GroundSolve Ltd
Consulting Geotechnical Engineers

DOLWAR, COEDPOETH

3035/REF

VERSION 1

22 DECEMBER 2023

FINAL

Prepared for:

David Jarvis

Prepared by: Ross Page

GroundSolve Ltd

DOCUMENT CONTROL

Report No. :	3035/REF
Report Status:	FINAL
Version No.:	1
Project Engineer:	Ross Page
Date of Issue:	22/12/2023

This report has been prepared by GroundSolve Ltd with all reasonable care and diligence, within the best practice and guidance current at the time of issue within the proposed redline boundary and proposed Site end use as presented by the Client.

This report is confidential to the Client and GroundSolve Ltd accepts no responsibility whatsoever to third parties to whom this report is presented.

Version No.	Description of Issue / Revision	Date of Issue	Author	Reviewed By	Approved By
1	Rev101	22/12/23	Ross Page	Alex Ridge	Sam Fishburne
			BSc (FGS)	BSc (FGS)	BEng (Hons) MSc FGS CGeol

CONTENTS

1 Introduction 7
1.1 Proposed Development 7
1.2 Previous Reports 8
1.3 Objectives 8
1.4 Assumptions 8
2 Site Details and Description 9
3 Site History 10
3.1 Site History Review 10
4 Environmental Setting 16
4.1 Geology 16
4.2 Mining and Quarrying 16
4.3 Hydrogeology 17
4.4 Hydrology 18
4.5 Environmental Designations 18
4.6 Landfill and Waste Management Activity 20
4.7 Local Industrial Land Uses 21
4.8 Radon Risk 22
4.9 Waste Classification and Materials Re-Use 23
5 Preliminary Geotechnical Assessment 24
5.1 Anticipated Ground Conditions 24
5.2 Site Levels, Earthworks and Site Preparation 24
5.3 Preliminary Foundation Solution 24
5.4 Preliminary Floor Slab Solution 24
5.5 Roads and Hardstanding 24
5.6 Drainage 24
6 Preliminary Conceptual SIte Model 25
6.1 Introduction 25
6.2 Conceptual Site Model 25
6.3 Hazards Identified with the Proposed Development 26

6.4 Potential Sources of Contamination 26
6.5 Potential Receptors of Contamination 26
6.6 Identification of Pathways 28
6.7 Contaminant Linkages 30
6.8 Uncertainties 30
6.9 Conceptual Site Model 31
6.10 Preliminary Contamination Hazard Assessment 32
6.11 Preliminary Assessment of Potential Pollutant Linkages 33
7 Conclusions and Recommendations 36
7.1 Environmental Risk Assessment 36
7.2 Restrictions 37
7.3 Proposed Scope of Works 37
8 References 38

LIST OF FIGURES

Figure 1: Proposed Development 7
Figure 2: Exist Site Layout 9
Figure 3: 1899 OS Map (1:2500) 11
Figure 4: 1912 OS Map (1:2500) 12
Figure 5: 1967 OS Map (1:2500) 13
Figure 6: 1988 OS Map (1:2500) 14
Figure 7: OS Map 2003 (1:10,000) 15
Figure 8: Preliminary Conceptual Ground Model – Schematic Section (not to scale) 31

LIST OF TABLES

Table 2.1 – Current Site Overview 9
Table 3.1 - Site History 11
Table 4.1 - Geological Summary 16
Table 4.2 - Coal Mining Activities 16
Table 4.3 - Other Extractive Industries 17
Table 4.4 - Groundwater Occurrence and Abstraction 17

Table 4.5 - Surface Water Features 18
Table 4.6 - Summary of Environmental Designations 18
Table 4.7 - Waste Management Activities 20
Table 4.8 - Other Potentially Contaminative Processes in the Locality 21
Table 4.9 - Radon Risk Status 22
Table 6.1 - Identified Potential Receptors 26
Table 6.2 - Matrix of Contaminant Linkages 30

APPENDICES

APPENDIX A: GROUNDSURE REPORT 39
APPENDIX B: TERMS OF THE PRA 40

EXECUTIVE SUMMARY

Introduction	GroundSolve Ltd (GSL) were commissioned by David Jarvis to undertake a Land Contamination Risk Management (LCRM) Preliminary Risk Assessment for an area of land referred to as the Dolwar, Coedpoeth (the "Site").
Proposed land use	The proposed development includes the demolition of the existing dwelling and the erection of a replacement dwelling.
Site location and surrounding land uses	Existing residential property. Surrounding land uses comprises mostly residential, with Coedpoeth Bowling Park to the northwest, a Parish Hall and Bryn Tabor Pre School to the north east
Site history	Site was agricultural grazing until its development as a residential property in 1968 and has remained in its current form to date.
Geology, Hydrogeology and Hydrology	Published data suggests no superficial deposits the underlying bedrock geology comprises Sandstone (Cefn Rock).
Ground Gases	Ground gas risk is low however site lies within a high risk radon area
Radon Requirements	Full Radon protection measures required
Potential contaminative features	No significant onsite source Electricity transformer 7m east of the site
Mining and quarrying	None
Previous investigations	None
Preliminary Geotechnical Assessment	Conventional spread foundations should be suitable
Waste Soils Classification	No evidence of significant contamination. Natural materials should be classified as inert by definition
Materials re-use	Onsite reuse possible however limited scope due to nature of development
Further works or other issues potentially restricting work	Phase II Ground investigation.

1 INTRODUCTION

GroundSolve Ltd (GSL) were commissioned by David Jarvis to undertake a Land Contamination Risk Management (LCRM) Preliminary Risk Assessment for an area of land referred to as Dolwar, Coedpoeth (the "Site").

1.1 PROPOSED DEVELOPMENT

Current plans are to demolish the existing dwelling and erect a new detached replacement dwelling. See **Figure 1**

Foundation loads are not known at this stage but based on experience are anticipated to be between 50 and 75kN/m run for two to three storey structures. Floor slab loadings are anticipated to be low, probably not exceeding 5kN/m². In addition, development levels have not yet been set.

The recommendations in this report are based on these assumptions, consequently, they should be reviewed, and if necessary revised during the detailed design.

As such, in accordance with the *'Updated technical background to the CLEA model'* (Environment Agency, 2009) and *'Suitable 4 Use Levels'* (LQM / CIEH 2015) the proposed generic land use for this development is RESIDENTIAL WITH HOMEGROWN PRODUCE.



Figure 1: Proposed Development

1.2 PREVIOUS REPORTS

No previous reports are available or known to have been undertaken.

1.3 OBJECTIVES

Taking into account the proposed development of the Site, the objectives of this appraisal were:

1. To determine the historical and current land use.
2. To establish the environmental setting of the Site.
3. To evaluate whether past mining or other extractive industries could have an influence on the Site.
4. To review previous pertinent third party reports;
5. To determine likely ground and groundwater conditions.
6. To determine the potential risks to human health and the wider environment.
7. To determine potential risks posed to the Site from hazardous ground gases and / or vapours.
8. To derive a Preliminary Conceptual Site Model.

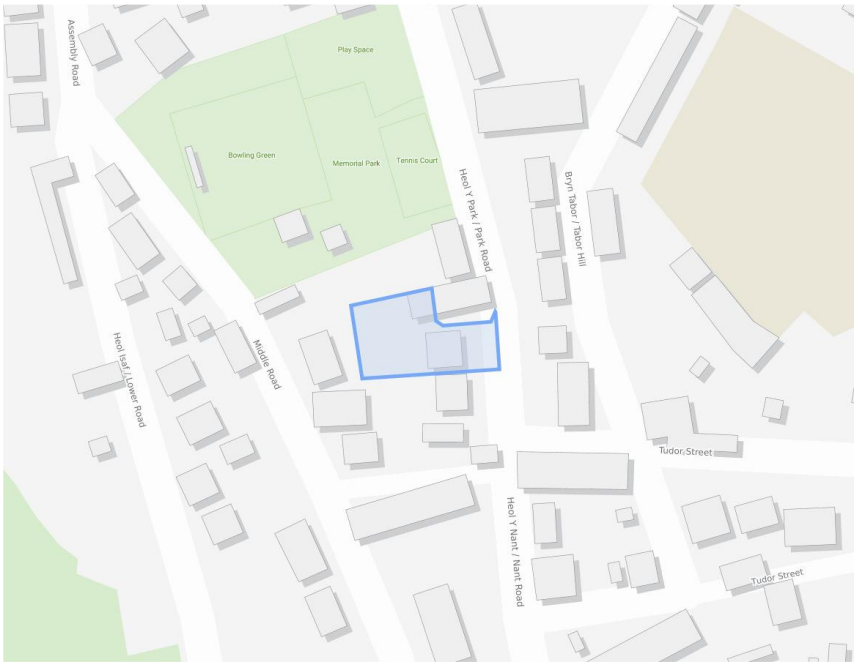
1.4 ASSUMPTIONS

The following assumptions are made in this report:

1. It is assumed that ground levels will not change significantly from those described in this report or a shown on proposed development drawings. If this is not the case, then amendments to the recommendations made in this report may be required.
2. Any references to observations of suspected asbestos-containing materials are for information only and should be verified by a suitably qualified asbestos specialist and/or confirmed by laboratory analysis.
3. The use of the term 'Topsoil' within this report is based on a visual identification only and that these materials have not necessarily been classified in accordance with BS3882:2015.
4. The comments and opinions presented in this report are based on the findings of the desk study performed by GroundSolve Ltd. There may be other conditions prevailing on the Site which have not been revealed by this investigation and which have not been taken into account by this report at this stage.
5. Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of the findings is conjectural and given for guidance only. Confirmation of ground conditions should be undertaken if deemed necessary.
6. This report has been prepared for the sole use of the Client. No other third party may rely upon or reproduce the contents of this report without the written approval of GroundSolve Ltd. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk.

2 SITE DETAILS AND DESCRIPTION

Table 2.1 – Current Site Overview

Site name	Dolwar, Coedpoeth
Site address	Dolwar, Park Road, Coedpoeth, Wrexham, LL11 3TD
National Grid Reference (NGR)	328344 350957
Approximate Site area	0.11ha
Site shape	Irregular  ***Figure 2: Exist Site Layout***
Current land use on the Site	Residential
Surrounding land uses	Surrounding land uses comprises mostly residential, with Coedpoeth Bowling Park to the northwest, a Parish Hall and Bryn Tabor Pre School to the north east
General topography and ground levels	The site lays higher to the east, with site levels at around 240 mAOD, to the west the existing garden slopes westward at levels 237 mAOD.

3 SITE HISTORY

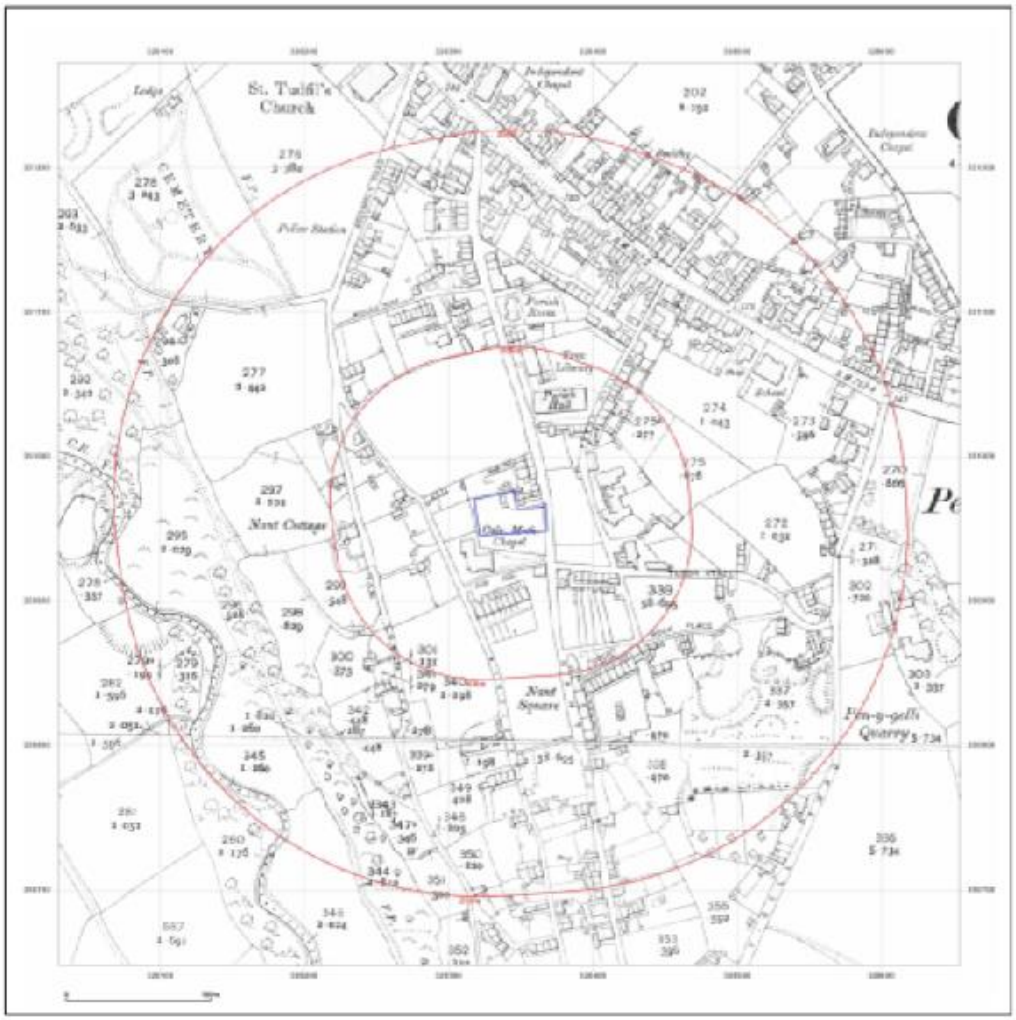
3.1 SITE HISTORY REVIEW

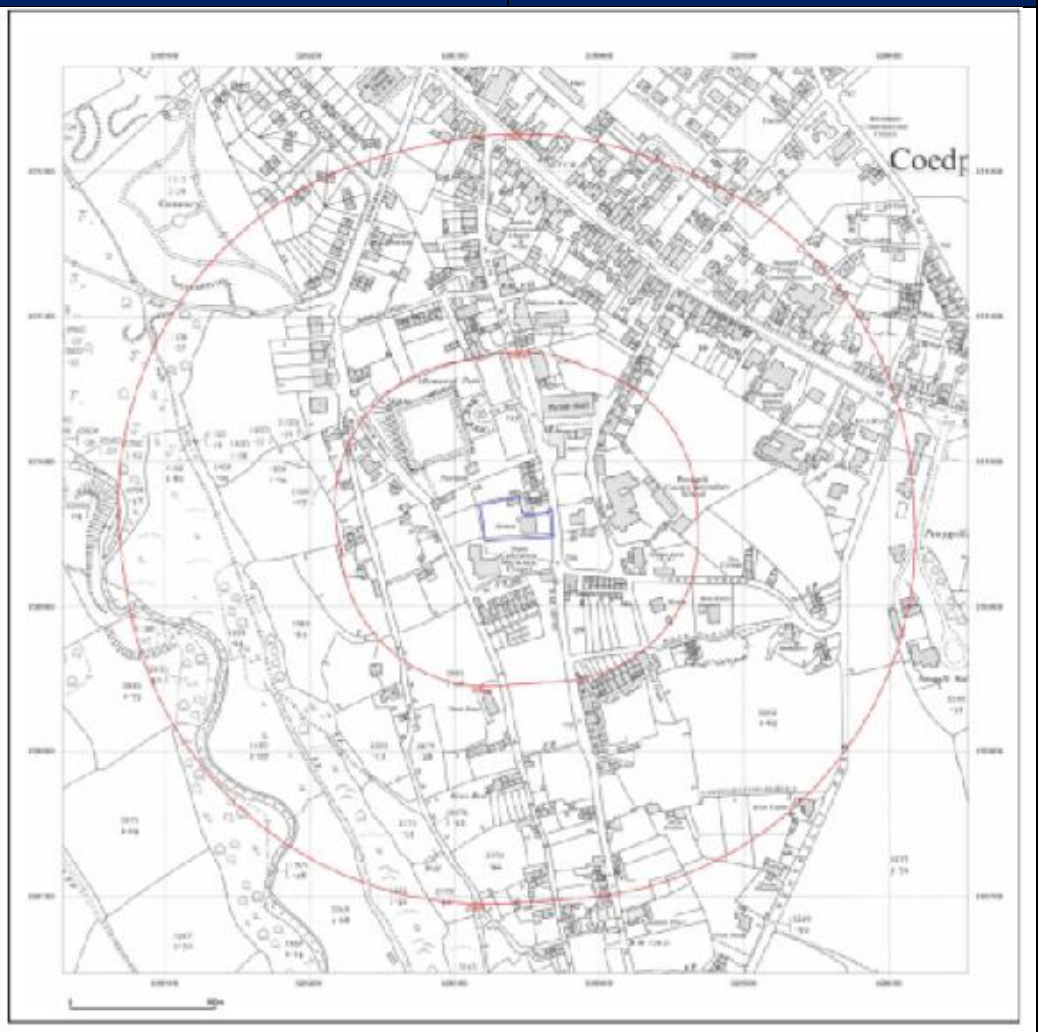
Extracts of Ordnance Survey (OS) plans dated from 1872 were reviewed. These were obtained as part of the Groundsure Report for the Site, which is presented in **Appendix A**.

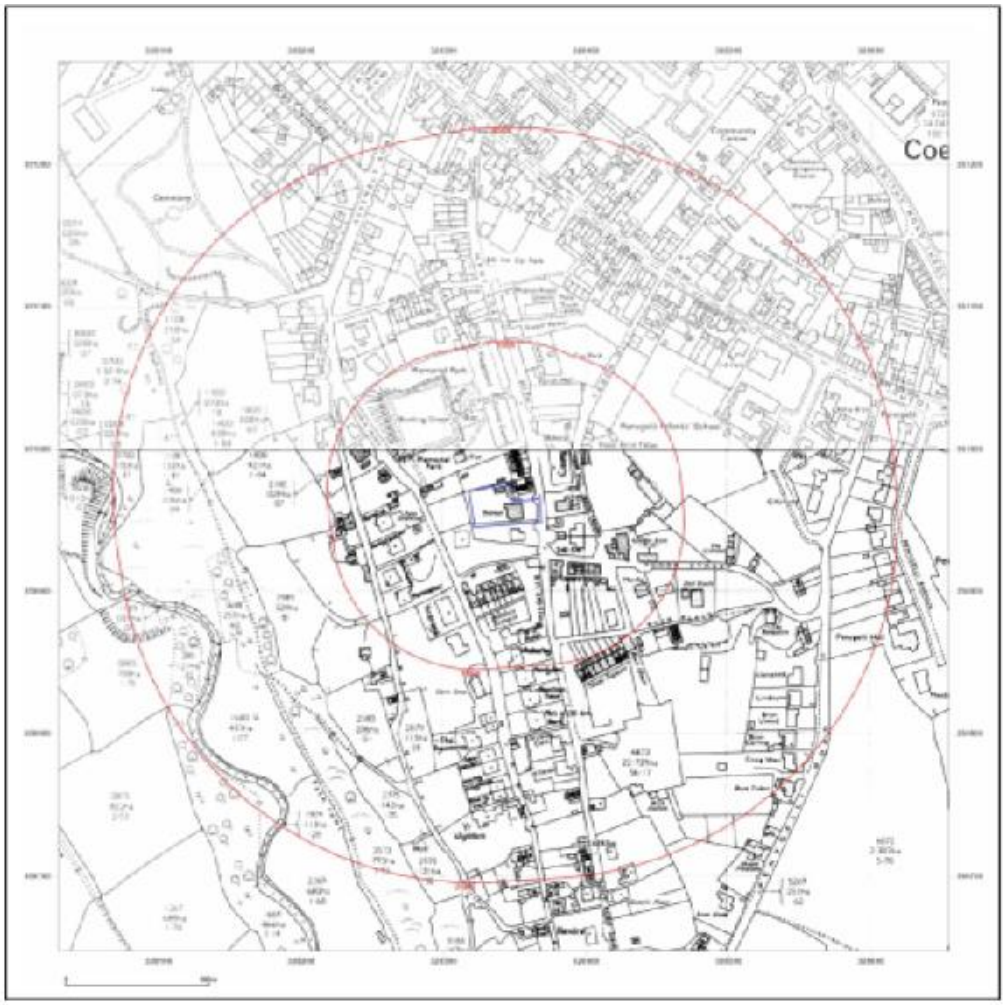
Table 3.1 below presents a summary of the main aspects of the Site relevant to the current and proposed future end uses. It is not the intention of this report to describe in detail all of the changes that have occurred on or adjacent to the Site, where these are not relevant to the land use.

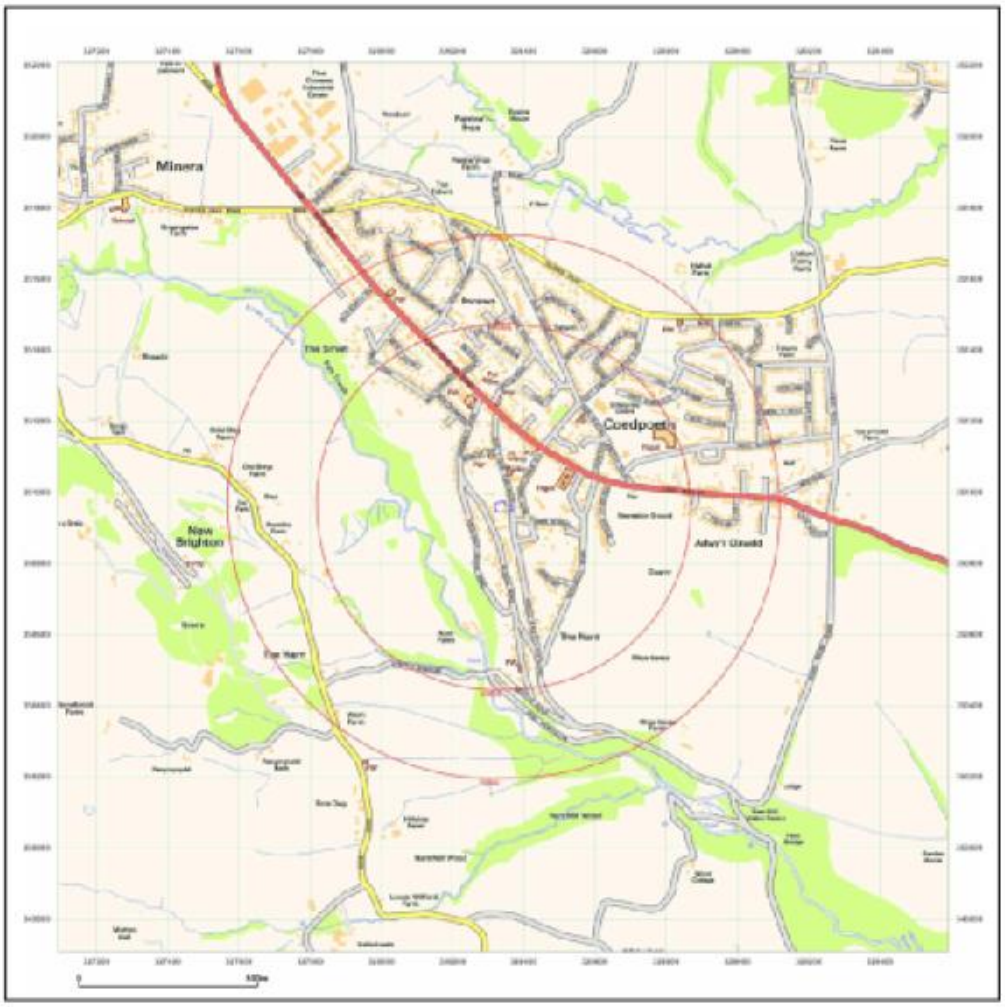
Table 3.1 - Site History

Time Period	On-Site features	Off-Site features
Pre-1900		
	Figure 3: 1899 OS Map (1:2500)	
	Onsite features are limited to a small building unlabelled, likely associated with the property directly north of the site. The remainder of the site is shown as open land pre-1900.	Offsite most of the land use around site comprises residential dwelling. Directly east of the site is noted a School, separated by Nant Road. Northeast is present a parish hall. A quarry, Pen Y Quarry, is present ~150m southeast. A cemetery is present 200m northwest.

Time Period	On-Site features	Off-Site features
1912		
	Figure 4: 1912 OS Map (1:2500)	
	No significant onsite changes occurred between 1899 and 1912.	Directly south of the site boundary appears a label “Caly Meth Chapel” with an associated structure appearing circa 1912. North of the Parish Hall to the northeast, appears “Free Library” label with an associated building. No other significant changes occurred.

Time Period	On-Site features	Off-Site features
1967		
	Figure 5: 1967 OS Map (1:2500)	
	Significant onsite development occurred between 1912 and 1967, with a residential structure appearing onsite circa 1968. With this new structure, the site boundary associated with the residential properties on the northern boundary appears to shrink, and a new property line for the address labelled “Dolwar” appears.	Offsite development is extensive between 1912 and 1967. Pen Y Gelli quarry appears to have been infilled. In addition, previously open land located northwest of the site becomes a post war memorial park, located opposite the still present Parish Hall. What was once open land beyond Nant Road on the eastern site boundary appears as developed with structures labelled “Bakery” and “Bryn Head”. The Golden Lion pub is also present ~100m southeast of the site. Residential properties also appear to the northwest of the memorial park in previously open land.

Time Period	On-Site features	Off-Site features
1988		
	Figure 6: 1988 OS Map (1:2500)	
	No significant changes.	The area previously noted as wholly a memorial park appears to have a bowling green located on with a tennis court and playground present. Residential development located west of “Middle Road” also appear between 1967 and 1988.

Time Period	On-Site features	Off-Site features
2023		
	Figure 7: OS Map 2003 (1:10,000)	
	No Significant onsite changes.	No significant offsite changes occurred between 1988 and 2023.

4 ENVIRONMENTAL SETTING

4.1 GEOLOGY

Table 4.1 - Geological Summary

Maps and publications referenced	British Geological Survey of England and Wales 1:50,000 Scale
Made ground / artificial ground	No made ground or infilled land was identified on the Groundsure report, however its likely as a result of on-site development that there may be some made ground or infilled land present.
Drift geology	No superficial geology has been identified as present onsite.
Solid geology	Published data suggests bedrock geology comprises Sandstone (Cefn Rock).
Faults	No faults are recorded as being present under the site.
Coal seams	No coal seams are recorded as present under the site, however it is noted there are in proximity to the site (104m W), and as such a Consultants Coal Mining Report was ordered, however highlighted no points of concern.

4.2 MINING AND QUARRYING

Table 4.2 - Coal Mining Activities

	Yes/No	**Comments**
Is the Site in an area of potential shallow coal workings?	No	No past underground mining recorded,
Is the Site in a high risk development area?	No	There are no probable unrecorded shallow workings beneath the site,
Are there any known shafts, adits, tips, lagoons, or opencast workings likely to affect the Site?	No	No spine roadways recorded at shallow depth,
Is exploratory work required to investigate the potential risk from shallow mining or quarrying?	No	No mine entries recorded within 100m of the site.

Table 4.3 - Other Extractive Industries

	Yes/No	Comments
Superficial drift deposits		
Evidence of extraction on or within 250 m of the Site?	Yes	No superficial drift deposits are recorded on site, however river terrace deposits (Alluvium) and Glacial Till are recorded as present 194m SW and 217m W.
Action required?	No	-
Solid Strata		
Any evidence of mineral extraction on or within 250 m of the Site?	Yes	Pen y gelli Quarries located 150m Southeast
Action required?	No	-

4.3 HYDROGEOLOGY

Table 4.4 - Groundwater Occurrence and Abstraction

	Presence/location	Comments
Environment Agency aquifer designation – Superficial Deposits	Offsite	194m SW (Secondary A)
Environment Agency aquifer designation – Bedrock	Onsite	Secondary A
Anticipated groundwater depth(s)	Onsite	Unknown.
Direction of flow	Onsite/Offsite	Unknown.
Current licensed abstractions – potable	Onsite/Offsite	None within 1000m
Source Protection Zones	Onsite/Offsite	None within 500m.
Springs	Onsite	NR.

NR - none recorded.

4.4 HYDROLOGY

Table 4.5 - Surface Water Features

	Presence/location	Comments
Nearest surface water feature	Offsite	190m SW (Afon Clywedog)
Other surface water features	Offsite	No other surface water features identified within 500m.
Canals, ponds, lakes, etc.	Offsite	NR.
Water Framework Directive (WFD) Surface Water Bodies	Offsite	189m SW (Clywedog Above Black Brook)
Licensed surface water abstractions	Offsite	None within 500m

Environment Agency GQA assessments: A = very good to E = poor

4.5 ENVIRONMENTAL DESIGNATIONS

Table 4.6 - Summary of Environmental Designations

	Presence/location	Comments
Sites of Special Scientific Interest (SSSI)	Onsite/Offsite	None within 500m
Conserved wetland sites (Ramsar sites)	Onsite/Offsite	None within 500m
Special Areas of Conservation (SAC)	Onsite/Offsite	None within 500m
Special Protection Areas (SPA)	Onsite/Offsite	None within 500m
National Nature Reserves (NNR)	Onsite/Offsite	None within 500m
Local Nature Reserves (LNR)	Onsite/Offsite	None within 500m
Designated Ancient Woodland	Offsite	231m SW, 232m W, 259m NW, 429m S and 474m NW.
Biosphere Reserves	Onsite/Offsite	None within 500m
Forest Parks	Onsite/Offsite	None within 500m
Marine Conservation Zones	Onsite/Offsite	None within 500m

	Presence/location	Comments
Green Belt	Onsite/Offsite	None within 500m
Proposed Ramsar sites	Onsite/Offsite	None within 500m
Possible Special Areas of Conservation (pSAC)	Onsite/Offsite	None within 500m
Potential Special Protection Areas (pSPA)	Onsite/Offsite	None within 500m
Nitrate Sensitive Areas	Onsite/Offsite	None within 500m
Nitrate Vulnerable Zones	Onsite/Offsite	None within 500m
SSSI Units	Onsite/Offsite	None within 500m

4.6 LANDFILL AND WASTE MANAGEMENT ACTIVITY

Table 4.7 - Waste Management Activities

	Presence/location	Comments
Active or recent landfill	Onsite/Offsite	None recorded within 500m.
Historical landfill (BGS records)	Onsite/Offsite	None recorded within 500m.
Historical landfill (LA/mapping records)	Onsite/Offsite	None recorded within 500m.
Historical landfill (EA/NRW records)	Offsite	Historical landfill recorded 431m E. Waste Type: Industrial, Household.
Historical waste sites	Off site	None recorded within 500m.
Licensed waste sites	Off site	None recorded within 500m.
Waste exemptions	Off site	174m NE - The Pharmacy Coedpoeth Ltd, Manchester House, Heol Maelor, Coedpoeth, Wrecsam, LL113LS 271m E - Castle Road, Castle Road, Coedpoeth, LL11 3NA 365m SW - Unit 11, Tunstall Trade Park, Brownhills Road, Tunstall, Stoke On Trent, ST6 4SE
Evidence of other landfilling or potential infilling on or within 250m of Site	Off site	None recorded within 250m.
Walkover evidence of fly-tipping on Site?	Onsite.	No walkover conducted.
Is a landfill/ground gas risk assessment required?	Onsite.	Not Recorded.

4.7 LOCAL INDUSTRIAL LAND USES

Other potentially contaminative activities are shown in **Table 4.8** below with those features considered pertinent to the conceptual site model highlighted in **bold**. The entries relate to activities within *circa* 250 m of the Site, with the exception of COMAH facilities where the assessment is extended to a distance of *circa* 500m from the Site.

Table 4.8 - Other Potentially Contaminative Processes in the Locality

	Location	Comments
Recent industrial land uses	Off site	7m E – Electricity Transformer 178m N - The Audio Cafe Ltd 193m NW - M & R Minibuses
Current or recent petrol stations	Off site	None recorded within 500m.
Electricity cables	Off site	None recorded within 500m.
Gas pipelines	Off site	None recorded within 500m.
Sites determined as Contaminated Land	Off site	498m NW - Former Lead Smelter Determination notice issued 13/05/2014 Remediation works undertaken 10/2015 and 12/2015. The mean concentration of Lead in the soil exceeds the derived site-specific assessment criteria by more than 2 times the SSSL of 1300mg/kg.
Control of Major Accident Hazards (COMAH)	Off site	None recorded within 500m.
Regulated explosive sites	Off site	None recorded within 500m.
Hazardous substance storage/usage	Off site	None recorded within 500m.
Historical licensed industrial activities (IPC)	Off site	None recorded within 500m.
Licensed industrial activities (Part A(1))	Off site	None recorded within 500m.
Licensed pollutant release (Part A(2)/B)	Off site	None recorded within 500m.
Radioactive Substance Authorisations	Off site	None recorded within 500m.
Licensed Discharges to controlled waters	Off site	None recorded within 500m.

	Location	Comments
Pollutant release to surface waters (Red List)	Off site	None recorded within 500m.
Pollutant release to public sewer	Off site	None recorded within 500m.
List 1 Dangerous Substances	Off site	None recorded within 500m.
List 2 Dangerous Substances	Off site	None recorded within 500m.
Pollution Incidents (EA/NRW)	Off site	None recorded within 500m.
Pollution inventory substances	Off site	None recorded within 500m.
Pollution inventory waste transfers	Off site	None recorded within 500m.
Pollution inventory radioactive waste	Off site	None recorded within 500m.

COMAH – Control of Major Accident Hazards (regulations); NIHHS – Notification of Installations Handling Hazardous Substances (regulations)

4.8 RADON RISK

Table 4.9 - Radon Risk Status

	Comments
Estimated properties affected	Between 10% and 30%
Radon Protection Measures required?	Full protective measures are required

4.9 WASTE CLASSIFICATION AND MATERIALS RE-USE

If the Site is to be redeveloped and materials are disposed of off Site, the material exported from the Site to Landfill should be hauled by a register waste carrier in accordance with Duty of Care Regulations 1991 and the Hazardous Waste Regulations 2005.

Based on the history of the Site and the anticipated potential contaminants of concern, it is considered unlikely that hazardous waste soil materials may be present beneath the majority of the Site; however, this will be subject to confirmatory investigation, sampling, laboratory analysis and waste classification in accordance with the Guidance on the Classification and Assessment of Waste (WM3).

It will be necessary to register the Site in advance of the intended reclamation works with the Environment Agency before disposal to landfill can take place. There will be requirement for the waste producer to provide appropriate Waste Acceptance Criteria (WAC) testing of the Soils for disposal to ensure that the soils are appropriately classified and that the landfill is licensed to receive such soils. A consignment note shall be completed, signed, and retained by all parties involved. The consignment note shall state the volume of waste, a physical description of the material and statement of its chemical composition. The waste consignment notes shall be kept by the contractor for a period of at least two years.

Subject to volumetric fill requirements and a future assessment of suitability of re-use (both chemically and geotechnically), some materials *may* be considered for potential re-use in line with an appropriate end-of-waste protocol such as WRAP Quality Protocol for Aggregates from Inert Waste, U1 Exemption or a Materials Management Plan in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP).

5 PRELIMINARY GEOTECHNICAL ASSESSMENT

5.1 ANTICIPATED GROUND CONDITIONS

The current BGS mapping shows that there are no superficial deposits present at the site but the bedrock is recorded as Sandstone (Cefn Rock).

5.2 SITE LEVELS, EARTHWORKS AND SITE PREPARATION

The relatively level nature of the site would suggest that significant cut/fill operations are not anticipated. Shallow excavations within the superficial deposits, should be feasible with conventional earthmoving equipment. Excavations will need shoring for safety reasons.

In the absence of direct site-specific evidence of water table levels, it would be prudent to assume at this stage the majority of water ingress will be from surface water and should be manageable via conventional pumping from sumps.

5.3 PRELIMINARY FOUNDATION SOLUTION

No loading information has been provided for this report.

It is anticipated that spread footings could be adopted for the foundations at this site. Excavations through the soils to a depth of about 1.0m should be stable in the short term, however, it is anticipated that if granular soils are present, these may gradually collapse into excavations, leading to instability of the sides of excavations. Excavations below the groundwater table may encounter running sand and collapse unless dewatering is carried out.

It is advisable to undertake an intrusive site investigation in order to assess ground conditions on site and provide a more detailed foundation recommendation.

5.4 PRELIMINARY FLOOR SLAB SOLUTION

It is anticipated that ground bearing floor slabs are achievable for the development. It is recommended that any made ground encountered on site is removed. The exposed formation should be proof rolled with a heavy roller to detect any soft spots and if identified, these should be removed and replaced with suitable granular material. The excavation should then be filled with suitably engineered compacted granular material.

5.5 ROADS AND HARDSTANDING

It is anticipated that the surface materials will require removal and replaced with engineered materials.

5.6 DRAINAGE

It is anticipated that the existing drainage on site may be used for the proposed development.

6 PRELIMINARY CONCEPTUAL SITE MODEL

6.1 INTRODUCTION

Based on the information provided in the previous sections of this report a combined preliminary conceptual site model and conceptual exposure model has been developed for the proposed future land use. This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors. In assessing the likely contaminants of concern present at the Site, reference has also been made to Defra and Environment Agency supporting documentation. A preliminary qualitative risk assessment has also been made of the likelihood of the linkage operating and its potential significance in accordance with CIRIA C552.

The preliminary conceptual model is presented in schematic form in **Section 6.9**. The potential pollutant linkages identified and the qualitative risk assessment for these are presented in Conceptual Site Model.

The terms used in the preliminary qualitative risk assessment are defined in **Appendix B**.

The following sections discuss all the identified potential on and off-site sources, pathways, and receptors in the context of the proposed development and plausible pollutant linkages which may represent a risk to identified receptors such as human health and/or controlled waters from the data gained from the desk study. At this stage, the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

Three impact potentials exist for any given site, these are:

- The site impacting upon itself;
- The site impacting on its surroundings; and
- The surroundings impacting on the site.

All three impacts need to be considered in a risk assessment.

- Sources; these are potential or known sources of contamination that may relate to a former land use or present site feature or process (e.g., Made Ground, infilled ground etc).
- Pathways; a pathway is defined as a mechanism or route by which a contaminant encounters, or otherwise affects a receptor. Pathways by which the identified receptors may be impacted upon in the context of the proposed development.
- Receptors; receptors are defined as people, living organisms, ecological systems, controlled waters, atmosphere, structures, and utilities that could be adversely affected by contaminant(s).

6.2 CONCEPTUAL SITE MODEL

Based on the data available the following Conceptual Site Model has been developed. The various components of the potential “source–pathway-receptor” pollutant linkages identified at the site.

6.3 HAZARDS IDENTIFIED WITH THE PROPOSED DEVELOPMENT

The hazard identification is based on the assumptions presented below:

- the site will be a residential development;
- the previous residential properties and outbuildings are a source of contamination.
- drinking water will be from mains supply.

6.4 POTENTIAL SOURCES OF CONTAMINATION

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

Potential On-site Sources of Contamination

- Existing buildings – no significant source to proposed development.

Potential Off-site Sources of Contamination

- Surrounding residential properties
- Electricity transformer 7m east of the site

6.5 POTENTIAL RECEPTORS OF CONTAMINATION

Based on the data previously discussed, the following potential receptors to contamination have been identified:

Table 6.1 - Identified Potential Receptors

Sensitive Receptors	
A	Humans – Predevelopment completion, i.e. working on site during demolition and construction.
B	Humans living on the site post construction.
C	Controlled waters – Surface Waters (rivers and streams)
D	Groundwater in the secondary A aquifer.
E	Local flora and fauna during and post construction.
F	Building structure and services.

The possible contaminant linkages are discussed below. It should be noted not all may be formed between all sources and receptors.

The preliminary assessment of risks undertaken for the development considers potential risks to receptors A to F in **Table 6.1** above. The receptors A to F incorporate each of the receptors normally required by the Local Authority to be considered in their planning conditions relating to land contamination:

- Human Health (A & B)
- Property (including buildings, crops, livestock, pets, woodland, service lines) (E & F)
- Adjoining land (D & F)
- Groundwater and surface water (C & D)
- Ecological systems (E)
- Buildings and structures (F)

It should be noted that there are no archaeological sites or ancient monuments considered to be within the zone of influence of the site. They are therefore not considered in the risk assessment.

The possible contaminant linkages are discussed below. It should be noted not all may be formed between all sources and receptors.

6.6 IDENTIFICATION OF PATHWAYS

Pathways to Human Health

There are various routes by which a potential contaminant may reach a receptor. For example, in areas where contaminated material is exposed, dermal contact with the material, inhalation or ingestion of dust may occur.

Inhalation or ingestion of dust and water could occur during the construction and development phase at the site. Pathways from dermal contact with soil and groundwater may also arise. It is considered that the risk of short-term exposure for ground workers and other construction workers is low unless there are asbestos fibres are encountered.

Post construction, the surface of the development area will be occupied with buildings and hard standing, with smaller garden areas. This will effectively eliminate the persistence of potential pathways such as long-term direct contact and dust inhalation/ingestion as long as the soil in the garden areas has no significant concentrations of contaminants.

Ground Gas

There is no credible on-site ground gas source unless deep organic rich Made Ground is encountered.

There is the potential for ground gases may migrate from the infilled sand pits further to the southeast due to the underlying glaciofluvial deposits with moderate gas permeability. Further site investigation is required to assess the risk from ground gases from this material.

Pathways to Controlled Waters

Groundwater levels at the site are anticipated to be at a depth of more than 5 m within the bedrock. However, there is the likelihood that perched groundwater will be present within / at the base of the glaciofluvial deposits. Lateral migration of potentially contaminated groundwater offsite (either via permeable made ground or the underlying aquifer) must be considered.

The vertical leaching of contaminants from any potential Made Ground into the groundwater is a potential pathway for contaminants to impact upon groundwater. The glaciofluvial deposits are anticipated to be underlain by Glacial Till (Clay) and therefore it is very unlikely for contaminates to make their way into the groundwater within the bedrock.

The site is not located within a groundwater source protection zone.

Surface run off from contaminated areas into surface watercourses must also be considered. Due to a lack of a hard standing site surface, this will be uncontrolled prior to and during the groundworks phase when this must be carefully managed.

Post construction the majority of the site and surface run-off will be limited and controlled through drains.

The nearest river source is 196m to the SE. There is limited viable overland migration pathways for surface run off to reach this receptors.

Other Pathways

Other potential pathways that are possibly less significant to the site but still require consideration are: potential phytotoxic effects on sensitive landscaping plants; chemical attack on foundations and services and permeation of contaminants through domestic water pipes. The risk to buildings from ground gases has been discussed under human health above.

6.7 CONTAMINANT LINKAGES

For each contamination source there are potential contaminant linkages with all receptors. However, in the context of this site, not all of the contaminant linkages are plausible, particularly those of potential groundwater contamination and lateral groundwater migration. The likelihood of the various pathways linking the contaminants to the receptors is presented in **Table 6.2** below:

Table 6.2 - Matrix of Contaminant Linkages

Source/ Contaminated Medium	Pathway	Receptor					
		A – Humans using the site pre-development	B – Humans living on the site post construction assuming clean garden	C – Surface water	D - Groundwater	E – Flora & Fauna Post Construction	F – Building & Services
Soil	Ingestion	**S**	**P**	**-**	**-**	**U**	**-**
	Dermal Contact/Direct Contact	**S**	**P**	**-**	**-**	**U**	**P**
	Inhalation	**S**	**P**	**-**	**-**	**U**	**-**
	Infrastructure/Drainage	**P**	**U**	**P**	**P**	**U**	**P**
	Groundwater	**P**	**U**	**U**	**U**	**U**	**P**
	Surface Water	**P**	**U**	**P**	**P**	**U**	**P**
Groundwater	Ingestion	**P**	**U**	**-**	**-**	**U**	**-**
	Inhalation	**S**	**U**	**-**	**-**	**U**	**-**
	Dermal Contact	**P**	**U**	**-**	**-**	**U**	**-**
	Groundwater	**P**	**U**	**P**	**P**	**U**	**P**
	Surface Water	**P**	**U**	**P**	**P**	**U**	**P**
Radon	Migration	**-**	**S**	**-**	**-**	**-**	**-**
Gas (CH4 CO2)	Migration	**P**	**P**	**-**	**-**	**U**	**U**

Key to significance of contaminant linkages
S = Significant Pathway **P** = Possible Pathway **U** = Unlikely Pathway **-** = Not Applicable
Only Significant and Possible contaminant linkages are taken forwards to the next part of the risk assessment.

6.8 UNCERTAINTIES

The following uncertainties exist in the preliminary conceptual model:

- The presence of any features unrecorded by the historic maps.
- Any unrecorded geological features.
- Any unrecorded pollution events during the Site's history.

6.9 CONCEPTUAL SITE MODEL

In accordance with BS 10175, a schematic section has been developed for the site based on the previously presented data and contaminant linkage assessment:

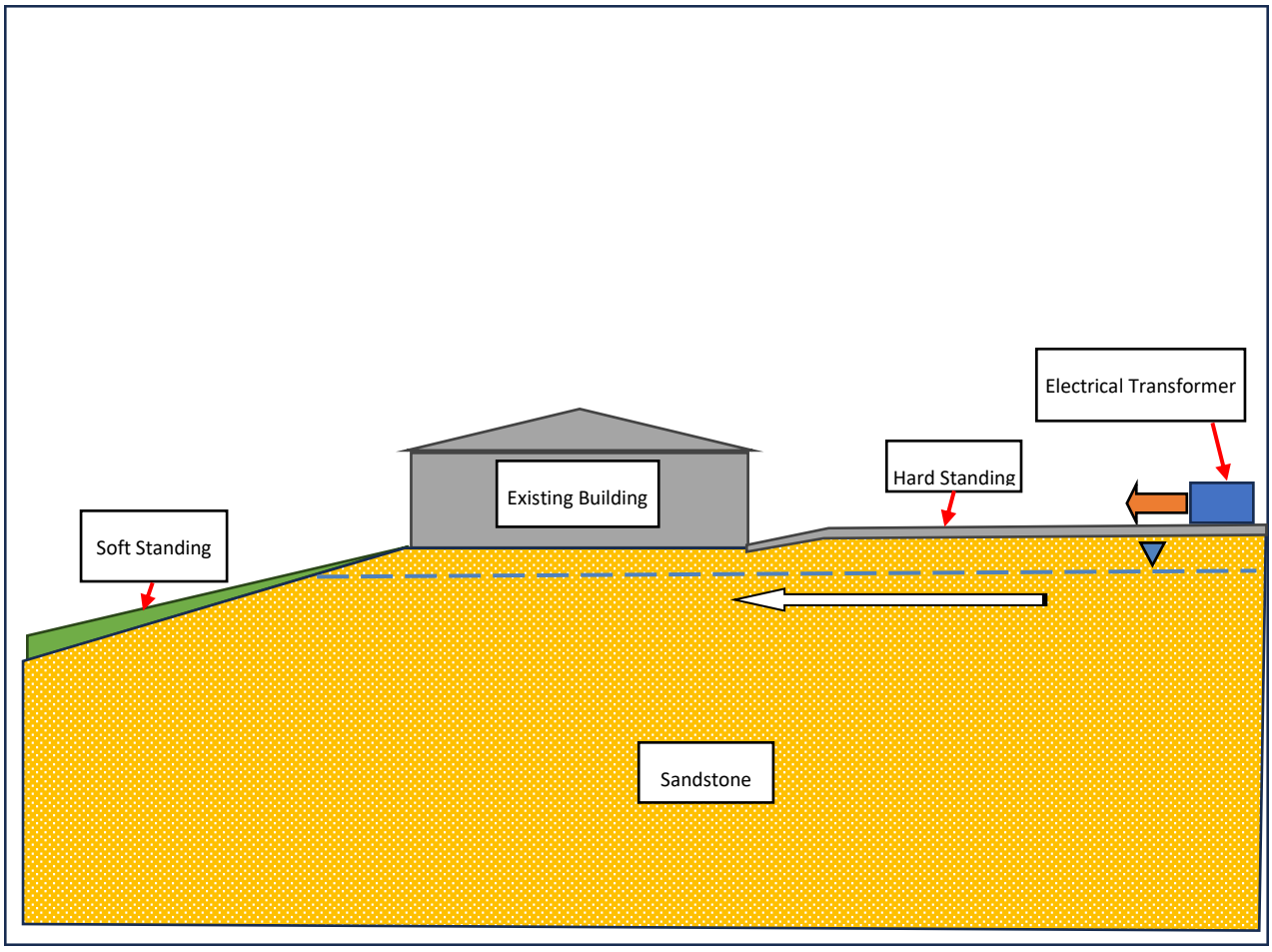


Figure 8: Preliminary Conceptual Ground Model – Schematic Section (not to scale)

Key

Human health pathway/ buildings exposure

Groundwater pathway

Groundwater

The model shows the predicted geology and topography, the major on-site potential contamination sources, and vulnerable receptors.

The information presented above represents the preliminary conceptual ground model that may need to be revised based on information obtained as part of any future intrusive investigation. A number of sensitive receptors and potential pathways and sources (in association with a list of likely contaminants) have been identified.

The ground model and proposed end use described above should be considered broadly representative of the standard housing (with vegetable uptake) as defined in SR3 “Updated Technical Model to the CLEA Model” (SC050021/SR3, 2011) for the purpose of this report.

6.10 PRELIMINARY CONTAMINATION HAZARD ASSESSMENT

The preliminary hazard assessment is based on current available guidance published by a number of sources and is summarised in **Appendix B**. A preliminary conceptual site model for this site has been established using the desk study information and has been used as a basis for the preliminary hazard assessment. The significant and possible potential pathways are only considered for the hazard assessment.

The preliminary hazard assessment is a qualitative assessment of the risks posed by each viable pollution link identified. The hazard assessment leads to a recommended subsequent activity that could be:

Action Required (AR) in the short term to break existing contaminant-pathway-receptor (CPR) link;

- Site Investigation Required (SIR) with objectives for risk estimation, or
- No Action Required (NAR) at this stage.

6.11 PRELIMINARY ASSESSMENT OF POTENTIAL POLLUTANT LINKAGES

Hazard Identification				Hazard Assessment			
Link	**Contaminant**	**Pathway**	**Receptor**	**Probability**	**Consequence**	**Risk**	**Hazard Assessment**
1	Contaminated soil/made ground/ groundwater	Ingestion (via soil dust) and inhalation (via soil dust and vapours), ingestion through dirty hands, dermal contact with soil/water.	A- Humans using the site during construction.	Low	Mild	**Low (L)**	NAR
2		Ingestion (via soil dust) and inhalation (via soil dust and vapours), ingestion through dirty hands, dermal contact with soil/water.	B- Humans using the site after development completion. No change of use.	Low	Medium	**Medium/Low (M/L)**	SIR- Total soil concentration of relevant contaminants for contractor's risk assessments.
3		Via service pipes	B- Humans using the site after construction. F- Building structures	Low	Mild	**Low (L)**	NAR
4		Downward migration	D- Perched groundwater	Low	Medium	**Medium/Low (M/L)**	SIR- Total soil concentration of relevant contaminants for contractor's risk assessments.
5		Downward migration	D – Secondary bedrock aquifer /water supply	Low	Medium	**Medium/Low (M/L)**	Potential Made Ground is in direct contact with bedrock aquifer - SIR

Hazard Identification				Hazard Assessment			
Link	**Contaminant**	**Pathway**	**Receptor**	**Probability**	**Consequence**	**Risk**	**Hazard Assessment**
6	Gas – Made Ground/ organic soils & Hydrocarbon vapours	Inhalation	A & B- Humans using the site during construction and after development completion.	Low	Medium	**Medium/Low (M/L)**	SIR to prove ground conditions and presence of any hydrocarbons impact

From the Table above, a range of risk ranking from low to medium was established. Potentially medium risks require quantification and consideration prior to development. The site investigation objectives described above should represent part of a detailed main stage investigation that should include overall characterisation of the ground in association with obtaining and analysing the information described above.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 ENVIRONMENTAL RISK ASSESSMENT

A preliminary risk assessment has been carried out based on the contaminant-pathway-receptor model as defined in Statutory Guidance to Part IIA of the Environment Protection Act, 1990, and in accordance with BS 10175: 2011 +A1 2013 “Investigation of Potentially Contaminated Sites – Code of Practice”. The characteristic ground conditions and elements of the surrounding environment and has been summarised and a risk assessment carried out.

The site has historically been a residential property since at least 1967 with an outbuilding in the rear garden used a as a garage. There is the potential for shallow Made Ground to be present on site, which may include metals, PAHs and asbestos. There is no evidence of any hydrocarbon storage or spills on the site but this cannot be ruled out. There is no credible ground gas source on site, except Radon. The site is located within a high-risk area and full radon protective measures are required. The protection measures will comprise a radon-proof barrier across the ground floor and provision for subfloor depressurization (a radon sump) or ventilation (a ventilated subfloor void). The design will compile with BRE Report BR211 (2015) Radon: Protective measures for new buildings.

There is no current off-site industrial land use with the exception of an electricity transformer within an influencing distance (7m E of the site).

The results of the risk assessments indicate that there is low potential source of contaminants present at the site and these present a low risk to receptors including humans, structures, controlled surface waters and ecological receptors with the exception of radon.

In order to make a quantitative assessment of the potential risks and so any required remedial measures can be designed; we recommend that a ground investigation is carried out in accordance with BS 10175: 2011+A1 2013 with a suitably qualified geologist or engineer supervising all works. This should be combined with a geotechnical investigation carried out in accordance with BS 5930:2015 + A1:2020.

The objectives of the Ground Investigation will be:

- to determine shallow soil and groundwater (if encountered) conditions, including whether significant contamination has resulted from past or current land uses;
- to determine the risks posed by any ground contamination and provide recommendations on remedial measures to manage such risks;
- to determine the risks posed to the Site from hazardous ground gases;
- to determine the existence, and if applicable, the extent of contamination within local groundwater beneath the Site;
- to provide advice relating to geotechnical issues associated with the Site.

7.2 RESTRICTIONS

At the time of reporting there are no known restrictions.

7.3 PROPOSED SCOPE OF WORKS

The following scope of works are proposed:

- 4No. window sample boreholes with monitoring well installations.
- Gas monitoring – 6 visits over 3 months.
- In situ geotechnical testing to assist with foundation design and recommendations.
- Geoenvironmental chemical testing on selected soil samples to include metals, pH, speciated PAH, speciated TPH, phenol, sulphate, TOC and asbestos screens in order to assess potential risks to human health based on historical land uses on and within close proximity to the Site and to assist with basic waste characterisation. The sampling and testing will be focused on any made ground encountered and the high risk areas of the proposed development i.e. private gardens.

8 REFERENCES

BRE BR211 (2015). Radon: Guidance on Protective Measures for New Dwellings. IHS BRE Press, Bracknell.
BRE SD1 (2005). Concrete in Aggressive Ground. Special Digest 1 (revised edition). IHS BRE Press, Bracknell.
BRE 414 (2001) Protective measures for housing on gas-contaminated land. BRE.
BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites - Code of Practice. British Standards Institution, London.
BS5930:2015+A12020 Code of practice for ground investigations BSI
BS8485 2015 Code of Practice for the design of protective measures for methane and carbon dioxide ground gases in new buildings. British Standards
BS8576-2013 Guidance on investigations for ground gas – permanent gases and volatile organic compounds (VOCs). BSI,
CIRIA Rep R 149 (1995a) Protecting Development from Methane. Report 149, CIRIA, London.
CIRIA Rep R 150 (1995b) Methane Investigation Strategies. Report 150, CIRIA, London.
CIRIA Rep R 132 (1996) A Guide for Safe Working on Contaminated Sites. Report 132, CIRIA, London.
CIRIA C552 (2001) Contaminated land risk assessment. A guide to good practice (report no. C552).
CIRIA C665 (2007) Assessing the risks posed by hazardous gases to buildings CIRIA, London
CIRIA C681 (2009) Unexploded ordnance (UXO) A guide for the construction industry (C681)
CIRIA C785 (2019) Unexploded ordnance (UXO) risk management guide for land-based projects (C785)
CIRIA C758D (2019) Abandoned mine workings manual (C758D)
Contaminated Land: Applications in Real Environments (CL:AIRE) (2011) Definition of Waste Code of Practice (version 2).
Department of Environment Food and Rural Affairs (DEFRA) (2012) Environmental Protection Act 1990:Part 2A Contaminated Land Statutory Guidance (report no. PB13735).
Environment Agency (2000) Technical Aspects of Site Investigation. Report P5-065/TR, Environment Agency, Bristol.
Environment Agency (2002) Guidance on Monitoring Landfill Leachate, Groundwater and Surface Water. Report LFTGN02, Environment Agency, Bristol.
Environment Agency (2007) Evaluation of Models for Predicting Plant Uptake of Chemicals from Soil. Report SC050021/SR, Environment Agency, Bristol.
Environment Agency (2015) Guidance on the Classification and Assessment of Waste Technical Guidance WM3 (1st edition).European Union (1998) Drinking Water Directive (Council Directive 98/83/EC).
Land Contamination Risk Management (LCRM) Environment Agency October 2020
https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm .
LQM/CIEH Ltd (2015) S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.
SoBRA (2017) Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater – Version 1.0.
The Water Framework Directive, (Standards and Classification) Directions (England and Wales).
World Health Organisation (2017) Guidelines for Drinking Water Quality (4th edition).
Britain From Above - https://britainfromabove.org.uk/en/image/WPW060399
http://www.warstateandsociety.com/Bombing-Britain
https://www.epa.gov/pfas/basic-information-pfas
UK Maps of Radon, http://www.ukradon.org/information/ukmaps
Health and Safety Executive (2015) Construction (Design and Management) Regulations.
Coal Authority Interactive Map Viewer, http://mapapps2.bgs.ac.uk/coalauthority/home.html
BGS Geology of Britain Viewer http://mapapps.bgs.ac.uk/geologyofbritain/home.html

APPENDIX A: GROUNDSURE REPORT

Groundsure
LOCATION INTELLIGENCE

Enviro+Geo Insight

DOLWAR, PARK ROAD, COEDPOETH, WREXHAM, LL11 3TD

Order Details

Date: 08/12/2023

Your ref: GSL3035_PO001583

Our Ref: GS-7Y1-WKC-XZA-7ER

Site Details

Location: 328344 350957

Area: 0.11 ha

Authority: Wrecsam - Wrexham County Borough Council ↗



Summary of findings p. 2 >

Aerial image p. 9 >

OS MasterMap site plan p.14 >

groundsure.com/insightuserguide ↗

Contact us with any questions at:
info@groundsure.com ↗
01273 257 755

Certified B Corporation

Summary of findings

Page	Section	Past land use >	On site	0-50m	50-250m	250-500m	500-2000m
15 >	1.1 >	Historical industrial land uses >	0	0	28	60	-
19 >	1.2 >	Historical tanks >	0	2	0	2	-
19 >	1.3 >	Historical energy features >	0	0	2	13	-
20	1.4	Historical petrol stations	0	0	0	0	-
20	1.5	Historical garages	0	0	0	0	-
21	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped >	On site	0-50m	50-250m	250-500m	500-2000m
22 >	2.1 >	Historical industrial land uses >	0	0	35	75	-
27 >	2.2 >	Historical tanks >	0	4	0	3	-
27 >	2.3 >	Historical energy features >	0	0	4	15	-
28	2.4	Historical petrol stations	0	0	0	0	-
28	2.5	Historical garages	0	0	0	0	-
Page	Section	Waste and landfill >	On site	0-50m	50-250m	250-500m	500-2000m
29	3.1	Active or recent landfill	0	0	0	0	-
29	3.2	Historical landfill (BGS records)	0	0	0	0	-
30	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
30 >	3.4 >	Historical landfill (EA/NRW records) >	0	0	0	1	-
30	3.5	Historical waste sites	0	0	0	0	-
30	3.6	Licensed waste sites	0	0	0	0	-
31 >	3.7 >	Waste exemptions >	0	0	2	4	-
Page	Section	Current industrial land use >	On site	0-50m	50-250m	250-500m	500-2000m
32 >	4.1 >	Recent industrial land uses >	0	1	2	-	-
33	4.2	Current or recent petrol stations	0	0	0	0	-
33	4.3	Electricity cables	0	0	0	0	-
33	4.4	Gas pipelines	0	0	0	0	-
33 >	4.5 >	Sites determined as Contaminated Land >	0	0	0	1	-

34	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
34	4.7	Regulated explosive sites	0	0	0	0	-
34	4.8	Hazardous substance storage/usage	0	0	0	0	-
35	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
35	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
35	4.11	Licensed pollutant release (Part A(2)/B)	0	0	0	0	-
35	4.12	Radioactive Substance Authorisations	0	0	0	0	-
35	4.13	Licensed Discharges to controlled waters	0	0	0	0	-
36	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
36	4.15	Pollutant release to public sewer	0	0	0	0	-
36	4.16	List 1 Dangerous Substances	0	0	0	0	-
36	4.17	List 2 Dangerous Substances	0	0	0	0	-
36	4.18	Pollution Incidents (EA/NRW)	0	0	0	0	-
37	4.19	Pollution inventory substances	0	0	0	0	-
37	4.20	Pollution inventory waste transfers	0	0	0	0	-
37	4.21	Pollution inventory radioactive waste	0	0	0	0	-
Page	Section	**Hydrogeology** >	On site	0-50m	50-250m	250-500m	500-2000m
38 >	**5.1** >	**Superficial aquifer** >	Identified (within 500m)				
40 >	**5.2** >	**Bedrock aquifer** >	Identified (within 500m)				
41 >	**5.3** >	**Groundwater vulnerability** >	Identified (within 50m)				
42	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
42	5.5	Groundwater vulnerability- local information	None (within 0m)				
43 >	**5.6** >	**Groundwater abstractions** >	0	0	0	0	2
44	5.7	Surface water abstractions	0	0	0	0	0
44 >	**5.8** >	**Potable abstractions** >	0	0	0	0	2
45	5.9	Source Protection Zones	0	0	0	0	-
45	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-
Page	Section	**Hydrology** >	On site	0-50m	50-250m	250-500m	500-2000m
46 >	**6.1** >	**Water Network (OS MasterMap)** >	0	0	2	-	-

47 >	6.2 >	Surface water features >	0	0	1	-	-
47 >	6.3 >	WFD Surface water body catchments >	1	-	-	-	-
47 >	6.4 >	WFD Surface water bodies >	0	0	1	-	-
48 >	6.5 >	WFD Groundwater bodies >	1	-	-	-	-
Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
49	7.1	Risk of flooding from rivers and the sea	None (within 50m)				
49	7.2	Historical Flood Events	0	0	0	-	-
49	7.3	Flood Defences	0	0	0	-	-
50	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
50	7.5	Flood Storage Areas	0	0	0	-	-
51	7.6	Flood Zone 2	None (within 50m)				
51	7.7	Flood Zone 3	None (within 50m)				
Page	Section	Surface water flooding					
52	8.1	Surface water flooding	Negligible (within 50m)				
Page	Section	Groundwater flooding >					
53 >	9.1 >	Groundwater flooding >	Negligible (within 50m)				
Page	Section	Environmental designations >	On site	0-50m	50-250m	250-500m	500-2000m
54 >	10.1 >	Sites of Special Scientific Interest (SSSI) >	0	0	0	0	1
55	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
55 >	10.3 >	Special Areas of Conservation (SAC) >	0	0	0	0	1
56	10.4	Special Protection Areas (SPA)	0	0	0	0	0
56	10.5	National Nature Reserves (NNR)	0	0	0	0	0
56	10.6	Local Nature Reserves (LNR)	0	0	0	0	0
56 >	10.7 >	Designated Ancient Woodland >	0	0	2	3	31
58	10.8	Biosphere Reserves	0	0	0	0	0
58	10.9	Forest Parks	0	0	0	0	0
58	10.10	Marine Conservation Zones	0	0	0	0	0
58	10.11	Green Belt	0	0	0	0	0
59	10.12	Proposed Ramsar sites	0	0	0	0	0

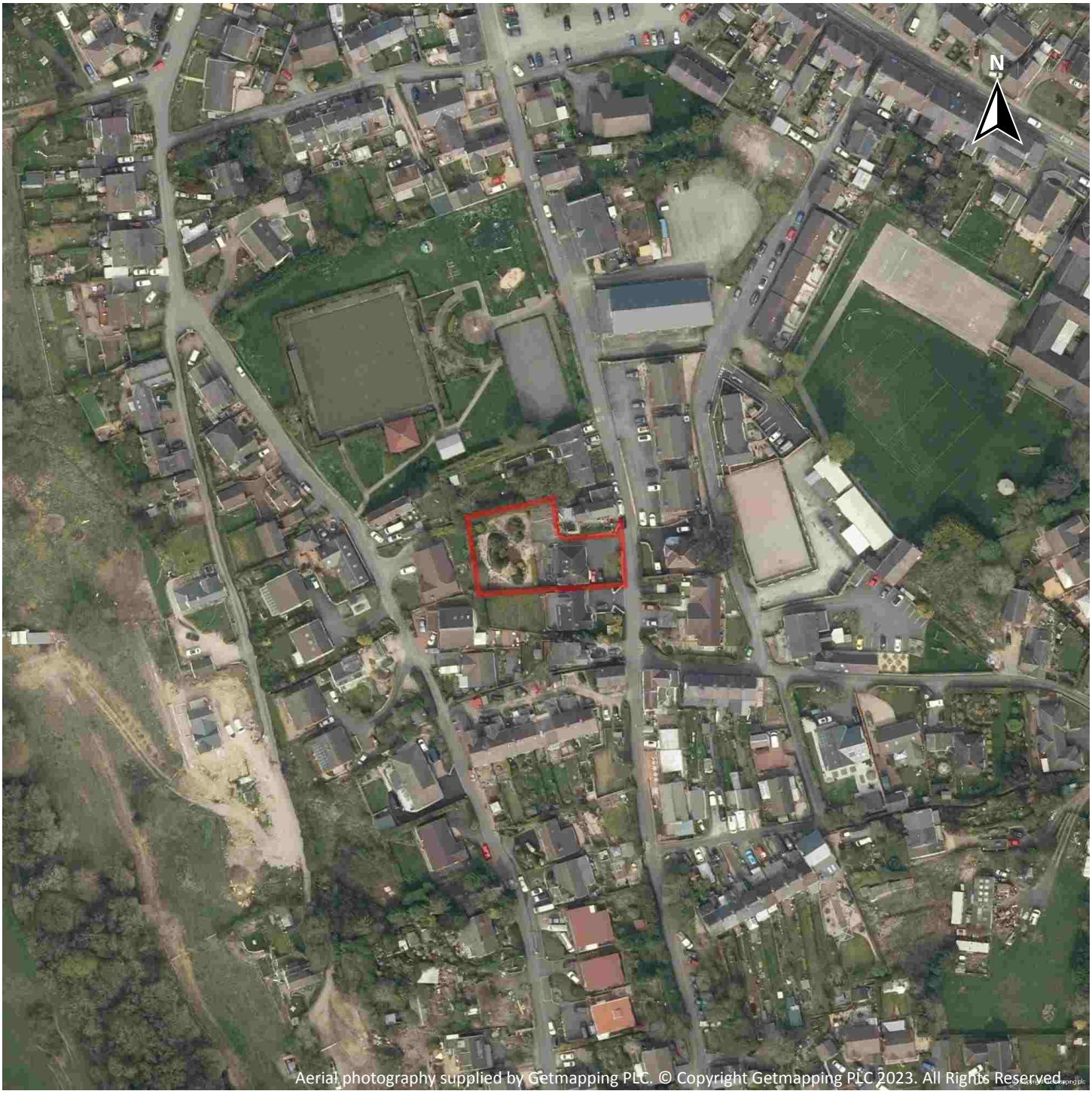
59	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
59	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
59	10.15	Nitrate Sensitive Areas	0	0	0	0	0
60	10.16	Nitrate Vulnerable Zones	0	0	0	0	0
61	10.17	SSSI Impact Risk Zones	0	-	-	-	-
61	10.18	SSSI Units	0	0	0	0	0
Page	Section	**Visual and cultural designations >**	On site	0-50m	50-250m	250-500m	500-2000m
62	11.1	World Heritage Sites	0	0	0	-	-
63	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
63	11.3	National Parks	0	0	0	-	-
63 >	**11.4 >**	**Listed Buildings >**	0	0	2	-	-
64	11.5	Conservation Areas	0	0	0	-	-
64	11.6	Scheduled Ancient Monuments	0	0	0	-	-
64	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	**Agricultural designations >**	On site	0-50m	50-250m	250-500m	500-2000m
65 >	**12.1 >**	**Agricultural Land Classification >**	Grade 4 (within 250m)				
66 >	**12.2 >**	**Open Access Land >**	0	0	1	-	-
66	12.3	Tree Felling Licences	0	0	0	-	-
67	12.4	Environmental Stewardship Schemes	0	0	0	-	-
67	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
68	13.1	Priority Habitat Inventory	0	0	0	-	-
68	13.2	Habitat Networks	0	0	0	-	-
68	13.3	Open Mosaic Habitat	0	0	0	-	-
68	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	**Geology 1:10,000 scale >**	On site	0-50m	50-250m	250-500m	500-2000m
69 >	**14.1 >**	**10k Availability >**	Identified (within 500m)				
70 >	**14.2 >**	**Artificial and made ground (10k) >**	0	0	0	2	-
71 >	**14.3 >**	**Superficial geology (10k) >**	0	0	3	9	-

72	14.4	Landslip (10k)	0	0	0	0	-
73 >	14.5 >	Bedrock geology (10k) >	1	0	2	7	-
74 >	14.6 >	Bedrock faults and other linear features (10k) >	0	0	5	10	-
Page	Section	**Geology 1:50,000 scale** >	On site	0-50m	50-250m	250-500m	500-2000m
76 >	15.1 >	50k Availability >	Identified (within 500m)				
77 >	15.2 >	Artificial and made ground (50k) >	0	0	0	2	-
78	15.3	Artificial ground permeability (50k)	0	0	-	-	-
79 >	15.4 >	Superficial geology (50k) >	0	0	3	4	-
80	15.5	Superficial permeability (50k)	None (within 50m)				
80	15.6	Landslip (50k)	0	0	0	0	-
80	15.7	Landslip permeability (50k)	None (within 50m)				
81 >	15.8 >	Bedrock geology (50k) >	1	0	2	7	-
82 >	15.9 >	Bedrock permeability (50k) >	Identified (within 50m)				
83 >	15.10 >	Bedrock faults and other linear features (50k) >	0	0	4	8	-
Page	Section	**Boreholes** >	On site	0-50m	50-250m	250-500m	500-2000m
84 >	16.1 >	BGS Boreholes >	0	1	0	-	-
Page	Section	**Natural ground subsidence** >					
85 >	17.1 >	Shrink swell clays >	Negligible (within 50m)				
86 >	17.2 >	Running sands >	Negligible (within 50m)				
87 >	17.3 >	Compressible deposits >	Negligible (within 50m)				
88 >	17.4 >	Collapsible deposits >	Very low (within 50m)				
89 >	17.5 >	Landslides >	Very low (within 50m)				
90 >	17.6 >	Ground dissolution of soluble rocks >	Negligible (within 50m)				
Page	Section	**Mining and ground workings** >	On site	0-50m	50-250m	250-500m	500-2000m
92 >	18.1 >	BritPits >	0	0	3	6	-
94 >	18.2 >	Surface ground workings >	0	0	23	-	-
95 >	18.3 >	Underground workings >	0	0	1	9	42
97	18.4	Underground mining extents	0	0	0	0	-
98	18.5	Historical Mineral Planning Areas	0	0	0	0	-

98 >	18.6 >	Non-coal mining >	0	0	5	6	38
103 >	18.7 >	JPB mining areas >	Identified (within 0m)				
104	18.8	The Coal Authority non-coal mining	0	0	0	0	-
104	18.9	Researched mining	0	0	0	0	-
104 >	18.10 >	Mining record office plans >	0	0	0	4	-
105 >	18.11 >	BGS mine plans >	0	0	1	2	-
105 >	18.12 >	Coal mining >	Identified (within 0m)				
105	18.13	Brine areas	None (within 0m)				
106	18.14	Gypsum areas	None (within 0m)				
106	18.15	Tin mining	None (within 0m)				
106	18.16	Clay mining	None (within 0m)				
Page	Section	Ground cavities and sinkholes >	On site	0-50m	50-250m	250-500m	500-2000m
107	19.1	Natural cavities	0	0	0	0	-
108 >	19.2 >	Mining cavities >	0	0	0	1	7
108	19.3	Reported recent incidents	0	0	0	0	-
109	19.4	Historical incidents	0	0	0	0	-
109	19.5	National karst database	0	0	0	0	-
Page	Section	Radon >					
110 >	20.1 >	Radon >	Between 10% and 30% (within 0m)				
Page	Section	Soil chemistry >	On site	0-50m	50-250m	250-500m	500-2000m
112 >	21.1 >	BGS Estimated Background Soil Chemistry >	1	1	-	-	-
112	21.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
112	21.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-
Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
113	22.1	Underground railways (London)	0	0	0	-	-
113	22.2	Underground railways (Non-London)	0	0	0	-	-
113	22.3	Railway tunnels	0	0	0	-	-
113	22.4	Historical railway and tunnel features	0	0	0	-	-
113	22.5	Royal Mail tunnels	0	0	0	-	-

114	22.6	Historical railways	0	0	0	-	-
114	22.7	Railways	0	0	0	-	-
114	22.8	Crossrail 1	0	0	0	0	-
114	22.9	Crossrail 2	0	0	0	0	-
114	22.10	HS2	0	0	0	0	-

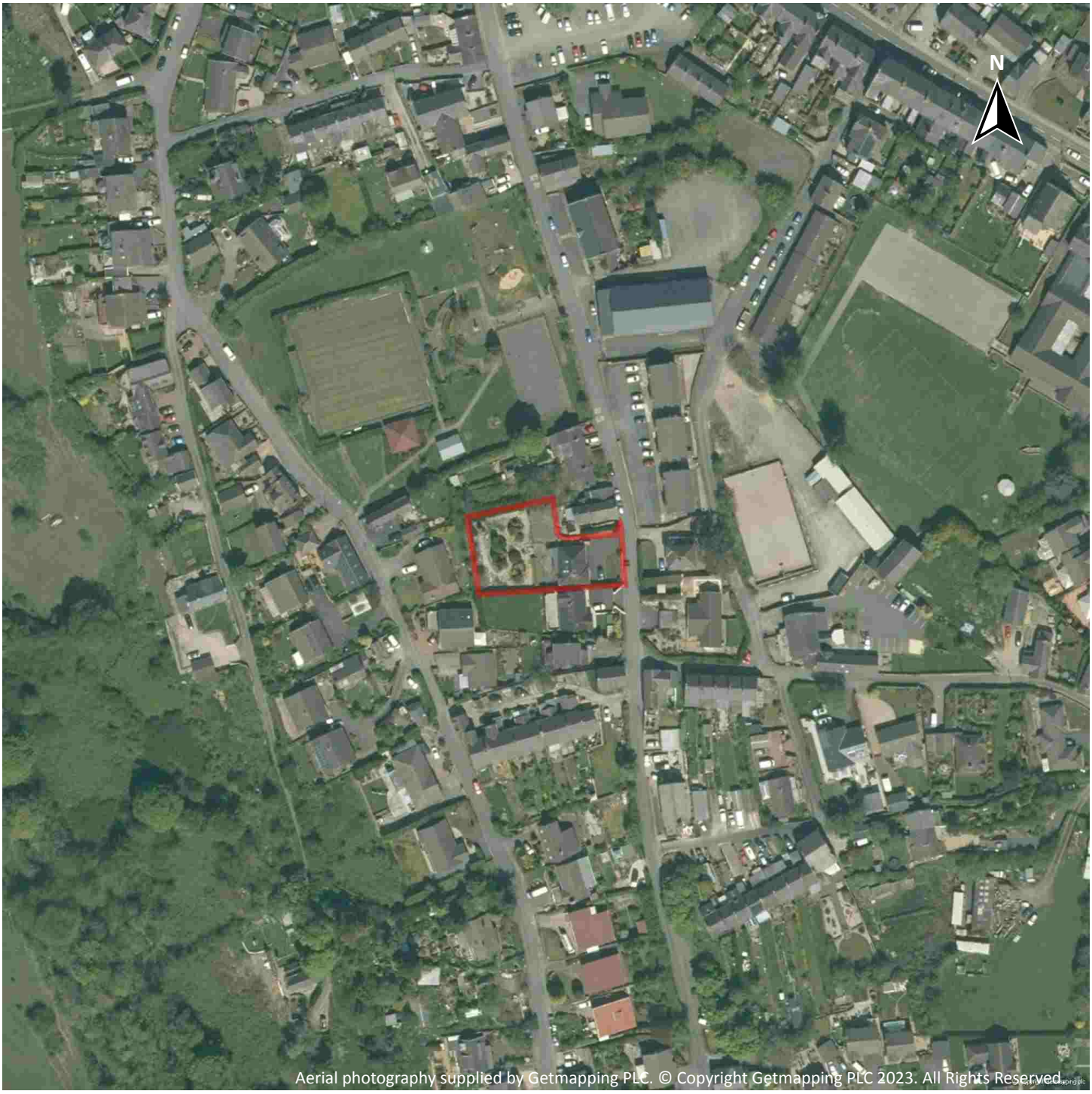
Recent aerial photograph



Capture Date: 10/04/2020

Site Area: 0.11ha

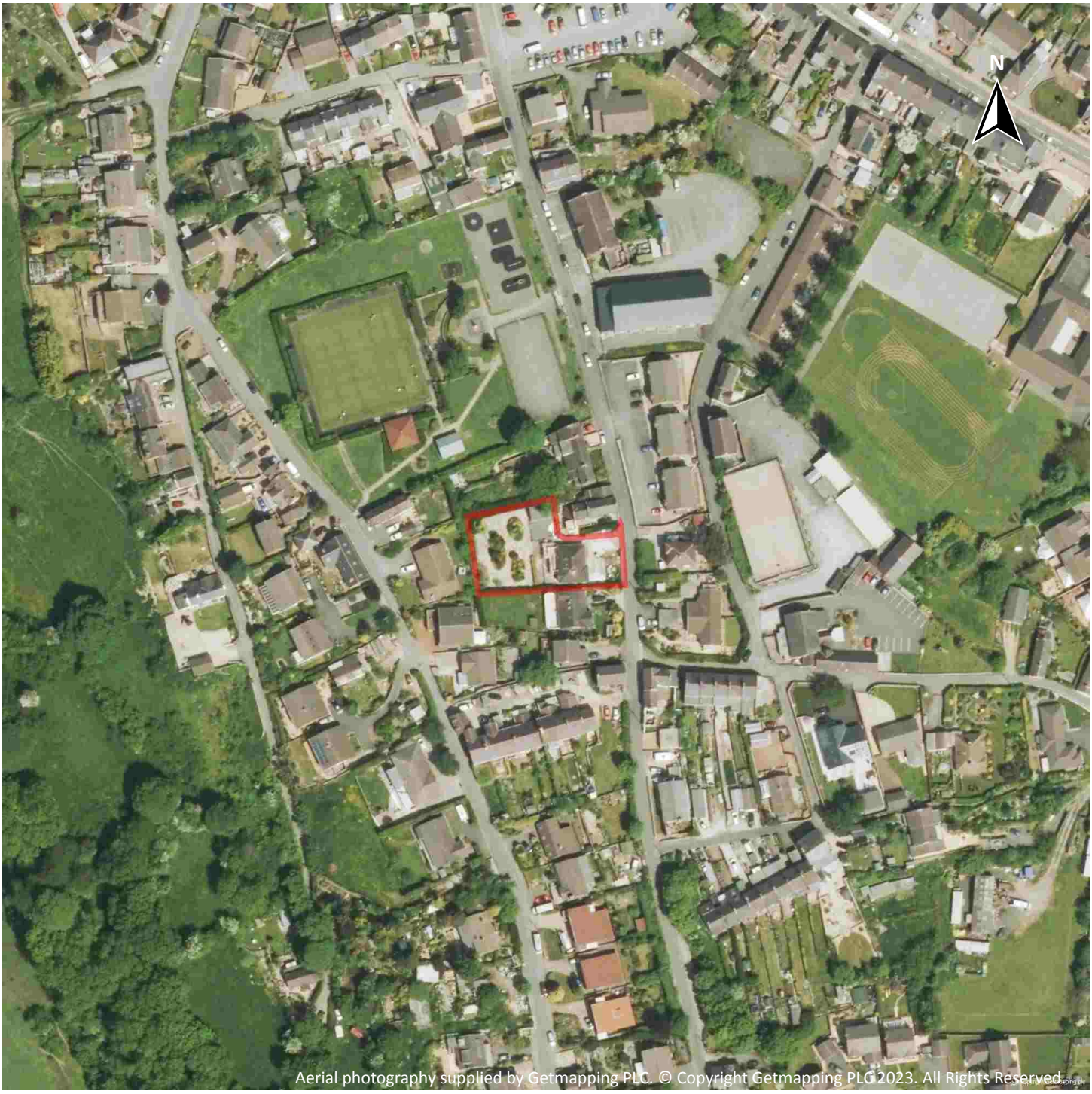
Recent site history - 2017 aerial photograph



Capture Date: 07/05/2017

Site Area: 0.11ha

Recent site history - 2013 aerial photograph



Capture Date: 09/06/2013

Site Area: 0.11ha

Recent site history - 2009 aerial photograph



Capture Date: 01/06/2009

Site Area: 0.11ha

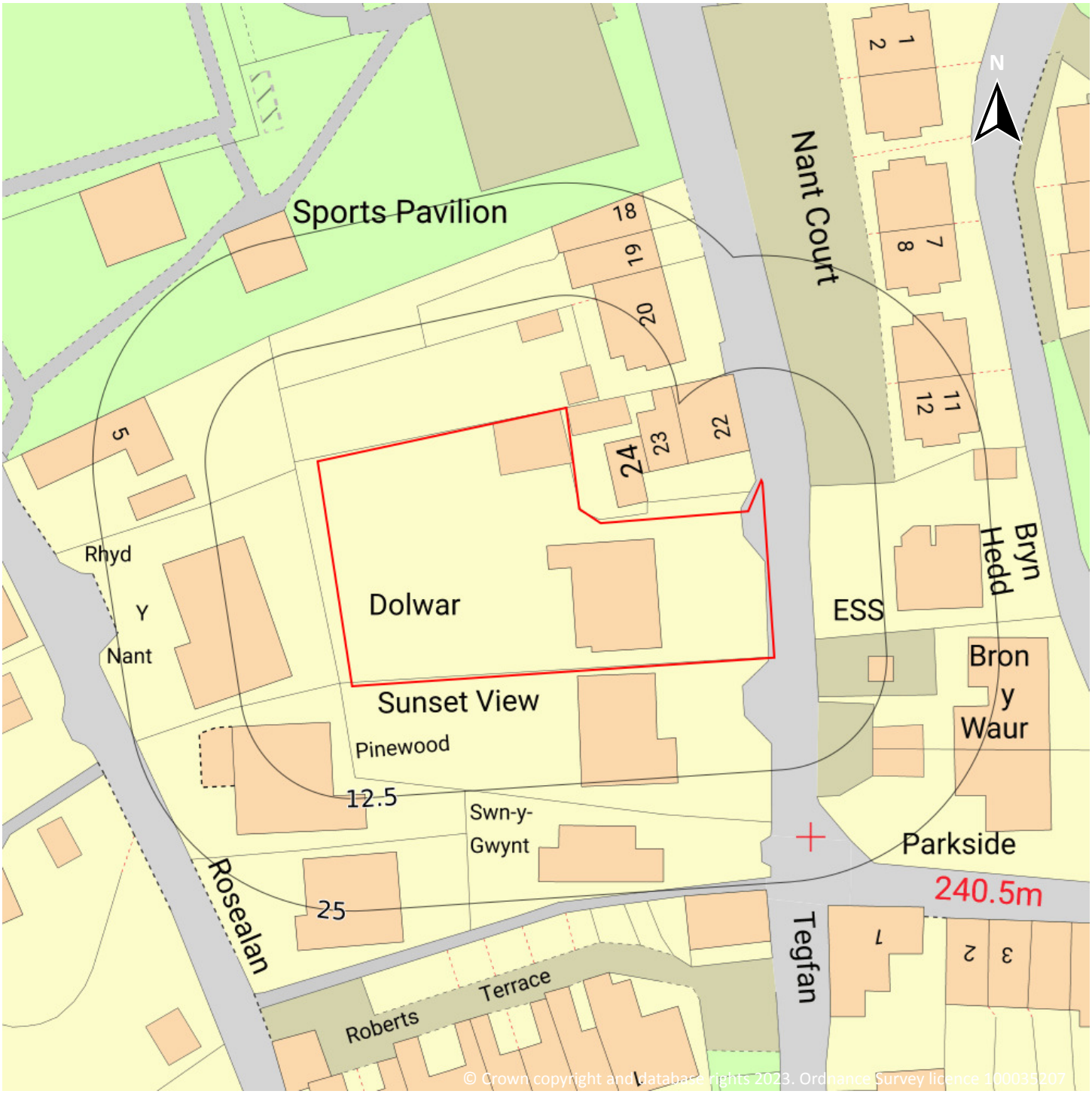
Recent site history - 2001 aerial photograph



Capture Date: 28/07/2001

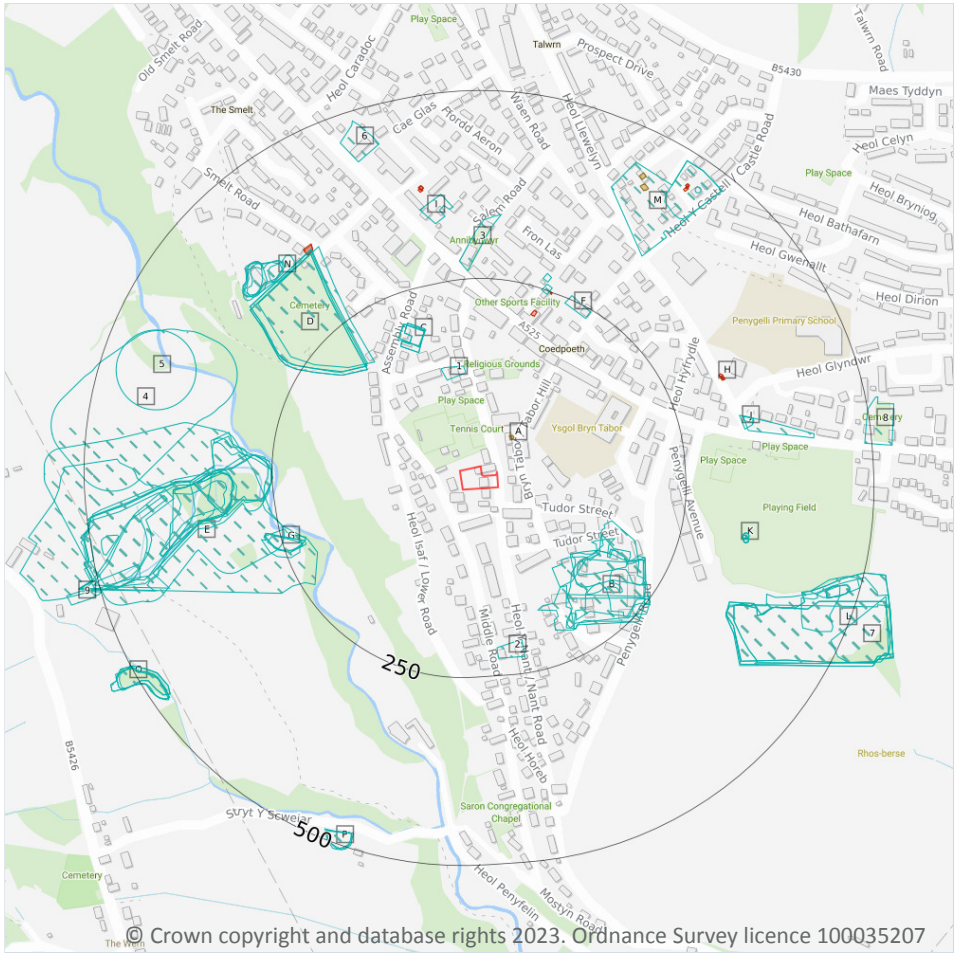
Site Area: 0.11ha

OS MasterMap site plan



Site Area: 0.11ha

1 Past land use



© Crown copyright and database rights 2023. Ordnance Survey licence 100035207

1.1 Historical industrial land uses

Records within 500m	88

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 15 >**

ID	Location	Land use	Dates present	Group ID
1	122m N	Police Station	1960	832467

ID	Location	Land use	Dates present	Group ID
B	128m SE	Unspecified Quarry	1960	926924
B	131m SE	Unspecified Quarry	1910	911807
B	132m SE	Unspecified Quarry	1949	983888
B	146m SE	Unspecified Quarry	1900	858690
B	146m SE	Unspecified Quarry	1938	940712
B	149m E	Unspecified Quarry	1872	900070
C	167m NW	Police Station	1985	862158
C	167m NW	Police Station	1974	944229
B	169m SE	Unspecified Ground Workings	1898	930444
C	173m NW	Police Station	1949	905381
C	175m NW	Police Station	1910	985953
D	183m NW	Cemetery	1985 - 1989	935030
D	183m NW	Cemetery	1960 - 1974	969139
D	184m NW	Cemetery	1900	909679
D	187m NW	Cemetery	1949	910369
D	187m NW	Cemetery	1910 - 1938	895318
B	193m SE	Unspecified Ground Workings	1949	886735
2	205m S	Smithy	1898	843054
E	210m SW	Lead Mine	1949	981880
G	218m W	Unspecified Pit	1985 - 1989	848497
G	221m W	Unspecified Pit	1974	924813
G	224m W	Unspecified Heap	1938	895623
G	226m W	Unspecified Pit	1949 - 1960	963659
F	236m NE	Smithy	1938	843055
E	245m W	Unspecified Disused Mine	1974	866405
F	245m N	Smithy	1910	843053
E	249m W	Unspecified Mine	1938	944851
E	251m W	Unspecified Mine	1960	892674

ID	Location	Land use	Dates present	Group ID
E	251m W	Lead Mine	1910	975609
E	255m W	Unspecified Heap	1985 - 1989	884713
3	261m N	Grave Yard	1872	817187
F	261m N	Smithy	1900	843052
E	284m W	Unspecified Ground Workings	1938	928690
E	298m W	Unspecified Heap	1974	868808
E	301m W	Unspecified Heap	1938	923038
E	302m W	Unspecified Ground Workings	1910	799136
E	304m W	Unspecified Heap	1949	901876
4	319m W	Lead Level	1872	806913
I	328m N	Police Station	1989	832468
E	329m W	Lead Wash	1900	797195
J	331m E	Smithy	1872	979901
K	331m E	Unspecified Old Shaft	1910	982681
K	332m E	Unspecified Old Shaft	1938	869219
K	332m E	Unspecified Old Shaft	1938	985045
K	332m E	Unspecified Old Shaft	1949	941196
K	334m E	Unspecified Disused Shaft	1974	875723
K	334m E	Unspecified Old Shaft	1960	876571
K	334m E	Unspecified Disused Shaft	1985 - 1989	917860
J	336m E	Smithy	1910	926176
J	336m E	Smithy	1938	864137
L	344m SE	Unspecified Disused Quarry	1974	869626
L	344m SE	Unspecified Disused Quarry	1985 - 1989	930638
L	345m SE	Unspecified Old Quarry	1960	922367
L	346m SE	Unspecified Old Quarry	1910 - 1938	902357
M	347m NE	Brick Works	1872	818668
N	348m NW	Refuse Heap	1872	828374

ID	Location	Land use	Dates present	Group ID
L	351m SE	Old Lead Shaft	1949	794287
L	351m SE	Unspecified Old Quarry	1898	880256
N	352m NW	Unspecified Heap	1949 - 1960	935227
N	353m NW	Unspecified Heaps	1910	930420
N	354m NW	Unspecified Heaps	1938	970453
N	355m NW	Refuse Heap	1872	828375
E	356m W	Unspecified Disused Mine	1985 - 1989	955998
N	357m NW	Unspecified Heap	1949	919820
5	373m W	Unspecified Level	1900	832128
E	382m W	Railway Sidings	1938	894549
E	391m W	Railway Sidings	1910	908552
M	416m NE	Refuse Heap	1872	828372
L	429m E	Unspecified Heap	1872	845034
6	433m N	Grave Yard	1872	817188
L	438m E	Unspecified Quarry	1900	816854
E	443m W	Railway Sidings	1900	928631
M	457m NE	Unspecified Tank	1872	823602
L	457m E	Unspecified Heap	1910 - 1938	990063
L	458m E	Unspecified Heap	1949	845503
E	462m W	Unspecified Heap	1949	802419
O	471m SW	Unspecified Heap	1872 - 1898	948667
O	471m SW	Unspecified Heap	1949	954387
O	476m SW	Unspecified Heap	1938	924233
O	477m SW	Unspecified Heap	1960	953062
O	477m SW	Unspecified Heap	1910	985414
P	480m S	Unspecified Heap	1949 - 1960	845689
P	480m S	Unspecified Heap	1938	859352
P	481m S	Unspecified Heap	1910	980773

ID	Location	Land use	Dates present	Group ID
7	487m SE	Unspecified Heap	1872	802701
8	491m E	Grave Yard	1872	817186
9	499m W	Railway Sidings	1938	794400

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m **4**

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 15 >**

ID	Location	Land use	Dates present	Group ID
A	49m NE	Unspecified Tank	1978 - 1993	134966
A	50m NE	Unspecified Tank	1987	149044
M	422m NE	Unspecified Tank	1983 - 1987	128012
M	435m NE	Unspecified Tank	1978	109482

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m **15**

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 15 >**

ID	Location	Land use	Dates present	Group ID
F	212m N	Electricity Substation	1983 - 1987	70438

ID	Location	Land use	Dates present	Group ID
F	247m N	Electricity Substation	1967 - 1978	80135
H	322m NE	Electricity Substation	1978	76822
H	323m E	Electricity Substation	1987	77786
H	323m NE	Electricity Substation	1993	81332
H	325m NE	Electricity Substation	1983	77091
N	351m NW	Electricity Substation	1983	71098
N	352m NW	Electricity Substation	1978 - 1987	73903
I	373m N	Electricity Substation	1993	83477
I	376m N	Electricity Substation	1983 - 1987	76169
I	376m N	Electricity Substation	1978	82212
M	450m NE	Electricity Substation	1993	79717
M	454m NE	Electricity Substation	1987	73320
M	456m NE	Electricity Substation	1983	70122
M	456m NE	Electricity Substation	1978	65483

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.5 Historical garages

Records within 500m	0

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-

grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

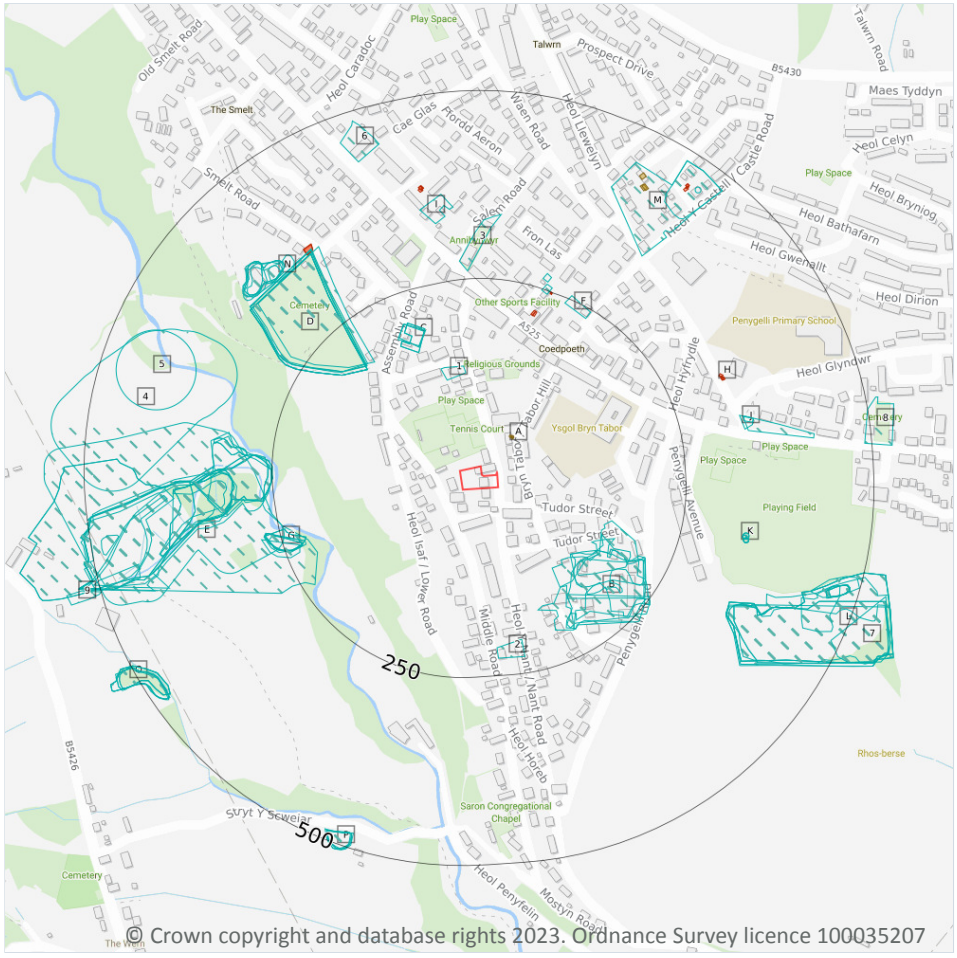
1.6 Historical military land

Records within 500m	0

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

This data is sourced from Ordnance Survey / Groundsure / other sources.

2 Past land use - un-grouped



2.1 Historical industrial land uses

Records within 500m	110

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 22 >**

ID	Location	Land Use	Date	Group ID
1	122m N	Police Station	1960	832467
B	128m SE	Unspecified Quarry	1960	926924
B	131m SE	Unspecified Quarry	1910	911807

ID	Location	Land Use	Date	Group ID
B	132m SE	Unspecified Quarry	1949	983888
B	146m SE	Unspecified Quarry	1900	858690
B	146m SE	Unspecified Quarry	1938	940712
B	149m E	Unspecified Quarry	1872	900070
C	167m NW	Police Station	1985	862158
C	167m NW	Police Station	1974	944229
B	169m SE	Unspecified Ground Workings	1898	930444
C	173m NW	Police Station	1949	905381
C	175m NW	Police Station	1910	985953
D	183m NW	Cemetery	1989	935030
D	183m NW	Cemetery	1985	935030
D	183m NW	Cemetery	1974	969139
D	183m NW	Cemetery	1960	969139
D	184m NW	Cemetery	1900	909679
D	187m NW	Cemetery	1949	910369
D	187m NW	Cemetery	1910	895318
D	188m NW	Cemetery	1938	895318
B	193m SE	Unspecified Ground Workings	1949	886735
2	205m S	Smithy	1898	843054
E	210m SW	Lead Mine	1949	981880
G	218m W	Unspecified Pit	1989	848497
G	218m W	Unspecified Pit	1985	848497
G	221m W	Unspecified Pit	1974	924813
G	224m W	Unspecified Heap	1938	895623
G	224m W	Unspecified Heap	1938	895623
G	226m W	Unspecified Pit	1949	963659
G	229m W	Unspecified Pit	1960	963659
F	236m NE	Smithy	1938	843055

ID	Location	Land Use	Date	Group ID
E	245m W	Unspecified Disused Mine	1974	866405
F	245m N	Smithy	1910	843053
E	249m W	Unspecified Mine	1938	944851
E	249m W	Unspecified Mine	1938	944851
E	251m W	Unspecified Mine	1960	892674
E	251m W	Lead Mine	1910	975609
E	255m W	Unspecified Heap	1989	884713
E	255m W	Unspecified Heap	1985	884713
3	261m N	Grave Yard	1872	817187
F	261m N	Smithy	1900	843052
E	284m W	Unspecified Ground Workings	1938	928690
E	284m W	Unspecified Ground Workings	1938	928690
E	298m W	Unspecified Heap	1974	868808
E	301m W	Unspecified Heap	1938	923038
E	301m W	Unspecified Heap	1938	923038
E	302m W	Unspecified Ground Workings	1910	799136
E	304m W	Unspecified Heap	1949	901876
4	319m W	Lead Level	1872	806913
I	328m N	Police Station	1989	832468
E	329m W	Lead Wash	1900	797195
J	331m E	Smithy	1872	979901
K	331m E	Unspecified Old Shaft	1910	982681
K	332m E	Unspecified Old Shaft	1938	985045
K	332m E	Unspecified Old Shaft	1938	869219
K	332m E	Unspecified Old Shaft	1949	941196
K	334m E	Unspecified Disused Shaft	1989	917860
K	334m E	Unspecified Disused Shaft	1985	917860
K	334m E	Unspecified Disused Shaft	1974	875723

ID	Location	Land Use	Date	Group ID
K	334m E	Unspecified Old Shaft	1960	876571
J	336m E	Smithy	1910	926176
J	336m E	Smithy	1938	864137
L	344m SE	Unspecified Disused Quarry	1989	930638
L	344m SE	Unspecified Disused Quarry	1985	930638
L	344m SE	Unspecified Disused Quarry	1974	869626
L	345m SE	Unspecified Old Quarry	1960	922367
L	346m SE	Unspecified Old Quarry	1910	902357
M	347m NE	Brick Works	1872	818668
N	348m NW	Refuse Heap	1872	828374
L	348m SE	Unspecified Old Quarry	1938	902357
L	351m SE	Unspecified Old Quarry	1898	880256
L	351m SE	Old Lead Shaft	1949	794287
N	352m NW	Unspecified Heap	1960	935227
N	353m NW	Unspecified Heap	1949	935227
N	353m NW	Unspecified Heaps	1910	930420
N	354m NW	Unspecified Heaps	1938	970453
N	354m NW	Unspecified Heaps	1938	970453
N	355m NW	Refuse Heap	1872	828375
E	356m W	Unspecified Disused Mine	1989	955998
E	356m W	Unspecified Disused Mine	1985	955998
N	357m NW	Unspecified Heap	1949	919820
5	373m W	Unspecified Level	1900	832128
E	382m W	Railway Sidings	1938	894549
E	391m W	Railway Sidings	1910	908552
M	416m NE	Refuse Heap	1872	828372
L	429m E	Unspecified Heap	1872	845034
6	433m N	Grave Yard	1872	817188

ID	Location	Land Use	Date	Group ID
L	438m E	Unspecified Quarry	1900	816854
E	443m W	Railway Sidings	1900	928631
M	457m NE	Unspecified Tank	1872	823602
L	457m E	Unspecified Heap	1910	990063
L	458m E	Unspecified Heap	1949	845503
L	460m E	Unspecified Heap	1938	990063
L	460m E	Unspecified Heap	1938	990063
E	462m W	Unspecified Heap	1949	802419
O	471m SW	Unspecified Heap	1872	948667
O	471m SW	Unspecified Heap	1898	948667
O	471m SW	Unspecified Heap	1949	954387
O	476m SW	Unspecified Heap	1938	924233
O	476m SW	Unspecified Heap	1938	924233
O	477m SW	Unspecified Heap	1960	953062
O	477m SW	Unspecified Heap	1910	985414
P	480m S	Unspecified Heap	1949	845689
P	480m S	Unspecified Heap	1960	845689
P	480m S	Unspecified Heap	1938	859352
P	480m S	Unspecified Heap	1938	859352
P	481m S	Unspecified Heap	1910	980773
7	487m SE	Unspecified Heap	1872	802701
8	491m E	Grave Yard	1872	817186
9	499m W	Railway Sidings	1938	794400

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	7

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 22 >**

ID	Location	Land Use	Date	Group ID
A	49m NE	Unspecified Tank	1993	134966
A	50m NE	Unspecified Tank	1987	149044
A	50m NE	Unspecified Tank	1978	134966
A	50m NE	Unspecified Tank	1983	134966
M	422m NE	Unspecified Tank	1987	128012
M	424m NE	Unspecified Tank	1983	128012
M	435m NE	Unspecified Tank	1978	109482

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	19

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 22 >**

ID	Location	Land Use	Date	Group ID
F	212m N	Electricity Substation	1983	70438
F	212m N	Electricity Substation	1987	70438
F	247m N	Electricity Substation	1967	80135
F	247m N	Electricity Substation	1978	80135
H	322m NE	Electricity Substation	1978	76822
H	323m E	Electricity Substation	1987	77786
H	323m NE	Electricity Substation	1993	81332

ID	Location	Land Use	Date	Group ID
H	325m NE	Electricity Substation	1983	77091
N	351m NW	Electricity Substation	1983	71098
N	352m NW	Electricity Substation	1987	73903
N	352m NW	Electricity Substation	1978	73903
I	373m N	Electricity Substation	1993	83477
I	376m N	Electricity Substation	1983	76169
I	376m N	Electricity Substation	1978	82212
I	376m N	Electricity Substation	1987	76169
M	450m NE	Electricity Substation	1993	79717
M	454m NE	Electricity Substation	1987	73320
M	456m NE	Electricity Substation	1983	70122
M	456m NE	Electricity Substation	1978	65483

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

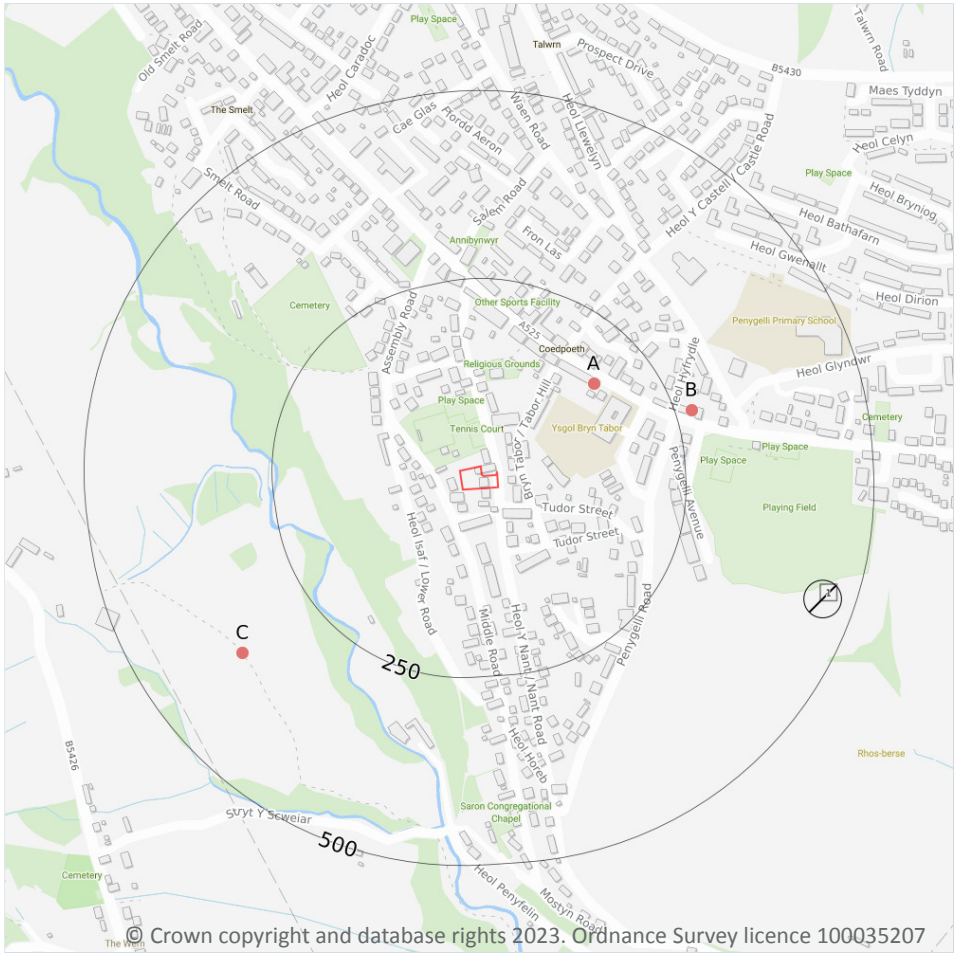
2.5 Historical garages

Records within 500m	0

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill



3.1 Active or recent landfill

Records within 500m	0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.2 Historical landfill (BGS records)

Records within 500m	0

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

This data is sourced from the British Geological Survey.

3.3 Historical landfill (LA/mapping records)

Records within 500m	0

Landfill sites identified from Local Authority records and high detail historical mapping.

This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.

3.4 Historical landfill (EA/NRW records)

Records within 500m	1

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

Features are displayed on the Waste and landfill map on **page 29 >**

ID	Location	Details		
1	431m E	Site Address: Rhosberse - Pengelli Avenue, Coedpoeth Licence Holder Address: -	Waste Licence: - Site Reference: - Waste Type: Industrial, Household Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrender: -	Operator: - Licence Holder: - First Recorded - Last Recorded: -

This data is sourced from the Environment Agency and Natural Resources Wales.

3.5 Historical waste sites

Records within 500m	0

Waste site records derived from Local Authority planning records and high detail historical mapping.

This data is sourced from Ordnance Survey/Groundsure and Local Authority records.

3.6 Licensed waste sites

Records within 500m	0

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.7 Waste exemptions

Records within 500m	6

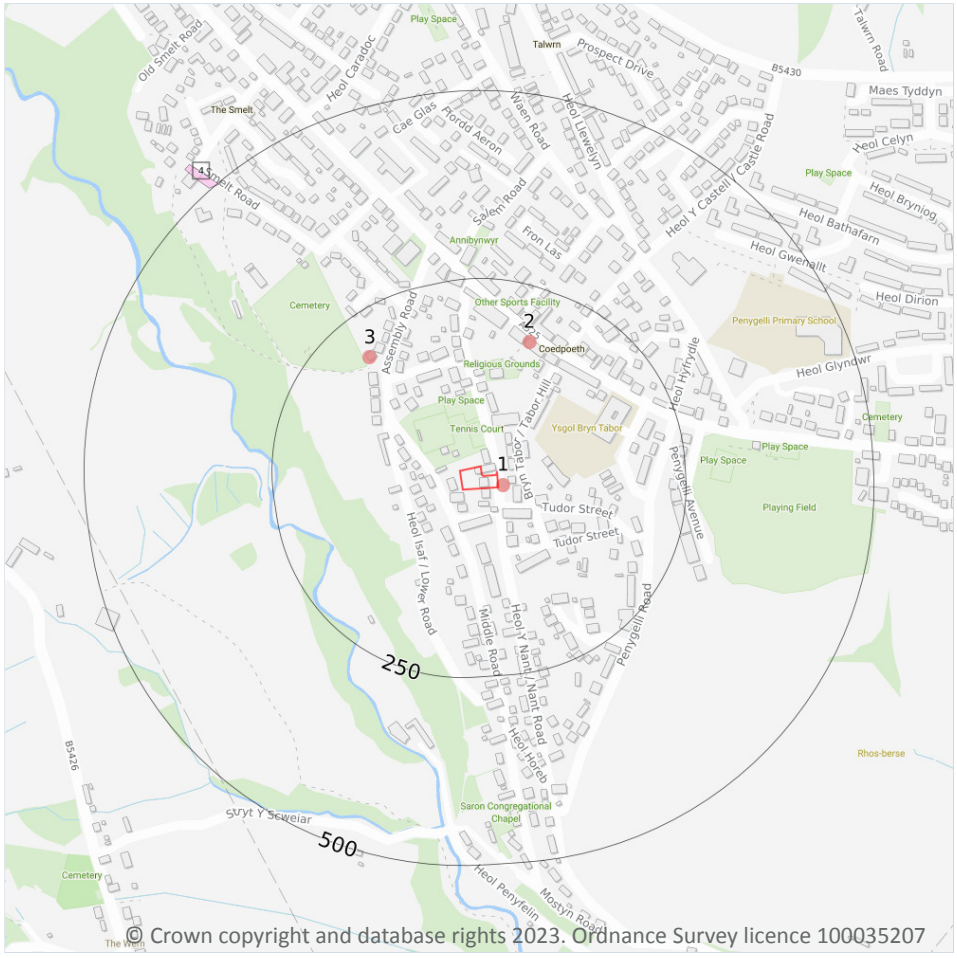
Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 29 >**

ID	Location	Site	Reference	Category	Sub-Category	Description
A	174m NE	The Pharmacy Coedpoeth Ltd, Manchester House, Heol Maelor, Coedpoeth, Wrecsam, LL113LS	NRW-WME022363	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
A	174m NE	Flat, Manchester House, Heol Maelor, Wrexham, Wrecsam, LL11 3LS	NRW-WME000413	Treating waste exemption	Waste Exemption - Non-Agricultural	Sorting and de-naturing of controlled drugs for disposal
B	271m E	Castle Road, Castle Road, Coedpoeth, LL11 3NA	WEX127853	Treating waste exemption	Not on a farm	Screening and blending of waste
B	271m E	Castle Road, Castle Road, Coedpoeth, LL11 3NA	WEX127853	Using waste exemption	Not on a farm	Use of waste in construction
C	365m SW	Unit 11, Tunstall Trade Park, Brownhills Road, Tunstall, Stoke On Trent, ST6 4SE	EA/EPR/VP3988AD/A001	Treating waste exemption	Not on a farm	Repair or refurbishment of WEEE
C	365m SW	ASSURANT DEVICE CARE CENTRE, UNIT 11,BROWNHILLS ROAD,Tunstall,STOKE-ON-TRENT ST6 4SE	EXP/VP3988AD	Treating waste exemption	Not on a farm	Repair or refurbishment of WEEE

This data is sourced from the Environment Agency and Natural Resources Wales.

4 Current industrial land use



4.1 Recent industrial land uses

Records within 250m	3

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 32 >**

ID	Location	Company	Address	Activity	Category
1	7m E	Electricity Sub Station	Clwyd, LL11	Electrical Features	Infrastructure and Facilities
2	178m N	The Audio Cafe Ltd	19, High Street, Coedpoeth, Wrexham, Clwyd, LL11 3RY	Recording Studios and Record Companies	IT, Advertising, Marketing and Media Services

ID	Location	Company	Address	Activity	Category
3	193m NW	M & R Minibuses	1, Bryn Clywedog, Coedpoeth, Wrexham, Clwyd, LL11 3SR	Vehicle Hire and Rental	Hire Services

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	0

Open, closed, under development and obsolete petrol stations.

This data is sourced from Experian.

4.3 Electricity cables

Records within 500m	0

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.4 Gas pipelines

Records within 500m	0

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.

4.5 Sites determined as Contaminated Land

Records within 500m	1

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

Features are displayed on the Current industrial land use map on **page 32 >**

ID	Location	Description	Site name	Category	Year identified
4	498m NW	Former Lead Smelter Determination notice issued 13/05/2014 Remediation works undertaken 10/2015 and 12/2015 The mean concentration of Lead in the soil exceeds the derived site specific assessment criteria by more than 2 times the SSSL of 1300mg/kg	Whitesmiths, Smelt Road, Coedpoeth, Wrexham, LL11 3SH	Contaminated Land - Remediated	2014

This data is sourced from Local Authority records.

4.6 Control of Major Accident Hazards (COMAH)

Records within 500m	0

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m	0

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m	0

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m	0

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.10 Licensed industrial activities (Part A(1))

Records within 500m	0

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.11 Licensed pollutant release (Part A(2)/B)

Records within 500m	0

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from Local Authority records.

4.12 Radioactive Substance Authorisations

Records within 500m	0

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.13 Licensed Discharges to controlled waters

Records within 500m	0

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.14 Pollutant release to surface waters (Red List)

Records within 500m	0

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.15 Pollutant release to public sewer

Records within 500m	0

Discharges of Special Category Effluents to the public sewer.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.16 List 1 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.17 List 2 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.18 Pollution Incidents (EA/NRW)

Records within 500m	0

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.19 Pollution inventory substances

Records within 500m	0

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.20 Pollution inventory waste transfers

Records within 500m	0

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

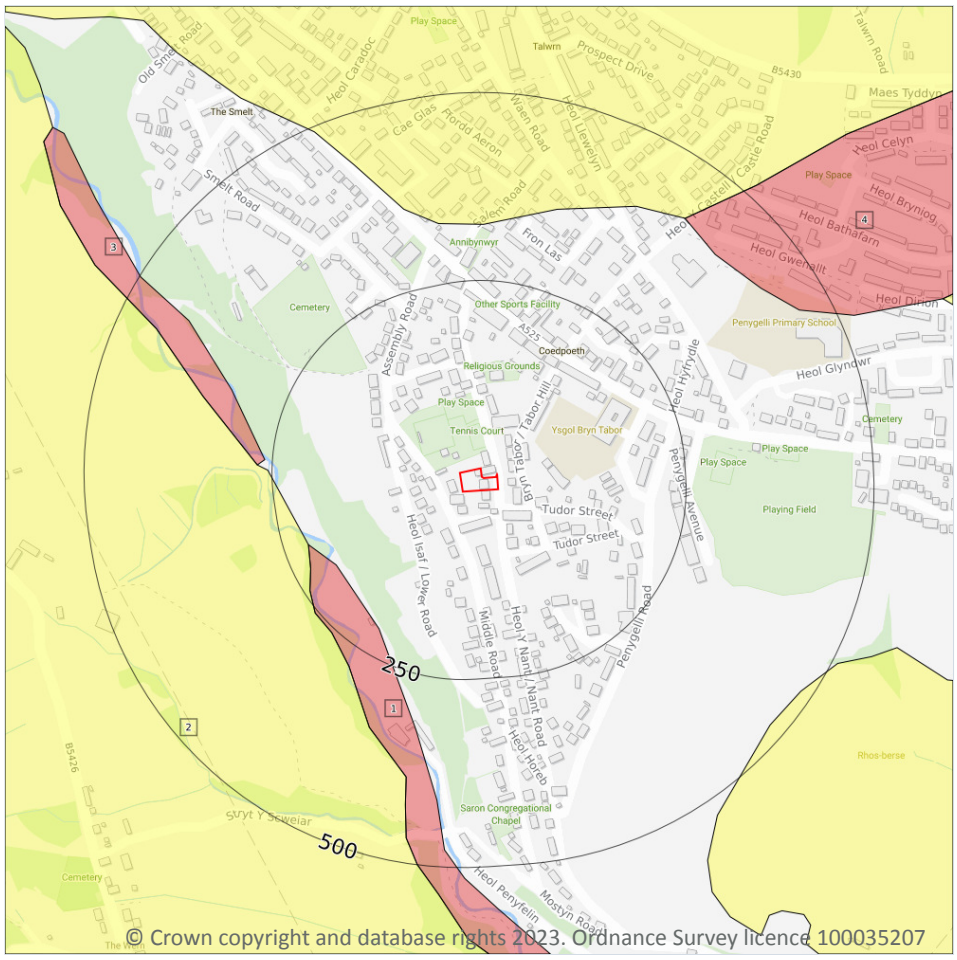
4.21 Pollution inventory radioactive waste

Records within 500m	0

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

5 Hydrogeology - Superficial aquifer



© Crown copyright and database rights 2023. Ordnance Survey licence 100035207

5.1 Superficial aquifer

Records within 500m	4

Aquifer status of groundwater held within superficial geology.

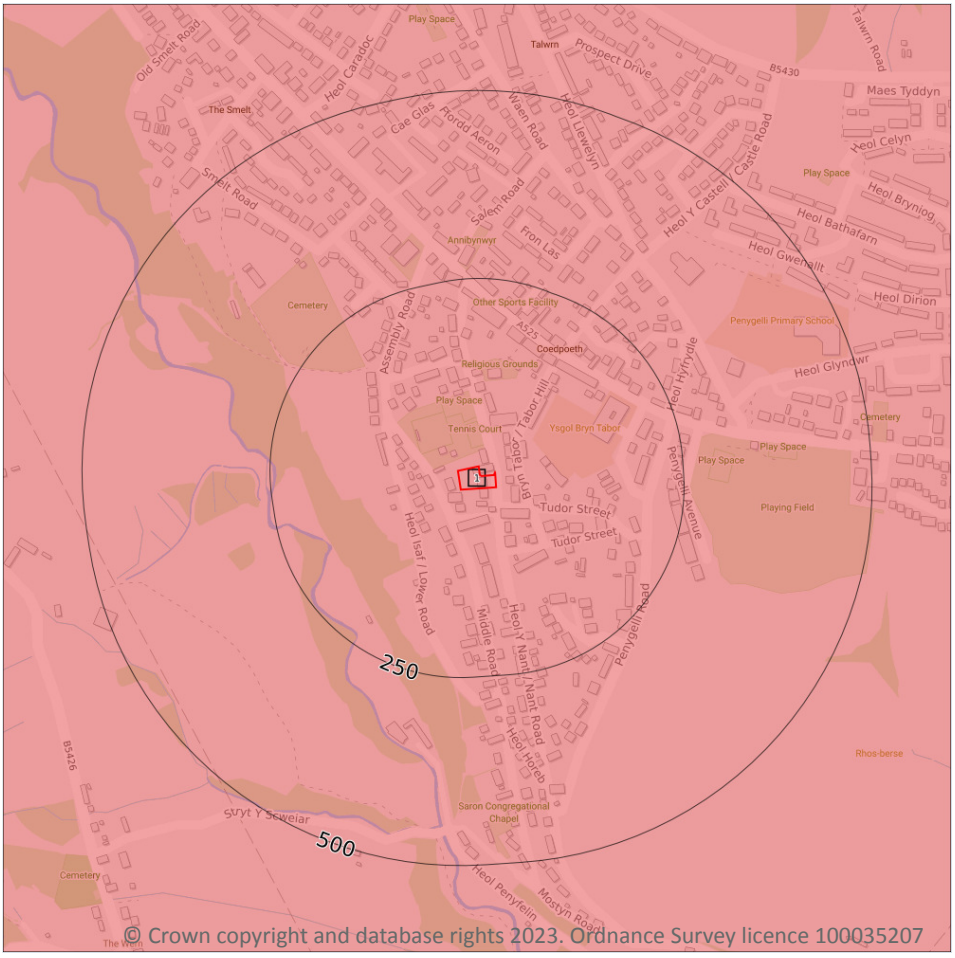
Features are displayed on the Hydrogeology map on **page 38 >**

ID	Location	Designation	Description
1	194m SW	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	217m W	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

ID	Location	Designation	Description
3	260m W	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
4	412m NE	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Bedrock aquifer



5.2 Bedrock aquifer

Records within 500m	1

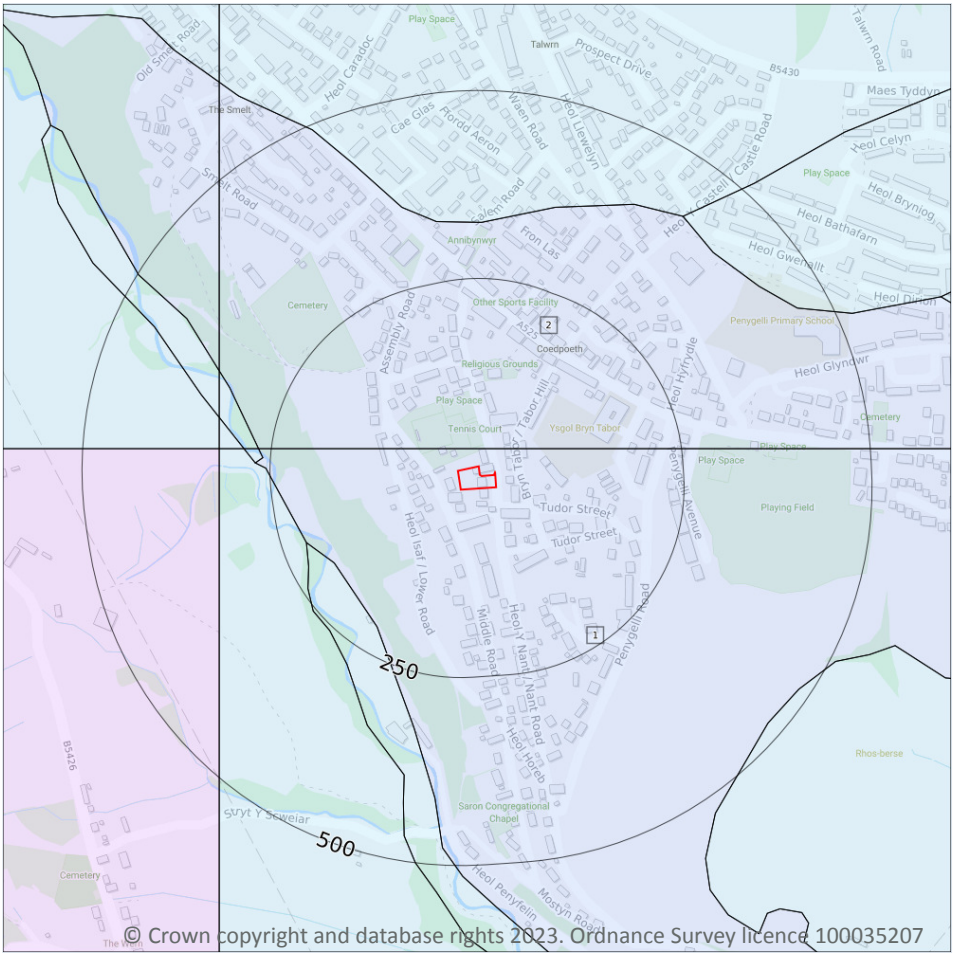
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 40 >**

ID	Location	Designation	Description
1	On site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Groundwater vulnerability



Site Outline

Search buffers in metres (m)

Superficial vulnerability

- Principal superficial aquifer, high vulnerability
- Secondary superficial aquifer, high vulnerability
- Principal superficial aquifer, medium vulnerability
- Secondary superficial aquifer, medium vulnerability
- Principal superficial aquifer, low vulnerability
- Secondary superficial aquifer, low vulnerability

Bedrock vulnerability

- Principal bedrock aquifer, high vulnerability
- Secondary bedrock aquifer, high vulnerability
- Principal bedrock aquifer, medium vulnerability
- Secondary bedrock aquifer, medium vulnerability
- Principal bedrock aquifer, low vulnerability
- Secondary bedrock aquifer, low vulnerability

Other information

- Unproductive aquifer
- Soluble rock risk
- Local information

5.3 Groundwater vulnerability

Records within 50m	2

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Features are displayed on the Groundwater vulnerability map on **page 41 >**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	**On site**	**Summary Classification: Secondary bedrock aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer**	**Leaching class: Low Infiltration value: <40% Dilution value: >550mm/year**	**Vulnerability: - Aquifer type: - Thickness: 3-10m Patchiness value: <90% Recharge potential: Low**	**Vulnerability: Low Aquifer type: Secondary Flow mechanism: Well connected fractures**
2	23m N	Summary Classification: Secondary bedrock aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: <40% Dilution value: >550mm/year	Vulnerability: - Aquifer type: - Thickness: 3-10m Patchiness value: <90% Recharge potential: Low	Vulnerability: Low Aquifer type: Secondary Flow mechanism: Well connected fractures

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

5.4 Groundwater vulnerability- soluble rock risk

Records on site	**0**

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

This data is sourced from the British Geological Survey and the Environment Agency.

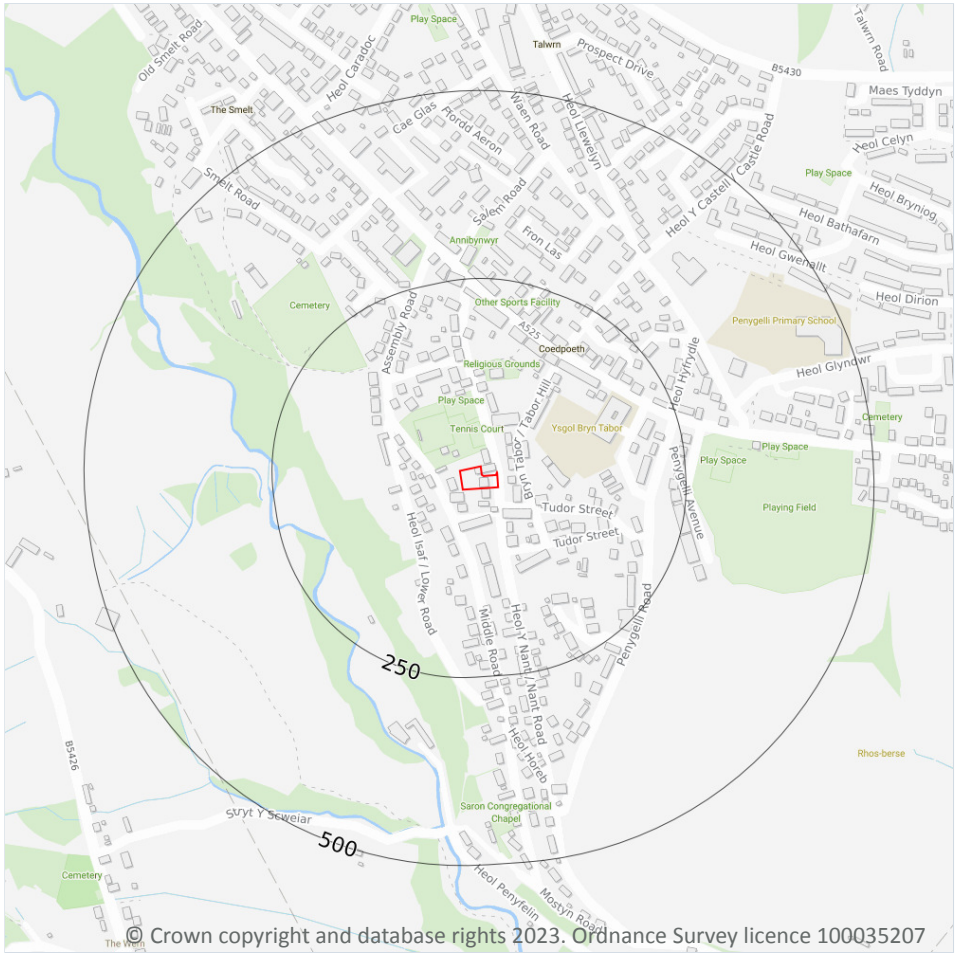
5.5 Groundwater vulnerability- local information

Records on site	**0**

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on enquiries@environment-agency.gov.uk ↗.

This data is sourced from the British Geological Survey and the Environment Agency.

Abstractions and Source Protection Zones



Site Outline

Search buffers in metres (m)

- Source Protection Zone 1 — Inner catchment
- Source Protection Zone 2 — Outer catchment
- Source Protection Zone 3 — Total catchment
- Source Protection Zone 4 — Zone of Special Interest
- Source Protection Zone 1c — Inner catchment - confined aquifer
- Source Protection Zone 2c — Outer catchment - confined aquifer
- Source Protection Zone 3c — Total catchment - confined aquifer
- Drinking water abstraction licences
- Drinking water abstraction licences — Polygon features
- Drinking water abstraction licences — Linear features
- Groundwater abstraction licence (point)
- Groundwater abstraction licence (area)
- Groundwater abstraction licence (linear)
- Surface Water Abstractions (point)
- Surface Water Abstractions (area)
- Surface Water Abstractions (linear)

5.6 Groundwater abstractions

Records within 2000m	2

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 43 >**

ID	Location	Details	
-	1434m NW	Status: Historical Licence No: 24/67/7/0035 Details: Potable Water Supply - Direct Direct Source: EAW Groundwater Point: PARK DAY LEVEL Data Type: Point Name: Dee Valley Water Plc Easting: 327050 Northing: 351641	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 05/07/1966 Expiry Date: - Issue No: 100 Version Start Date: 05/07/1966 Version End Date: -
-	1472m W	Status: Historical Licence No: 24/67/7/0035 Details: Potable Water Supply - Direct Direct Source: EAW Groundwater Point: SPEEDWELL SHAFT Data Type: Point Name: Dee Valley Water Plc Easting: 326890 Northing: 351330	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 05/07/1966 Expiry Date: - Issue No: 100 Version Start Date: 05/07/1966 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.7 Surface water abstractions

Records within 2000m	0

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

This data is sourced from the Environment Agency and Natural Resources Wales.

5.8 Potable abstractions

Records within 2000m	2

Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 43 >**

ID	Location	Details	
-	1434m NW	Status: Historical Licence No: 24/67/7/0035 Details: Potable Water Supply - Direct Direct Source: EAW Groundwater Point: PARK DAY LEVEL Data Type: Point Name: Dee Valley Water Plc Easting: 327050 Northing: 351641	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 05/07/1966 Expiry Date: - Issue No: 100 Version Start Date: 05/07/1966 Version End Date: -
-	1472m W	Status: Historical Licence No: 24/67/7/0035 Details: Potable Water Supply - Direct Direct Source: EAW Groundwater Point: SPEEDWELL SHAFT Data Type: Point Name: Dee Valley Water Plc Easting: 326890 Northing: 351330	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 05/07/1966 Expiry Date: - Issue No: 100 Version Start Date: 05/07/1966 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.9 Source Protection Zones

Records within 500m	0

Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

This data is sourced from the Environment Agency and Natural Resources Wales.

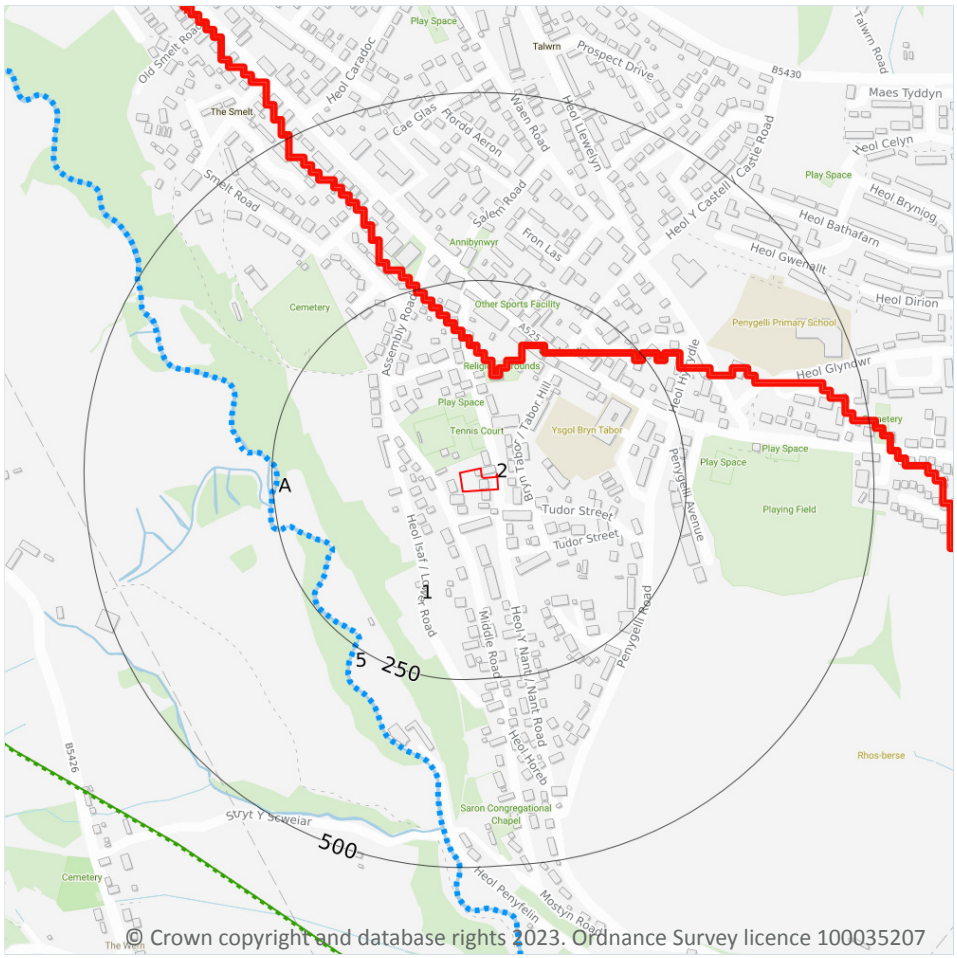
5.10 Source Protection Zones (confined aquifer)

Records within 500m	0

Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

This data is sourced from the Environment Agency and Natural Resources Wales.

6 Hydrology



Site Outline

Search buffers in metres (m)

Water Network (OS MasterMap)

Surface water features (wider than 5m)

Surface water features (narrower than 5m)

WFD River, canal and surface water transfer water bodies

WFD Lake water bodies

WFD Transitional and coastal water bodies

WFD Surface water body catchments boundaries

WFD Groundwater body boundaries

6.1 Water Network (OS MasterMap)

Records within 250m	2

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

Features are displayed on the Hydrology map on **page 46 >**

ID	Location	Type of water feature	Ground level	Permanence	Name
5	190m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Afon Clywedog

ID	Location	Type of water feature	Ground level	Permanence	Name
A	243m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Afon Clywedog

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	1

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

Features are displayed on the Hydrology map on **page 46 >**

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	1

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.

Features are displayed on the Hydrology map on **page 46 >**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
1	**On site**	**River WB catchment**	**Clywedog - above Black Brook**	**GB111067051720**	**Clywedog - Dee**	**Dee**

This data is sourced from the Environment Agency and Natural Resources Wales.

6.4 WFD Surface water bodies

Records identified	1

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site.

Features are displayed on the Hydrology map on **page 46 >**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
4	189m SW	River	Clywedog - above Black Brook	GB111067051720	Moderate	Fail	Moderate	2016

This data is sourced from the Environment Agency and Natural Resources Wales.

6.5 WFD Groundwater bodies

Records on site	**1**

Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place.

Features are displayed on the Hydrology map on **page 46 >**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
2	**On site**	**Dee Carboniferous Coal Measures**	**GB41102G204800**	**Poor**	**Poor**	**Good**	**2017**

This data is sourced from the Environment Agency and Natural Resources Wales.

7 River and coastal flooding

7.1 Risk of flooding from rivers and the sea

Records within 50m	0

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m within the Risk of Flooding from Rivers and Sea (RoFRaS)/Flood Risk Assessment Wales (FRAW) models. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition. The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance).

This data is sourced from the Environment Agency and Natural Resources Wales.

7.2 Historical Flood Events

Records within 250m	0

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.3 Flood Defences

Records within 250m	0

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.4 Areas Benefiting from Flood Defences

Records within 250m	0

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.5 Flood Storage Areas

Records within 250m	0

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

This data is sourced from the Environment Agency and Natural Resources Wales.

River and coastal flooding - Flood Zones

7.6 Flood Zone 2

Records within 50m	0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.7 Flood Zone 3

Records within 50m	0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

8 Surface water flooding

8.1 Surface water flooding

Highest risk on site	**Negligible**
Highest risk within 50m	**Negligible**

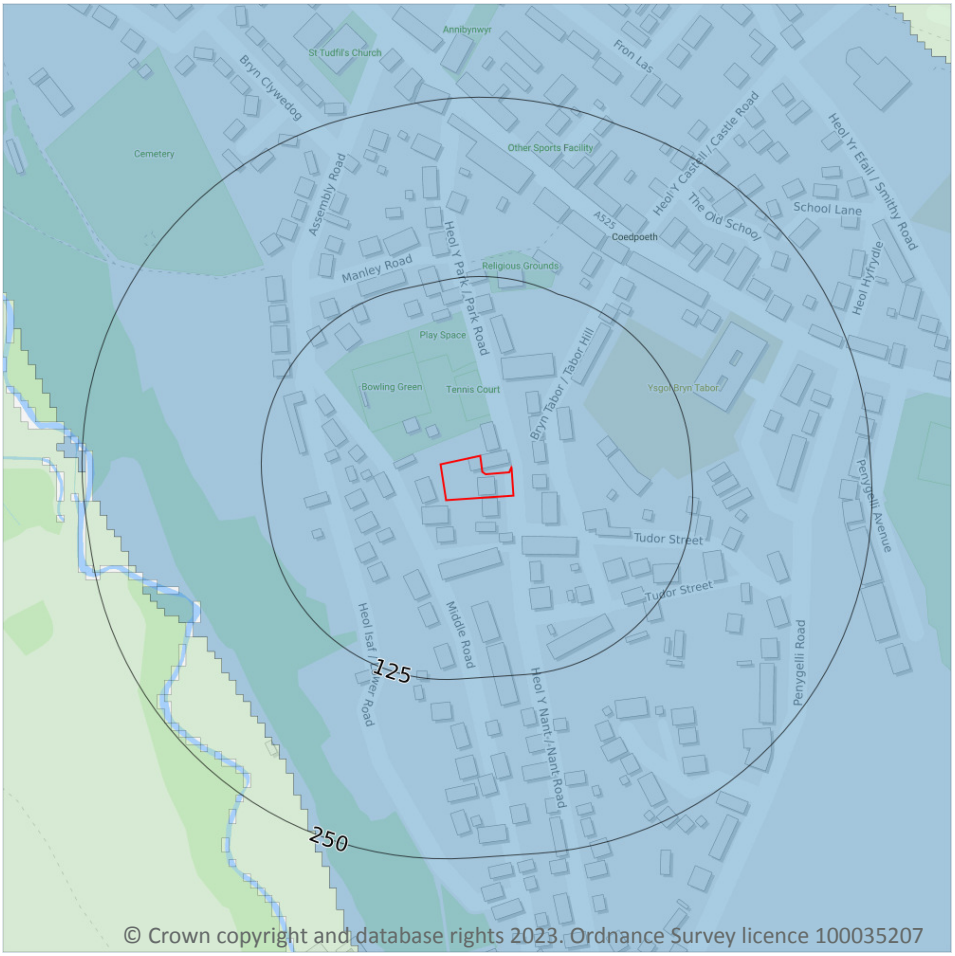
Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site. The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Negligible
1 in 250 year	Negligible
1 in 100 year	Negligible
1 in 30 year	Negligible

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding



Site Outline

Search buffers in metres (m)

High

Moderate - High

Moderate

Low

Negligible

9.1 Groundwater flooding

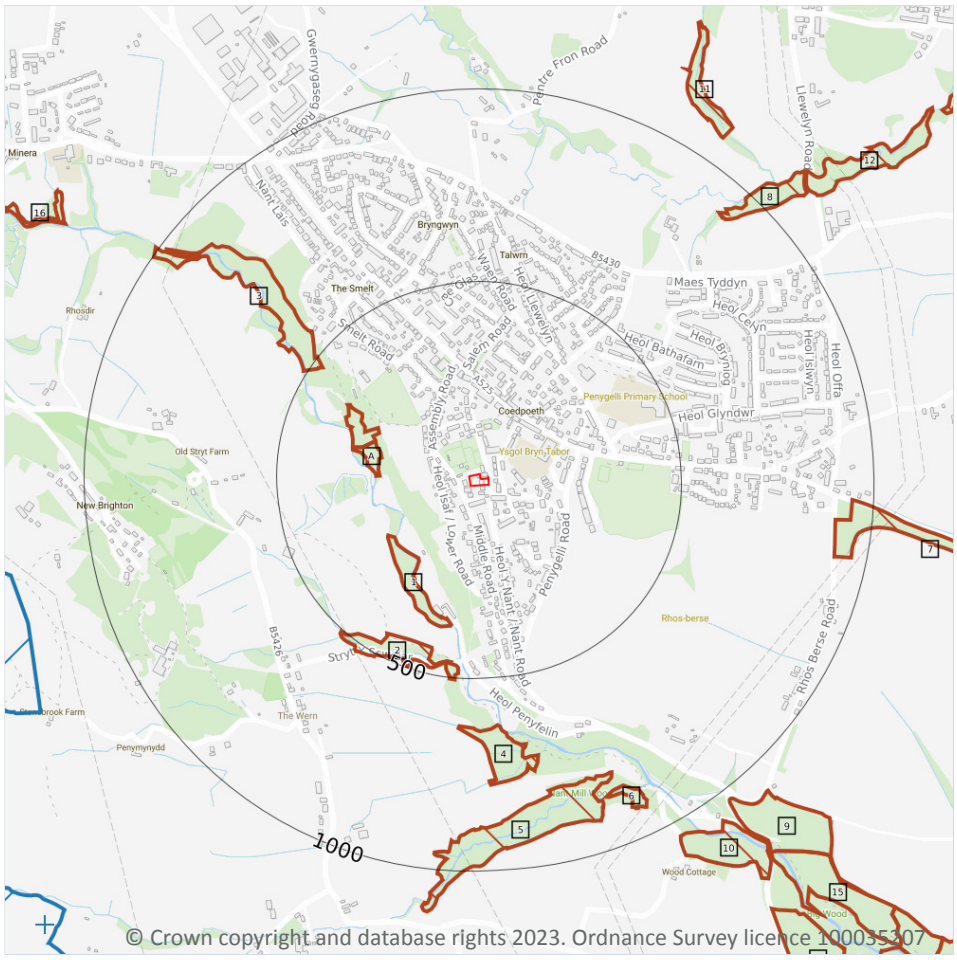
Highest risk on site	**Negligible**
Highest risk within 50m	**Negligible**

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on **page 53 >**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations



10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	1

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

Features are displayed on the Environmental designations map on **page 54 >**

ID	Location	Name	Data source
13	1203m W	Ruabon / Llantysilio Mountains and Minera	Natural Resources Wales

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.2 Conserved wetland sites (Ramsar sites)

Records within 2000m	0

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.3 Special Areas of Conservation (SAC)

Records within 2000m	1

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

Features are displayed on the Environmental designations map on **page 54 >**

ID	Location	Name	Features of interest	Habitat description	Data source
14	1203m W	Berwyn a Mynyddoedd De Clwyd / Berwyn and South Clwyd Mountains	Wet heathland with cross-leaved heath; Dry heaths; Alpine and subalpine heaths; Grasslands on soils rich in heavy metals; Dry grasslands and scrublands on chalk or limestone; Blanket bog; Very wet mires often identified by an unstable `quaking` surface; Calcium-rich springwater-fed fens; Acidic scree; Base-rich scree; Plants in crevices in base-rich rocks; Limestone pavements; Caves not open to the public; Mixed woodland on base-rich soils associated with rocky slopes; Western acidic oak woodland; Great crested newt; Lesser horseshoe bat.	Bogs, Marshes, Water fringed vegetation, Fens; Improved grassland; Inland rocks, Screes, Sands, Permanent Snow and ice; Heath, Scrub, Maquis and Garrigue, Phygrana; Coniferous woodland; Humid grassland, Mesophile grassland; Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites); Dry grassland, Steppes; Inland water bodies (Standing water, Running water); Broad-leaved deciduous woodland	Natural Resources Wales

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.4 Special Protection Areas (SPA)

Records within 2000m	0

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.5 National Nature Reserves (NNR)

Records within 2000m	0

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.6 Local Nature Reserves (LNR)

Records within 2000m	0

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.7 Designated Ancient Woodland

Records within 2000m	36

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

Features are displayed on the Environmental designations map on **page 54 >**

ID	Location	Name	Woodland Type
1	231m SW	Unknown	Ancient Semi Natural Woodland
A	232m W	Unknown	Restored Ancient Woodland Site
A	259m NW	Unknown	Ancient Semi Natural Woodland
2	429m S	Unknown	Restored Ancient Woodland Site

ID	Location	Name	Woodland Type
3	474m NW	Unknown	Ancient Semi Natural Woodland
4	624m S	Unknown	Restored Ancient Woodland Site
5	803m S	Unknown	Ancient Semi Natural Woodland
6	855m SE	Unknown	Ancient Semi Natural Woodland
7	904m E	Unknown	Restored Ancient Woodland Site
8	907m NE	Unknown	Ancient Semi Natural Woodland
9	1029m SE	Unknown	Restored Ancient Woodland Site
10	1039m SE	Unknown	Ancient Semi Natural Woodland
11	1071m NE	Unknown	Ancient Semi Natural Woodland
12	1118m NE	Unknown	Ancient Semi Natural Woodland
15	1203m SE	Unknown	Restored Ancient Woodland Site
16	1236m NW	Unknown	Ancient Semi Natural Woodland
-	1253m S	Unknown	Restored Ancient Woodland Site
18	1323m SE	Unknown	Restored Ancient Woodland Site
-	1403m SE	Unknown	Restored Ancient Woodland Site
-	1488m SE	Unknown	Restored Ancient Woodland Site
19	1516m NE	Unknown	Ancient Semi Natural Woodland
C	1522m SE	Unknown	Plantation on Ancient Woodland Site
-	1556m SW	Unknown	Ancient Semi Natural Woodland
-	1572m E	Unknown	Plantation on Ancient Woodland Site
C	1582m SE	Unknown	Plantation on Ancient Woodland Site
-	1603m SE	Unknown	Restored Ancient Woodland Site
-	1621m E	Unknown	Restored Ancient Woodland Site
-	1623m E	Unknown	Restored Ancient Woodland Site
-	1652m SE	Unknown	Ancient Semi Natural Woodland
C	1666m SE	Unknown	Restored Ancient Woodland Site
-	1682m E	Unknown	Restored Ancient Woodland Site
-	1774m SE	Unknown	Ancient Semi Natural Woodland

ID	Location	Name	Woodland Type
-	1875m SE	Unknown	Ancient Semi Natural Woodland
-	1899m NW	Unknown	Ancient Semi Natural Woodland
-	1959m SE	Unknown	Ancient Semi Natural Woodland
-	2000m NW	Unknown	Restored Ancient Woodland Site

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.8 Biosphere Reserves

Records within 2000m	0

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.9 Forest Parks

Records within 2000m	0

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

This data is sourced from the Forestry Commission.

10.10 Marine Conservation Zones

Records within 2000m	0

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.11 Green Belt

Records within 2000m	0

Areas designated to prevent urban sprawl by keeping land permanently open.

This data is sourced from the Ministry of Housing, Communities and Local Government.

10.12 Proposed Ramsar sites

Records within 2000m	0

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m	0

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

This data is sourced from Natural England and Natural Resources Wales.

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m	0

Special Protection Areas (SPAs) are areas designated (or ‘classified’) under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m	0

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

This data is sourced from Natural England.

10.16 Nitrate Vulnerable Zones

Records within 2000m	0

Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

This data is sourced from Natural England and Natural Resources Wales.

SSSI Impact Zones and Units

10.17 SSSI Impact Risk Zones

Records on site	0

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

This data is sourced from Natural England.

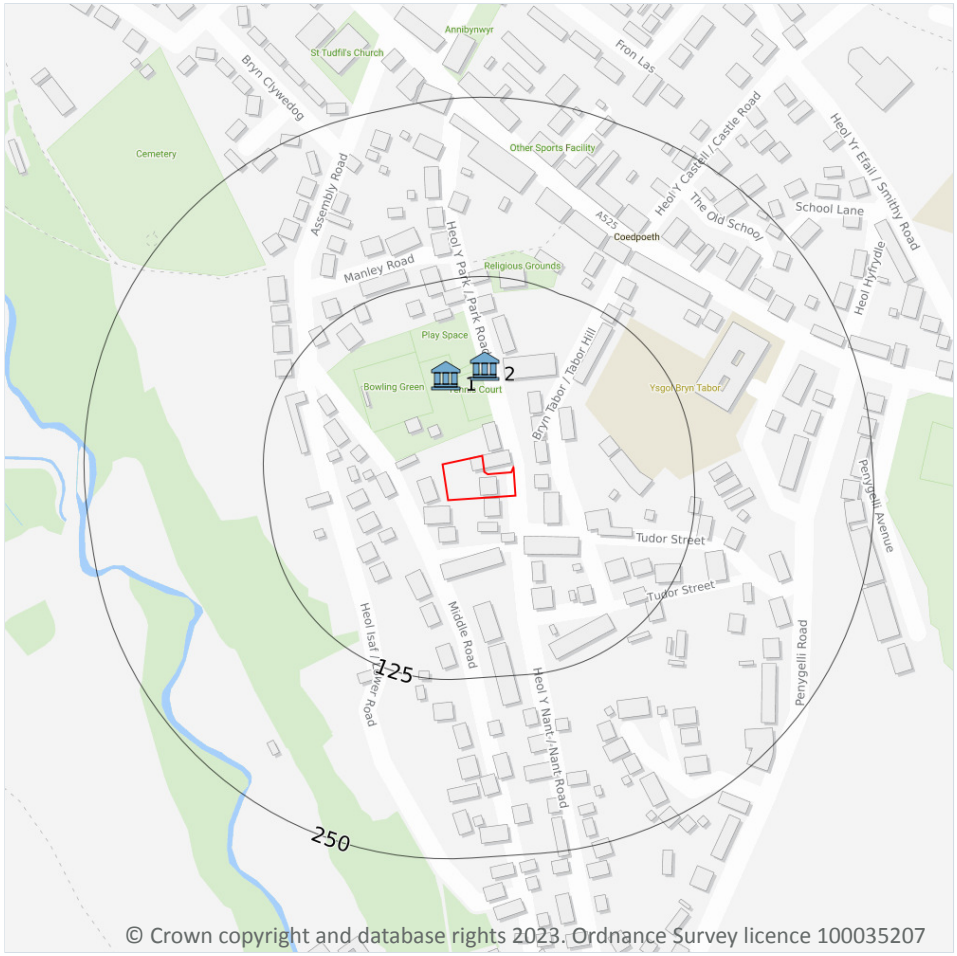
10.18 SSSI Units

Records within 2000m	0

Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

This data is sourced from Natural England and Natural Resources Wales.

11 Visual and cultural designations



Site Outline

Search buffers in metres (m)

- Listed buildings
- Conservation areas
- Conservation areas - no data
- National Parks
- Areas of Outstanding Natural Beauty
- Registered parks and gardens
- Scheduled Monuments
- World Heritage Sites

11.1 World Heritage Sites

Records within 250m	0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.2 Area of Outstanding Natural Beauty

Records within 250m	0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

11.3 National Parks

Records within 250m	0

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.

11.4 Listed Buildings

Records within 250m	2

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.

Features are displayed on the Visual and cultural designations map on **page 62 >**

ID	Location	Name	Grade	Reference Number	Listed date
1	60m N	War Memorial, In The Public Park, Opposite The Library.	II	16450	26/10/1995
2	63m N	Entrance Gates To Park, Forms The Main Entrance To The Park, Opposite The Libary.	II	16451	26/10/1995

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.5 Conservation Areas

Records within 250m	0

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.6 Scheduled Ancient Monuments

Records within 250m	0

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

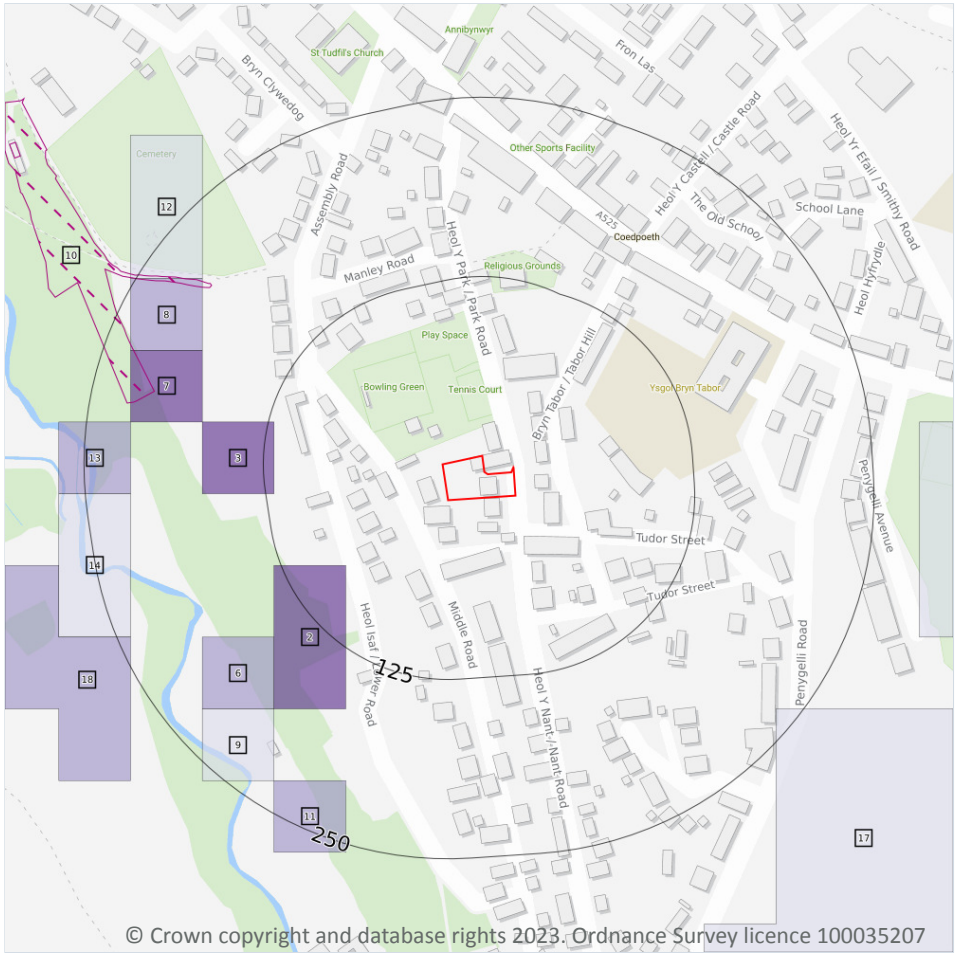
11.7 Registered Parks and Gardens

Records within 250m	0

Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

12 Agricultural designations



Site Outline

Search buffers in metres (m)

- Grade 1 - excellent quality
- Grade 2 - very good quality
- Grade 3a - good quality
- Grade 3b - moderate quality
- Grade 4 - poor quality
- Grade 5 - very poor quality
- Timber felling licences
- Open Access land

12.1 Agricultural Land Classification

Records within 250m	12

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on **page 65 >**

ID	Location	Classification	Description
2	85m SW	Grade 5	Very poor quality agricultural land
3	118m W	Grade 5	Very poor quality agricultural land
6	154m SW	Grade 4	Poor quality agricultural land

ID	Location	Classification	Description
7	170m W	Grade 5	Very poor quality agricultural land
8	186m NW	Grade 4	Poor quality agricultural land
9	189m SW	Grade 3b	Moderate quality agricultural land
11	208m SW	Grade 4	Poor quality agricultural land
12	212m NW	Grade 3b	Moderate quality agricultural land
13	218m W	Grade 4	Poor quality agricultural land
14	219m W	Grade 3b	Moderate quality agricultural land
17	235m SE	Grade 3b	Moderate quality agricultural land
18	241m SW	Grade 4	Poor quality agricultural land

This data is sourced from Natural Resources Wales.

12.2 Open Access Land

Records within 250m	**1**

The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

Features are displayed on the Agricultural designations map on **page 65 >**

ID	Location	Name	Classification	Other relevant legislation
10	204m NW	-	Open Access Registered Common Land	-

This data is sourced from Natural England and Natural Resources Wales.

12.3 Tree Felling Licences

Records within 250m	**0**

Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

This data is sourced from the Forestry Commission.

12.4 Environmental Stewardship Schemes

Records within 250m	0

Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. The schemes identified may be historical schemes that have now expired, or may still be active.

This data is sourced from Natural England.

12.5 Countryside Stewardship Schemes

Records within 250m	0

Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

This data is sourced from Natural England.

13 Habitat designations

13.1 Priority Habitat Inventory

Records within 250m	0

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

This data is sourced from Natural England.

13.2 Habitat Networks

Records within 250m	0

Habitat networks for 18 priority habitat networks (based primarily, but not exclusively, on the priority habitat inventory) and areas suitable for the expansion of networks through restoration and habitat creation.

This data is sourced from Natural England.

13.3 Open Mosaic Habitat

Records within 250m	0

Sites verified as Open Mosaic Habitat. Mosaic habitats are brownfield sites that are identified under the UK Biodiversity Action Plan as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates.

This data is sourced from Natural England.

13.4 Limestone Pavement Orders

Records within 250m	0

Limestone pavements are outcrops of limestone where the surface has been worn away by natural means over millennia. These rocks have the appearance of paving blocks, hence their name. Not only do they have geological interest, they also provide valuable habitats for wildlife. These habitats are threatened due to their removal for use in gardens and water features. Many limestone pavements have been designated as SSSIs which affords them some protection. In addition, Section 34 of the Wildlife and Countryside Act 1981 gave them additional protection via the creation of Limestone Pavement Orders, which made it a criminal offence to remove any part of the outcrop. The associated Limestone Pavement Priority Habitat is part of the UK Biodiversity Action Plan priority habitat in England.

This data is sourced from Natural England.

14 Geology 1:10,000 scale - Availability



14.1 10k Availability

Records within 500m	1

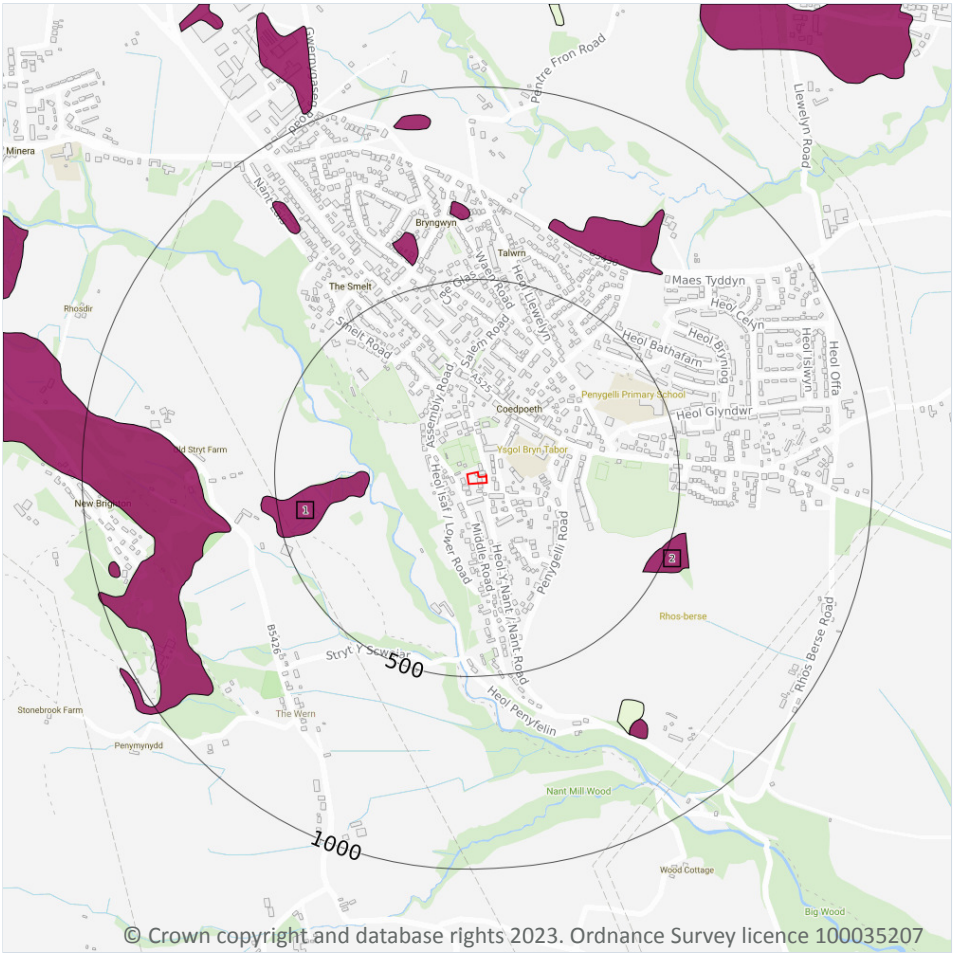
An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 69 >**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**Full**	**Full**	**Full**	**Full**	**SJ25SE**

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Artificial and made ground



Site Outline

Search buffers in metres (m)

- Reclaimed ground
- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

14.2 Artificial and made ground (10k)

Records within 500m	2

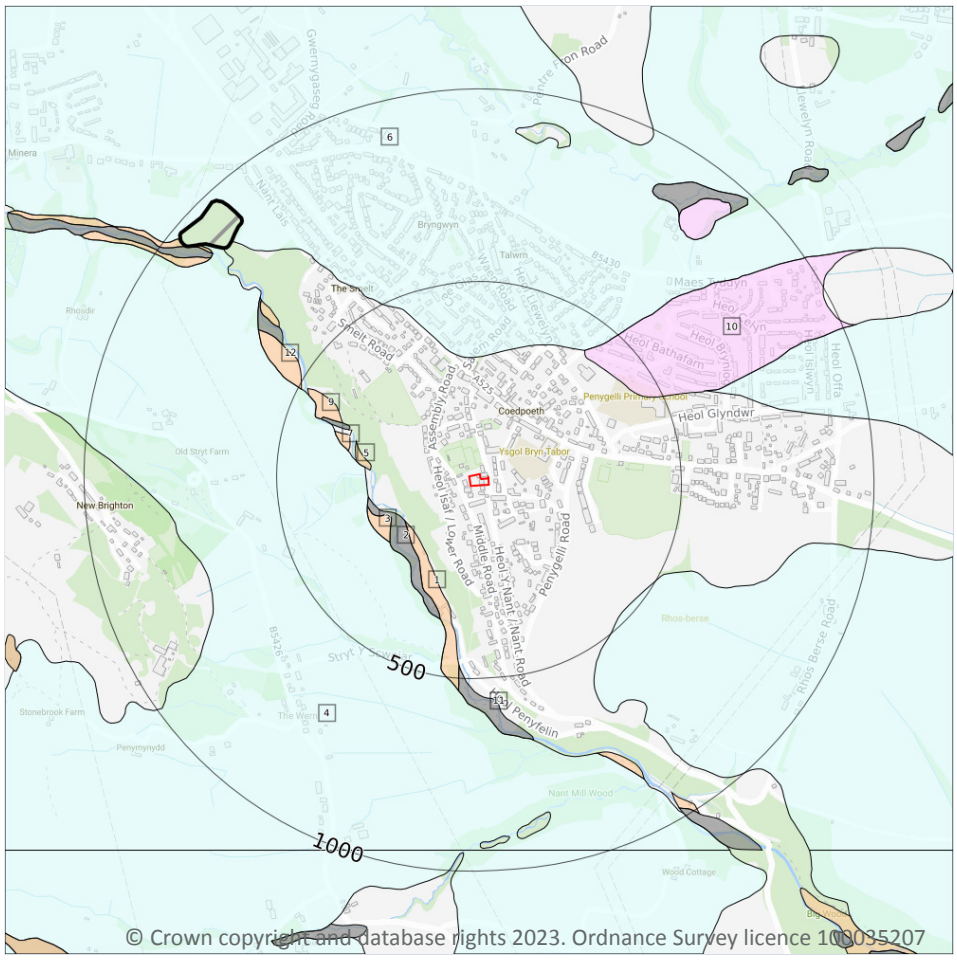
Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on **page 70 >**

ID	Location	LEX Code	Description	Rock description
1	254m W	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
2	464m SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (10k)

Superficial geology (10k)
Please see table for more details.

14.3 Superficial geology (10k)

Records within 500m	12

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:10,000 scale - Superficial map on **page 71 >**

ID	Location	LEX Code	Description	Rock description
1	188m SW	RTDU-XSV	River Terrace Deposits (undifferentiated) - Sand And Gravel	Sand And Gravel
2	193m SW	ALV-C	Alluvium - Clay (unlithified Deposits Coding Scheme)	Clay
3	222m SW	RTDU-XSV	River Terrace Deposits (undifferentiated) - Sand And Gravel	Sand And Gravel
4	252m SW	TILL-DMTN	Till - Diamicton	Diamicton

ID	Location	LEX Code	Description	Rock description
5	256m W	RTDU-XSV	River Terrace Deposits (undifferentiated) - Sand And Gravel	Sand And Gravel
6	303m N	TILL-DMTN	Till - Diamicton	Diamicton
7	319m W	RTDU-XSV	River Terrace Deposits (undifferentiated) - Sand And Gravel	Sand And Gravel
8	334m W	ALV-C	Alluvium - Clay (unlithified Deposits Coding Scheme)	Clay
9	357m NW	RTDU-XSV	River Terrace Deposits (undifferentiated) - Sand And Gravel	Sand And Gravel
10	401m NE	GFDU-XSV	Glaciofluvial Deposits - Sand And Gravel	Sand And Gravel
11	468m S	ALV-C	Alluvium - Clay (unlithified Deposits Coding Scheme)	Clay
12	491m NW	RTDU-XSV	River Terrace Deposits (undifferentiated) - Sand And Gravel	Sand And Gravel

This data is sourced from the British Geological Survey.

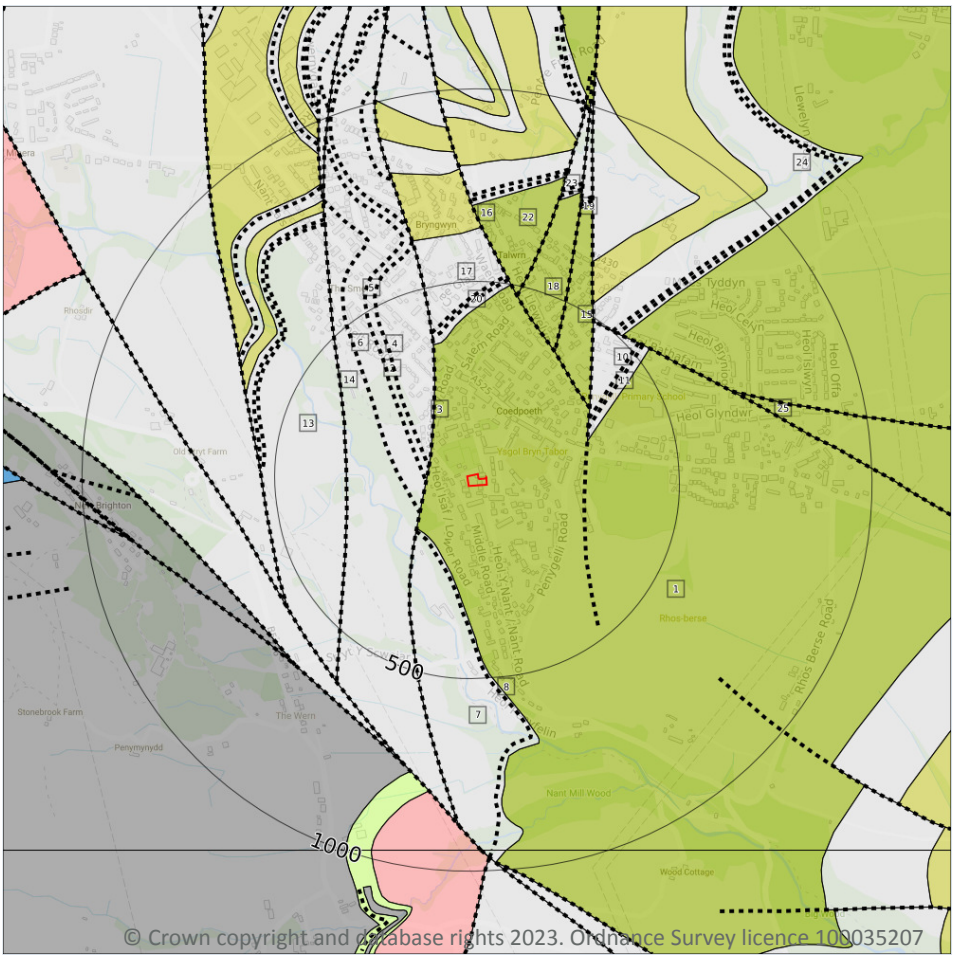
14.4 Landslip (10k)

Records within 500m	**0**

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (10k)

Bedrock geology (10k)
Please see table for more details.

14.5 Bedrock geology (10k)

Records within 500m	10

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 73 >**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CF-SDST**	**Cefn Rock - Sandstone**	**Bolsovian Sub-age**
2	102m W	PLMC-MDSS	Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (undifferentiated) - Mudstone, Siltstone And Sandstone	Bolsovian Sub-age - Langsettian Sub-age

ID	Location	LEX Code	Description	Rock age
7	169m SW	PLMC-MDSS	Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (undifferentiated) - Mudstone, Siltstone And Sandstone	Bolsovian Sub-age - Langsettian Sub-age
10	279m E	PLMC-MDSS	Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (undifferentiated) - Mudstone, Siltstone And Sandstone	Bolsovian Sub-age - Langsettian Sub-age
13	314m W	PLMC-MDSS	Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (undifferentiated) - Mudstone, Siltstone And Sandstone	Bolsovian Sub-age - Langsettian Sub-age
15	323m NE	CF-SDST	Cefn Rock - Sandstone	Bolsovian Sub-age
17	353m N	PLMC-MDSS	Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (undifferentiated) - Mudstone, Siltstone And Sandstone	Bolsovian Sub-age - Langsettian Sub-age
18	371m NE	CF-SDST	Cefn Rock - Sandstone	Bolsovian Sub-age
22	474m N	CF-SDST	Cefn Rock - Sandstone	Bolsovian Sub-age
24	491m NE	PLMC-MDSS	Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (undifferentiated) - Mudstone, Siltstone And Sandstone	Bolsovian Sub-age - Langsettian Sub-age

This data is sourced from the British Geological Survey.

14.6 Bedrock faults and other linear features (10k)

Records within 500m **15**

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

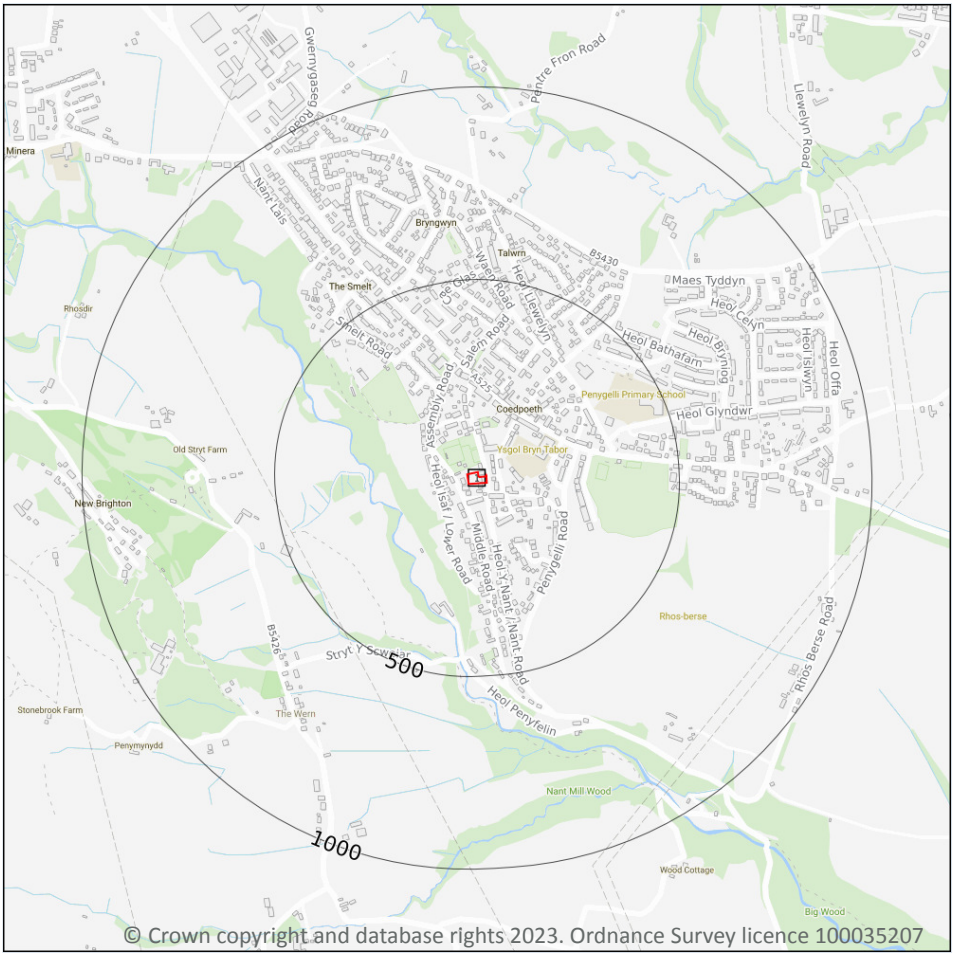
Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 73 >**

ID	Location	Category	Description
3	102m W	FAULT	Normal fault, inferred
4	102m W	ROCK	Coal seam, inferred
5	108m W	ROCK	Coal seam, inferred
6	145m SW	ROCK	Coal seam, inferred
8	177m SW	ROCK	Coal seam, inferred
9	254m E	FAULT	Normal fault, inferred

ID	Location	Category	Description
11	293m NE	FOSSIL_HORIZON	Fossil horizon, marine band
12	307m NE	ROCK	Coal seam, inferred
14	314m W	FAULT	Normal fault, inferred
16	323m NE	FAULT	Normal fault, inferred
19	371m NE	FAULT	Normal fault, inferred
20	372m N	FOSSIL_HORIZON	Fossil horizon, marine band
21	384m N	ROCK	Coal seam, inferred
23	474m N	FAULT	Normal fault, inferred
25	491m NE	FAULT	Normal fault, inferred

This data is sourced from the British Geological Survey.

15 Geology 1:50,000 scale - Availability



15.1 50k Availability

Records within 500m	1

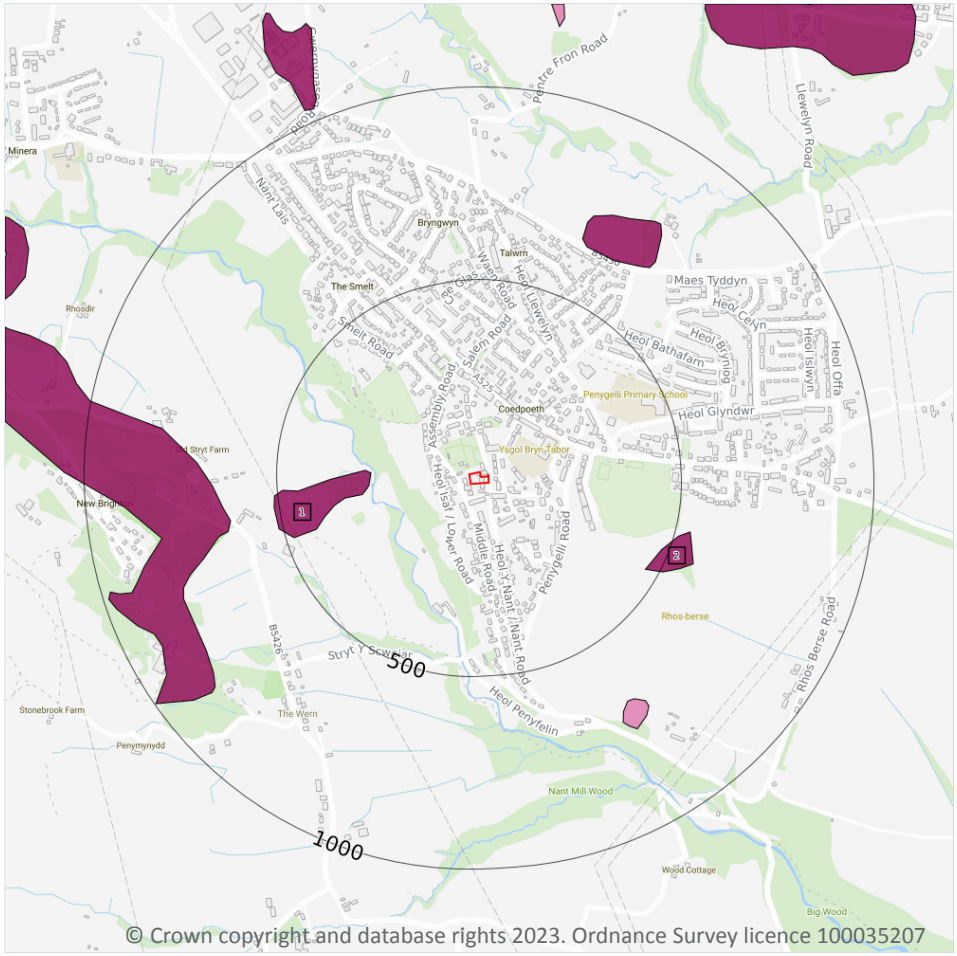
An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme. Where 50k data is not available, this area has been filled in with 625k scale data.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 76 >**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**Full**	**Full**	**Full**	**Full**	**EW121_wrexham_v4**

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Artificial and made ground



15.2 Artificial and made ground (50k)

Records within 500m	2

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:50,000 scale - Artificial and made ground map on **page 77 >**

ID	Location	LEX Code	Description	Rock description
1	256m W	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
2	465m SE	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

This data is sourced from the British Geological Survey.

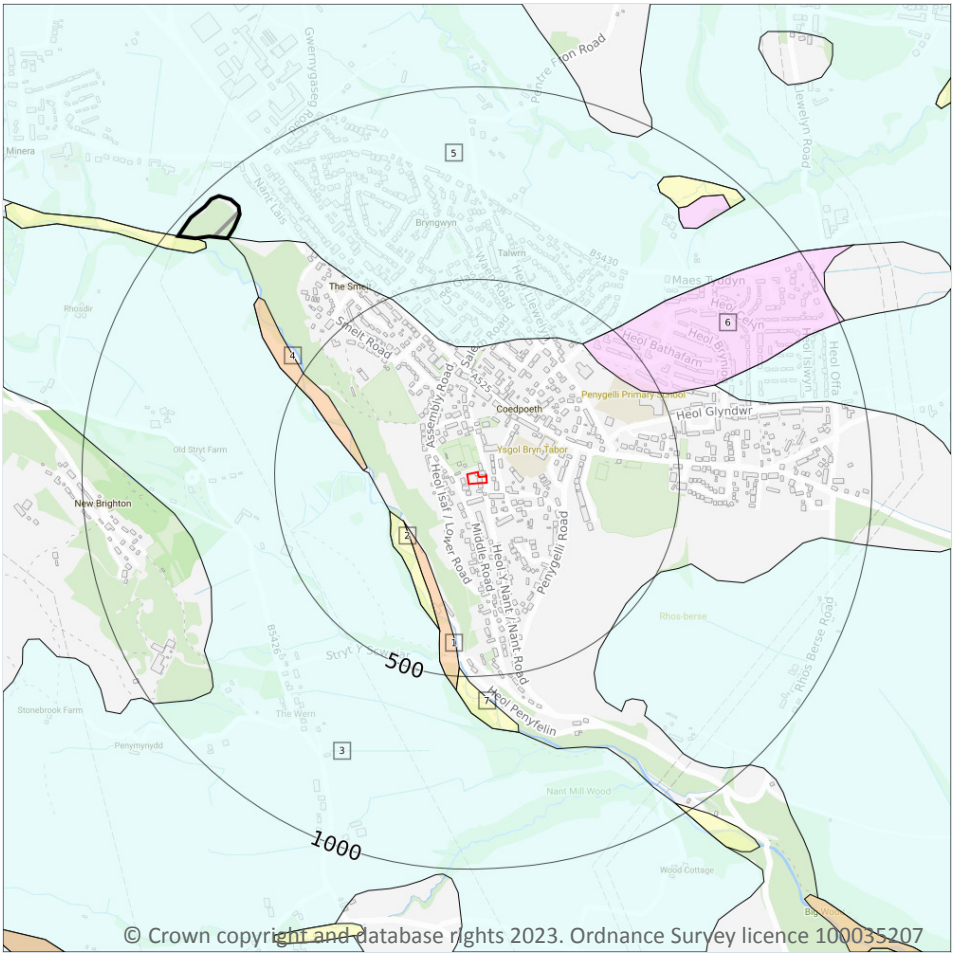
15.3 Artificial ground permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

15.4 Superficial geology (50k)

Records within 500m **7**

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 79 >**

ID	Location	LEX Code	Description	Rock description
1	194m SW	RTDU-XSV	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)	SAND AND GRAVEL
2	195m SW	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL
3	217m W	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
4	260m W	RTDU-XSV	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)	SAND AND GRAVEL

ID	Location	LEX Code	Description	Rock description
5	325m N	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
6	412m NE	GFDUD-XSV	GLACIOFLUVIAL DEPOSITS, DEVENSIAN	SAND AND GRAVEL
7	477m S	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

15.6 Landslip (50k)

Records within 500m	0

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

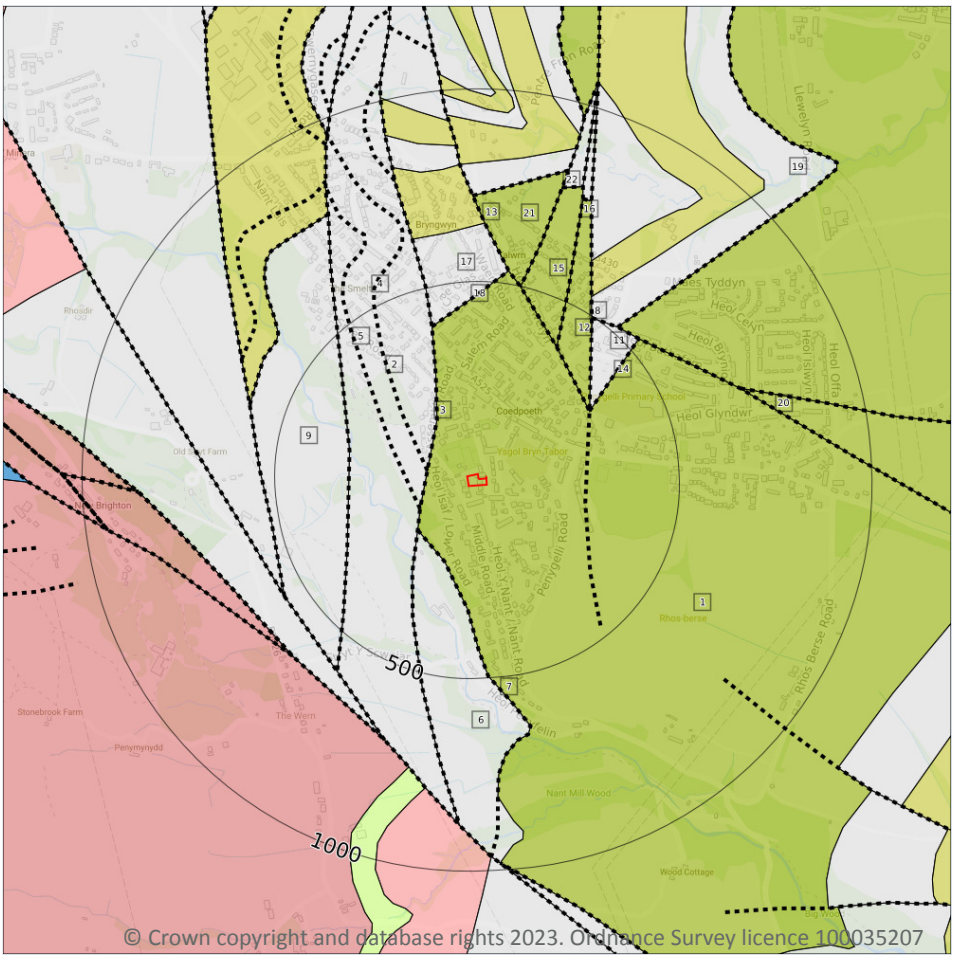
15.7 Landslip permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (50k)

Bedrock geology (50k)
Please see table for more details.

15.8 Bedrock geology (50k)

Records within 500m	10

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 81 >**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CF-SDST**	**CEFN ROCK - SANDSTONE**	**WESTPHALIAN**
2	104m W	PLMC-MDSS	PENNINE LOWER COAL MEASURES FORMATION AND PENNINE MIDDLE COAL MEASURES FORMATION (UNDIFFERENTIATED) - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN

ID	Location	LEX Code	Description	Rock age
6	175m SW	PLMC-MDSS	PENNINE LOWER COAL MEASURES FORMATION AND PENNINE MIDDLE COAL MEASURES FORMATION (UNDIFFERENTIATED) - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
9	307m W	PLMC-MDSS	PENNINE LOWER COAL MEASURES FORMATION AND PENNINE MIDDLE COAL MEASURES FORMATION (UNDIFFERENTIATED) - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
11	318m NE	PLMC-MDSS	PENNINE LOWER COAL MEASURES FORMATION AND PENNINE MIDDLE COAL MEASURES FORMATION (UNDIFFERENTIATED) - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
12	318m NE	CF-SDST	CEFN ROCK - SANDSTONE	WESTPHALIAN
15	384m NE	CF-SDST	CEFN ROCK - SANDSTONE	WESTPHALIAN
17	399m N	PLMC-MDSS	PENNINE LOWER COAL MEASURES FORMATION AND PENNINE MIDDLE COAL MEASURES FORMATION (UNDIFFERENTIATED) - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
19	496m NE	PLMC-MDSS	PENNINE LOWER COAL MEASURES FORMATION AND PENNINE MIDDLE COAL MEASURES FORMATION (UNDIFFERENTIATED) - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
21	499m N	CF-SDST	CEFN ROCK - SANDSTONE	WESTPHALIAN

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m	**1**

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Fracture**	**High**	**Moderate**

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m	12

Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 81 >**

ID	Location	Category	Description
3	104m W	FAULT	Fault, inferred, displacement unknown
4	105m W	ROCK	Coal seam, inferred
5	140m SW	ROCK	Coal seam, inferred
7	175m SW	ROCK	Coal seam, inferred
8	258m E	FAULT	Fault, inferred, displacement unknown
10	307m W	FAULT	Fault, inferred, displacement unknown
13	318m NE	FAULT	Fault, inferred, displacement unknown
14	318m NE	ROCK	Coal seam, inferred
16	384m NE	FAULT	Fault, inferred, displacement unknown
18	399m N	ROCK	Coal seam, inferred
20	496m NE	FAULT	Fault, inferred, displacement unknown
22	499m N	FAULT	Fault, inferred, displacement unknown

This data is sourced from the British Geological Survey.

16 Boreholes



Site Outline

Search buffers in metres (m)

- Confidential
- 0 - 10m
- 10 - 30m
- 30m+
- Unknown

16.1 BGS Boreholes

Records within 250m	1

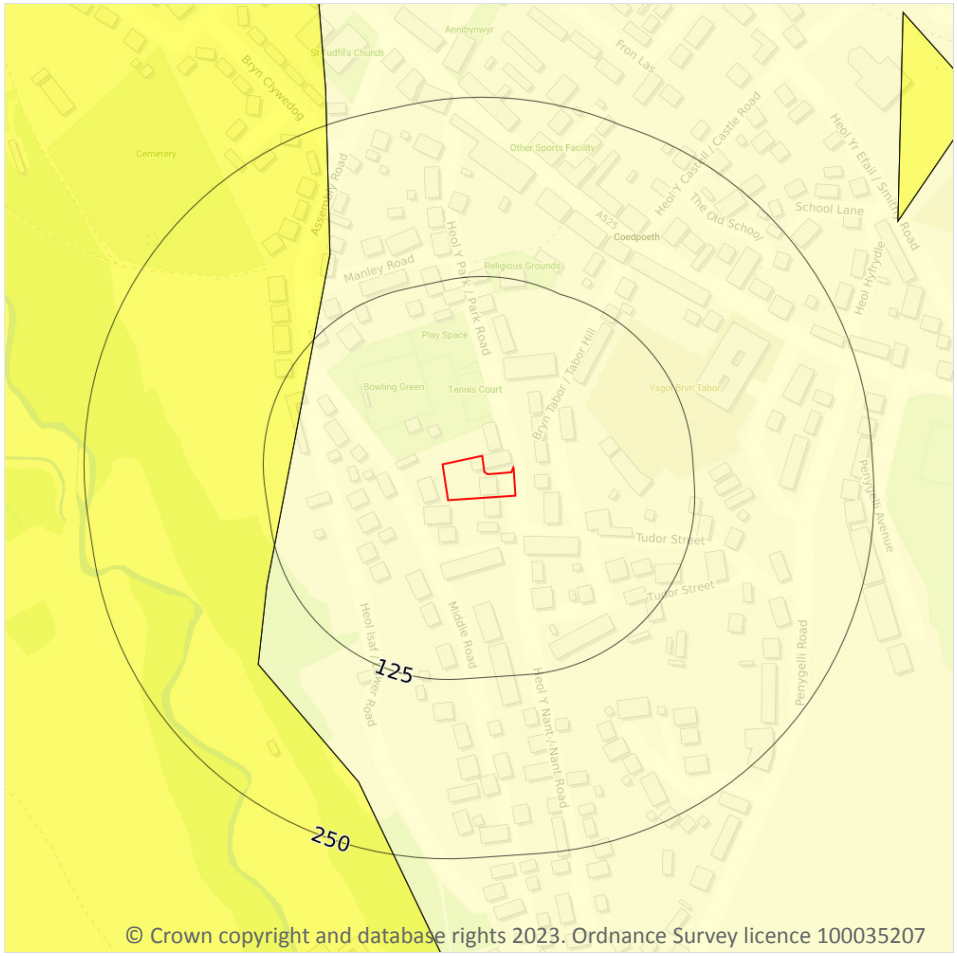
The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

Features are displayed on the Boreholes map on **page 84 >**

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	42m NW	328280 350990	COEDPOETH BOWLING GREEN TH	2.2	N	146870 ↗

This data is sourced from the British Geological Survey.

17 Natural ground subsidence - Shrink swell clays



17.1 Shrink swell clays

Records within 50m	1

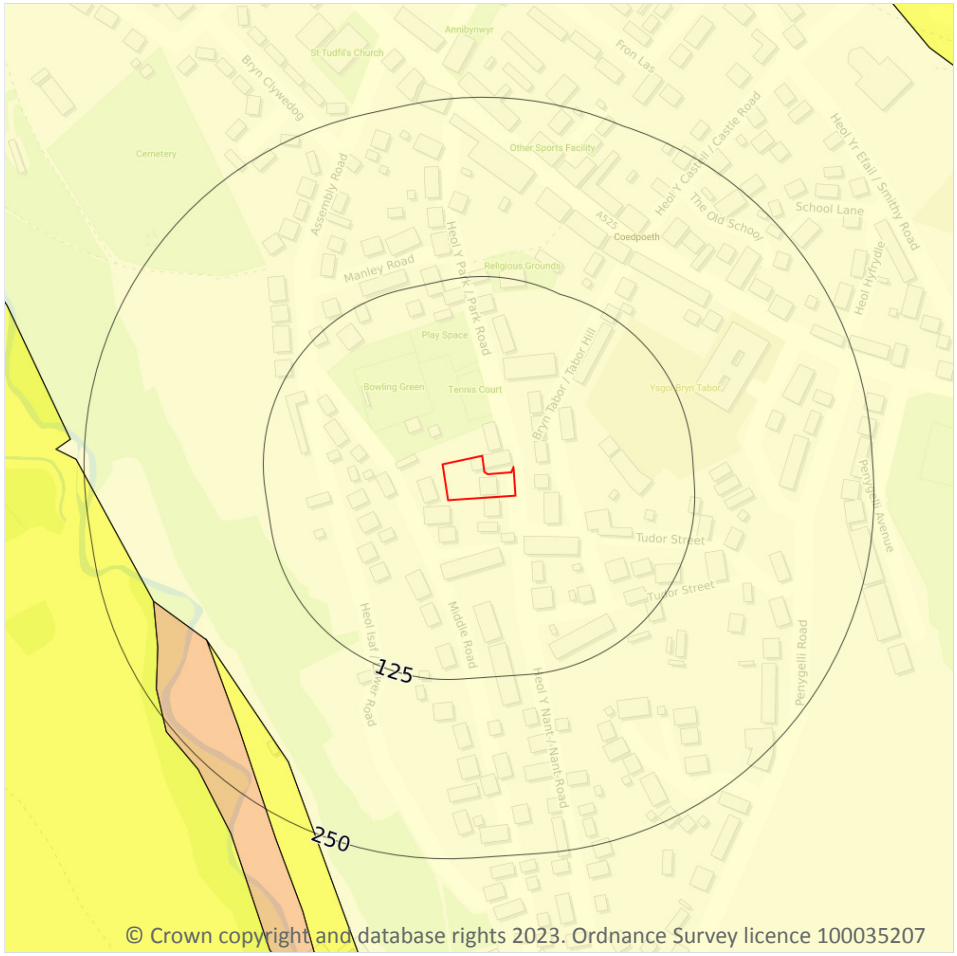
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 85 >**

Location	Hazard rating	Details
On site	**Negligible**	**Ground conditions predominantly non-plastic.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.2 Running sands

Records within 50m	1

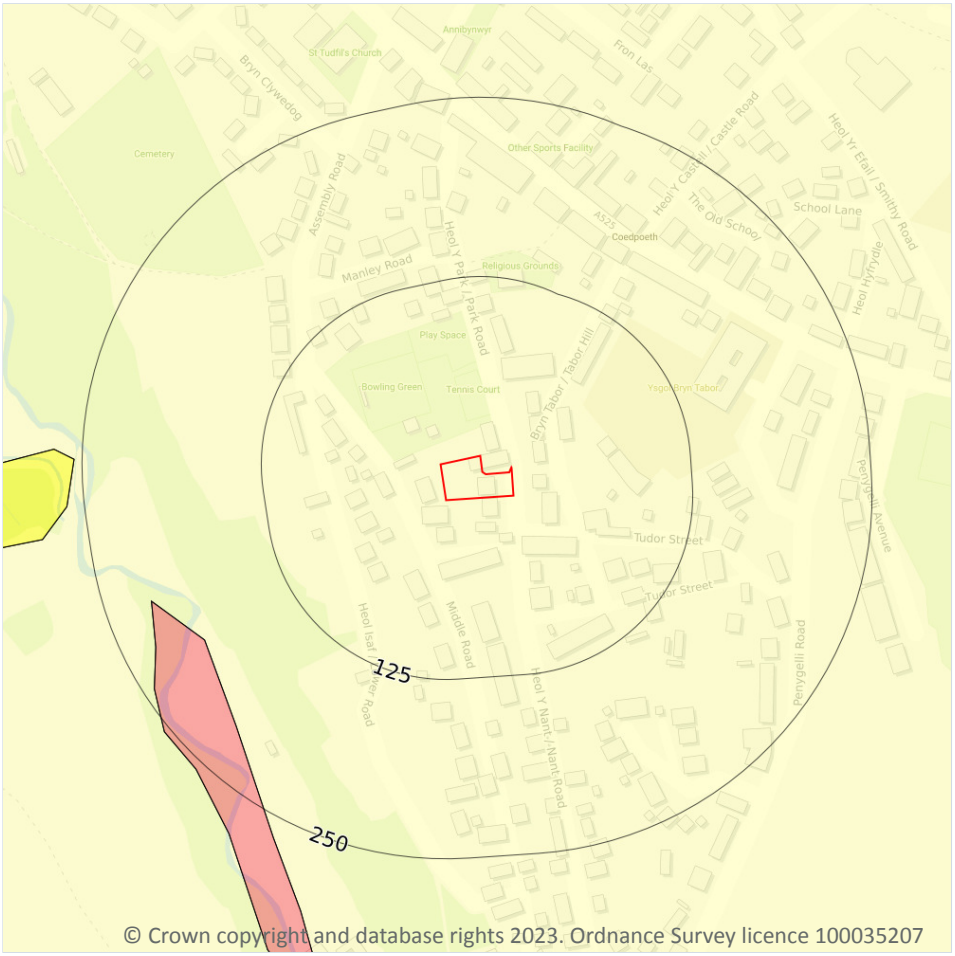
The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on **page 86 >**

Location	Hazard rating	Details
On site	**Negligible**	**Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.3 Compressible deposits

Records within 50m	1

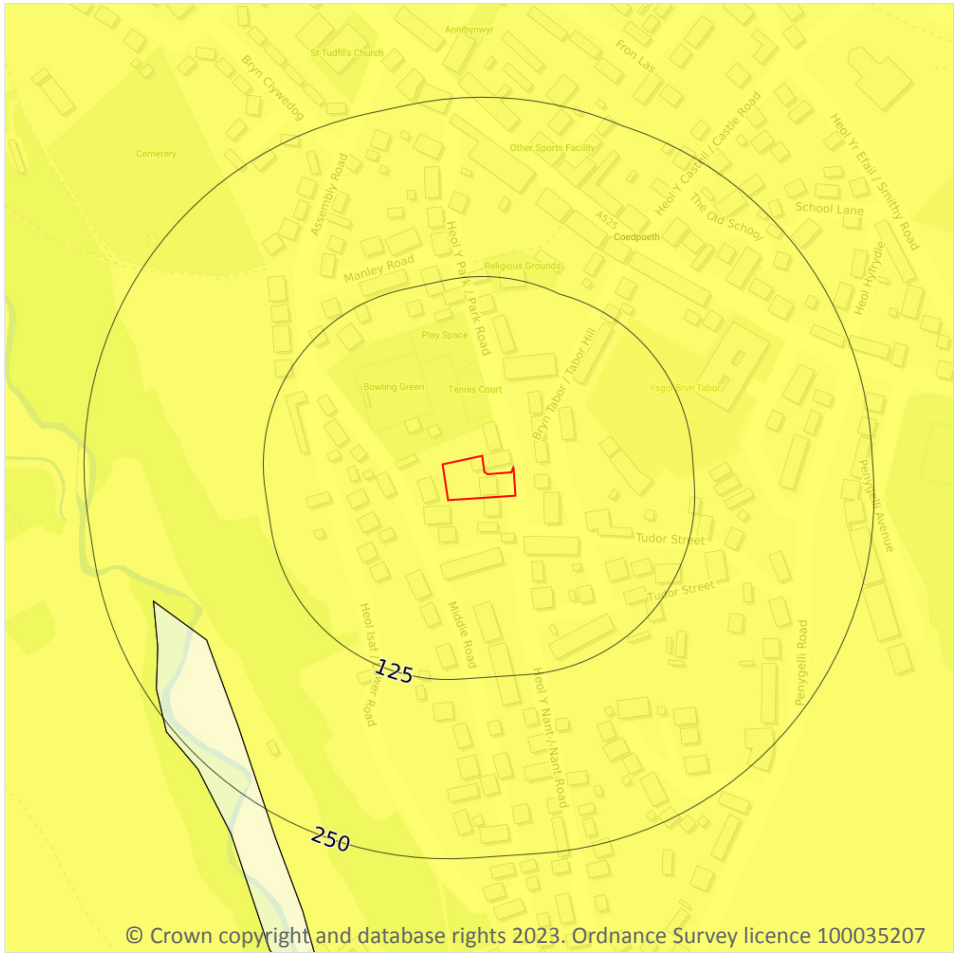
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 87 >**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.4 Collapsible deposits

Records within 50m	1

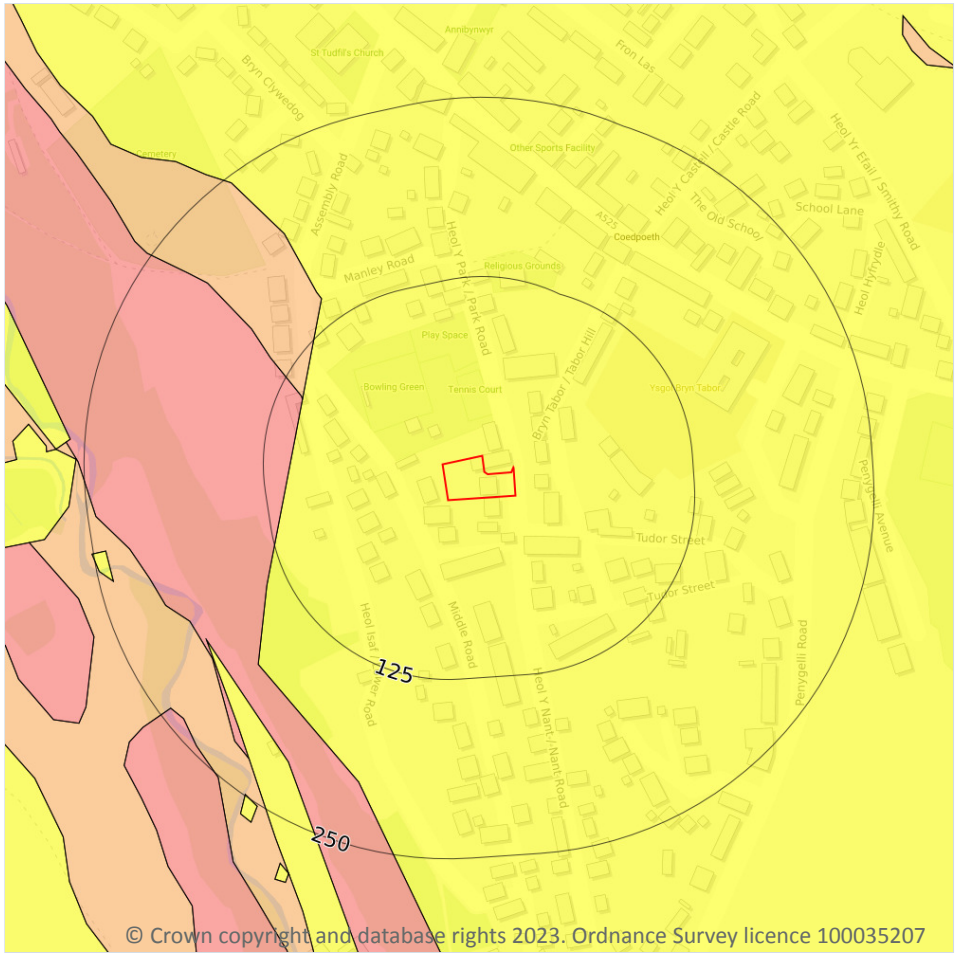
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 88 >**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides



17.5 Landslides

Records within 50m	1

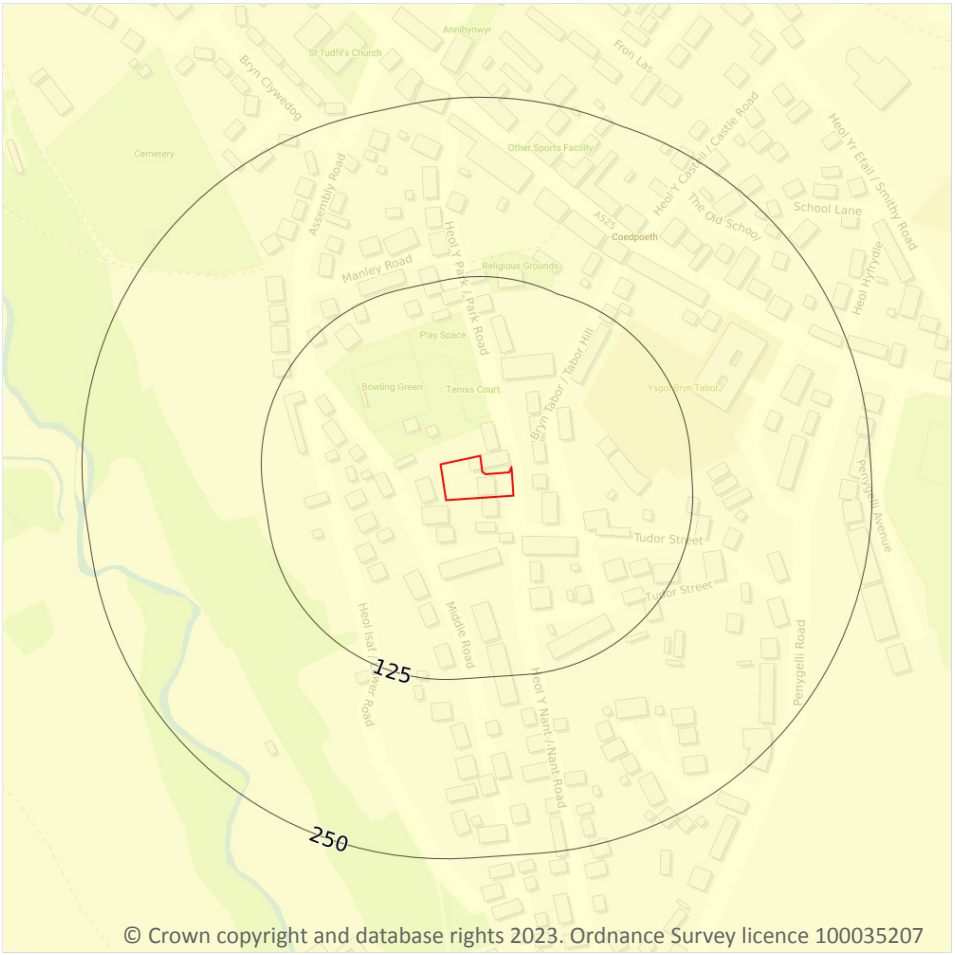
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 89 >**

Location	Hazard rating	Details
On site	**Very low**	**Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.6 Ground dissolution of soluble rocks

Records within 50m	1

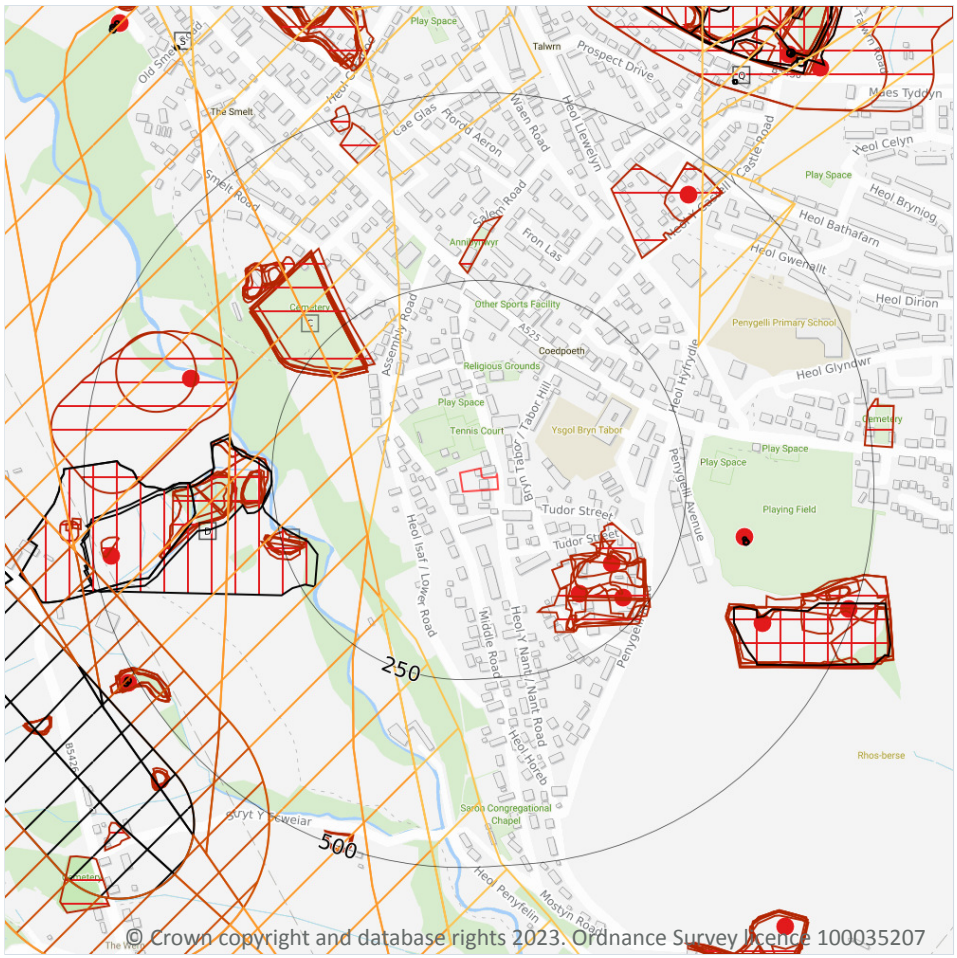
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 90 >**

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

This data is sourced from the British Geological Survey.

18 Mining and ground workings



Site Outline

Search buffers in metres (m)

- BritPits
- Surface ground workings
- Underground workings
- Underground mining extents
- Historical mineral planning areas
- TCA non-coal mining

Non Coal Mining

- Sporadic underground mining of restricted extent possible
- Localised small scale underground mining possible
- Small scale mining possible
- Underground mining known or likely within or in close proximity
- Underground mining known within or in very close proximity

18.1 BritPits

Records within 500m	9

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

Features are displayed on the Mining and ground workings map on **page 92 >**

ID	Location	Details	Description
B	176m SE	Name: Penygelli Quarries Address: Coedpoeth, WREXHAM, Clwyd Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
B	180m SE	Name: Penygelli Quarries Address: Coedpoth, WREXHAM, Clwyd Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
B	220m SE	Name: Penygelli Quarries Address: Coedpoeth, WREXHAM, Denbighshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
G	333m E	Name: Pen-y-gelli Shaft Address: Coedpoeth, WREXHAM, Denbighshire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
F	379m W	Name: Minera Lead Mines, Deep Day Level Address: Minera, WREXHAM, Clwyd Commodity: Lead Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
8	394m SE	Name: Minera Stone Quarry Address: Adw'r Clawdd, Coedpath, WREXHAM, Denbighshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority

ID	Location	Details	Description
I	450m NE	Name: Talwrn Brick Works Address: Coedpoeth, WREXHAM, Denbighshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
K	475m W	Name: New Minera Lead Mine, Burton's Shaft Address: New Brighton, WREXHAM, Denbighshire Commodity: Vein Minerals Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
H	492m E	Name: Minera Stone Quarry Address: Adwy'r Clawdd, Coedpoth, WREXHAM, Clwyd Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority

This data is sourced from the British Geological Survey.

18.2 Surface ground workings

Records within 250m **23**

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining and ground workings map on **page 92 >**

ID	Location	Land Use	Year of mapping	Mapping scale
B	128m SE	Unspecified Quarry	1960	1:10560
B	131m SE	Unspecified Quarry	1910	1:10560
B	132m SE	Unspecified Quarry	1949	1:10560
B	146m SE	Unspecified Quarry	1900	1:10560
B	146m SE	Unspecified Quarry	1938	1:10560
B	149m E	Unspecified Quarry	1872	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
B	169m SE	Unspecified Ground Workings	1898	1:10560
C	183m NW	Cemetery	1989	1:10000
C	183m NW	Cemetery	1985	1:10000
C	183m NW	Cemetery	1974	1:10000
C	183m NW	Cemetery	1960	1:10560
C	184m NW	Cemetery	1900	1:10560
C	187m NW	Cemetery	1949	1:10560
C	187m NW	Cemetery	1910	1:10560
C	188m NW	Cemetery	1938	1:10560
B	193m SE	Unspecified Ground Workings	1949	1:10560
E	218m W	Unspecified Pit	1989	1:10000
E	218m W	Unspecified Pit	1985	1:10000
E	221m W	Unspecified Pit	1974	1:10000
E	224m W	Unspecified Heap	1938	1:10560
E	224m W	Unspecified Heap	1938	1:10560
E	226m W	Unspecified Pit	1949	1:10560
E	229m W	Unspecified Pit	1960	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.3 Underground workings

Records within 1000m **52**

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

Features are displayed on the Mining and ground workings map on **page 92 >**

ID	Location	Land Use	Year of mapping	Mapping scale
D	210m SW	Lead Mine	1949	1:10560
D	251m W	Unspecified Mine	1960	1:10560
G	332m E	Unspecified Old Shaft	1949	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
G	334m E	Unspecified Disused Shaft	1989	1:10560
G	334m E	Unspecified Disused Shaft	1985	1:10000
G	334m E	Unspecified Disused Shaft	1974	1:10000
G	334m E	Unspecified Old Shaft	1960	1:10560
H	351m SE	Old Lead Shaft	1949	1:10560
K	356m W	Unspecified Disused Mine	1989	1:10560
K	356m W	Unspecified Disused Mine	1985	1:10000
M	507m SW	Unspecified Old Shaft	1898	1:10560
M	512m SW	Unspecified Old Shaft	1960	1:10560
Q	608m NE	Unspecified Old Shaft	1900	1:10560
R	611m W	Unspecified Disused Mine	1989	1:10560
R	611m W	Unspecified Disused Mine	1985	1:10000
R	611m W	Unspecified Disused Mine	1974	1:10000
Q	638m NE	Disused Colliery	1949	1:10560
Q	640m NE	Colliery	1872	1:10560
Q	647m NE	Unspecified Disused Mine	1960	1:10560
A	659m N	Unspecified Old Shaft	1900	1:10560
-	670m N	Unspecified Old Shaft	1900	1:10560
Q	676m NE	Unspecified Disused Shafts	1985	1:10000
Q	676m NE	Unspecified Disused Shafts	1974	1:10000
S	677m NW	Unspecified Old Shafts	1900	1:10560
Q	679m NE	Unspecified Disused Shafts	1989	1:10560
Q	679m NE	Unspecified Disused Shafts	1985	1:10000
Q	679m NE	Unspecified Disused Shafts	1974	1:10000
Q	680m NE	Unspecified Shaft	1872	1:10560
-	719m W	Unspecified Shaft	1949	1:10560
-	721m W	Unspecified Shaft	1960	1:10560
X	745m NW	Unspecified Old Shaft	1960	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
X	748m NW	Unspecified Old Shaft	1949	1:10560
X	750m NW	Unspecified Old Shafts	1900	1:10560
-	782m W	Unspecified Shaft	1960	1:10560
-	800m W	Unspecified Shaft	1900	1:10560
-	807m W	Unspecified Shaft	1872	1:10560
-	814m NW	Unspecified Shaft	1949	1:10560
-	814m NW	Coal Shaft	1872	1:10560
-	817m NW	Unspecified Shaft	1900	1:10560
-	833m N	Old Colliery	1949	1:10560
-	854m N	Unspecified Disused Shafts	1985	1:10000
-	854m N	Unspecified Disused Shafts	1974	1:10000
-	859m N	Unspecified Old Shaft	1960	1:10560
-	860m N	Unspecified Old Shaft	1900	1:10560
-	860m N	Unspecified Old Shaft	1949	1:10560
-	861m N	Unspecified Old Shaft	1960	1:10560
-	863m N	Unspecified Old Shaft	1949	1:10560
-	867m N	Unspecified Old Shaft	1900	1:10560
-	867m N	Unspecified Disused Shafts	1985	1:10000
-	867m N	Unspecified Disused Shafts	1974	1:10000
-	893m SW	Old Lead Shaft	1949	1:10560
-	928m N	Unspecified Old Shaft	1900	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground mining extents

Records within 500m	0

This data identifies underground mine workings that could present a potential risk, including adits and seam workings. These features have been identified from BGS Geological mapping and mine plans sourced from the BGS and various collections and sources.

This data is sourced from Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	49

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

Features are displayed on the Mining and ground workings map on **page 92 >**

ID	Location	Name	Commodity	Class	Likelihood
A	104m W	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
1	136m W	Not available	Iron Ore (Bedded)	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
2	140m SW	North Wales (ra)	Vein Mineral	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
3	175m SW	Not available	Iron Ore (Bedded)	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
4	179m SW	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.

ID	Location	Name	Commodity	Class	Likelihood
F	307m W	Not available	Iron Ore (Bedded)	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
6	318m NE	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
9	399m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
10	435m SW	Not available	Iron Ore (Bedded)	D	Underground mining is considered likely to have occurred within or close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
M	435m SW	Not available	Iron Ore (Bedded)	D	Underground mining is considered likely to have occurred within or close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
12	496m NE	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
13	520m W	Not available	Iron Ore (Bedded)	D	Underground mining is considered likely to have occurred within or close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
14	521m W	Not available	Iron Ore (Bedded)	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
O	535m SW	Not available	Iron Ore (Bedded)	E	Underground mining is known or considered likely within or very close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
15	542m NE	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.

ID	Location	Name	Commodity	Class	Likelihood
M	550m SW	Not available	Iron Ore (Bedded)	E	Underground mining is known or considered likely within or very close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
P	556m SW	Not available	Iron Ore (Bedded)	E	Underground mining is known or considered likely within or very close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
16	562m SW	Not available	Iron Ore (Bedded)	D	Underground mining is considered likely to have occurred within or close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
17	581m SW	Not available	Iron Ore (Bedded)	D	Underground mining is considered likely to have occurred within or close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
18	594m W	Not available	Iron Ore (Bedded)	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
S	622m NW	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
19	625m NE	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
20	626m SW	Not available	Iron Ore (Bedded)	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
21	630m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
22	634m SW	Not available	Vein Mineral	E	Underground mining is known or considered likely within or very close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.

ID	Location	Name	Commodity	Class	Likelihood
23	637m SW	Not available	Vein Mineral	D	Underground mining is considered likely to have occurred within or close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
25	654m SW	North Wales (ra)	Vein Mineral	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
-	660m S	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	723m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	731m S	Not available	Vein Mineral	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	753m W	Not available	Iron Ore (Bedded)	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
-	765m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	768m NW	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	775m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.

ID	Location	Name	Commodity	Class	Likelihood
-	792m S	Not available	Vein Mineral	A	Underground mine workings are uncommon, although the geology is similar to that worked elsewhere. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	796m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	805m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	854m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	903m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	919m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	920m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	941m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	946m S	Not available	Vein Mineral	A	Underground mine workings are uncommon, although the geology is similar to that worked elsewhere. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.

ID	Location	Name	Commodity	Class	Likelihood
-	946m S	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	956m NW	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	964m S	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	975m S	Not available	Vein Mineral	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	981m N	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	982m S	Not available	Iron Ore (Bedded)	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.

This data is sourced from the British Geological Survey.

18.7 JPB mining areas

Records on site	1

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

Location	Details
On site	**In addition to being located inside an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property which may supplement this information. Please note, the plans held by JPB may also relate to non-mining records. Further details and a quote for services (if appropriate) can be obtained by emailing this report to enquiries.gs@jpb.co.uk ↗.**

This data is sourced from Johnson Poole and Bloomer.

18.8 The Coal Authority non-coal mining

Records within 500m	**0**

This data provides an indication of the potential zone of influence of recorded underground non-coal mining workings. Any and all analysis and interpretation of Coal Authority Data in this report is made by Groundsure, and is in no way supported, endorsed or authorised by the Coal Authority. The use of the data is restricted to the terms and provisions contained in this report. Data reproduced in this report may be the copyright of the Coal Authority and permission should be sought from Groundsure prior to any re-use.

This data is sourced from The Coal Authority.

18.9 Researched mining

Records within 500m	**0**

This data indicates areas of potential mining identified from alternative or archival sources, including; BGS Geological paper maps, Lidar data, aerial photographs (from World War II onwards), archaeological data services, websites, Tithe maps, and various text/plans from collected books and reports. Some of this data is approximate and Groundsure have interpreted the resultant risk area and, where possible, specific areas of risk have been captured.

This data is sourced from Groundsure.

18.10 Mining record office plans

Records within 500m	**4**

This dataset is representative of Mining Record Office and/or plan extents held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

Location	Mineral
393m W	Lead
440m W	Lead

Location	Mineral
450m W	Lead
465m W	Lead

This data is sourced from Groundsure.

18.11 BGS mine plans

Records within 500m	3

This dataset is representative of BGS mine plans held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

Location	Mineral
197m SW	Lead
375m SW	Lead
407m SW	Lead

This data is sourced from Groundsure.

18.12 Coal mining

Records on site	1

Areas which could be affected by past, current or future coal mining.

Location	Details
On site	**The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site. This can be ordered directly through Groundsure or your preferred search provider.**

This data is sourced from the Coal Authority.

18.13 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.14 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.15 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

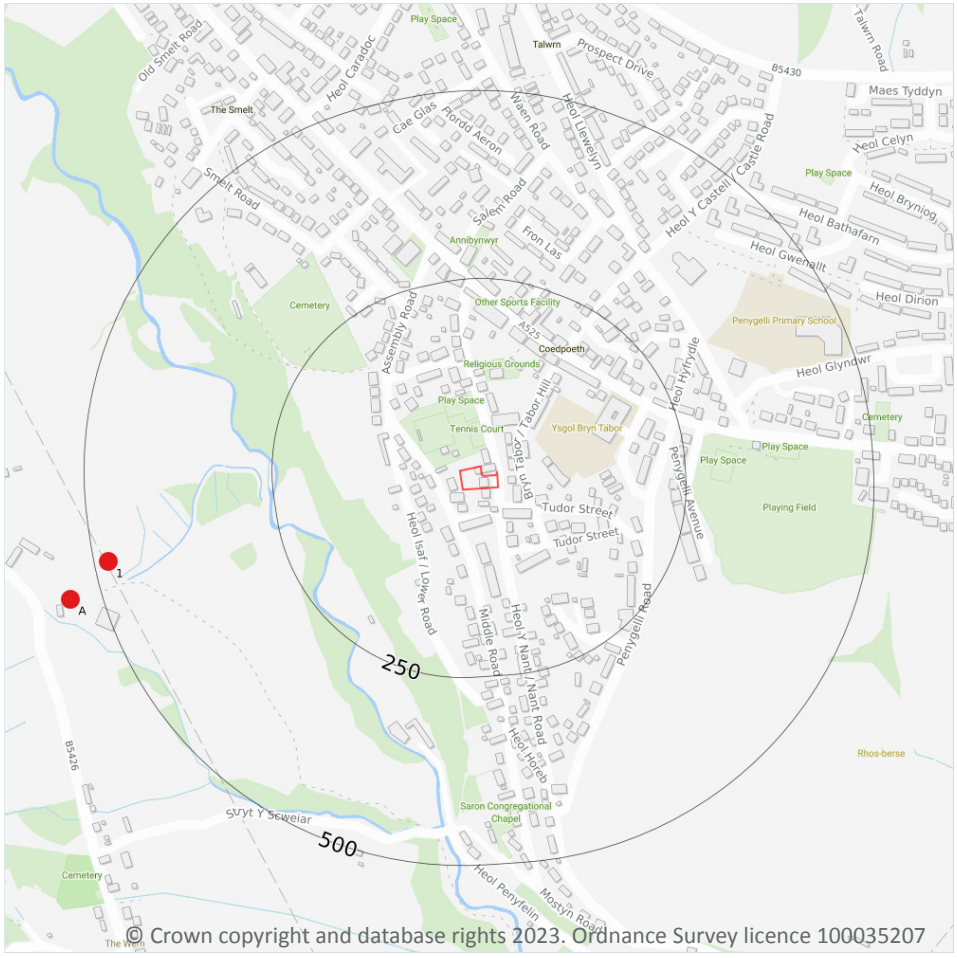
18.16 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

19 Ground cavities and sinkholes



© Crown copyright and database rights 2023. Ordnance Survey licence 100035207

Site Outline

Search buffers in metres (m)

- Natural cavities (Area)
- Natural cavities (Point)
- Mining cavities
- Reported recent incidents
- Historical incidents
- BGS karst database (Point)
- BGS karst database (Line)
- BGS karst database (Area)

19.1 Natural cavities

Records within 500m	0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Stantec UK Ltd.

19.2 Mining cavities

Records within 1000m	8

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

Features are displayed on the Ground cavities and sinkholes map on **page 107 >**

ID	Location	Mine Address	Mineral	Data source	Publisher
1	481m W	Minera Burton's Shaft, Minera, Wrexham	-	Clwyd and Powys Metal Mines Survey	-
A	541m W	Burton's Shaft, Minera New, Clwyd	-	THE NON FERROUS MINES OF FLINTSHIRE	NORTHERN CAVERN AND MINE RESEARCH SOC.
A	541m W	Minera New, Minera, Wrexham	-	Clwyd and Powys Metal Mines Survey	-
-	749m S	Nant Minera, Clwyd	-	THE NON FERROUS MINES OF FLINTSHIRE	NORTHERN CAVERN AND MINE RESEARCH SOC.
-	749m S	Minera Nant, Minera, Wrexham	Lead	Clwyd and Powys Metal Mines Survey	-
-	821m W	Meadow Shaft, Clwyd	-	THE NON FERROUS MINES OF FLINTSHIRE	NORTHERN CAVERN AND MINE RESEARCH SOC.
-	828m W	Minera Meadows Shaft, Minera, Wrexham	-	Clwyd and Powys Metal Mines Survey	-
-	934m SW	The Wern Area, Clwyd	-	COMPUTERISED DATABASE OF BATSITES IN GREAT BRITAIN	NATURE CONSERVANCY COUNCIL(UNPUBLISHED)

This data is sourced from Stantec UK Ltd.

19.3 Reported recent incidents

Records within 500m	0

This data identifies sinkhole information gathered from media reports and Groundsure's own records. This data goes back to 2014 and includes relative accuracy ratings for each event and links to the original data sources. The data is updated on a regular basis and should not be considered a comprehensive catalogue of all sinkhole events. The absence of data in this database does not mean a sinkhole definitely has not occurred during this time.

This data is sourced from Groundsure.

19.4 Historical incidents

Records within 500m	0

This dataset comprises an extract of 1:10,560, 1:10,000, 1:2,500 and 1:1,250 scale historical Ordnance Survey maps held by Groundsure, dating back to the 1840s. It shows shakeholes, deneholes and other 'holes' as noted on these maps. Dene holes are medieval chalk extraction pits, usually comprising a narrow shaft with a number of chambers at the base of the shaft. Shakeholes are an alternative name for suffusion sinkholes, most commonly found in the limestone landscapes of North Yorkshire but also extensively noted around the Brecon Beacons National Park.

Not all 'holes' noted on Ordnance Survey mapping will necessarily be present within this dataset.

This data is sourced from Groundsure.

19.5 National karst database

Records within 500m	0

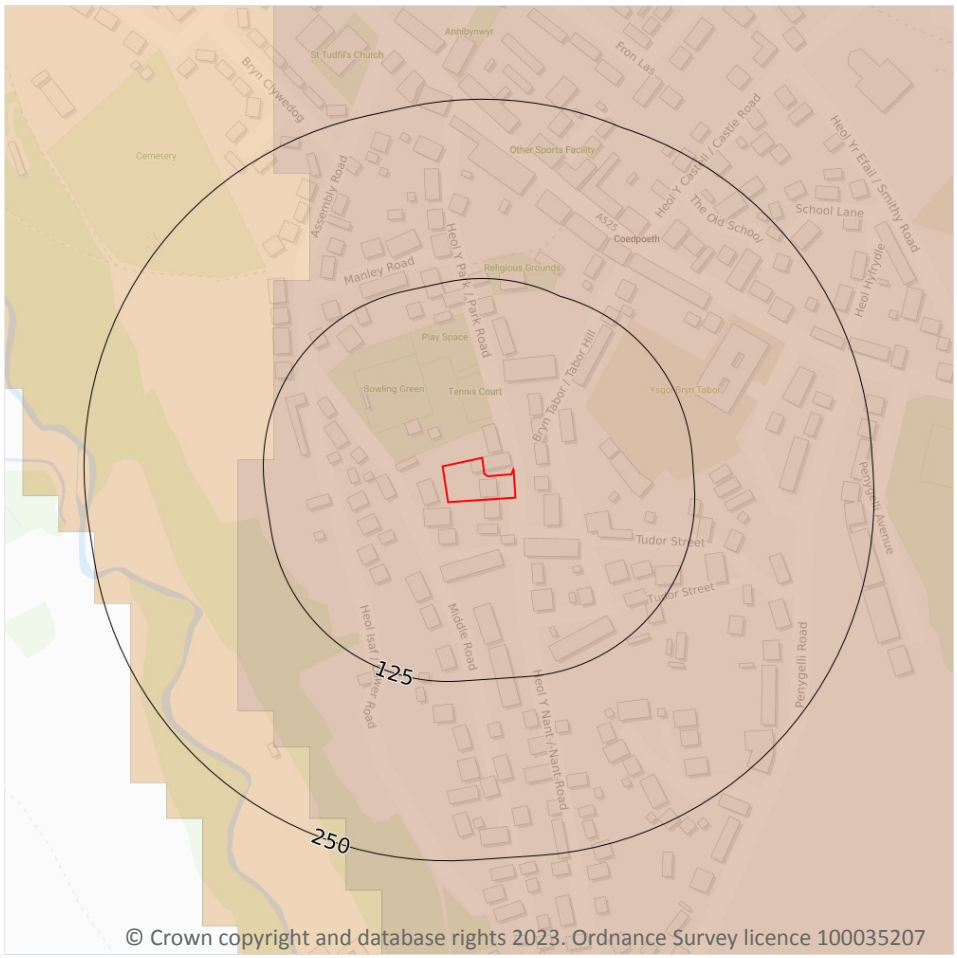
This is a comprehensive database of national karst information gathered from a wide range of sources. BGS have collected data on five main types of karst feature: Sinkholes, stream links, caves, springs, and incidences of associated damage to buildings, roads, bridges and other engineered works.

Since the database was set up in 2002 data covering most of the evaporite karst areas of the UK have now been added, along with data covering about 60% of the Chalk, and 35% of the Carboniferous Limestone outcrops. Many of the classic upland karst areas have yet to be included. Recorded so far are: Over 800 caves, 1300 stream sinks, 5600 springs, 10,000 sinkholes.

The database is not yet complete, and not all records have been verified. The absence of data does not mean that karst features are not present at a site. A reliability rating is included with each record.

This data is sourced from the British Geological Survey.

20 Radon



Site Outline

Search buffers in metres (m)

- Greater than 30%
- Between 10% and 30%
- Between 5% and 10%
- Between 3% and 5%
- Between 1% and 3%
- Less than 1%

20.1 Radon

Records on site	1

The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

Features are displayed on the Radon map on **page 110 >**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Between 10% and 30%**	**Full**

This data is sourced from the British Geological Survey and UK Health Security Agency.

21 Soil chemistry

21.1 BGS Estimated Background Soil Chemistry

Records within 50m	2

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km^2. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km^2; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**15 mg/kg**	**No data**	**>1200 mg/kg**	**>720 mg/kg**	**>6.0 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**
24m N	15 mg/kg	No data	>1200 mg/kg	>720 mg/kg	>6.0 mg/kg	60 - 90 mg/kg	15 mg/kg

This data is sourced from the British Geological Survey.

21.2 BGS Estimated Urban Soil Chemistry

Records within 50m	0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

This data is sourced from the British Geological Survey.

21.3 BGS Measured Urban Soil Chemistry

Records within 50m	0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

This data is sourced from the British Geological Survey.

22 Railway infrastructure and projects

22.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

22.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

22.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

22.4 Historical railway and tunnel features

Records within 250m	0

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

This data is sourced from Ordnance Survey/Groundsure.

22.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

22.6 Historical railways

Records within 250m	0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

22.7 Railways

Records within 250m	0

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

22.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

22.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

22.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

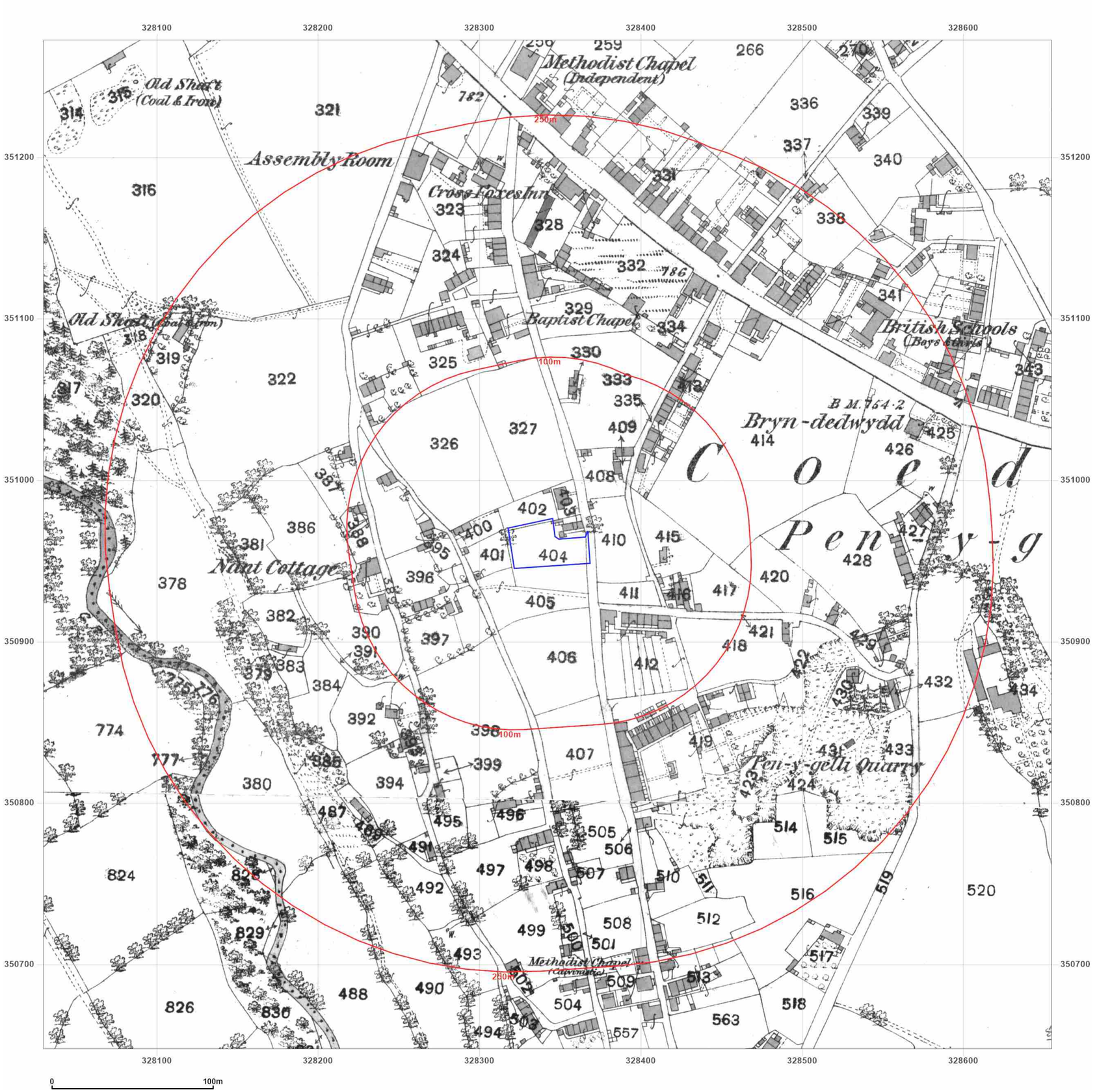
This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference ↗.

Terms and conditions

Groundsure's Terms and Conditions can be accessed at this link: www.groundsure.com/terms-and-conditions-april-2023/ ↗.



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD, COEDPOETH, WREXHAM, LL11 3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: County Series
Map date: **1874**
Scale: 1:2,500
Printed at: 1:2,500

N
W E
S

Surveyed 1874
Revised 1874
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1874
Revised 1874
Edition N/A
Copyright N/A
Levelled N/A

Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: County Series

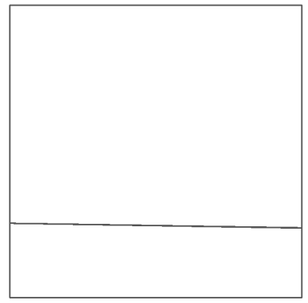
Map date: **1899**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1899
Revised 1899
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1899
Revised 1899
Edition N/A
Copyright N/A
Levelled N/A

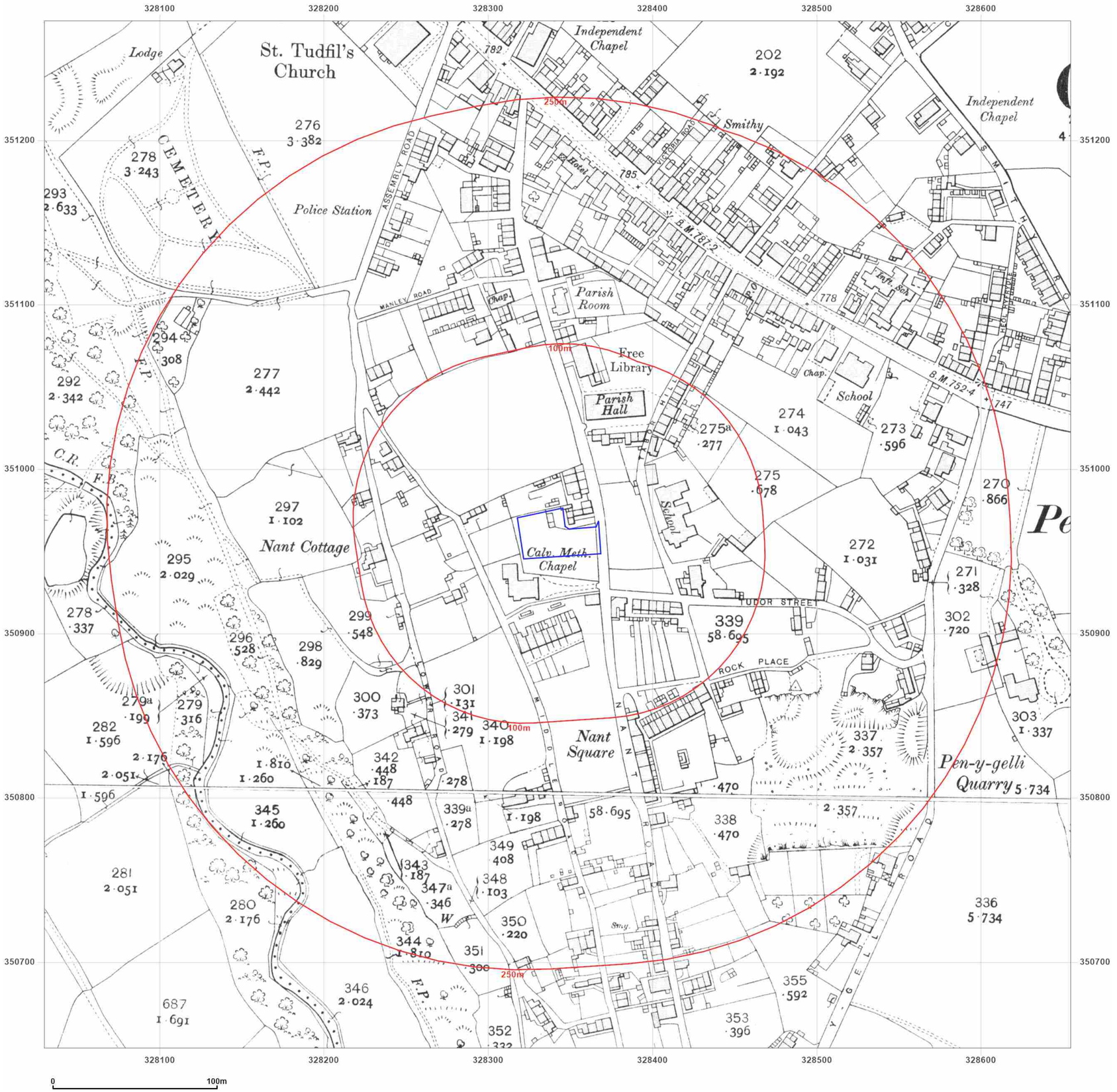
Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: County Series

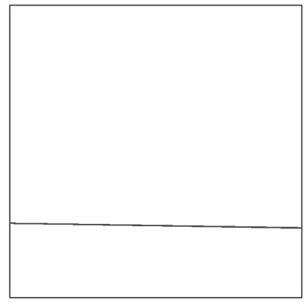
Map date: **1912**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1912
Revised 1912
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1912
Revised 1912
Edition N/A
Copyright N/A
Levelled N/A

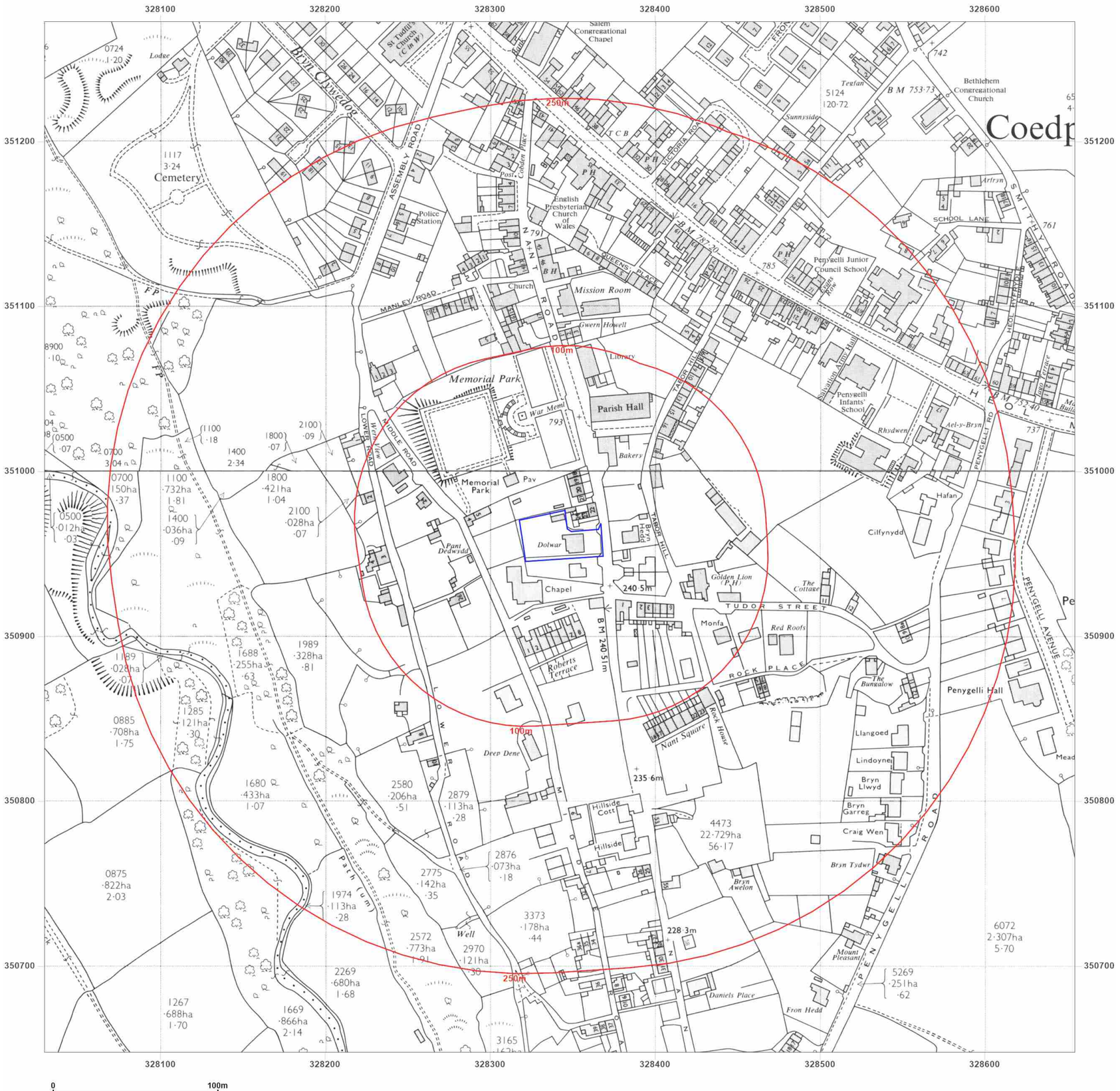
Powered by

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

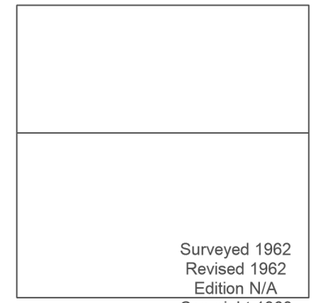
Map date: **1962**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1962
Revised 1962
Edition N/A
Copyright 1964
Levelled 1959



Surveyed 1962
Revised 1962
Edition N/A
Copyright 1963
Levelled 1959

Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid
Map date: **1962-1967**
Scale: 1:2,500
Printed at: 1:2,500

N
W E
S

Surveyed 1967
Revised 1967
Edition N/A
Copyright 1968
Levelled 1959

Surveyed 1962
Revised 1962
Edition N/A
Copyright 1963
Levelled 1959

Powered by

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

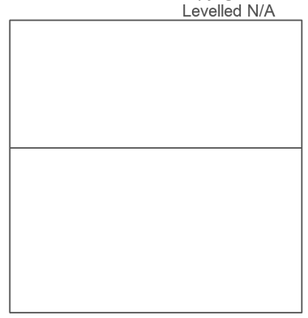
Map date: **1968**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

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



Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

Map date: **1973-1976**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

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

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

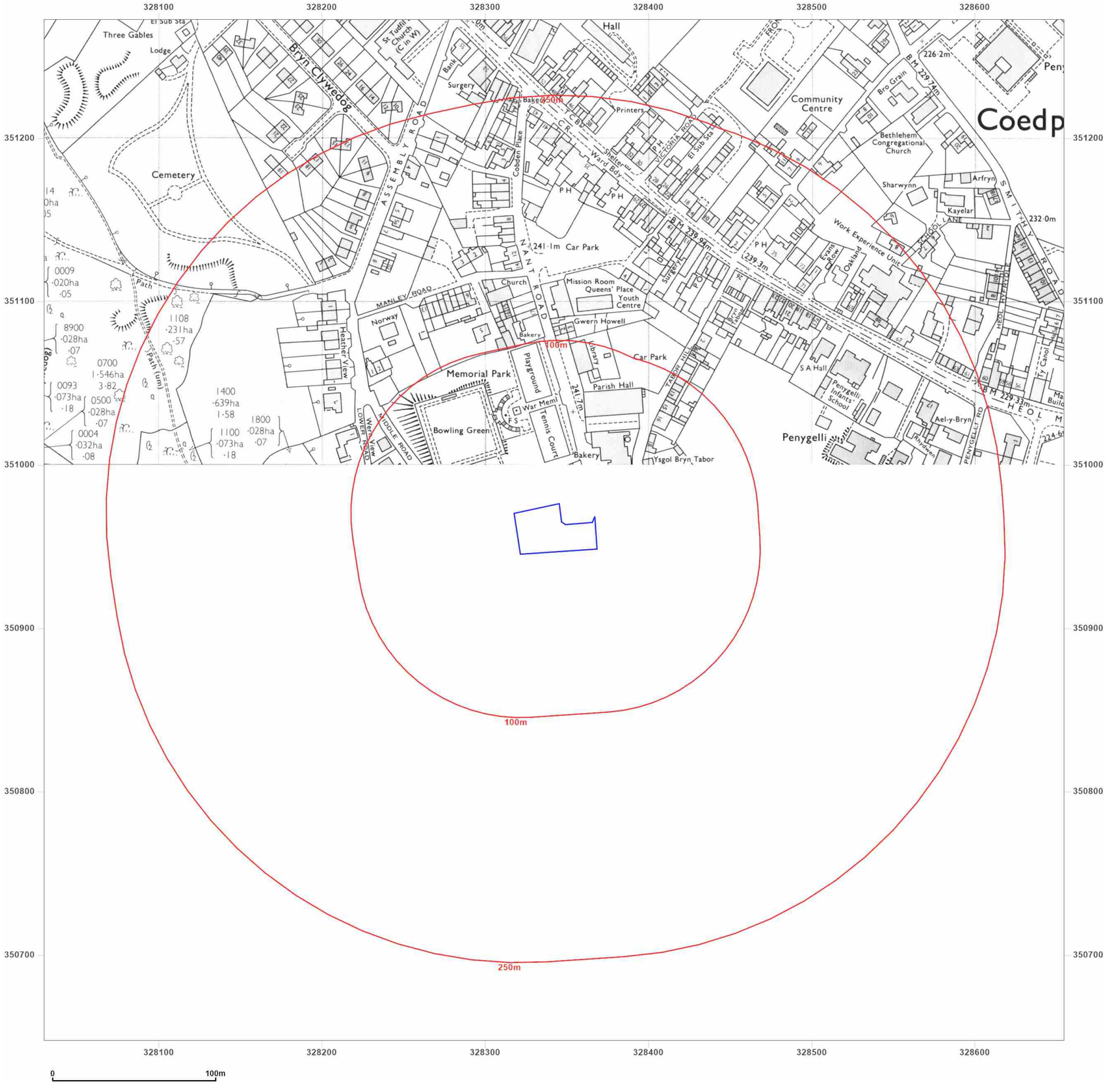
Powered by

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

Map date: **1978**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

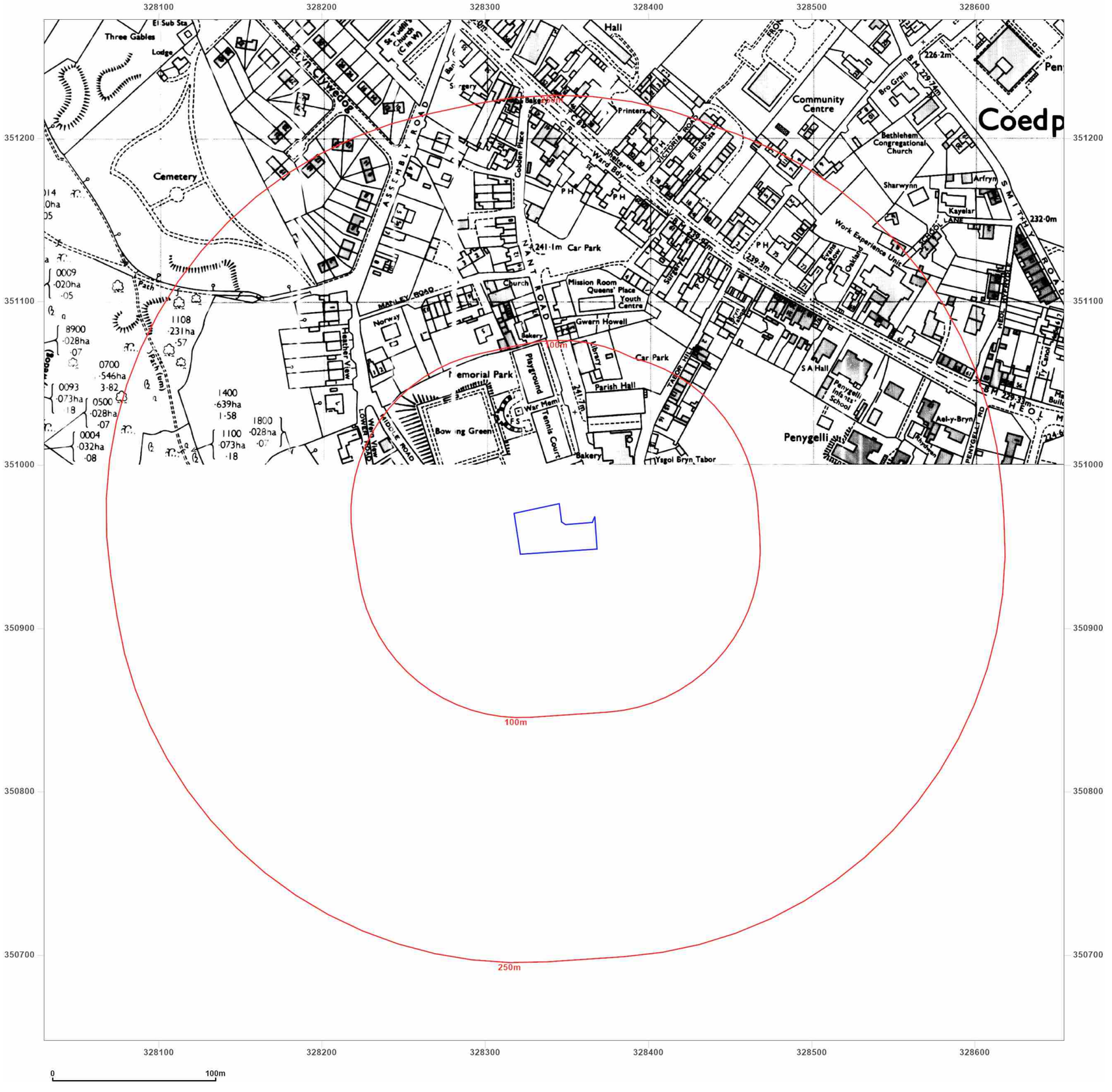
Surveyed 1978
Revised 1978
Edition N/A
Copyright 1979
Levelled 1959

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid
Map date: 1979
Scale: 1:2,500
Printed at: 1:2,500

N W E S

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

Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

Map date: **1984**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

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

Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

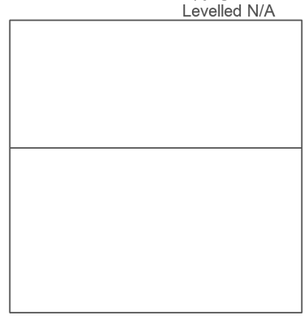
Map date: **1987**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1987
Revised 1987
Edition N/A
Copyright 1987
Levelled N/A



Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

Map date: **1983-1988**

Scale: 1:2,500

Printed at: 1:2,500

N W E S

Surveyed 1983
Revised 1983
Edition N/A
Copyright 1984
Levelled 1959

Surveyed 1959
Revised 1988
Edition N/A
Copyright 1988
Levelled 1959

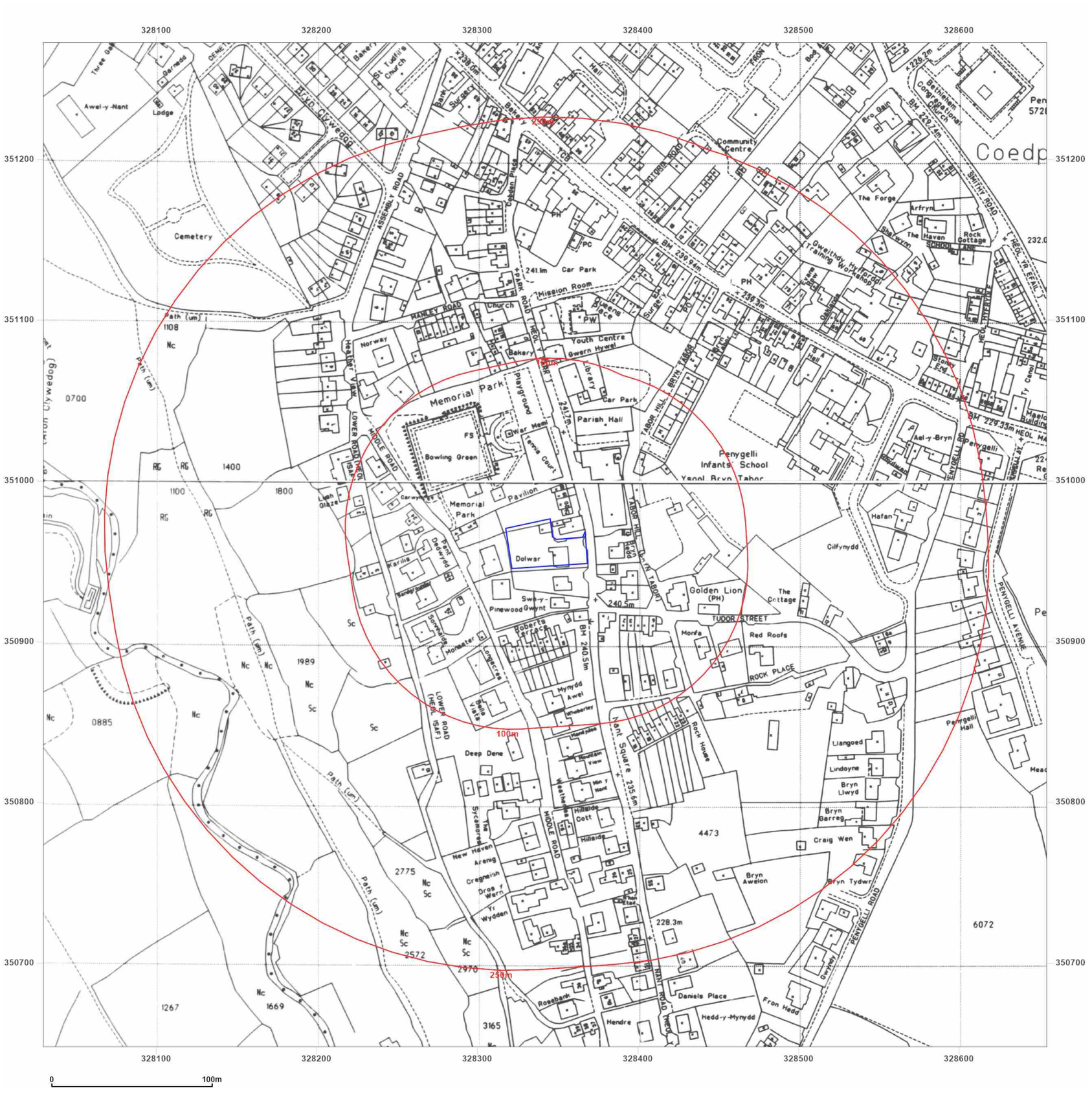
Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

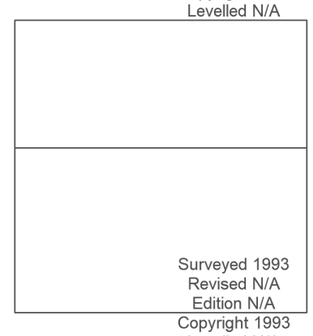
Map date: **1993**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

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



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

Powered by

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

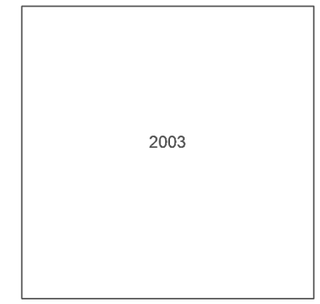
Site Details:

DOLWAR, PARK ROAD, COEDPOETH, WREXHAM, LL11 3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

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

N
W E
S



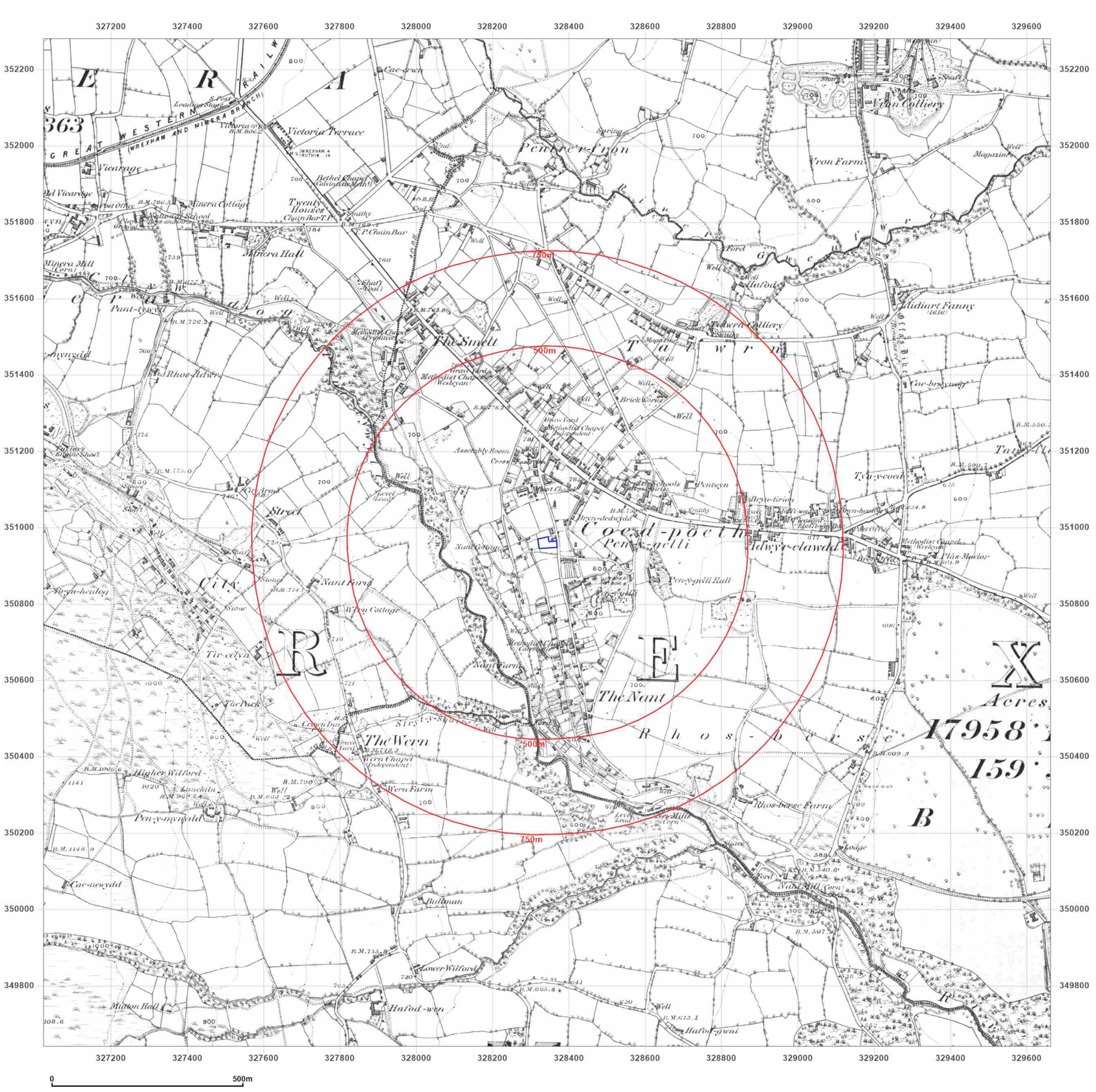
Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

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

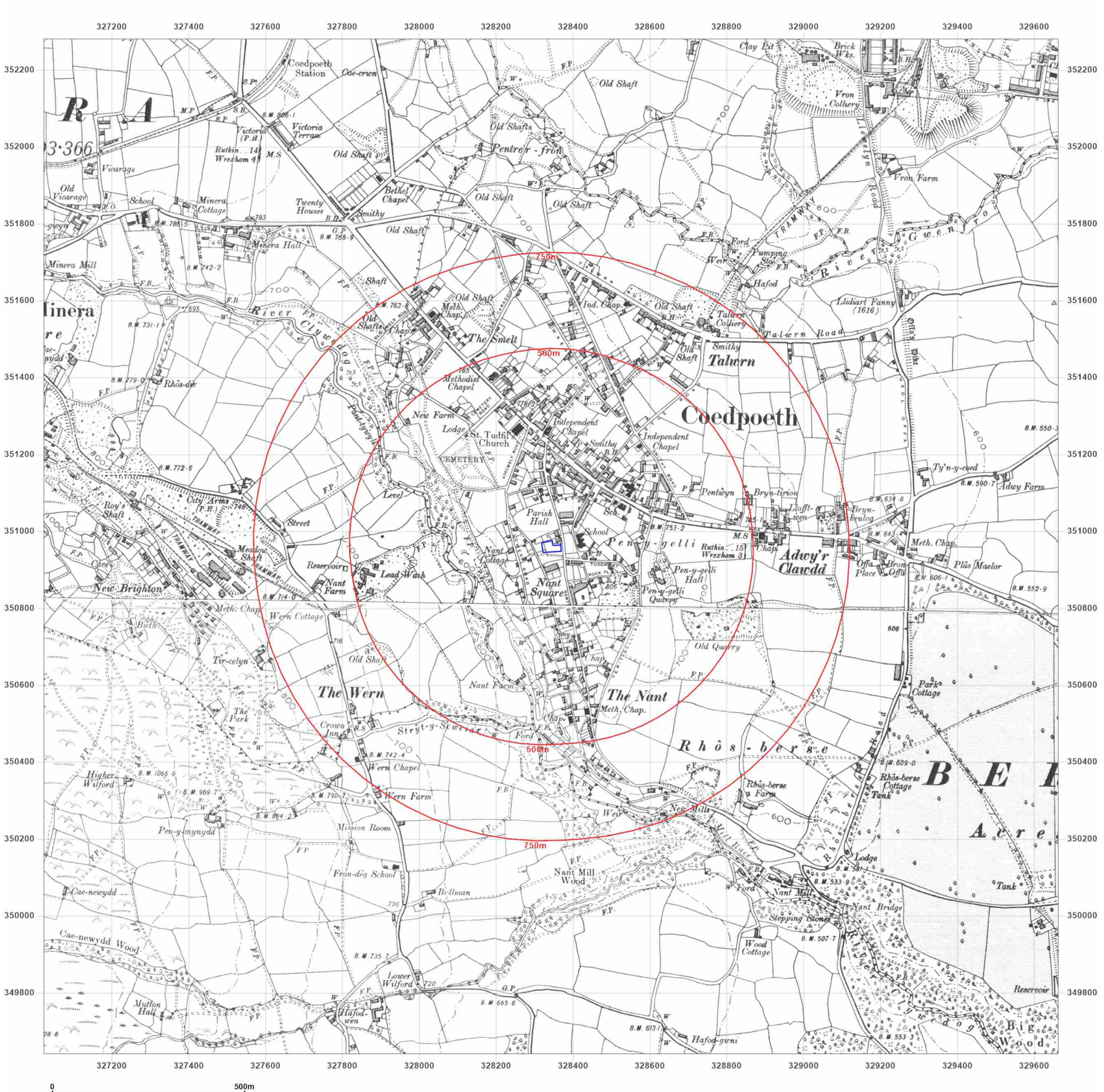
Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: County Series

Map date: **1898-1900**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1870
Revised 1900
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1873
Revised 1898
Edition N/A
Copyright N/A
Levelled N/A

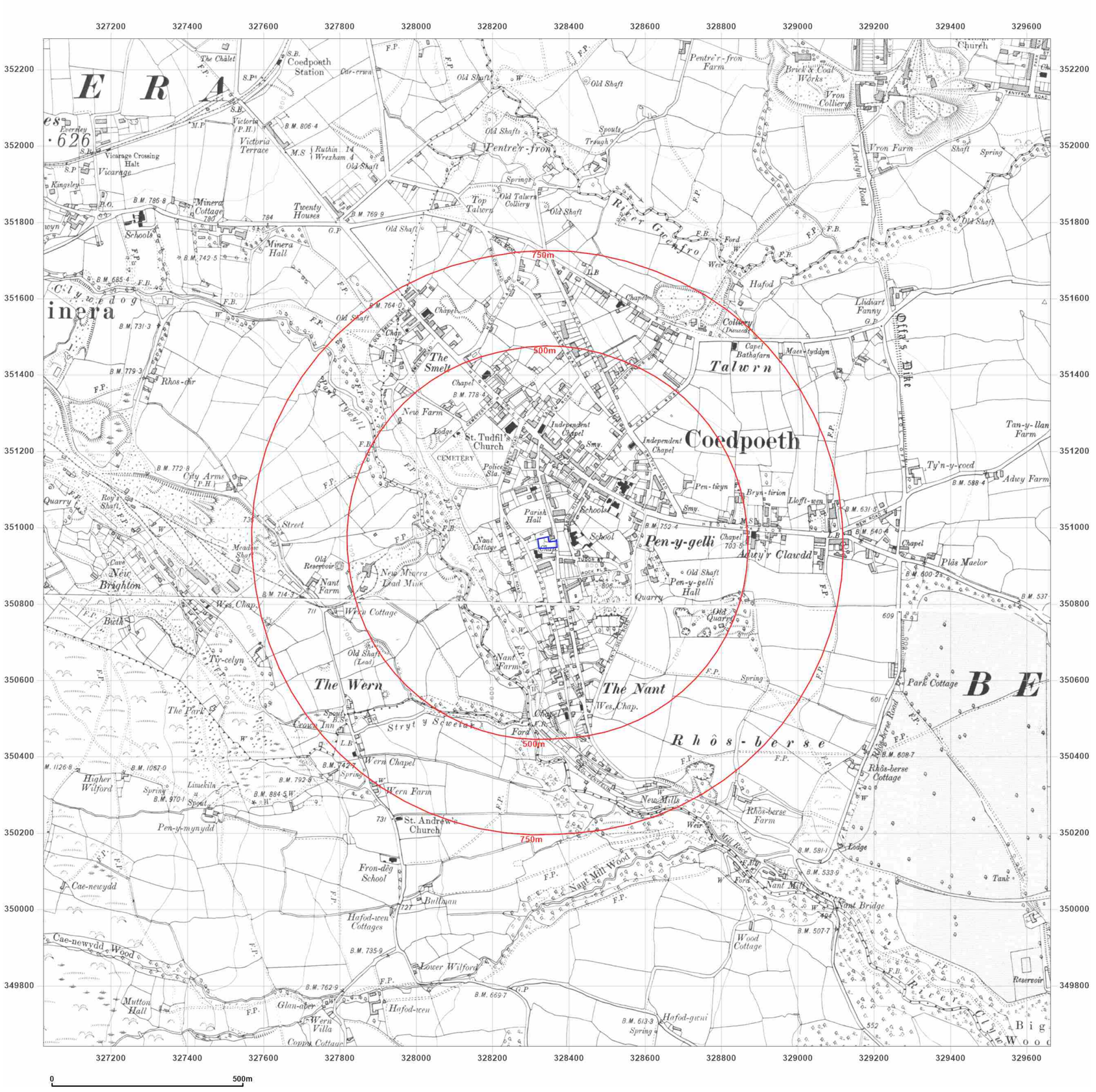
Powered by

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: County Series

Map date: **1910**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1871
Revised 1910
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1872
Revised 1910
Edition N/A
Copyright N/A
Levelled N/A

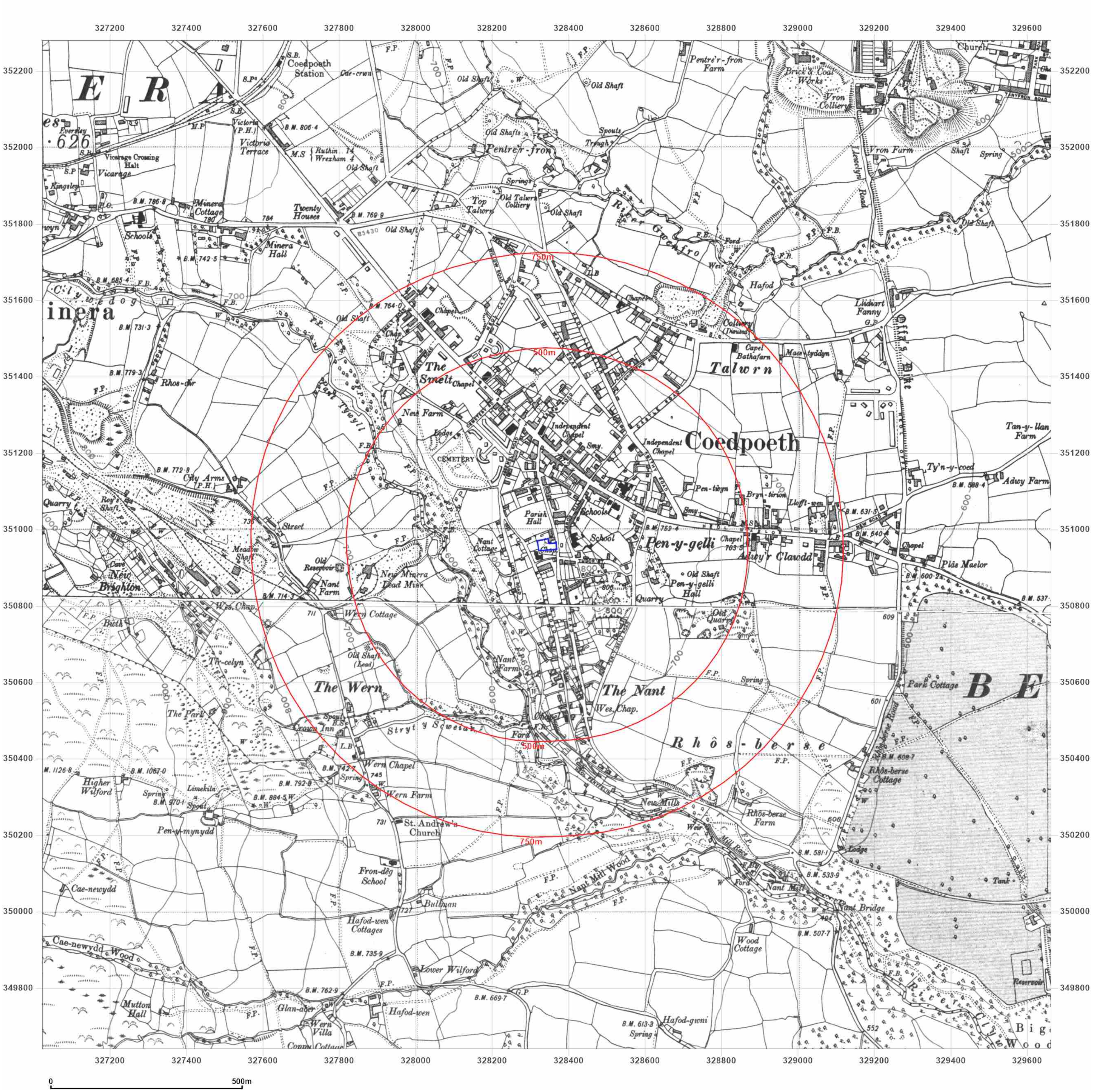
Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1871
Revised 1938
Edition 1938
Copyright N/A
Levelled N/A

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

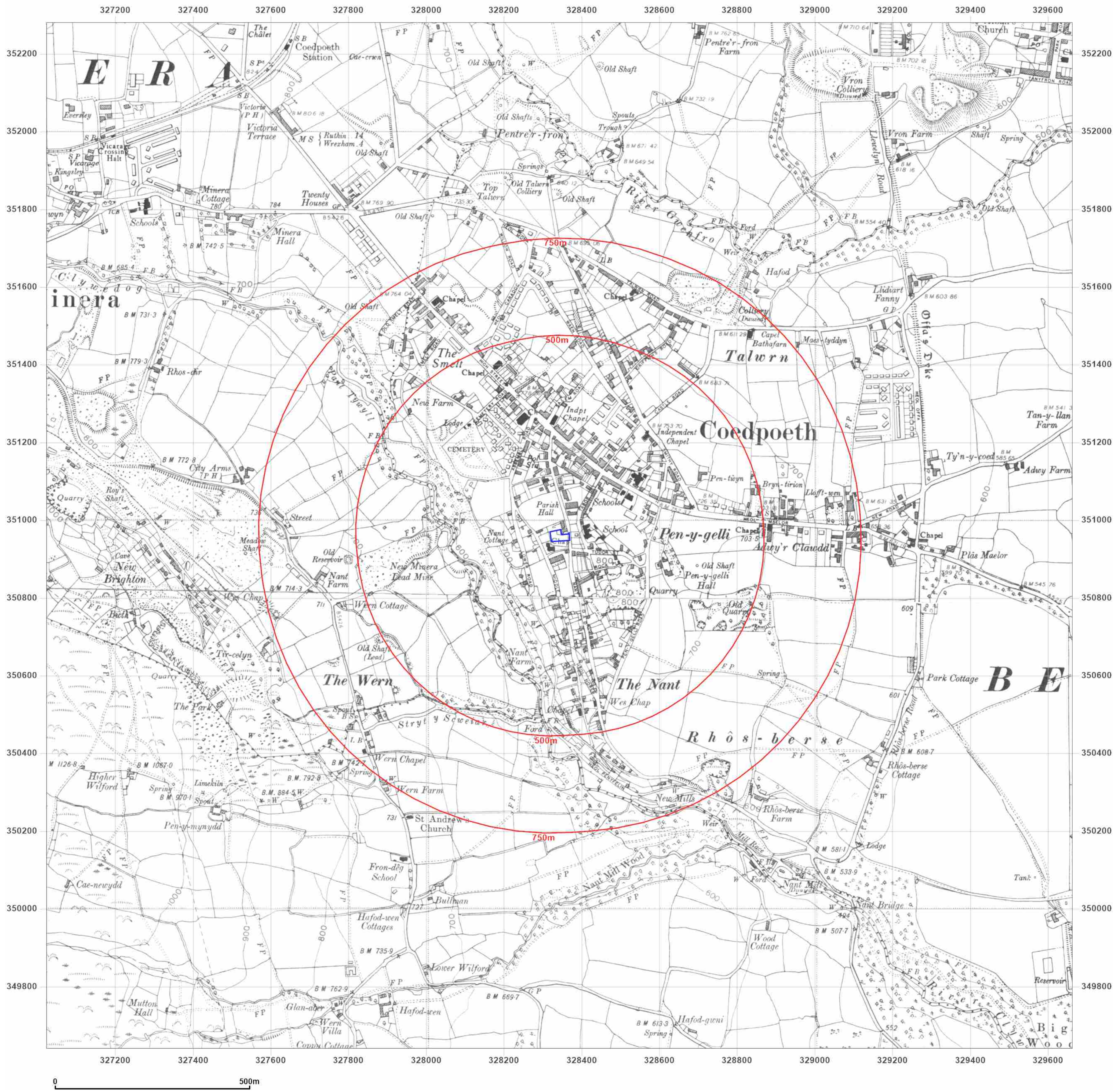
Powered by

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Site Details:

DOLWAR, PARK ROAD, COEDPOETH, WREXHAM, LL11 3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: County Series

Map date: 1949

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1871
Revised 1949
Edition N/A
Copyright N/A
Levelled N/A

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

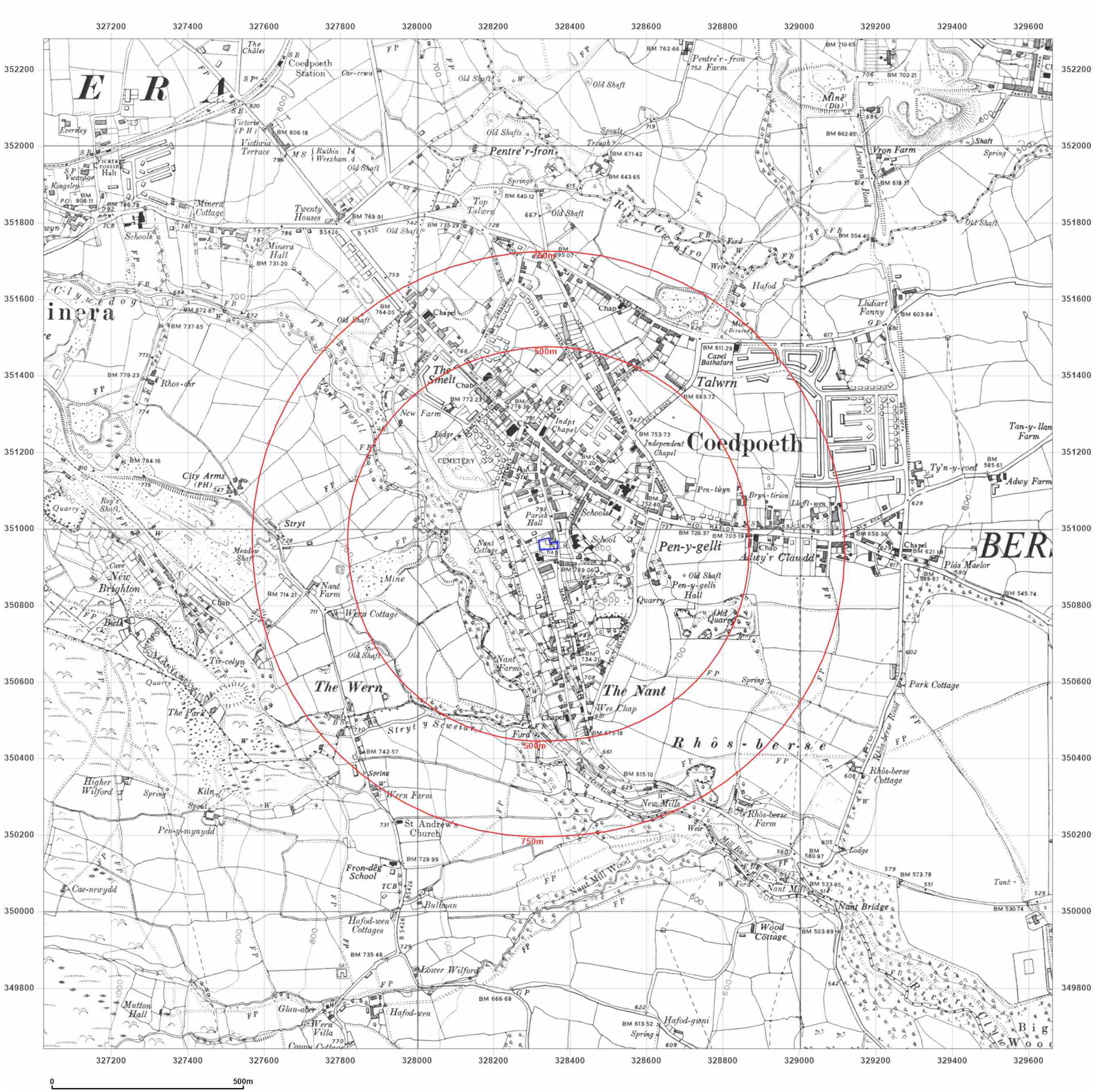
Powered by

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: Provisional

Map date: **1960**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1960
Revised 1960
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1960
Revised 1960
Edition N/A
Copyright N/A
Levelled N/A

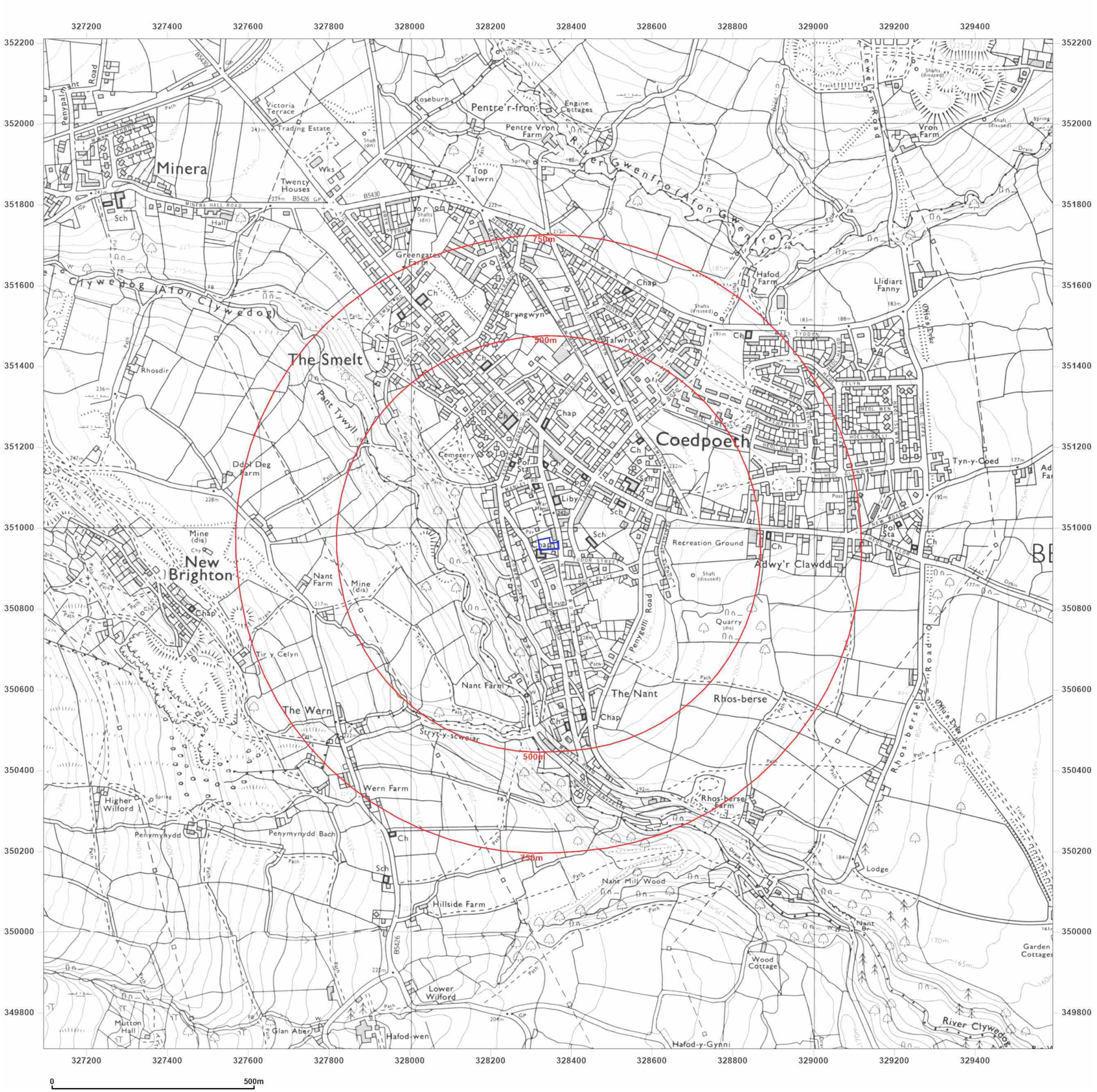
Powered by

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

Map date: **1976**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1970
Revised 1976
Edition N/A
Copyright 1976
Levelled 1973

Surveyed 1973
Revised 1975
Edition N/A
Copyright 1976
Levelled 1973

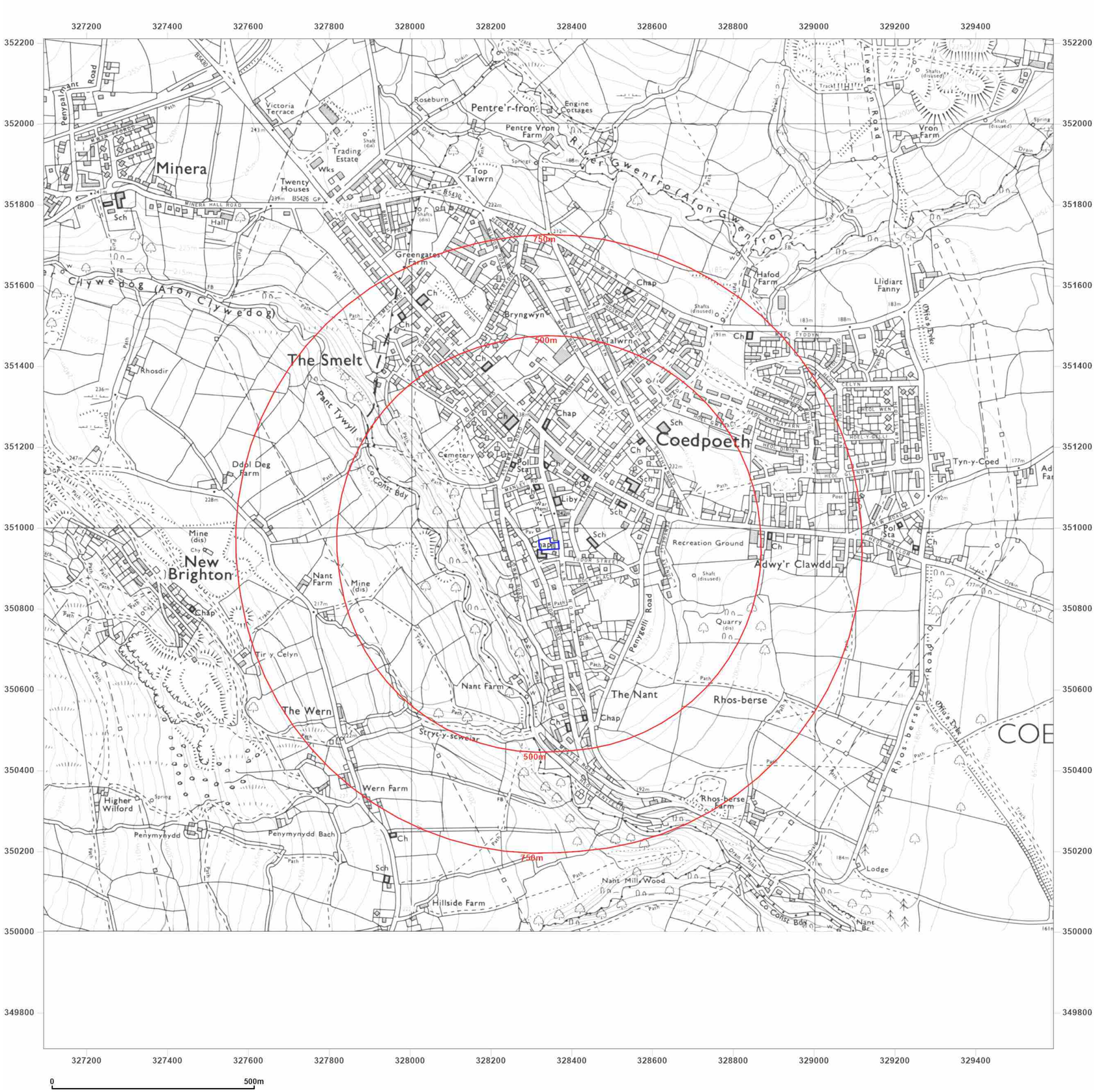
Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

Map date: **1985**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1970
Revised 1985
Edition N/A
Copyright N/A
Levelled N/A

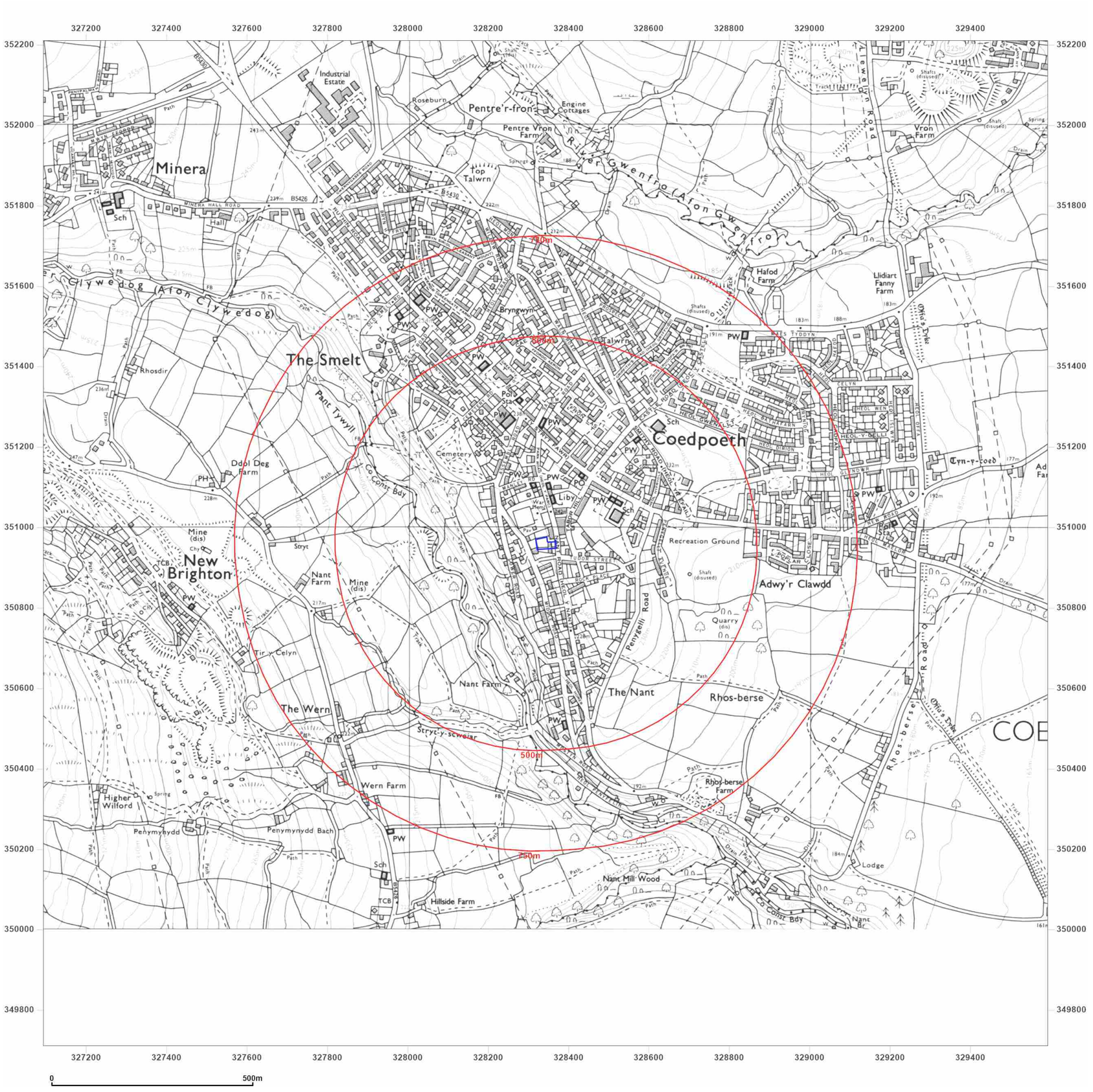
Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid

Map date: **1989**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1983
Revised 1989
Edition N/A
Copyright N/A
Levelled N/A

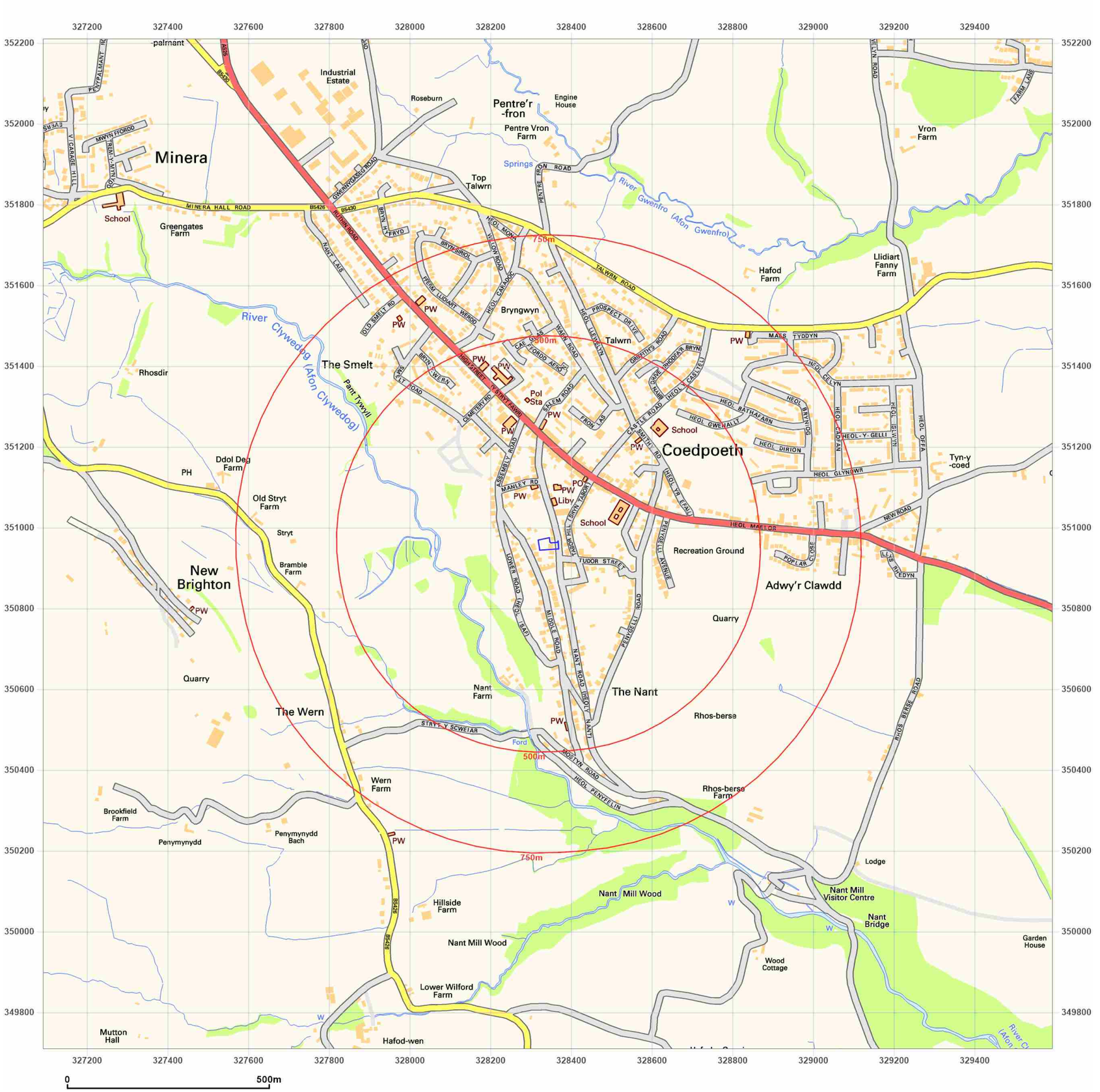
Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

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

N
W E
S

2001

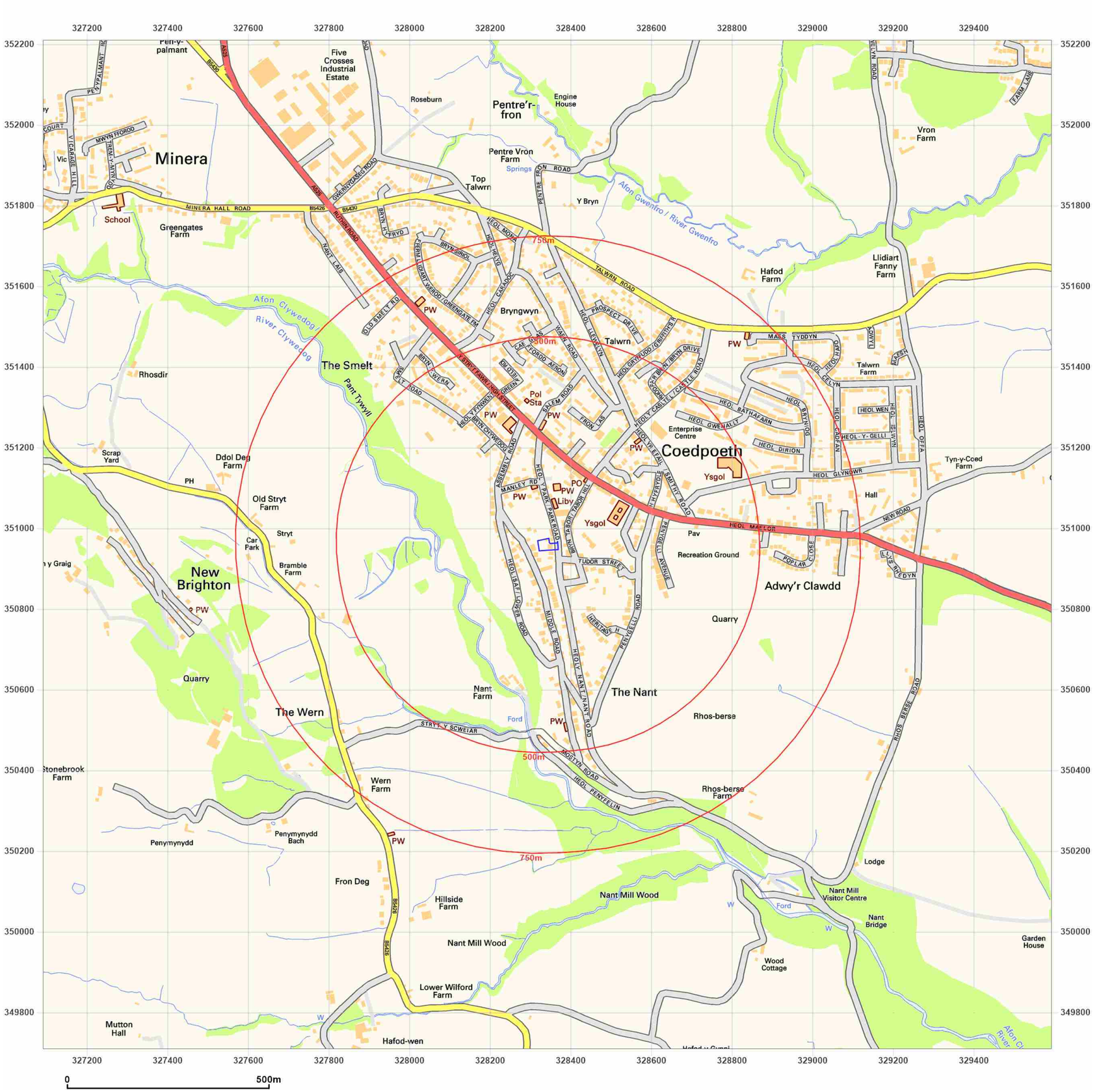
Powered by

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

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

N
W E
S

2010

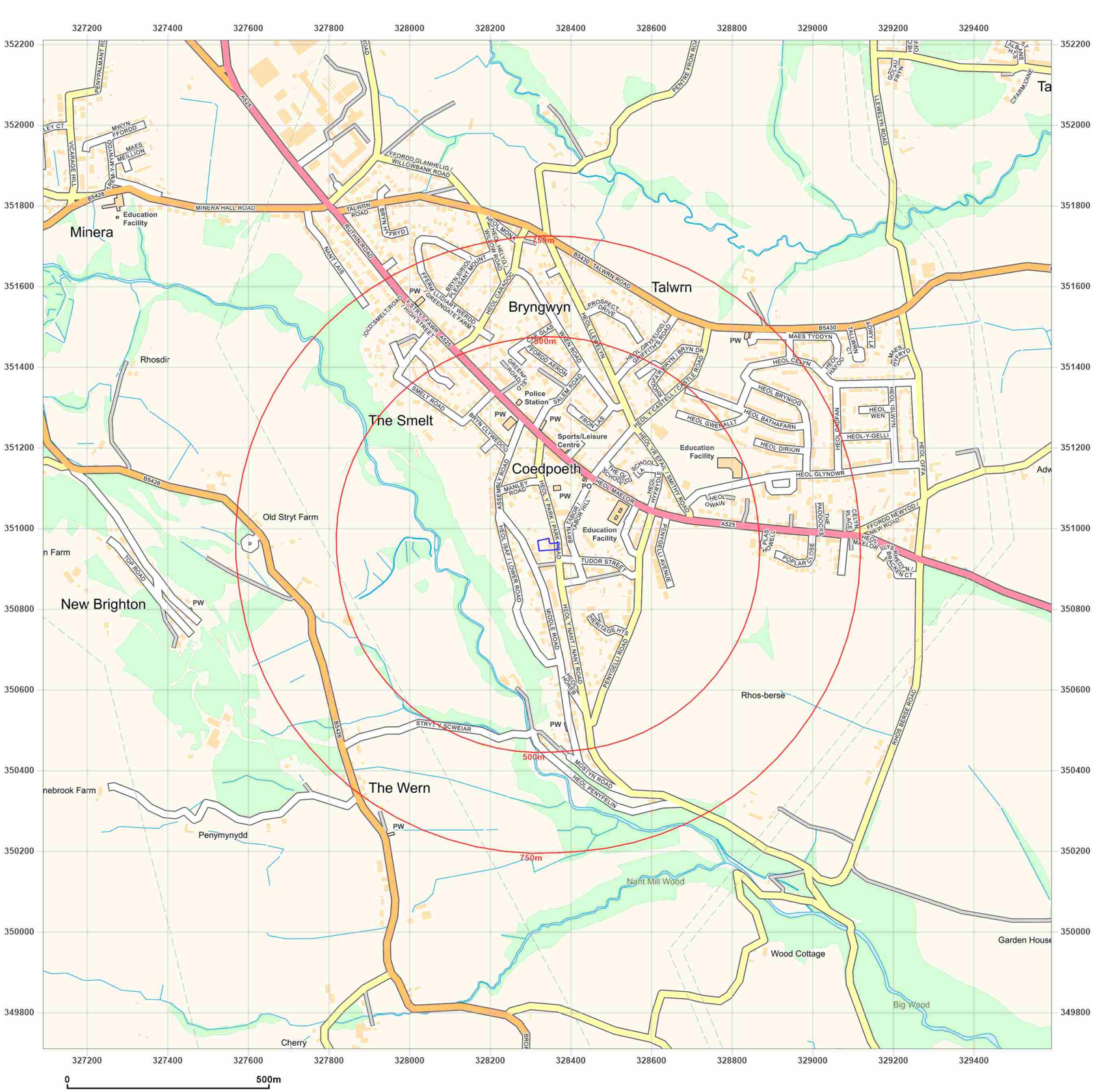
Powered by

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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



Groundsure INSIGHTS

Site Details:

DOLWAR, PARK ROAD,
COEDPOETH, WREXHAM, LL11
3TD

Client Ref: GSL3035_PO001583
Report Ref: GS-GVO-F76-UN9-LU5
Grid Ref: 328342, 350960

Map Name: National Grid
Map date: **2023**
Scale: 1:10,000
Printed at: 1:10,000

N
W E
S

2023

Powered by OS

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

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 08 December 2023

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

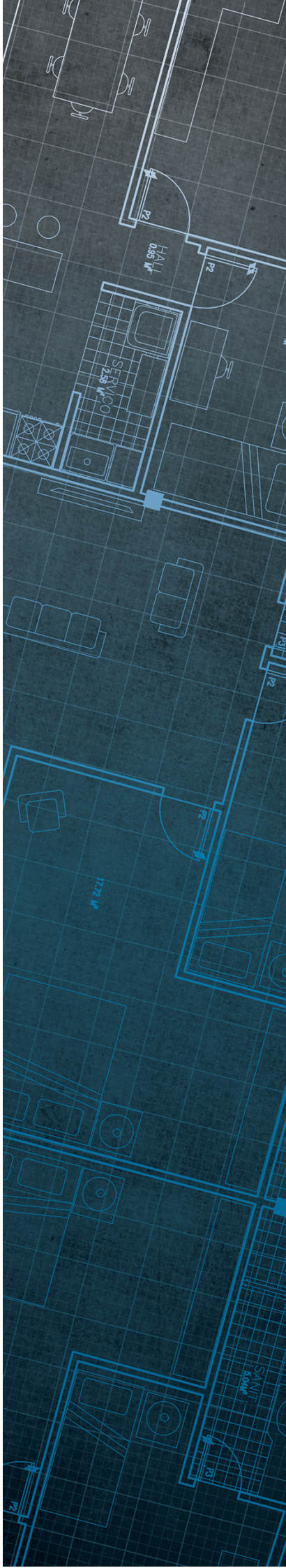
The Coal Authority

Consultants

Coal Mining Report

Dolwar, Park Road, Coedpoeth,
Wrexham, Ll11 3td
Denbighshire

Date of enquiry:	**8 December 2023**
Date enquiry received:	**8 December 2023**
Issue date:	**8 December 2023**
Our reference:	**51003394155001**
Your reference:	**GS-OP2-SYX-LEN-6TL**



Consultants

Coal Mining Report

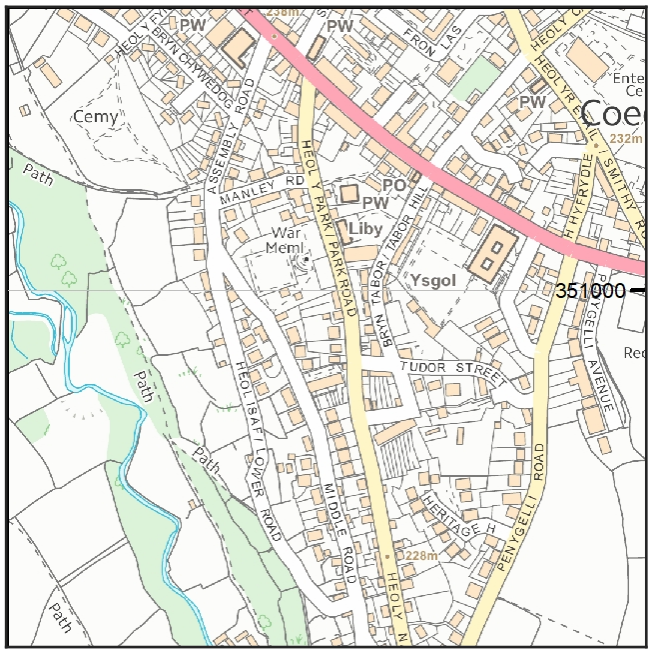
This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

GROUNDSURE LIMITED

Enquiry address

Dolwar, Park Road, Coedpoeth, Wrexham, Ll11 3td
Denbighshire



Approximate position of property

Map data

Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right 2018. All rights reserved.

Ordnance Survey Licence number: 100020315

How to contact us

0345 762 6848 (UK)
+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
The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

7089	16713	14886
PO0	9972	4607
0		

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

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.

Copyright © 2023 The Coal Authority

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.

Copyright © 2023 The Coal Authority

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.

Copyright © 2023 The Coal Authority

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.

Copyright © 2023 The Coal Authority

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.

Copyright © 2023 The Coal Authority

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.

Copyright © 2023 The Coal Authority

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.

Copyright © 2023 The Coal Authority

The Coal Authority

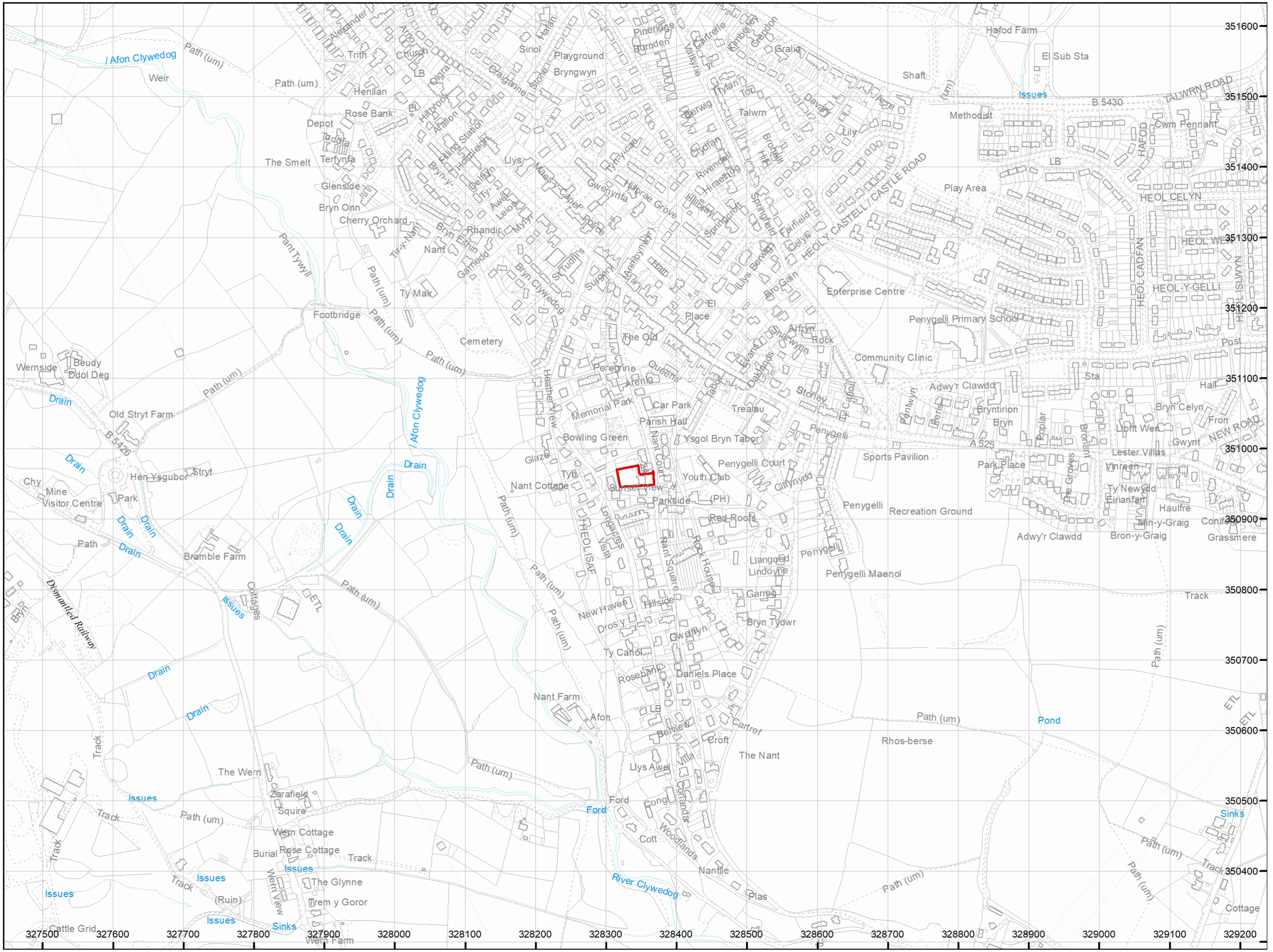
Summary of findings

Reproduced by permission of Ordnance Survey on behalf of HMSO.
© Crown copyright and database right 2018. All rights reserved.
Ordnance Survey Licence number: 100020315

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



How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)
www.groundstability.com

APPENDIX B: TERMS OF THE PRA

Environmental Risk Assessment Methodology & Terminology

LEGISLATION OVERVIEW

This report includes hazard identification and environmental risk assessment in line with the risk-based methods referred to in relevant UK legislation and guidance. Government environmental policy is based upon a "suitable for use approach," which is relevant to both the current use of land and also to any proposed future use. The contaminated land regime is the statutory regime for remediation of contaminated land that causes an unacceptable level of risk and is set out in Part 2A of the Environmental Protection Act 1990 ("EPA 1990"). The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:

a) Significant harm is being caused or there is a significant possibility of such harm being caused;

or

b) Pollution of controlled waters is being, or is likely to be, caused."

In order to assist in establishing if there is a "significant possibility of significant harm" there must be a "contaminant linkage" for potential harm to exist. That means there must be a source(s) of contamination, sensitive receptors present and a connection or pathway between the two. This combination of contaminant-pathway-receptor is termed a "contaminant linkage or CPR linkage."

Part IIA of The Environmental Protection Act 1990 is supported by a substantial quantity of guidance and other Regulations. Key implementing legislation of the Part 2A regime includes the Contaminated Land (England) Regulations 2006 (SI 2006/1380) as amended by the overarching legislation for the contaminated land regime, which implements the provisions of Part IIA of the Environmental Protection Act 1990 (as inserted by section 57 of the Environment Act 1995), came into force on 14th July 2000 together with recent amended regulations: Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263). Revised Contaminated Land Statutory Guidance was published by DEFRA in April 2012. Part IIA defines the duties of Local Authorities in dealing with it. Part IIA places contaminated land responsibility as a part of planning and redevelopment process rather than Local Authority direct action except in situations of very high pollution risk.

In the planning process guidance is provided by National Planning Policy Framework (NPPF) of July 2018 which requires that a site which has been developed shall not be capable of being determined "contaminated land" under Part IIA. In practice, Planning Authorities require sites being developed to have a lower level of risk post development than the higher level of risk that is required in order to determine a site as being contaminated in accordance with Part IIA. This is to ensure that there is a suitable zone of safety below the level for Part IIA determination and prevent

recently developed sites becoming reclassified as contaminated land if there are future legislative or technical changes (e.g., a substance is subsequently found to be more toxic than previously assessed this increases its hazard).

The criteria for assessing concentrations of contaminants and hence determining whether a site represents a hazard are based on a range of techniques, models and guidance. Within this context it is relevant to note that Government objectives are:

a) to identify and remove unacceptable risks to human health and the environment;

b) to seek to bring damaged land back into beneficial use;

c) to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable.

These three objectives underlie the "suitable for use" approach to risk management and remediation of contaminated land. The "suitable for use" approach focuses on the risks caused by land contamination. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Risks therefore should be assessed on a site-by-site basis.

The "suitable for use" approach then consists of three elements:

a) ensuring that land is suitable for its current use - in other words, identifying any land where contamination is causing unacceptable risks to human health and the environment, assessed on the basis of the current use and circumstances of the land, and returning such land to a condition where such risks no longer arise ("remediating" the land); the contaminated land regime provides the regulatory mechanisms to achieve this;

b) ensuring that land is made suitable for any new use, as planning permission is given for that new use - in other words, assessing the potential risks from contamination, on the basis of the proposed future use and circumstances, before official permission is given for the development and, where necessary to avoid unacceptable risks to human health and the environment, remediating the land before the new use commences; this is the role of the town and country planning and building control regimes; and

c) limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought - in other words, recognising that the risks from contaminated land can be satisfactory assessed only in the context of specific uses of the land (whether current or proposed), and that any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby running the risk of distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources).

The mere presence of contaminants does not therefore necessarily warrant action, and consideration must be given to the scale of risk involved for the use that the site has and will have in the future.

OVERALL METHODOLOGY

The work presented in this report has been carried out in general accordance with recognised best practice as detailed in guidance documents such as in the EA online guidance: Land Contamination: Risk Management (LCRM) (Environment Agency, 2020), and BS10175:2011+A2 2017. Important aspects of the risk assessment process are transparency and justification. The particular rationale behind the risk assessments presented is given in this appendix.

The first stage of a two-staged investigation and assessment of a site is the Preliminary Investigation (BS 10175:2011), often referred to as the Phase 1 Study, comprising desk study and walk-over survey, which culminates in the Preliminary Risk Assessment. A preliminary conceptual site model (CSM) is developed which identifies potential geotechnical and geo-environmental hazards and the qualitative degree of risk associated with them. From the geo-environmental perspective, the Hazard Identification process uses professional judgement to evaluate all the hazards in terms of potential contaminant linkages (of contaminant source-pathway-receptor). Potential contaminant linkages are potentially unacceptable risks in terms of the current contaminated land regime legal framework and require either remediation or further assessment. These are normally addressed via intrusive ground investigation and generic risk assessment.

The second stage is the Ground Investigation, Generic Risk Assessment and Geotechnical Interpretation. This represents the further assessment mentioned above. The scope of the Ground Investigation is based on the findings of the Preliminary Risk Assessment and is designed to reduce uncertainty in the geotechnical and geo-environmental hazard identification. The Ground Investigation comprises fieldwork, laboratory testing and usually also on-site monitoring. The Ground Investigation may include the Exploratory, Main and Supplementary Investigations described in BS 10175:2011+A2 2017. The results of the Ground Investigation reduces uncertainty in the geotechnical and geo-environmental risks. Depending on the findings more detailed investigations or assessments may be required.

PRELIMINARY RISK ASSESSMENT

Current practice recommends that the determination of potential liabilities that could arise from land contamination be carried out using the process of risk assessment, whereby "risk" is defined as:

> "(a) The probability, or frequency, or occurrence of a defined hazard; and
> (b) The magnitude (including the seriousness) of the consequences."

The UK's approach to the assessment of environmental risk is set out in by the Department of the Environment Transport and the Regions (2000) publication "A Guide to Risk Assessment and Risk Management for Environmental Protection" (also called Greenleaves II). This established an iterative, systematic staged process which comprises:

a) Hazard identification;
b) Hazard assessment;
c) Risk estimation;
d) Risk evaluation;
e) Risk assessment;

At each stage during the development process, the above steps are repeated as more detailed information becomes available for the site.

For an environmental risk to be present, all three of the following elements must be present:

- Source/Contaminant: hazardous substance that has the potential to cause adverse impacts;
- Receptor: target that may be affected by contamination: examples include human occupants/users of site, water resources (rivers or groundwater), or structures;
- Pathway: a viable route whereby a hazardous substance may come into contact with the receptor.

The absence of one or more of each component (contaminant, pathway, receptor) would prevent a contaminant linkage being established and there would be no significant environmental risk.

The identification of potential contaminant linkages is based on a Conceptual Model of the site, which is subject to continual refinement as additional data becomes available. As part of a Preliminary Risk Assessment (Desk Study and site walk over) a Preliminary Conceptual Site Model (PCSM) is formed. Based on the PCSM, potential contaminant linkages can be assessed. If the PCSM and hazard assessment indicate that a contaminant linkage is not of significance then no further assessment or action is required for this linkage. For each significant and potential linkage, a risk assessment is carried out. The linkages which potentially pose significant risks may require a variety of responses ranging from immediate remedial action or risk management or, more commonly, further investigation and risk assessment. This next stage is termed a Phase II Main Site Investigation and should provide additional data to allow refinement of the Conceptual Site Model and assess the level of risk from each contaminant linkage.

Definition of Risk Assessment Terminology

CIRIA Report C552, Contaminated Land Risk Assessment A Guide to Good Practice, 2001 sets out a methodology for estimating risk. The methodology for risk evaluation is a qualitative method for interpreting the output for the risk estimation stage of the assessment. It involves the classification of the:

- Magnitude of the potential consequence (severity) of risk occurring.
- Magnitude of the probability (likelihood) of the risk occurring.

The classification of consequence and probability are set out in table B1 and B2 below:

Table B1 Classification of Consequence

Classification	Definition	Examples
Severe (Sv)	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environment protection Act 1990, Part IIA. Short term risk of pollution of controlled waters. Catastrophic damage to buildings / property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem	High concentrations of cyanide on the surface of an informal recreation area Major spillage of contaminants from site into controlled water. Explosion causing building collapse (can also equate to a short-term human health risk if buildings are occupied.)
Medium (Md)	Chronic damage to Human Health ("significant harm"). Pollution of controlled waters. A significant change in a particular ecosystem, organism forming part such ecosystem.	Concentrations of contaminants from site exceeding generic or site-specific screening criteria. Leaching of contaminants into a major or minor aquifer. Death of species within a designated nature reserve.
Mild (Mi)	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures, and services. Damage to sensitive buildings / structures / services or the environment.	Pollution of non-classified groundwater. Damage to building, rendering it unsafe to occupy (e.g., foundation damage resulting in instability)
Minor (Mr)	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by measures such as protective clothing etc). Easily repairable effects of damage to buildings, structures, and services.	The presence of contaminants at such concentrations that protective equipment is required during site work. The loss of plants in a landscaping scheme. Discolouration of concrete.

The classification of consequence does not take into account the probability of the consequence being realised. Therefore there may be more than one consequence for a particular pollutant linkage. Both a severe and medium classification can result in death. Severe relates to short term (acute) risk while medium relates to long term (chronic) risk. Mild relates to significant harm but to

less sensitive receptors. Minor classification relates to harm which is not significant but could have a financial cost.

Table B2 Classification of Probability

Classification	Definition
High likelihood (Hi)	There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable in the long term, or there is evidence at the receptor or harm or pollution.
Likely (Li)	There is a pollutant linkage, and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood (Lw)	There is a pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the short term.
Unlikely (Ul)	There is a pollutant linkage, but circumstances are such that it is improbable that an event would occur even in the very long term.

The classification gives a guide as to the severity and consequence of identified risk when compared with other risk presented on the site. It should be noted that if a risk is identified it cannot be classified as “no risk” but as “very low risk”. Differing stakeholders may have a different view on the acceptability of a risk.

Once the consequence and probability have been classified these can be compared using a matrix (**Table B3**) to identify an overall risk category. These categories and the actions required are categorised in **Table B4.**

Table B3 Risk Evaluation Matrix

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High likelihood (Hi)	Very High Risk (VH)	High Risk (H)	Moderate Risk (M)	Mod/Low Risk (M/L)
	Likely (Li)	High Risk (H)	Moderate Risk (M)	Mod/Low Risk (M/L)	Low Risk (L)
	Low likelihood (Lw)	Moderate Risk (M)	Mod/Low Risk (M/L)	Low Risk (L)	Very Low Risk (VL)
	Unlikely (Ul)	Mod/Low Risk (M/L)	Low Risk (L)	Very Low Risk (VL)	Very Low Risk (VL)

Table B4 Risk Categorisations

Very High Risk (VH)	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High Risk (H)	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer-term.
Moderate Risk (M)	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low Risk (L)	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk (VL)	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

GENERIC QIANTITATIVE RISK ASSESSMENT

In the following sections the current UK guidance on risks to the following receptors are discussed: human health, plant life and controlled waters

Human Health

The overall methodology for assessing the risk to human health from potential contaminants in soil is set out in the Environment Agency's guidance "Using Soil Guideline Values" SC050021/SGV Introduction, March 2009 and using the CLEA 1.06 model software (and CLEA 1.071 for nickel). The generic assessment criteria are in accordance with the following:

- Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil;
- Science Report SC050021/SR3: Updated technical background to the CLEA model;
- Science Report SC050021/SR4: CLEA Software (Version 1.071, 2014) & Handbook;
- Toxicological reports and SGV technical notes;
- Toxicological data published by LQM/CIEH (2009) and CL:AIRE/EIC/AGS (2009);
- DEFRA Development of Category 4 Screening Levels for assessment of land affected by contamination - SP1010 (December 2013);
- LQM/CIEH Suitable 4 Use Levels (S4ULs) for Human Health Risk Assessment; and,
- Toxicology review published by the European Food Safety Authority for nickel (2015).

In March 2014 six 'proposed' Category 4 Screening Levels (pC4SL) were issued by Defra. These screening values are considered to be within Category 4 as defined in the Contaminated Land Statutory Guidance and indicate safe levels for new developments passing through the planning system. The SGV for lead has been withdrawn, and the pC4SL for lead has been derived using current best practice. In January 2015 LQM/CIEH published S4ULs for 89 contaminants in accordance with the C4SL methodology.

Note that groundwater contamination may pose a risk to human health but that there are no relevant generic assessment criteria available for comparison. GroundSolve has derived our own assessment criteria for this.

Phytotoxic Risks

Generic assessment of phytotoxicity is by comparison with guideline values presented in the British Standard for Topsoil and the MAFF document "Code of Good agricultural practice for the protection of soil", October 1998. This is in accordance with LCRM's reference to DEFRA notice CLAN 4/04.

Controlled Waters

Risks to controlled waters (groundwater and surface waters) from contaminants are assessed in accordance with the EA documents "The Environment Agency's Approach to Groundwater Protection" (2017) and Remedial Targets Methodology (RTM, 2006). Pollutant inputs from

contaminated land sites are considered as passive inputs under the European Water Framework Directive (2000/60/EC) (WFD) and its daughter Directives, and as such are regulated under the Environment Agency's 'limit' pollution objective. Acceptable water quality targets (WQT) are defined for protection of human health (based on Drinking Water Standards (DWS)) and for protection of aquatic ecosystems (Environmental Quality Standards (EQS)). The risk posed to controlled waters from total soil concentrations cannot be directly assessed. The risk is assessed either by comparison of results of leachate tests carried out on soil samples, or from the direct testing of samples of groundwater to screening criteria. Leachate testing generally forms a conservative assessment and is not appropriate for organic contaminants.

CURRENT GUIDANCE ON INTERPRETATION OF CHEMICAL ANALYSIS OF SOILS

Contaminated land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995. This supports a 'suitable for use' based approach to the risk assessment of potentially contaminated land. The site-specific risk assessment is based upon assessment of plausible contaminant linkages, referred to as the contaminant-pathway- receptor model, based upon the current or proposed use of the site.

Before undertaking a risk assessment, a conceptual site model is devised in order to identify the potential contaminants, pathways and receptors. The individual contaminants, pathways and receptors then need to be further investigated in order to refine the initial assessment and risk assessment undertaken.

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. These reports (CLR7-10) together with associated "SGV" documents were withdrawn and the following documents have been published as revised guidance to the CLEA assessment:

- Environment Agency : 2008: Using Soil Guideline Values SC050021/SGV Introduction, March 2008.
- Environment Agency : 2008: Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
- Environment Agency : 2008: Science Report SC050021/SR3: Updated technical background to the CLEA model.
- Environment Agency : 2008 : Compilation of Data for Priority Organic Contaminants for Derivation of Soil Guideline Values Science report SC050021/SR7
- Environment Agency : Science Report SC050021/SR4: CLEA Software (Version 1.071, 2015) & Handbook.
- DEFRA Development of Category 4 Screening Levels for assessment of land affected by contamination - SP1010 (December 2013).
- LQM/CIEH Suitable 4 Use Levels for Human Health Risk Assessment.

Additional guidance on statistical assessment replacing CLR 7 is partly provided in:

- CL:AIRE: 2009: Guidance on Comparing Data With a Critical Concentration

A different approach to the statistical appraisal of data is required depending on whether the assessment of risk is to assess whether land is Contaminated Land in accordance with regulations, or whether the assessment is to assess whether the site is suitable for new development in according with Planning guidance. This is discussed further in CL:AIRE: 2009 "Guidance on Comparing Data With a Critical Concentration".

The introduction of the Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) reassessed the CLEA Model and the derived SGVs (and associated GACs calculated using the model). This re-assessment concluded that the SGVs/GACs were conservative screening criteria for determining the suitability of soil with regard to the risk to human health under the planning regime and defined a new upper limit for planning purposes which is the boundary between the new Category 3 and 4. In March and September 2014 DEFRA issued guidance on these new Category 4 Screening Levels (C4SL) and these are discussed further below.

Soil Guideline Values

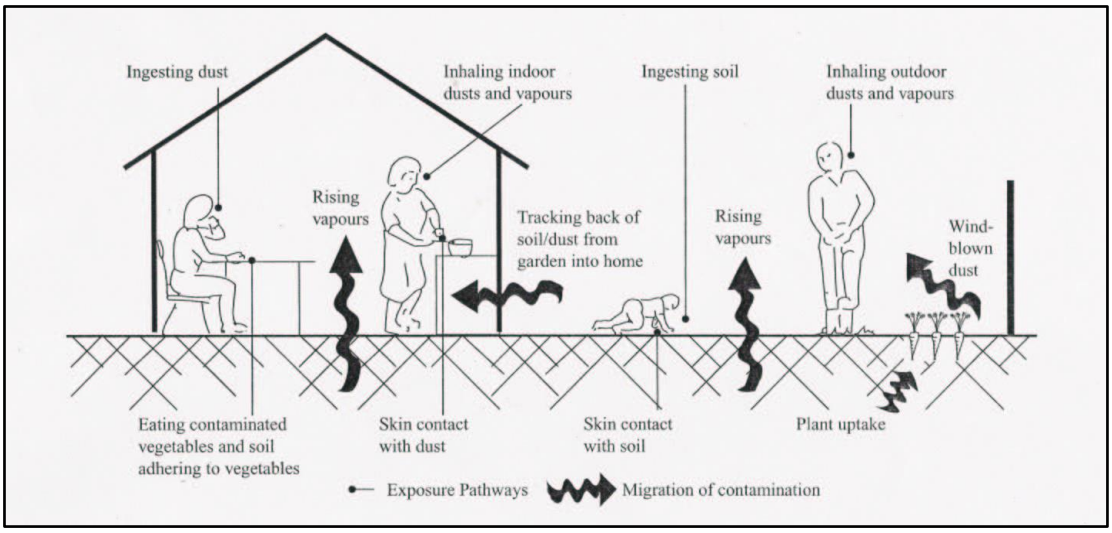
A program for the derivation of SGVs based on the above guidance is provided by the Environment Agency and is entitled "CLEA Software Version 1.06". These reports, together with supporting toxicology reviews ("Tox" or Supplementary Information Reports) for individual substances (which will be gradually updated), Soil Guideline Value Reports and other guidance referred to in the above documents, provide guidance and the scientific basis for assessing the risk to human health from potential contaminants. Soil Guideline Value Reports (SGV Reports) have been published for a number of contaminants and these are published on the Environment Agency website. Eventually the reports will include SGVs for:

- heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury nickel (now withdrawn), and selenium;
- benzene, ethylbenzene, toluene, and xylenes;
- phenol;
- dioxins and dioxin-like polychlorinated biphenyls (PCBs);
- polycyclic aromatic hydrocarbons (PAHs) – 11 substances.

In September 2015, CLEA was re-issued as 'CLEA Version 1.071'. Currently, the software has been used to produce an in-house GAC for nickel, following with withdrawal of the SGV.

In addition, CIEH through LQM and the EIC have published generic assessment criteria (GACs) for a wide variety of other parameters including metals, hydrocarbons, chlorinated aliphatic compounds, PAHs and explosive substances for three standard land uses. These have been produced to supplement the Environment Agency guidance. These GACs will be replaced by SGVs when or if the Environment Agency publishes any more SGVs.

The CLEA model has been developed to calculate an estimated tolerable daily soil intake (TDSI) for site users given a set 'default' exposure pathways. Ten human exposure pathways are covered in the CLEA model as presented below:



- Ingestion:
  - ingestion of outdoor soil;
  - ingestion of indoor dust;
  - ingestion of home-grown vegetables;
  - ingestion of soil attached to home grown vegetables.

- Dermal Contact:
  - dermal contact with outdoor soil;
  - dermal contact with indoor dust.

- Inhalation:
  - inhalation of outdoor dust;
  - inhalation of indoor dust;
  - inhalation of outdoor soil vapour;
  - inhalation of indoor soil vapour.

It should be noted that there are other potential exposure pathways on some sites not included in the CLEA model e.g., certain organic compounds can pass through plastic water pipes into drinking water supply.

The presence and/or significance of each of the above exposure pathways are dependent on the type of land use being considered and the nature of the contaminant under scrutiny. Accordingly, the CLEA model considers for principle 'default' land use types and makes a series of 'default' assumptions with regard to human exposure frequency, duration and critical human target groups for each land use considered:

- residential land use;
- allotments;
- commercial and industrial land use.

The land use categories defined in the CLEA are detailed below.

Residential: This land use category assumes that people live in a variety of dwellings including terraced, detached and semi-detached houses up to two storeys high. The structure of buildings varies. Default parameters for building materials and building design are included in CLEA documents to calculate the relevant multi-layer diffusion coefficients for vapour intrusion and to model indoor vapour intrusion. The CLEA model assumes that regardless of the style of housing the residents will have access to either a private garden or community open space nearby, and that soil tracked into the home will form indoor dust. It allows for the ingestion pathways from home grown vegetables.

Allotments: The CLEA model incorporates an assessment of land provided by local authorities specifically for people to grow fruit and vegetables for their own consumption. Consumption of such fruit and vegetables present several exposure pathways; plants absorb contaminants mainly via water uptake through roots, the contaminants move to edible portions of plants via translocation and contaminated soil particles become trapped in the skin and between leaves. At present the model fails to account for exposure through the consumption of animals, and their products (e.g., eggs), which have been reared on contaminated land.

Commercial/Industrial: Although there are a wide variety of workplaces and work-related activities, the CLEA assessment of this land-use assumes that work occurs in a permanent, three-storey structure, where employees spend most time indoors, conducting office-based or light physical work. The model assumes employees sit outside during breaks for most of the year. Limitations in applying this land-use to different industries is detailed in EA publication "Updated technical background to the CLEA model" (2011). The generic model assumes that the site would not be covered by hard standing. Risk of exposure to contaminants would be clearly less where commercial land is essentially all buildings and hard standing.

Based on the assumptions of each land use and the associated applicable exposure pathways, a 'Soil Guideline Value' (SGV) may be calculated for each contaminant under consideration for a particular land use in order to determine whether certain contaminant soil concentrations pose a significant risk to human health. The primary purpose of the CLEA SGVs are as 'trigger values' – indicators to a risk assessor that soil concentrations below this level require no further assessment as it can be assumed that the soil is suitable for the proposed use. Where soil concentrations occur above the SGV then further assessment of the results is required. The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012 provides new clarity on the assessment of risk where soil concentrations exceed the SGV. The guidance introduces a four-stage classification system relating to concentration of contaminants and the assessed risk which indicates appropriate actions. Category 1 and 2 sites are classified as "Contaminated Land" as defined in Part IIA of The Environmental Protection Act (1990). Category 3 and 4 sites are not considered as "Contaminated Land" in accordance with the Act. This can be explained using the figure on the following page.

There are also difficulties in establishing soil concentrations of contaminants beyond which risks from exposure to these contaminants would be 'unacceptable' and that they would lead to "significant possibility of significant harm" as defined in Part IIA of The Environmental Protection Act (1990) and determine that the land is "contaminated." This ultimately requires detailed 'toxicological' information of the health effects of individual contaminants and also a scientific judgement on what constitutes an 'unacceptable' risk. It is for local authorities or the

Environment Agency to determine whether a particular site is contaminated land, and it is for local Planning Authorities to determine whether land affected by contamination can be redeveloped.

Given the SGVs have been derived only for a limited number of contaminants and there was little prospect of further SGVs being published, two professional groupings have produced Generic Assessment Criteria (GACs) in accordance with the CLEA model for a large number of additional contaminants. These GACs were recognised in the new Contaminated Land Statutory Guidance (DEFRA, 2012) and have been produced as follows:

- *LQM/CIEH : 2009 Nathaniel CP, McCaffrey C, Ashmore MH, Cheng NPS GROUP, Gillett A, Ogden R & Scott D : 2009 . The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd edition). Land Quality Press, Nottingham.*
- *CL:AIRE/EIC/AGS: 2009 : Soil Generic Assessment Criteria (GAC) for Human Health Risk Assessment. Contaminated Land: Applications in Real Environments, Environment Industries Commission & Association of Geotechnical and Environmental Specialists. December 2009.*

Category 4 Screening Levels and LQM/CIEH Suitable 4 Use Levels

For new developments progressing through the planning regime, it is desirable that the soil concentrations are within Category 4 where there is a valid contaminant linkage. The upper boundary between Category 4 and 3 is not defined in the guidance. This boundary can also be better defined by carrying out a Detailed Quantified Risk Assessment (DQRA) and this is discussed later in this appendix.

In December 2013 Defra issued the findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived. The report was not designed to produce 'final' C4SL as the steering group producing the report believes that final C4SL should be set by a 'relevant authority' (e.g., Defra), the toxicological framework proposed has not been reviewed by the Committee on Toxicity and the document has yet to be subject to peer review.

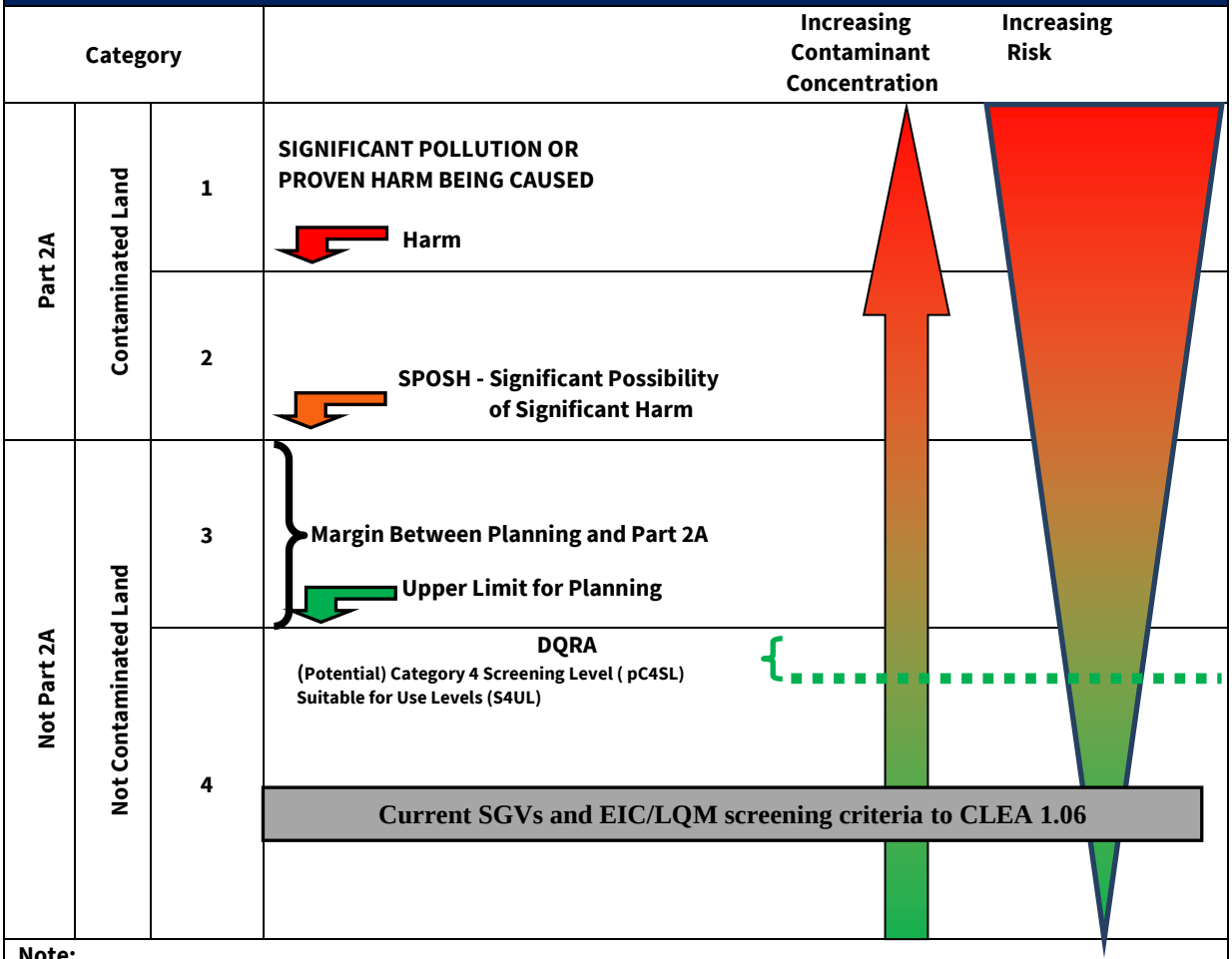
In March 2014, appendices to the main Defra report were published detailing the derivation of pC4SL for 6 contaminants and other appendices regarding a review of the CIEH/CL:AIRE statistics guidance and sensitivity analysis. For each contaminant, a range of pC4SL have been produced relating to modifying toxicological parameters only, modifying exposure parameters only or by modifying both. It should be noted that the pC4SL produced for lead (the SGV was withdrawn in 2011) has undertaken a relatively large toxicological review in relation to modelling blood lead concentrations. pC4SL have been produced for:

- Arsenic;
- Benzene;
- Benzo(a)pyrene (as a surrogate marker for PAHs);
- Cadmium;
- Chromium (VI); and
- Lead

As previously discussed the values were initially published as 'potential' C4SL but have become 'final' following DEFRA having issued a policy decision letter indicating that they are to be used in the planning regime (letter of 3rd September 2014). It is considered that the pC4SL provide a

simple test for deciding whether land is suitable for use without any remediation. The pC4SL represent a new set of screening levels that are more pragmatic (but strongly precautionary) compared to the existing soil guideline values (SGVs and the other GACs calculate in accordance with the existing CLEA methodology). The pC4SL provide cautious estimates of contaminant concentrations in soil that are still considered to present an acceptable level of risk, within the context of Part 2A, by combining information on toxicology, exposure assessment and normal levels of exposure to these contaminants. pC4SL values should not be seen as 'SPOH values.' Exceeding a pC4SL means that further investigation is required, not that the land is necessarily contaminated. In January 2015, LQM published Suitable 4 Use Levels (S4ULs) for a further 89 contaminants using the Defra C4SL methodology. In a similar manner to the pC4SLs, no authoritative review has been undertaken although the approach and quality of the work undertaken is widely accepted as being of high quality.

Relationship Between Contaminant Concentration, Risk and Screening Values



Note:
The vertical scale should not be considered as being linear and will be site and contaminant specific.

- SPOSH concentrations could be 10 to 100 times the SGV/EIC/LQM screening concentration.
- C4SL were issued as 'potential' but have become 'final' following DEFRA having issued a policy decision letter indicating that they are to be used in the planning regime (letter of 3rd September 2014).

Lead:
The SGV for lead was withdrawn in 2011 and is not used in this report. The pC4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling in line with current scientific understanding of lead toxicology.

Nickel
The SGV for nickel was withdrawn in 2015 and is not used in this report. In-house GACs for nickel have been produced using the updated toxicological review by the EFSA and the CLEA 1.071 software.

Public Open Space
The Defra report (December 2013) has also introduced exposure scenarios for two other commonly occurring land uses which require assessment (under the planning and Part 2A regimes) on a relatively frequent basis. These exposure scenarios are:

- Public Open Space – Space Near Residential Housing (POS_{resi}); and,
- Public Open Space – Public Park (POS_{park}).

Potential use of pC4SL relating to Public Open Space (POS) require care due to the significant variability in exposure characteristics. For example, POS may include:

- Children's play areas, public parks where children practise sport several times a week and teenagers only once a week;
- Grassed areas adjacent to residential properties which are rarely used;
- Dedicated sports grounds where exposure is only to players and groundworkers; and,
- Nature reserves or open ground with low level activity (for example, dog walking).

Within the Defra report (December 2013) the following exposure scenarios have been modelled as these are considered the most important for potential exposure for the critical receptor i.e., young children:

- Green open space close to housing, including tracking back of soil (POS_{resi}); and
- Park-type scenario where distance is considered sufficient to discount tracking back of soil (POS_{park}).

Detailed Quantified Risk Assessment (DQRA)
SGVs, GACs, pC4SL and S4ULs are based on a number of basic assumptions. There are two main options for developing Site Specific Assessment Criteria (SSAC) by adjusting the CLEA model so that they have greater relevance to the site:

- **Simple adjustment of the generic SGV / C4SL model**. Such adjustment is restricted to the choice of exposure routes selected for the generic land use, building type, soil type and soil organic matter content within the CLEA software.

- **Detailed adjustment.** It may be relevant to make greater modifications to the model due to the specific use of the land in question. This can include modification to any parameter value, including exposure assumptions, building parameters, and the choice and application of fate and transport models. This is equally relevant to site-specific modifications of existing generic land uses, the development of new land uses, and the inclusion of additional exposure pathways. Much of this can be undertaken using the CLEA software. Depending on the complexity of the detailed adjustments required, it may be necessary to use other tools either alone or in conjunction with the CLEA software. Both options should follow established protocols for DQRA and require sufficient justification and supporting information for the adjustments made. Detailed adjustments are likely to require substantially greater technical justification and supporting documentation, especially if modifications are based on information not contained within the SGV framework documents.

The two choices present the risk assessor with three options/decisions:

1. Use a published SGV/GAC/pC4SL/S4UL if it can be demonstrated that the assumptions inherent in the value are appropriate to the site in question. If they are not, proceed to either option 2 or 3 below.

2. Make simple site-specific adjustments to the generic exposure model used to derive the SSAC. Three examples of when this could be appropriate are:

    a. High density residential development with no exposed contaminated soil at surface. It is appropriate in this case to consider the relevance of direct contact pathways and consumption of homegrown produce.

    b. Soil type is significantly different (specifically when soil type is likely to be less protective e.g., made ground) to that assumed in the SGV/GAC/pC4SL/S4UL.

    c. Soil organic matter content is significantly different to that assumed in the derivation of the SGV/GAC/pC4SL/S4UL.

3. If simple adjustments are not sufficient to reflect site conditions, undertake a DQRA. This may be undertaken using the CLEA software or by using an alternative risk assessment methodology that is relevant, appropriate, authoritative, and scientifically based. Changes to toxicological end points may also be considered, although this should only be undertaken by a toxicology expert. In the context of this guidance, simple adjustments of a generic land use scenario for soil type or SOM content for example are not considered sufficient to be classed as a DQRA.

DQRAs should be conducted with the agreement of the local authority (or the Environment Agency) since it is the authority that determines whether land is Contaminated Land or whether Planning Permission for a new development may be granted.

Representative Data

The type, quantity and quality of the available soil data influence the method chosen to obtain a site representative soil concentration that is compared with an SGV/GAC/pC4SL/S4UL in the screening process. The soil data should be representative of the exposure scenario being considered. This can include factors such as:

- Averaging area over which exposure occurs;
- Sample depth; and,
- Heterogeneity of soil.

where the 'averaging area' is defined as:

> *"That area (together with a consideration of depth) of soil to which a receptor is exposed or which otherwise contributes to the creation of hazardous conditions".*

Site investigations take discrete samples from a given area (and to a certain depth). It has to be assumed that these samples are to some degree representative of the contaminant concentration throughout that volume of soil. The critical soil volume (taking into account area and depth) which might be usefully compared with an SGV/GAC/pC4SL/S4UL is a site-specific decision, but a starting point is the generic land use scenarios used in the derivation of the SGV/GAC/pC4SL/S4UL. The critical soil volume depends on two factors:

- Contaminant distribution and vertical profile (bands of highly contaminated material or lateral hot spots should not necessarily be averaged out with more extensive cleaner areas of soil without justification)
- Contribution to average exposure underpinning the SGV. Direct contact exposure pathways depend on the adult or child coming into contact with near-surface soils and the area over which that exposure occurs is usually important (i.e., the averaging area). Vapour pathways are less dependent on surface area, for example vapour intrusion may result from a highly concentrated hot spot beneath a building leading to elevated average indoor air concentrations. For the three standard land uses for which SGVs are derived, relevant considerations are:
- For the standard **residential or allotment land use**, the critical soil volume is the area of an individual garden, communal play area or working plot from the surface to a depth of between 0.50m and 1.00m. This is the ground over which children are most likely to come into contact with soil or from which vegetable and fruit produce will be harvested. In the case of volatile contaminants, it may also be appropriate to consider the volume of soil underneath the footprint of the building although vapour intrusion may be driven by a soil volume much smaller than this if the contaminant source is highly concentrated.
- For the standard **commercial land use**, the critical soil volume has to be decided on a case-by- case basis due to the wide range of possible site layouts. However, for non-volatile contaminants, landscaped and recreational areas around the perimeter of office buildings are likely to be most important. For volatile contaminants, the footprint occupied by the building itself should also be considered.

- For **most exposure pathways**, the contamination is assumed to be at or within one metre of the surface.

The use of averaging areas must be justified on the basis of relevance to the exposure scenario. SGVs are relevant only when the exposure assumptions inherent in them are appropriate for the identified exposure averaging area. Further guidance on critical soil volumes and the consideration of averaging exposure areas can be found in:

- *Secondary model procedure for the development of appropriate soil sampling strategies for land contamination (Environment Agency, 2000);*
- *Guidance on comparing soil contamination data with a critical concentration (CIEH/CL:AIRE, 2009); and*
- *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Appendix I (Defra December 2013, March 2014)*

It is the mean soil concentration for the individual contaminant within an individual averaging area, which is compared to the SGV. However, as contaminant concentrations vary across a site, and sampling and analysis will introduce measurement errors, the comparison between measured mean concentration and the SGV must take this uncertainty into account.

There are two principal options available to obtain site representative soil concentrations from a site investigation dataset; statistical and non-statistical methods. Data objectives, quality and quantity are likely to determine which approach is most appropriate. If statistical methods such as those presented in CIEH/CL:AIRE (2011) are to be used, sufficient data need to be available or obtained. No one single statistical approach is applicable to all sites and circumstances. The wider range of robust statistical techniques developed by organisations including the US Environmental Protection Agency (USEPA) are also important tools. Risk assessors should choose an appropriate statistical approach on the basis of the specific site and the decision that is being made. For further guidance on the appropriate use of statistical approaches, refer to USEPA 2006 or good environmental monitoring statistics textbooks.

When statistical approaches are inappropriate (this will depend on the objectives of the site investigation), individual or composite samples should be compared directly to the SGV. Guidance on use of alternative data handling approaches such as the use of composite sampling can be found in documents such as:

- *Verification of remediation of land contamination* (Environment Agency, 2010);
- *Sampling and testing of wastes to meet landfill Waste Acceptance Criteria* (Environment Agency, 2005);
- *Guidance on choosing a sampling design for environmental data collection* (USEPA, 2002); and,
- *Soil Quality – Sampling, ISO 10381 series* (ISO, 2002–2007).

The statistical tests should not be used as arbiters for decisions under Part 2A. They are an additional, useful line of evidence to assist in decision-making. The implications of the basis for the derivation of the site representative soil concentration must be taken into account in any decision-making process and clearly documented.

Where the statistical tests are conducted in accordance with the method described in CL:AIRE 2009:

- For the Planning situation, it has to be demonstrated that the concentration of contaminants is low compared to the pC4SL/S4UL or SSAC. All of the test data should be below the screening criteria and no statistical analysis is required or if there are exceedances of the criteria then a statistical assessment is required. For the statistical assessment this decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is lower than the screening criteria.

- For the Part 2A scenario the regulator needs to determine whether the concentration of contaminants is greater than the SGV/GAC/pC4SL/S4UL or SSAC. This decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is higher than the SSAC. However, the regulator may proceed with determination if there is just a 51% probability, "on the balance of probabilities."

If the screening levels are exceeded then more sophisticated quantitative risk assessment can be undertaken or remedial action may be taken to break the contaminant linkages. The benefits of undertaking a quantitative risk assessment must be weighed against the likelihood that it will bring about cost savings in the proposed remediation. Further information about the use of soil guideline values is provided in Environment Agency : 2008: Using Soil Guideline Values SC050021/SGV Introduction, March 2008.

GENERIC RISK ASSESSMENT CRITERIA FOR RISK TO PLANTS

Soil contaminants, if present at sufficient concentrations, can have an adverse effect on the plant population. Phytotoxic effects can be manifested by a variety of responses, such as growth inhibition, interference with plant processes, contaminant-induced nutrient deficiencies and chlorosis (yellowing of leaves). All chemicals are probably capable of causing phytotoxic effects. Thus, the phytotoxic potential of substances is dependent on the concentrations capable of having adverse effects on plants and the concentrations likely to be found at contaminated sites. Phytotoxicity is a difficult parameter to quantify given that experimental techniques vary widely, and variations exist in plant tolerances, soil effects and synergistic/antagonistic reactions between chemicals. Contaminants may be taken up and accumulated by plants through a range of mechanisms. The principal pathways are active and/or passive uptake through the plant root, adsorption to root surfaces and volatilisation from the soil surface followed by foliar uptake. After plant uptake, contaminants may be metabolised or excreted, or they may be bioaccumulated and this is highly species dependant. Many of the substances capable of adversely affecting vegetation exert this effect because of their water solubility, a characteristic that could result in their transport from contaminated sites into adjacent locations where the chemical may generate a phytotoxic response. This could be important if, for example, the adjacent site has important conservation status.

The concentration in soil at which substances become phytotoxic depend on a range of factors including plant type, soil type, pH, the form and availability of the contaminant and other vegetation stress factors that may be present (such as drought). Some plants (including some rare plants will only grow in soils where there are relatively high concentrations which would be phytotoxic to other species. Whilst many contaminants may be phytotoxic, data are limited. Some heavy metals are essential as trace elements for plant growth but may become toxic at higher concentrations.

GroundSolve has carried out a review of a number of current and former guidance documents and other texts on phytotoxicity. It is not possible to produce a definitive list of phytotoxic substances on account of the variables mentioned above. However, a number of metals are repeatedly cited as commonly occurring priority pollutants. As a result, the following list is adopted by GroundSolve as indicators of the potential for phytotoxicity: As, Cr, Cu, Ni and Zn (note that Boron has been excluded from this list because the more modern studies do not assess this).

As the CLEA framework is a risk-based approach, applied to humans, an alternative strategy is required to assess the risk to plants from substances that are phytotoxic. Reference to published criteria and background concentrations can help put site data into context. Published assessment criteria for the protection of plant life from a number of countries are given in the following Table. The most authoritative source is the British Standard for topsoil, but this only lists three elements. LCRM states that the ICRCL Guidance Note 70/90 can be used for initial screening criteria. This approach has been adopted by GroundSolve where BS3882 is lacking, but where an ICRCL 70/90 criterion is lacking, the lowest criterion in Table below from, firstly UK, and, secondly, European and then other worldwide criteria. The adopted criteria are highlighted in the table 3.8. The MAFF value of 250 mg/kg has been chosen for As over the ICRCL value of 50 mg/kg as MAFF explains the 50 is applicable to vegetables and human health, whereas 250 is applicable to the plants themselves.

Table B.5: Published Assessment Criteria for Phytotoxic Elements (mg/kg)							
Reference	**As**	**CR (Total)**	**Cr (III)**	**Cr (VI)**	**Cu**	**Ni**	**Zn**
British Standard for topsoil (BS3882:2007)	-	-	-	-	200 (pH >7) 135 (pH 6-7) 100 (pH 5.5-6.0)	110 (pH >7) 75 (pH 6-7) 60 (pH 5.5-6.0)	300 (pH >7) 200 (pH 6-7) 200 (pH 5.5-6.0)
MAFF Code of Good Agricultural Practice for the Protection of Soil (1998)	250	-	400 for sites containing sewage and sludge	-	500 (grass) but may fall to 250 for clover and sensitive species (at pH>6)	110 (pH>7) 75 (pH 6-7) 60 (pH 5.5-6.0)	1000 (clover & grass at pH 6), may fall to 300 for sensitive species (at pH 6-7)
ICRCL 59/83 (1987) now withdrawn for human health assessment	-	-	-	-	130	70	300
ICRCL 70/90 (1990) threshold trigger value	50	-	-	25 *	250	-	1000
Dutch ecotoxicological intervention value (Swartjes 1993 & 1994)	40	230	-	7	190	-	-
Australian Guideline B(1) (1999), Interim Urban Ecological Investigation Level (EIL). Soils not generally considered phytotoxic below these EILs.	20	-	400	1	100	60	200
New Zealand guidelines for timber treatment sites (1977), estimated based on Cu bioavailability *	-	-	-	-	500 - 1000 clay soils	-	-
New Zealand guidelines for timber treatment sites (1977), soil criteria for protection of plant life (residential/ agricultural setting)	10-20	-	600	25	130	-	-
Note: * Cr (VI) is only likely to be present in as a significant proportion of total Cr where pH >12 so this does not routinely need to be tested for regarding plant health.							

CURRENT GUIDANCE FOR CONTROLLED WATERS RISK ASSESSMENT

Summary of Regulatory Context

Government policy is based upon a "suitable for use approach," which is relevant to both the current use of land and also to any proposed future use. When considering the current use of land, Part IIA of the Environment Protection Act 1990 [4] (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995 [5], which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, controlled waters or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

> *"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:*
>
> a) *Significant harm is being caused or there is a significant possibility of such harm being caused; or,*
>
> b) *Pollution of controlled waters is being, or is likely to be, caused."*

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

> *"the entry into controlled waters of **any** poisonous, noxious or polluting matter or **any** solid waste matter"*

Part IIA is supported by a substantial quantity of guidance and other Regulations, especially for England, The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012. The document re-confirms the duties of Enforcing Authorities in dealing with contamination including the role of the Environment Agency which has powers under Part 7 of The Water Resources Act (1991) to take action to prevent or remedy the pollution of controlled waters, including circumstances where the pollution arises from contamination in the land.

Part IIA introduces the concept of a contaminant linkage; where for potential harm to exist, there must be a connection between the source of the hazard and the receptor via a pathway. Risk assessment in contaminated land is therefore directed towards identifying the contaminants, pathways and receptors that can provide contaminant linkages. This is known as the contaminant-pathway-receptor link (CPR or contaminant linkage).

Part IIA places contaminated land responsibility as a part of the planning and redevelopment process rather than Local Authority or Environment Agency taking direct action except in situations of very high pollution risk or where harm is occurring. In the planning process guidance is provided by National Planning Policy Framework (NPPF) of March 2012. This requires that a site which has been developed shall not be capable of being determined "contaminated land" under Part IIA. Therefore, appropriate risk-based investigation is required to identify the contaminant

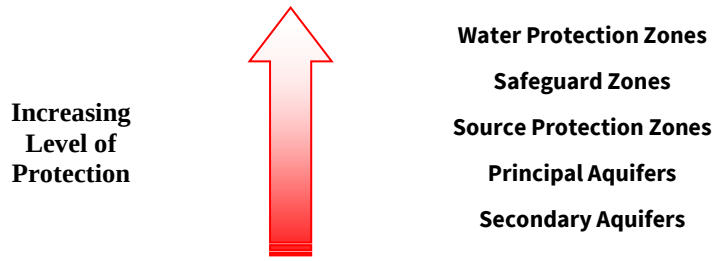
linkages that can then be assessed, and then mitigated using methods that can be readily agreed with the planners.

Environment Agency Guidance

Legislation and guidance surrounding the protection of controlled waters in the UK is numerous and can be complex. The Environment Agency's overall position on groundwater is *"To protect and manage groundwater resources for present and future generation in ways that are appropriate for the risks that we identify"* (The Environment Agency's Approach to Groundwater Protection, 2017). In brief, the core objectives of the existing legislation serve to enforce this position.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document was influential as it provided a focus for key developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was then revised in 1998, since which there have been substantial changes in legislation, driven by Europe. Key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991 as amended by the Water Act 2003. Further to legislative changes, gaps identified in the 1998 PPPG required addressing. These changes are reflected in the Environment Agency Policy document *The Environment Agency's Approach to Groundwater Protection"* of March 2017.

The Environment Agency follows a tiered, risk-based approach to drinking water protection, and this should be taken into account when carrying out controlled waters risk assessment:



Tools available for Risk Assessment of Controlled Waters

In order for a developer of a potentially contaminated site to fulfil their obligations under the legislation, a site assessment would be required to be undertaken in order to identify any potential risks to controlled waters and to derive suitable clean-up criteria if necessary to ensure the protection of controlled waters. A number of tools are available for this purpose.

Three main stages apply to any risk assessment of controlled waters, these are:

i. Risk Screening (devise Conceptual Site Model, making reference to groundwater vulnerability maps, site setting etc)

ii. Generic Risk Assessment (using the EA Remedial Targets Methodology – Tier 1 - Comparison of groundwater data with relevant standards)

iii. Detailed Quantitative Risk Assessment (Consideration of aquifer properties and site-specific parameters, using the EA Remedial Targets Methodology - Tiers 2 & 3)

The process is summarised below (Taken from the Environment Agency GP3 consultation document, 2006):

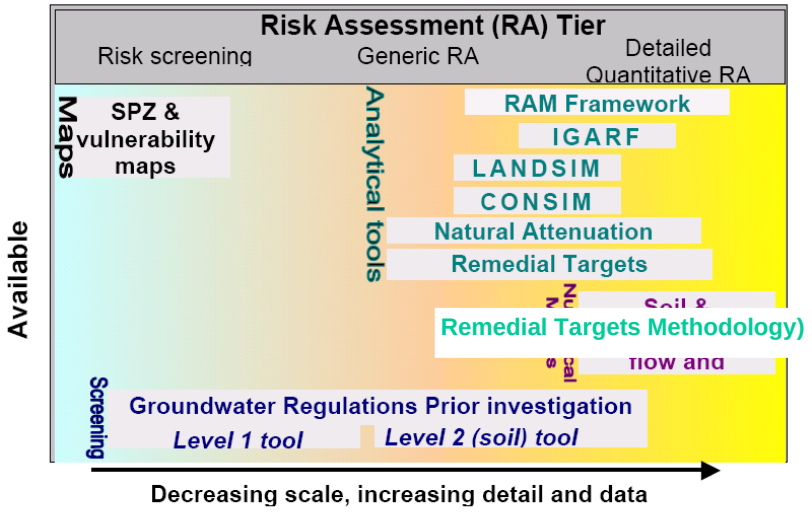


Figure 1-1 Environment Agency groundwater assessment tools, mapped against the different levels of risk assessment.

When assessing groundwater impact the Environment Agency advocate the application of their framework methodology "Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination" Environment Agency (2006). The methodology has four tiers of assessment:

Tier 1 utilises either a soil concentration (calculation of pore water concentrations based on partitioning calculations), leaching test or pore-water concentration of perched water as a source concentration input and these are contrasted directly to water quality standards. No dilution or attenuation is considered at Level 1.

Tier 2 (groundwater) considers dilution of the contaminant within the underlying receiving groundwater or surface water body. To determine a dilution, factor the infiltration rate of pore water and the discharge of groundwater beneath the source must be determined. Level 2 Assessment comprises a comparison between measured groundwater concentrations with to water quality standards.

Tier 3 considers natural attenuation in the form of dispersion, retardation and degradation of the contaminant. As the levels are progressed, the assessment becomes increasingly more detailed and less conservative as the data requirements are increased with each successive tier. The Environment Agency has released Excel Worksheets to carry out basic calculations using a conservative approach up to Tier 3. However, in this case the conceptual model is a simple one and assumes there is a simple migration of contaminants from the source zone into the aquifer receptor. Using these worksheets requires a sensitivity analysis showing how by varying each parameter, what effect it might have on the outcome of the assessment. Groundwater conceptual models are not always this simple.

Tier 4 is for more complex conceptual models where multiple sources, multiple pathways, multiple receptors and complex water balances can be assessed.

The Environment Agency developed a spreadsheet-based code to support the Remedial Target Methodology, and the code is capable of undertaking assessments for Tiers 1 to 3. Tier 4 assessment is not supported by the spreadsheet-based code.

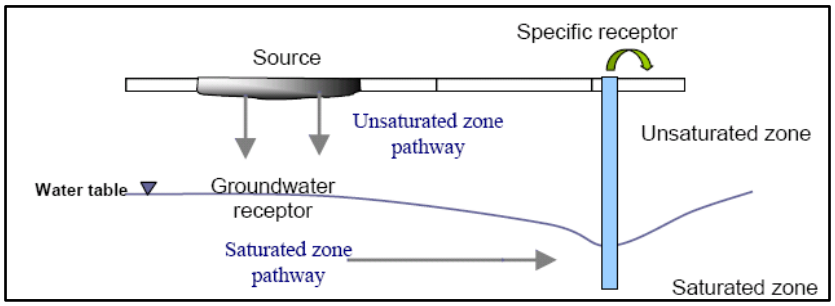
A more advanced code, ConSim 2, developed on behalf of the Environment Agency to support the Remedial Targets Methodology, allows for the introduction of additional geological horizons and is used mainly to determine the concentrations reaching a receptor and the timescales over which this may happen.

The codes assess only the dissolved phase contaminants. There are many further codes commercially available for use in controlled waters risk assessment, particularly for more complex situations, however, these should be used with caution and only once agreement has been obtained from the Environment Agency. All have the overall aim of the estimation of risk from contaminant linkages and the protection of controlled waters.

General notes on each stage of the controlled waters risk assessment process

Risk Screening

The understanding of the Conceptual Site Model (CSM) is the key to assessing any site. Using a robust CSM, potential pathways or receptors may be screened out from any further assessment at an early stage. For example, if the pathway through the unsaturated zone is blocked by the presence of a significant thickness of low permeability clay. A greater understanding of the CSM is achieved with each tier of risk assessment. An example of a basic Source-Pathway-Receptor concept is given below (taken from the Environment Agency GP3, 2006):



Generic Risk Assessment

When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with screening criteria. Published values of screening criteria with which chemical test results can be compared are published in the following guidance:

There is a hierarchy of screening criteria which is as follows:

- Updated Recommendations on Environmental Technical Standards, River Basin Management (2015-21), April 2012 by the UK Technical Advisory Group on the Water Framework Directive;
- Environmental Quality Standards (EQS) for freshwaters based on The EC Dangerous Substances Directive (76/464/EEC and Daughter Directives);

- Surface Waters (Abstraction for Drinking Water)(Classification) Regulations (1996)
- Surface Waters (Fishlife) (Classification) Regulations (1997)
- UK Drinking Water Standards (DWS) (Water Supply (Water Quality) Regulations 2000);
- Dutch Ministry of Housing, Spatial Planning and Environment (2001) Intervention Values and Target Values – soil quality standards;
- World Health Organisation Guidelines for Drinking Water (2004)

Should the Level 1 or 2 assessments indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

- To devise suitable remedial solutions;
- To carry out more investigation, sampling and analysis;
- To conduct a site-specific Detailed Quantitative Risk Assessment (DQRA) to whether or not the soil materials are suitable for their site-specific intended use or to devise a site-specific clean-up level.

Detailed Quantitative Risk Assessment (DQRA)

The decision to carry out a DQRA will be dependent on the extent and implications of the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the former two stages. The CSM will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment, the remainder having been screened out.

Additional site-specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria derived will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or *compliance point*. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

Definition of Controlled Waters

The term 'controlled waters' is defined in Section 104 of the Water Resources Act 1991 as:

> *"Territorial Waters…which extend seawards for three miles…, coastal waters…, inland freshwaters, waters in any relevant lake or pond or of so much of any relevant river or watercourse as is above the freshwater limit, and ground waters, that is to say, any waters contained in underground strata."*

Note that the definition of groundwater under the Water Resources Act 1991 includes all water within underground strata (including soil / pore water in the unsaturated zone). The definition of groundwater under the Groundwater Directive however is limited to water in the saturated zone. For the purposes of Part IIA of the Environmental Protection Act 1990, the Environment Agency

recommends that the groundwater within the saturated zone only is considered as the receptor (rather than soil / pore water).

Environment Agency's Aquifer Designations

The Environment Agency have classified different types of aquifers from which groundwater can be extracted. The aquifer designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey.

The maps are split into two different types of aquifer designation:

- **Superficial (Drift)** – permeable unconsolidated (loose) deposits.
- **Bedrock (Solid)** – solid permeable formations e.g., sandstone, chalk, limestone.

The aquifer designations displayed on the Environment Agency maps are as follows:

- **Principal Aquifers (formerly termed Major Aquifers) –** These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as a major aquifer.
- **Secondary Aquifers (formerly termed Minor Aquifers) –** These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types:
    - **Secondary A** - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers;
    - **Secondary B** - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
    - **Secondary Undifferentiated** - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- **Unproductive Strata (formerly termed Non-Aquifer) –** These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Hazardous and Non-Hazardous Substances

The Groundwater (England and Wales) Regulations 2009 control the disposal to the hydrogeological environment of potentially polluting substances which are divided into Hazardous Substances and Non-hazardous Contaminants (this roughly approximates to the former List 1 and List 2 substances).

Hazardous Substances are the most damaging and toxic and must be prevented from directly or indirectly entering the groundwater environment. Hazardous Substances include mineral oils and hydrocarbons, pesticides, biocides, herbicides, solvents and some metals. Discharge of Hazardous Substances to Controlled Waters must be prevented.

Non-hazardous Pollutants are any contaminants other than Hazardous Substances. Non-hazardous Pollutants are potentially toxic but are less harmful than Hazardous Substances, but their direct discharge to groundwater is generally not permitted and any indirect discharge to groundwater must be limited and be controlled by technical precautions in order to prevent pollution. Non-hazardous Pollutants include ammonia and nitrites, many metals and fluorides.

MANAGEMENT OF CONTAMINATED LAND

When risk assessment of the site has been completed and this indicates that remedial works are required, the main guidance in managing this process is set out in the DEFRA/EA online guidance LCRM (2020) "Land Contamination: Risk Management" The stages of managing remediation are as follows:

(a) Options Appraisal and develop Remediation Strategy;
(b) Develop Implementation Plan and Verification Plan;
(c) Remediation, Verification and Monitoring.

The Remediation Strategy sets out the remediation targets, identifies technically feasible remedial solutions and presents an evaluation of the options so that these can be assessed enabling that the most suitable solution is adopted. An outline of the proposed remedial method should be presented. Agreement should be sought of the appropriate statutory bodies for the Remediation Strategy before proceeding to the next stage.

The Implementation Plan is a detailed method statement setting out how the remediation is to be carried out including stating how the site will be managed, welfare procedures, health and safety considerations together with practical measures such as details of temporary works, programme of works, waste management licences and regulatory consents required. Agreement should again be sought of the appropriate statutory bodies for this Plan.

The Verification Plan sets out the requirements for gathering data to demonstrate that the remediation has met the required remediation objectives and criteria. The Verification Plan presents the requirements for a wide range of issues including the level of supervision, sampling and testing regimes for treated materials, waste and imported materials, required monitoring works during and post remediation, how compliance with all licenses and consents will be checked etc. Agreement should again be sought of the appropriate statutory bodies for the Verification Plan. On completion of the remediation a Verification Report should be produced to provide a complete record of all remediation activities on-site and the data collected as required in the Verification Plan. The Verification Report should demonstrate that the remediation has met the remedial targets to show that the site is suitable for the proposed use.

GLOSSARY

TERMS				UNITS	
AST	Above Ground Storage Tank			m	Metres
BGS	British Geological Survey			km	Kilometres
BSI	British Standards Institute			%	Percent
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes			%v/v	Percent volume in air
CIEH	Chartered Institute of Environmental Health			mb	Milli Bars (atmospheric pressure)
CIRIA	Construction Industry Research Association			l/hr	Litres per hour
CLEA	Contaminated Land Exposure Assessment			ha	Hectare (10,000m^2)
CSM	Conceptual Site Model			µg/l	Micrograms per Litre (parts per billion)
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)			ppb	Parts Per Billion
DWS	Drinking Water Standard			mg/kg	Milligrams per kilogram (parts per million)
EA	Environment Agency			ppm	Parts Per Million
EQS	Environmental Quality Standard			mg/m^3	Milligram per metre cubed
GAC	General Assessment Criteria			Mg/m^3	Megagram per metre cubed
GL	Ground Level			$µg/m^3$	Microgram per metre cubed
GSV	Gas Screening Value			m bgl	Metres Below Ground Level
HCV	Health Criteria Value			m bcl	Metre Below Cover Level
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel)			mOD	Metres Above Ordnance Datum (sea level)
ND	Not Detected			kN/m^2	Kilo Newtons per metre squared
LMRL	Lower Method Reporting Limit			kPa	Kilo Pascal – same as kN/m^2
NR	Not Recorded			µm	Micro metre
OD	Ordnance Datum				
PAH	Poly Aromatic Hydrocarbon				
PCB	Poly-Chlorinated Biphenyl				
PID	Photo Ionisation Detector				
PCSM	Preliminary Conceptual Site Model				
SGV	Soil Guideline Value				
TPH (CWG)	Total Petroleum Hydrocarbon (Criteria Working Group)				
SPT	Standard Penetration Test				
SVOC	Semi Volatile Organic Compound				
UST	Underground Storage Tank				
VCCs	Vibro Concrete Columns	VSCs	Vibro Stone Columns		
VOC	Volatile Organic Compound				