Phase I Geoenvironmental Site Assessment
Hydro Aluminium Deeside Ltd

Reference:16-685-R1-2
Date: May 2024

PHASE I GEOENVIRONMENTAL SITE ASSESSMENT

Hydro Aluminium Deeside Ltd
Bridge Road
Wrexham
LL13 9PS

Prepared for:

Portal Construction NW Ltd

Report Ref: 16-685-R1-2
Date Issued: May 2024

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QUALITY ASSURANCE

PROJECT NUMBER	16-685		
VERSION	Version 1	Version 2	
REMARKS	Issue 1	Issue 2 – updated proposed layout and site boundary	
DATE	April 2023	May 2024	
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QUALIFICATIONS	MSci (Hons), FGS, MIEnvSc	BSc (Hons), FGS, MIEnvSc, CEnv	
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EXECUTIVE SUMMARY

Site Address	Hydro Aluminium Deeside Ltd, Bridge Road, Wrexham, LL13 9PS	
Grid Reference	E 337582, N 349213	
Site Area	2.3 Ha.	
Proposed Development	Portal Construction NW intends to construct a proposed recycling materials sorting facility and covered storage bays with associated service infrastructure and external hardstanding.	
Current Site Use	The subject site is a rectangular shaped parcel of land located to the east of Wrexham and is currently used for storage of goods by Hydro Aluminium Deeside Ltd. Goods stored on site comprise aluminium billets manufactured through a recycling process within the main facility located to the north east of the development area. There is a large mound running along the southwestern boundary extending approximately 7 m above ground level. There is also a smaller mound running along the north-eastern boundary adjacent to the main Hydro Aluminium Deeside Ltd facility, however this only extends 2-3 m above ground level. The material within the mounds appears to be a mix of soil and stones with some timber and metal. Scrub vegetation is present on the north-eastern mound with the southwestern stockpile covered in semi-compacted soil and gravel. Semi-mature trees line the north-western and southwestern boundaries, with no vegetation present in the northern sector. A service road runs through the centre of the site with an associated weigh bridge. A storage area and lorry park are present in the northwest and southeast respectively.	
Site History	Historical mapping suggests that the site remained as undeveloped agricultural land with ponds until circa 1949, when it was transformed as a part of Royal Ordnance Factory (ROF) Wrexham. A number of buildings were constructed and associated tracks, which remained in place until circa 1976 when all buildings were removed from site. By 1986, the site was vacant with no features noted on the mapping and it remained this way until 2000 when an entry gate was constructed along the south-eastern boundary. By 2020 the service road through the centre of the site had been constructed, and the site remains in this layout to the present day.	
Environmental Setting	Drift Geology	Glacial Till – CLAY, SAND, GRAVEL
	Bedrock Geology	Salop Formation – MUDSTONE, SANDSTONE and CONGLOMERATE
	Faults	There are no bedrock faults or any other linear features within 500 m of the site.
	Hydrogeology	Secondary A (bedrock aquifer) with secondary undifferentiated (superficial aquifer) recorded. One active groundwater abstraction licence is recorded 559 m south-east with the purpose of process water.
	Hydrology	The nearest off-site surface water feature is an inland river located 15 m north-west.
	Flood Risk	Unaffected by flooding from rivers.

Drainage	A formal drainage survey has not been completed; however, manholes were noted to run along the eastern side of the southwestern stockpile.
Landfill Sites and Ground Gases	No landfill sites (current or historic) are located within 250 m of the site. The site has undergone some historic development and ground working, the Made Ground associated with the historic development may produce hazardous ground gases such as methane and carbon dioxide. Historical mapping suggests the potential for munition storage on site. This was likely kept in controlled conditions with careful handling to ensure no spillages or damage.
Radon	The site is noted to be within an area where less than 1 % of homes are at or above the action level.
Coal Mining/Land Stability	The site is located in a coal mining reporting area but not within a development high-risk area. There is no evidence of any coal mining activity within close proximity of the and it is therefore considered that there is a low risk from coal mining.
Hazardous Installations	No hazardous installations that could potentially prejudice the proposed development have been identified within influencing distance of the subject site. The Hydro Aluminium works is licenced under permit number BK3638IF.
Initial Conceptual Site Model	The following potential on-site sources of contamination have been identified: - Made Ground (former structures, tracks) – Heavy metals, asbestos, Polycyclic Aromatic Hydrocarbons (PAHs), Total Petroleum Hydrocarbons (TPHs), hazardous ground gas (carbon dioxide, methane) - Former earthworks / infilled ground (former ponds and field boundaries) – Heavy metals, asbestos, PAHs, TPHs, Hazardous Ground Gas (carbon dioxide, methane) - On site storage and lorry park (localised spillages of fuel) – PAH, TPH - Use of the site as a former cordite factory – Explosives (Picrite, nitroglycerine and nitrocellulose).
Recommendations	A detailed Phase II intrusive geoenvironmental ground investigation should be undertaken in order to confirm the findings of the initial conceptual site model.

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DRAWING LIST

16-685-001 - Site Location Plan
16-685-002 - Proposed Development Plan
16-685-003 - Historical Features Plan
16-685-004 - Site Features Plan

1. INTRODUCTION

1.1. BACKGROUND

E3P Ltd has been commissioned by Portal Construction NW Ltd to undertake a Phase I Geoenvironmental Site Assessment at land off Bridge Road, Wrexham.

This report is required to determine potential contaminated land liabilities and geotechnical constraints as part of a proposed site redevelopment.

1.2. PROPOSED DEVELOPMENT

Portal Construction NW intends to construct a proposed recycling materials sorting facility and covered storage bays with associated service infrastructure and external hardstanding.

Drawing 16-685-002 (Appendix III) identifies the proposed development layout with the red line boundary.

A snapshot of the proposed development layout is indicated in Figure 1.1.

FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT



1.3. OBJECTIVES

The objectives of the geoenvironmental investigation are as follows:

- Review historical plans, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority information available in order to complete a desk study in line with Environment Agency (EA) document Land Contamination: Risk Management (LC:RM) (2019).
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors.
- Assess the desk-study information and, where possible, provide preliminary recommendations in relation to foundations, pavement construction and floor slabs.
- Provide recommendations regarding future works required and undertake a preliminary pre-construction cost appraisal.

1.4. SOURCES OF INFORMATION

Background information was sought from the following sources:

- Groundsure Search;
- Historical mapping dated 1872 to 2023. A selection of historical maps are reproduced in Appendix V;
- On-line planning records held by Wrexham County Borough Council;
- Consultations with representatives of Wrexham County Borough Council;
- Magic Map Groundwater Vulnerability Map;
- Radon: Guidance on protective measures for new buildings (BRE Document BR 211, 2007);
- British Geological Survey Map;
- Groundsure IO database;
- https://zeticauxo.com/downloads-and-resources/risk-maps/; and,
- https://flood-map-for-planning.service.gov.uk.

1.5. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.6. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.

1.7. RISK CLASSIFICATION

E3P has utilised the available data to classify the site on the basis of its likely contaminated land liability and potential for geotechnical constraints in relation to the site development. The risk classification definitions are summarised in Table 1.1.

TABLE 1.1 RISK CLASSIFICATION

RISK	DEFINITION
Low	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property.
Low Moderate	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property with regard to the proposed use. However, minor issues may require further consideration in the event of future redevelopment of the site.
Moderate	Some potential contaminated land liabilities/geotechnical constraints are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue but the purchaser/developer may wish to make further enquiries of the vendor or undertake further environmental improvements. Redevelopment of the site will likely require further site investigation.
Moderate High	Some potentially significant contaminated land liabilities/geotechnical constraints have been identified at the property that requires further assessment, including intrusive ground investigations.
High	Significant potential contaminated land liabilities/geotechnical constraints have been identified at the property. Further assessment including intrusive ground investigation will be required to determine the level of risk and associated liability.

2. SITE SETTING

2.1. SITE DETAILS

Site Address	Hydro Aluminium Deeside Ltd, Bridge Road, Wrexham, LL13 9PS
National Grid Reference	E 337582, N 349213
Site Area	2.3 Ha.

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location map is presented in Appendix III as Drawing 16-685-001.

2.2. CURRENT SITE USE

E3P has undertaken a site walkover of the entire site and a description of the key findings is summarised in Table 2.1.

TABLE 2.1 SITE DESCRIPTION

Occupancy/Use	The subject site is a rectangular shaped parcel of land located to the east of Wrexham and is currently used for storage of goods by Hydro Aluminium Deeside Ltd. Goods stored on site comprise aluminium billets manufactured through a recycling process within the main facility located to the north east of the development area. The Hydro Aluminium works is licenced under permit number BK3638IF. A service road runs through the centre of the site with an associated weigh bridge.	
Surface Cover (%)	**Buildings**	0%
	Hardstand	40%
	Soft Cover	60%
Structures	There are no structures present on the development site.	
Access	Vehicular access can be gained through a mechanical gate in the southern corner of the site. Pedestrian access can be granted through the same entrance and from the adjacent main factory facility.	
Slope	The land varies from circa 31.5 m AOD in the north to 32.0 m AOD in the south, however, there is a large stockpile / mound running along the southwestern boundary extending approximately 7 m above ground level. There is also a smaller mound running along the north-eastern boundary, however this only extends 2-3 m above ground. The material within the mounds appears to be a mix of soil and stones with some timber and metal.	
Retaining Structures	No retaining structures have been identified.	
Vegetation/Ecology	Scrub vegetation is present on the north-eastern mound with the southwestern stockpile covered in semi-compacted soil and gravel. Semi-mature trees line the north-western and southwestern boundaries, with no vegetation present in the northern sector. A habitat survey will be required to support the planning application.	

Hazardous Material Storage	An above-ground storage tank (AST) was noted in the southeast of the site and was labelled to contain 'liquid argon'. No further hazardous material storage has been identified.
Asbestos-Containing Material (ACM)	No evidence of ACM was noted across the site during the site walkover. ACM may have been used in the former structures on-site and may not have been correctly managed during demolition. ACM (fibres and fragments) may therefore be present within the underlying Made Ground soils.
Polychlorinated Biphenyls (PCBs)	There is no equipment identified that may contain PCBs within the site boundary; however, an electricity substation is located circa 5 m to the northeast of the site within the Hydro Aluminium building.
Waste Storage	Potentially hazardous waste streams are unlikely to be generated on site and none were observed during the preliminary site inspection. Waste storage associated with the wider works (skips) were observed but these were not within the proposed development site boundary.
Drainage	A formal drainage survey has not been completed; however, manholes were noted to run along the eastern side of the southwestern stockpile.

2.3. SURROUNDING AREA

The surrounding area land uses are summarised in Table 2.2.

TABLE 2.2 SURROUNDING LAND USES

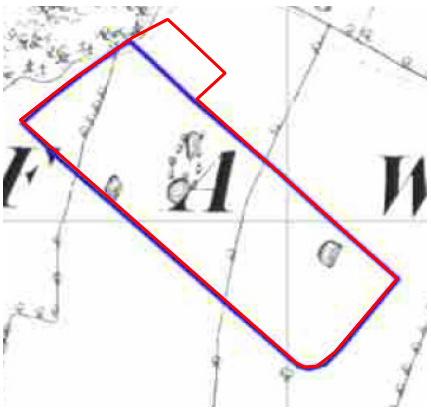
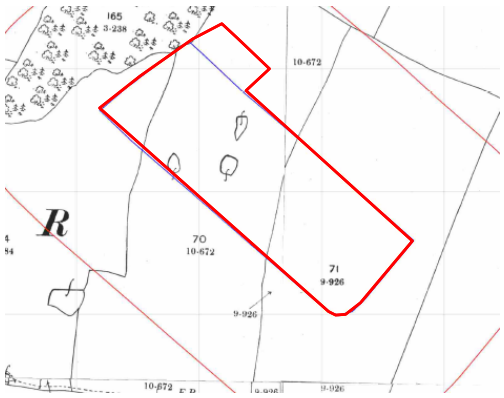
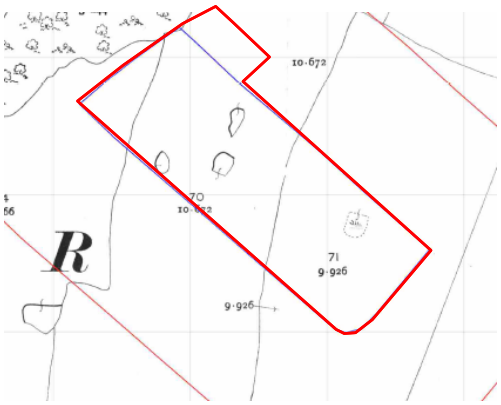
DIRECTION	LAND USE
North	Main Hydro Aluminium Deeside Facility, Wrexham Industrial Estate
East	Bridge Road, HMP Berwyn
South	Residential Units, Bridge Road, Clywedog Road East, Open space
West	Wrexham Industrial Estate

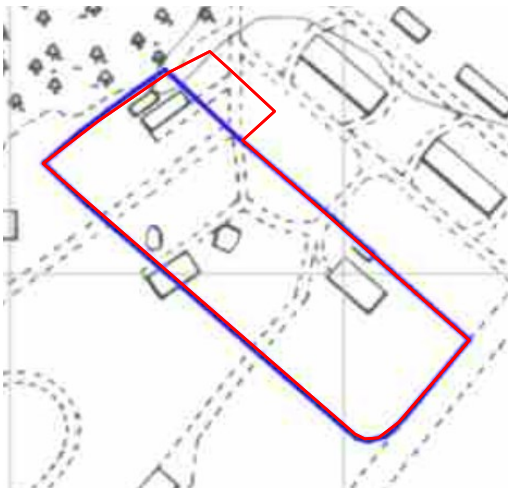
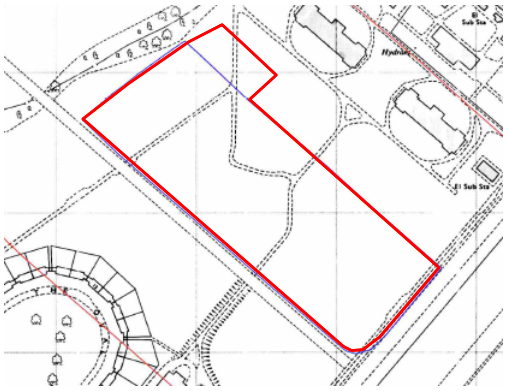
3. SITE HISTORY

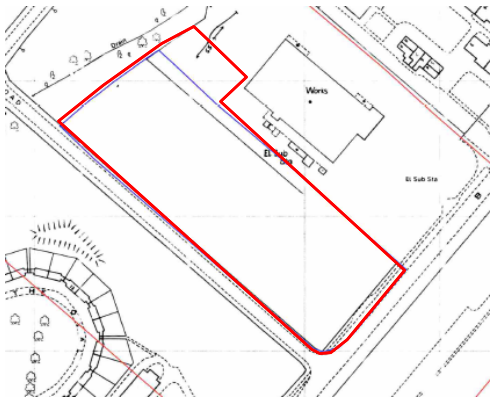
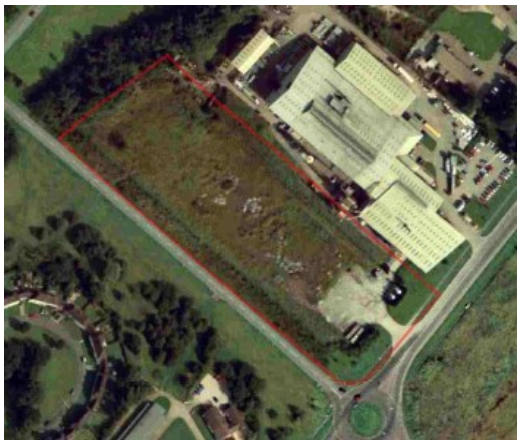
3.1. ON-SITE HISTORICAL DEVELOPMENT

A review of historical mapping and historical aerial imagery pertinent to the site is summarised in Table 3.1. In addition, historical site features are presented on Drawing No 16-685-003 in Appendix III.

TABLE 3.1 HISTORICAL DEVELOPMENT

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1872 **1:10,560**	Four ponds are recorded on site with two field boundaries present running north to south through the area.	
1899 **1:2,500**	The easternmost pond is no longer recorded. There are no further changes to the site from 1872.	
1912 **1:2,500**	An area of marshland is recorded in the location of the former pond in the east of the site.	

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1949 **1:10,560**	The site has been transformed with three large buildings present across the site and two smaller units, connected by a network of tracks, as a part of ROF Wrexham. Two of the ponds remain and the pond furthest north is no longer present.	
1961 **1:2,500**	The tracks leading from the centre of the site towards the westernmost building appear to be raised on a banking. An earth mound (blast mound) has been recorded in the south of the site. It is believed that these were used to protect buildings from accidental explosions. Two further small structures are recorded in the centre of the site. One large building is now present in the north, with the smaller unit no longer recorded. The small unit at the eastern boundary is also no longer shown. The ponds are no longer recorded.	
1976-1978 **1:2,500**	All buildings have been removed from the site, however, most of the tracks still remain in place. The small tracks that lead up to the buildings have been removed, as has the blast mound in the south of the site. The banking that the southernmost tracks were situated appears to have been flattened.	

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1986 **1:2,500**	All features that have previously been marked on the site are no longer recorded and the site is left unoccupied. A small stream appears to be present in the north east of the site.	
2000 **Aerial Image** **Groundsure.com**	The site remains unoccupied and covered with vegetation with an access point to the southeast of the site, and what appears to be hardstanding and a storage area.	
2009 **Aerial Image** **Groundsure.com**	A stockpile has been created along the southwestern boundary of the site. There are no further significant changes.	

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
2020 **Aerial Image** **Groundsure.com**	The centre of the site has been cleared of vegetation and a small stockpile has been created along the north-eastern boundary. A roadway is present from the north-east to the entrance along Bridge Road. Aside from this, there have been no further changes and the site remains in this layout to the present day.	

3.2. OFF-SITE HISTORICAL DEVELOPMENT

A review of potentially contaminative uses identified on historical Ordnance Survey maps within a 250 m radius of the site is summarised in Table 3.2.

TABLE 3.2 SURROUNDING HISTORICAL DEVELOPMENT

SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Works (Former Military) Then: no longer recorded	0 – 750 m	Pre 1949–Pre 1982 Pre 1982–Present	All directions
Electrical Sub Station Then: no longer recorded	5 m	Pre 1986–Pre 2003 Pre 2003–Present	North East
Factory Then: no longer recorded	20 m	Pre 1979–Pre 2001 Pre 2001–Present	East
Tank Then: no longer recorded	42 m	Pre 1909–Pre 1949 Pre 1949–Present	North
Infilled Ponds Then: no longer recorded	85 – 250 m	Pre 1872–Pre 1949	All directions
Works Then: marked as The Bridgeway Centre Then: no longer recorded	100 m	Pre 1964–Pre 1992 Pre 1992–Pre 2023 Pre 2023–Present	North East

3.3. PLANNING HISTORY

E3P has undertaken a review of online planning records held by Wrexham County Borough Council and the following information has been obtained for the site:

- Planning application P/2020/0552 – Application granted and valid from 2020 for the proposed '*development of a new finished goods storage area 68m x 40m adjoining the current finished goods yard.*'

3.4. ANECDOTAL INFORMATION

A web-based search of the subject site has not recovered any environmentally pertinent information.

3.5. PREVIOUS REPORTS

A previous report written by Genesis Environmental Limited in 2001 (ref: ADE/178/SR) has been provided, with the pertinent information discussed below. The report relates to the current site in addition to the adjacent Hydro Aluminium site to the north.

- The top two meters of soil to the northwest of the main factory building is Made Ground derived from ROF Wrexham. Made Ground contains building rubble, in addition to ash and slag.
- In 1995, Royal Ordnance ESG stated the land is likely to be contaminated by conventional contaminants (metals, hydrocarbons, PAHs, PCB and asbestos) and by unconventional contaminants (nitro-glycerine, nitrocellulose and picrite). No evidence of asbestos or explosives was found during the intrusive investigation.
- Elevated concentrations of lead and zinc were identified in the Made Ground in two out of six sampling locations.
- Concrete floors from former explosive factories are still in place ~2 m bgl.
- Tests for explosives in soils was completed however none were detected within the analysis completed.
- Identified PCBs are likely to derive from a capacitor factory between 1951 and 1983.
- Exceedances have been identified in groundwater for arsenic, copper, mercury, zinc and sulphate.
- It is noted that near-surface contamination with heavy metals does not appear to present unacceptable levels of risk to human receptors.

4. ENVIRONMENTAL SETTING

4.1. GEOLOGY AND HYDROGEOLOGY

The British Geological Survey (BGS) map (Sheet 121) for the site, (1:50,000, Solid and Drift editions) and online records indicate the site is underlain by the geological sequence presented in Table 4.1.

TABLE 4.1 SUMMARY OF UNDERLYING GEOLOGY

GEOLOGICAL UNIT	CLASSIFICATION	DESCRIPTION	AQUIFER CLASSIFICATION
Drift	Glacial Till	CLAY, SAND, GRAVEL	Secondary undifferentiated
Solid	Salop Formation	MUDSTONE, SANDSTONE and CONGLOMERATE	Secondary A aquifer

A summary of on-site and nearby BGS borehole records is included in Table 4.2.

TABLE 4.2 SUMMARY OF BGS RECORDS

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
On-site - SW	2.60 m	Not encountered	Sandy to very stiff red/brown CLAY > 2.60 m	Not encountered
On-site - N	3.00 m	Sandy clay with brick rubble 0.35 m	Stiff red/brown CLAY > 3.00 m	Not encountered
5 m NE	18.10 m	Clay Fill 0.30 m	Stiff CLAY > 18.10 m	Not encountered

There are no bedrock faults or any other linear geological features within 500 m of the site.

The Groundsure report indicates that the site is not located within a groundwater source protection zone, however, a Source Protection Zone 3 is located 432 m southeast Furthermore, there is one active groundwater abstraction within 1 km of the site. The groundwater abstraction is located 559 m SE with an annual volume of 131,400 m^3 for process water and abstracts the water direct from underground strata.

4.2. NATURAL LANDFORM AND GEOMORPHOLOGY

Based on the initial geological assessment, a review of available topographic data and pertinent mapping, E3P has undertaken a preliminary geomorphological assessment of the landform and its possible mechanism for formation.

A review of relevant records indicates that the site has not been subject to significant anthropogenic changes with the current site topography broadly representing natural landform, however, ground workings have taken place on-site due to the site's previous use as a Royal Ordnance Factory. Two stockpiles are also present on site.

4.3. GEOTECHNICAL DATA

Geotechnical data presented within a commercially available environmental database is summarised in Table 4.3

TABLE 4.3 SUMMARY OF GEOTECHNICAL DATA

HAZARD	DESIGNATION
Shrink-Swell Clay	Very low risk
Landslides	Very low risk
Ground Dissolution	Negligible risk
Compressible Ground	Negligible risk
Collapsible Deposits	Very low risk
Running Sand	Negligible risk

4.4. COAL MINING

The Groundsure report states the site is in an area that may be affected by coal mining.

A CA mining report was obtained (Ref: 51003339065001) dated 15th February 2023.

The CA operates a risk-based approach to the assessment of potential instability issues associated with future development of land located within the predefined CA consultation areas. This risk-based approach subdivides the potential risk into "low" and "high" risk categories.

The risk categories can be defined as:

Low-Risk Sites – Deemed to be land where coal mining has taken place, however, it was at such depth not to pose a risk to new development and it, therefore, contains no known recorded risks and as such no further assessment is required.

For low-risk sites, the CA categorically states:

> *If your proposed development is within the Development Low Risk Area there is no need for you to submit any coal mining information with your planning application and The Coal Authority will not be consulted by the LPA. The LPA will include our Standing Advice as an informative note within the decision notice.*

High-Risk Sites – Deemed to be landholdings located within an area known to contain legacy risks that include:

- Mine entries (shaft or adit);
- Shallow coal workings (recorded and probable);
- Workable coal seam outcrops;
- Mine gas sites and areas;
- Recorded coal-mining-related hazards;
- Geological features (fissures and break lines); and
- Former surface mining sites (sometimes using historic opencast extraction methods).

4.5. COAL MINING INFORMATION

Prior to the enactment of the Coal Mines Regulation Act (1872), which came into force on the 1st January 1883, there was no statutory requirement to record the extent of abandoned mine workings and as such the CA has no knowledge of extensive workings throughout the UK Coal Fields where shallow workings are present at a depth that could result in a subsidence event in the future (through successive cavitation) associated with failure of support mechanism.

To determine if a site may have unrecorded or recorded coal mine workings requires the consideration of a wide range of information and E3P has completed a review of relevant information in relation to potential coal mining activities.

In the first instance, E3P has reviewed the Coal Authority Online Viewer and an excerpt of this is presented as Figure 4.1. This map shows that the site lies within the coal mining reporting area but not a development high risk area. Furthermore, there are no coal seams noted to be present within close proximity of the site and the nearest mine entry is approximately 6 km away.

FIGURE 4.1 EXCERPT OF THE COAL AUTHORITY ONLINE VIEWER

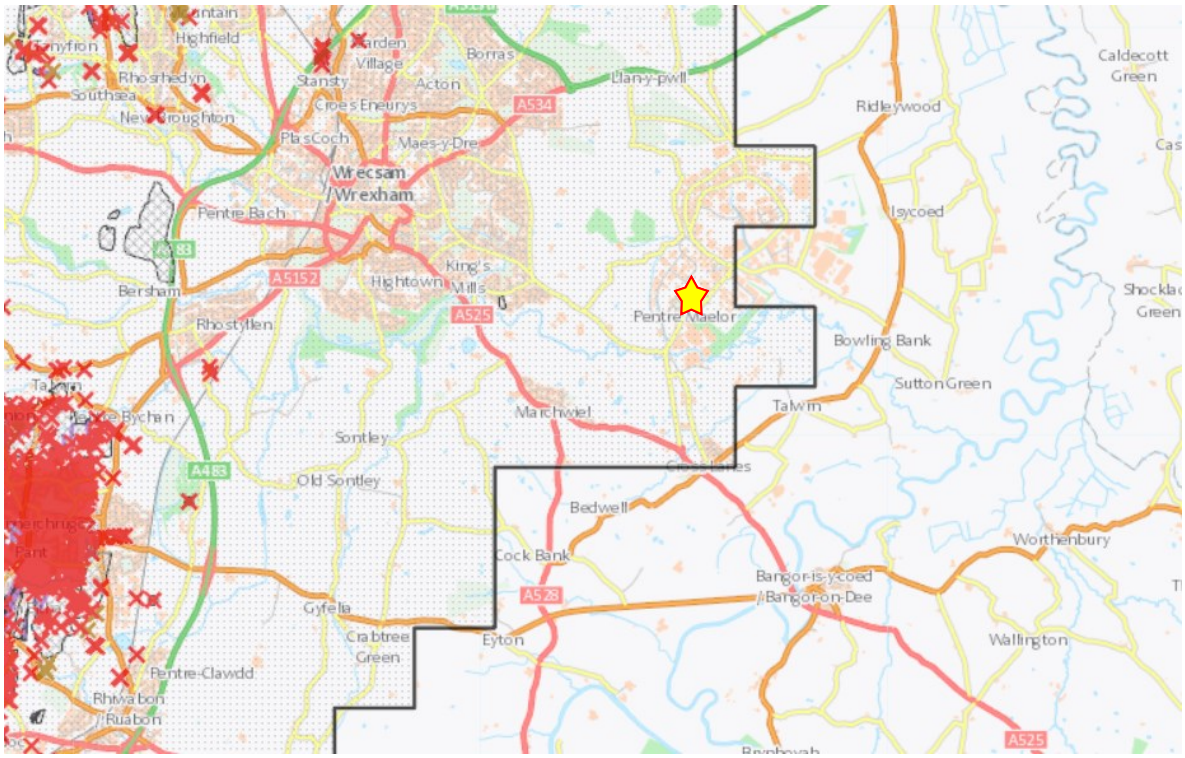


Table 4.4 provides a summary of pertinent coal mining information within the Coal Authority Mining Report (ref: 51003339065001).

TABLE 4.4 COAL MINING INFORMATION

SOURCES OF INFORMATION	SUMMARY
Known Past Underground Mining	No past mining recorded
Probable Unrecorded workings	None
Spine Roadways at Shallow Depth	No spine roadway recorded at shallow depth
Mine Entries within 100m of the site	None recorded within 100 m of the enquiry boundary
Mine Abandonment plans	None available
Known outcrops	No outcrops recorded
Faults / Fissures	No faults, fissures or breaklines recorded
Opencast mines	None recorded within 500 metres of the enquiry boundary
Coal Authority Managed Tips	None recorded within 500 metres of the enquiry boundary

SOURCES OF INFORMATION	SUMMARY
Remediated Sites	None recorded within 50 metres of the enquiry boundary.
Coal Mining Subsidence	The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.
Mine Gas	None recorded within 500 metres of the enquiry boundary
Mine Water	None recorded within 500 metres of the enquiry boundary
Future Underground Mining	None recorded
Coal Authority Development Advice	N/A
British Geological Survey Mapping	The 1:50,000 geological mapping for the area notes no coal mining related features within or around the site boundary. 
Historical Ordnance Survey Mapping	Mining related features do not appear on historical mapping in proximity of the site.
Historical Site Investigations	No pertinent information has been obtained from the historical site investigation report provided to E3P.

4.5.1. COAL AUTHORITY PLAN

The Coal Authority plan referenced: MR-LARGE-PLOT-51003339065001-1676470700317 shows no coal mining related features are located within or in close proximity to the site boundary.

FIGURE 4.2 COAL AUTHORITY PLAN FOR THE SITE



4.6. COAL MINING RISK ASSESSMENT

This risk assessment comprises a desk-based review of all available information on coal mining issues that are relevant to the application site deemed to be located within a high-risk area. This includes:

- Interpretation of information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues;
- Setting out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development; and
- Demonstrating to the local planning authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

The coal mining risk assessment is summarised in Table 4.5.

TABLE 4.5 SUMMARY OF COAL MINING RISK ASSESSMENT

COAL MINING RISK ASSESSMENT	YES/NO	RISK ASSESSMENT
Recorded Underground Coal Mining at Shallow Depth (< 30 m)	No	Negligible
Recorded Underground Coal Mining at Shallow Depth (> 30 m)	No	Negligible
Evidence of Unrecorded Surface Extraction of Coal Outcrop	No	Negligible
Unrecorded Underground Coal Mining at Shallow Depth (< 30 m)	No	Negligible
Mine Entries (Shaft/Adits)	No	Negligible
Coal Mining Geology – Fractures/Fissures	No	Negligible
Recorded Gas Emissions	No	Negligible

COAL MINING RISK ASSESSMENT	YES/NO	RISK ASSESSMENT
Recorded Mining Surface Hazard	No	Negligible
Surface Mining (Opencast)	No	Negligible

Based on the above, a negligible risk of unrecorded coal mining at shallow depth has been identified. It is considered that no further works will be required.

4.7. BRINE WORKINGS

The site is not situated within the Cheshire Salt Field and is not within an area deemed to be at risk from historic brine workings or rock salt extraction.

4.8. RADON RISK POTENTIAL

The site is located within an area where less than 1 % of homes are at or above the action level and therefore no radon protective measures are required.

4.9. PRELIMINARY GEOTECHNICAL ASSESSMENT

Based on the desk-study information, the following geotechnical assessment has been made:

- It is likely there will be significant Made Ground deposits and obstructions in the locations of the former building footprints. All relict foundations will require grubbing out, prior to the construction of the proposed development.
- A number of historically infilled ponds are present within the site boundary, which are potential sources of alluvial deposits, silts and possible organic peat deposits in addition to potential depths of Made Ground. Investigation will be required in order to assess these and undertake in-situ geotechnical testing to determine the likely foundation solution for plots in these areas.
- There are no great topographical variances in the forms of mounds running the length of the site. In order to construct the proposed development, significant earthworks will be required to create a level developable platform.
- An assessment of volume change potential will be required where cohesive drift deposits are identified.

4.10. HYDROLOGY

Surface water features within 250 m of the subject site are summarised in Table 4.6.

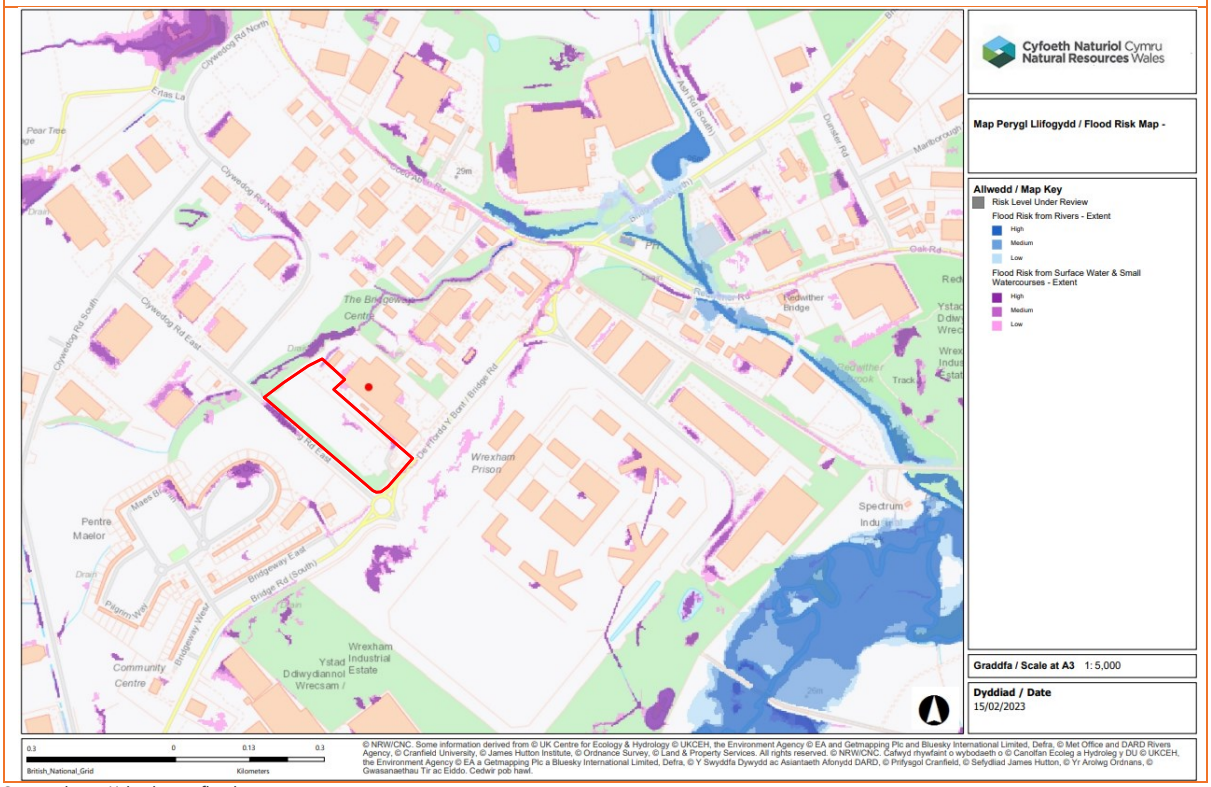
TABLE 4.6 SURFACE WATER FEATURES

SURFACE WATER FEATURE	QUALITY	DISTANCE (m)	DIRECTION
Inland River	Unknown	0 m	N
Inland River	Unknown	15 m	NW
Inland River	Unknown	175 m	N
Inland River	Unknown	177 m	N

SURFACE WATER FEATURE	QUALITY	DISTANCE (m)	DIRECTION
Inland River	Unknown	180 m	N
Inland River	Unknown	182 m	N
Inland River	Unknown	196 m	S

The site is predominantly located within a currently defined "Flood Risk Zone 1"; defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding (< 0.1%), and as such is considered to be unaffected by river flooding. The drain in the north east of the site is noted to be of medium flood risk from surface water and small watercourses. In addition, the Groundsure report states there is a limited potential for groundwater flooding to occur at the site. The National Resources Wales (NRW) Flood Risk Map for the site is presented in Figure 4.3.

FIGURE 4.3 NRW FLOOD RISK MAP



Source - https://check-your-flood-risk.naturalresources.wales/home/GetRiskLevels?rnd=1676460889473&postcode=ll13%209ps&address=HYDRO%20ALUMINIUM%20DEESIDE%20LTD%2C%20BRIDGE%20ROAD%2C%20WREXHAM%20INDUSTRIAL%20ESTATE%2C%20WREXHAM%2C%20LL13%209PS&latitude=337601.11&longitude=349283&localCustodianCode=6955&culture=en-GB#results-view

4.11. INDUSTRIAL LAND USES

Industrial land uses within 250 m are summarised in Table 4.7.

TABLE 4.7 SUMMARY OF INDUSTRIAL LAND USES

FEATURE	CATEGORY	DISTANCE (m)	DIRECTION
Electricity Sub-Station	Infrastructure and Facilities	5 m	NE
Hydro	Industrial Products	43 m	NE
Electricity Sub-Station	Infrastructure and Facilities	77 m	W
Decor-Jam Ltd	Industrial Products	120 m	NW
K D Insulation Services Ltd	Construction Services	121 m	NE
Unimaq	Industrial Products	126 m	NE
Bridgeway Garage	Repair and Servicing	126 m	NE
Electricity Sub-Station	Infrastructure and Facilities	155 m	W
Electricity Sub-Station	Infrastructure and Facilities	158 m	NW
Hydraquip	Engineering Services	168 m	N
Electricity Sub-Station	Infrastructure and Facilities	169 m	N
Eriks Industrial Services	Repair and Servicing	173 m	N
Williams Services	Repair and Servicing	184 m	NE
A S T Plastic Containers UK	Industrial Products	199 m	NW
Electricity Sub-Station	Infrastructure and Facilities	215 m	NE
D H D	Industrial Products	220 m	NE
Associated Toolmakers Ltd	Industrial Products	227 m	NE
Electricity Sub-Station	Infrastructure and Facilities	233 m	NW
Electricity Sub-Station	Infrastructure and Facilities	243 m	NW

4.12. SENSITIVE LAND USES

The closest residential properties are located 70 m to the southwest of the site. The site is within a SSSI Impact Risk Zone stating aviation infrastructure requires consultation. Furthermore, any industrial/ agricultural development that has the potential to cause air pollution also requires consultation prior to construction. An ancient semi-natural woodland is recorded at the northern site boundary.

4.13. SITE SENSITIVITY ASSESSMENT

The site is assessed to be located within a “Moderate” sensitivity setting as discussed in Table 4.8.

TABLE 4.8 SITE SENSITIVITY ASSESSMENT

SENSITIVITY PROFILE	DISCUSSION	RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not located within a source protection zone or a drinking water safeguard zone.	Low
Distance to the Closest Groundwater Abstraction Point	The nearest active groundwater abstraction point is located 559 m southeast of the site for the purpose of process water.	Low
Aquifer Classification in Superficial Drift Deposits	Secondary Undifferentiated	Low
Aquifer Classification in Bedrock	Secondary A	Moderate
Is the Site Underlain by Low-Permeability Drift to Depths in Excess of 10 m?	BGS boreholes have been completed to circa 18 m bgl and show superficial deposits underlying the site comprising very stiff, slightly sandy CLAY soils. These will reduce the potential for mobile phase contaminants to migrate towards the bedrock aquifer.	Low
Is the Site Located Within 50 m of a Surface Watercourse?	The nearest surface watercourse is an inland river located 15 m NW of the site. There is a drain present in the very north east of the site.	High
Sensitive Land Uses	Residential properties are located approximately 70 m SW of the site. The site is located in a SSSI Impact Risk Zone. An ancient semi natural woodland is present at the northern site boundary.	High
OVERALL SITE ENVIRONMENTAL SENSITIVITY		Moderate

5. REGULATORY DATA

5.1. LANDFILL SITES AND WASTE TREATMENT SITES

There are no recorded historical or active landfill sites within 500 m of the subject site.

5.2. REGULATORY DATABASE

The information summarised in Table 5.1 has been obtained from a commercially available environmental database. The summary table only includes records from within 250 m of the subject site and are not otherwise detailed in the report.

TABLE 5.1 SUMMARY OF ENVIRONMENTAL DATA

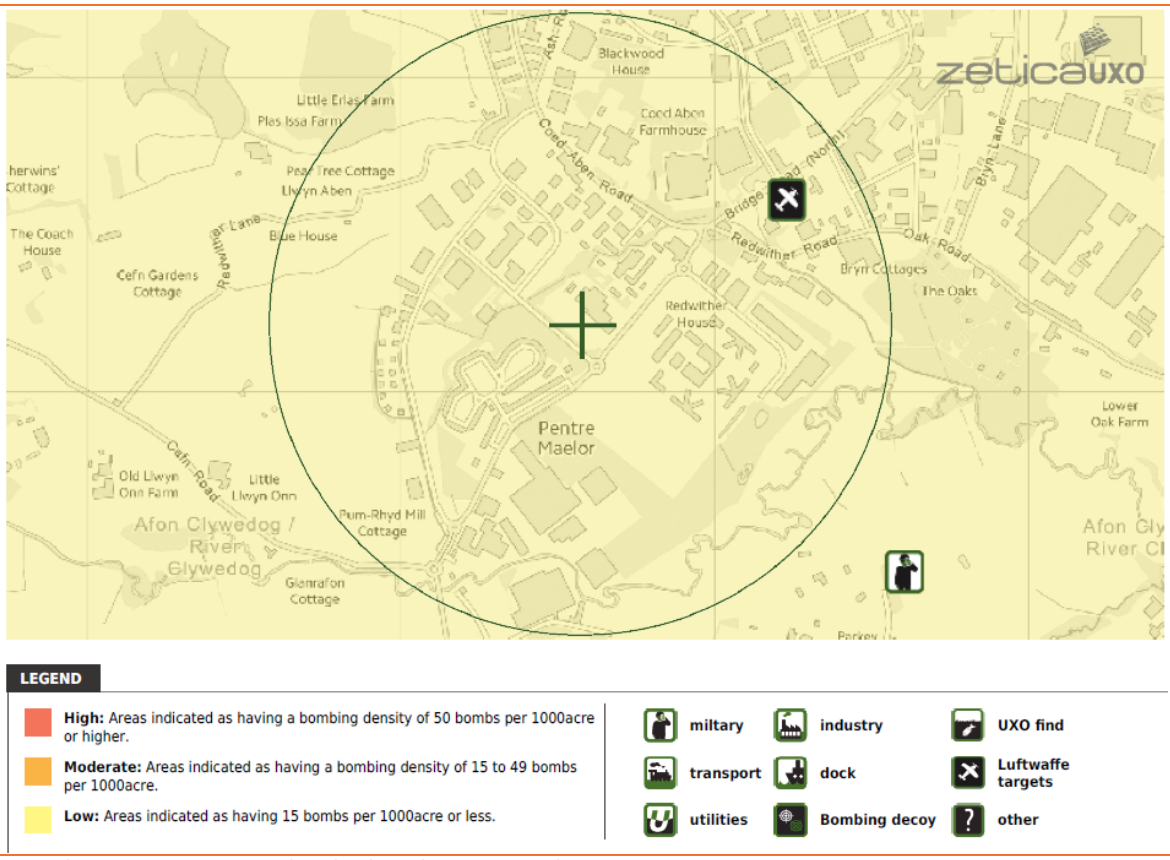
RECORD	ENTRIES WITHIN 250 m	DETAILS
Contaminated Land Register Entries and Notices	0	None Identified
Authorised Industrial Processes (IPC/IPPC/LAPPC)	15	All assigned to Hydro Aluminium Deeside Ltd for melting non-ferrous metals, melting with lead/ cadmium – all from same license created in 2004 and then renewed in 2015, 2018 and 2022.
Fuel Stations Entries	0	None Identified
Licensed Radioactive Substances	0	None Identified
Enforcements, Prohibitions or Prosecutions	0	None Identified
Discharge Consents	2	No active licensed discharges
Pollution Incidents	7	08/05/2002 – 46 m NE – Unidentified pollutant – Minor impact on air 08/05/2002 – 46 m NE – Unidentified pollutant – Minor impact on air 17/08/2001 – 81 m SW – Atmospheric pollutant – Minor impact on air 02/07/2013 – 85 m SW – Unidentified pollutant – No impact 04/05/2001 – 207 m N – Waste Materials – Minor impact on water 16/07/2014 – 232 m NE – Smoke – No impact 01/06/2001 – 233 m NE – Unidentified pollutant – Minor impact on water
Consents Issued Under the Planning (Hazardous Substances) Act 1990	0	None Identified

RECORD	ENTRIES WITHIN 250 m	DETAILS
Control of Major Accident Hazard (COMAH) Sites	0	None Identified

5.3. UNEXPLODED ORDNANCE

The regional unexploded bomb risk map from Zetica (2014) indicates that the site is in an area at low risk from possible unexploded ordnance (UXO) resulting from the Second World War. The Zetica UXO Risk Map is presented as Figure 5.1.

FIGURE 5.1 ZETICA UXO RISK MAP



Source - https://zeticauxo.com/downloads-and-resources/risk-maps/

A preliminary UXO risk assessment has been obtained from Brimstone which is included in Appendix VII. The main findings of the report have been summarised below:

- *The wider Wrexham area did not experience air raids during WWI.*
- *The Site was located within the WWII-era Rural District of Wrexham which sustained 3.8 bombs / 1,000 acres, a very low bombing density.*
- *No evidence of bombing within 500 m of the site identified at a preliminary stage.*

- *No historic mapped evidence of bomb damage in the immediate vicinity.*
- *Royal Ordnance Factory (ROF) Wrexham was a large WWII cordite manufacturing factory. The Site was located within a relatively central location area; it appears to have comprised a bunded structure potentially used for ordnance storage. Past experience confirms that UXO contamination of such sites can and did occur.*
- *During WWII, the Site occupied a section of ROF Wrexham, largely comprising open, undeveloped ground with a partially bunded structure.*
- *This structure, and seemingly the associated bunding, had been cleared by 2006. A bunded feature was present in the centre of the Site, although its origin is unknown at a preliminary stage. By this time, an area of hardstanding was also located in the east. The large area of hardstanding in the west, and associated accessway, had been laid by 2021.*
- *The risk associated with (any) very shallow buried UXO will have been partially mitigated. The risk associated with (any) shallow and deep buried UXO will likely remain mitigated.*
- *As the Site was located relatively centrally within the factory complex, the risk that ordnance storage features were located on or adjacent to the Site cannot be discounted at a preliminary stage. Note, a structure potentially related to ordnance storage is visible on Site in WWII-era photography.*
- *It is quite possible that an unexploded British AA shell struck the Site during WWII and penetrated to a shallow depth. However, any such UXO incident is highly unlikely to have been overlooked within this sensitive site.*
- *The proposed SI works will disturb a relatively large volume of soil, thereby increasing the probability of a UXO encounter.*

A Stage 2 Detailed Risk Assessment is recommended to assess the risk to the proposed development and any necessary groundworks.

5.4. CONSULTATION WITH EHO

Consultation with the Environmental Health Officer for Wrexham County Borough Council has confirmed the following:

- The site is not registered as contaminated land.
- The site may be considered and possibly investigated as contaminated land in the future in light of the details below however it is not currently being looked at under the Part 2a legislation and it is unlikely any inspection would occur in the near future.
- The contaminated Land Team does not yet have a comprehensive land database regarding historic land use of contamination. However, the limited information available indicated the site is situated in an area formerly used by the MoD for the manufacture of explosives.
    i. The Royal Ordnance Factory (ROF) was the largest explosives factory in the area.
    ii. The site covered an area of over 1400 acres and was served by its own railway.
    iii. It became operational in 1941 and was spread out a large area to minimise damage from accidental explosion.
    iv. Two units were built for the manufacture of Cordite W.
    v. Decommissioned on 11th August 1945.
    vi. Cordite was produced using Nitrocellulose (NC) guncotton, Nitro-glycerine (NG) and the inclusion of Nitroguanidine (Picrite).
- After the closure of the site, the land was sold for redevelopment as Wrexham Industrial Estate.
- Records show there may be three former ponds on site.
- The Wrexham County Borough Council Contaminated Land Team are not aware of a reason why the site would not be considered suitable for its current use (commercial/industrial), however in relation to a future redevelopment, all potential contamination issues would be dealt with through the planning process and our recommendations for a contamination assessment would be dependent on the specifics of the planning application.

6. INITIAL CONCEPTUAL SITE MODEL

In accordance with EA LCRM (2019) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), E3P has developed an initial conceptual site model (CSM) to identify potential contamination sources, migration pathways and receptors within the study area. This is summarised within Table 6.1.

ON-SITE SOURCES OF CONTAMINATION

The following potential on-site sources of contamination have been identified:

- Made Ground (footprint of former structures, tracks, former Royal Ordnance Factory) – Heavy metals, asbestos, Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated biphenyls (PCBs), Total Petroleum Hydrocarbons (TPHs), Hazardous Ground Gas (carbon dioxide, methane)
- Former earthworks/ infilled ground (former ponds and field boundaries) – Heavy metals, asbestos, PAHs, TPHs, Hazardous Ground Gas (carbon dioxide, methane)
- Agricultural land use, storage on site, lorry park (localised spillages of fuel) – PAH, TPH
- Former Royal Ordnance Factory – Explosives associated with cordite manufacturing (nitro-glycerine, nitrocellulose and picrite)

OFF-SITE SOURCES OF CONTAMINATION

The following potential off-site source of contamination have been identified:

- Works, Factory – 0 -750 m (all directions) – Made Ground – Heavy metals, inorganic compounds, PAHs, hydrocarbon compounds, asbestos, PCBs
- Electrical Sub Station – 5 m NE – PCBs
- Tank – 42 m N – Spillages/Leaks – PAH, TPH, S/VOC

The main contaminants of concern identified from the off-site sources indicated above are deemed to present a low risk as the sources are likely associated with minor leaks, spills, and localised isolated events occurring away from the site itself.

TABLE 6.1 INITIAL CONCEPTUAL SITE MODEL

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL1 PL2	Heavy Metals, non-volatile PAH, TPH, PCBs (Made Ground)	Dermal contact. Dermal contact and ingestion.	Future site users. Off-site receptors.	Likely	Moderate	LOW
Assessment: Due to the previous development on site, it is considered likely that Made Ground will be present in the location of former structures and tracks. Infilled ponds and field boundaries are also a potential source of Made Ground. The Made Ground material is likely to comprise inert material such as brick and concrete and may be a source of low-level heavy metal and non-volatile PAH contamination. The previous ground investigation completed by Genesis Environmental Ltd identified elevated concentrations of lead and zinc in Made Ground to the northwest of the main factory building in two out of six sampling locations. PCBs were also identified in soil samples which were likely associated with the former capacitors factory, therefore the presence of PCBs on the subject site area cannot be discounted. Heavy metals, non-volatile PAHs and PCBs may pose a short-term risk to construction workers who may come into contact with impacted soils during earthworks. There is also a risk to future commercial end users through dermal contact and ingestion in areas of soft cover. **Recommendation:** Intrusive investigation required to confirm the above assessment. Provision of hard standing or clean cover system may be required to mitigate risks to future users. Construction works completed with PPE and provision of welfare.						
PL1 PL2 PL4	Explosives associated with cordite manufacturing (nitro-glycerine, nitrocellulose and picrite)	Dermal contact and ingestion Vapour inhalation	Future site users. Off-site receptors.	Likely	Moderate	LOW
Assessment: The site was formerly part of the Wrexham Royal Ordnance Factory, where cordite was manufactured on the subject site. As such the site is at risk from explosive compounds such as nitro-glycerine, nitrocellulose and picrite which can affect human health through inhalation along with dermal contact and ingestion. If present, the compounds identified may pose a risk to future end users as well as construction workers during any future earthworks. Additionally, if present the determinants above pose a flammable and explosive risk. The previous phase of ground investigation no evidence of contamination by explosives was identified however it was concluded that their presence cannot be excluded.						

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
Recommendation: An intrusive investigation will be required to confirm the above assessment. Should nitro-glycerine, nitrocellulose and picrite contamination be identified during the intrusive phase of works, appropriate mitigation and remediation measures will be required.						
PL3	ACM in Made Ground	Inhalation of dust.	Future site users. Buildings. Off-site land users.	Likely	Moderate	**LOW**
Assessment: Due to the previous development on site and its use as a storage facility, it is considered likely that Made Ground will be present on site. The Made Ground material may contain ACM/fibres. ACM poses a risk through fibre and dust inhalation and if present may pose a risk to future site users as well as construction workers during any future earthworks/demolition and to adjacent third-party property should dust be generated during those works. **Recommendation:** An intrusive investigation will be required to confirm the above assessment. These risks can be mitigated through the development of a detailed enabling works strategy following guidance and protocol specified within the Control of Asbestos Regulations (2012) and industry best practice as detailed in CIRIA733 (Asbestos in Soil and Made Ground: A guide to understanding risk). Construction works completed with PPE and provision of suitable welfare.						
PL4	Volatile contaminants such as hydrocarbons – fuel spillages, vehicle storage, agricultural equipment	Inhalation of vapours. Migration through permeable strata and preferential pathways.	Future site users. Off-site receptors.	Low Likelihood	Low	**LOW**
Assessment: No significant sources of volatile contamination have been identified. Possible fuel leaks/spills associated with vehicle storage may be a potential source of volatile hydrocarbons. Future site users may be exposed to volatile contaminants via inhalation and accumulation of vapours in indoor space, representing a long-term risk. Volatile contamination may pose a short-term risk to construction workers, particularly in confined spaces.						

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
Recommendation: Investigation is required to confirm if the Made Ground soils are impacted by volatile contaminants. Should potentially volatile contamination be identified during the intrusive phase of works, appropriate mitigation measures will be required.						
PL4	Methane, carbon dioxide – Made Ground, infilled ground (former ponds, field boundaries)	Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces.	Future site users. Buildings. Off-site land users.	Likely	Moderate	**LOW**
Assessment: Due to the previous development on site, it is considered likely that Made Ground will be present on site. This Made Ground material, the infilled ponds and field boundaries, together with any off-site infilled features within close proximity, may be sources of hazardous ground gases such as carbon dioxide and methane which have associated asphyxiation and explosive risks. **Recommendation:** An intrusive investigation will be required, with the installation of monitoring wells to facilitate gas monitoring recommended to assess for the presence of ground gases. Risks to future end users can be mitigated through the installation of ground gas protection measures in new structures.						

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL5	Mobile contaminants – Made Ground, possible fuel spills	Surface runoff. Migration through permeable strata and preferential pathways. Perched waters migration.	Groundwater (secondary A aquifer). Surface water (Inland river 15 m NW and on-site drain).	Low Likelihood	Low	LOW
Assessment: No significant sources of mobile contamination have been identified. Localised impacted Made Ground represents a potential source of mobile contamination. Possible fuel leaks/spills associated with vehicle storage may be a potential source of hydrocarbons. The site is underlain by a secondary A bedrock aquifer, a drain is present on site and an inland river is located 15 m north. Cohesive drift deposits will somewhat reduce the potential for mobile phase contaminants to migrate towards the underlying bedrock aquifer. The sensitivity of the aquifer is reduced given there are no potable groundwater abstractions within 1km. **Recommendation:** Intrusive investigation with chemical analysis of soil and groundwater samples is recommended to assess the presence of mobile contaminants and facilitate further risk assessment.						
PL6	Sulphate in Made Ground	Sulphate attack on concrete.	Building structure.	Low Likelihood	Low	LOW
Assessment: The presence of pH and sulphate within any localised Made Ground deposits may result in corrosion of buried concrete within the proposed development. **Recommendation:** Assessment must be undertaken to confirm the levels of pH and sulphate at the subject site and thus determine the concrete classification						

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL7	Organic contaminants – TPH (Made Ground, Works/Factory)	Ingestion of tainted water supply.	Future site users. Water pipes.	Likely	Moderate	LOW
Assessment: Likely probability as there is potential for contamination at pipeline depth across the site (0.75–1.35 m). Elevated hydrocarbon concentrations may be present in localised areas beneath the site as a result of possible fuel spillages. **Recommendation:** An intrusive investigation is required to confirm the requirements for the proposed water supply.						
PL8	Phytotoxic contaminants (Made Ground)	Direct Contact (plant uptake).	Flora.	Likely	Low	LOW
Assessment: Contamination may be present within shallow Made Ground which may be taken up by flora in soft landscaping, however, the majority of the proposed surface cover is likely to be hardstanding. **Recommendation:** Intrusive investigation required to confirm the above assessment. If identified, a cover system may be required within any future proposed landscaped areas.						

Main exposure pathways:
PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants;

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. SITE SUMMARY

Current Site Use	The subject site is a rectangular shaped parcel of land located to the east of Wrexham and is currently used for storage of goods by Hydro Aluminium Deeside Ltd. Goods stored on site comprise aluminium billets manufactured through a recycling process within the main facility located to the north east of the development area. There is a large mound running along the southwestern boundary extending approximately 7 m above ground level. There is also a smaller mound running along the north-eastern boundary adjacent to the main Hydro aluminium Deeside Ltd facility, however this only extends 2-3 m above ground. The material within the mounds appears to be a mix of soil and stones with some timber and metal. Scrub vegetation is present on the north-eastern mound with the southwestern stockpile covered in semi-compacted soil and gravel. Semi-mature trees line the north-western and southwestern boundaries, with no vegetation present in the northern sector. A service road runs through the centre of the site with an associated weigh bridge. A storage area and lorry park are present in the northwest and southeast respectively.
Historical Site Use	Historical mapping suggests that the site remained as undeveloped agricultural land with ponds until circa 1949, when it was transformed as a part of Royal Ordnance Factory (ROF) Wrexham. A number of buildings were constructed and associated tracks, which remained in place until circa 1976 when all buildings were removed from site. By 1986, the site was vacant with no features noted on the mapping and it remained this way until 2000 when an entry gate was constructed along the south-eastern boundary. By 2020 the service road through the centre of the site had been constructed, and the site remains in this layout to the present day.
Site Sensitivity	The site is considered to be in a moderate sensitivity area due to the location of residential properties and surface watercourses, situated 70m SW and 15m NW of the site respectively.

7.2. CONTAMINATED LAND ASSESSMENT

Human Health	Due to the previous development on site, it is considered likely that Made Ground will be present in the footprint of former structures and tracks. Former ponds and field boundaries are also a potential source of Made Ground. The Made Ground material is likely to comprise inert material such as brick and concrete and may be a source of low-level heavy metal, PAH, TPH and asbestos contamination. As the site has also previously been used as agricultural land, albeit pre1961, this may have resulted in unrecorded storage of farming equipment and the potential for localised fuel spillages. There is also potential for fuel spillages to occur around the lorry park, due to refuelling and generic vehicle oil and fuel leaks. The site was formally part of Wrexham Royal Ordnance Factory with the site producing cordite. Therefore, there is considered to be a risk of explosive contamination in the form of nitro-glycerine, nitrocellulose and picrite.
Controlled Waters	No significant sources of mobile contamination have been identified. Localised impacted Made Ground represents a potential source of mobile contamination. Possible fuel leaks/spills associated with vehicle storage may be a potential source of hydrocarbons. The site is underlain by a secondary A bedrock aquifer and an inland river is located 15 m north. BGS boreholes have been completed to circa 18 m bgl and show superficial deposits underlying the site comprising slightly sandy CLAY soils. These will reduce the potential for mobile phase contaminants to migrate towards the bedrock aquifer. The sensitivity of the aquifer is reduced given there are no potable groundwater abstractions within 1km. Intrusive investigation with chemical analysis of soil and groundwater samples is recommended to assess the presence of mobile contaminants and facilitate further risk assessment.
Ground Gas	Made Ground material that is present on site from historical development, may be a source of hazardous ground gases such as carbon dioxide and methane which have associated asphyxiation and explosive risks. In addition, the infilled field boundaries and ponds are a potential source of hazardous ground gases.
Potable Water	No significant sources of contamination have been identified that would pose a significant risk to the proposed potable water supply, however, this will need to be confirmed following intrusive investigation.

7.3. COAL MINING

Coal Mining	The site is located in a coal mining reporting area but not within a development high-risk area. There is no evidence of any coal mining activity within close proximity of the and it is therefore considered that there is no risk from coal mining.

7.4. GEOTECHNICAL ASSESSMENT

Geological	BGS borehole records on-site and in close proximity show shallow Made Ground deposits to circa 0.50 m bgl underlain by clay soils to depths in excess of 18.00 m bgl. A number of historically infilled ponds are present within the site boundary, which are potential sources of alluvial deposits, silts and possible organic peat deposits in addition to potential depths of Made Ground. Investigation will be required in order to assess these and undertake in-situ geotechnical testing to determine the likely foundation solution for plots in these areas.
Civil and Structural	It is likely there will be Made Ground deposits and obstructions in the location of the former structures on the site. All relict foundations will require grubbing out, prior to the construction of the proposed development. Shallow bedrock is not anticipated across the site.
Abnormal Foundations	Foundation solutions will be largely dependent on the proposed development levels and the requirement to cut and fill to achieve the development platform levels. An abnormal engineering solution may be required where there is significant thickness of Made Ground, tree influence, loose granular soils or soft cohesive deposits.

END OF REPORT

APPENDIX I
LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.

8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

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10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II
GLOSSARY

TERMS

ACM	Asbestos-containing material	**MMP**	Materials management plan
ADS	Acoustic design statement	**ND**	Not detected
AST	Above-ground storage tank	**NDP**	Nuclear density probe
BGS	British Geological Survey	**NMP**	Noise management plan
BSI	British Standards Institute	**NPSE**	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	**NR**	Not recorded
CA	Coal Authority	**PAH**	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	**PCB**	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	**PI**	Plasticity index
CIRIA	Construction Industry Research Association	**PID**	Photo ionisation detector
CLEA	Contaminated land exposure assessment	**POS**	Public open space
CML	Council of Mortgage Lenders	**PPE**	Personnel protective equipment
CoC	Contaminants of concern	**ProPG**	Professional practice guidance
CSM	Conceptual site model	**QA**	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	**SGV**	Soil guideline value
DWS	Drinking water standard	**SPH**	Separate-phase hydrocarbon
EA	Environment Agency	**SPT**	Standard penetration test
EQS	Environmental quality standard	**SVOC**	Semi-volatile organic compound
FFL	Finished floor level	**TPH**	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	**TPH CWG**	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	**UKWIR**	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	**UST**	Underground storage tank
HCV	Health criteria value	**VCC**	Vibro-concrete column
ICSM	Initial conceptual site model	**VOC**	Volatile organic compound
LEL	Lower explosive limit	**VRSC**	Vibro-replacement stone columns
LMRL	Lower method reporting limit	**VSC**	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	**WHO**	World Health Organisation
MCV	Moisture condition value	**WRAP**	Waste and Resources Action Programme

MIBK	Methyl isobutyl ketone	**WTE**	Water table elevation
m	Metres	**ppm**	Parts per million
km	Kilometres	**mg/m^3**	Milligram per metre cubed
% v/v	Percent volume in air	**m bgl**	Metres below ground level
mb	Millibars (atmospheric pressure)	**m bcl**	Metre below cover level
l/hr	Litres per hour	**mAOD**	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	**kN/m^2**	Kilonewtons per metre squared
ppb	Parts per billion	**µm**	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	**SSRT**	Site Specific Remediation Target
PSD	Particle Size Distribution	**DD**	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	**Mc**	Moisture Content
ρ	Bulk Density	**GPR**	Ground Penetrating Radar
NDP	Nuclear Density Probe	**FFL**	Finished Floor Level
LEL	Lower Explosive Limit	**UKWIR**	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	**LOD**	Limit of Detection

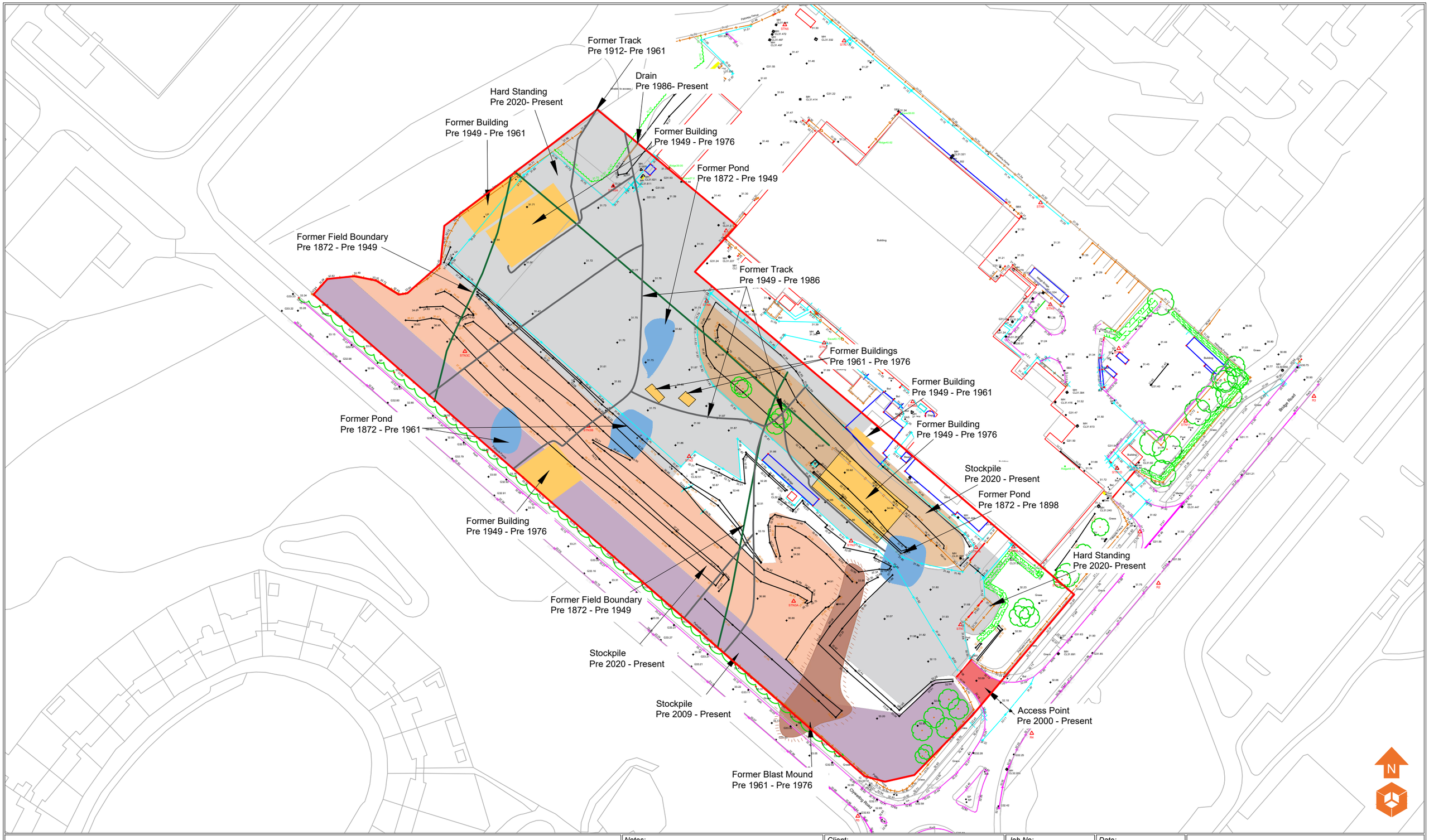
APPENDIX III
DRAWINGS

DRAWING 16-685-001 – SITE LOCATION PLAN





Notes:		Client: Pace	Job No: 16-685	Date: 09.05.2024	Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk		
			Drawing No: 002	Scale: NTS			
P1	REVA	09.05.2024	OW	BH	Job Title: Hydro Aluminium Deeside Ltd	Drawing Title: Proposed Development Plan	The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.
Phase	Issue	Date	Drawn	Checked			



Historical Features

- Former Buildings
- Former Ponds
- Former Field Boundaries
- Former Footpaths
- Former Blast Mound
- Stockpile
- Stockpile
- Stockpile
- Hard Standing
- Drain

Notes:

Client: Pace

Job No: 16-685

Date: 13.05.2024

Drawing No: 003

Scale: NTS

Phase	Issue	Date	Drawn	Checked
P1	REVE	13.05.2024	OW	BH
P1	REVD	12.04.2023	OW	GB
P1	REVC	04.04.2023	OW	GB
P1	REVB	27.02.2023	HM	BH
P1	REVA	15.02.2023	LM	MD

Job Title: Hydro Aluminium Deeside Ltd

Drawing Title: Historical Features Plan

e3p
Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
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Historical Features

- HGV Parking
- Stockpile
- Finished Product Storage Area
- Softstanding
- Service Road / Hardstanding
- Liquid Argon Storage
- HGV Loading Area
- Office Cabin
- Weighbridge
- Hedge
- Trees
- Lamp Posts
- Wooden Fence
- Site Enrance
- Barrier

Notes:

Client: Pace

Job No: 16-685

Date: 13.05.2024

Drawing No: 004

Scale: NTS

P1	REVD	13.05.2025	OW	BH
P1	REVC	05.05.2023	LM	BH
P1	REVB	27.02.2023	HM	BH
P1	REVA	17.02.2023	LM	MD
Phase	Issue	Date	Drawn	Checked

Job Title: Hydro Aluminium Deeside Ltd

Drawing Title: Site Features Plan

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APPENDIX IV
PHOTOGRAPHS

PLATE 1 LIQUID ARGON STORAGE TANK – SOUTH-EAST



PLATE 2 STOCKPILE – SOUTH-WESTERN BOUNDARY



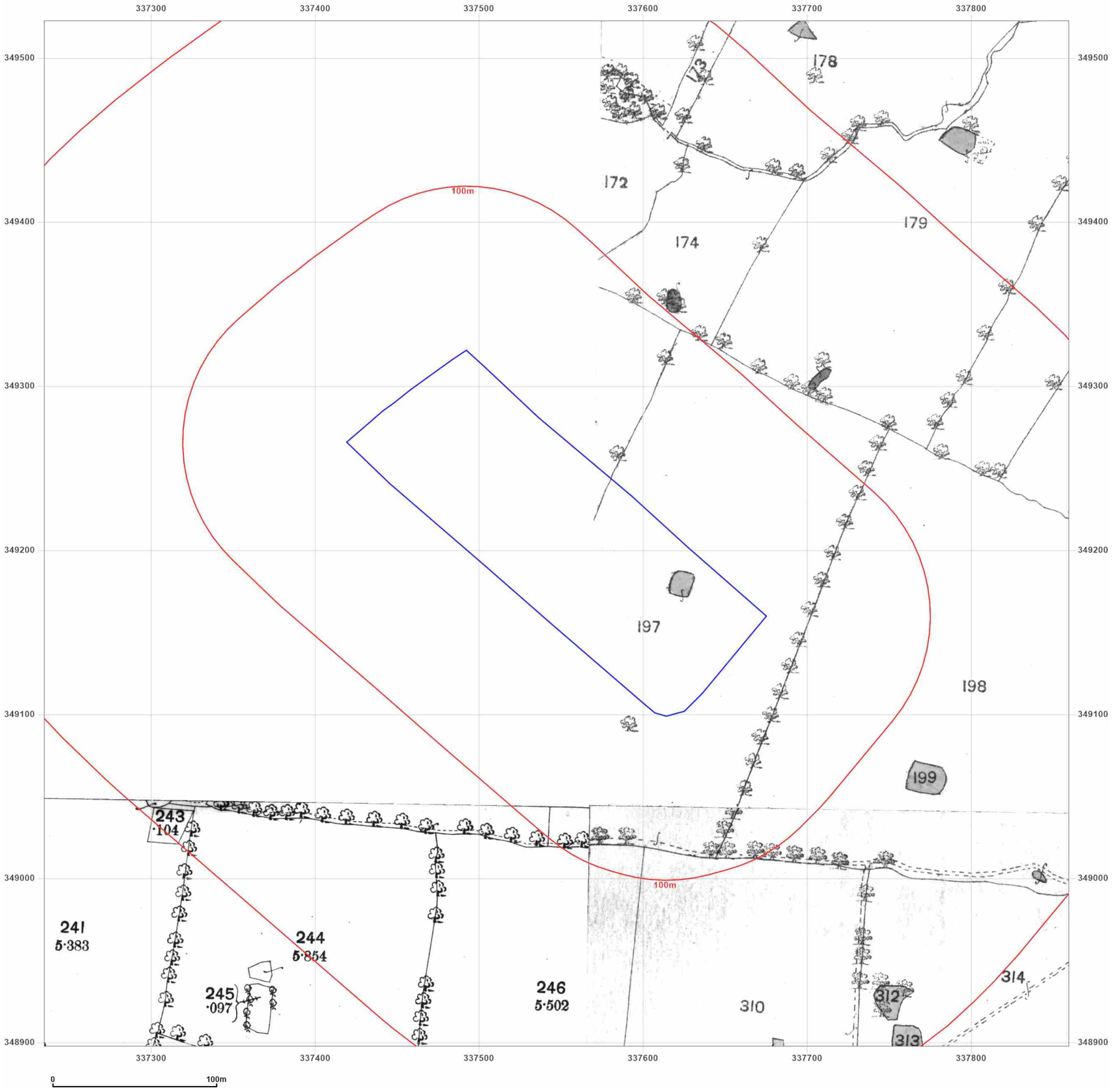
PLATE 3 LORRY PARK – SOUTH-WEST



PLATE 4 END PRODUCT STORAGE – NORTH



APPENDIX V
HISTORICAL MAPS



Groundsure INSIGHTS

Site Details:

337582 , 349213

Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: County Series

Map date: **1872-1873**

Scale: 1:2,500

Printed at: 1:2,500

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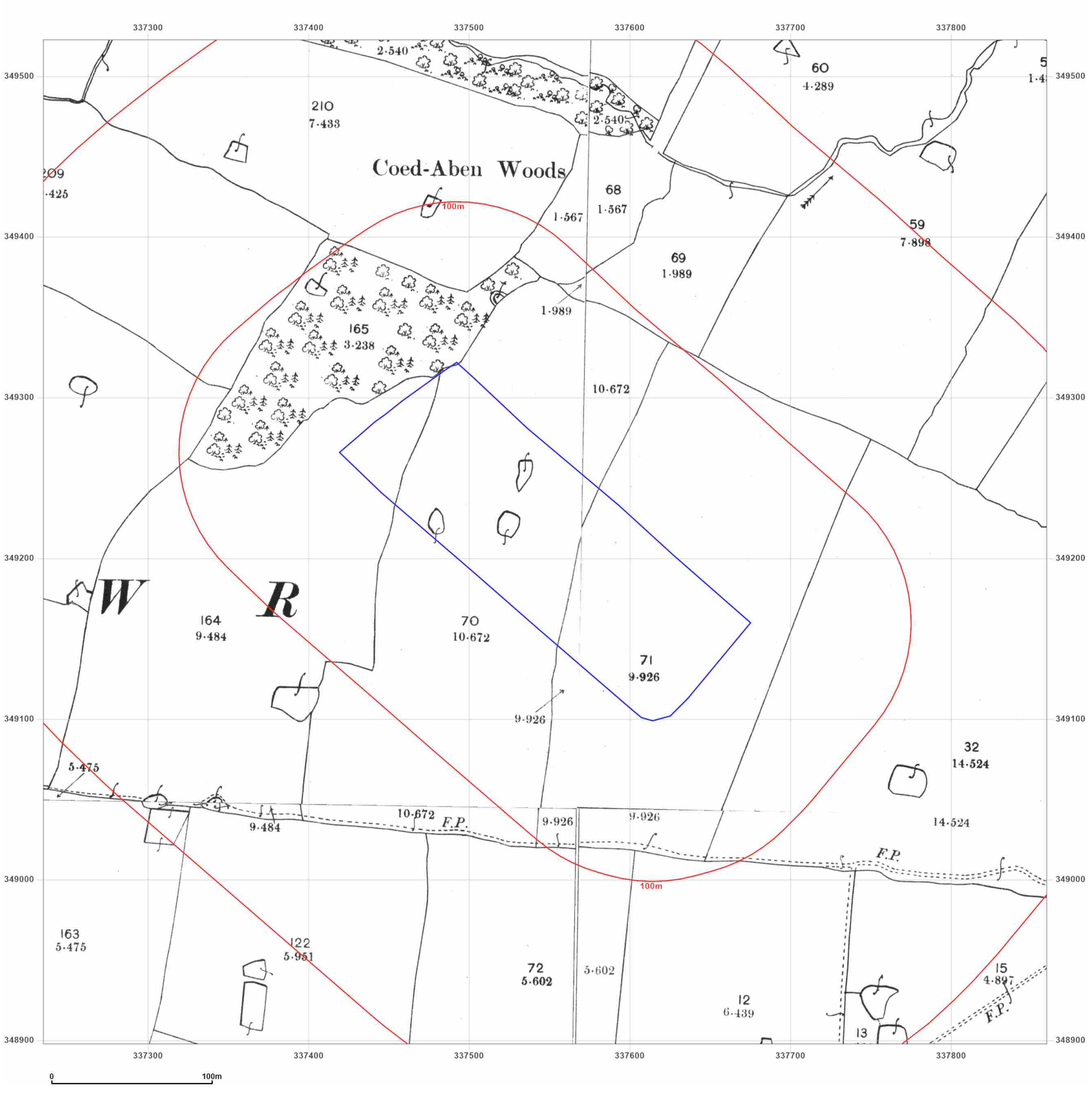
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Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: County Series

Map date: **1899**

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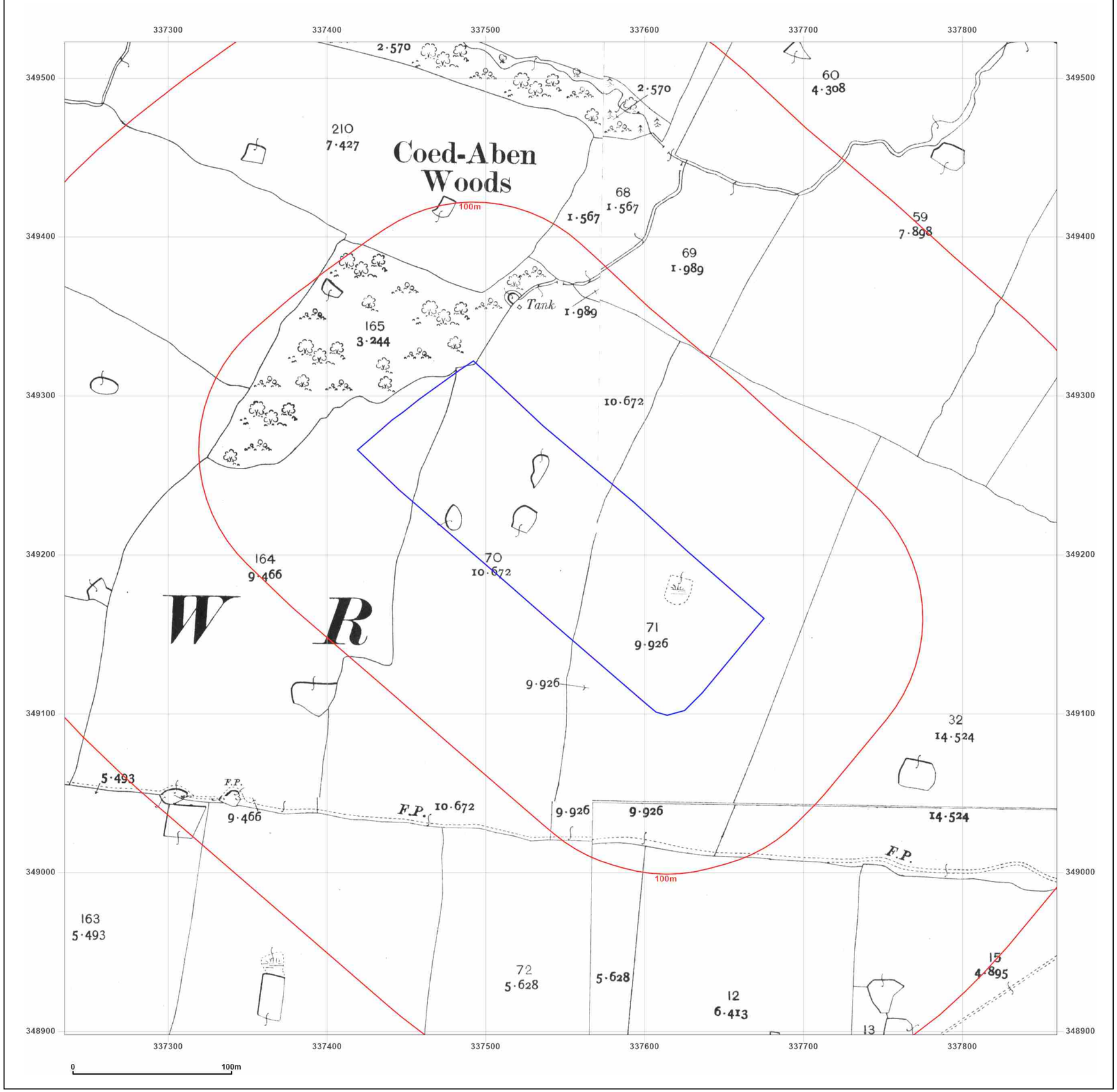
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Grid Ref: 337547, 349210

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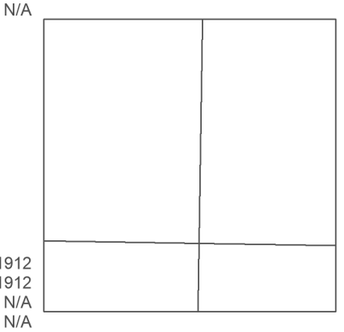
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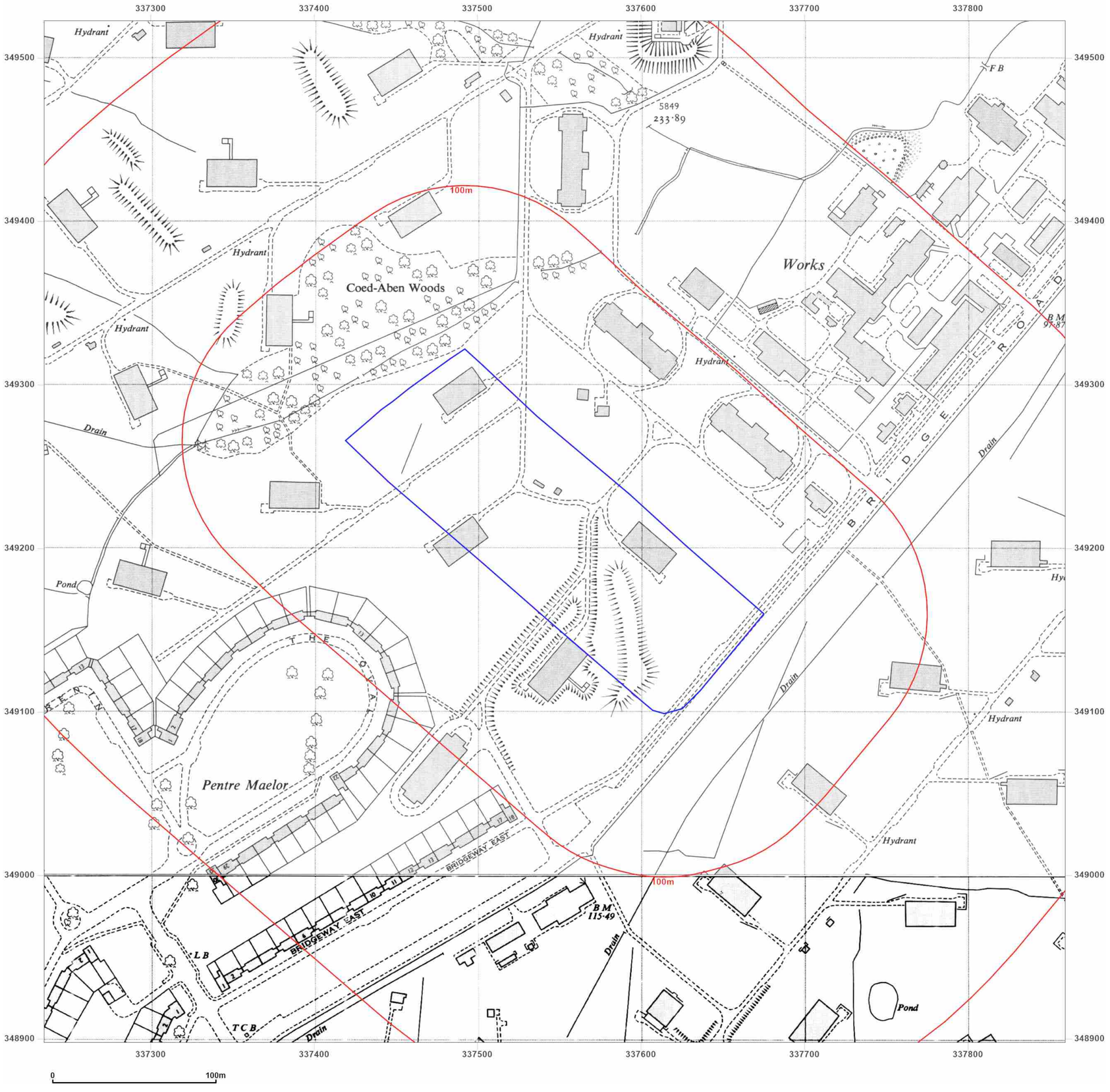
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Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1961**

Scale: 1:2,500

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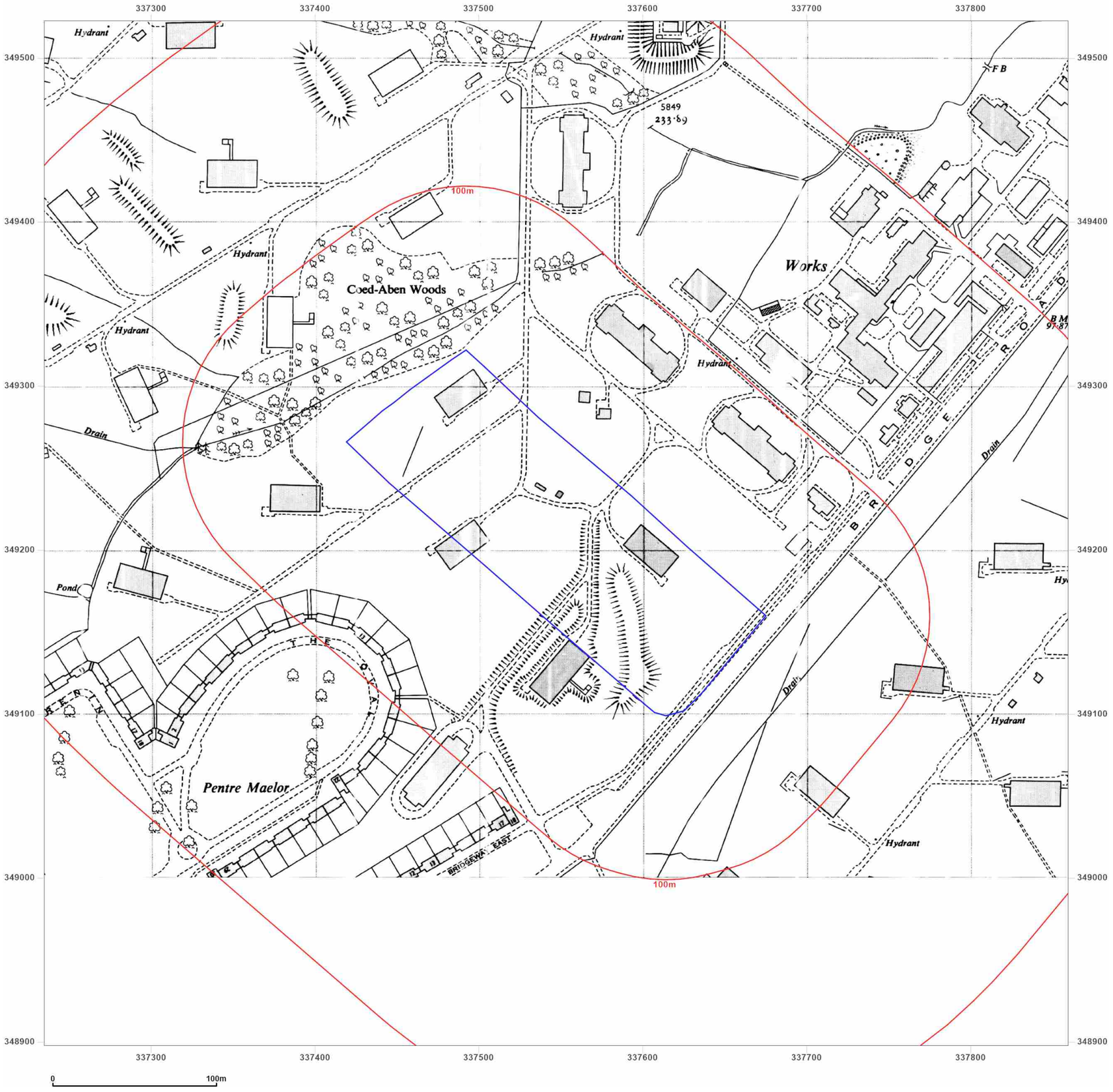
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Map date: **1961**

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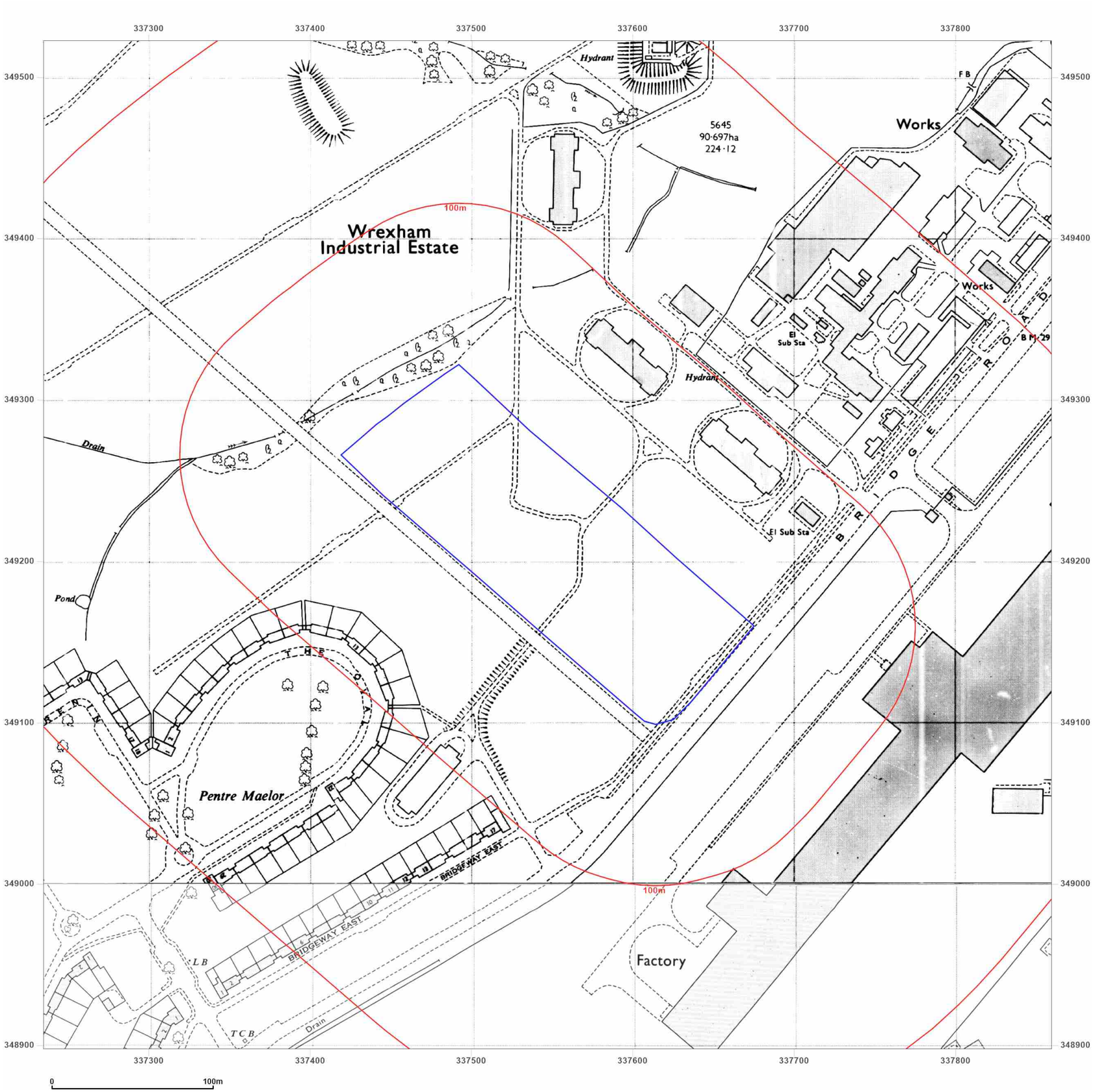
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Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1976-1978**

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Printed at: 1:2,500

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Revised 1976
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Copyright 1976
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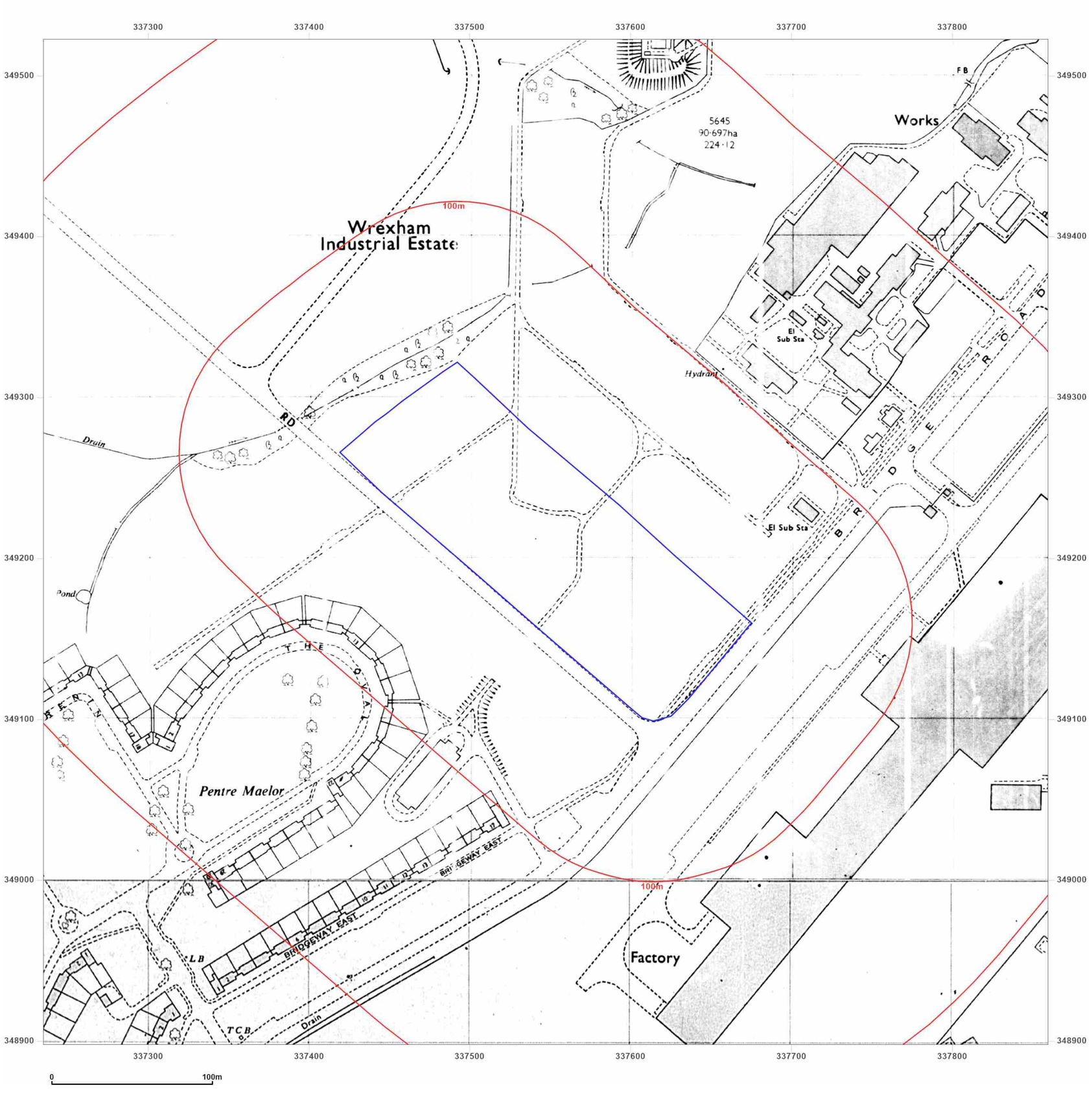
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Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1982**

Scale: 1:2,500

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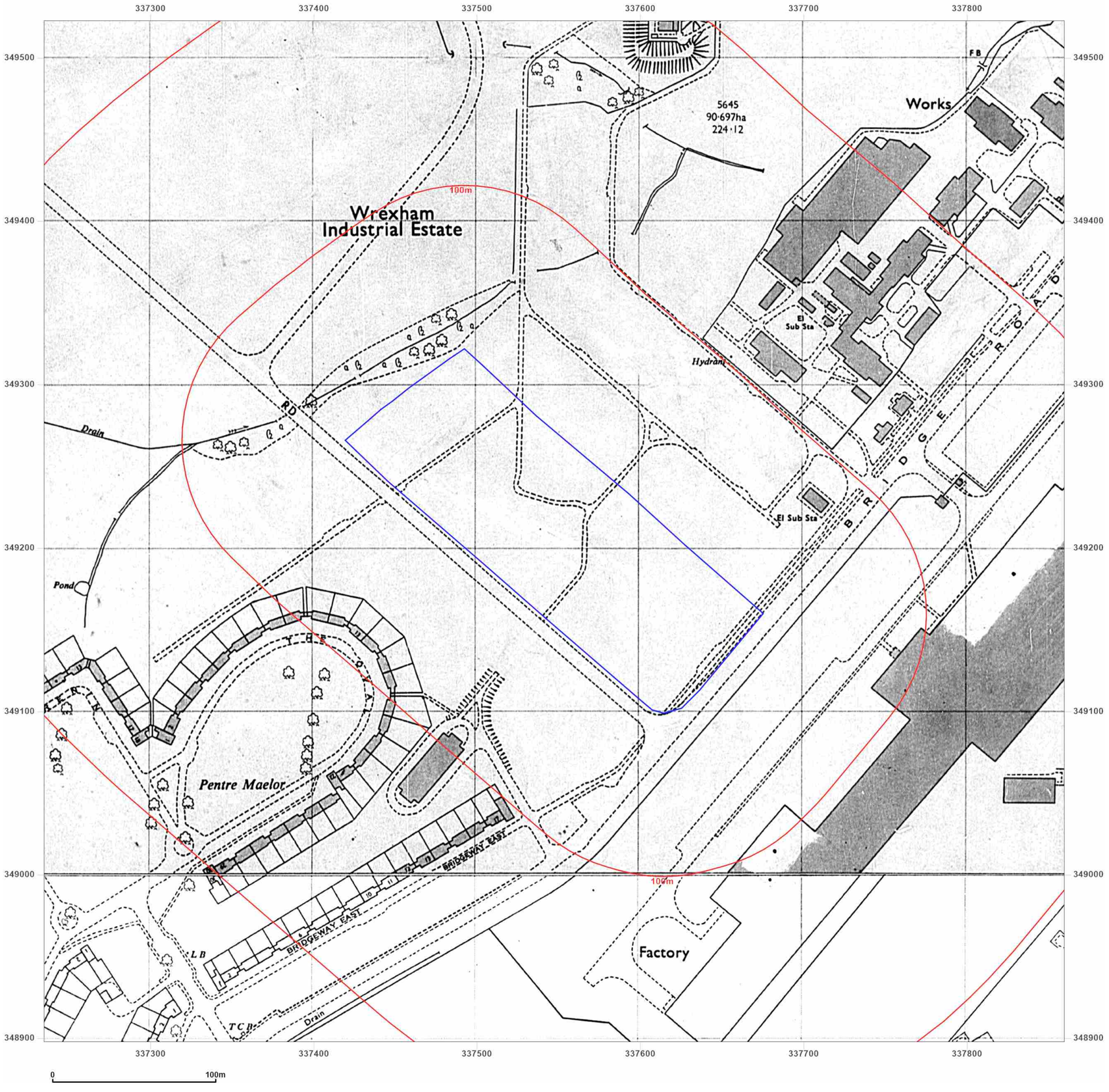
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Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1982-1984**

Scale: 1:2,500

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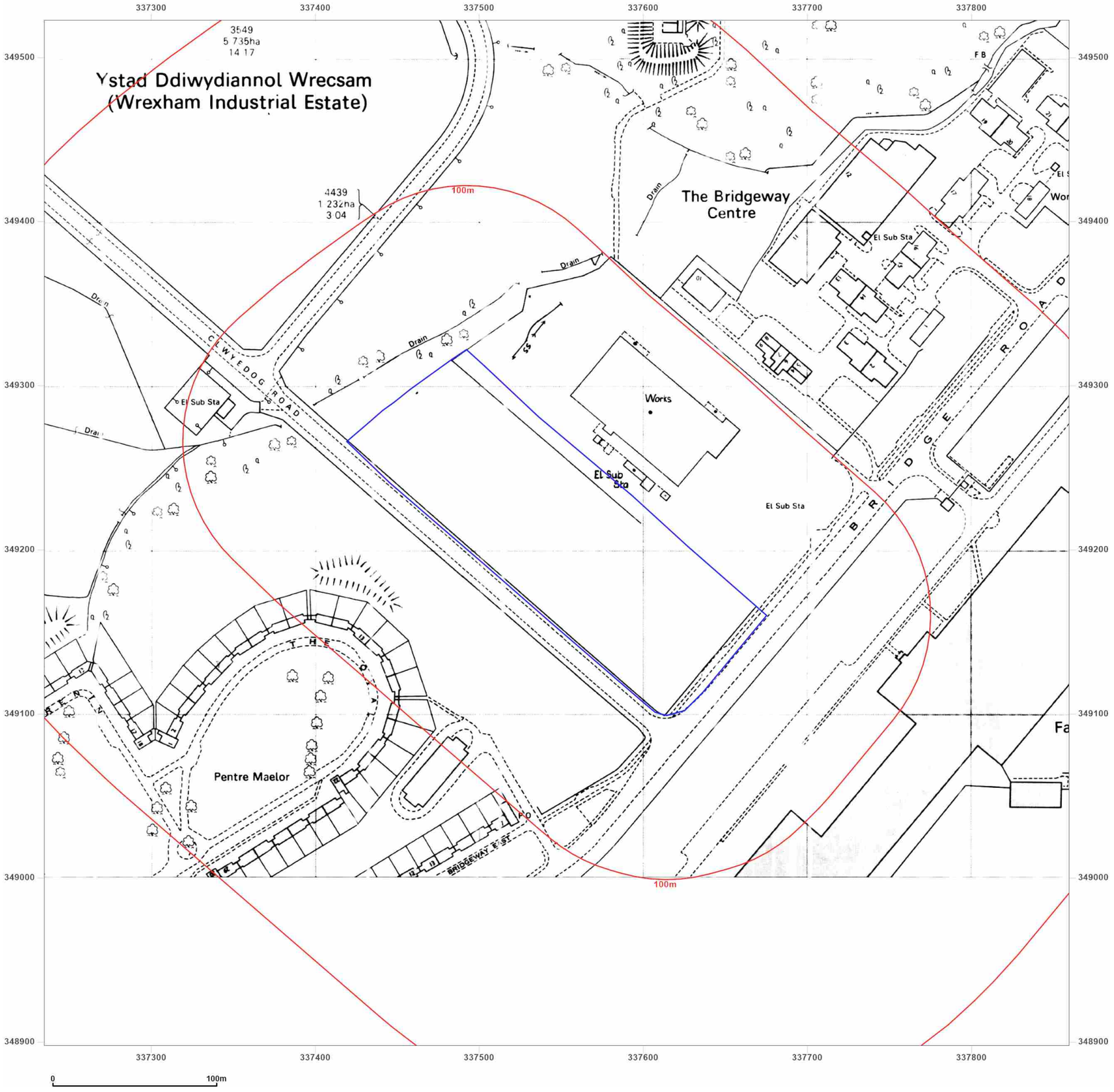
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Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1986**

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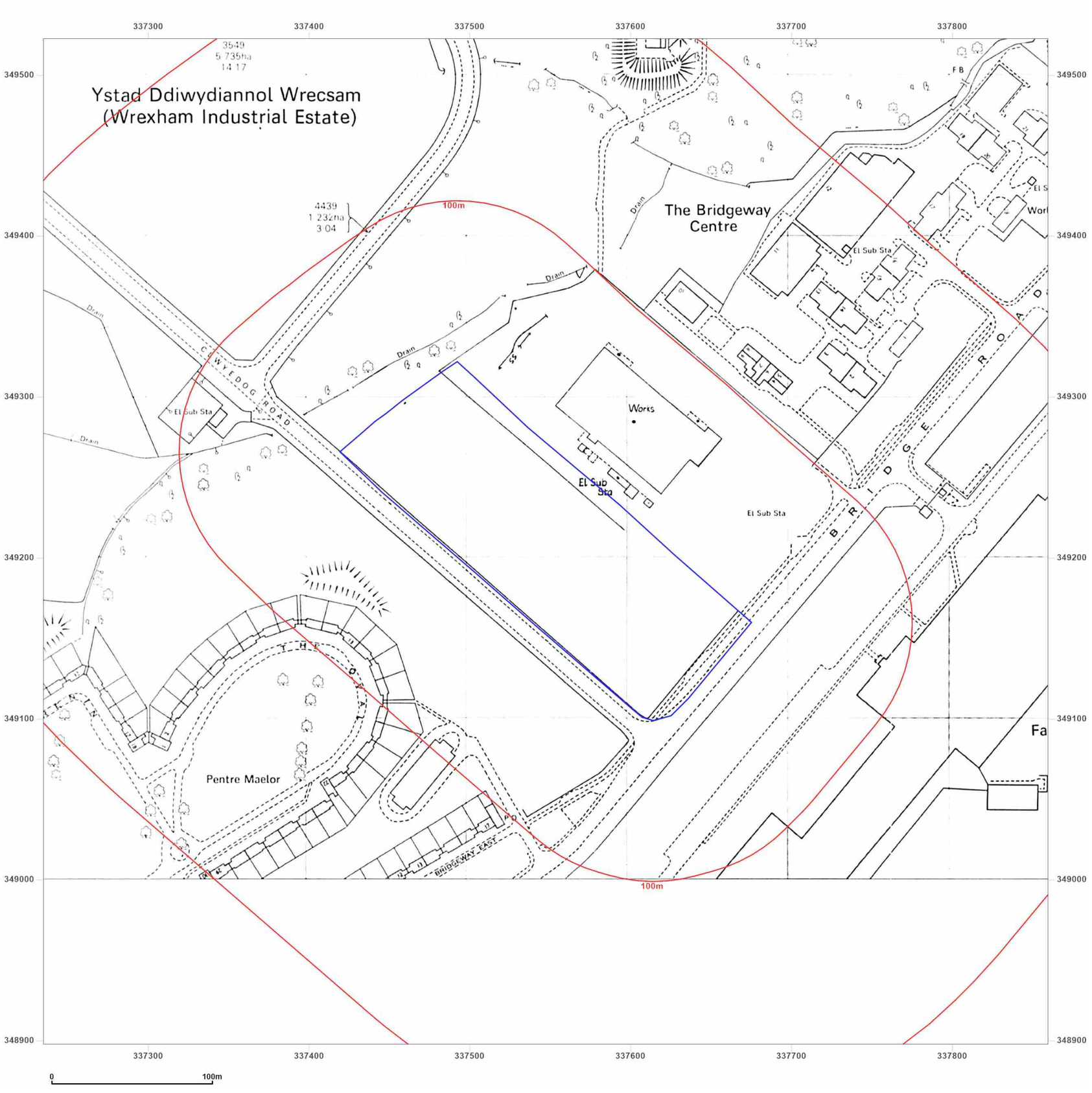
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Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1986**

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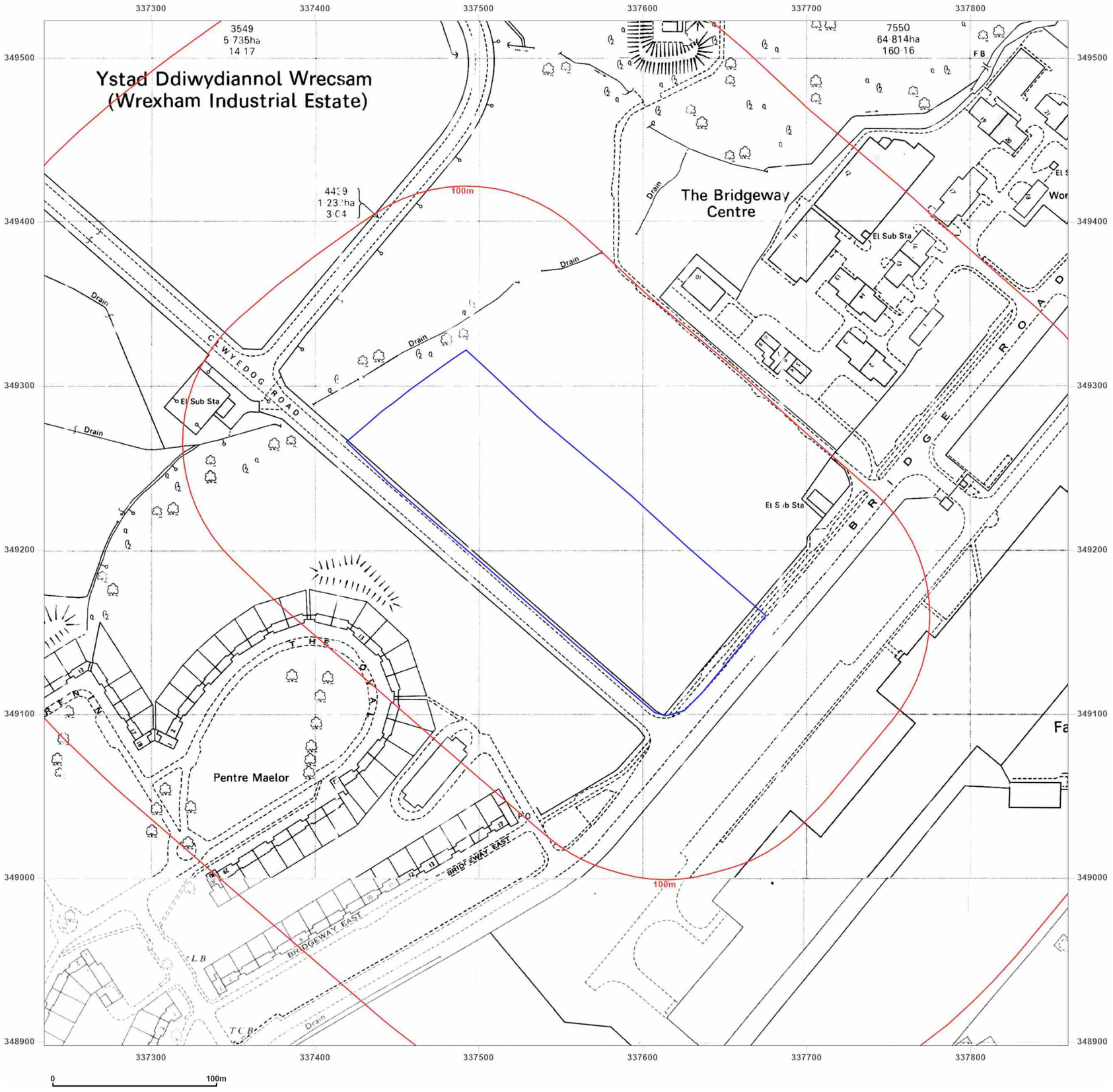
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Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1985-1989**

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Edition N/A
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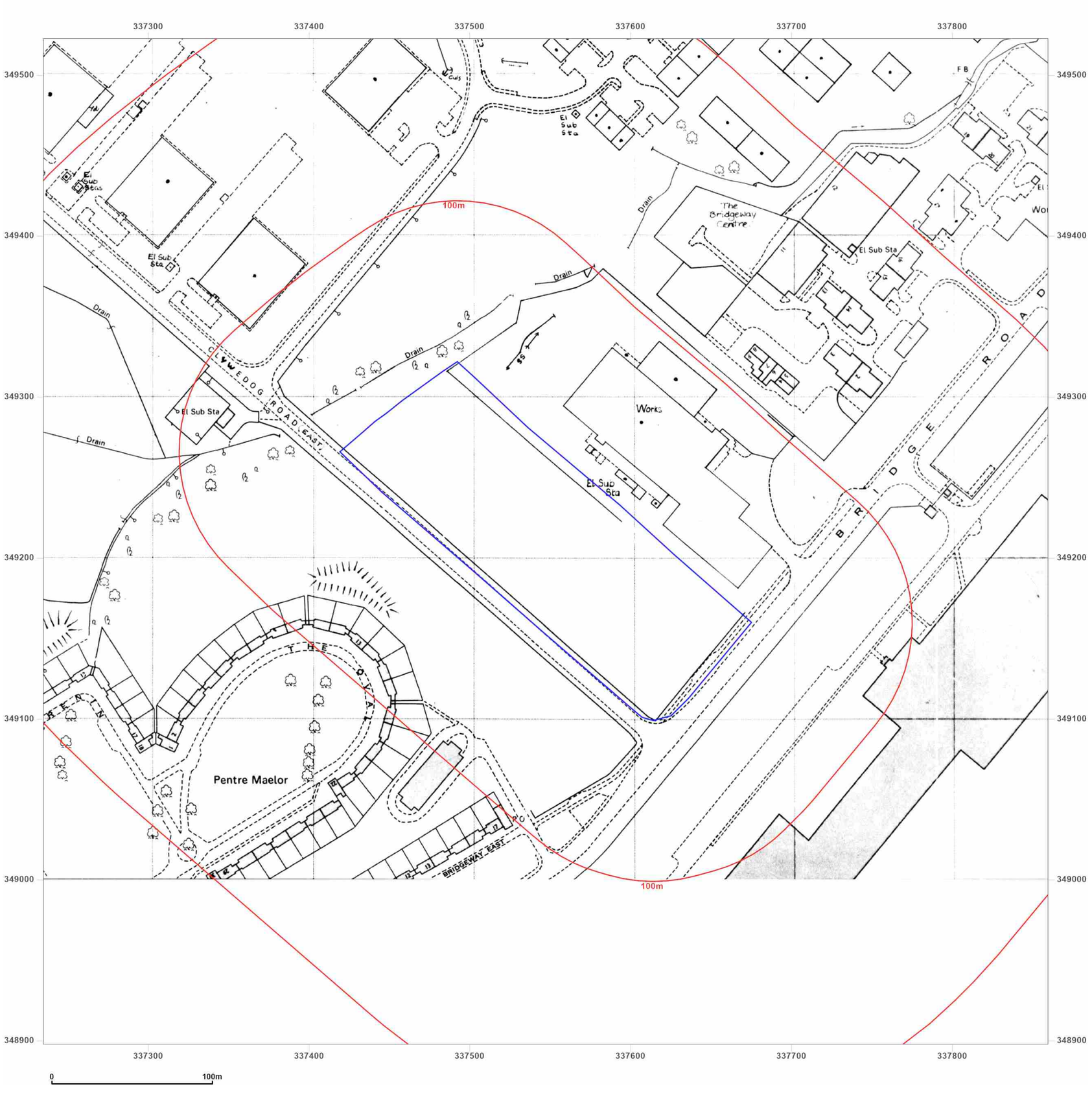
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Site Details:

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Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1991**

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Edition N/A
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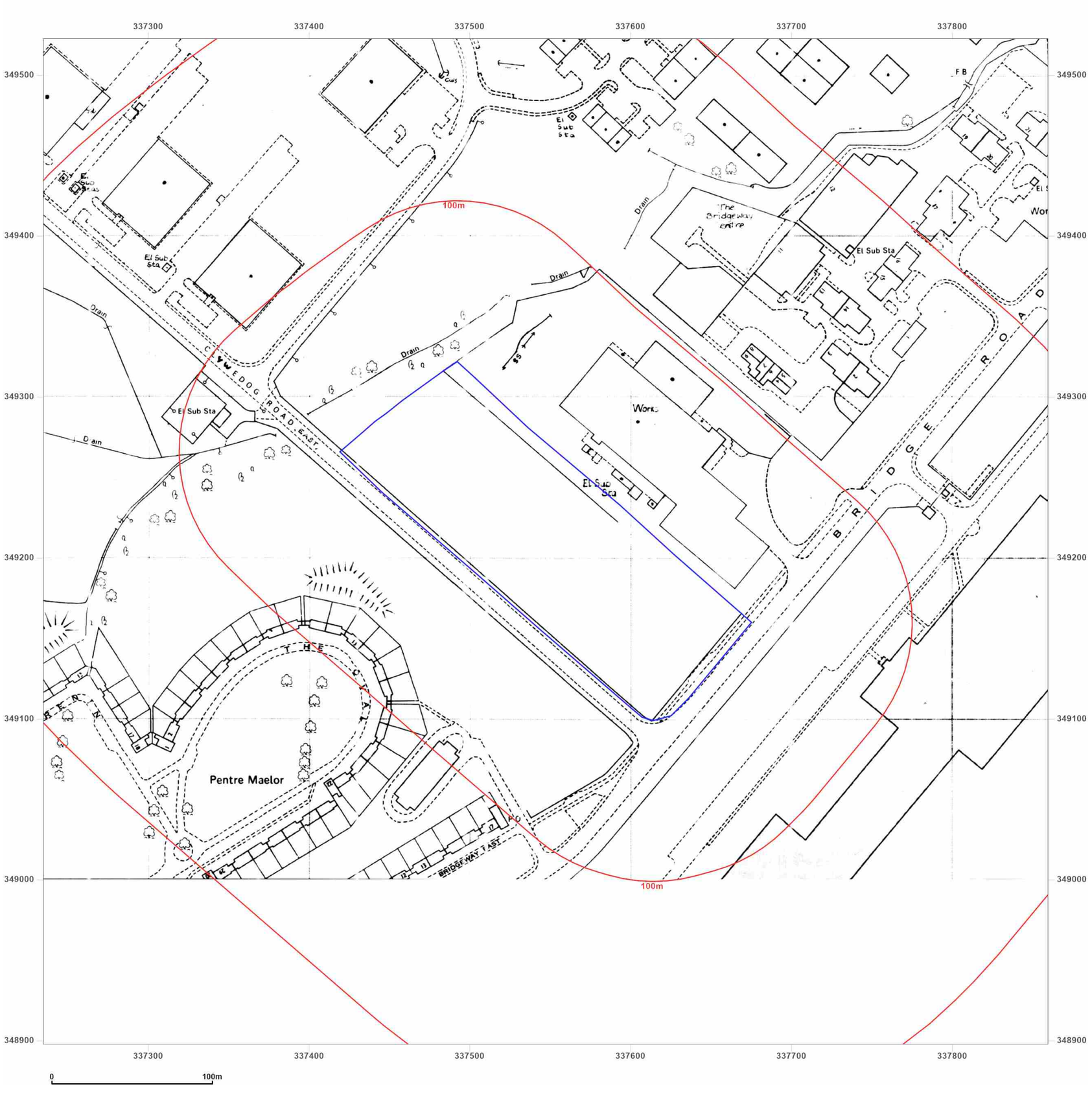
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Groundsure INSIGHTS

Site Details:

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Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

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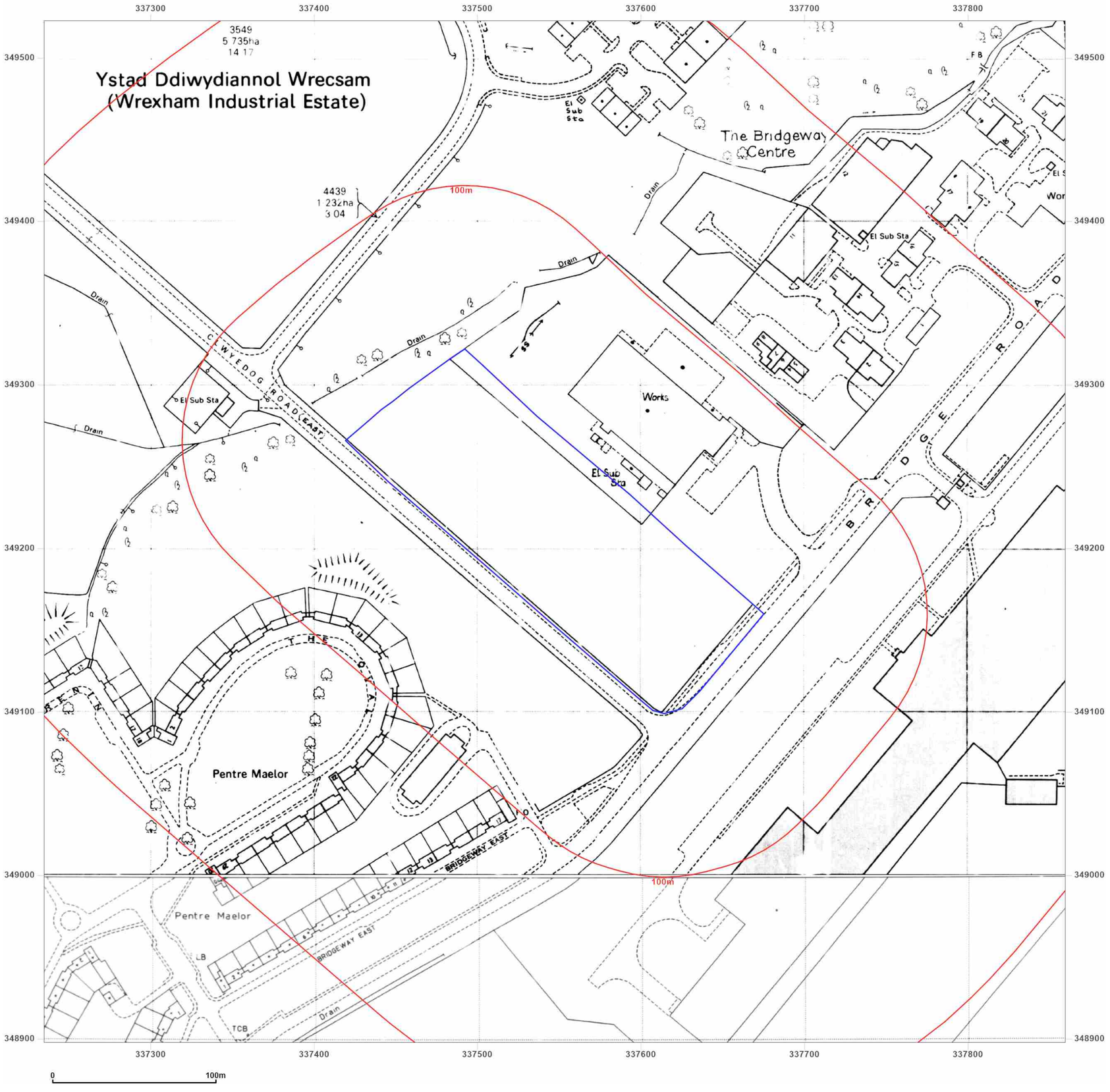
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Site Details:

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Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1989-1992**

Scale: 1:2,500

Printed at: 1:2,500

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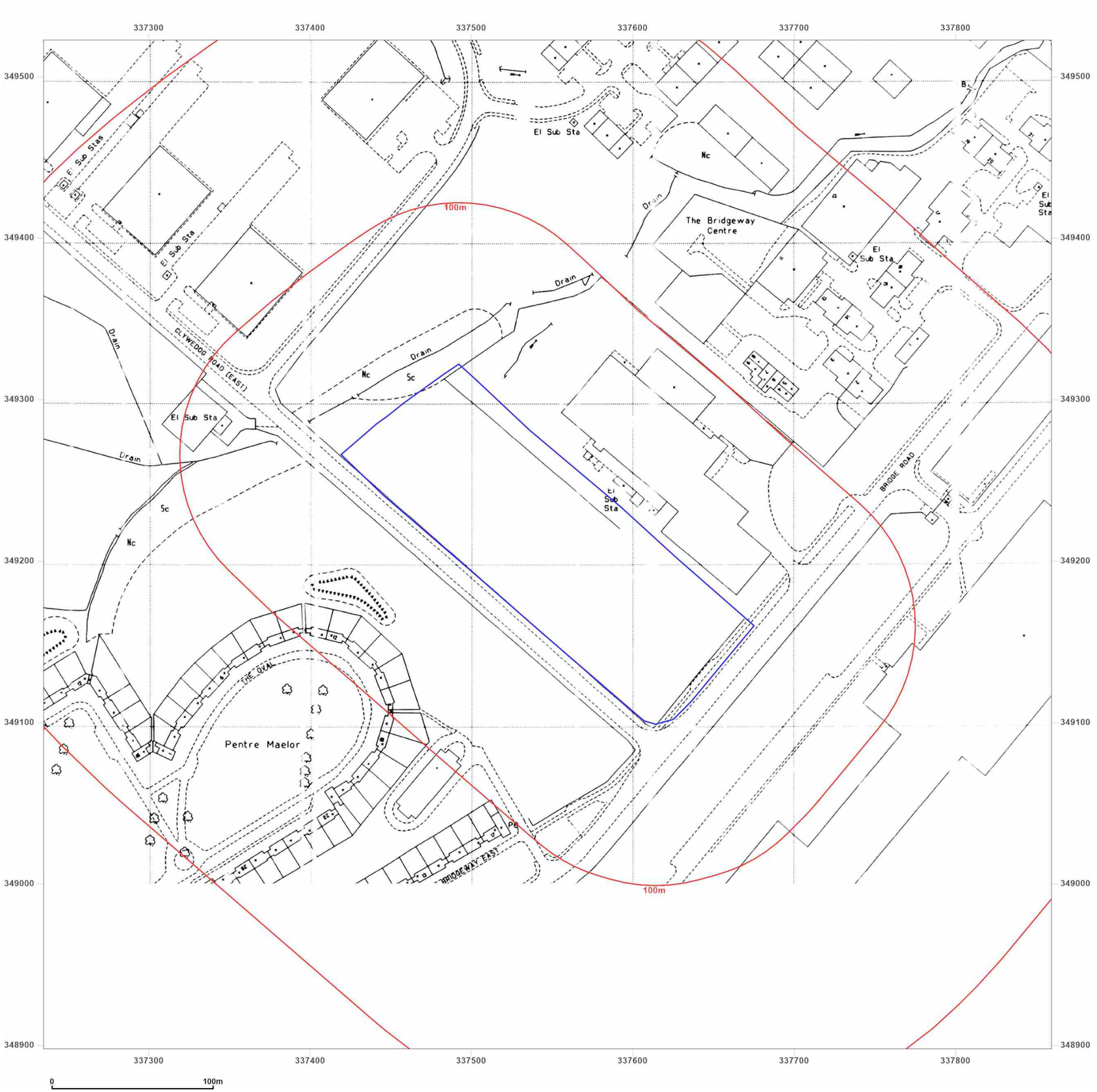
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Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1992**

Scale: 1:2,500

Printed at: 1:2,500

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

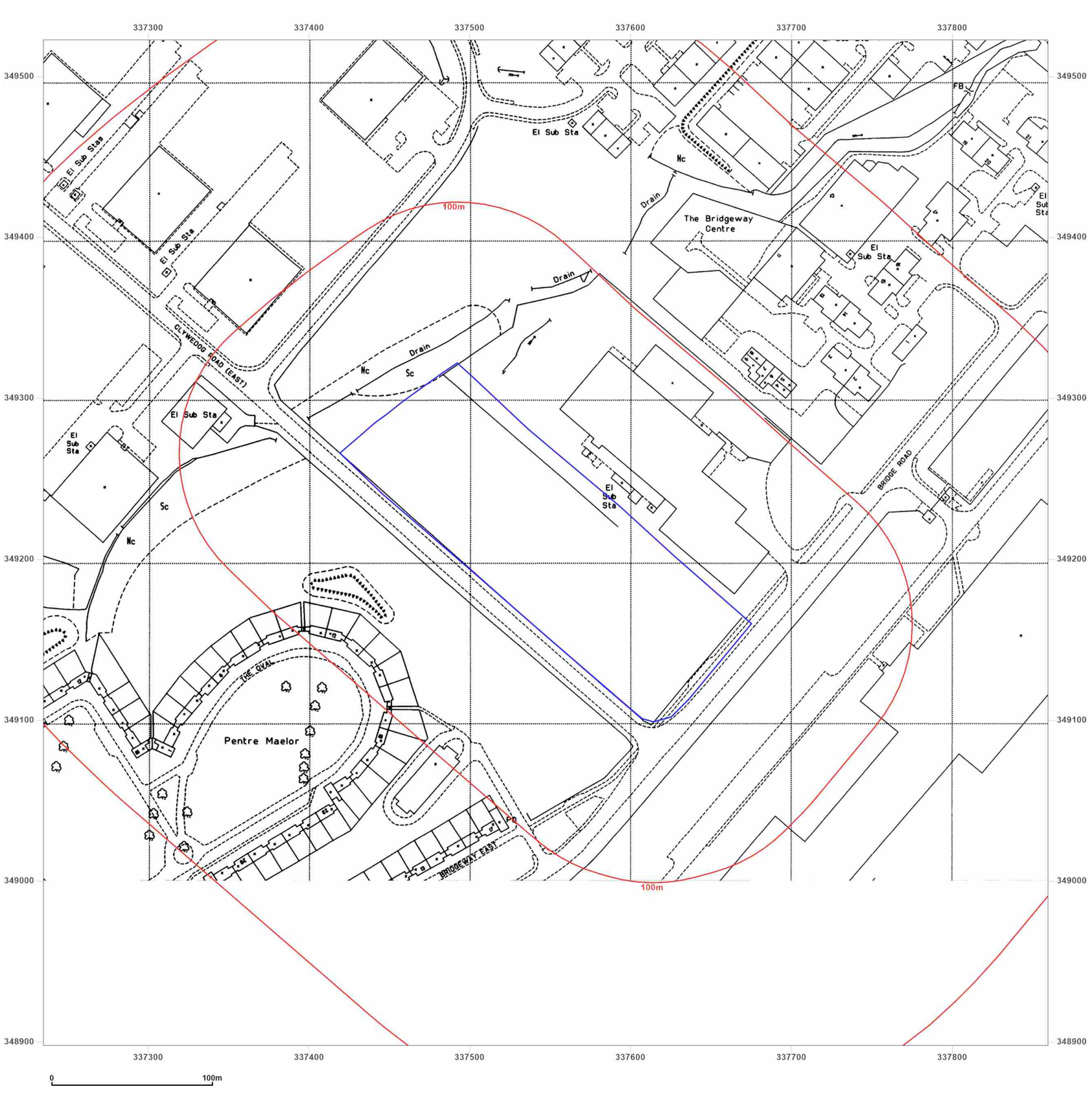
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Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1993**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed N/A
Revised 1993
Edition N/A
Copyright 1993
Levelled N/A

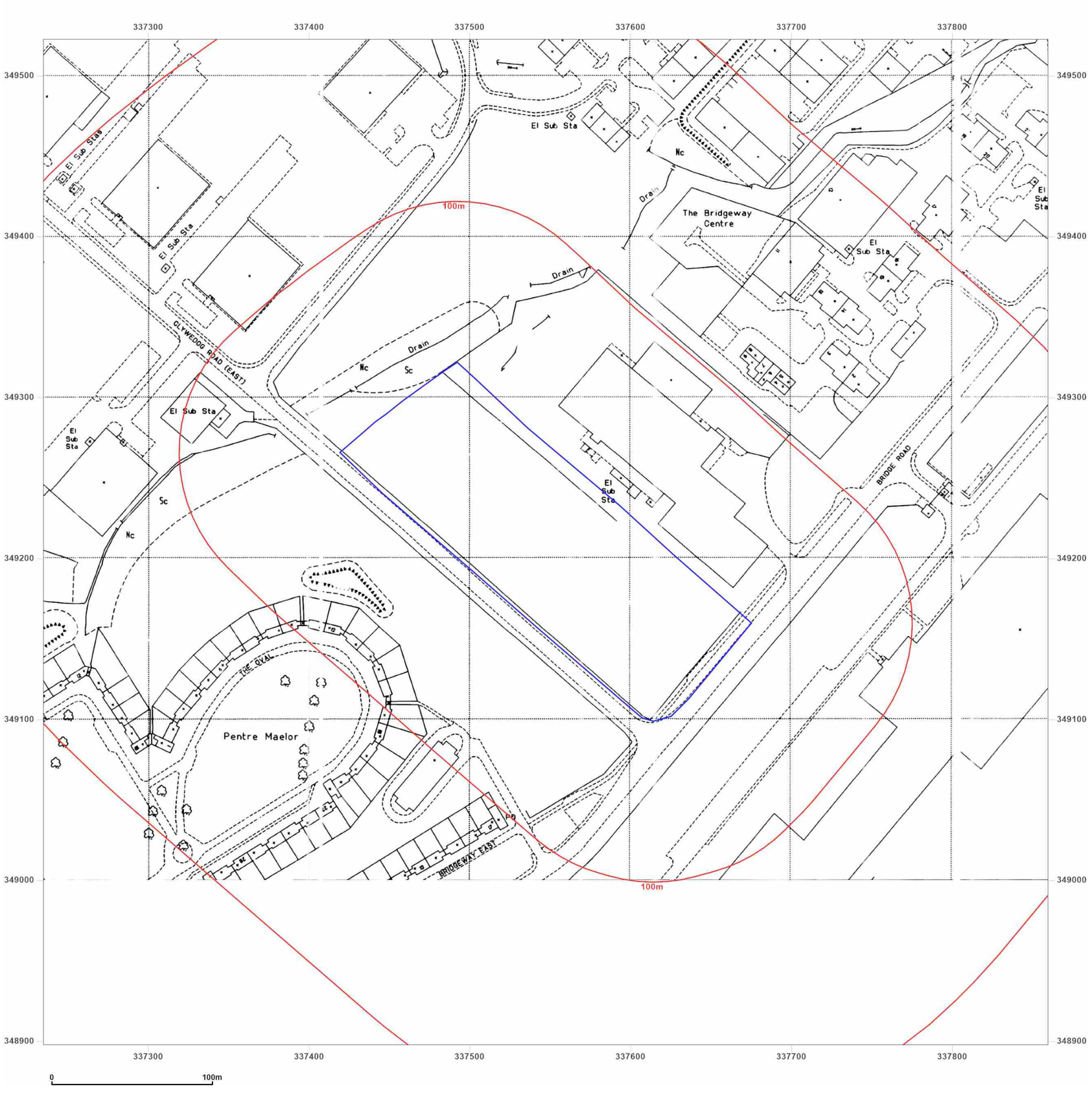
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Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

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

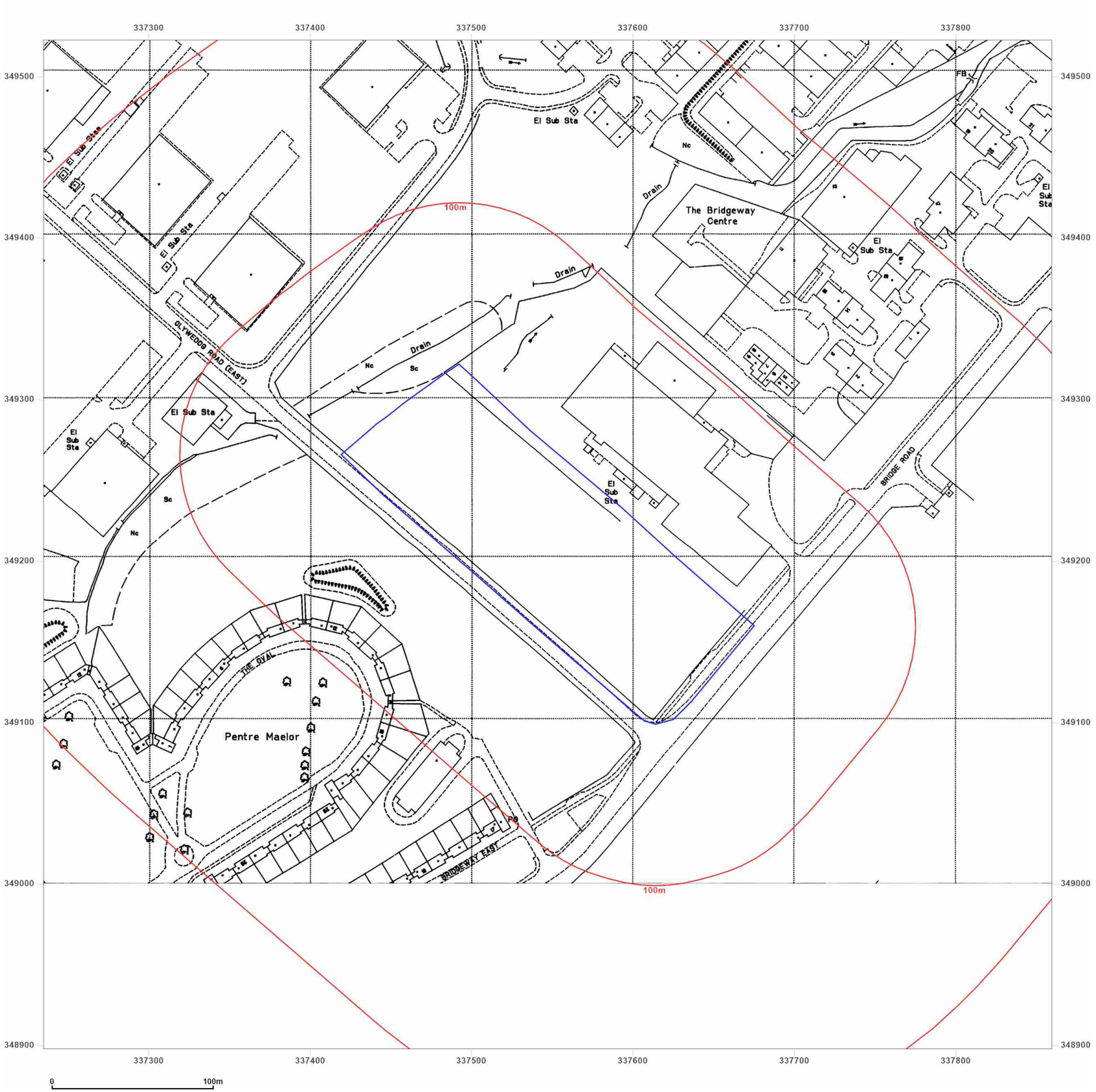
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Site Details:

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Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1994**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1994
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

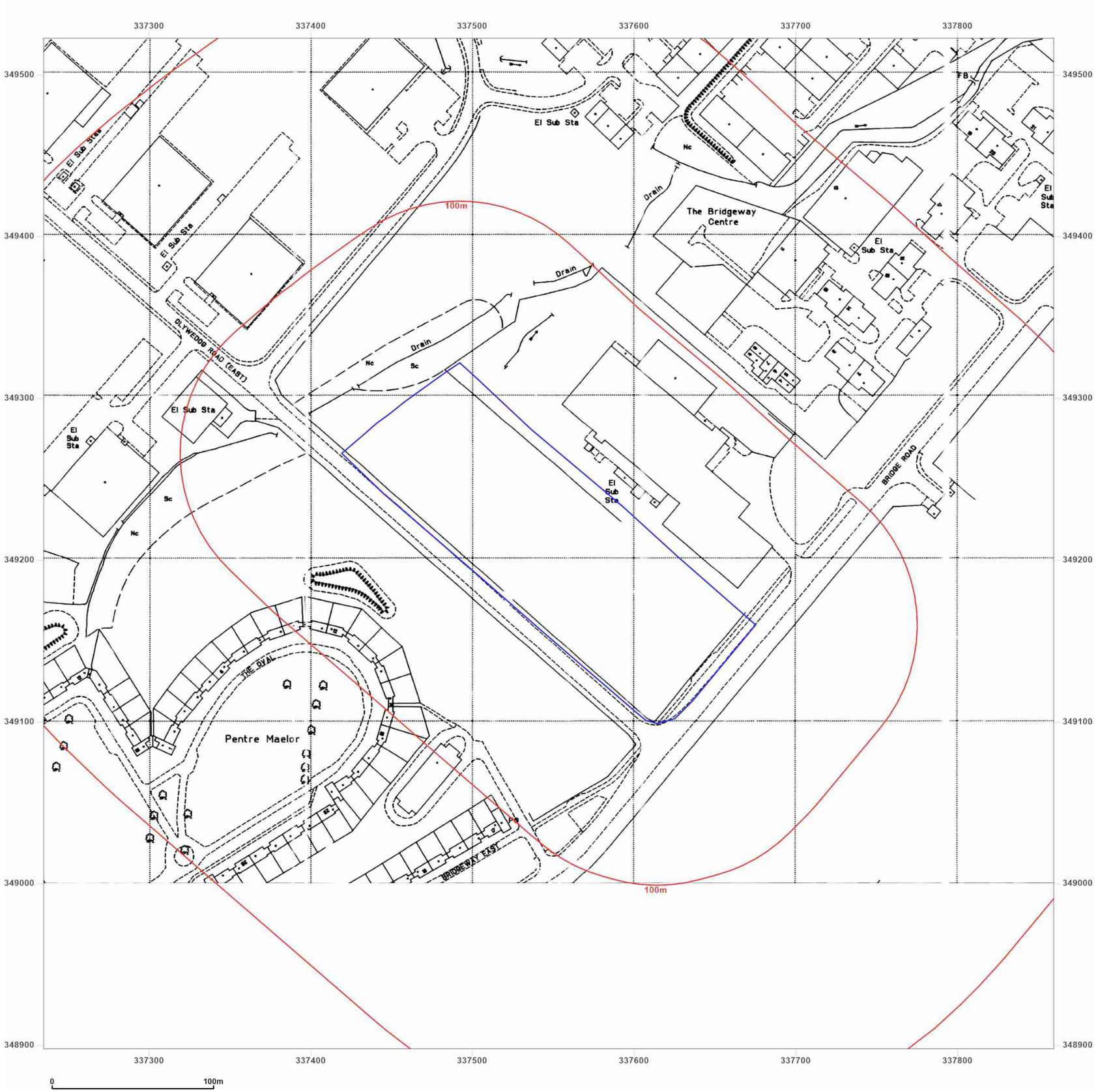
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Groundsure INSIGHTS

Site Details:

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Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1994**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1994
Levelled N/A

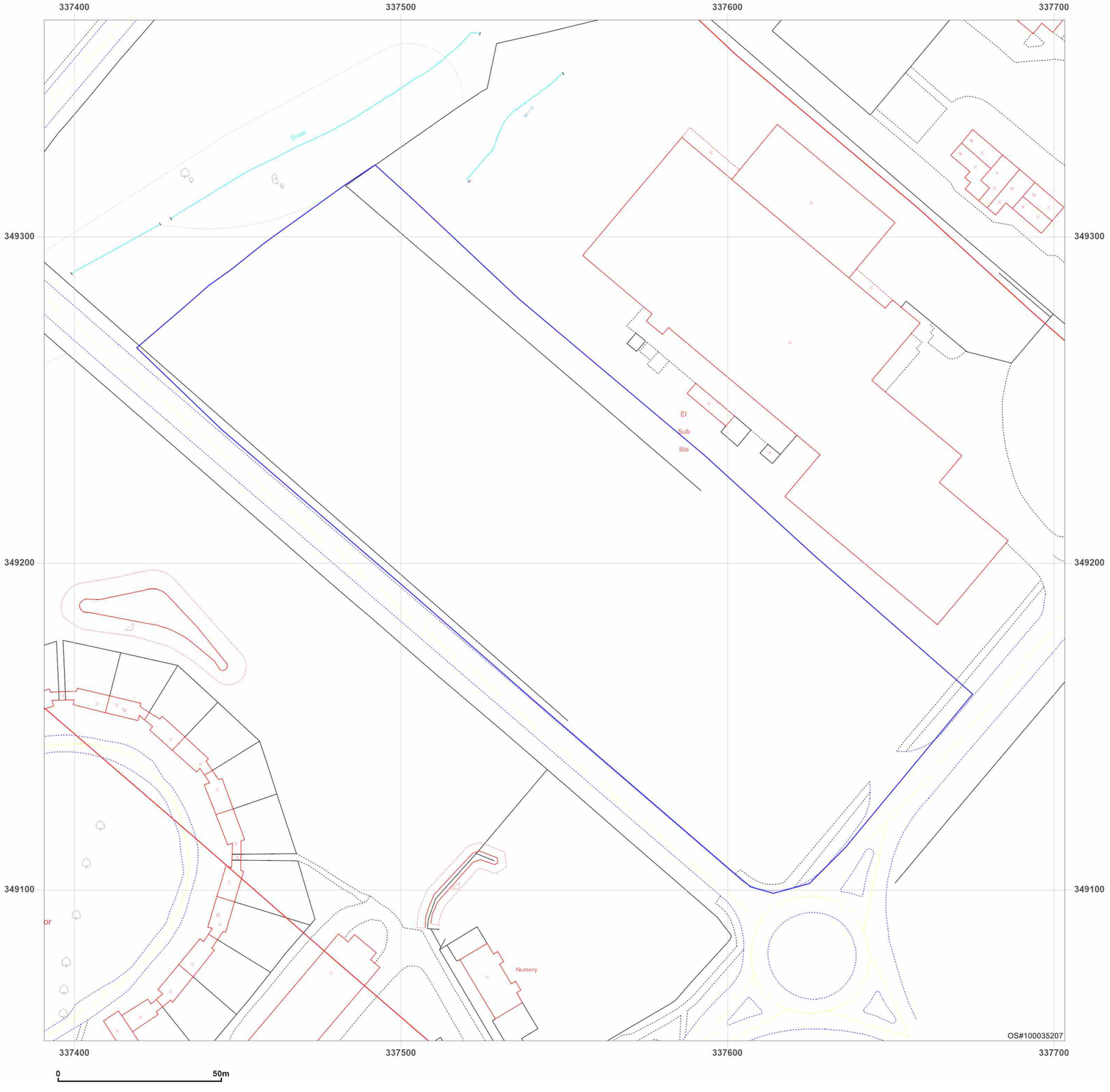
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Groundsure INSIGHTS

Site Details:

337582 , 349213

Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: LandLine
Map date: **2003**
Scale: 1:1,250
Printed at: 1:1,250

N
W E
S

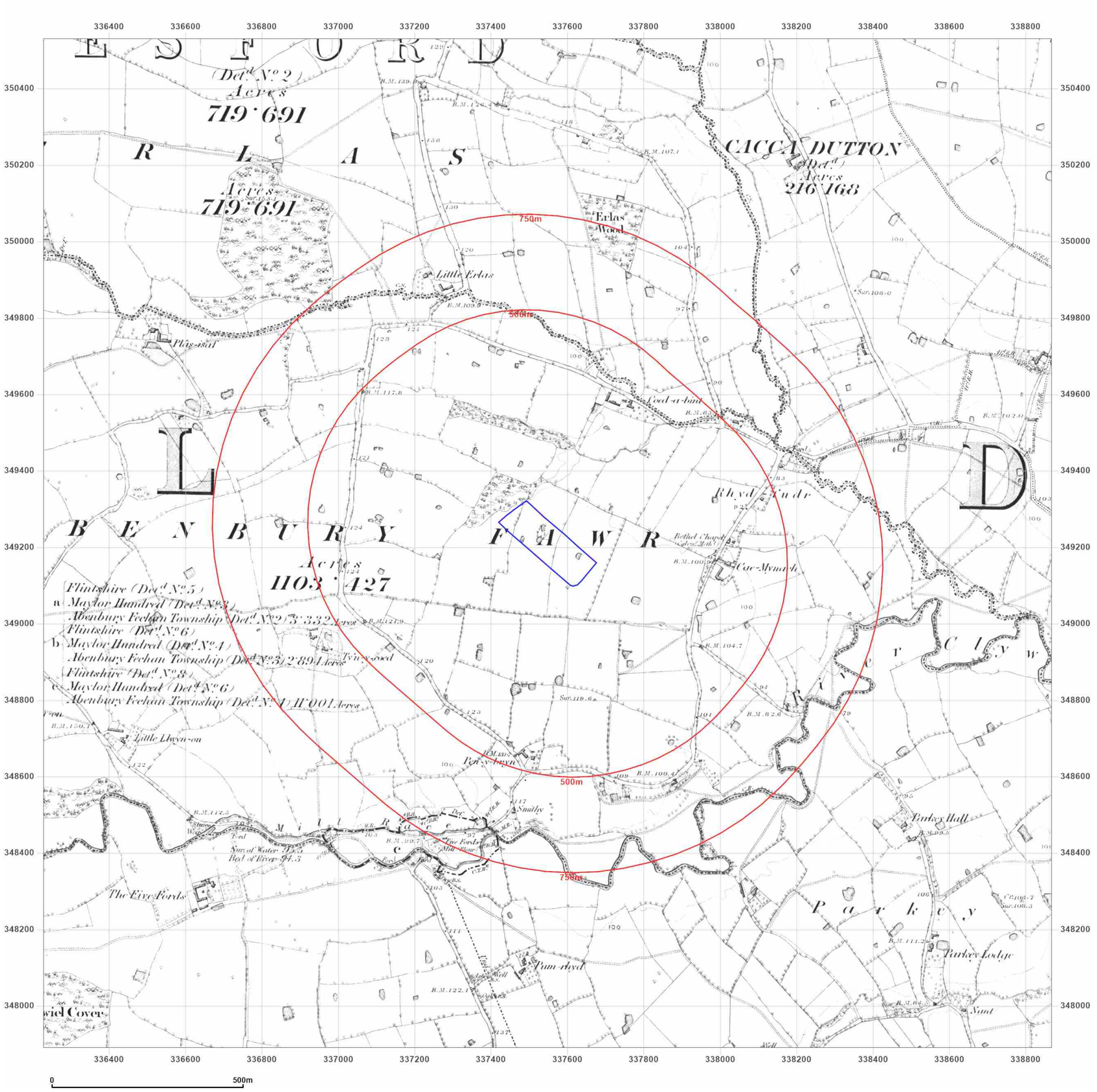
2003

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Groundsure INSIGHTS

Site Details:

337582 , 349213

Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: County Series

Map date: **1872**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

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

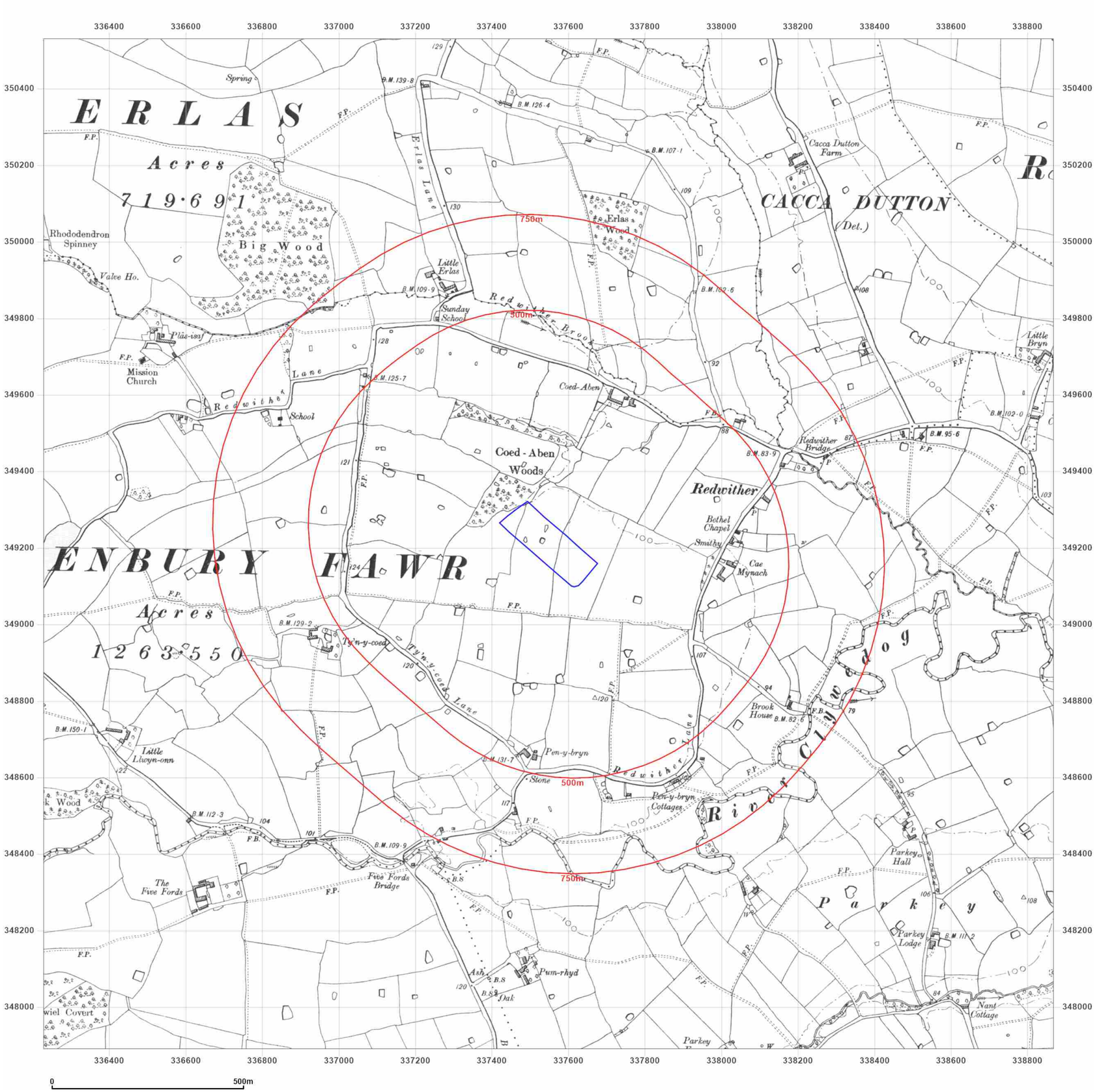
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Groundsure INSIGHTS

Site Details:

337582 , 349213

Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: County Series

Map date: **1898**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1872
Revised 1898
Edition N/A
Copyright N/A
Levelled N/A

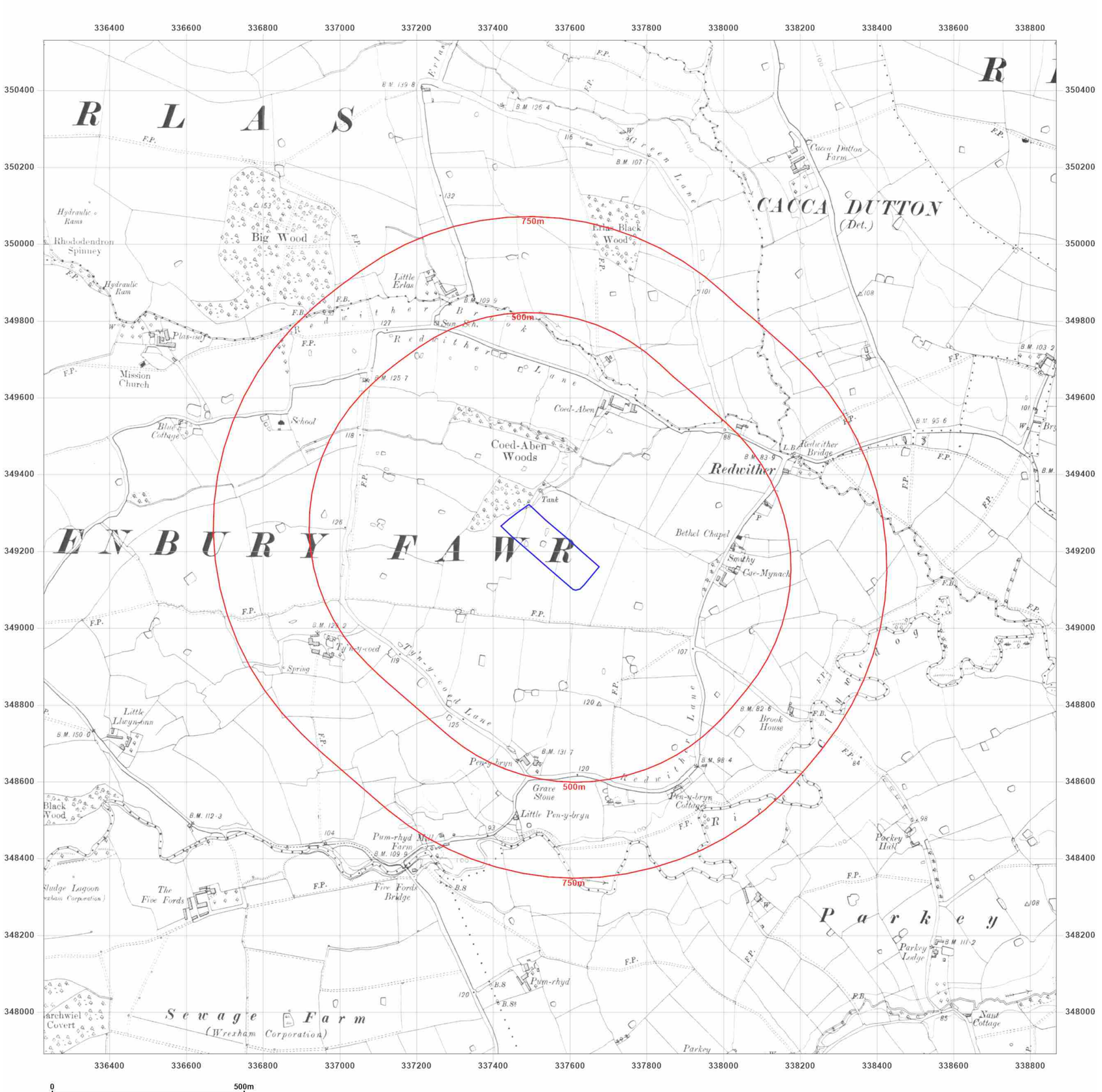
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Groundsure INSIGHTS

Site Details:

337582 , 349213

Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: County Series

Map date: **1909**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1872
Revised 1909
Edition N/A
Copyright N/A
Levelled N/A

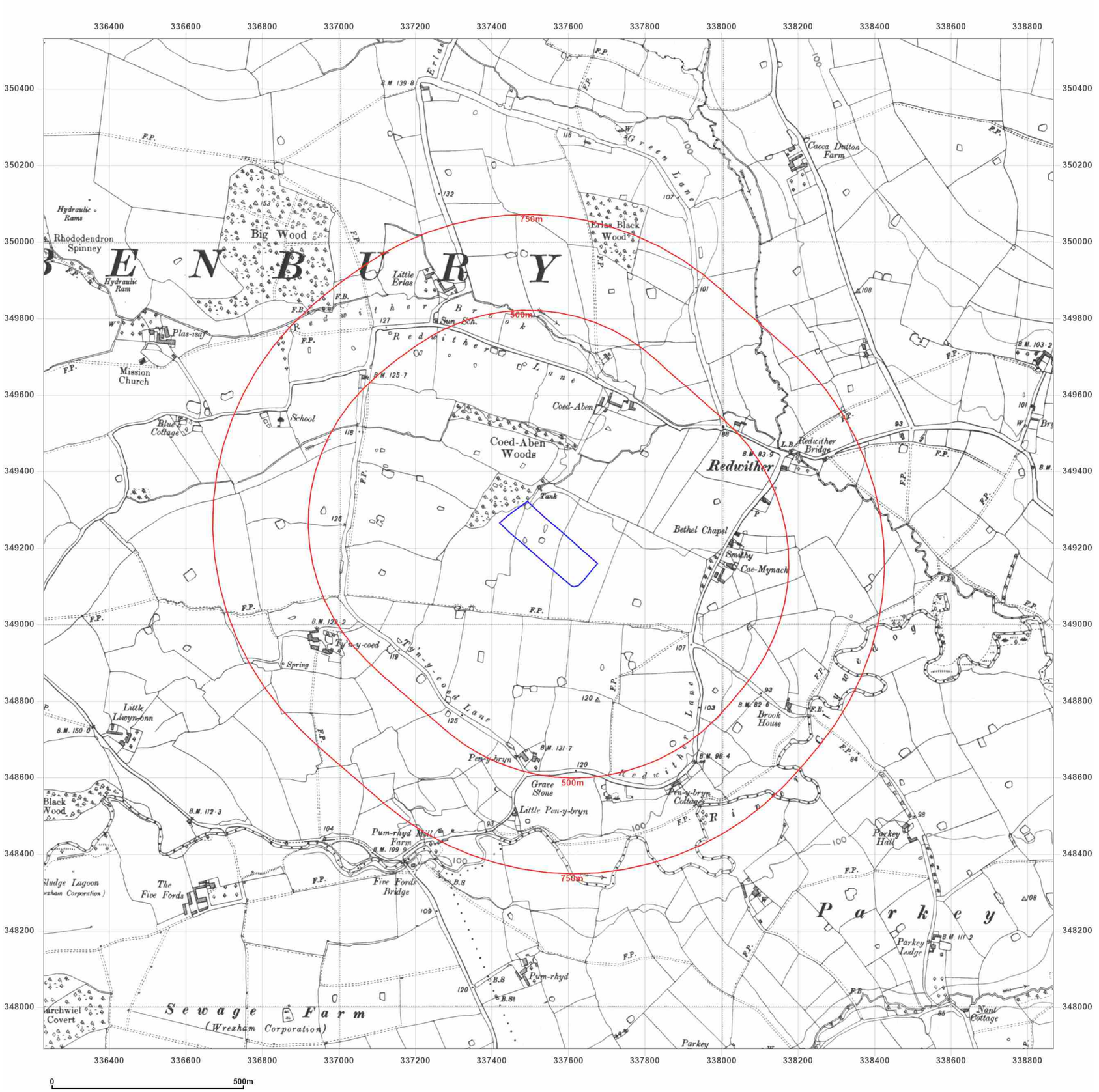
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Groundsure INSIGHTS

Site Details:

337582 , 349213

Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1872
Revised 1938
Edition 1938
Copyright N/A
Levelled N/A

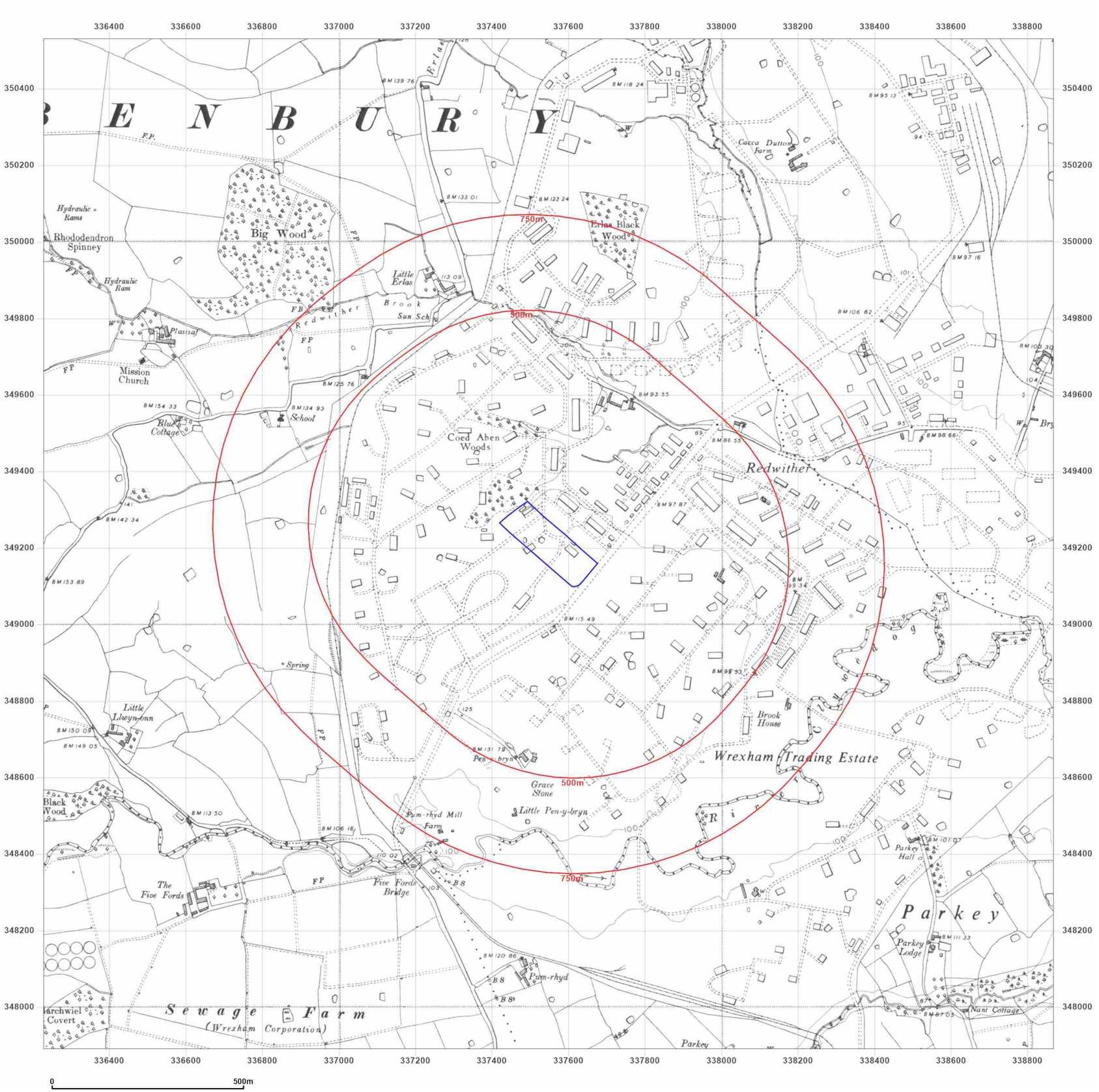
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Groundsure INSIGHTS

Site Details:

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Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: County Series

Map date: **1949**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1872
Revised 1949
Edition N/A
Copyright N/A
Levelled N/A

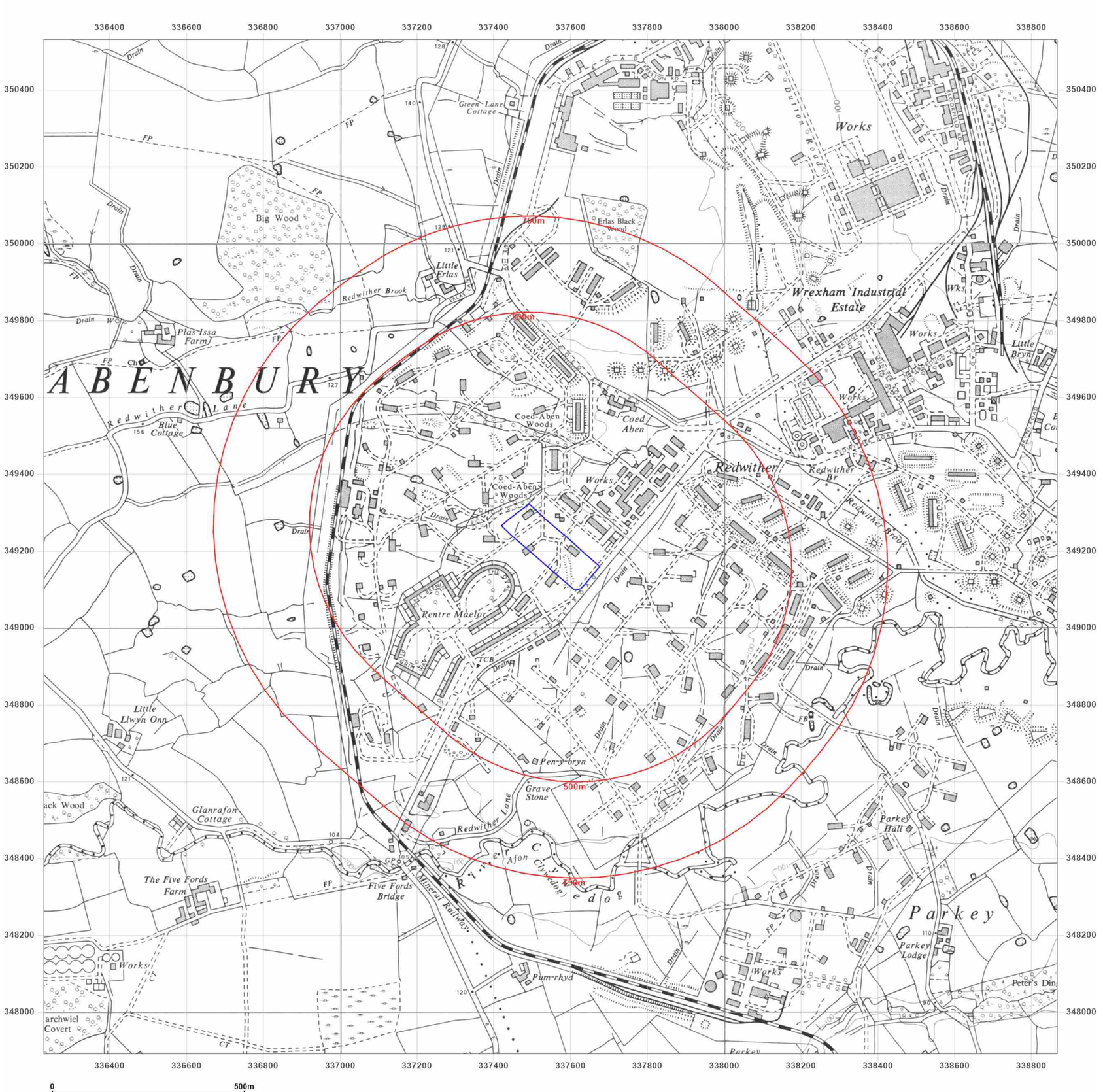
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Site Details:

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Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: Provisional

Map date: **1960-1964**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1874
Revised 1960
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1964
Revised 1964
Edition N/A
Copyright N/A
Levelled N/A

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Site Details:

337582 , 349213

Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1979-1982**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
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Surveyed 1970
Revised 1982
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1975
Revised 1978
Edition N/A
Copyright 1979
Levelled 1969

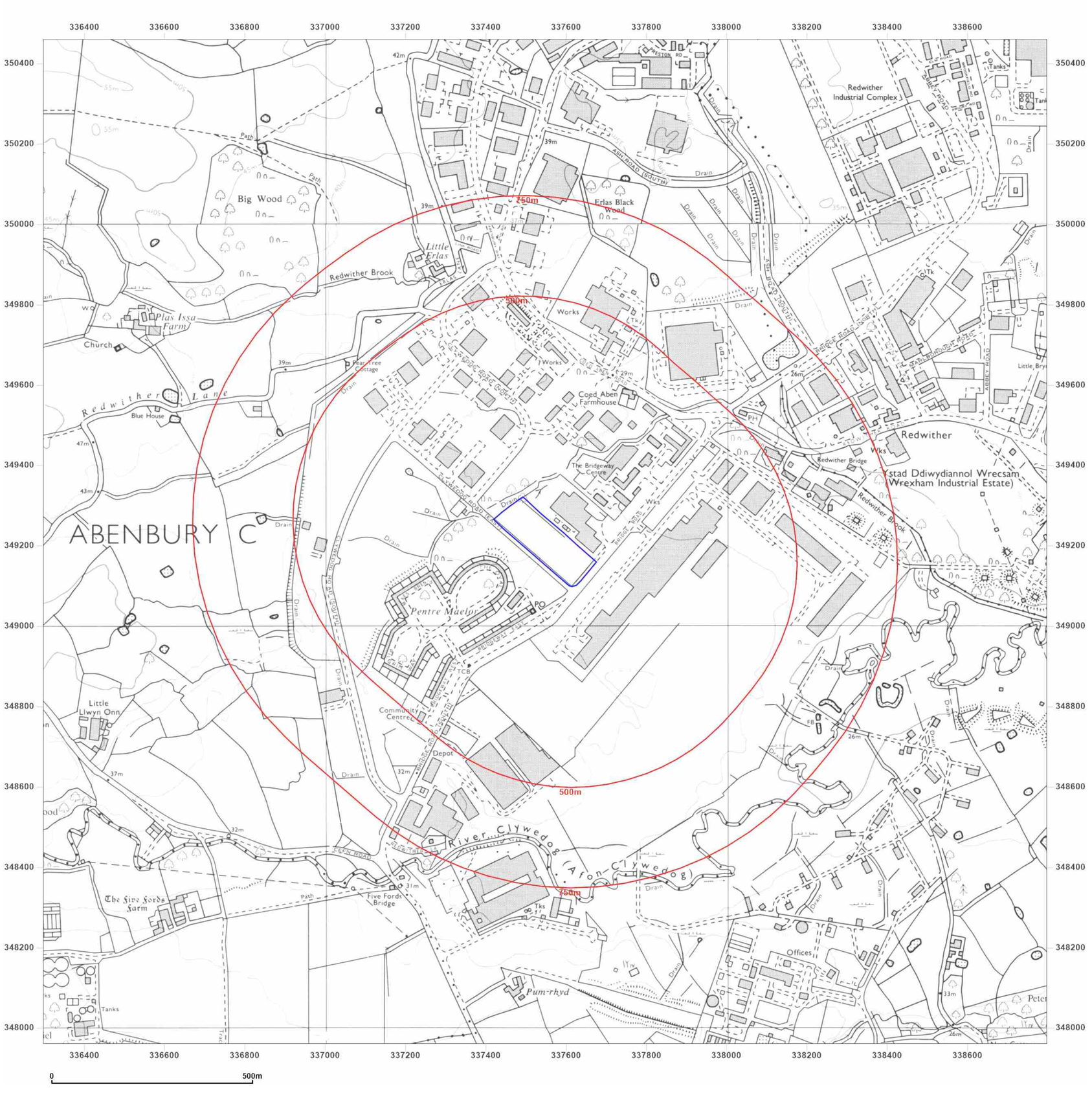
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Groundsure INSIGHTS

Site Details:

337582 , 349213

Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **1992**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
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Surveyed 1990
Revised 1992
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1983
Revised 1992
Edition N/A
Copyright N/A
Levelled N/A

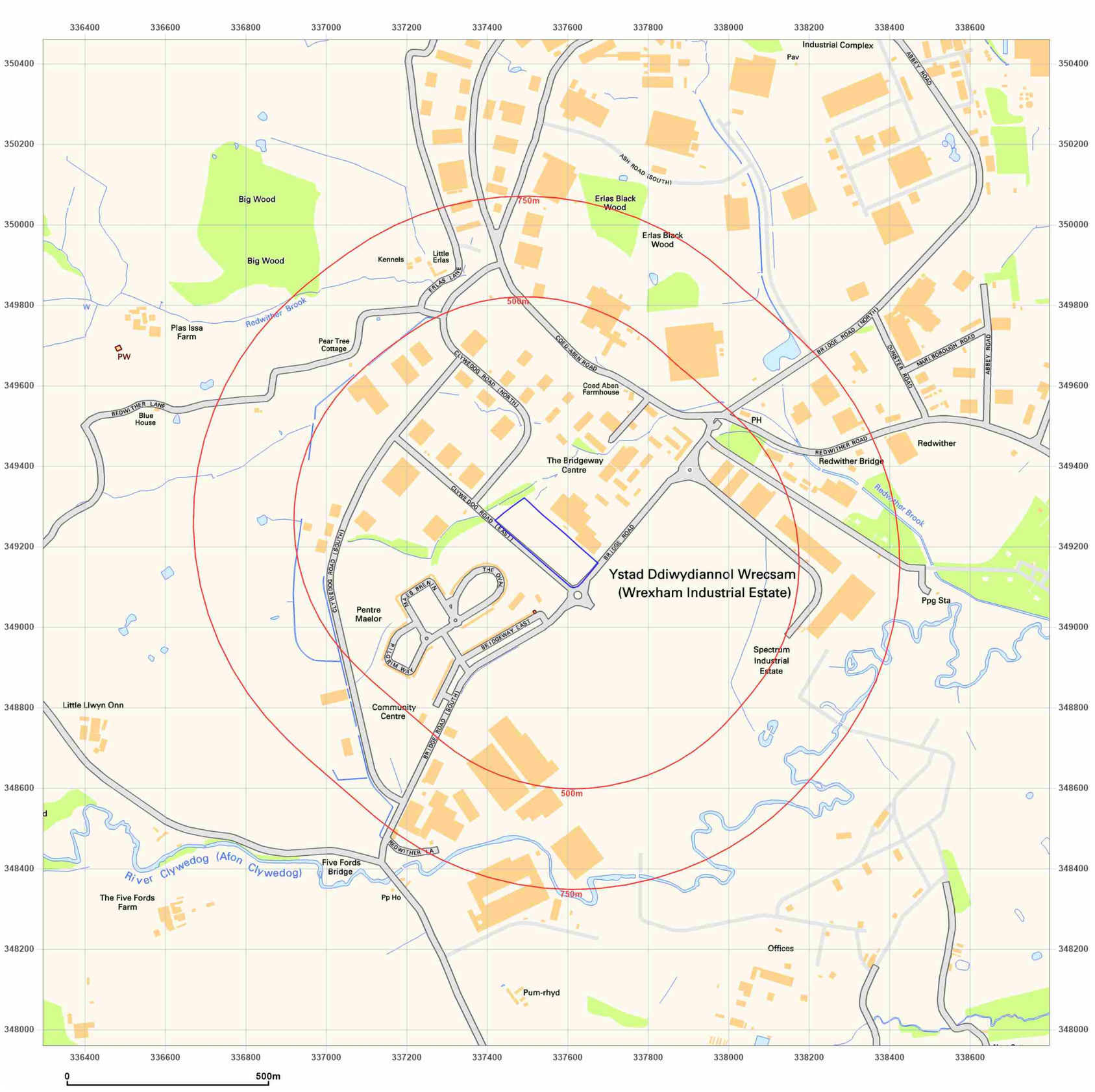
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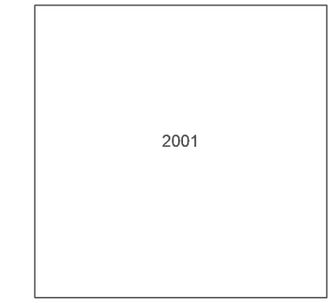
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Map date: **2001**

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Printed at: 1:10,000

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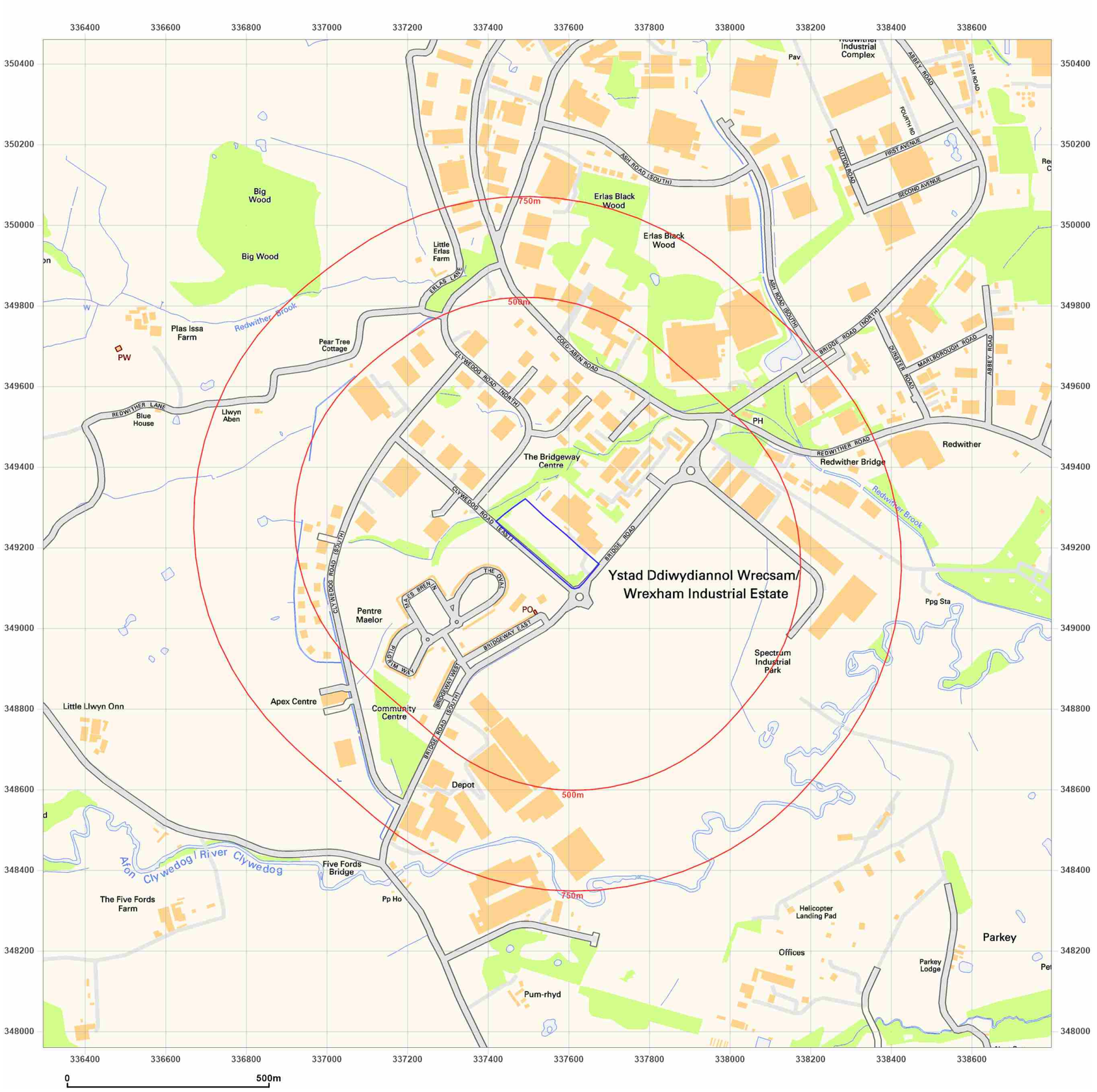
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Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **2010**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
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2010

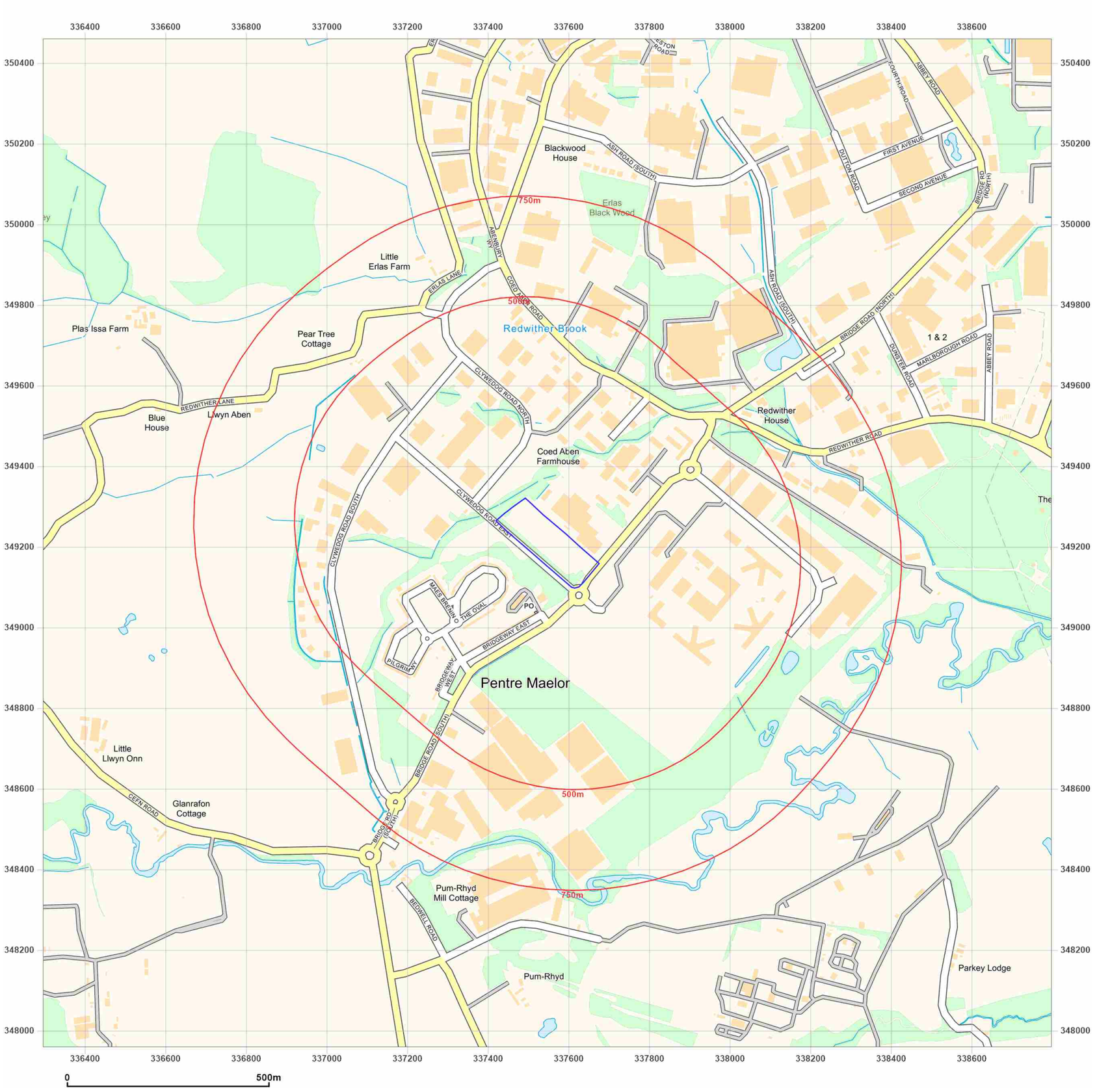
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Site Details:

337582 , 349213

Client Ref: 004121
Report Ref: GS-9357310
Grid Ref: 337547, 349210

Map Name: National Grid

Map date: **2023**

Scale: 1:10,000

Printed at: 1:10,000

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APPENDIX VI
COAL AUTHORITY REPORT

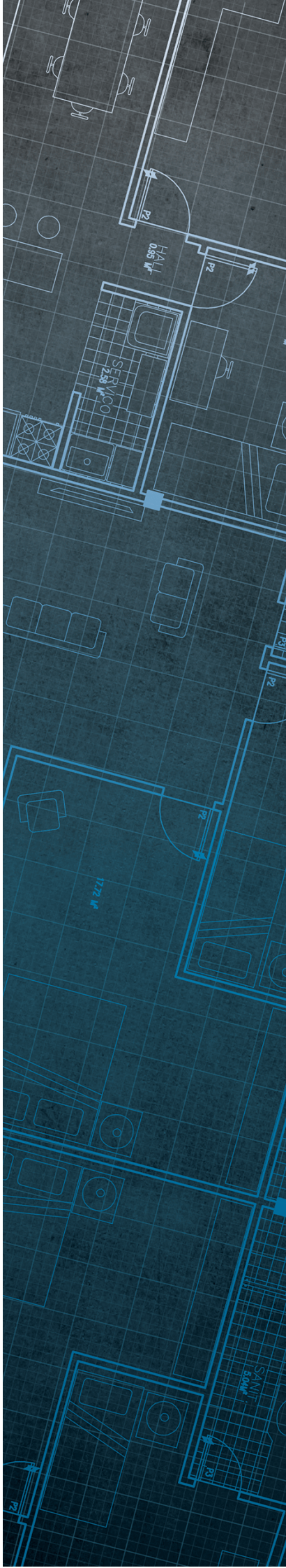
The Coal Authority

Consultants

Coal Mining Report

Aec Engineering Limited
Bridge Road North
Wrexham Industrial Estate
Wrexham
LL13 9PS

Date of enquiry:	**15 February 2023**
Date enquiry received:	**15 February 2023**
Issue date:	**15 February 2023**
Our reference:	**51003339065001**
Your reference:	**004138**



Consultants
Coal Mining Report

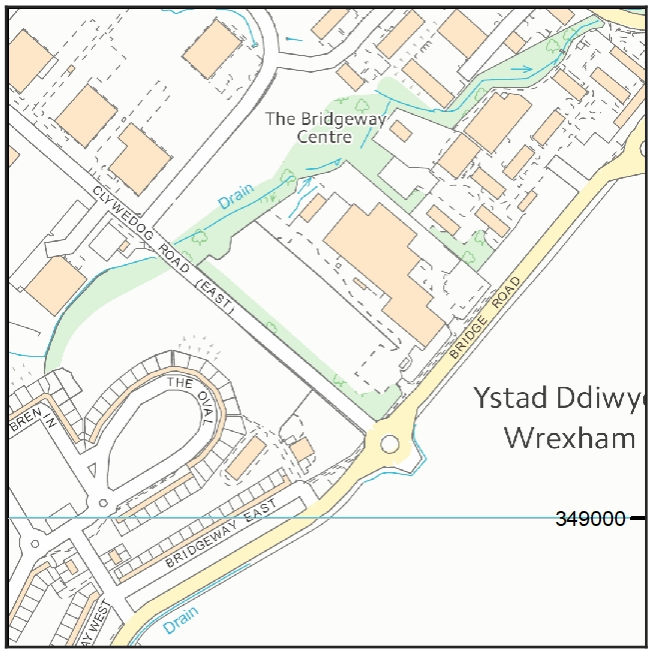
This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

E3P

Enquiry address

Aec Engineering Limited
Bridge Road North
Wrexham Industrial Estate
Wrexham
LL13 9PS



Approximate position of property

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+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

@coalauthority
/company/the-coal-authority
/thecoalauthority
/thecoalauthority

Section 1 – Mining activity and geology

Past underground mining
No past mining recorded.

Probable unrecorded shallow workings
None.

Spine roadways at shallow depth
No spine roadway recorded at shallow depth.

Mine entries
None recorded within 100 metres of the enquiry boundary.

Abandoned mine plan catalogue numbers
None available.

Outcrops
No outcrops recorded.

Geological faults, fissures and breaklines
No faults, fissures or breaklines recorded.

Opencast mines
None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips
None recorded within 500 metres of the enquiry boundary.

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Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations
None recorded within 50 metres of the enquiry boundary.

Remediated sites
None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence
The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas
None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes
None recorded within 500 metres of the enquiry boundary.

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Section 3 – Licensing and future mining activity

Future underground mining
None recorded.

Coal mining licensing
None recorded within 200 metres of the enquiry boundary.

Court orders
None recorded.

Section 46 notices
No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices
The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land
The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

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Section 4 – Further information

Based on the responses in this report, no further information has been highlighted.

Future development

If development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply specialist engineering practice required for former mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or coal mines without first obtaining the permission of the Coal Authority.

MINE GAS: Please note, if there are no recorded instances of mine gas within 500m of the enquiry boundary, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded. Developers should be aware that the investigation of coal seams, mine workings or mine entries may have the potential to generate and/or displace underground gases. Associated risks both to the development site and any neighbouring land or properties should be fully considered when undertaking any ground works. The need for effective measures to prevent gases migrating onto any land or into any properties, either during investigation or remediation work, or after development must also be assessed and properly addressed. In these instances, the Coal Authority recommends that a more detailed Gas Risk Assessment is undertaken by a competent assessor.

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Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk.**

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

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Opencast mines
Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips
Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations
Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites
Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence
Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas
Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission. Please note, if there are no recorded instances of mine gas reported, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded.

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Mine water treatment schemes
Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining
Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing
Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders
Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices
Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices
Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land
Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

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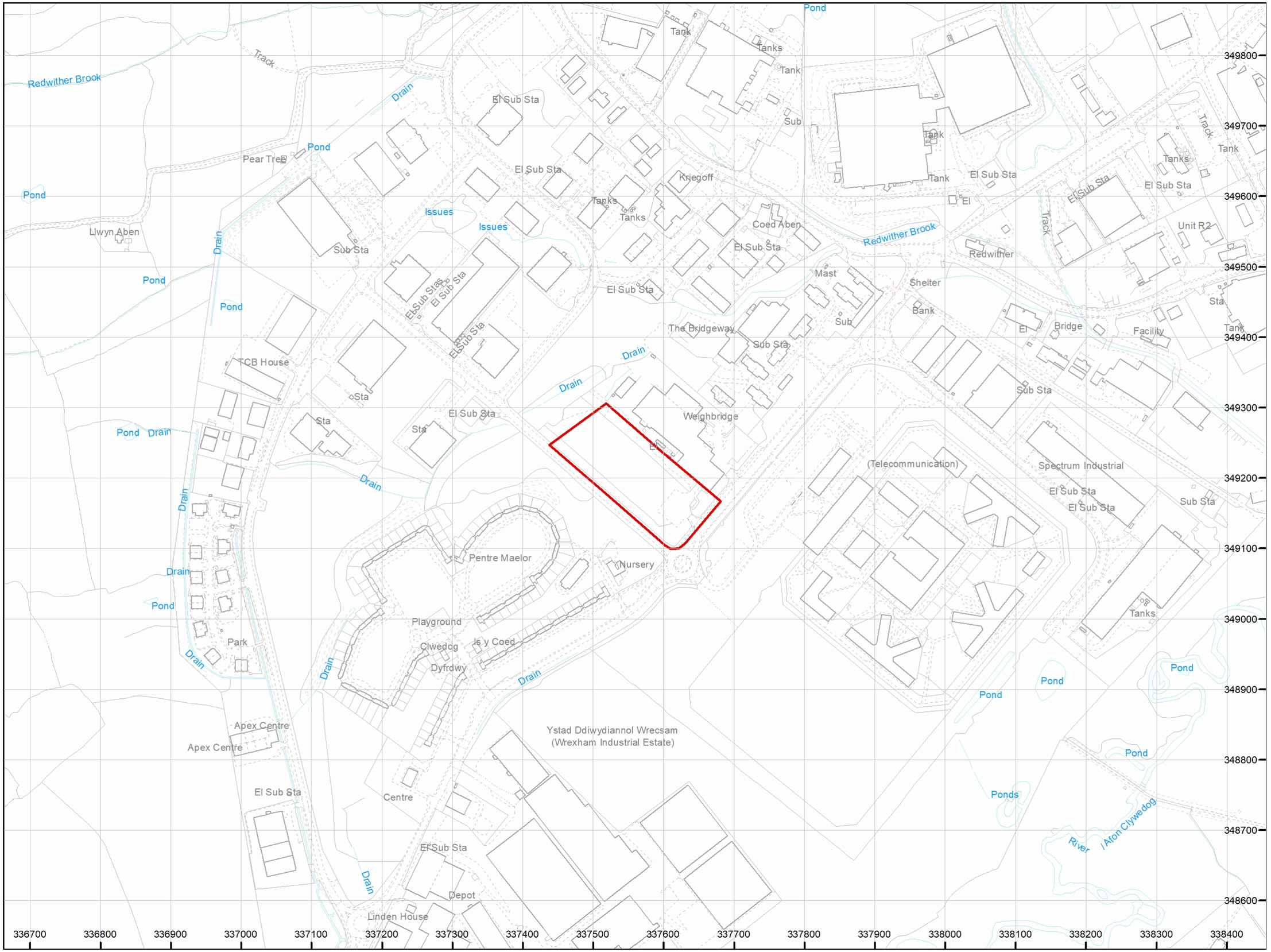
Summary of findings

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The map highlights any specific surface or subsurface features within or near to the boundary of the site.

Key

Approximate position of the enquiry boundary shown



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APPENDIX VII
PRELIMINARY UXO REPORT

STAGE 1 PRELIMINARY UXO RISK ASSESSMENT

REPORT REF: PRA-23-2036 | Revision: 0

Client: E3P
Project: Hydro Aluminium Deeside, Wrexham
Date: 14/02/2022

BRIMSTONE
Suite 6, Delta House, Laser Quay,
Culpeper Close, Rochester, ME2 4HU
0207 117 2492
www.brimstoneuxo.com

INTRODUCTION

The Stage 1 Preliminary Risk Assessment is an initial screening assessment designed to highlight any sources of unexploded ordnance (UXO) with the potential to contaminate a given site.

The aim of the Stage 1 assessment is to identify or discount the need for further detailed research - a Stage 2 Detailed UXO Risk Assessment.

This desktop assessment has been researched and written by a dedicated Researcher / Risk Assessor and produced in accordance with the CIRIA C681 Guidelines: 'Unexploded Ordnance, a Guide for the Construction Industry' (published in 2009).

In preparation for this assessment, original wartime records, historic OS mapping and the *Brimstone UXO Sources Database* have been reviewed. The latter incorporates multiple datasets plotting the positions of a variety of domestic military sites and confirmed historic German bombing targets.

The Stage 1 Preliminary Risk Assessment considers the following:

1. The Proposed Works
2. Enemy Action during WWI and WWII
3. British / Allied Military Activity
4. Historic Site Occupancy
5. Risk Mitigating Factors

THE SITE

The Site (approximately centred on the National Grid Ref: SJ 37529 49242) is located within Wrexham Industrial Estate, approximately 4.5km west of Wrexham Central railway station.
The western and eastern sections comprise areas of hardstanding, with an accessway intersecting the Site between these two areas. Note, the west, and an area in the centre, appear to be used for open air storage. Open, undeveloped ground comprises remaining sections, with mature vegetation present along the southern border. It is bound to the north by the main works associated with Hydro Aluminium Deeside, to the east by Bridge Road, to the south by Clywedog Road East and to the west by further mature vegetation.



THE PROPOSED WORKS

SI works will comprise 12 window samples to 5.45m bgl, 15 mechanically excavated trial pits to approximately 3m bgl and three cable percussive boreholes with in-situ testing to 20m bgl.
The future development on Site will involve the construction of an aluminium processing plant and associated access. No details regarding the proposed foundations were available at the time of writing.

ENEMY ACTION DURING WWI AND WWII

Potential Source of UXO	Significant?	Details	
WWI German Bombing	×	The wider Wrexham area did not experience air raids during WWI.	
WWII German Bombing	✓	British District Bombing Density Statistics	The Site was located within the WWII-era Rural District of Wrexham which sustained 3.8 bombs / 1,000 acres, a very low bombing density
		Evidence of bomb strikes / damage	No evidence of bombing within 500m of the site identified at a preliminary stage.

			No historic mapped evidence of bomb damage in the immediate vicinity. N.B. These maps are not thought to accurately represent the site layout during WWII.
		Local Bombing Decoy Sites	None located within a significant distance. The closest was located approximately 7.2km east.
		Local German Bombing Targets	No confirmed primary or secondary Luftwaffe bombing targets in the vicinity. RAF Wrexham (4.4km north-west) and ROF Wrexham (on Site) would have been easily identifiable as profitable targets.
WWII German Cross Channel Artillery Shelling	×	n/a	
BRITISH / ALLIED MILITARY ACTIVITY			
Potential Source of UXO	**Significant?**	**Details**	
WWII Home Guard (HG) activity	×/✓	A detached unit of the 6th Denbighshire (Wrexham) HG battalion was likely responsible for guarding the ROF. The possibility that the Site was accessed by armed HG soldiers cannot be discounted at this stage.	
Site requisitioned for wartime military use	×	n/a	
Existing or historic Army or RAF training area / weapons range	×	n/a	
Existing or historic military bases and other installations	×	n/a	
Existing or historic munitions or explosives factories	×/✓	Royal Ordnance Factory (ROF) Wrexham was a large WWII cordite manufacturing factory. The Site was located within a relatively central location area; it appears to have comprised a bunded structure potentially used for ordnance storage.	
Existing or historic military storage depots	×	n/a	
Existing or historic military defensive fortifications	×/✓	The ROF perimeter was fortified. The closest recorded defensive feature was a pillbox approximately 650m east.	
WWII light and / or heavy anti-aircraft (LAA and HAA) fire	✓	Two permanent HAA batteries were active within range of the Site during WWII. LAA guns likely defended vulnerable points such as ROF Wrexham and RAF Wrexham. Due to Wrexham's location on a Luftwaffe flight path to Liverpool, the Luftwaffe were frequently active in the region and therefore these guns would have expended ammunition over the wider area.	
WWII pipe-mined locations and beach minefields	×	n/a	
SITE HISTORY			
What was the Site occupancy historically, especially during WWI and WWII?	During WWII, the Site occupied a section of ROF Wrexham, largely comprising open, undeveloped ground with a partially bunded structure.		
RISK MITIGATING FACTORS			
Post-conflict ground works	This structure, and seemingly the associated bunding, had been cleared by 2006. Note, a bunded feature was present in the centre of the Site, although its origin is unknown at a preliminary stage. By this time, an area of hardstanding was also located in the east. The large area of hardstanding in the west, and associated accessway, had been laid by 2021.		
Likelihood of UXO remaining	The risk associated with (any) very shallow buried UXO will have been partially mitigated. The risk associated with (any) shallow and deep buried UXO will likely remain mitigated.		

CONCLUSIONS
German UXO: • Although the wider Wrexham area was never the subject of a large-scale concentrated air raid, the wider area experienced bombing due to its vulnerable position close to Luftwaffe flight paths in and out of Liverpool. The Site itself, however, is unlikely to have experienced an elevated bombing density. • Although no original Luftwaffe records identifying ROF Wrexham as a target are available, it was never the subject of a medium or large-scale raid. Even if a small-scale raid resulted in bombs striking the study area, the factory (as a priority vulnerable point) would have been well protected. • Fire watchers or AA gunners would have observed any UXB falls, and ARP wardens would have searched the factory and grounds for delayed action bomb (UXB) entry holes. Therefore, it is considered highly unlikely that a UXB strike could have been overlooked on Site. • However, the proposed SI works will disturb a relatively large volume of soil, thereby increasing the probability of a UXB encounter.
British / Allied UXO: • The Site occupied part of a cordite manufacturing factory during WWII. Past experience confirms that UXO contamination of such sites can and did occur. • As the Site was located relatively centrally within the factory complex, the risk that ordnance storage features were located on or adjacent to the Site cannot be discounted at a preliminary stage. Note, a structure potentially related to ordnance storage is visible on Site in WWII-era photography. • It is quite possible that an unexploded British AA shell struck the Site during WWII and penetrated to a shallow depth. However, any such UXO incident is highly unlikely to have been overlooked within this sensitive site. • However, the proposed SI works will disturb a relatively large volume of soil, thereby increasing the probability of a UXO encounter.

RECOMMENDATION(S)	
SI Works	A **Stage 2 Detailed Risk Assessment** is recommended to elucidate the risk to the proposed works.
Development Works	

APPENDIX VIII
BGS RADON REPORT

GeoReports

British Geological Survey

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HD1 1RL

Radon Report

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

Report Id: ***BGS_338368/54170***

Client reference: 16685

Search location



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Search location indicated in red

This report describes a site located at National Grid Reference 337544, 349224. Note that for sites of irregular shape, this point may lie outside the site boundary. Where the client has submitted a site plan the assessment will be based on the area given.

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Radon Report: UK

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

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

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

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

Requirement for radon protective measures

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

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

NO RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

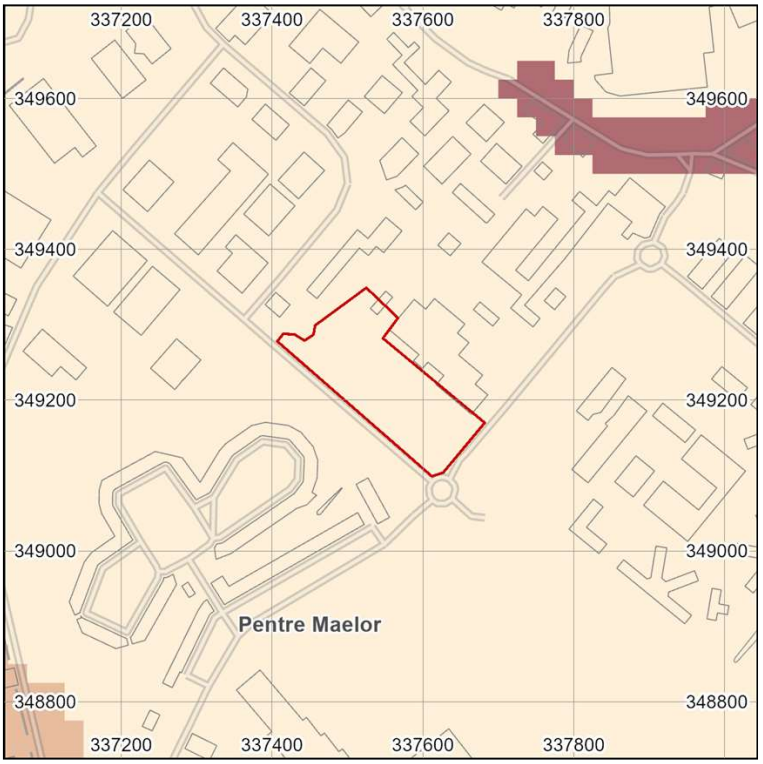
More details of the protective measures required are available in *BR211 Radon: Guidance on protective measures for new buildings (2023 Edition)*.

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

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

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Radon Affected Area



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

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

Is the property in a radon Affected Area as defined by the UK Health Security Agency (UKHSA) and if so what percentage of homes are estimated to be at or above the Action Level? NO

Additional Information

THE PROPERTY IS IN AN AREA WHERE LESS THAN 1% OF HOMES ARE ESTIMATED TO BE AT OR ABOVE THE ACTION LEVEL. THE PROPERTY IS NOT IN A RADON AFFECTED AREA.

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

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

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

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

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

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

Further information on radon is available from the UKHSA at www.ukradon.org.

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What is radon?

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

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

Radon in workplaces

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

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