Review of aerial imagery and historical mapping

Aerial imagery from google maps has been observed at the site and within the surrounding area. These images show no obvious signs of topographic features that would suggest the presence of sink holes at the site. It should be noted that the site is located within a built-up area, as a result subsidence features are more difficult to observe, they may be present but hidden by vegetation or infrastructure.

## 2.9 Natural ground instability

Numerous Trees and hedges are present around the site boundaries and sporadically across the site. Cohesive deposits of the Alluvium and River Terrace Deposits Formation may be affected by potential for shrink-swell ground movements in clays as a result of changes in moisture content from removal or growth of trees.

The site is underlain at shallow depth by potentially soluble strata (Chalk), overlain by clays, sands and gravels with a potentially deep-water table. There is a risk of voids being present due to the dissolution of the chalk. This is discussed in more detail below (Section 2.10). The site slopes from east to west, the soils may be more compressible and have the potential, when loaded, to result in significant settlement of the ground resulting in damage to structures.

## 2.10 Natural chalk cavities

### 2.10.1 Background

The site is underlain at shallow depth by potentially soluble strata (Chalk), overlain by sands and gravels with a potentially deep water table and there is a potential risk of the formation of voids by the dissolution of the chalk.

As shown in Figure 2.10, dissolution features can include voids, collapse sinkholes, and dissolution widened discontinuities in the chalk with dissolution pipe. Subsidence sinkholes are caused by overlying granular materials collapsing into the chalk dissolution features. These often originate by material at depth collapsing into a dissolution void, causing a void to migrate upwards to form a subsidence feature at the surface.

The presence of layers of dense or cemented materials or cohesive layers can prevent or restrict the void reaching the surface, but creating a potential for surface subsidence in the future when conditions change. The collapse of materials into voids can cause either voids, or loosened material which can extend in a zone surrounding the central core of the collapsed material.

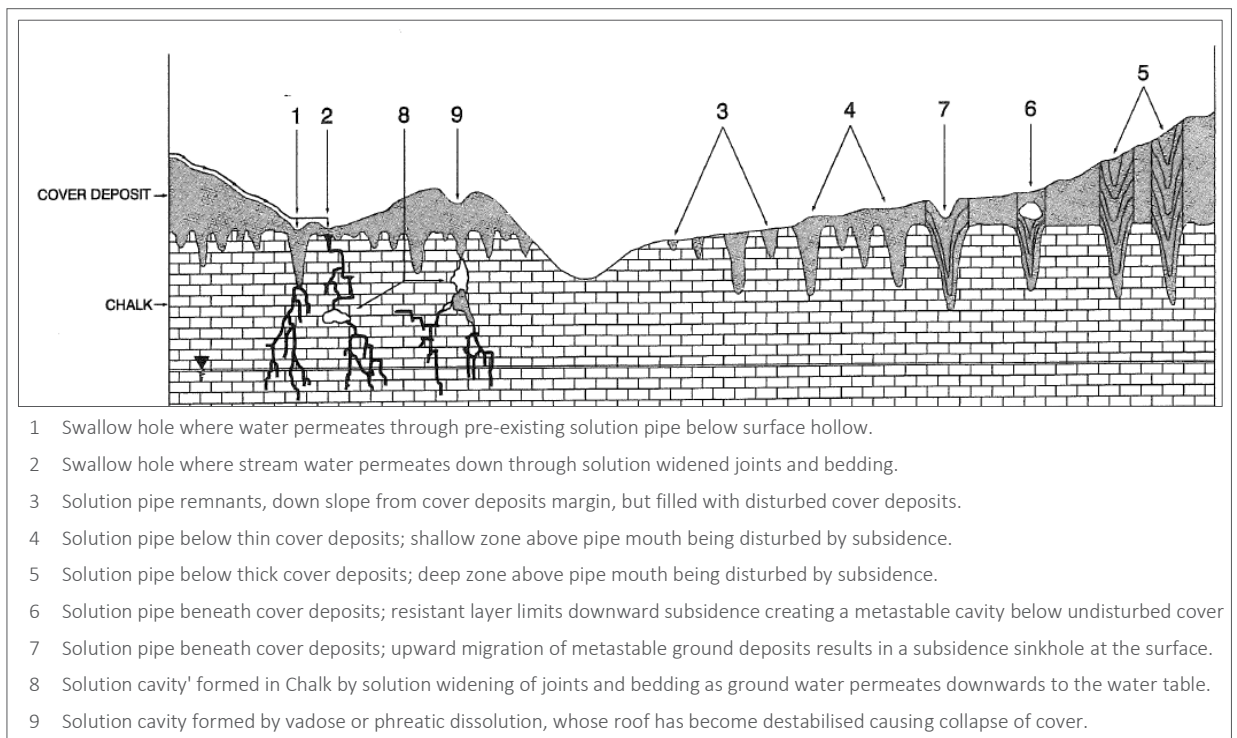


Figure 2.10: Schematic diagram of natural chalk solution features<sup>2</sup>

### 2.10.2 Evidence of cavities on site

There is no evidence that cavities have been, or are present, on the site.

<sup>2</sup> From McDowell, et. al. Quarterly Journal of Engineering Geology and Hydrogeology 2008, v.41, p279-290.



### *2.10.3 Evidence of cavities in the adjacent area*

Records from the Peter Brett Associates natural cavities database indicates that three solution pipes approximately 320m south-east of the site.

### *2.10.4 Conclusions*

In summary, there is no documented evidence that significant ground instability due to the collapse of voids within the gravels and Chalk on the site. However, there is evidence of solution pipes within 500m of the site, from the same strata underlying the site. On this basis, it should not be fully discounted and further consideration of the risk posed by solution features will need to be taken into account at the ground investigation and construction phases.

## **2.11 Cambering, gulls and periglacial slip surfaces**

### *2.11.1 Background*

The site slopes down to the west and originated in the immediate post-glacial era, the site is half a mile within the glacial limit, and then from the River Ver, but with a much stronger flow than today as the ice sheet and glaciers melted. In addition, the ground identified as Ice-scoured Montane, which had been frozen to form permafrost, during the glaciation seasonally melted causing repeated freeze-thaw cycles and as it did so, the clay softened and downslope creep occurred.

Furthermore, the presence of River Terrace Deposits and the larger topography of the area suggests the historic flow of the River Ver may have run through the site.

Slopes which have previously been affected by such movements may be only marginally stable, with very low factors of safety. Slope failures can be reactivated by small changes in conditions, either by increasing disturbing forces (e.g. placing a load on a slope) or reducing the resisting forces (e.g. removal of toe resistance, or increasing groundwater pore pressure).

### *2.11.2 Cambering and gulls*

There is no direct evidence of 'cambering' or 'gulls' occurring at the site, the desk study has identified no presence of limestone and ironstone rock horizons, overlaying soluble horizons. As such, there is considered to be little potential risk of 'gulls' occurring beneath parts of the site because of the geological and topographical circumstances that exist and no further investigation is required.

### *2.11.3 Periglacial slip surfaces*

There is no direct evidence of Periglacial slip surfaces on site, the desk study has identified a negligible risk from slip surfaces and landslides. As such, there is considered to be little potential risk of 'gulls' occurring beneath parts of the site because of the geological and topographical circumstances that exist and no further investigation is required.

## 2.12 Waste management and landfill

There are is one waste management site recorded within 250m of the site, as listed in Table 2.9.

Table 2.9: Waste management sites

Site Name and Location	Details
Park Street Sewage Works (including landfill) Watling Street, St Albans, Hertfordshire. Park Street Sewage Works borders the site.	Status: Closed. Operational dates: 1897 - 1965 Size: Unknown Wastes accepted: Contaminated waters, Sewerage. Prohibited wastes: Unknown

As shown in Table 2.9, there is no record of wastes accepted by the landfill, only from the sewage works.

## 2.13 Regulatory Information

Information in the GroundSure Report (Appendix D), relating to various regulatory controls has been reviewed, with a summary presented below in Table 2.10.

Table 2.10: Regulatory information within 500m of the site

Regulatory Data	Distance from Site	Details	Potential Risk	Comment
Discharge Consents	348m south-east	Miscellaneous discharges - surface water (revoked - unspecified)	No	Due to being down gradient of the site.
	407m south-east	Miscellaneous discharges - surface water (revoked - unspecified)		
	499m south-east	Miscellaneous discharges - surface water (revoked - unspecified)		
Local Authority Pollution Prevention and Controls	40m east	Authorised Petrol filling station	Yes	Due to its proximity to the site.
	431m south-east	Treating and using Waste exemption Treating, burning, Aerobic composting of waste wood and plant matter	No	Due to small volume of waste and distance from the site
	454m south-east	Treating and using Waste exemption Treating, burning, Aerobic composting of waste wood and plant matter. Incorporation of ash into soil.	No	Due to small volume of waste and distance from the site
Pollution Incidents	320m south-west	August 2001, Contaminated Water, Category 4 – no impact	No	Due to its distance from the site and the Category 4

Regulatory Data	Distance from Site	Details	Potential Risk	Comment
				classification of the incident.
	428m south-east	January 2003, Unidentified oils (133814), Category 3–minor incident	No	Due to the Category 3 classification of the incident.
	432m south-east	December 2002, Unidentified oils (125765), Category 3–minor incident	No	Due to the Category 3 classification of the incident.
	436m south-east	June 2002, Gas and Fuel oils (84739), Category 3–minor incident	No	Due to the Category 3 classification of the incident.
	436m south-east	June 2002, Diesel (83162), Category 3–minor incident	No	Due to the Category 3 classification of the incident.
Trade Directory Entries	40m east	Active BP Car wash	Yes	Due to its proximity to the site and As the hydrogeological gradient and direction is not known.
	58m north-east	Active Mount SF Car wash	Yes	
	220m south-east	Active Watercress beds	No	
	231m south-east	Active Medical equipment and supplies	No	
Fuel Station Entries	53m north-east	Open Petrol station	Yes	As the hydrogeological gradient and direction is not known.
Control of major accident hazards sites (COMAH)	N/A	No entries on Control of major accident hazards sites were recorded within 500m of the site.	No	-
Registered radioactive substances	N/A	No entries on registered radioactive substances were recorded within 500m of the site.	No	-
Notification of installations handling hazardous substances	N/A	No entries on notification of installations handling hazardous substances were recorded within 500m of the site.	No	-

## 2.14 Natural soil chemistry

Information contained within the environmental report (Appendix D) gives indicative (estimated) concentration values for the natural soils at the site for a selection of Contaminants of Potential Concern (CoPC). These have been reproduced in Table 2.11.

Table 2.11: Natural soil chemistry

Element	Arsenic	Cadmium	Chromium	Lead	Nickel
Concentration (mg/kg)	15	<1.8	60 - 90	100	15 - 30

The data in Table 2.11 is considered within the geo-environmental assessment.

## 2.15 Radon

The radon risk is reported in the environmental report.

The guidance indicates that the site is not in a Radon Affected Area and no radon protection measures are required.

## 2.16 Unexploded ordnance (UXO)

In general accordance with CIRIA Report C681 (Stone et al 2009) a non-specialist UXO screening exercise has been undertaken for the purposes of ground investigation and is presented in Table 2.12 .

Table 2.12: Non-specialist UXO screening (for the purposes of ground investigation)

Data	Comment	Further Assessment Required
Site History	There is no indication of former military use from the desk study.	No
Post War Development	The 1924 to 1966 OS mapping shows no 'ruins' or areas of missing housing, suggesting little to no bomb damage.	No
Geology Type	The ground conditions comprise a medium to thick River terrace deposit and alluvium over Lewes Chalk. There is the potential that UXO, if present, would remain undetected.	Yes
Surface Cover during WWI	The surface cover during WWII comprised open fields. There is the potential that UXO, if present, would remain undetected.	Yes
Indicator of Aerial Delivered UXO	Screening against the regional bomb risk map (Hertfordshire) <b>Appendix D</b> indicates the site to be in an area where the bomb risk is very low. Review of <a href="http://www.bombsight.com">www.bombsight.com</a> indicates that no bombs landed in the immediate vicinity.	No

The non-specialist UXO screening exercise has indicated that whilst there is the potential for UXO to remain undetected due to the presence of open fields at the site during WWII and due to the ground conditions comprising a medium to thick River Terrace Deposit, no further assessment is required with regard to UXO in relation to ground investigation, however further assessment may be considered prudent for construction activities.



### 3. OUTLINE CONCEPTUAL MODEL

#### 3.1 Introduction

The outline Conceptual Model (oCM) incorporates evidence from the site walkover, the Desk Study and previous investigations carried out at the site. The formulation of an outline Conceptual Model is a key component of the LCRM methodology. The oCM incorporates a ground model of the site physical conditions and an exposure model of the possible contaminant linkages; it forms the basis for Generic Quantitative Risk Assessment (GQRA) in accordance with current guidelines.

#### 3.2 Ground model

The preliminary ground model presented in Section 2 provides an understanding of the ground conditions and is the basis for preparing the preliminary geotechnical hazard assessment (Section 3.3) and the preliminary geo-environmental exposure model (**Appendix G**).

#### 3.3 Geotechnical hazard identification

##### 3.3.1 Context

The preliminary geotechnical hazard identification has been undertaken in accordance with the general requirements of ICE/DETR Document 'Managing Geotechnical Risk' and the HE documents HD 41/15 and CD 622.

The following section sets out the identified geotechnical hazards and the development elements potentially affected (see Table F.1 in **Appendix F** for further information).

##### 3.3.2 *Plausible geotechnical hazards*

Plausible geotechnical hazards identified at the site are:

- Uncontrolled Made Ground (variable strength and compressibility).
- Soft / loose compressible ground (low strength and high settlement potential).
- Shrinkage / swelling of the clay fraction of soils under the influence of vegetation.
- Variable lateral and vertical changes in ground conditions.
- Attack of buried concrete by aggressive ground conditions.
- Obstructions.
- Existing below ground structures to remain (Sewerage tunnels).
- Changing groundwater conditions.
- Risk from erosion or flooding.
- Slope stability issues – general slopes.
- Earthworks – unsuitability of site won material to be reused as fill.
- Solution features in Chalk.
- Cavities in the superficial deposits, due to solution features.
- Problematic soils.

### 3.3.3 *Potential development elements affected*

Development elements potentially affected by geotechnical hazards are:

- Buildings – foundations.
- Buildings – floor Slabs
- Roads and pavements.
- Services.
- General slopes.
- Retaining walls.
- Gardens.
- Construction staff, vehicles and plant operators.
- Earthworks control, inability to place and compact fill.
- Insufficient fill to complete earthworks.

Health and safety risks to site Contractors and maintenance workers have not been assessed during these works and will need to be considered separately during design.

## 3.4 Geo-environmental exposure model

### 3.4.1 *Context*

The preliminary exposure model is used to identify geo-environmental hazards and to establish potential pollution linkages, based on the source-pathway-receptor (SPR) approach.

A viable pollution linkage requires all the components of an SPR to be present. If only one or two are present, there is no linkage and no further assessment is required.

The following section sets out the identified geo-environmental hazards and the potential receptors and pathways. This is detailed further in Table G.2 in **Appendix G**.

### 3.4.2 *Potential contaminants*

For the purpose of this assessment the potential contaminants have been separated according to whether they are likely to have originated from an on-site or off-site source.

#### 3.4.2.1 *Potential on-site sources of contamination*

- Made Ground, associated with flytipping of material onto the site possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, Polycyclic aromatic hydrocarbon (PAH) and petroleum hydrocarbons (S01).
- Sewerage and effluent including Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) and Antimicrobial resistance (AMR) from the pipeline running across the site, in the case of a break or a leak (S02)
- Agricultural pesticides and fertilisers containing high concentrations of Nitrogen, Phosphorous and other chemical nutrients. (S03).

- Made Ground, potentially containing asbestos fibres and Asbestos Containing Materials from demolition and construction as well as other unconstrained waste from spillover from the landfill directly next to the site boundary. (S04).

#### 3.4.2.2 *Potential off-site sources of contamination*

- Leachate from landfilled waste including household, commercial and industrial, asbestos, animal processing wastes located on the western boundary. There is no evidence to suggest that the landfill was lined or capped (S05).
- Ground gases (carbon dioxide and methane) from organic and waste materials in the landfilled Made Ground adjacent to the site (S06).
- Ground gases (carbon dioxide and methane) from organic materials in the Alluvium and River terrace deposits (S07).
- Historic septic tanks, unspecified tanks and unspecified heaps on the historic sewage works site including; Sewerage, effluent, Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) and Antimicrobial resistance (AMR) (S08).
- Spillages from historic and current garages and fuelling stations on Watling Street, north-east of the site boundary including PAH, petroleum hydrocarbons, Volatile Organic Compounds (VOC) and Semi-volatile Organic compounds (SVOC). (S09)
- Surface water run off with high levels of; Polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS), Benzo(b)fluoranthene, and Benzo(g-h-i)perylene. (S10)

#### 3.4.3 *Potential receptors*

The following potential receptors in relation to the proposed land use have been identified.

- People (neighbours, site end users) (R01).
- Development end use (buildings, utilities and landscaping) (R02).
- Groundwater: Secondary A aquifer status of the River Terrace Deposits and Primary aquifer of Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated) (R03).
- Surface water: the River Ver. (R04)
- Plant life (R05)

#### 3.4.4 *Potential pathways*

The following potential pathways have been identified.

- Ingestion, skin contact, inhalation of dust and outdoor air by people (P01).
- Methane ingress via permeable soils and/or construction gaps (P02).
- VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P03).
- Root uptake by plant (P05).
- Methane ingress to the root zone from the landfill site, by plants (P06).
- Migration of contaminant via leachate migration through the saturated and unsaturated zone in the River Terrace Deposits (P07).

- Migration of contaminant from the groundwater within the River Terrace Deposits to the groundwater within the Lewes Nodular Chalk Formation and Seaford Chalk Formation aquifer (P08).
- Abstraction and consumption by people (or other utilisation) of groundwater (P09).
- Surface water via overland flow (P10).
- Surface water via base flow from groundwater (P12).

Health and safety risks to site development contractors and maintenance workers have not been assessed as part of this study and will need to be considered separately.

The above sources, pathways and receptors have been considered as part of the Preliminary Risk Assessment in accordance with LCRM (2019), are considered to be plausible in the context of this site.



## 4. DESK STUDY CONCLUSIONS

### 4.1 Geotechnical conclusions

The following plausible geotechnical risks are identified.

- Variable Made Ground - settlement or differential settlement of foundations, floor slabs, roads and infrastructure elements.
- Low strength, compressible ground – risk of shear failure and excessive settlement of foundations, roads and infrastructure elements.
- Attack of buried concrete by aggressive ground conditions – the development site may contain Made Ground and potentially sulfate bearing soils.
- Shrinkage/swelling of clay – settlement/heave of foundations, especially where located within the influence of trees and vegetation.
- Loose Made Ground, leading to difficulty with excavation due to trench instability.
- Earthworks – Low bearing capacity or settlement of new fill and impact on foundations, floor slabs, roads and infrastructure and construction plant.
- Earthworks – Slope stability - Impact on retaining walls and integrity of foundations.
- Potential for unforeseen ground conditions and the risks associated with limited data.

### 4.2 Geoenvironmental conclusions

Based on historical and current land uses and in accordance with the processes set out in hydrock methodologies:

- It is unlikely that the site would be classified as Contaminated Land under Part 2A of the EPA 1990.
- The overall risk from land contamination at the site is considered to be Medium to Low for the current development, as it remains as agricultural land, however this is dependent on the geo-environmental findings of a ground investigation and further investigation of the historic landfill adjacent to the site.

### 4.3 General comments

Hydrock Consultants Limited (Hydrock) has prepared this report in accordance with the instructions of M Scott Properties Ltd; Ms T Sutton; Ms T Good; Mr W Hughes and Mr J Hughes. (the Client), by e-mail dated August 2021 under the terms of appointment for Hydrock, for the sole and specific use of the Client and parties commissioned by them to undertake work where reliance is placed on this report. Any third parties who use the information contained herein do so at their own risk. Hydrock shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared or for use of the report by any parties not defined in Hydrock's appointment.

This report details the findings of work carried out in September 2021. The report has been prepared by Hydrock on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, not all potential environmental constraints or liabilities associated with the site may have been revealed.

Hydrock has used reasonable skill, care and diligence in the design of the investigation of the site and in its interpretation of the information obtained. The inherent variation of ground conditions allows only

definition of the actual conditions at the locations and depths of trial pits and boreholes at the time of the investigation. At intermediate locations, conditions can only be inferred.

Groundwater data are only representative of the dates on which they were obtained and both levels and quality may vary.

Unless otherwise stated, the recommendations in this report assume that ground levels will remain as existing. If there is to be any re-profiling (e.g. to create development platforms or for flood alleviation) then the recommendations may not apply.

Information provided by third parties has been used in good faith and is taken at face value; however, Hydrock cannot guarantee its accuracy or completeness.

The work has been carried out in general accordance with recognised best practice. The various methodologies used are referenced in Appendix E. Unless otherwise stated, no assessment has been made for the presence of radioactive substances or unexploded ordnance. Where the phrase 'suitable for use' is used in this report, it is in keeping with the terminology used in planning control and does not imply any specific warranty or guarantee offered by Hydrock.

Unless otherwise stated, at the time of this investigation the future routes of water supply pipes had not been established. This investigation and sampling strategy may not be fully compliant with UKWIR recommendations. Consequently, a targeted investigation and specific sampling and chemical testing may be required at a later date once the routes of the supply pipes are known. In addition, it is recommended that the relevant water supply company be contacted at an early stage to confirm its requirements for assessment, which may not necessarily be the same as those recommended by UKWIR.

Whilst the preliminary risk assessment process has identified potential risks to construction workers, consideration of occupational health and safety issues is beyond the scope of this report.

The non-specialist UXO screening has been undertaken for the purposes of ground investigation only (i.e. low risk activity in accordance with CIRIA Report C681). Further assessment should be undertaken with regards to other higher risk activities e.g. construction.

Please note that notwithstanding any site observations concerning the presence or otherwise of archaeological sites, asbestos-containing materials or invasive weeds, this report does not constitute a formal survey of these potential constraints and specialist advice should be sought.

Any site boundary line depicted on plans does not imply legal ownership of land.

## 5. RECOMMENDATIONS FOR FURTHER WORKS

### 5.1 Ground investigation objectives

In order to confirm the actual risks to receptors and confirm the ground conditions with respect to potential geotechnical and geo-environmental risks, an appropriate intrusive investigation will need to be undertaken post-planning. Post-planning works will likely be dealt with in the form of clearing planning conditions. This investigation will need to:

- determine the depth and distribution of landfill/Made Ground and natural strata across the site;
- determine the soil strength/density profile beneath the site;
- determine the rock strength/density profile beneath the site;
- determine the depth/level of groundwater beneath the site;
- determine the ground gas concentrations beneath the site;
- determine CBRs to assist with pavement design;
- assess trench stability, over break potential and 'diggability';
- allow soil infiltration rate testing;
- allow sampling for chemical and geotechnical laboratory testing;
- allow soil classification to allow geotechnical characterisation and determine suitability for reuse of soils within earthworks;
- obtain information in terms of Aggressive Chemical Environment for Concrete Class (ACEC Class).

Following investigation, assessment will be required to:

- update the Ground Model;
- update the Geotechnical Risk Register;
- provide preliminary Geotechnical Design recommendations;
- update the Conceptual Site Model (CSM), including identification of plausible pollution linkages;
- undertake generic quantitative risk assessment of potential chemical contaminants to establish 'suitability for use' under the current planning regime;
- discuss potential environmental liabilities associated with land contamination (soil, water and gas); and
- provide outline mitigation recommendations to ensure the site is 'suitable for use'.

### 5.2 Ground investigation recommendations

Specific recommendations for this site include;

- Window sample locations along the western boundary of the site to determine influence of the landfill on site geologies and facilitate monitoring of groundwater and ground gasses, and to provide environmental and geotechnical samples for further analysis.

- Rotary core locations across site to determine depth of Chalk strata below natural soils/made ground, to determine groundwater levels, to determine effects of the landfill on site geologies and facilitate monitoring of groundwater and ground gasses, and to provide environmental and geotechnical samples for further analysis.
- Trial pitting locations across site to determine depth of made ground/natural strata and to provide environmental and geotechnical samples for further analysis.

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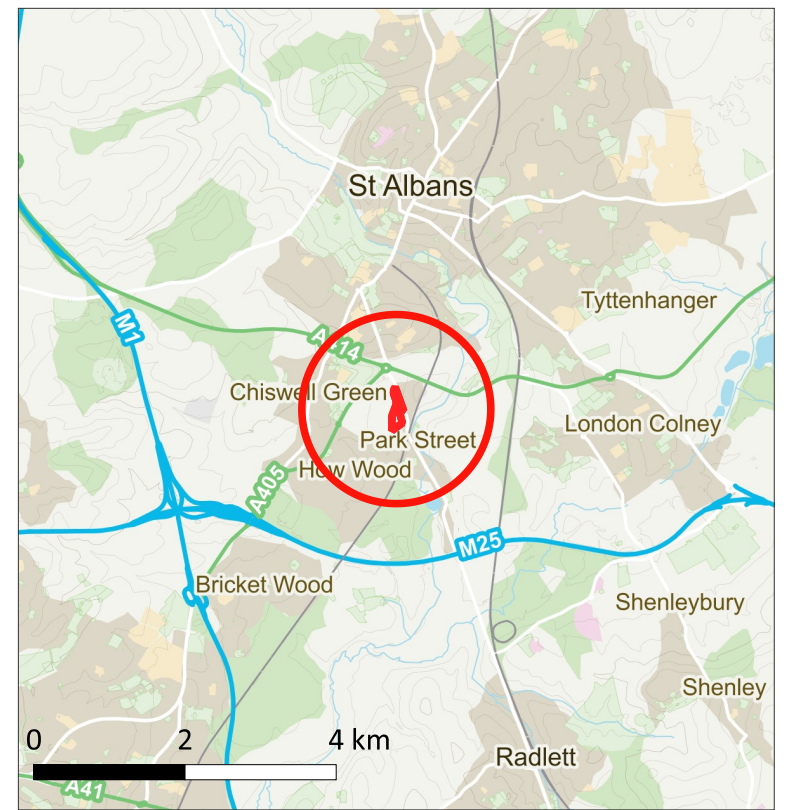
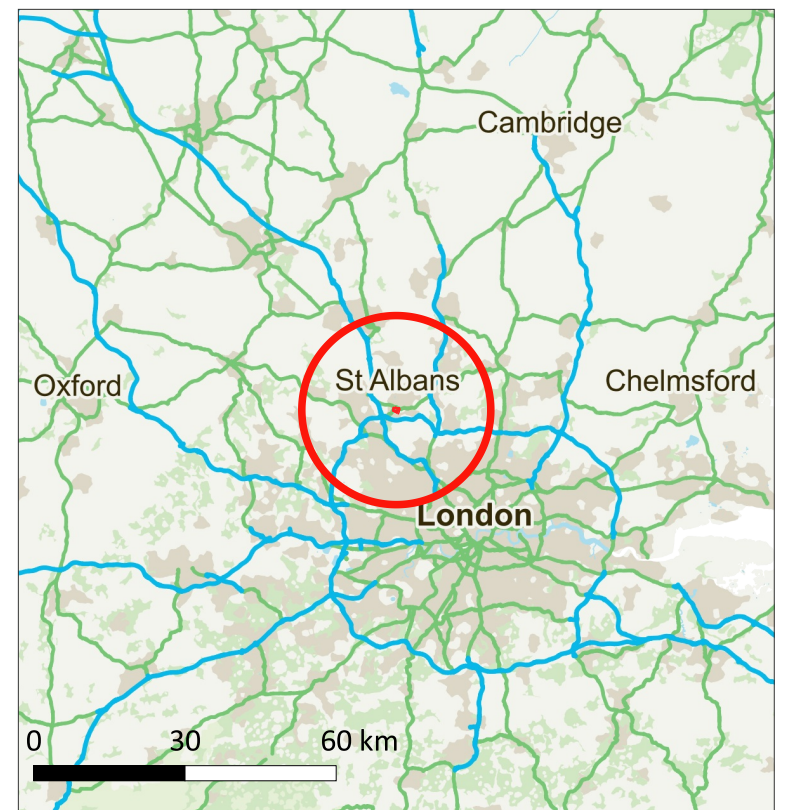
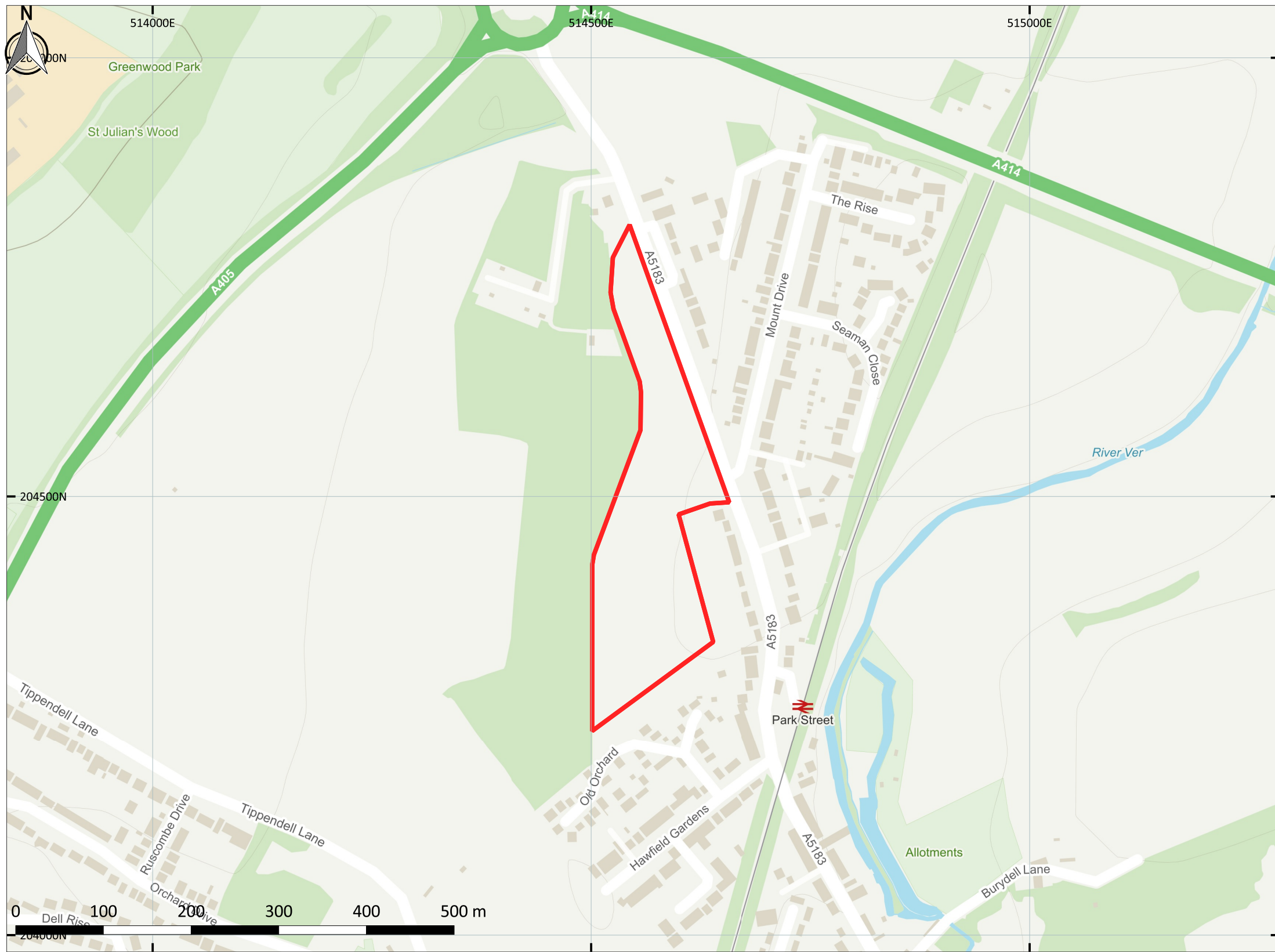
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# Appendix A Drawings



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KEY PLAN



Site Boundary

NOTES

1. Contains OS data © Crown copyright and database right (2021)

REVISIONS

REV.	DRAWN BY INITIALS	CHECKED BY INITIALS	DATE	REVISION NOTES/COMMENTS
P01	AL	XX	10/10/21	First issue
P02	MW	EC	28/01/22	Revised boundary



TITLE  
SITE LOCATION PLAN

HYDROCK PROJECT NO.  
20880

SCALE @ A3  
1:5,000

CLIENT  
M Scott Properties

PURPOSE OF ISSUE  
SUITABLE FOR INFORMATION

STATUS  
S2

PROJECT  
Watling Street, Park Street, St Albans

DRAWING NO.  
20880-HYD-XX-ZZ-DR-GE-1000

REVISION  
P02

## Appendix B Field Reconnaissance Photographs



<p><b>Desk Study Photograph 1</b></p>	
<p><b>Date:</b>06/09/21</p>	
<p><b>Direction Photograph Taken:</b> Looking north from eastern boundary</p>	
<p><b>Description:</b> Stover and vegetation typical to site.</p>	

<p><b>Desk Study Photograph 2</b></p>	
<p><b>Date:</b>06/09/21</p>	
<p><b>Direction Photograph Taken:</b> Looking south from eastern boundary</p>	
<p><b>Description:</b> Stover and vegetation typical to site.</p>	



<p><b>Desk Study Photograph 3</b></p>	
<p><b>Date:</b>06/09/21</p>	
<p><b>Direction Photograph Taken:</b> N/A</p>	
<p><b>Description:</b> Manhole cover (one of 3) and inspection pit found on site for the sewer main running north to south.</p>	

<p><b>Desk Study Photograph 4</b></p>	
<p><b>Date:</b>06/09/21</p>	
<p><b>Direction Photograph Taken:</b> Looking south on the western boundary.</p>	
<p><b>Description:</b> Berm running along the western boundary. Manmade waste and landfill material can be found on the west of the berm (Right of photo).</p>	



<p><b>Desk Study Photograph 5</b></p>	
<p><b>Date:</b>06/09/21</p>	
<p><b>Direction Photograph Taken:</b> Looking North from the centre of the site.</p>	
<p><b>Description:</b> Photo shows elevation drop from highest point of the site to the lowest.</p>	

<p><b>Desk Study Photograph 6</b></p>	
<p><b>Date:</b>06/09/21</p>	
<p><b>Direction Photograph Taken:</b> Looking east from the middle of the site.</p>	
<p><b>Description:</b> Photo shows elevation change from the site boundary to highest point.</p>	



<p><b>Desk Study Photograph 7</b></p>	
<p><b>Date:</b>06/09/21</p>	
<p><b>Direction Photograph Taken:</b> Looking west from the middle of the site.</p>	
<p><b>Description:</b> Photo shows western site boundary (south of the berm) with mature coniferous trees and giant hogs weed.</p>	

<p><b>Desk Study Photograph 8</b></p>	
<p><b>Date:</b>06/09/21</p>	
<p><b>Direction Photograph Taken:</b> Looking west from the western boundary of the site.</p>	
<p><b>Description:</b> Photo shows land past the western boundary on to the historic landfill, showing slight elevation drop and burnt out car.</p>	

## Appendix C Historical Ordnance Survey Maps



**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_1250\_1\_1  
**Grid Ref:** 514566, 204278

**Map Name:** National Grid

**Map date:** 1963

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed 1962  
 Revised 1962  
 Edition N/A  
 Copyright 1963  
 Levelled 1956

Surveyed 1962  
 Revised 1962  
 Edition N/A  
 Copyright 1963  
 Levelled 1958

Surveyed 1962  
 Revised 1962  
 Edition N/A  
 Copyright 1963  
 Levelled 1956

Surveyed 1962  
 Revised 1962  
 Edition N/A  
 Copyright 1963  
 Levelled 1956

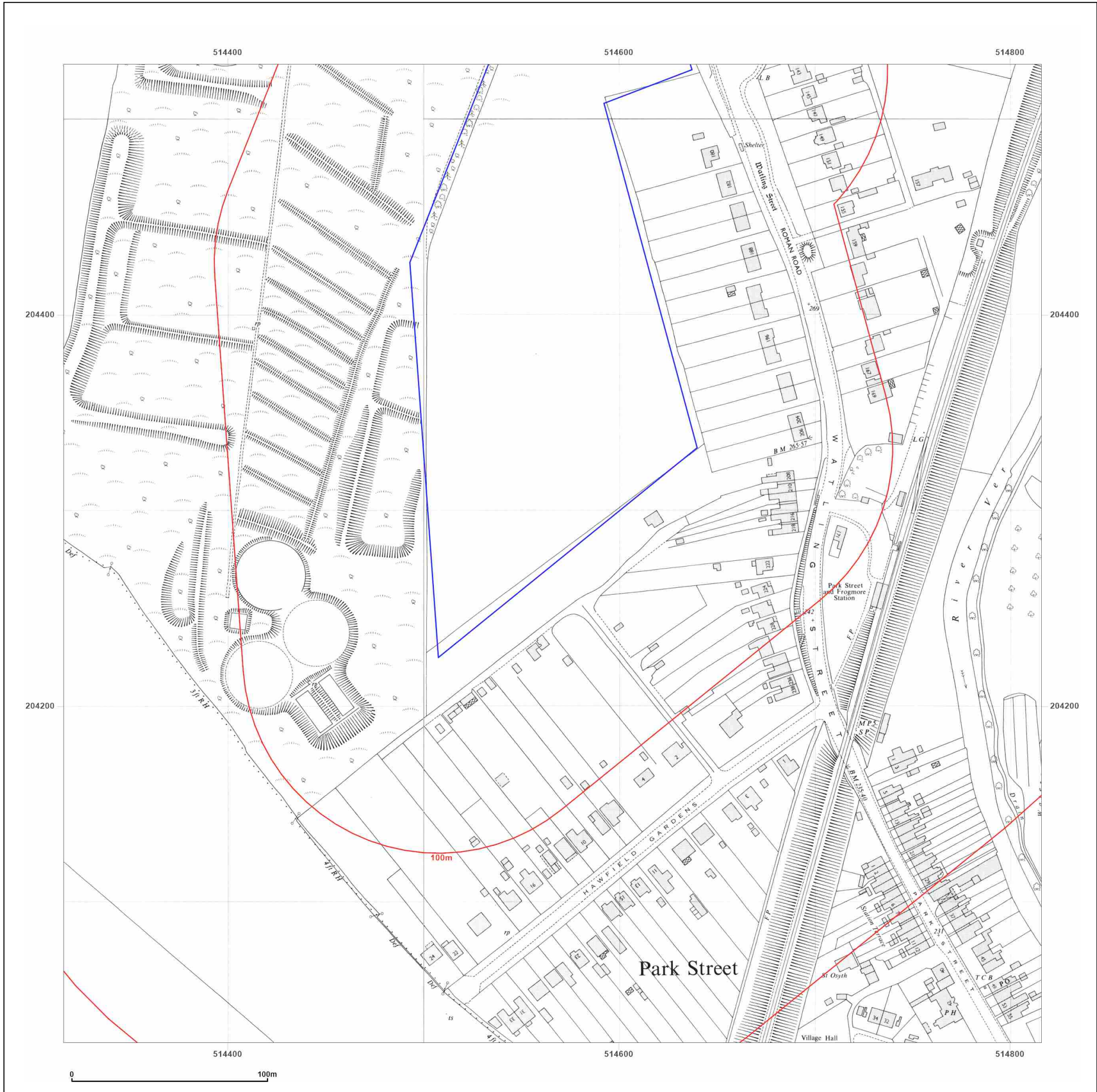


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Production date: 07 September 2021

Map legend available at:  
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**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_1250\_1\_1  
**Grid Ref:** 514566, 204278

**Map Name:** National Grid

**Map date:** 1992

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed 1992 Revised 1992 Edition N/A Copyright N/A Levelled N/A	Surveyed 1992 Revised 1992 Edition N/A Copyright N/A Levelled N/A
Surveyed 1992 Revised 1992 Edition N/A Copyright N/A Levelled N/A	Surveyed N/A Revised N/A Edition N/A Copyright 1992 Levelled N/A



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**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_1250\_1\_1  
**Grid Ref:** 514566, 204278

**Map Name:** National Grid

**Map date:** 1992

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed 1962  
 Revised 1962  
 Edition N/A  
 Copyright 1992  
 Levelled N/A

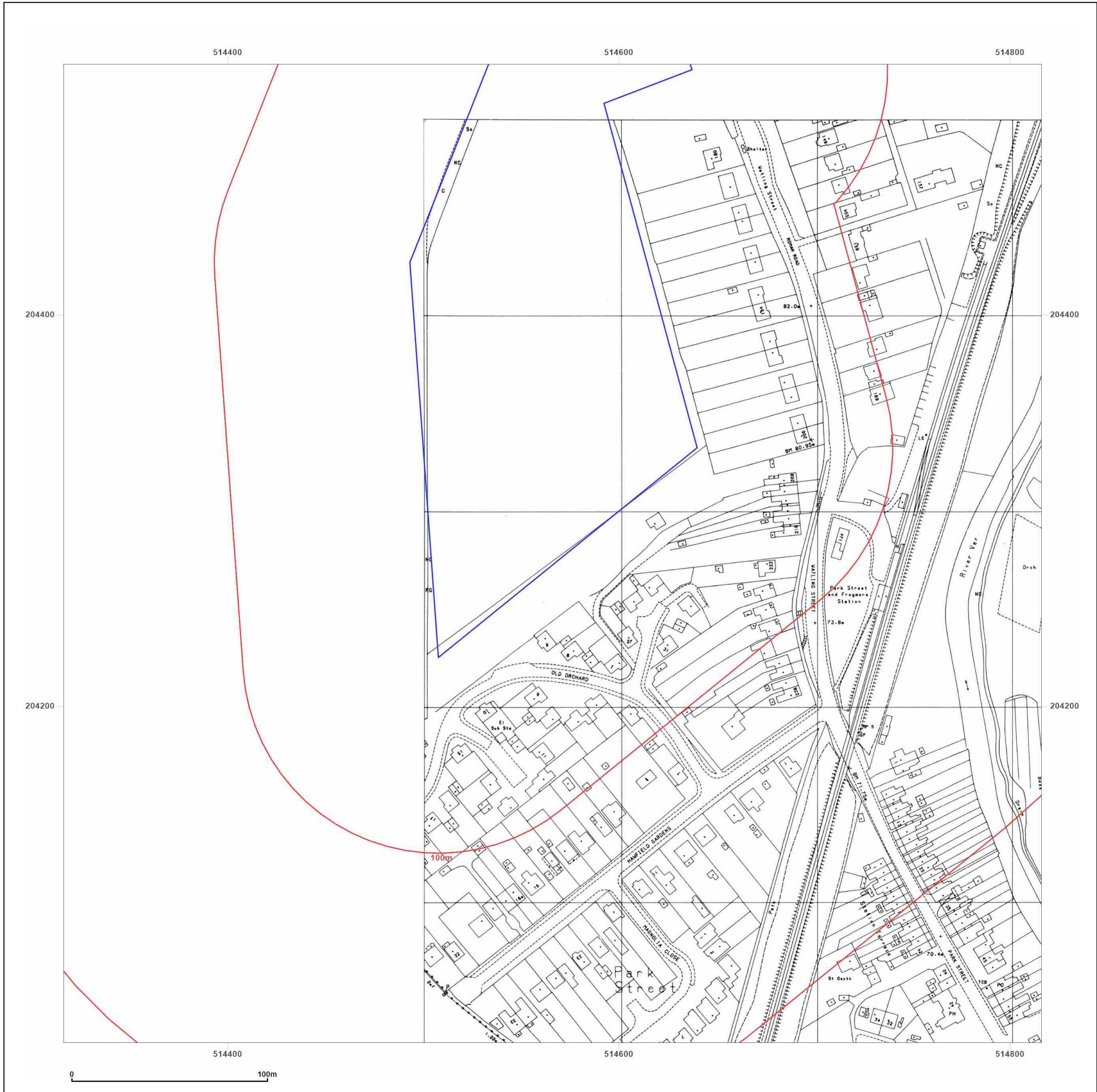


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**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_1250\_1\_1  
**Grid Ref:** 514566, 204278

**Map Name:** National Grid

**Map date:** 1992

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed N/A  
 Revised N/A  
 Edition N/A  
 Copyright 1992  
 Levelled N/A

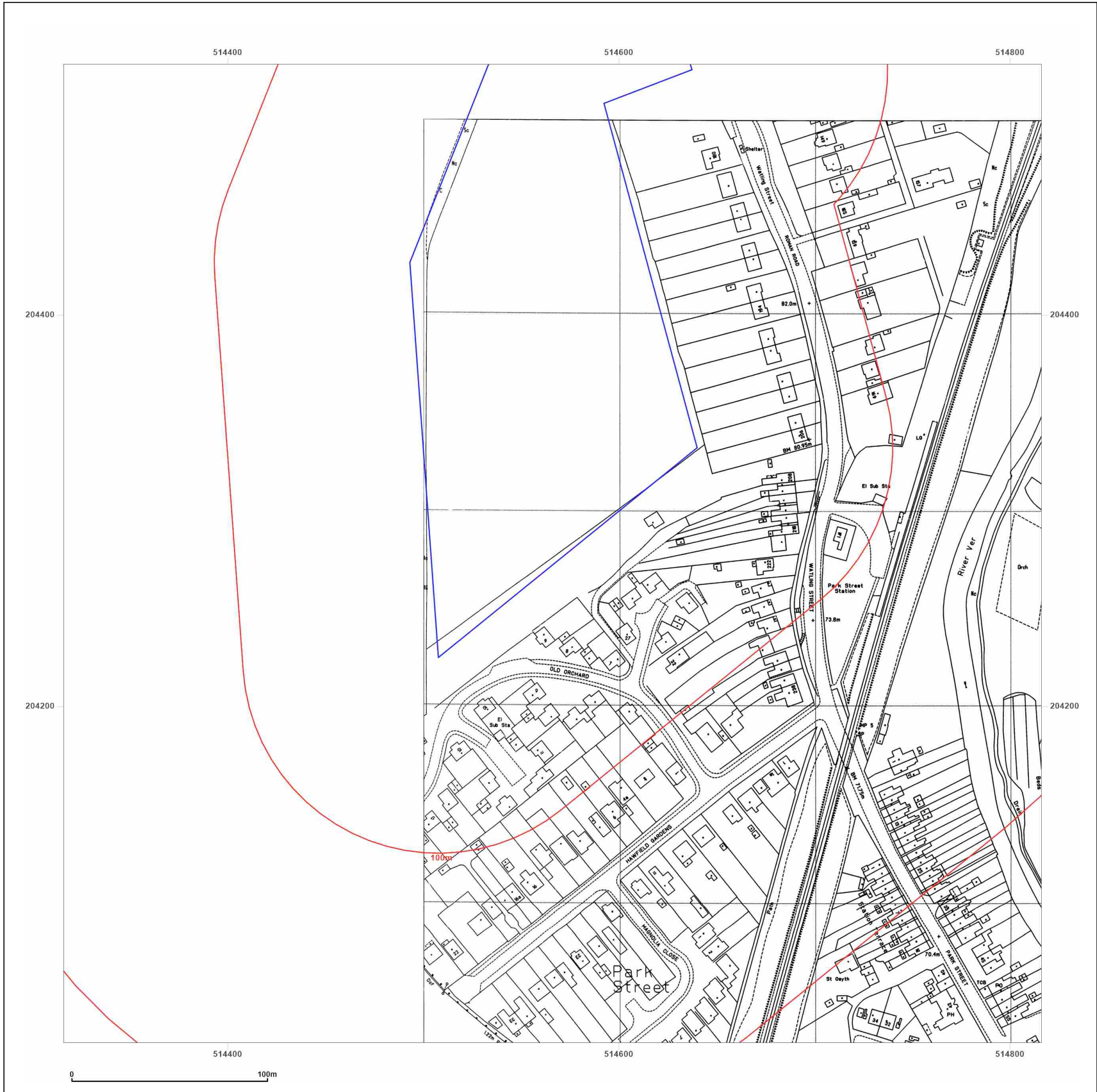


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**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_1250\_1\_2  
**Grid Ref:** 514566, 204778

**Map Name:** National Grid

**Map date:** 1963

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed 1962  
 Revised 1962  
 Edition N/A  
 Copyright 1963  
 Levelled 1958

Surveyed 1962  
 Revised 1962  
 Edition N/A  
 Copyright 1963  
 Levelled 1958

Surveyed 1962  
 Revised 1962  
 Edition N/A  
 Copyright 1963  
 Levelled 1956

Surveyed 1962  
 Revised 1962  
 Edition N/A  
 Copyright 1963  
 Levelled 1958

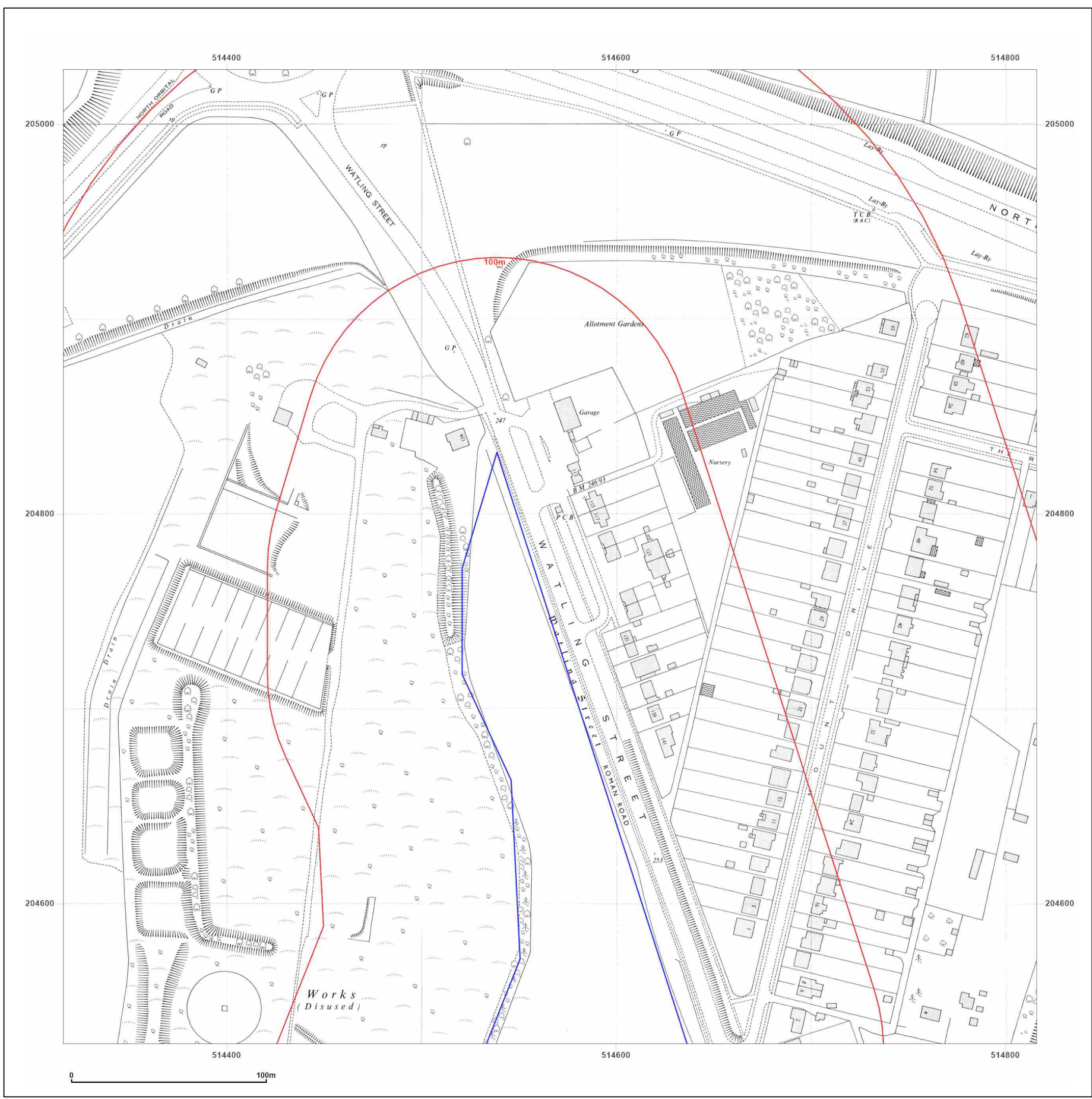


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**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_1250\_1\_2  
**Grid Ref:** 514566, 204778

**Map Name:** National Grid

**Map date:** 1970

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed 1962  
 Revised 1969  
 Edition N/A  
 Copyright 1970  
 Levelled 1956

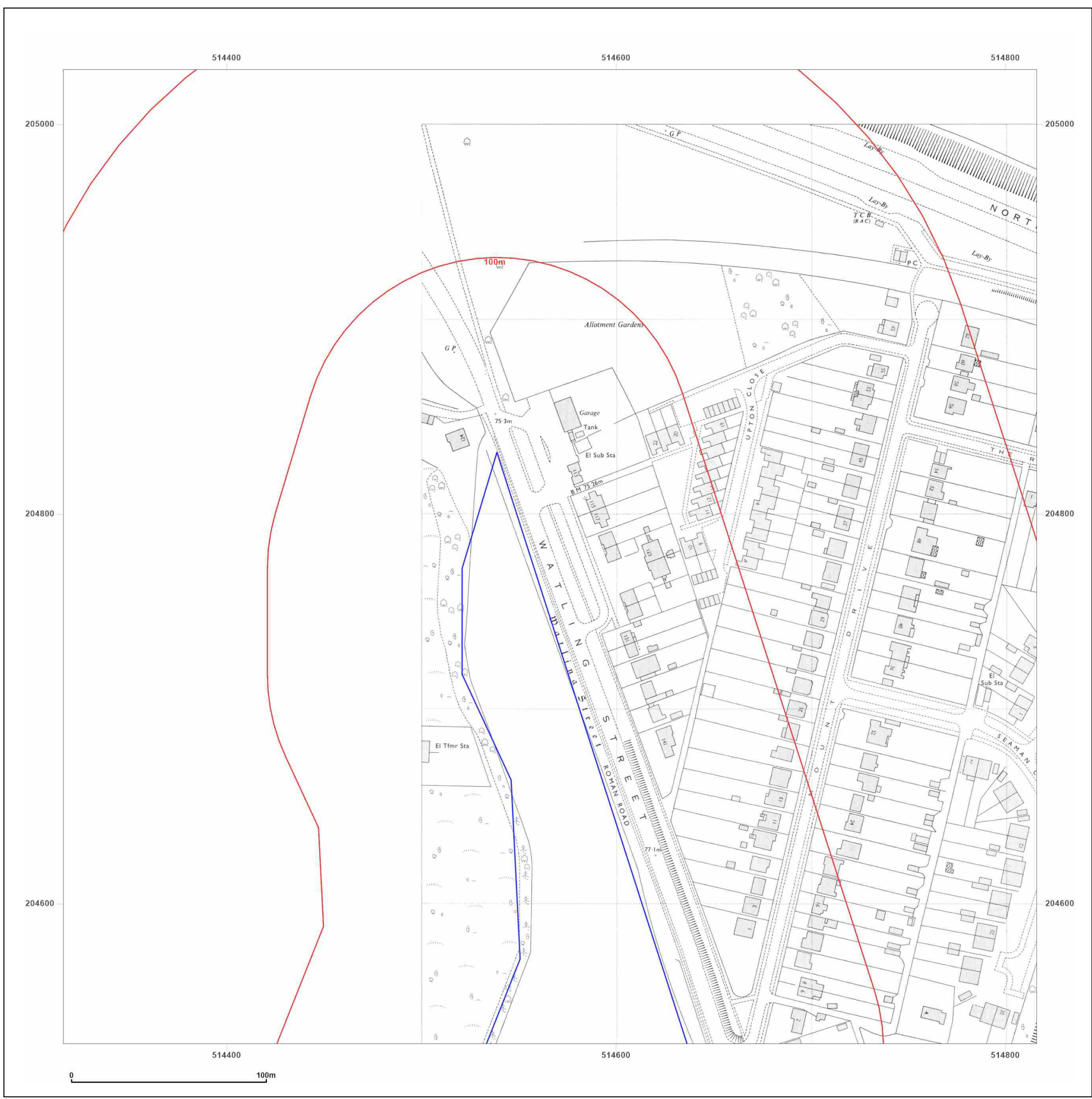


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**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_1250\_1\_2  
**Grid Ref:** 514566, 204778

**Map Name:** National Grid

**Map date:** 1969-1974

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed 1962	Surveyed 1962
Revised 1974	Revised 1974
Edition N/A	Edition N/A
Copyright 1974	Copyright 1974
Levelled 1958	Levelled 1958

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

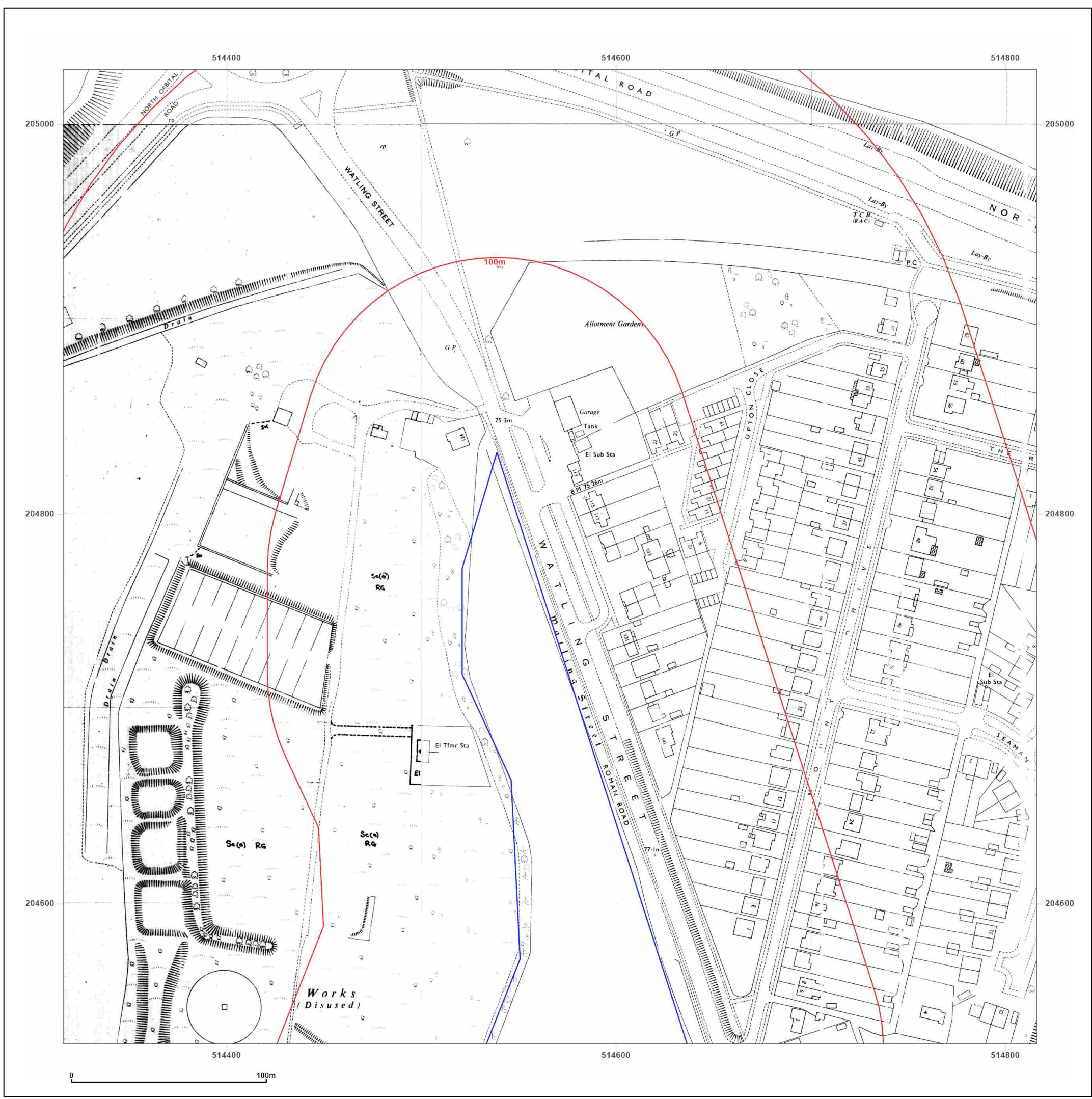


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**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_1250\_1\_2  
**Grid Ref:** 514566, 204778

**Map Name:** National Grid

**Map date:** 1974-1979

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed 1976 Revised 1979 Edition N/A Copyright 1979 Levelled 1976	Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A
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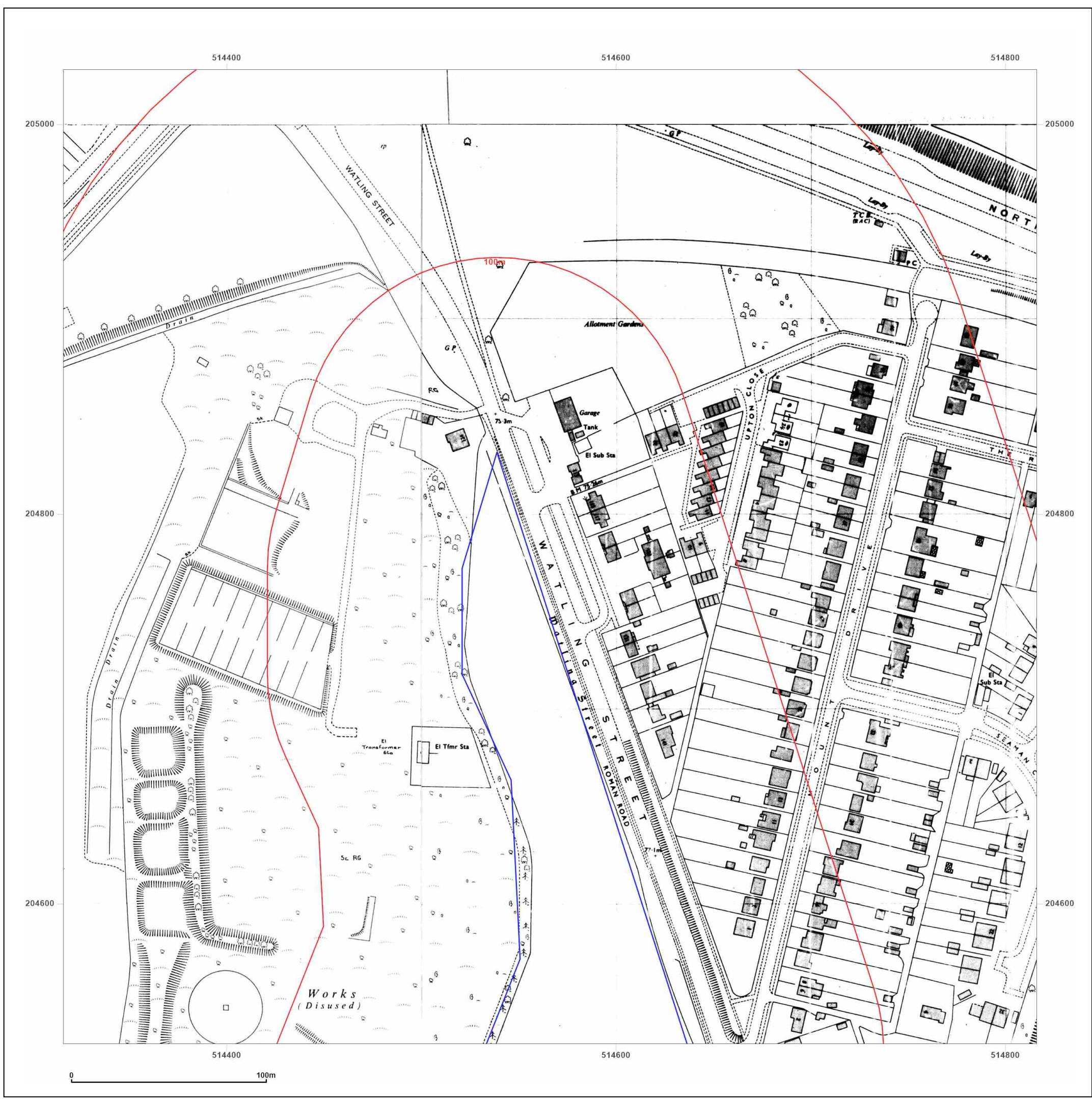


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**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_1250\_1\_2  
**Grid Ref:** 514566, 204778

**Map Name:** National Grid

**Map date:** 1992

**Scale:** 1:1,250

**Printed at:** 1:2,000



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 Revised 1992  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

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 Revised 1992  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

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**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_LS\_1\_1  
**Grid Ref:** 514565, 204215

**Map Name:** County Series

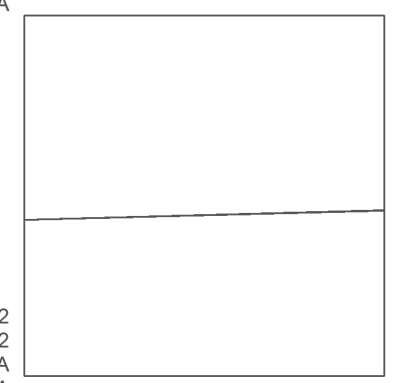
**Map date:** 1872

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1872  
 Revised 1872  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



Surveyed 1872  
 Revised 1872  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

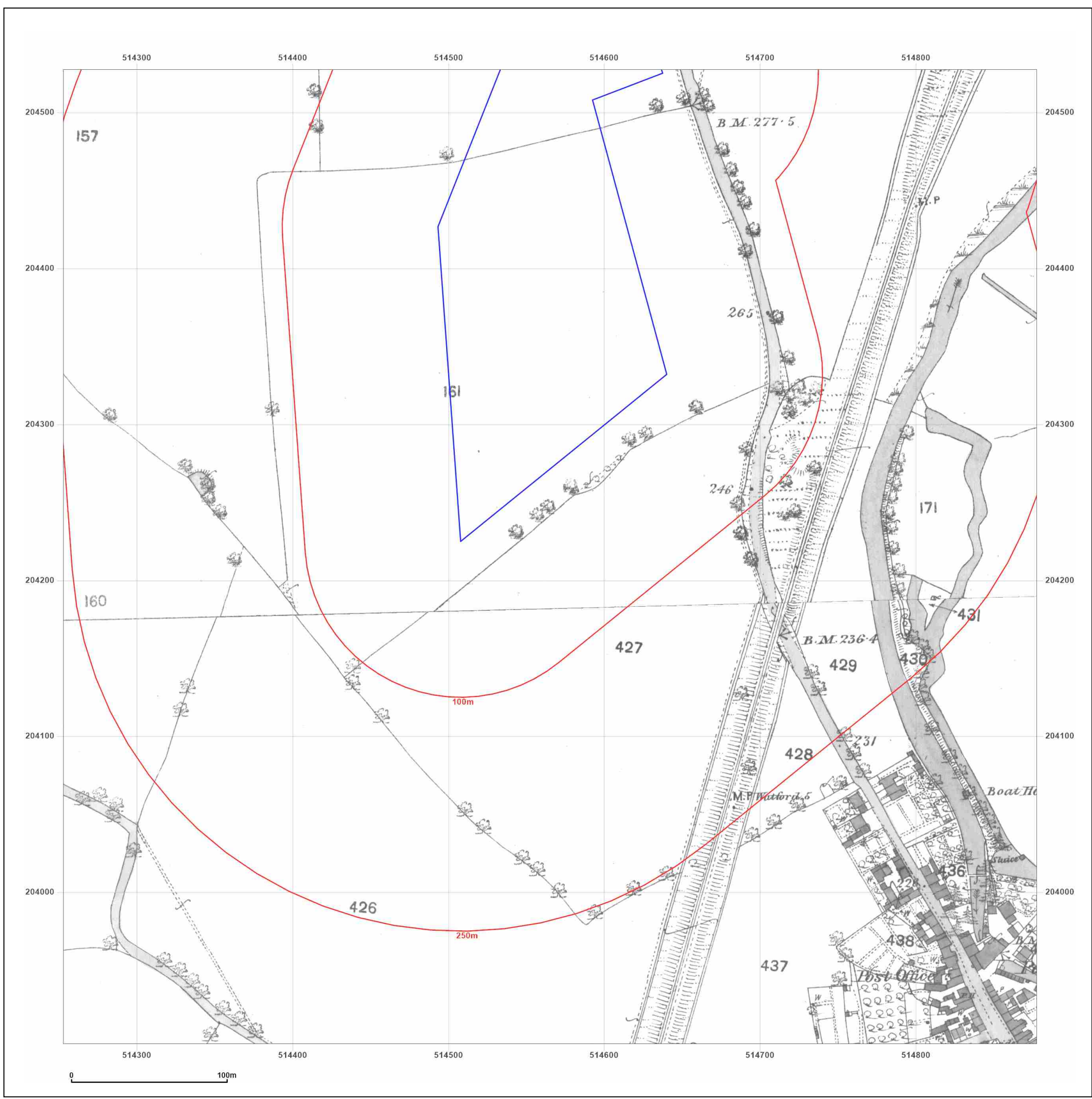


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**Site Details:**

514587, 204575

**Client Ref:** PO-09620-C-20880-C  
**Report Ref:** GS-8175188\_LS\_1\_1  
**Grid Ref:** 514565, 204215

**Map Name:** County Series

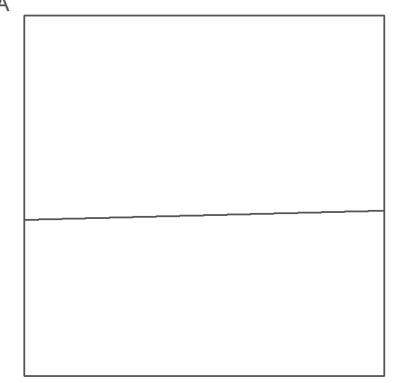
**Map date:** 1880

**Scale:** 1:2,500

**Printed at:** 1:2,500



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 Edition N/A  
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