

Our ref: 7962si

Site Investigation Report
for land at
Cwrt Pentwmpath,
Llay

For: Castlemead Group Limited
Abenbury House
17 Wilkinson Business Park
Clywedog Road South
Wrexham
LL13 9AE

21st December 2022

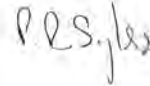
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Document Verification

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**Document Revision**

Report Reference	Date	Description	Prepared	Checked and Approved
7962si	21 st December 2022	Site Investigation Report	J A Lewis	P R Sykes

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1.0 Introduction

- 1.1 This report details the findings of the site investigation for a proposed residential development on land at Cwrt Pentwmpath, Llay. This report was prepared on instructions received from our client Castlemead Group Limited, Abenbury House, 17 Wilkinson Business Park, Clywedog Road South, Wrexham, LL13 9AE .
- 1.2 The copyright of this report and the associated plans/documents prepared by Coopers (Chester) Ltd, trading as Coopers, is solely owned by Coopers. Consequently, neither this report nor the associated plans/documents may be reproduced, published or adapted without the express written approval of Coopers. Complete copies of this report may, however, be made and distributed by our client as an expedient in dealing with matters directly related to its commission.
- 1.3 The accuracy of map extracts cannot be guaranteed and it should be recognised that different conditions on /adjacent the site may have existed between and subsequent to the various map surveys. Historical map extracts are produced as an appendix report by Groundsure under licence from Ordnance Survey. Coopers can reproduce and use these extracts in this report under their Ordnance Survey Licence No. AL100005579.
- 1.4 Where data supplied by others, including that from previous investigations, has been used it has been assumed that the information is correct. No responsibility can be accepted by Coopers for inaccuracies within the data supplied by others. We would advise that our client makes their own detailed enquiries to the Local Authorities to determine any additional planning constraints which may be applied to this site and which have not been identified within this report.
- 1.5 The results of the exploratory holes are based upon the facts established from observations and field tests. It should be recognised that strata may vary considerably from point to point and the groundwater regime may be influenced by seasonal or other factors. While every attempt is made to assess the likelihood and extent of such variations, conditions may nevertheless exist which are undisclosed by this investigation.
- 1.6 This report has been prepared in accordance with the Building Regulations “Site preparation and resistance to contaminants and moisture: Approved Document C”, 2013 and complies with the requirements associated with the planning guidance. This report should address the conditions placed within the planning conditions regarding the ground conditions and contamination. This report has been prepared in accordance with the requirements of the NHBC Standards, Chapter 4.1. The scope of this report complies with the criteria for certification under the Initial Assessment including the Desk Study (D1), the Walkover Survey (D2), and the Basic Investigation (D4). This report constitutes a Tier 1: Preliminary Risk Assessment and Tier 2: Generic Quantitative Risk Assessment in accordance the Environment Agency online guidance Land Contamination: Risk Management (LCRM). The report is also prepared in accordance with BS10175: 2011+A2:2017, and complies with Phase 1 (Preliminary Investigation), and Phase 2 (Exploratory Investigation) investigation.
- 1.7 The further actions deemed necessary to be completed prior to development of the proposed site for residential development have been listed in Section 23.0 of this report. The full extent of further actions may not be limited to those issues stated and, during the course of the development, additional further actions may be required.

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- 1.8 **The report should be read in its entirety, including all associated drawings and appendices. Coopers cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.**
- 1.9 Arboricultural survey and advice on arboricultural issues are considered to be outside the scope of this report except for their effect on the foundations to the proposed buildings. Where identification of any species is made, especially invasive plants such as Japanese knotweed, Himalayan balsam or giant hogweed, this should only be considered as a preliminary assessment and subject to confirmation by a professional ecologist. Coopers takes no responsibility for failing to identify, or the incorrect identification of, any tree or plant species on site.
- 1.10 This report is prepared and written in the context of the purposes stated above and should not be used in a different context. Furthermore, new information, improved practices and legislation may necessitate an alteration to this report in whole or in part after its submission. Therefore, with any change in circumstances or after the expiry of one year from the date of this report, the report should be referred to Coopers for reappraisal.

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2.0 Executive Summary

Grid Reference	SJ 335 557 (Refer to Drawing No. 7962/L1)
Approximate Area	1.17 acre (0.474 ha)
Site Investigation Data (Appendices 7 to 10)	The excavation of a 5 No. machine dug trial pits, 3 No. infiltration test pits, 1 hand dug trial pit and hand held dynamic cone penetrometer test location on 23 rd November 2022 by Coopers.
Basis of Assessment (Section 3.0)	The proposed development will consist of residential properties potentially including 1 No. two storey apartment block, 1No. semi detached and one mews of bungalows with associated private gardens, landscaping and car parking with a current electricity sub-station to remain in situ.
Site Location, Description and Boundaries (Section 4.0)	The site was located to the south of Eighth Avenue, Llay. The site comprised of a 2No. two storey apartment blocks with car parking, gardens and soft landscaping and an electricity sub-station.
Site History (Section 5.0)	The site was shown to be greenfield land since the earliest historical mapping, until it was developed with the apartment blocks by 1980.
Hazardous Installations (Section 6.0)	No hazardous installations or permitted sites recorded on site or within 250m of the site boundary.
Utility Locations (Sections 4.0 and 6.0)	- Overhead and underground British Telecom (BT) lines crossing the site. - High voltage power lines are present in the north of the site connected to an on site electricity sub-station. Low voltage power lines cross the centre of the site approximately north to south from the electricity sub-station, then along the southern end of the western site boundary and also follow just parallel to the outside of the eastern site boundary. - Foul sewers cross the site, draining off to the south east. - Surface water drainage flows to on site soakaway pits. - A potable water supply pipe enters the site along the western boundary. - A gas supply is present along Eighth Avenue to the west of the site boundary and to the south of the site. - Overhead service lines were surveyed on site but the service was undefined.
Protected sites etc (Section 7.0)	A Local Nature Reserve was recorded 709m to the south of the site and numerous Ancient Woodlands within the vicinity of the site, the nearest being 44m to the north east. There are no archaeologically protected sites within 250m of the site.
Geology, Hydrology & Hydrogeology (Section 8.0)	The information below is based upon the desk study information only: <u>Drift</u> – Glaciofluvial deposits of sand and gravel below the majority of the site with Glacial Till comprised of clay, sand and/or sand and gravel deposits across the north western boundary. <u>Bedrock</u> – Salop Formation comprised of mudstone, sandstone and conglomerates. <u>Geological Faults</u> – an inferred fault is present approximately 400m to the west of the site of the site, trending north west to south east. <u>Groundwater</u> - the Glaciofluvial deposits were designated as a Secondary (A) Aquifer, the Glacial Till a Secondary (Undifferentiated) Aquifer, and the bedrock as a Secondary (A) Aquifer. The site does not lie within a Groundwater Source Protection Zone. There were no permitted groundwater abstraction points within 2km of the site. <u>Hydrology</u> – Nant y Gaer was the nearest surface water course 82m to the north east of the site. <u>Flood Risk</u> – the site lies in an area with a 0.1% chance of flooding from rivers, surface water and small watercourses and the sea. The highest risk due to surface water flooding was recorded to be 0.1m to 0.3m depth as a 1 in 100 year occurrence in the far south east of the site only. The remainder of the site was reported as not being at risk due to surface water flooding. <u>Mineral Safeguarding</u> No historical mineral planning permissions are applicable to the site and the site lies outside a mineral safeguarding area. A Category 1 Aggregates Safeguarding Area for sand and gravel lies adjacent to the site with a very low likelihood that this resource would be accessed adjacent to the proposed development. <u>Oil and Gas Production</u> The UK government has placed a moratorium on hydraulic fracturing (or fracking) of shales but the geological potential exists for this to occur in the future.

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Coal Mining and Brine Extraction (Section 9.0)	The area is not affected brine extraction. However, the site is underlain by 5 No. coal seams at depths 680m and greater, in which extraction ceased by 1966. There are no recorded mine entries within 750m of the site and no opencast mining in the area. There is no known proposal for mine working at depth or opencast in the area. There are no records of subsidence due to coal mine working in the locality of the site. No special precautions are considered necessary due to the past mine extraction.
Ground Conditions (Section 11.0)	<u>Topsoil/madeground (similar to topsoil):</u> No topsoil recorded only madeground (similar to topsoil) on site, including brick, rare glass, ceramics and plastics. <u>Madeground:</u> Shallow madeground including generally brick, glass, ceramics, natural stone and plastic, with limestone gravel below tarmacadam hardstanding and in service trenches. <u>Drift strata:</u> Interbedded sand and clay strata, generally with a clayey sand band overlying clay then a gravelly sand stratum below. Sand and gravel was found locally. <u>Bedrock:</u> Not encountered. <u>In situ testing:</u> The clay strata were proven to be between firm and very stiff with undrained shear strengths of between 78kPa and 182kPa recorded, giving an approximate equivalent safe bearing capacity of between 133kPa and 312kPa. Equivalent Standard Penetration Test values in the sand and gravel stratum recorded N values of 15 and above confirming the sand and gravel to be at least medium dense. The sand strata were assumed to be at least loose to medium dense. <u>Underground structures:</u> No structures such as floor slabs recorded but services were encountered within exploratory holes. <u>Groundwater:</u> Only minor groundwater seepages were noted in two locations perched at the head of the clay strata.
Ground Gas Risk Assessment (Section 12.0)	No recorded historical or active landfill sites are present within 250m of the site. The conceptual model has demonstrated that there is a negligible risk posed to the proposed development. The site is therefore classified as Green in accordance with the NHBC Report No. 10627-R01(04)/CS1 in accordance with BS8485:2015+A1:2019.
Radon (Section 12.0)	Basic precautions are required for radon in the new buildings on this site.
Contamination (Section 13.0)	No contamination encountered in any of the strata. No mobile contamination identified on site to date. Standard polyethylene piping may be used.
Sub-Soil Classification (Section 14.0)	<u>Soil Properties</u> Natural sand – assumed to be frost susceptibility. Clay – medium shrinkage. <u>Concrete Classification (Based on BRE Special Digest 1 (2005))</u> The worst case sulphate conditions for the site would be: natural clay - DS-1, AC-1s, DC-1; natural sand - DS-1, AC-1, DC-1.
Trees (Section 15.0)	Mature and semi mature trees line the site boundary and have been present on site until recent felling.
Ground Floor Slabs (Section 16.0)	Precast (block and beam) suspended floor slabs are likely to be used on site.
Anticipated Foundations (Section 17.0)	The foundation types are subject to finalised planning layout, ground conditions and external works levels and investigation following demolition. Foundations have been proposed based on the current ground levels. Foundations are likely to be on mixed bearing strata of firm, firm to stiff and stiff clay, loose to medium dense sand and medium dense sand and gravel. Maximum safe bearing capacity 100kPa recommended. Bearing strata at less than 1.2m depth across part of the building footprints but extending deeper in areas of tree influence in the clay up to 2.5m below current ground level, with heave precautions required in some sections. Therefore, mass concrete trenchfill foundations with localised heave precautions are recommended.
Dewatering, Trench Side Stability (Sections 18 and 19.0)	Significant dewatering would not be required in deep excavations and service/drainage trenches. However, seasonal factors may affect changes in groundwater levels at the site, resulting in the requirement for dewatering for shallow foundations or drainage trenches. Generally, clays, sands and sand and gravel encountered across the site will remain stable in the short term but may become unstable after being left open over longer periods of time.

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Potential Infiltration (Section 20.0)	The three infiltration test locations each failed on the first test, showing the shallow ground conditions would be unsuitable for permeable paving in the proposed car parking area. Infiltration rates at depth in the east of the site were very slow, currently indicating that a deep crate infiltration system would not be practicable.
Road and Parking Sub-Grade (Section 21.0)	The clay materials can achieve in situ CBRs between 3% and 5%. The sands beyond the clay should be able to achieve an estimated in situ CBR of up to 5%. The loose to medium dense sand can be engineered to achieve an estimated in situ CBR of up to 5% and the medium dense sand and gravel to achieve between 5% and 10%.
Build phase remediation and validation (Section 22.0)	Remediation – - No known remediation required across the site with regards to contamination. - Madeground (similar to topsoil) and madeground are chemically suitable for use but due to glass fragments and other anthropogenic inclusions cannot be used in the growing medium. - It is recommended that the madeground (similar to topsoil) is removed from site. The madeground may be re-used below hardstanding and building footprints. - Additional soil sampling required in the vicinity of electricity sub-station once the services have been disconnected and the tarmacadam forming the car park has been removed to assess for potential presence of PCBs. If present, soils containing PCBs will require delineation and segregation and assessment for their potential re-use. Should PCBs be encountered in the soils, these soils will require delineation and segregation should they require excavation, to prevent the re-use of these soils within the growing medium and assess the potential for their re-use on site if required. - A low density polyethylene (LDPE) membrane 400µm (1600 gauge) recommended for installation in conjunction with the pre-cast suspended concrete floor slab as protection against radon ingress. Validation – - An addendum letter report with regards to the PCB sampling and risk assessment would need to be provided by a qualified geo-environmental consultant for submission to Wrexham CBC, in support of the planning application and the NHBC. - If topsoil and/or sub-soil are imported to site, sampling for chemical testing required. - Validation of removal of madeground and madeground (similar to topsoil) from growing medium. - Validation report to be provided to the regulators with regards to data collated relating to the imported soils. - Validation of radon protection measures recommended together with validation reporting.
Further Actions (Section 23.0)	- Submit this site investigation report to Wrexham CBC in support of the planning application and approval from the CLO and to the NHBC for approval. - Due to the presence of services within and adjacent to the site, consultations should be held with service providers regarding plans to adopt, divert, or abandon the services. - Soil sampling, risk assessment and reporting with regards to potential PCBs in the vicinity of the electricity sub-station following the disconnection of the services and lifting of the car park surface. Report to be submitted to Wrexham CBC in support of the planning application. - Additional investigation of ground conditions following demolition of the current buildings and in the vicinity of the proposed mews bungalows to aid foundation design. - In situ CBR tests undertaken within road corridors and parking areas. - Refinement of plot specific foundations, following production of finalised external works drawings and drainage plans. - Delineation/segregation of madeground (similar to topsoil) and madeground, with removal of madeground (similar to topsoil) from site. - Removal of waste stockpile from site to a permitted waste management site. - Validation of the radon protection installation is recommended with the production of a validation report, for submission to the regulators for approval (if the latter is required). - The direct transfer of topsoil/subsoil to the site would require the application of either a U1 exemption or an MMP, depending on the volumes to be imported. - Validation of imported topsoil and subsoils if required, with validation report prepared for submission to Wrexham CBC in support of the planning application. - If surplus strata require offsite removal they are likely to require testing to confirm suitability for the intended end use at the receiving site. Where strata are intended for landfill they may require testing for Waste Acceptance Criteria (WAC).

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3.0 Basis of Assessments

3.1 Development proposals

The proposed development will consist of 25 No. residential properties potentially including semi-detached and mews bungalows and one two storey apartment block, with associated car parking, private gardens and public open space. The proposed planning layout is presented in Munro Associates Preliminary Site Layout (Option B) Drawing No. 20.211 P-105 RevB, presented in Appendix 16.

It is assumed that all materials and workmanship will comply with the Building Regulations and the NHBC Standards.

3.2 Previous site investigation

Coopers are unaware of any previous site investigation being undertaken at the site.

4.0 Site Location, Description and Boundaries

4.1 General

The 1.17 acre (0.474 ha) site was located to the east of Eighth Avenue, Llay, approximately 5.5km to the north of Wrexham town centre, at National Grid Reference SJ 335 557. The location of the site is shown on Drawing No. 7926/L1 in Appendix 16.

The site was irregular in shape. The site was recorded to lie at approximately 80m above Ordnance Datum (aOD) at the northern corner of the site and 75.5m aOD at the southern corner of the site.

4.2 Site description

At the time of the investigation, the site was occupied by 2 No. two storey apartment blocks interlinked with a walkway, one building present in the north west of the site the other in the centre. The buildings were surrounded by lawned areas, 2 No. private gardens, parking bays, access paths and an access road. A single garage was present in the far east of the site and 4 No. outbuildings were present in the southern half of the site. Photographs 1 to show the general site status. The layout of the site can be seen in Drawing No. 7962/AP, presented in Appendix 16.

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Photograph 1: View to the north showing site access road and east end of current apartment block



Photograph 2: View to the south west along the front of the apartment blocks, with slope up to Eighth Avenue and telegraph pole/overhead BT lines in west corner of site



Photograph 3: View to the north west



Photograph 4: View to the south east across the current car park

The site was surrounded by board fencing along the western boundary, which followed part of the access road. The private gardens were fenced off with mesh and board fences. Rail fencing followed the access paths and access road. A waste heap, covering an area approximately 1m x 1m, including soil, wire mesh, wooden planks and concrete was located to the west of the site (see Photograph 5).

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Photograph 5: Waste heap in west of site

The site sloped down from the north at approximately 80m above Ordnance Datum (aOD) to 77m aOD in the south. It also sloped down from approximately 78.5m aOD in the far west of the site to 76.5m aOD in the east of the site. The main decrease in site levels was noted to be in the northern half of the site, with a bank falling by approximately 1m over approximately 3m distance to the west and north of the building in the west of the site.

The majority of the trees originally present across the site, had recently been felled. Mature trees and a hedge were present along the northern half of the eastern site boundary.

An electrical sub-station was located immediately next to the garage (see Photograph 6) and backing onto the central part of eastern boundary. A coarse limestone gravel, clear of vegetation, was present around the sub-station with turf beyond the gravel surround to the northern side. No evidence of possible contamination was observed around the outside of the sub-station.



Photograph 6: View to the north west



Photograph 7: View to the south east across the current car park

A BT telegraph pole was located on the western site boundary with overhead wires extended across the western part of the site to the buildings (see Photograph 2). A street light was present in the far west corner and far north corner of the site and a further light was located adjacent to the car park. Manholes for soakaways were observed in the east of the site.

As shown in Drawing No. 7962/AP, presented in Appendix 16, the site was bounded by Eighth Avenue to the north west and a public footpath to the south west, with residential properties beyond to the north, west and south of the site. A field was located adjacent to the north east of the site. An above ground domestic kerosene fuel tank was noted adjacent to the far south east corner of the site boundary, as shown in Photograph 7.

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5.0 Site History

Information regarding the history of the site and its immediate adjacent area (<250m radius) is shown on the available historical OS mapping at scales of 1:10,560, 1:10,000, 1:1,250 and 1:2,500 supplied by Groundsure Insights, presented in Appendix 1. All relevant former features indicated on the maps on site have been reproduced on the Site Plan, Drawing No. 7962/01 contained in Appendix 16.

On Site: The first available historical OS map of 1872 indicated the site to have been agricultural land, subdivided by field boundaries. The early maps show the site was originally formed by parts of 8 No. fields, segregated with tree lined hedges/fencing. The current buildings were constructed by circa 1980 together with the electricity sub-station adjacent to the north eastern site boundary.

Adjacent: The historical maps record the surrounding land use from 1872 as agricultural land with:

- 1 No. pond 50m to the south west, 1 No. approximately 200m to the north east and 1 No. 200m to the north west;
- scattered residential buildings, one being immediately adjacent to the south eastern site boundary;
- a minor road approximately 100m to the east of the site;
- 3 No. wells, the nearest being approximately 100m to the east of the site; and
- a water course flowing north west to south east, approximately 100m to the north east of the site boundary, with a woodland following the course.

By, 1899 1 No. small gravel pit approximately 10m in diameter, was present approximately 170m to the north east, which was no longer present by 1960.

By 1938, a housing estate with public open spaces had been developed in the vicinity of the site, including Eighth Avenue, adjacent to the western site boundary, the 2 No. ponds to the north west and south have been developed upon. A depression was recorded in a public open space approximately 210m to the south west of the site from circa 1960 until 1973. By 1970 a depot was noted to be present approximately 100m to the south of the site.

The pond and area of the former gravel pit to the north east of the site were constructed upon by a residential development built by 1980.

6.0 Hazardous Installations and Development Constraints

6.1 The Groundsure Enviro+Geo Insight report, dated 11th November 2022 (presented in Appendix 2) indicates that none of the following were present within 250m of the site, at the time of issue.

- Records of active or historic Part A(1) permits and Integrated Pollution Prevention and Control processes.
- Records of active or historic Part A(2) and Part B activities.
- Records of enforcement or prohibition notices.
- Records of Environment Agency Recorded Pollution Incidents for Lists 1 and 2 substances.
- Records of storage and release of Radioactive Substances.
- Records of sites determined as Contaminated Land under Part 2A EPA 1990.
- Records of Environment Agency underground high pressure oil and gas pipelines.
- No fuel stations.

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- Records of operational and non-operational permitted landfill sites, waste treatment and disposal sites and non-operational waste transfer stations.

2 No. pollution incidents were reported to have occurred within the last 10 years, one 14m to the north east and one 189m to the east of the site in 2013 and 2014 respectively. Both incidents related to the impact caused by sewage effluent with a minor impact recorded to land and no impact to air.

6.2 The Groundsure Enviro+Geo Insight report did not record any of the following hazardous sites within 500m of the proposed development:

- Records of current COMAH and NIHHS sites.
- Records of planning hazardous substance consents and enforcements.
- Notification of installations handling hazardous substances.

6.3 The consultation response from Wrexham County Borough Council (CBC), presented in Appendix 3, confirmed that they hold no record of closed, operational or proposed landfill sites within 250m of the proposed development.

6.4 The Wrexham CBC response identified that, according to their records, the only potentially contaminative use on site may be due to the presence of the electricity sub-station on site. This resulted in the planning condition being recommended for a contamination assessment to be undertaken with regards to the Planning Application Reference P/2022/0914).

6.5 The site is referenced on generic risk maps of being at low risk of unexploded ordnance, with no recorded military, target or UXO finds recorded in the local area.

6.6 Service plans were provided by the client, which recorded the following, as depicted on Drawing No. 7962/01, presented in Appendix 16:

- Overhead and underground British Telecom (BT) lines crossing the site.
- High voltage power lines are present in the north of the site connected to an on site electricity sub-station. Low voltage power lines cross the centre of the site approximately north to south from the electricity sub-station, then along the southern end of the western site boundary and also follow just parallel to the outside of the eastern site boundary.
- Foul sewers cross the site, draining off to the south east.
- Surface water drainage flows to on site soakaway pits.
- A potable water supply pipe enters the site along the western boundary.
- A gas supply is present along Eighth Avenue to the west of the site boundary and to the south of the site.
- Overhead service lines were surveyed on site but the service was undefined.

7.0 Animal Burial Sites and other Environmental, Archaeological, Ecological and Conservation Issues

7.1 The Animal and Plant Health Agency does not provide information concerning records relating to animal burial sites. However, the agency recommends that it should be contacted immediately if animal burials are encountered during development works.

7.2 According to the Groundsure Enviro+Geo Insight report (presented in Appendix 2) there were no Sites of Special Scientific Interest (SSSI), Special Protection Areas, Special Areas of Conservation, Ramsar Sites, National Nature Reserves, Environmentally Sensitive Areas, Areas of Outstanding Beauty or National Parks within 1km of the site.

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- 7.3 The Groundsure Enviro+Geo Insight report referenced a Local Nature Reserve, located 709m to the south of the site and numerous Ancient Woodlands within the vicinity of the site, the nearest being 44m to the north east.
- 7.4 The Groundsure Enviro+Geo Insight report did not report any archaeological protected sites within 250m of the site.
- 7.5 A tree survey had been undertaken by Tree Solutions, dated 17th September 2021, as presented in Appendix 4. This provides details relating to the presence of the hedges and trees/former trees present on site.
- 7.6 No ecological surveys concerning invasive species or protected species were provided to Coopers. If these have not been undertaken, it is recommended that specialists are consulted.

8.0 Geology, Hydrology & Hydrogeology

8.1 Drift

The geological maps referenced in the Groundsure Enviro+Geo Insight report (presented in Appendix 2) and the Geology of Britain Viewer presented on the BGS website () record drift comprising Glaciofluvial deposits (sand and gravel) below the majority of the site with Glacial Till (clay potentially interbedded with sands/sands and gravels) immediately adjacent to the north western site boundary and overlapping this boundary. The Glacial Till was shown to extend off site to the south west and north east, as well as to the west.

The nearest BGS borehole log SJ35NW6 (see Appendix 5) for a location approximately 400m to the west of the site, indicates drift deposits comprising gravel to 37.49m below ground level (bgl).

8.2 Bedrock

The geological maps referred to in Section 8.1 show the drift deposits are underlain across the site by the Salop Formation comprised of mudstone, sandstone and conglomerates at depths considered likely to be greater than at least 20m bgl, according to the nearest BGS borehole log.

8.3 Geological Faults

The BGS mapping indicates an inferred fault is present approximately 400m to the west of the site of the site, trending north west to south east.

8.4 Groundwater Vulnerability, Hydrogeology and Hydrology

According to the Groundsure Enviro+Geo Insight report (presented in Appendix 2) and Magic Map (<https://magic.defra.gov.uk/MagicMap.aspx>), the Glaciofluvial deposits underlying the site were designated as a Secondary (A) Aquifer and the Glacial Till overlapping the site boundary was designated as a Secondary (Undifferentiated) Aquifer. The bedrock was designated as a Secondary (A) Aquifer.

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The site was recorded as not lying within a Groundwater Source Protection Zone. According to the Groundsure Enviro+Geo Insight report, there were no current groundwater abstractions within 2km of the site. The nearest historical groundwater abstraction permit was recorded for general farming and domestic purposes at 1.88km to the north east of the site. Wrexham CBC advised that they hold no record of any private water supplies within 2km of the site (see Appendix 3).

The nearest surface water course recorded on the OS mapping, is Nant y Gaer, 82m to the north east of the site. This flows north west to north east and is a tributary of the River Alyn, approximately 800m to the south east of the site. The River Alyn is a surface water body considered under the Water Framework Directive. The last status of this water body was recorded by the Groundsure Enviro+Geo Insight report to have a good chemical rating, a moderate ecological rating and an overall moderate rating in 2016.

No current surface water abstraction permits were noted within 1km of the site.

The general topography of the site was recorded to slope slightly down gradient from north to south and from west to east. This trend is generally towards the surface water courses the Nant y Gaer to the east and the River Alyn to the south east. It was considered that, should there be any shallow groundwater flow within the drift deposits, that this would follow this trend towards the water courses, particularly the Nant y Gaer.

8.5 Flood Risk

According to the Natural Resources Wales website (<https://naturalresources.wales/flooding/managing-flood-risk/understanding-your-flood-risk-results?>), there was a 0.1% chance of flooding from rivers, surface water and small watercourses and the sea at the site. The Groundsure Enviro+Geo Insight report recorded the highest risk due to surface water flooding of 0.1m to 0.3m depth to be a 1 in 100 year occurrence in the far south east of the site only. The remainder of the site was reported as not being at risk due to surface water flooding.

Site specific assessments of flood risks are not part of the remit of this report. Reference should be to relevant specialist assessments of flood risk and drainage for further details on limitations and requirements to mitigate against risks of flooding for the proposed end use.

8.6 Subsidence Hazards

According to the Groundsure Enviro+Geo Insight report, the site was assessed to have a negligible to very low risk hazard of being affected by natural ground subsidence, shrink swell clay, landslides, collapsible deposits, running sand, dissolution of soluble rocks and compressible ground stability.

8.7 Mineral Safeguarding

Where mineral resources are present the mineral planning authority may designate areas as Mineral Safeguarding Areas (MSA) and Mineral Consultation Areas (MCA). These are aimed to safeguard areas from unnecessary sterilisation by non-mineral development.

The Groundsure Enviro-Geo Insight report stated that there are no historical mineral planning permissions applicable to the site. The site was indicated by the BGS and Welsh Government “North East Wales: Aggregates Safeguarding Map for Wales” as lying outside a mineral safeguarding area but with a Category 1 Aggregates Safeguarding Area for sand and gravel adjacent to the north east.

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Given the location of this area was indicated as following the Nant y Gaer surface water course with a designated Ancient Semi-Natural Woodland along its banks, there is a very low likelihood that this resource would be accessed adjacent to the proposed development.

8.8 Oil and Gas Production

The UK government has placed a moratorium on unconventional extraction of onshore natural gas via hydraulic fracturing (or fracking) of shales (primarily Bowland Shale Formation – within Carboniferous bedrock). As with many parts of north east Wales the geological conditions exist which are locally favourable for small scale onshore gas production via fracking. Subject to political and socio-economic considerations there is potential that the fracking of shale gases may occur locally in the future, which would be subject to regulatory and planning obligations.

9.0 Coal Mining, Brine Extraction and Other Mine Extraction

- 9.1 The Coal Authority Interactive Map Viewer reports that the site lies within a Coal Mine Reporting Area. A CON29M Coal Mining report was obtained for the site (see Appendix 6), which indicates that the site is underlain by past underground mining within 5 No. coal seams at depths between 680m and 910m bgl. These were last worked in 1966. The site does not lie within an area of current underground coal mining.

There are no recorded mine entries within 20m of the site, or within the site boundary, according to the Coal Authority report and there were none recorded on the Coal Authority Interactive Map Viewer within 750m of the site.

While the site overlies future potential reserves of coal, the Coal Authority is not aware of any proposed coal mining in the area, due to applications received or licences granted.

No known opencast mining has occurred within the site boundary and the site does not lie within 200m of an opencast coal mine. There are no proposals to undertake opencast coal mining within 800m of the site boundary.

The Coal Authority is not aware of any subsidence due to coal mining on site or in the area, which may have posed structural damage to properties. The Authority has no record of mine gas emissions posing a risk to properties in the area.

- 9.2 It is considered that the effects of coal mining within the area will not have an adverse impact on the proposed development as the coal measures are located at depth greater than 680m bgl with no shallow coal measures present, and mining activities ceased in 1966. The Coal Authority consider that over the time period since then, subsidence will have ceased. The most likely method used to extract the coal at such depths would have been long wall mining. This method involved the advancement of the face supports once coal had been extracted, leaving the rock unsupported leading to collapse where coal had been removed. Subsidence tended to correlate with the advancement of the working face, with influence at the surface occurring after a time lag. Studies have shown that subsidence activities generally may occur between 2 years and 7 years with a few instances taking up to 11 years. Therefore, no special precautions are required for the proposed development in respect of coal extraction.
- 9.3 The Groundsure Enviro+Geo Insight report (see Appendix 2) stated that the site does not lie within an area affected by any other form of mine extraction, including brine extraction activities. No special precautions are required for the proposed development in respect of such mining activities.

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10.0 Ground Investigation Methodology

- 10.1 Coopers were commissioned by Castlemead Group Limited to undertake a site investigation, in order to determine potential geotechnical and geo-environmental risks and constraints associated with the proposed residential development and to assess the infiltration potential of the ground to assist with the proposed drainage design.
- 10.2 The ground investigation was undertaken while residents still occupied the buildings to be replaced by the new development. Exploratory hole locations were limited by the presence of the current buildings, fencing, live services across the whole site and the need to maintain safe access for the residents. A survey of on site services was provided to Coopers, the locations of which can be seen on Drawing No. 7962/01 presented in Appendix 16.
- 10.3 The ground investigation was completed on 23rd November 2022. Coopers supervised the excavation of 5 No. machine dug trial pits (TP101 to TP05) and 3 No. machine dug infiltration test pits using a JCB 3CX machine and undertook 1 No. hand dug trial pit (HDTP01). The locations of the exploratory holes are also depicted on Drawing No. 7962/01.
- The trial pits were excavated to between depths of 2.6m and 2.8m bgl, with the exception of TP05, which was terminated at 1.3m bgl, due to the potential presence of underlying services identified during the excavation.
- The hand dug trial pit was excavated at a location where services were present in the near vicinity and the ground levels prevented safe access to the excavator.
- Infiltration test pits ITP01 and ITP03 were excavated to shallow potentially permeable strata to assess the potential for the installation of permeable paving below the proposed car park, these being excavated to 1.8m bgl and 1.0m bgl respectively. ITP02 was taken to 2.5m, to assess the potential for a deep infiltration system.
- 10.4 The exploratory hole locations were positioned in part to gain a spread which would enable assessment of the general ground conditions across the site. The proposed location of infiltration test pit ITP02 was to be nearer to the electricity sub-station but due to the detection of site services at the proposed location, ITP02 needed to be moved further south to the location presented on Drawing No. 7962/01. Due to the electricity sub-station being live, with services feeding and exiting the substation on the three accessible sides, it was not feasible to undertake any excavation immediately adjacent to the substation.
- 10.5 In situ testing was undertaken to enable assessment of the bearing capacities of the strata encountered. Hand shear vane tests were completed on cohesive strata within the trial pits, where feasible. One hand held dynamic cone penetrometer test location was completed adjacent to trial pit TP02, in order to establish the equivalent standard penetration test (SPT) N values of the sand and gravel.
- 10.6 The presence of all the exploratory holes permitted Coopers to select soil samples for chemical analysis in order to characterise the made ground and natural ground conditions. The samples were submitted to Derwentside Environmental Testing Services Limited (DETS), an MCERTS accredited laboratory, for chemical analysis. All samples analysed were stored in appropriate containers supplied by the laboratory. Where samples were not collected immediately by the laboratory, these were refrigerated to ensure they were kept at a temperature below 8°C.

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The chemical analysis appropriate to the environmental risk assessment was scheduled as discussed in Section 13.7. Samples were also scheduled for analysis applicable to the assessment of sulphate attack on concrete, as discussed in Section 14.

- 10.7 Cohesive soil samples were also taken for submission to Murray Rix for geotechnical testing, this including moisture content and plasticity index.

11.0 Ground Conditions

11.1 General

The data collated from the exploratory holes undertaken by Coopers was used to define the ground conditions across the site. The locations of the exploratory holes are illustrated on Drawing No. 7962/01, in Appendix 16. Exploratory hole logs are presented in Appendices 7 to 10.

11.2 Topsoil/madeground (similar to topsoil)

No topsoil was identified in the exploratory holes. Madeground (similar to topsoil) was present in each exploratory hole, these having been excavated within areas of soft landscaping, with the exception of infiltration test pit ITP02, excavated within the current car park. The madeground (similar to topsoil) had the same characteristics across the site, this being a slightly gravelly, sandy silt. The gravel comprised various lithologies and anthropogenic inclusions, predominantly brick but also rare glass, ceramics and plastic. This stratum varied between 0.2m and 0.5m thick.

11.3 Madeground

Madeground was encountered in trial pits TP01, TP02, TP05 and infiltration test pits ITP01 to ITP03. This ranged between 0.01m and 1.1m thickness, the base of the madeground ranging between 0.3m and 0.7m bgl except in TP05 where the depth of madeground was recorded to 1.3m bgl but the overall depth could not be proven. It is considered that this was likely to be within a service trench.

Madeground in ITP02, located in the car park, comprised 0.1m thick tarmacadam over a 0.2m thick gravel base of limestone. This was found to overlie a relic topsoil.

Madeground gravel, 0.1m thick, was also encountered in TP01, the gravel being comprised of limestone and mudstone, possibly associated with an adjacent service trench fill.

Madeground in the remaining exploratory holes was recorded to be generally a slightly silty, slightly clayey, gravelly sand, the gravel being comprised of brick, glass, natural stone and plastic fragments. A low cobble content of brick was also reported in some locations.

11.4 Natural strata

Drift strata

The ground investigation identified that generally there were interbedded sand and clay strata across the site. The bedding tended to follow a similar pattern across the centre of the site from east to west.

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A slightly silty gravelly sand with variable proportions of clay, usually clayey to very clayey, tended to be present immediately below the made ground (similar to topsoil) and made ground strata. This sand stratum was present to depths ranging between 0.9m and 1.3m bgl and was between 0.5m to 0.9m thick. Below this was a slightly sandy, slightly gravelly, silty clay. The base of this stratum ranged between 1.3m and greater than 2.6m bgl (depth not proven in TP03) and was between 0.4m and at least 1.3m thick. A second sand stratum was present below the clay, this being slightly silty and gravelly to very gravelly. The lower sand stratum was not encountered in trial pit TP03, but it is considered that it may be present below the clay stratum. The lower sand stratum was present to at least 1.8m and 2.8m bgl at the base of the trial pits and the thickness was up to at least 1.1m.

In trial pit TP02, a clay stratum was encountered immediately below the made ground, this having a high sand content. This overlay a slightly clayey sand and gravel below with a second slightly silty, sandy clay stratum below. The clay stratum was present to 1.3m bgl and 0.6m thick. The sand and gravel stratum was recorded to 2.7m bgl and was 1.4m thick.

A very clayey sand stratum was recorded below the made ground (similar to topsoil) in trial pit TP04 to 1.8m bgl (1.3m thick). However, this lay immediately over the second slightly silty sand stratum, with no clay encountered within the trial pit, the second sand stratum noted to the base of the trial pit at 2.8m bgl, being at least 1m thick.

Bedrock

No bedrock was encountered within the exploratory hole locations.

11.5 In-situ test results

The field observations of the clay identified this to be usually firm, becoming firm to stiff with depth in places. However, the clay in trial pit TP03 was described as being very stiff and appeared to be desiccated in comparison with the clay elsewhere on site. Hand shear vane tests undertaken within the upper clay sample arisings from the trial pits indicated that the clays were generally firm to stiff, with undrained shear strengths being between 78kPa and 98kPa. These when converted would provide an approximate equivalent safe bearing capacity of between 133kPa and 168kPa. An undrained shear strength of 120kPa was recorded confirming the field description of the clay being stiff, where the sample was taken in TP01, converted to an approximate equivalent safe bearing capacity of 205kPa. The very stiff clay in TP03 was confirmed by undrained shear strengths of 150kPa and 182kPa being recorded. This clay would provide an approximate equivalent safe bearing capacity of between 257kPa and 312kPa.

It was considered, based on field observations, that the sands across the site are generally loose to medium dense. The hand held DCP test, DCP01, recorded equivalent standard penetration test (SPT) N values in the sand and gravel stratum of at least 15 and greater (see results in Appendix 10). This confirmed the sand and gravel stratum at this location was at least medium dense, providing an equivalent safe bearing capacity of at least 100kPa.

11.6 Subterranean structures

No structures such as floor slabs were encountered during the site investigation.

A shallow service cable was encountered in the east face of the trial pit TP01, potentially a BT cable, offset from the mapped location.

An obstruction was encountered in trial pit TP05 at 1.3m, which may have been associated with an electricity cable.

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11.7 Groundwater

No significant groundwater was encountered during the ground investigation. Minor seepages were noted in only two locations, at the head of the clay stratum, in TP01 (at 0.9m bgl) and ITP02 (at 1.0m bgl).

11.8 Visual and olfactory observations

No visual or olfactory evidence of mobile/volatile contamination was recorded in any of the exploratory holes. No evidence spillages was seen around the electricity sub-station.

12.0 Landfill Sites and Ground Gases

12.1 General

Coopers have appraised the potential risk of ground gases to provide a conceptual model in terms of source-pathway-receptor in accordance with:

- BS8576:2013 “Guidance in investigations for ground gas. Permanent gases and volatile organic compounds”.
- BS 8485:2015+A1:2019 “Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings”.
- CIEH - “The local authority guide to ground gas”. S Wilson, G Card and S. Haines. September 2008.
- CL:AIRE - RB17 “A pragmatic approach to ground gas risk assessment”. November 2012.
- “Technical paper: Risk and reliability in gas protection design – 20 years on: Part 1”. G. Card, J Lucas and S Wilson. August 2019.
- NHBC (2007) “Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present. 10627-R01(04)”.
- NHBC (2016) Technical Extra 20. “Ground gas update – site assessment, characterisation and design of gas protection measures”

It should be noted that the characteristic design models within the NHBC reports assume standard residential houses have a pre-cast suspended slab, this being the required floor slab type in zones of tree influence with heave (discussed in Section 15). It is also likely to be commercially preferential to use suspended pre-cast (block and beam) floor slabs where ground gas protection measures are required. For other types of buildings or slab construction reference should be made to the design and assessment criteria within alternative guidance documents referenced above.

All information and advice regarding requirements for gas precaution measures are considered to be provisional until approval from statutory bodies has been granted.

The gas generation potential of the ground conditions on site has been appraised in accordance with the CL:AIRE Research Bulletin RB17 and BS8576:2013, which outline an approach for pragmatic assessments of hazardous ground gas on low risk sites without in situ monitoring. The approach for this site has been used based upon the conceptual site model discussed below, which demonstrates the potential sources of ground gases, the pathways available to the proposed development and the receptors.

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12.2 Potential Sources

Landfills (on and off site)

The Groundsure Enviro+Geo Insight report, presented in Appendix 2 and the Wrexham CBC consultation response, presented in Appendix 3, did not identify any registered operational or non-operational landfill sites located within 250m of the site boundary or on site.

Coal Mining

A preliminary risk assessment has made reference to the CL:AIRE “Good Practice for Risk Assessment for Coal Mine Gas Emissions”, October 2021, as the site lies within an area of coal mining activities.

The site was recorded by the Coal Authority as being underlain by deep coal measures between 680m and 910m bgl, which have been worked up until 1966. Based on the age and depth of the coal seams, these are likely to have become flooded which will significantly reduce the potential for ground gas to be generated, such that there is a negligible to very low likelihood of ground gas generation potential.

The Coal Authority did not refer to any shallow mine workings within the vicinity of the site.

The Coal Authority report stated that there is no record of mine gas emissions requiring action by the Coal Authority within the boundary of the site.

Deep madeground (on site)

Only shallow madeground was identified on site, which did not contain any organic matter. Therefore, for this reason and the fact that no deep madeground was encountered on site, which may be considered as a potential source for ground gas generation, the madeground present would not be considered as a significant source of ground gas on site.

Organic Rich Strata (on site)

No organic strata were encountered on site and the likelihood of this being present is considered to be negligible based on the BGS recorded drift geology for the site and there being no former ponds recorded on the historical mapping, in which organic rich strata may typically be found.

Other off site features

Three ponds were recorded as being present within the vicinity of the site, the nearest having been 50m to the south west, then one 200m to the north east and one 200m to the north west. A small gravel pit approximately 10m in diameter, was present approximately 170m to the north east, which was no longer present by 1960. The ponds to the south west and north west are likely to have been infilled by 1938 and the pond to the north east and the gravel pit were infilled by 1980, when housing was developed over these voids.

It is considered that the materials used to fill the ponds and gravel pit would have been suitable for construction purposes and therefore would likely have included limited proportions of organic matter. The voids did not cover a significant area, therefore the volume of fill and depth was limited. If organic matter was present within the fill materials this would likely have degraded over the time since they were placed within the voids, such that the ground gas generation potential would now be very low and any ground gas generated would comprise only carbon dioxide. Consequently, the flow rate potential of the ground gas if generated would be very low.

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A depression was recorded in a public open space (POS) approximately 210m to the south west of the site from circa 1960 until 1973. This appears to still be a public open space with a sports pitch on recent Google Earth photographs, the ground being level, indicating the void was filled. It is unknown if any organic inclusions were within the fill, but given the age of the fill, as discussed above, organic matter present would likely have significantly degraded by now. Remaining organic matter would have a low potential to generate significant concentrations of ground gas. Any ground gas generated would likely comprise slightly elevated carbon dioxide concentrations with a very low flow rate potential, but negligible methane concentrations.

Radon

The Groundsure Enviro+Geo Insight report provides an assessment of the percentage likelihood of residential properties within a 75m grid which are affected by radon levels above the action level. The data having been sourced from the BGS and Public Health England. This stated that the proposed development lies within an area where between 5% and 10% of residential properties are affected by radon concentrations above the action level. As such, basic radon protection measures are required for the proposed properties.

12.3 Potential Pathways

The coal measures are known from the BGS mapping to be at significant depth of at least 680m bgl. These are overlain by the Salop Formation comprised of mudstone and sandstone with conglomerates, further overlain by drift deposits likely to be greater than 20m deep, which include clay strata. It is considered that if any mine gases were generated within the coal seams, there would be a negligible likelihood that this would be able to migrate to the surface due to the significant depth. The overlying bedrock which includes mudstone, which tends to have a low permeability and drift strata including low permeability cohesive strata, would also attenuate this migration. No significant pathways are present within the proximity of the site, which may provide preferential pathways, with the nearest inferred fault line being reported approximately 400m from the site and no coal mine openings being recorded within 750m of the site. Three historical wells were recorded approximately 100m beyond the site boundary, but it is considered that these would have been sunk into the overlying sandstone within the Salop Formation, if they were sunk into the bedrock, in order to obtain a potable water supply. These wells being isolated offsite, would not form a pathway for potential mine gas between the coal seams and the site.

If carbon dioxide was generated by the fill in the POS to the south of the site, the majority of this would more likely dissipate vertically to the surface of the POS. Some lateral migration of the ground gas may take place via the intervening relatively permeable Glaciofluvial strata, identified by the BGS mapping. A proportion of this may also subsequently migrate vertically to the surface dissipating to the air where soft cover is present. Intervening service trenches, being filled with granular materials may also provide preferential pathways if the natural ground is more cohesive, diverting ground gases. Given the distance of 210m between the POS and the site, and the potential for only slightly elevated carbon dioxide concentrations to be present with very low flow rate potential, it is considered unlikely that significant concentrations of ground gases would be able to migrate to the site boundary.

The former offsite ponds would likely be located within depressions in the cohesive Glacial Till identified by the BGS mapping as being present beyond the site boundary. The relatively low permeability of these strata would limit the migration of potential very low concentrations of carbon dioxide with low flow rate potential from the former ponds. The distance would provide attenuation and in the case of the pond location to the north east, there is an intervening valley, which would reduce the potential gas migration between the pond to the north east and the site. This would also have the same effect on any ground gas which may migrate from the former gravel pit.

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It is considered unlikely that significant concentrations of carbon dioxide will reach the foundations, where they may find pathways into the properties via cracks within the floor slabs and surrounding service entrances, causing elevated concentrations within the buildings. It is unlikely that carbon dioxide concentrations may build up in confined spaces such as service trenches. However, contractors would need to undertake their own risk assessment should it be necessary to enter confined spaces.

12.4 Receptors

Future Occupants: The primary receptors are anticipated to be the future occupants of the residential plots if there was a build up due to the ingress of potential hazardous gases through the ground floor slabs of the properties. These are considered highly sensitive receptors for the purposes of the conceptual model.

Adjacent residents and workers: These can be exposed to hazardous gas if sources of gas are generated on site and migrate beyond the site boundary or preferential pathways exist for the horizontal migration of gases beyond the site boundary.

Construction/Maintenance Workers: Other receptors include construction workers, primarily through work within trenches or excavations where preferential pathways for the migration and collection of gases could occur. HSE guidance on safe working in confined space details potential dangers from gases within trenches, assessments required and precautions to take prior to entering a confined space. The appointment of a supervisor to ensure the necessary procedures and precautions are in place where construction workers intend to enter a confined space is advisable in accordance with HSE guidance.

12.5 Ground Gas Conceptual Site Model Summary

The conceptual model has demonstrated that there were no sources of ground gas on site and no significant sources within 250m of the site boundary, with only a very low potential for ground gas generation and very low flow rate potential within former ponds, a small gravel pit and a depression within the POS. Deep coal seams are present below the site but with a negligible to very low likelihood of ground gas generation potential.

The intervening ground conditions, distance and topography between the potential ground gas sources will attenuate any ground gases generated. It is therefore considered that there is a negligible risk posed by ground gases to the proposed development.

12.6 Ground gas remediation/verification requirements

The conceptual model has demonstrated that there is a negligible risk posed to the proposed development from potential ground gases arising from sources on site and beyond the site boundary. As such, the site would be classified as CS1 in accordance with BS8485:2015+A1:2019, and Green in accordance with the NHBC Report No. 10627-R01(04). No ground gas protection measures will be required within the development. However, basic radon protection measures will be required in the new build plots, in accordance with BRE Report 211, "Radon: Guidance on Protective Measures for New Dwellings", 2015.

Remediation requirements

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The design of Basic Radon protection measures follow BRE 211 (2015) “Radon: Guidance on protective measures for new buildings”. The radon protection measures are required for all occupied buildings. Should there be internal garages, radon protection is required for internal garages and adjoining garages which include an internal door to the habitation. No radon protection measures are required for detached garages.

The BRE 211 guidance references the provision of a virgin polymer, low density polyethylene (LDPE) membrane of a minimum thickness of 300µm (1200 gauge) within the floor slab construction with subfloor ventilation to satisfy basic protection measures. BRE 211 details that the radon membrane may be liable to damage during installation and construction and that where there is risk of this a thicker and/or reinforced membrane should be installed. Due to the tendency for 300µm thick membranes to be damaged during installation, some manufacturers are withdrawing this specification and now producing radon membranes with a minimum thickness of 400µm (1600 gauge), which Coopers recommend for use with a pre-cast suspended floor slab, likely to be used on site.

The membrane should be sealed (taped or welded) and provide a continuous barrier to the external wall of the building, other than service entry pipes which are to be sealed to the membrane. The position of the membrane within the floor slab construction is included within the enclosed typical details by floor slab construction.

Typical construction details with radon mitigation measures for a pre-cast slab, the client’s preferred floor slab type, are illustrated in Drawing No. 7962/LRH&HRH/BR/PC/RA/G/01 presented in Appendix 16. These provide general guidance. These drawings can be applied to apartment block but being potentially the more complex than the house plots, it is recommended that a specific design is provided to match the architectural layout once floor slab is determined.

Public Health Wales recommend, in reference to the UK Health Security Agency (formerly Public Health England), that future residents undertake radon monitoring within the first year of occupation. Should radon be identified above target levels then remedial measures such as extraction of the subfloor ventilation layer (if installed) will be required. Whilst these can be undertaken via the air bricks to the subfloor void, these can be difficult to install and some developers prefer the addition of a further access plug connecting the subfloor to the surface. While is acceptable to construct the property with a cast in situ floor slab with no sub-floor void, this factor may need to be taken into consideration when designing the floor slab construction.

BRE 211 details that there is no specific statutory requirement for inspection of radon protection measures, however if not installed correctly then there is a high risk this will be identified following occupation and require costly remedial measures. BRE 211 therefore strongly recommends inspection of the membrane installation is carried out. Once the floor slab design is known then procedures for verification of the radon membranes can be provided.

This assessment should be provided to the regulatory bodies for approval prior to commencing development.

12.7 Conclusions

The site is characterised as Green in accordance with the NHBC Report No. 10627-R01(04)/CS1 in accordance with BS8485:2015+A1:2019. However, the site is located within an area where between 5% and 10% of residential properties are affected by radon concentrations above the action level. Consequently, basic radon protection measures are required for the proposed properties.

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This assessment should be provided to Wrexham CBC for approval prior to commencing development.

13.0 Contamination

13.1 Conceptual Model

In accordance with current guidance and best practice, this risk assessment has been assessed in the form of potential sources of contamination and the pathways with which they may affect potential targets/receptors. The targets/receptors have been assessed to determine how they are likely to use the land and hence consider what actual risk is likely to be present associated with identified contamination on site. Recommendation for site investigation has been assessed in light of the land use and the form of possible contamination which may be encountered.

13.2 Potential Point Sources of Contamination

The source types listed below detail the potential contamination that could affect the receptors if present. A brief description of the potential pathways and receptors is included (where applicable) with each source type as these are intrinsically linked within the conceptual model. A more detailed assessment of the receptors and the method of pathway migration is listed in Sections 13.3 and 13.4 respectively.

Sources on site

The site had been a greenfield site since the first available mapping, until the current buildings were developed by 1980, together with an electricity sub-station in the east of the site. Shallow madeground and reworked natural ground was expected to be present on site, used in the development of the buildings and associated hardstanding, as was encountered within the exploratory holes discussed in Section 11.0. A small waste heap approximately 1m x 1m was present included what appeared to be inert materials these being soil, wooden planks, mesh and concrete, which will need to be removed from site once the development commences.

No visual or olfactory evidence of contamination was recorded within the exploratory holes.

Based on the inclusions within the madeground (similar to topsoil)/madeground, elevated concentrations of metals, semi-metal elements and compounds, speciated polycyclic aromatic hydrocarbon (PAH) (16) compounds and low frequency asbestos fibres may typically be found in association with such materials. However, as the madeground (similar to topsoil)/madeground was recorded to contain limited anthropogenic materials, contaminant concentrations would likely be low across the main body of the site.

Prior to the ban on the production of polychlorinated biphenyl compounds (PCBs) in the UK, these were typically used within electricity sub-stations. The manufacture of PCBs was banned in the UK in 1981, and the retention of PCBs within equipment has gradually been phased out since then, this now being limited to restricted volumes in certain apparatus. Where reasonably practicable PCBs must be removed from equipment completely but by 2025, this will be mandatory.

The on-site electricity sub-station would therefore have contained PCBs when it was first brought into operation, but it is not known if the system has been partially or totally drained of the PCBs to date. No evidence of spillages was noted on the gravel surrounding the electricity sub-station. Had there been leaks within the sub-station these would most likely have been contained within the structure of the building.

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With total soil concentrations in the general madeground (similar to topsoil) and madeground potentially being low, these would have a very low potential to leach in elevated concentrations. As the madeground is only in thin strata and present only in parts of the site, it is considered, that should there be any leachate generated from the madeground (similar to topsoil)/madeground, concentrations would be very low and would not provide a significant loading.

Ground Gas

The sources of hazardous ground gas and the risk posed to the development have been addressed within Section 12.0 of this report.

Adjacent land uses

No land uses were identified immediately adjacent to the site boundary which may give rise to leachable contaminants and those which may be windblown in the form of dust to pose a risk to the future receptors. One modern plastic above ground domestic kerosene fuel tank was identified adjacent to the south east corner of the site boundary. This appeared to be in good condition, with a low likelihood of leaks expected. Spillages could have occurred during the filling of the tank, but given the cut-out system on delivery tankers there is a low likelihood this could have occurred. If leaks or spillages have taken place, this would have resulted in elevated total petroleum hydrocarbon (TPH) compounds in the soils, which can mobilise through the soil.

Former ponds, 50m and more beyond the site boundary have been built upon. Therefore, it is considered that any madeground used in the development or permitted to remain would have contained limited mobile contaminants. Any leachate potentially generated from the madeground would likely be limited due to overlying housing or hardstanding reducing rain infiltration through the madeground or where open to water infiltration, the leachability potential would have been reduced over time.

Shallow fill placed within the POS 210m to the south west of the site in the 1970s, may give rise to leachable/mobile contaminants. However, given the age of the materials it is likely that the leachability potential has reduced.

13.3 Targets/Receptors

Proposed land use and future site users

The proposed development is to comprise residential properties with associated private gardens and shared landscaped areas and car parking. The future site users will include the occupants, visitors and maintenance contractors to the residential properties.

As can be seen on the Munro Associates Preliminary Site Layout (Option B) Drawing No. 20.211 P-105 RevB, presented in Appendix 16, the electricity sub-station is to remain in-situ as part of the redevelopment of the site. The access road immediately adjacent to the electricity sub-station will also remain. Car parking will still be present adjacent to the south of the substation with soft landscaping surrounding this. It is considered that residents may only walk adjacent to the electricity sub-station but would not be undertaking any activities such as gardening in this area. Contractors may undertake maintenance of the landscaping adjacent such as mowing the lawn. Given the services in this area, it would not be feasible to undertake any planting at depth.

Adjacent Landowners

Should contamination be encountered, during dry periods on site when soils are exposed, contaminated dusts may be created by the development and be carried with the prevailing wind. We would advise that during dry periods, the site is dampened down to suppress the dust.

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Following the completion of the development, wind blown dusts may migrate from the gardens and landscaped areas.

Controlled waters

The site is underlain by Glaciofluvial deposits designated as a Secondary (A) Aquifer. It is considered unlikely that this would provide a sufficient local water supply but may support a base flow for the nearby surface water course. The Glacial Till overlapping the site boundary was designated as a Secondary (Undifferentiated) Aquifer. The bedrock was designated as a Secondary (A) Aquifer, the bedrock being at greater than 20m bgl. Although the aquifer within the bedrock was defined as being a potential water supply, being a Secondary (A) Aquifer, the site was recorded as not lying within a Groundwater Source Protection Zone and no current groundwater abstractions were recorded within 2km of the site.

The nearest surface water course the Nant y Gaer, lies 82m to the north east of the site, this being a tributary of the River Alyn, approximately 800m to the south east of the site. No current surface water abstraction permits were noted within 1km of the site.

13.4 Pathways

Where ground is bare of vegetation or only lightly vegetated, if contaminated soils or asbestos fibres are present, these could become windborne during dry periods of weather, thereby potentially transporting contaminants. Site users and adjacent site users may become exposed to potential contaminants arising from the made ground.

Exposure pathways for contact to soils are dependent upon the types of contaminants. The greatest exposure for future residents to the potential contaminants on site is through dermal contact, ingestion via hand to mouth contact, or direct ingestion of soil or soil adhered to home grown vegetation. Airborne contaminants in dust may be inhaled. Soils may also be tracked back into the house permitting the inhalation of indoor dust.

PCBs have a low mobility and leachability in soils, due to adsorption to the soils. If a leak or spillage of PCBs had occurred historically, the contaminant is not expected to have migrated a significant distance from the electricity sub-station. There was no visual or olfactory evidence of contaminants within the exploratory holes in the vicinity of the electricity sub-station. If PCB contamination had mobilised a short distance, given the topography of the site trending north to south and west to east, this may be present below the current and proposed car park. PCBs have a low volatility, therefore they would not pose a risk due to vapour inhalation within the proposed residential properties. Future residents of the site are unlikely to come into contact with the PCBs, as these would be below mainly hardstanding and a limited area of newly placed landscaping. Grounds maintenance contractors would not be expected to be digging in this area due to underlying services.

Should there have been spillages or leaks of kerosene from the above ground domestic fuel tank, any fuel is likely to have migrated away from the site boundary due to the topography sloping away to the south and east.

Contractors may come into contact with contaminants elsewhere on site within the made ground (similar to topsoil) and made ground, if present, when undertaking maintenance work on the properties or in the road corridors. However, exposure is deemed as short term and controlled under health and safety applications.

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The drift strata generally comprised interbedded clay and sand strata. This drift strata may extend beyond the site boundary towards the south east but Glacial Clays would be expected towards the north west. Lateral groundwater migration would be impeded by the cohesive clay strata and upper clayey sand strata, but where it finds a pathway into the deeper gravelly sand strata, this may migrate towards the south and east following the general topography of the site and the surrounding area. If any leachates were generated, these would be attenuated by the upper clay and clayey sand strata.

The general topography beyond the site was recorded to slope slightly down gradient from north to south and from west to east, generally towards the surface water courses the Nant y Gaer to the east and the River Alyn to the south east. It was considered that, should there be any shallow groundwater flow within the drift deposits, that this would follow this trend towards the water courses, particularly the Nant y Gaer.

The ground conditions and distance would attenuate any potential leachates generated, from reaching the underlying Secondary (A) Aquifer within the bedrock at least 20m bgl and the nearest surface water course lying 82m to the north east of the site.

13.5 Summary of preliminary risk assessment for human health

The preliminary conceptual site model has shown that the site has been greenfield land, which subsequently was developed with the residential properties currently on site. Shallow madeground (similar to topsoil) and madeground identified on site may contain elevated concentrations of inorganic contaminants, speciated PAH (16) compounds and asbestos fibres, although the likelihood is deemed to be very low due to the nature of the madeground (similar to topsoil)/madeground. The madeground (similar to topsoil)/madeground was recorded to contain anthropogenic inclusions of brick, ceramics, glass and plastic, which tend to be relatively inert. The small waste heap was considered to pose a negligible risk of contamination.

An electricity sub-station on site will have contained PCBs during the course of its use, which if spillages had occurred, would have migrated a limited distance due to adsorption to soils. The sub-station is to remain on site and proposed adjacent hardstanding and underlying services will prevent future site users coming into contact with PCBs in the ground if present, assuming the soils remain in situ, making this a negligible risk to future residents, as it would be unlikely for them to come into contact with PCB contaminated soils. There would be a very low potential for ground maintenance contractors to come into contact with such soils. However, consideration should be given to the potential for the soils to be relocated to the garden growing medium during the construction process. Any soils containing PCB contamination may then pose a moderate to high risk to the health of future residents, being exposed due to dermal contact, ingestion of contaminated soils and vegetables and inhalation of contaminated dust indoors and outdoors.

Should elevated concentrations of contaminants be present within the madeground (similar to topsoil)/madeground, the site users may become exposed to these materials in the growing medium, with predominant exposure pathways being ingestion of contaminated soils via hand to mouth or plant uptake and inhalation of dust indoors and outdoors. Madeground (similar to topsoil)/madeground would pose a negligible to very low risk to adjacent site users should any of these materials become airborne as dust.

Generally, off site sources of contaminants were deemed to pose a negligible risk to the proposed development. The adjacent above ground fuel tank poses a negligible to very low risk, with the likelihood of TPH contamination if present in the ground, migrating away from the site boundary.

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13.6 Summary of preliminary groundwater/hydrology risk assessment

A negligible risk is posed to the controlled waters receptors, the Secondary (A) Aquifer within the underlying bedrock and the surface water course 82m from the site due to the potential for only very low leachate concentrations to be generated, the attenuation of leachates migrating vertically through the clay and clayey sand bands and attenuation due to the distance between the source and the receptor.

13.7 Sampling Strategy

Coopers took soil samples from the exploratory holes on the site, with 3 No. madeground (similar to topsoil), 5 No. madeground, 2 No. sand and 1 No. clay samples scheduled for chemical analysis, as summarised in Table 1. The samples were submitted to DETS, an MCERTS accredited laboratory, the results of which are presented in Appendix 12.

There was no visual or olfactory evidence of mobile contamination in the exploratory holes to suggest presence of such contamination and as discussed in Section 13.2, the likelihood of TPH contamination having migrated onto site from the adjacent above ground kerosene fuel tank posing a negligible to very low risk. Due to there being no evidence of mobile contaminants in the exploratory holes in the vicinity of the electricity sub-station, PCBs were not scheduled for analysis. However, it is recommended that once the services are disconnected and the current hardstanding in the car park is removed, that soil samples are taken from adjacent to the electricity sub-station, in order to confirm that there have been no historical spillages of PCBs which may then be relocated across the site or may pose a risk to development contractors.

The testing schedule included the Coopers standard human health suite (CLR metals, cyanide, phenols and speciated (16) polycyclic aromatic hydrocarbon (PAH) compounds). Asbestos fibre identification was also scheduled on the madeground (similar to topsoil) and madeground samples.

Table 1 – Chemical analysis scheduled

Strata	Coopers suite	Asbestos Fibre ID
Madeground (similar to topsoil)	4	4
Madeground	4	5
Sand	2	-
Clay	1	-

13.8 Contamination Results

13.8.1 Human Health Risk Assessment

Assessment of soil results

The justification for human health risk assessment concerning chemical contaminants is included in Appendix 11.

The chemical analysis results relating to the soil samples taken were assessed by Coopers against the Soil Tier 1 Threshold values applied for residential properties with plant uptake for all samples taken, given that part of the site will have private gardens. The Soil Tier 1 Threshold Values applied, include the C4SLs where available. For other criteria, the S4ULs were applied except for copper, nickel and zinc, for which the phytotoxic threshold values are more conservative than those applicable to human health. These are relevant in assessing whether the materials on site may be detrimental to plant growth. The Soil Tier 1 Threshold Values are presented in Appendix 11. The chemical analysis results are presented in Appendix 12.

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None of the madeground (similar to topsoil), madeground, sand and clay samples were reported to contain concentrations of determinands in excess of the available Tier 1 Threshold values. None of the samples tested for potential presence of asbestos fibres were reported to contain asbestos fibres.

13.8.2 Controlled Waters Risk Assessment

No significant sources of contamination were identified in the exploratory holes. Therefore, the potential for leachates to be generated in significant concentrations by the materials on site is considered to be negligible.

13.8.3 Water Supply Pipes

The site is within the Hafren Dyfrdwy 'Severn Dee' water supply area. Subject to whether the development entirely fronts onto a road or footpath with an existing connection or comprises a new access road and requires the installation of a new water main, applications to connect an existing water main or construct a main must be made via Hafren Dyfrdwy's website

Guidance by the UK Water Industry Research organisation (UKWIR) (referenced in the "Contaminated Land Assessment Guidance", published by Water UK) requires the assessment of potable water supply pipelines to be made on a risk based approach. The procedures include a phased approach to risk assessment including preliminary risk assessment, and specifications for types of contaminants being tested.

Where sources of potential contaminants that could impact on a potable water supply are identified within the desk study or intrusive investigation, these are to be assessed to determine the impact on selection of pipe materials.

All strata within the site have been appraised and characterised. The site had no evidence of mobile contamination which may include TPH compounds, volatile organic compounds, semi-volatile compounds, phenols, chlorinated phenols and cresols which may impact on the water supply pipe materials. Concentrations would be considered to be below thresholds for standard PE pipes for mobile contaminants.

13.8.4 Revised conceptual site model following site investigation

The preliminary conceptual site model considered that there was a low likelihood that the madeground (similar to topsoil)/madeground would provide a source of contaminants, which may pose a risk to human health. The site investigation has shown that as there were no elevated concentrations of determinands, the madeground (similar to topsoil)/madeground poses a negligible risk to human health of the future site users, if these materials remained within the growing medium in the gardens. To date there is no evidence of PCB contamination in the ground in the vicinity of the electricity sub-station. Should any be present beyond the footprint of the sub-station this will pose a very low risk to the future occupants of the new residential properties, if this should be in soils present below hardstanding and topsoil, where no digging will take place. Due to the low mobility of the PCBs these are not expected to have migrated into the area of proposed gardens. However, consideration will need to be given to the potential for the soils in the vicinity of the sub-station to be relocated to the growing medium, during the development process, where the PCBs may then pose a moderate to high risk. The PCBs pose a negligible risk to controlled waters, due to their low mobility.

It is considered that with limited total soils concentrations, that there is no source to generate significant concentrations of leachates. Given the intervening low permeability clays and clayey sands, the distance to the underlying Secondary (A) Aquifer and the nearest surface water course, the site investigation confirms there is a negligible risk posed to controlled waters by the materials which have been encountered on site.

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14.0 Sub Soil Classification

14.1 General

Selected soil samples were scheduled for chemical and geotechnical analysis as discussed in Sections 10.6 and 10.7. Copies of the chemical and geotechnical results received are provided within Appendices 12 and 13, respectively.

14.2 Results of Laboratory Analysis

Table 2 - Summary of chemical analysis

Strata	No. of samples for analysis	SO ₄ (2:1) (water soluble)	pH	Mobile/ Static
		mg/l	-	
Madeground gravel	1	14	7.9	Mobile
Madeground sand	2	Highest concentration - 22	Lowest value - 6.0	Mobile
Natural clay	1	11	6.8	Static
Natural sand	1	Highest concentration - 14	Lowest value - 6.9	Mobile

Table 3 - Summary of geotechnical analysis

Strata	No. of samples for analysis	Plasticity Index (corrected)	Passing <425 micron
		%	%
Clay	3	15.84-21.25	72-85

14.3 Interpretation

Groundwater Mobility

Madeground sand - Mobile
Natural clay – Static
Natural sand – Mobile

Frost Susceptibility

Natural sand – assumed potential for more than 10% of silt within granular samples – frost susceptible

Shrinkage Potential

Clay – Medium

Soil/Groundwater Classification

Based upon Table C1 and D1 of BRE Special Digest 1 (2005), the Design Sulphate (DS) class, Aggressive Chemical Environment for Concrete (AC) class, and Design Concrete (DC) class for each of the strata types, except pyritic mudstone is given below: -

Madeground sand - DS-1, AC-1, DC-1
Natural clay – DS-1, AC-1s, DC-1
Natural sand – DS-1, AC-1, DC-1

Medium shrinkage clay has been recommended based on the highest corrected plasticity index (PI) results recorded on site.

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Any fill material to be imported onto the site should be tested and should not exceed the classifications given above.

Based upon the above classification, the ready-mixed concrete (designated mix) appropriate for Design Class DC-1, for the natural ground would be as detailed in Table 4.

Table 4 - Sub-structure ready mix concrete designations by end use over the site

<u>Use as substructure and ground floors</u>	<u>Ready-mixed concrete (designated mix)</u>
General Use:	
• Rough blinding (non-structural)	- GEN1
• Infill	- GEN1
• Unreinforced oversite concrete below timber floors	- GEN1
• Structural blinding and overbreak	- GEN1
• In situ external concrete for drives and paths	- PAV1
• In situ external concrete foundations for precast concrete paving slabs	- GEN1
• Fill to wall cavity	- GEN1
• Solid filling under steps	- GEN1
Floor Slabs:	
• House or garage with reinforced concrete floor slab, either suspended or precast.	- RC35
• House with non-reinforced slab (ground bearing) with either:	
a) Permanent finish to be added, e.g. screed or floating floor.	- GEN1
b) No permanent finish to be added, e.g. carpet.	- GEN2
• Garage with non-reinforced slab (ground bearing)	- GEN3
Foundations:	
• Strip foundations	- GEN1
• Trench fill	- GEN1
• Other mass concrete foundations	- GEN1
• Reinforced concrete footing	- RC35

Notes:

- 1) Worst case sulphate conditions over the entire site are ACEC Class AC-1/AC-1s, and Design Chemical Class DC-1.
- 2) Classification and designation in accordance with NHBC guidance, Section 2.1 – Table 1, and BS8500-1, 2006.
- 3) The above conditions represent the worst case conditions identified within the testing of soils on the site.
- 4) Any fill material to be imported onto the site should be tested and should not exceed the classifications given above.

15.0 Trees

- 15.1 Hedges and mature/semi mature trees were noted along part of the site boundaries, and to have been present sporadically across the site until recently within the site boundary, these having now been felled. Prior to the trees being felled they were surveyed by Tree Solutions, as presented in the report dated 17th September 2021 (see Appendix 4). The assessment was completed in accordance with the British Standard BS5837:2012.
- 15.2 Clay strata interbedded generally with sand strata and occasionally sand and gravel were encountered across the majority of the site. Based on the general nature of the clays, they may be subject to influence by changing moisture content associated with tree roots. The soils may be affected where existing tree roots are removed or their roots severed by construction foundations, which would cause rehydration of clay subsoils and subsequent swelling of the clay or 'heave' in clays with plasticity. Likewise, they may be impacted by the growth of immature or semi-mature trees, where the root ball expands and can cause the clay beneath foundations to shrink causing subsidence.

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- 15.3 The geotechnical results demonstrated the clay sampled in exploratory holes located away from trees to have a medium shrinkage potential. It was observed during the ground investigation that the clay sample taken from TP03 at 1.4m was desiccated, likely due to the close proximity of trees to this location and their moisture demand. The desiccation was confirmed by the geotechnical test results for this sample (see Appendix 13) which indicated the natural moisture content (13.5 %) to be less than the plastic limit (14%). This sample was not considered as being representative of the general clay characteristics of the site, due to its proximity to the trees. The sand bands present below the clay strata were noted at variable depths. There is a potential that the sand/sand and gravel strata may remove the impact of tree influence on the clay locally within the building footprints.

16.0 Ground Floor Slabs

16.1 General Requirements

Based upon the developer's general commercial preferences for floor slab construction, plots are more likely to be constructed with precast (block and beam) suspended concrete floor slabs.

16.2 Gas Precaution Measures

Based on the gas risk assessment undertaken, ground gas precaution measures will not be required, the site being characterised as CS1 in accordance with BS8485:2015+A1:2019/Green in accordance with the NHBC Traffic Light System. However, the site lies within an area where basic radon protection measures are required, with typical construction details for radon mitigation measures for a pre-cast slab, being illustrated in Drawing No. 7962/LRH&HRH/BR/PC/RA/G/01 presented in Appendix 16.

16.3 Heave Precautions

Based upon the ground conditions and assuming the clay has a medium shrinkage potential, properties may be liable to heave. Should these be constructed with a precast suspended concrete floor slab, these will require a sub floor void of 250mm.

17.0 Foundations

17.1 General

The locations of the exploratory holes are shown on Coopers Drawing No. 7962/01 in Appendix 16. Copies of the exploratory hole logs are presented in Appendices 7 to 10.

17.2 Development Proposals

The proposed development will consist of 25 No. residential properties potentially including 1 No. semi-detached building and 1 No. mews building comprised of bungalows and 1 No. two storey apartment block, with associated car parking, private gardens and landscaped areas. The proposed planning layout is presented in Munro Associates Preliminary Site Layout (Option B) Drawing No. 20.211 P-105 RevB, presented in Appendix 16.

It is assumed that all materials and workmanship will comply with the Building Regulations and the NHBC Standards. It is understood that there will be limited regrading of the site. Therefore, for the purposes of this report, it has been assumed that foundations will be constructed from the current ground levels.

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Where private drainage is proposed to be laid, careful consideration must be given to the relative levels of the foundations and the drainage pipework. This information needs to be reviewed to ensure that no foundations are being undermined by drainage pipework and that no foundation loads are being applied to the drainage pipework.

17.3 Tree Influence

As outlined in Sections 15.0 and 16.0, the clay strata, where present, are subject to volumetric change associated with trees with special precautions required for heave, where plots are located within the zone of tree influence.

17.4 Bearing Strata and Safe Bearing Capacities

Based upon the findings of the intrusive investigation and subject to finalised layout proposals we would anticipate that bearing strata would consist of the following:

- Loose to medium dense sand – 100kPa
- Medium dense sand and gravel – 150kPa
- Firm clay – 100 kPa
- Firm to stiff clay – 125 kPa
- Stiff clay - 150 kPa
- Very stiff clay - >150 kPa

17.5 Minimum Formation Depths

The assumed minimum foundation depths relative to proposed ground level should be assumed for the following strata types:

- Foundations on natural clay strata – 900mm
- Foundations on natural sand or sand and gravel – 600mm

17.6 Foundation Recommendations

All foundations and floor slabs for the plots should be specifically designed by a Structural Engineer once the planning layout, external works and slab level requirements have been finalised. The following options are conjectured for the proposed development area based upon depth to bearing strata from preliminary proposed slab levels. It should be noted that the proposals have not accounted for possible deeper remnant substructures, including for example drains or basements.

As discussed in Section 11, the site is underlain by interbedded firm, firm to stiff and stiff clay with loose to medium dense sand strata and localised medium dense sand and gravel. The three proposed buildings will span across variable bearing strata, assumed to include clay subject to tree influence below each proposed building footprint, as indicated on Drawing No. 7962/FDZ, presented in Appendix 16. However, further trial pits are recommended in the vicinity of the mews bungalows to determine whether sand is present below the whole footprint.

Sections of the each building are likely to be founding on firm, firm to stiff, or stiff clay which is partially located in the zone of tree influence, with foundations required to be greater than 1.2m depth but less than 2.5m from current ground level, but other sections are underlain by clay beyond the zone of tree influence and potentially sand and sand and gravel, where foundations would be 1.2m or less than the current ground level. Therefore, we would recommend that a **Mass Concrete Trench Fill Foundation** should be employed across the whole of each building footprint. The Drawing 7962/FDZ indicates that sections of the foundations will also require **heave precautions**.

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- Based on medium shrinkage clay, minimum foundation depth 0.9m below proposed ground level.
- Minimum concrete thickness is assumed to be 0.5m thick unless specifically designed.
- Formation is to step in areas of tree influence, in accordance with NHBC guidance.
- Maximum safe bearing capacity limited to 100kPa in firm, firm to stiff, stiff and very stiff clay, loose to medium dense, medium dense sand and sand and gravel taking account of the general structural design, although the strata may provide a greater safe bearing capacity in places.
- Foundation widths subject to engineering designs for house types by structural engineers.
- The viability for deeper mass concrete trench fill is largely determined by trench stability.
- If difficulty experienced constructing deeper trenches due to side wall instability then contact Coopers to advise on alternative options.
- Where influenced by trees the formation depths should be considered the minimum depth in cohesive strata.
- Where tree heave influence is recorded there is a requirement for compressible materials on the mass concrete trench fill foundation (as medium shrinkage potential clay), and the inclusion of a subfloor mitigation (250mm minimum void beneath block and beam floor slab).
- All former footings, service runs and pipes to be removed prior to construction of new foundations.

For further details refer to Drawing Nos. 7962/Tf/01 and 7962/TfH/01 in Appendix 16. The zones of foundation design have been illustrated on Drawing No. 7962/FDZ, presented in Appendix 16.

Foundation designs are preliminary and may alter with change in proposed slab levels and planning layout. Unexpected basements found following the demolition would also impact on the foundation design. It is recommended that additional investigation is undertaken within the building footprints following demolition to confirm ground conditions and in the vicinity of the proposed mews bungalows. Deeper foundations may then be required in the proposed apartment block. If sand was encountered below the whole footprint of the mews bungalows this would remove the tree influence on foundation design, with the potential for nominally reinforced strip foundations being possible.

18.0 Trench Side Stability

- 18.1 Generally, clays, sands and sand and gravel encountered across the site will remain stable in the short term but may become unstable after being left open over longer periods of time. This will also be highly dependent on the weather conditions at the time of excavation as well as the period of time the trench is left open.
- 18.2 Should trenches need to remain open for longer periods or require manned entry then they should be supported at all times or, where suitable, battered to the angle of repose of the soil. Battering of excavations should be avoided in the proximity of trees proposed for retention and existing structures without assessment from experienced engineering personnel.
- 18.3 Trench excavations for foundations/services must be adequately supported at all times and should be in accordance with the recommendations of CIRIA Report 97: Trenching Practice.
- 18.4 Further guidance on this aspect of site works is given in the British Standards for “Workmanship on Building Sites”, BS 8000, Parts 1 and 14, and in the Construction Industry Training Board’s Site Safety Note 10.
- 18.5 Shallow excavations are likely to be within the capacity of conventional hydraulic plant.

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19.0 Dewatering

- 19.1 Minor groundwater seepages were recorded perched at the head of the clay stratum, in TP01 (at 0.9m bgl) and ITP02 (at 1.0m bgl). Based on the site investigation significant dewatering would not be required in deep excavations and service/drainage trenches. However, it should be noted that seasonal factors may affect changes in groundwater levels at the site. Consequently, dewatering may be necessary in the winter or at times of prolonged rainfall for shallow foundations or drainage trenches.
- 19.2 If former/existing drainage runs are encountered during the excavation of either foundations or service/drainage trenches these will need to be immediately diverted around the excavation and proposed plot footprints, and the excavations may require localised dewatering where breached.
- 19.3 It is anticipated that surface runoff from the site itself may accumulate in open excavations and trenches, and may require dewatering.
- 19.4 Groundwater should not be discharged into the existing sewer system or ditches without prior agreement from Natural Resources Wales and the Local Authority.
- 19.5 Further guidance can be obtained from the CIRIA Report 113 entitled “Control of Groundwater for Temporary Works”.

20.0 Potential Infiltration

20.1 Infiltration test methodology

Coopers undertook BRE Digest 365 compliant infiltration testing, 23rd November 2022 at 3 No. locations, referenced ITP01 to ITP03, as illustrated on Drawing No. 7962/01, presented in Appendix 16. The infiltration test pit logs are presented in Appendix 8.

Depths of infiltration test pits were selected in order to assess the ground conditions appropriate to the preferred method of infiltration design. A permeable paving system was proposed below the car park in the centre of the site, with two shallow infiltration test pits excavated (ITP01 and ITP03). These were to be taken to 0.5m below the made ground, but a clayey sand 0.4m thick was encountered over clay at 0.5m below the made ground in ITP01 at this depth. The test pit was therefore excavated through the clay stratum to the sand stratum below at 1.7m bgl, this being excavated into by 0.1m. ITP03 was excavated to 1.0m bgl, within a 0.5m thickness of sand stratum below the made ground. A deep infiltration system was to be preferred in the east of the site, ITP02 being excavated to 2.5m bgl, the test pit including a clayey sand stratum over clay over a gravelly sand stratum. Minor spalling prevented the test pit being taken to a greater depth, so as to maintain the stability of the test pit. No groundwater was recorded in ITP01 and ITP03. A slight groundwater ingress was recorded in ITP02, perched at the head of the clay, but this did not accumulate at the base of the test pit.

A slotted pipe was placed in test pits ITP01 and ITP02 and backfilled with 20mm single sized limestone gravel. ITP03, being shallow and stable was left open. The pits were subsequently filled with water from a 3,000 gallon bowser to the base of the made ground stratum and monitored to determine the time of outflow between 25% to 75% of the effective depth to calculate infiltration rates (detailed below). If successful tests were to be completed in particular locations, these were to be retested two more times to simulate worst case conditions following heavy and prolonged rainfall events. The infiltration test data is presented in Appendix 14.

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20.2 Infiltration test results

The infiltration rates are summarised in Table 5 and the infiltration test results are presented in Appendix 14.

Table 5 – Summarised infiltration test pit results

Infiltration test pit location	Infiltration test	Time taken for water level to reach 25% effective depth	Time taken for water level to reach 75% effective depth	Infiltration rate (m/sec)	Pass/fail
ITP01	1	14.7 minutes	8 hours 15 minutes (projected time)	1.82E-06	FAILED
ITP02	1	36.14 minutes	3 hours 16 minutes	5.81E-06	FAILED
ITP03	1	54 minutes	4 hours (projected time)	9.8E-06	FAILED

ITP01

The test in infiltration test pit location ITP01 below the north side of the proposed car park, failed on the first test. The water level fell steadily to the 25% effective depth (0.705m bgl) after 14 minutes. The infiltration of the water then reduced significantly, with the 75% effective depth not having been reached after the last monitored depth at 2 hours 59 minutes. The time for the water level to reach the 75% effective depth was extrapolated to be in excess of 8 hours. A poor infiltration rate of 1.82E-06 m/sec was obtained. The first infiltration test was considered to have failed. This would not provide a sufficient infiltration rate for a permeable paving system.

ITP02

The water level in the deep infiltration test pit ITP02 in the east of the site fell at a slow steady rate throughout reaching the 25% effective depth after 36 minutes and the 75% effective depth only after 3 hours 16 minutes. A poor infiltration rate was achieved of 5.81E-06 m/sec, which would not be satisfactory to permit a deep crate infiltration system.

ITP03

The infiltration test undertaken in ITP03 in the south western area of the proposed car park failed, due to very poor infiltration rate. The water level only reached the 25% effective depth after 54 minutes. The rate continued to be very slow, with the 75 % effective depth not having been reached after almost 1.5 hours when the light was fading on site. If the infiltration rate was projected to the 75% effective depth, it is estimated it would have taken at least 4 hours to drain to this depth, but potentially more. The infiltration rate calculated, based on this projected rate was 9.8E-06 m/sec.

20.3 Conclusion

All three infiltration test pit locations failed. In ITP01 and ITP03, it is likely that this was due to the shallow clayey sand present immediately below the made ground, with clay known to be present below this stratum in ITP01. Based on the exploratory holes across the site, it is likely that clay is present below the sand stratum ITP03, slowing the infiltration rate down significantly. Although the infiltration rate in ITP02 failed, it was quicker than the shallow infiltration test pits potentially due to this being partially undertaken within a greater thickness of the deeper gravelly sand stratum.

Site Investigation Report for land at
Cwrt Pentwmpath, Llay

21.0 Road and Parking Bay Sub-Grade

- 21.1 Following the demolition and removal of current surfaces, the anticipated car parking and access paths sub-grade materials are likely to generally comprise loose to medium dense clayey sand but potentially also firm clay, as encountered in the west of the site to date (refer to exploratory hole logs presented in Appendices 7 to 10).
- 21.2 In accordance with Volume 7, Section 2 of the Department of Transport, Departmental Standard Interim Advice Note 73/06 Revision 1 – Design Manual for Roads and Bridges, and Plasticity Index values of firm, firm to stiff and stiff clay on this site, the clay subgrade is estimated to have a CBR of between 3% to 5%. It is estimated the loose to medium dense sand strata would provide a CBR of up to 5%.
- 21.3 Proposals are subject to the review by Wrexham CBC – Highways Department. However, we would recommend that all sub-grade materials are in situ CBR tested at proposed road formation level prior to final pavement design.
- 21.4 It is recommended that if initial roads and sewer construction is proposed to commence during the winter months then a longer period should be allowed for construction due to the potential for weather disruptions to the site.

22.0 Build Phase Remediation and Verification Requirements

22.1 Ground gas/radon

Based on the ground gas risk assessment, no ground gas mitigation measures will be required, as discussed in Section 12. the installation of basic radon protection measures will be required within the floor slab design, as discussed in Section 12.

22.2 Remediation to protect human health/controlled waters

Known ground conditions

Based on the current human health and controlled waters risk assessment relating to ground conditions encountered, no remediation measures will be required across the general site, due to the chemical characteristics of the materials encountered. However, additional soil sampling to assess for potential PCB contamination, is recommended adjacent to the electricity sub-station once the services have been disconnected and the tarmac forming the car park has been removed. Should PCBs be encountered in the soils, these soils will require delineation and segregation should they require excavation, to prevent the re-use of these soils within the growing medium and assess the potential for their re-use on site if required. An addendum letter report would need to be provided by a qualified geo-environmental consultant for submission to Wrexham CBC, in support of the planning application and the NHBC.

Unforeseen contamination

During the ground preparatory works, the groundworks contractor would need to maintain a watching brief to ensure that should areas of potentially undisclosed contaminant be found then a qualified geo-environmental consultant, such as Coopers, is contacted to visit the site to sample and assess the materials in order to determine whether remedial measures are required. Should this be the case then the findings, assessments, and remediation proposal may require regulatory approval prior to undertaking any remediation works. Should materials be identified that are geotechnically unsuitable to be re-used (such as buried trees) in the proposed development then these must be segregated and removed from site.

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22.3 Remediation with regards to acceptable physical characteristics of madeground (similar to topsoil) and madeground for re-use

While the madeground (similar to topsoil) and madeground have been shown to be chemically suitable for use, these soils have been identified as containing rare inclusions of brick and glass. The British Standards BS 3882:2015 for topsoil and BS8601:2013, state that topsoil and subsoil should be free of sharps such as glass. Therefore, it is recommended that the madeground (similar to topsoil) and madeground are not used within the private gardens or soft landscaping areas. However, it is considered that the subsoil, being granular, would be geotechnically suitable for use below hardstanding and below the proposed plots, if this can be segregated from the overlying madeground (similar to topsoil).

It is envisaged that there will be sufficient site won subsoil available for the development, but there may be a shortfall of topsoil. Materials to be imported to site would require validation as discussed in Section 22.4.

In accordance with Definition of Waste Code of Practice (discussed in Section 22.5), it would not be possible to transfer these materials for use in another development, so would need to be kept segregated from subsoil arisings to be designated for use on site or disposal.

22.4 Validation processes

Validation of growing medium

It is recommended that the gardens and soft landscaped areas are validated to confirm the removal of madeground (similar to topsoil) and madeground and therefore potential glass, prior to placement of the inert subsoils and topsoil. This may be undertaken by confirmation that the natural strata are exposed with photographic evidence.

Verification of imported materials if required

It is envisaged that there will be sufficient site won subsoil available for the development, but there may be a shortfall of topsoil, due to the physical nature of the madeground (similar to topsoil) present on site. Should soils need to be imported to site, for example to provide a growing medium in the gardens and soft landscaping areas, it is recommended that prior to accepting imported sources, samples should be analysed by the material provider, proving the soil inert, preferably with provenance to aid the certification of the site. Soils must not be accepted from areas where Japanese Knotweed or other invasive or injurious plants, as specified by the Natural Resources Wales, are suspected to have been growing.

We would advise that the suitable imported material should be sampled by an independent, suitably qualified geo-environmental consultant, to confirm the initial assessment that the material is inert. Currently, the NHBC are requesting certification from developers that all imported topsoil to sites is suitable for use. Clause 10.2.8 states “Topsoil should not contain contamination which may present a hazard to the occupants” and “Topsoil should be provided to a minimum thickness of 100mm”. BS3882 (2015) and the Contaminated Land Exposure Assessment (CLEA) guidelines provide advice on determining the “suitability of topsoil”.

The developer should maintain the integrity and quality of any topsoil/subsoil brought onto site, ensuring that it does not become cross contaminated through poor site practice.

Any imported inert fill/subsoil required for backfilling or regrading should comprise a good quality fill, free of demolition detritus (such as bricks, brick ties, etc) as well as deleterious materials (such as timber, glass and asbestos). These should have provenance and chemical analysis to prove the strata to be imported as inert prior to acceptance on site. The analysis from the provider of the inert fill must be current and relevant for the material being imported.

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Additional independent analysis of topsoil/subsoil should be completed to confirm the source documents. Reference has been made to the Welsh Contaminated Land Working Group guidance document relating to garden validations “Requirements for the chemical testing of imported materials for various end uses and validation of cover systems” The following chemical testing quota is recommended once the soils have been imported to the site. The type of testing and sample frequency is dependent upon the provenance of the materials.

- Topsoil Testing (greenfield source): 4 samples to be taken from deliveries up to 250m³ with an additional 1 sample per 250m³, for volumes greater than 250m³.
- Topsoil Testing (unverified source): 1 sample per 50m³.
- Subsoil Testing (greenfield): 4 samples to be taken from deliveries up to 250m³ with an additional 1 sample per 250m³, for volumes greater than 250m³.
- Subsoil Testing (quarried source): no requirement for testing.
- Subsoil Testing (unverified source): 1 sample per 50m³.

Confirmation of the volume of material imported to site must be provided to ensure that representative sampling has been undertaken in accordance with the required testing frequency.

Samples should be analysed for CLEA inorganics/metals, speciated (16) PAH compounds, phenols, banded aliphatic and aromatic TPH compounds, pH and asbestos fibre screen.

The copper, nickel and zinc threshold values in British Standard BS3882:2015 ‘Specification for Topsoil and Requirements for Use’ are significantly lower than the human thresholds and it is advised that these should be adopted for imported materials placed in gardens and areas of landscaping.

Should elevated concentrations be identified within the imported soils additional testing or assessments may be appropriate.

The testing of soils for validation must be taken from the construction site to ensure these are representative of the soils actually used within the gardens. The samples can be taken from stockpiles on site or in situ following placement within gardens and landscaping. Where soils are being kept within tested stockpiles on site it is imperative that good stockpile management practices are adopted. This can include segregation of stockpiles from different origin, fencing or warning signs to prevent inadvertent cross-mixing, and not placing stockpiles on tarmac roads, contaminated made ground or adjacent to areas of heavy plant traffic.

Results of the chemical analysis would be screened against the Tier 1 Threshold Values presented in the table in Appendix 11.

Validation report

A qualified geo-environmental consultant would be required to prepare a validation report with regards to the soils contaminated with PCBs if encountered and imported materials, if required. The report would need to include, for example, laboratory analysis, photographic records and delivery notes, where applicable.

This verification report would need to be submitted for approval in support of the planning application and NHBC conditions.

Proposed Temporary above Ground Fuel Storage Tank

It is anticipated that a bunded diesel fuel storage tank may be present within the compound area of the site during the construction phase and will be decommissioned once development is complete.

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Mobile filling of plant may also occur. Plant should be checked and maintained regularly to ensure fuel/oil leakages do not occur. All staff on the development site must be warned of the potential consequences that a fuel spillage will have for both the development and the surrounding environment.

Any contamination resulting from spillages during construction works may be considered under the Environmental Damage (Prevention and Remediation) (England) Regulations (2015). Any contaminants released during the development process must be immediately reported to statutory bodies and appropriate remediation agreed. These are likely to require consideration of the contamination in terms of the significant possibility of adverse effects (rather than significant harm) to land, water, habitats, and protected species.

It is recommended that the position of the fuel tanks are recorded and the ground underlying the tanks is sampled and analysed to confirm that spillages have not impacted these areas of the site.

22.5 Disposal and Control of Excavated Materials

It should be noted that where possible, all soils should remain on site, as part of a sustainable building policy, or where suitable to be transferred for re-use rather than sent to landfill. Should unforeseen contaminated soils be encountered which require re-use or additional soils are needed to raise site levels, depending on the volume, a Materials Management Plan (MMP) may be required. If the volume is below 1000 tonnes then it may be feasible to apply for a U1 waste exemption instead.

The intended use of soils excavated from the site would be detailed within the contractors MMP for implementation within the construction phase. The Material Management Plan would require the identification and classification of materials intended for re-use or disposal off-site (including classification as inert, non-hazardous, stable non-reactive hazardous, or hazardous waste) and volume targets for disposal of each type, prior to excavation.

Each soil type which is intended for removal will be classified with one of the following EC waste designation codes, as detailed within Environment Agency “*Technical Guidance WM3 - Hazardous Waste*”. Generally, the soils would be classified as:

- **17 05 04 soil and stones other than mentioned in 17 05 03 – not containing hazardous substances.**

Should soils be found to contain PCBs these may be classified as:

- **17 05 03 soil and stones containing hazardous substances**

Based upon the chemical analysis of the samples taken to date, Coopers can advise the waste characteristics of the natural strata, made ground (similar to topsoil) and made ground would likely be:

Non hazardous waste, likely to be inert following testing for Waste Acceptance Criteria (WAC) if intended for landfill.

Should soils be found to include PCBs, these may be categorised as:

Non hazardous waste, possible hazardous following testing for WAC if intended for landfill.

Materials are however a commodity and re-use, or transfer would be preferred.

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It is recommended that the chemical analysis results obtained to date plus future WAC analysis are provided to a waste disposal site for confirmation of the disposal route, to enable the detailed assessment and full characterisation of the waste.

Where materials are excavated for construction purposes these should be retained on site for engineering purposes where considered suitable for use, if possible, to ensure sustainability of the development. The developer may complete the works under the CL:aire Development Industry Code of Practice for the Definition of Waste, Version 2 (or superseding versions if relevant). Within the Code of Practice, there are two paths which may guide the documentation required for the form of soil management systems. The initial path expects a Remediation Strategy to be produced for the site (assuming it to be potentially contaminated) to determine which strata or areas of the site are considered to be contaminated with regard to the proposed land use (Route A). The second path expects a Design Statement to be utilised for those sites where there is no contamination per se (Route B). Based on the characteristics identified at this site to date, a Design Statement would be applicable.

Direct transfer of naturally occurring soils may be undertaken, however a robust assessment of the materials has to be undertaken to confirm this material is suitable for use and uncontaminated. It should be noted that the degree of threshold for contamination will be judged on the receiving sites requirements (based on the proposed end use).

The Code of Practice requires 4 No. factors to be addressed within the Material Management Plan:

- (1) Protection of human health and protection of the environment;
- (2) Suitability of use, without further treatment;
- (3) Certainty of use; and
- (4) Quantity of material.

With regard to Box A within the Code of Practice (c.3.7, p.13), the material types encountered have been classified to determine the 'Categorisation of materials within the ground'. Areas and volumes of strata noted below, will require assessment by a qualified quantity surveyor. These volumes would not represent the volumes of soils likely to be excavated through any part of the construction phase of the site redevelopment, rather the anticipated total volume of that stratum.

Table 6 - Categorisation of materials within the ground in accordance with CL:aire Code of Practice

(1) Material that is capable of being used in another place on the same site without treatment*; (2) Material that is capable of being used in another place on the same site following ex-situ treatment on site*; (3) Material that is capable of being used in another development site without treatment (Direct Transfer); (4) Material that is capable of being used in another development site following ex-situ treatment on another site e.g. Hub site*; (5) Material that is not capable of being used on the site or elsewhere and requires recovery or disposal off site as waste; or (6) Material that will be surplus to requirements and requires recovery or disposal off site as waste. * Having regard to the conceptual model (receptors and pathways) and appropriate risk assessment of the location where materials are to be used. We do not consider damping down to be treatment.

Madeground (similar to topsoil)(6)

The madeground (similar to topsoil) has been shown to be physically unsuitable for re-use within the growing medium in the gardens and soft landscaping. This will require disposal to a permitted waste disposal site.

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Madeground (1) and (6)

The madeground would not require treatment. It would not be suitable for re-use within the growing medium in the gardens and soft landscaped areas due to the physical nature of the material. However, it would be considered to be geotechnically suitable for use beneath buildings, roads and hardstanding (subject to suitable compaction designed for the end use).

Natural materials – subsoil (1), (3) and (6) proven to be suitable for use

Natural strata would not require treatment and would be suitable for re-use in gardens and soft landscaped areas as a growing medium, and where geotechnically suitable for use beneath buildings, roads, or as up fill (subject to suitable compaction for the designated end use). These materials if proven geotechnically and chemically suitable for use on other sites may be transferred under an MMP for the receiving site.

22.6 Risks to Groundworks Contractors

We do not anticipate that groundworks contractors will be detrimentally affected by the materials present on site assuming basic site hygiene is followed; comprising wearing gloves, overalls, steel toe capped boots and hard hat on site, and basic welfare facilities are present within the site.

23.0 Further Actions

- Submit this site investigation report to Wrexham CBC in support of the planning application and approval from the CLO and to the NHBC for approval.
- Due to the presence of services within and adjacent to the site, consultations should be held with service providers regarding plans to adopt, divert, or abandon the services.
- Soil sampling, risk assessment and reporting with regards to potential PCBs in the vicinity of the electricity sub-station following the disconnection of the services and lifting of the car park surface. Report to be submitted to Wrexham CBC in support of the planning application.
- Additional investigation of ground conditions following demolition of the current buildings and in the vicinity of the proposed mews bungalows to aid foundation design.
- In situ CBR tests undertaken within road corridors and parking areas.
- Refinement of plot specific foundations, following production of finalised external works drawings and drainage plans.
- Delineation/segregation of madeground (similar to topsoil) and madeground, with removal of madeground (similar to topsoil) from site.
- Removal of waste stockpile from site to a permitted waste management site.
- Validation of the radon protection installation is recommended with the production of a validation report, for submission to the regulators for approval (if the latter is required).
- The direct transfer of topsoil/subsoil to the site would require the application of either a U1 exemption or an MMP, depending on the volumes to be imported.
- Validation of imported topsoil and subsoils if required, with validation report prepared for submission to Wrexham CBC in support of the planning application.
- If surplus strata require offsite removal they are likely to require testing to confirm suitability for the intended end use at the receiving site. Where strata are intended for landfill they may require testing for Waste Acceptance Criteria (WAC).

Site Investigation Report for land at Cwrt Pentwmpath, Llay

24.0 References

- A study of the published geological maps.
- A review of data held in the Coopers archives.
- Inspection of historical OS Maps provided by Groundsure.
- Review of Groundsure Enviro+Geo Insight report.
- Review of the GOV.UK website.
- Review of the BGS website.
- Review of the tree survey completed by Tree Solutions, dated 17th September 2021.
- The findings of exploratory holes undertaken by Coopers on 23rd November 2022.
- The results of contamination testing carried out by DETS.
- The results of geotechnical testing undertaken by Murray Rix.
- BS 3882:2015 - Specification for topsoil and requirement for use.
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- BS 8576:2013 – Guidance on Investigations for Ground Gas (Permanent Gases and Volatile Organic Compounds (VOCs)).
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Site Investigation Report for land at
Cwrt Pentwmpath, Llay

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- Environment Agency Report: SC050021/SR2 - Human health toxicological assessment of contaminants in soil, 2009
- Environment Agency Report: SC050021/SR3 - Updated technical background to the CLEA model, 2009.
- Environment Agency Report: SC050021/SR4 - CLEA Software (Version 1.04 beta) Handbook, 2009.
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- Highways Agency, Volume 1 - Manual of Contract Documents for Highway, Series 600 - Earthworks, Amendment November 2009.
- NHBC Standards.
- NHBC Report No. 10627-R01 (04): Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present, January 2007.
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Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 1

Historical Maps

Site Details:

CWRT PENTWMPATH, LLAY,
WREXHAM, LL12 0TT

Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: County Series

Map date: 1874-1875

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1875
Revised 1875
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1874
Revised 1874
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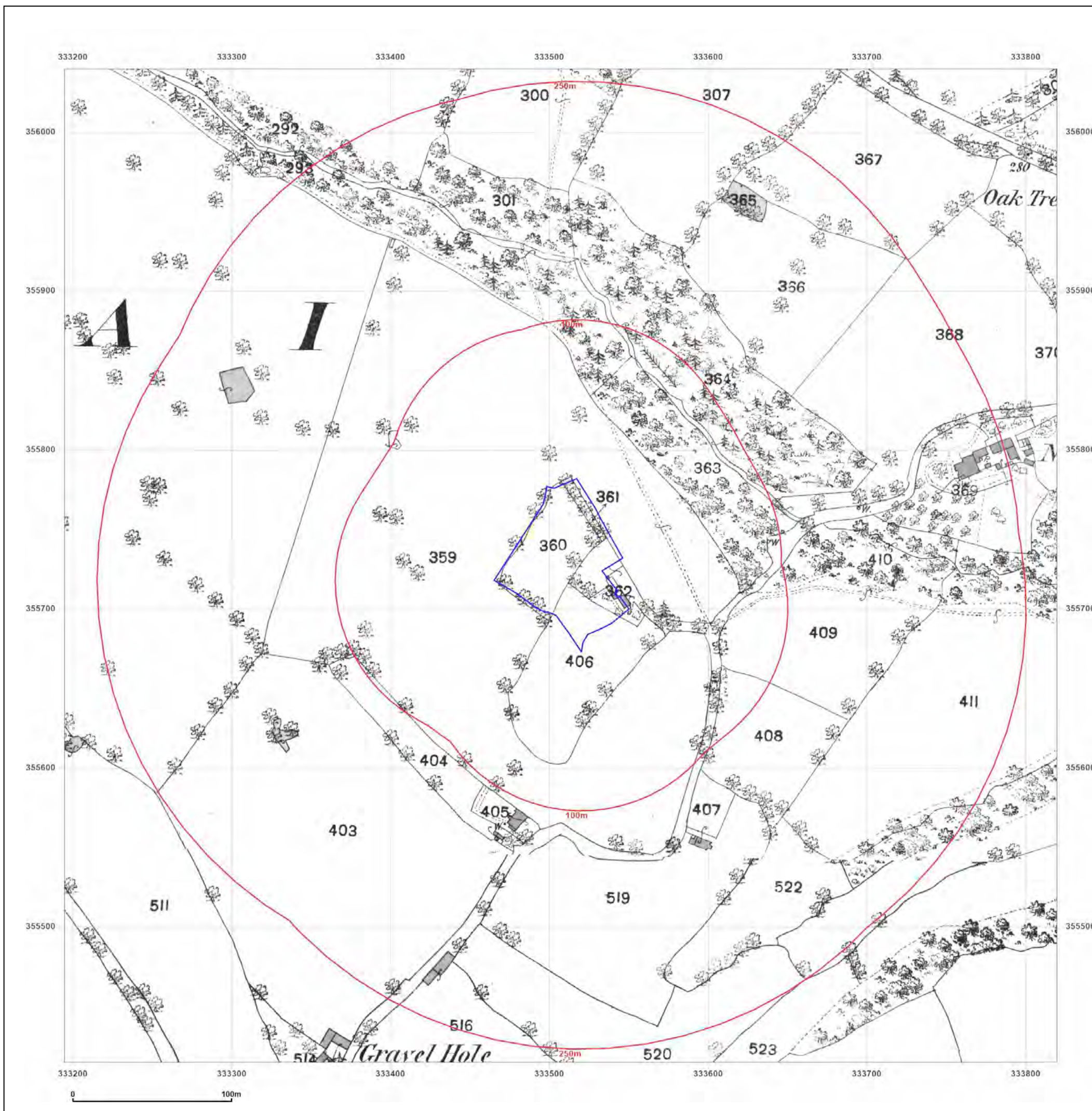


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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: County Series

Map date: 1899

Scale: 1:2,500

Printed at: 1:2,500



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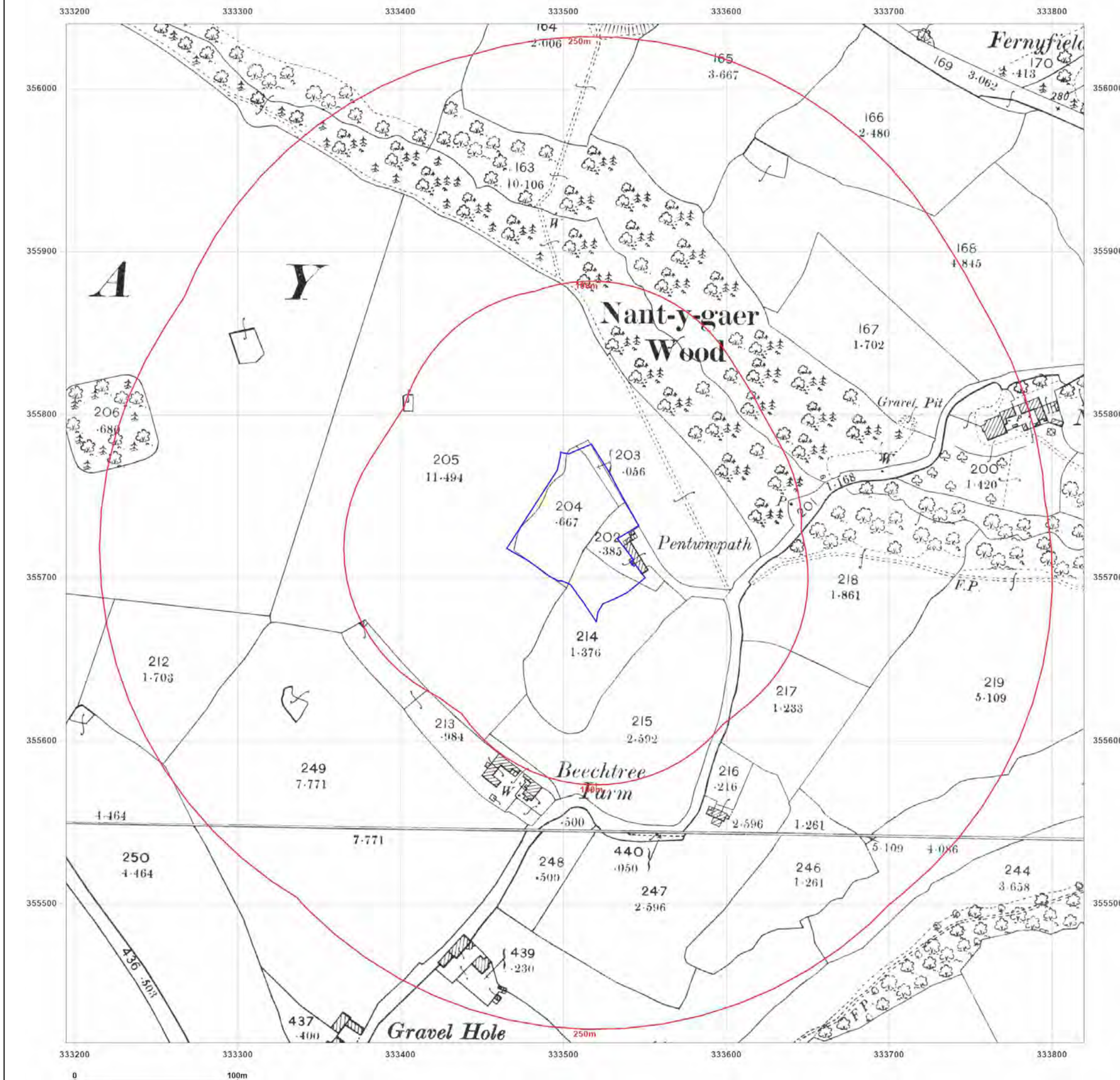


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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: County Series

Map date: 1912

Scale: 1:2,500

Printed at: 1:2,500



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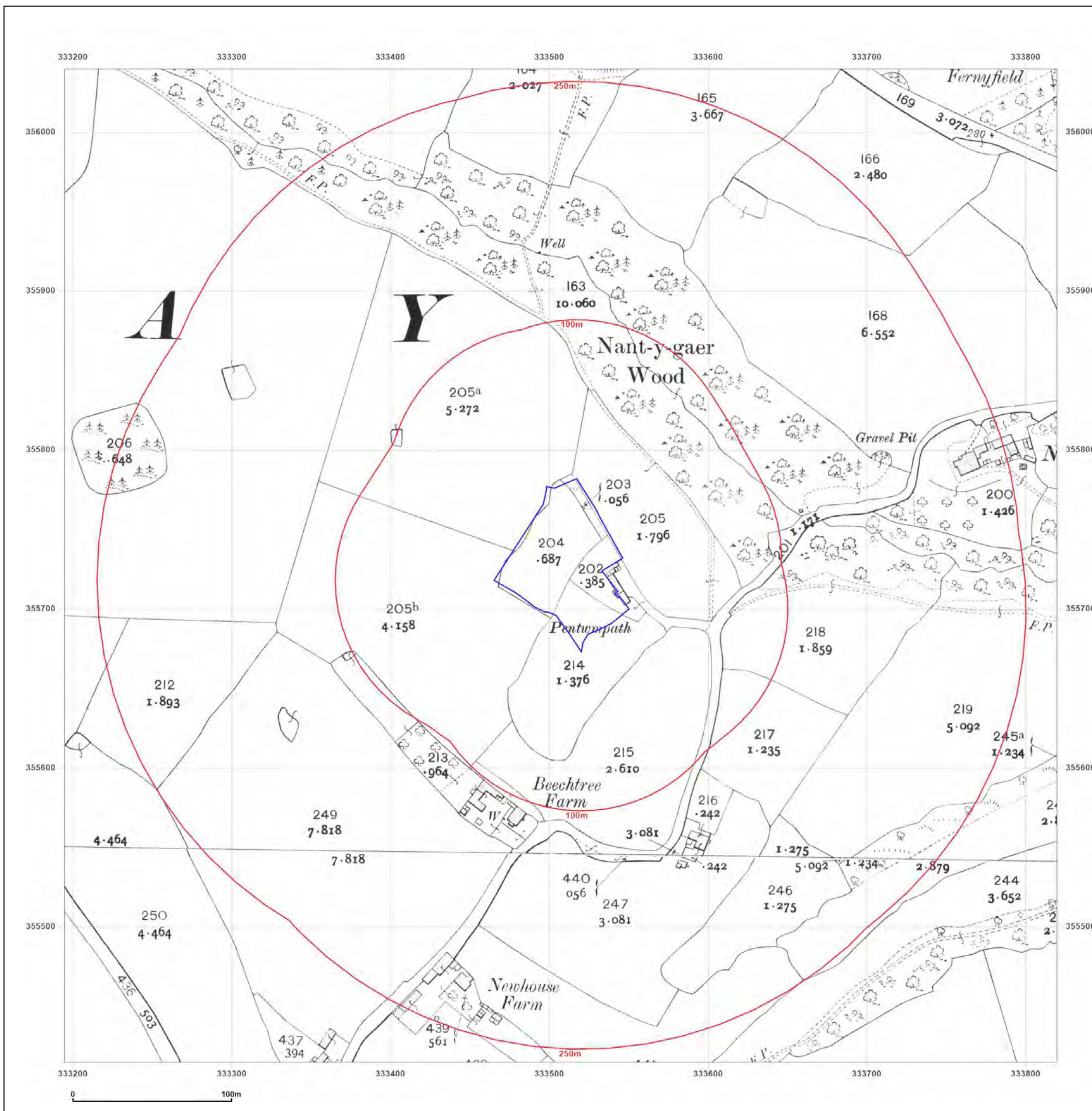


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Site Details:

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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1970-1973

Scale: 1:2,500

Printed at: 1:2,500



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Edition N/A
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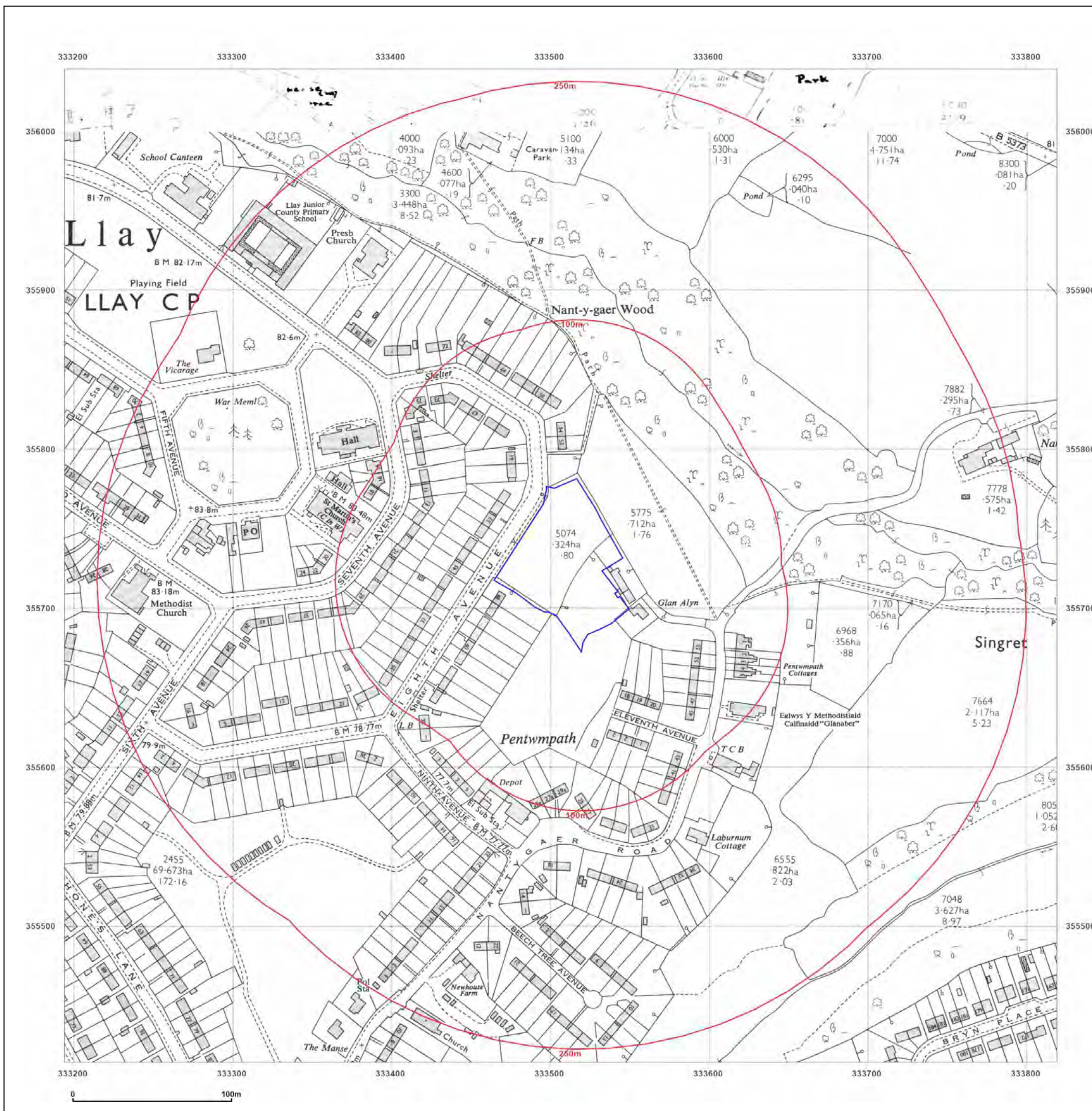


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Site Details:

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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1973

Scale: 1:2,500

Printed at: 1:2,500



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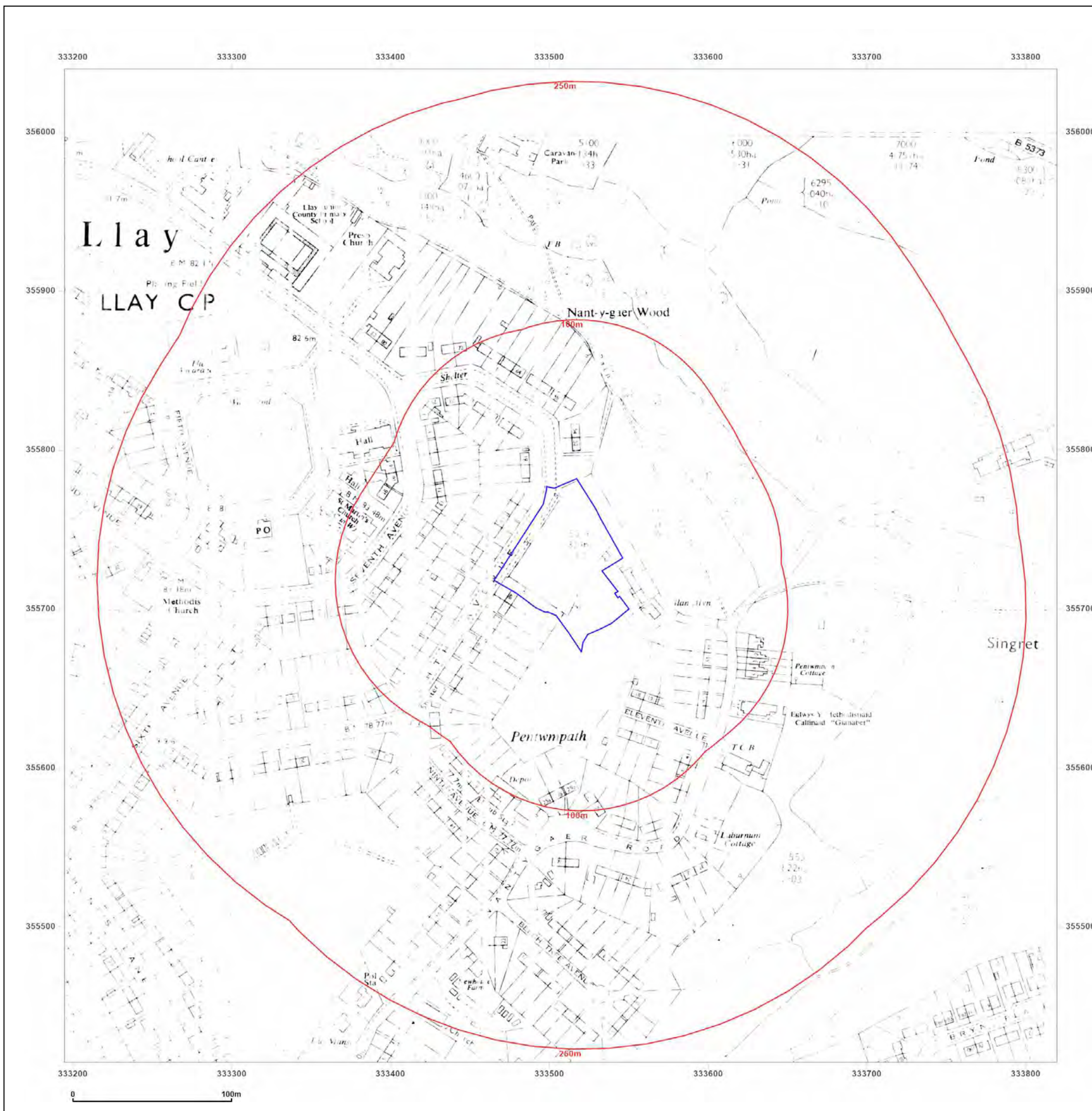


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Site Details:

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WREXHAM, LL12 0TT

Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1970-1975

Scale: 1:2,500

Printed at: 1:2,500



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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1980

Scale: 1:2,500

Printed at: 1:2,500



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

Surveyed N/A
Revised N/A
Edition 1980
Copyright N/A
Levelled 1959

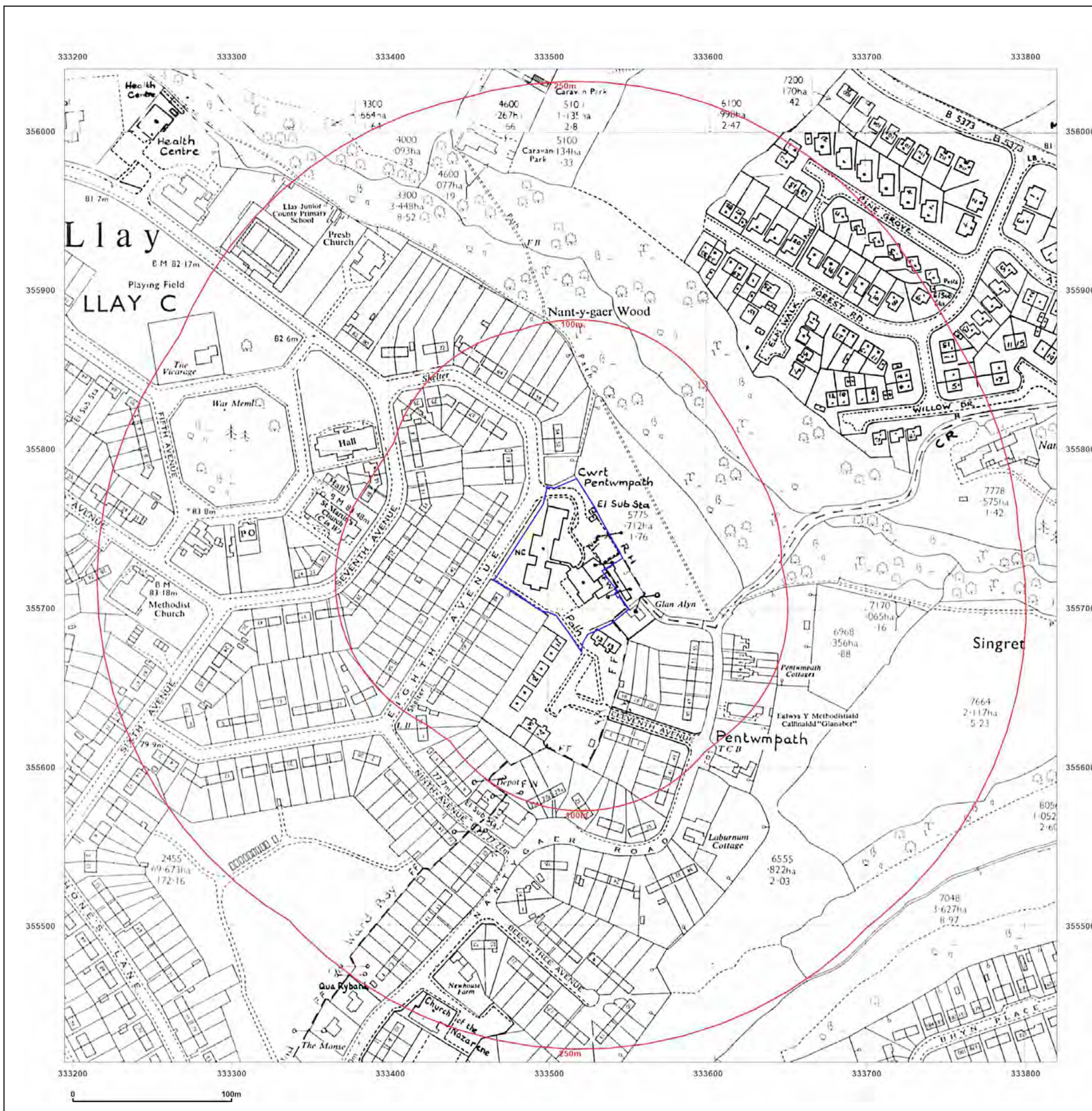


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Site Details:

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WREXHAM, LL12 0TT

Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1984

Scale: 1:2,500

Printed at: 1:2,500



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Surveyed 1983
Revised 1983
Edition N/A
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Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1984

Scale: 1:2,500

Printed at: 1:2,500



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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1990

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A
Revised N/A
Edition N/A
Copyright 1990
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1990
Levelled N/A

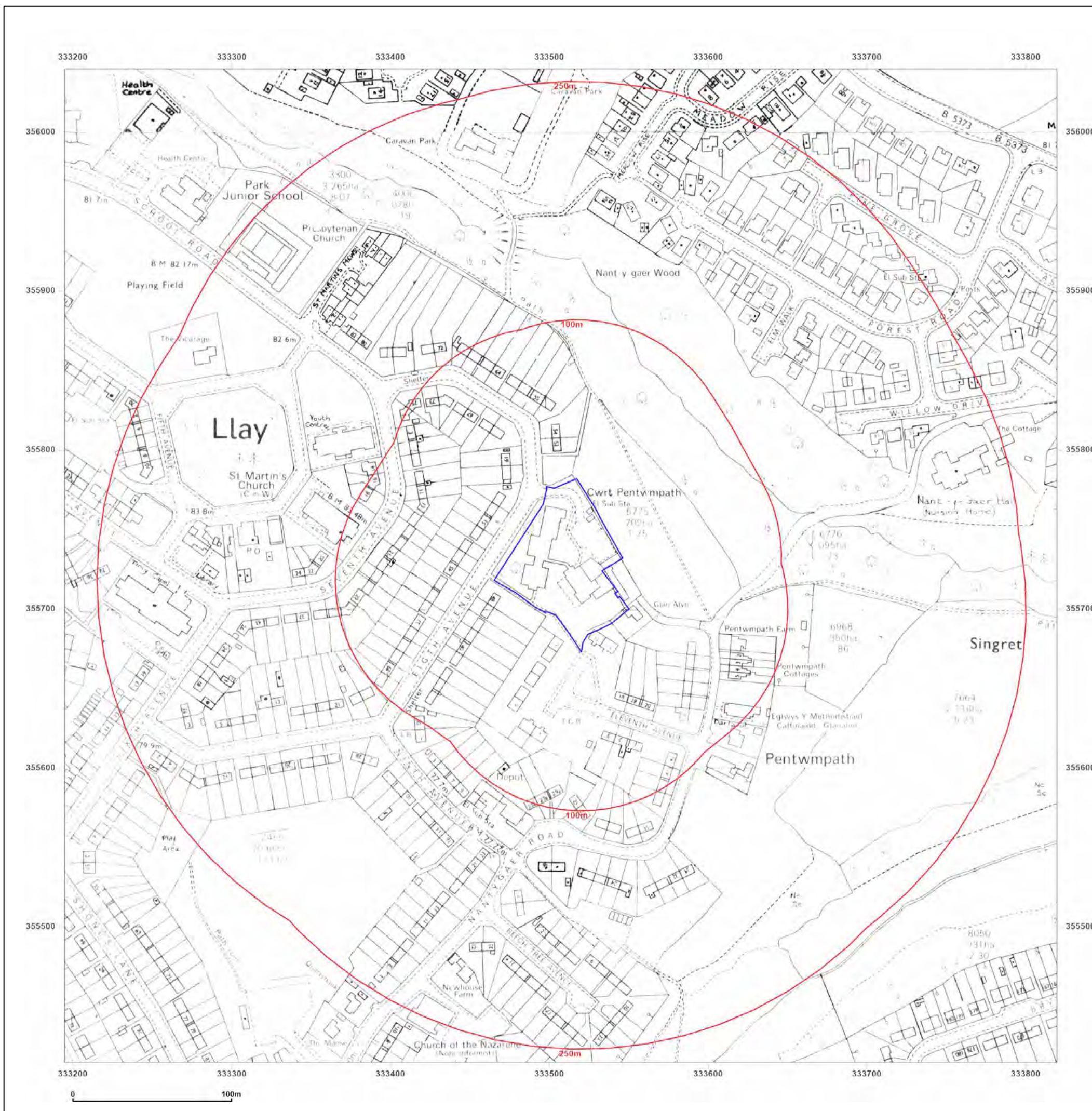


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Site Details:

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WREXHAM, LL12 0TT

Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1991

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A
Revised N/A
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Site Details:

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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1993

Scale: 1:2,500

Printed at: 1:2,500



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

Surveyed N/A
Revised N/A
Edition N/A
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Site Details:

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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: LandLine

Map date: 2003

Scale: 1:1,250

Printed at: 1:1,250

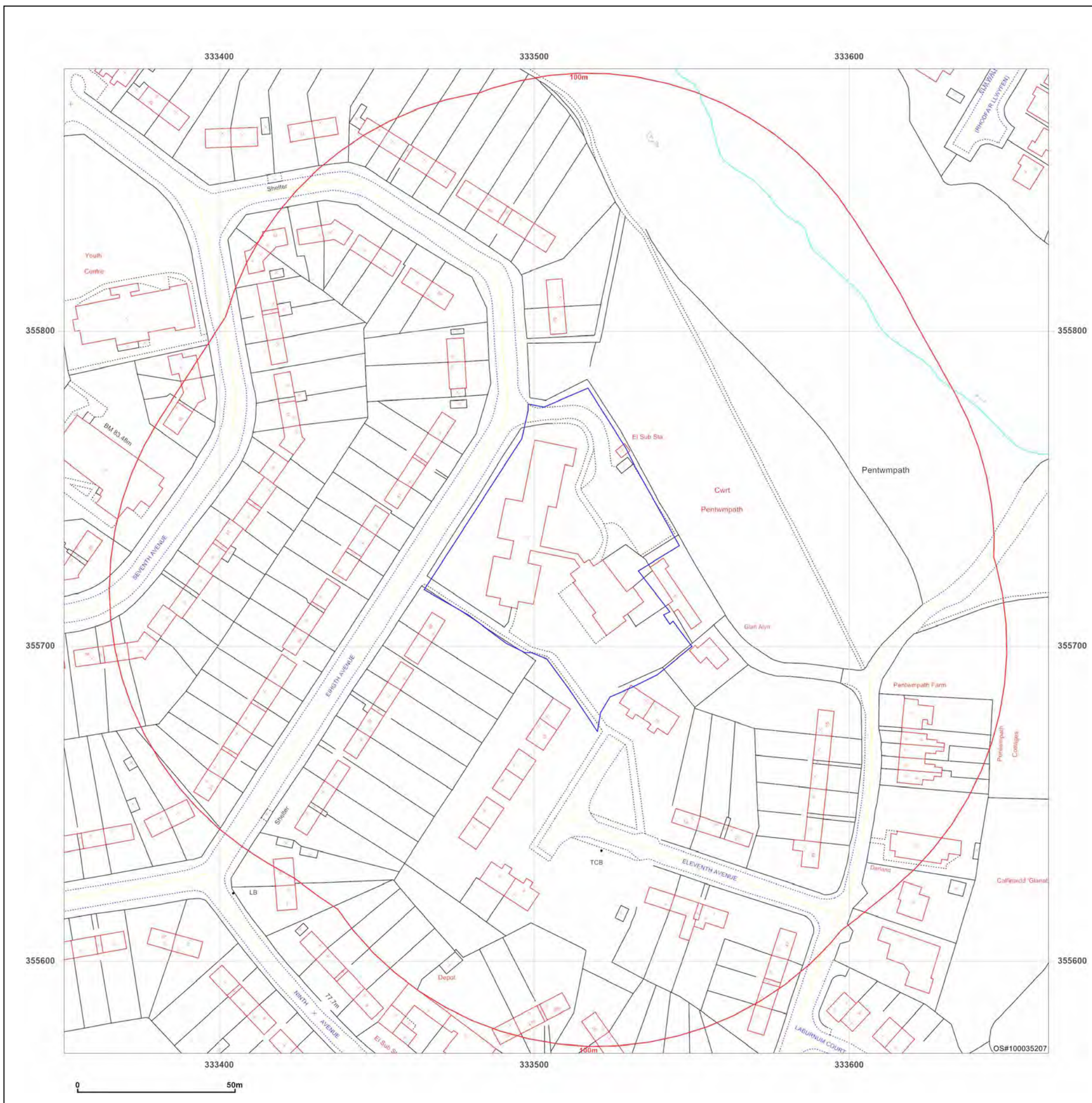


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Site Details:

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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: County Series

Map date: 1898-1900

Scale: 1:10,560

Printed at: 1:10,560



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

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

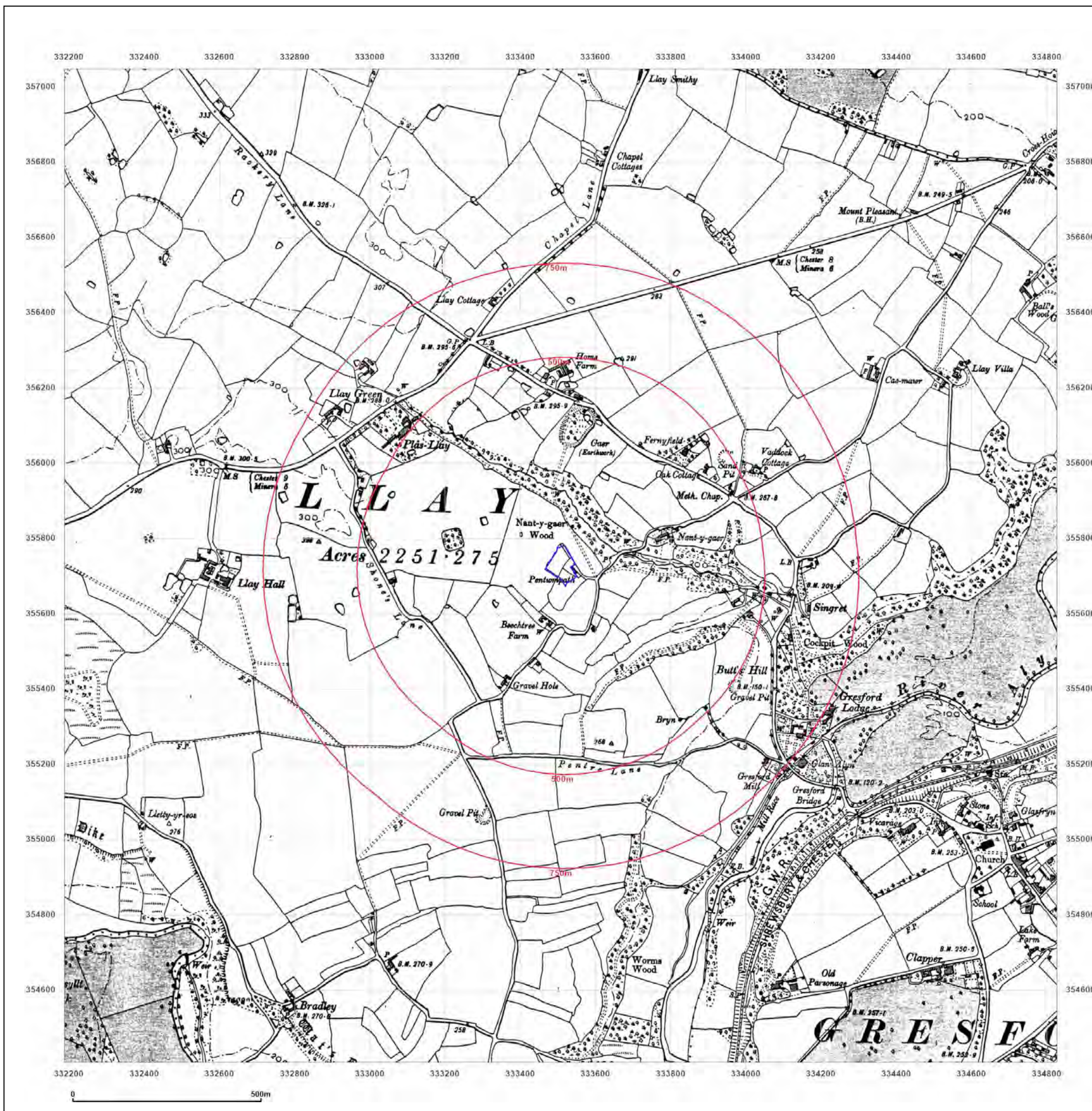


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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: County Series

Map date: 1900

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1871
Revised 1900
Edition N/A
Copyright N/A
Levelled N/A

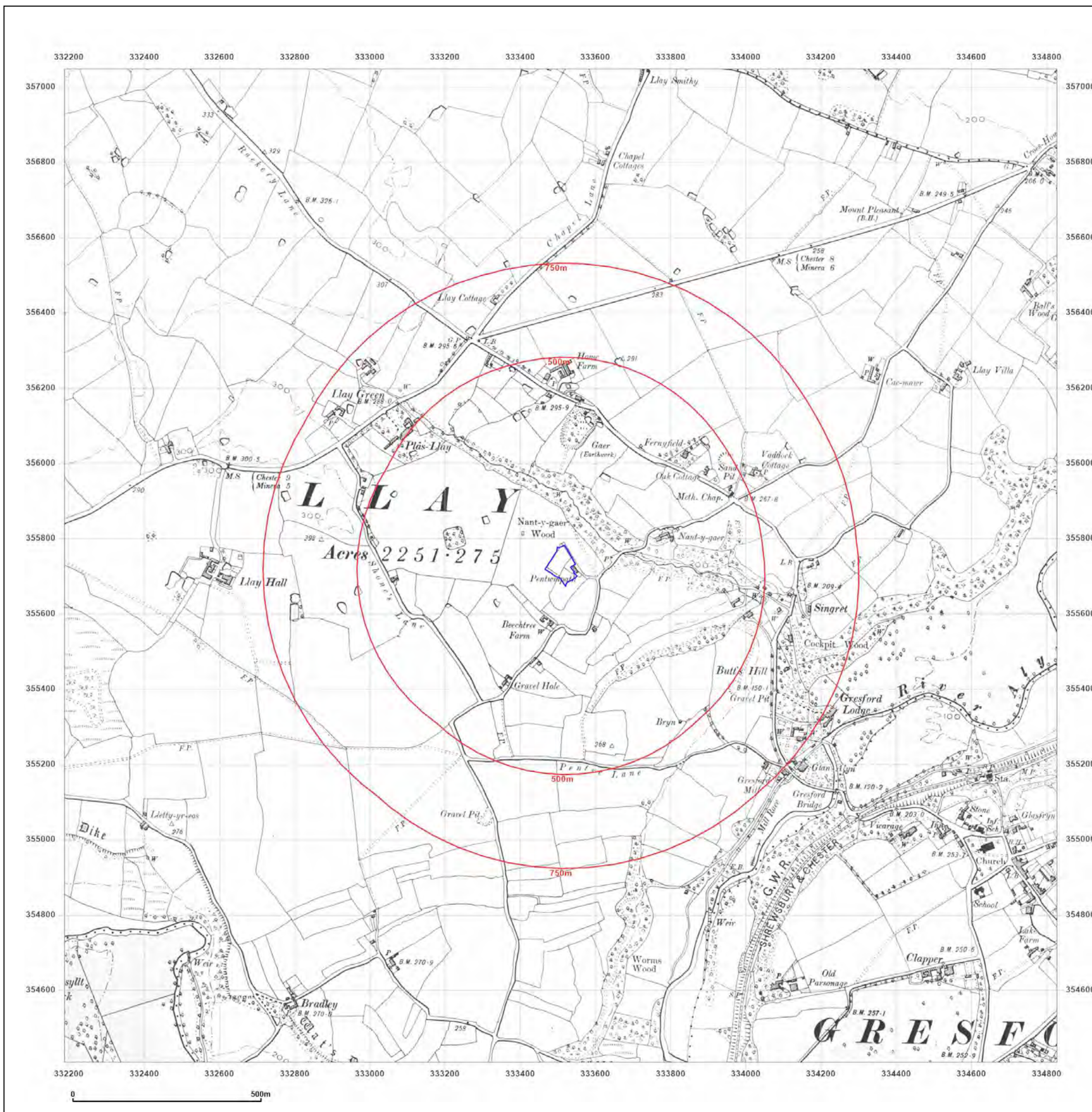


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Site Details:

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WREXHAM, LL12 0TT

Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: County Series

Map date: 1909

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1871
Revised 1909
Edition N/A
Copyright N/A
Levelled N/A

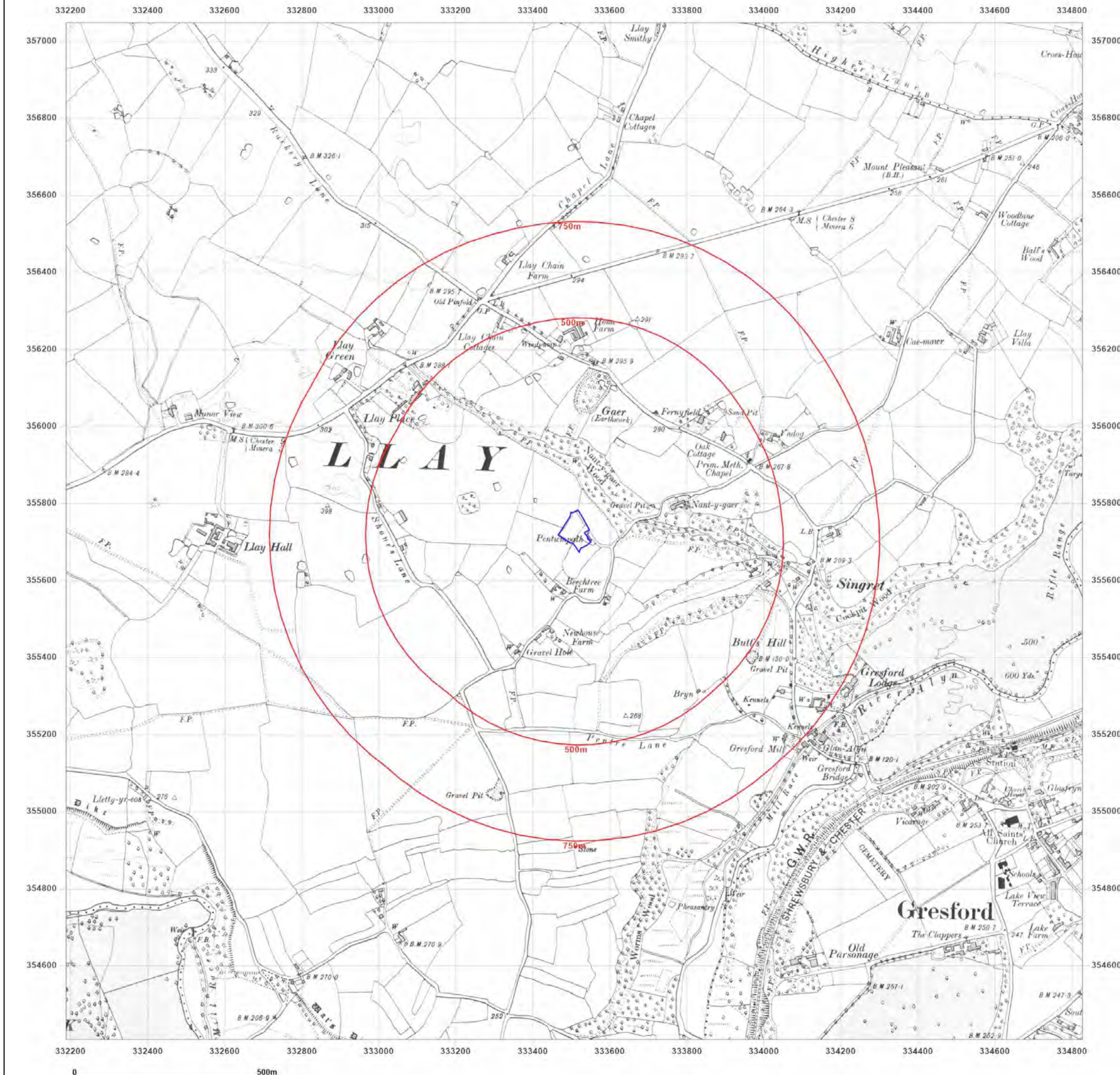


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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: County Series

Map date: 1938

Scale: 1:10,560

Printed at: 1:10,560



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

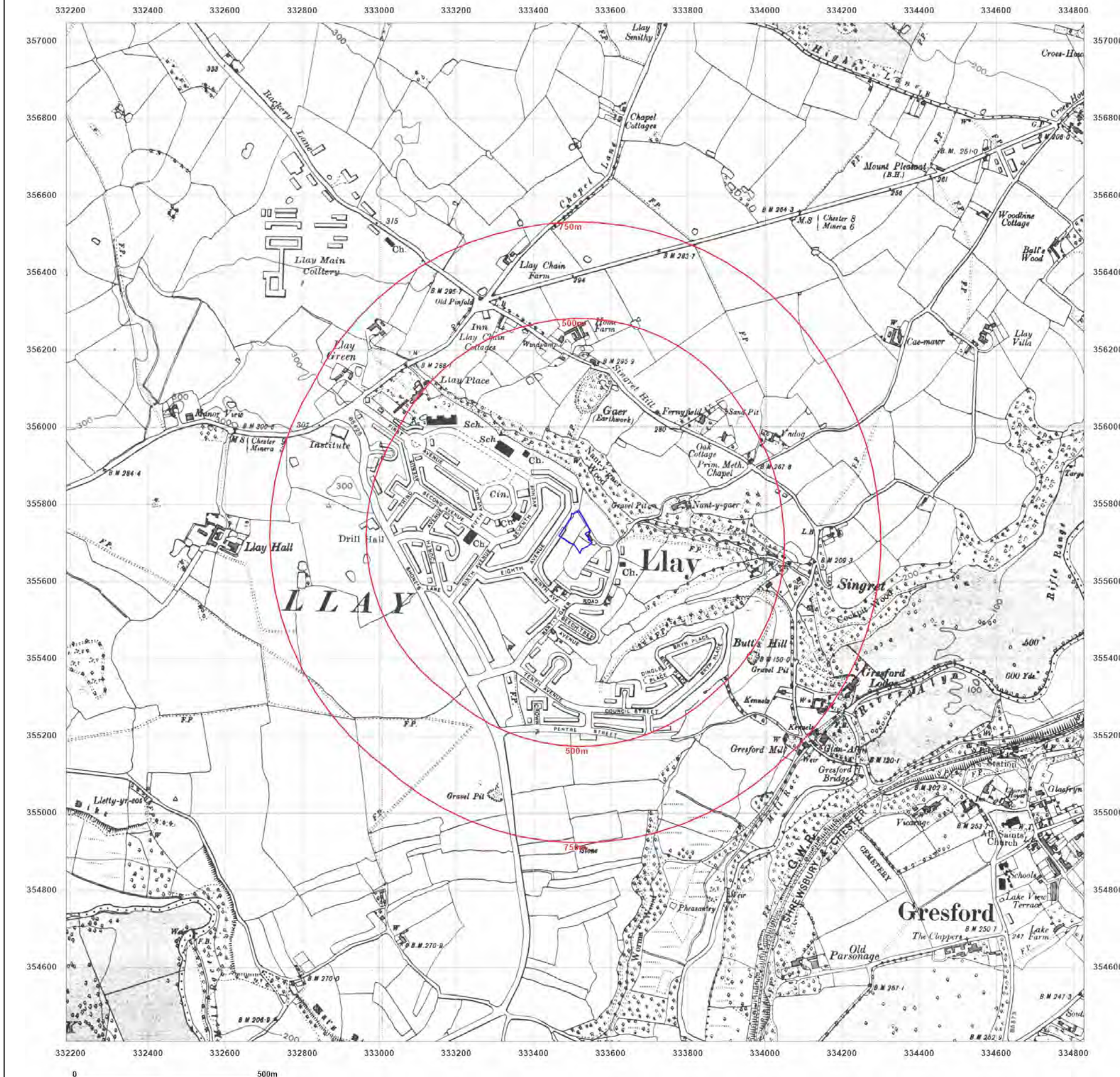


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Site Details:

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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: County Series

Map date: 1949

Scale: 1:10,560

Printed at: 1:10,560



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

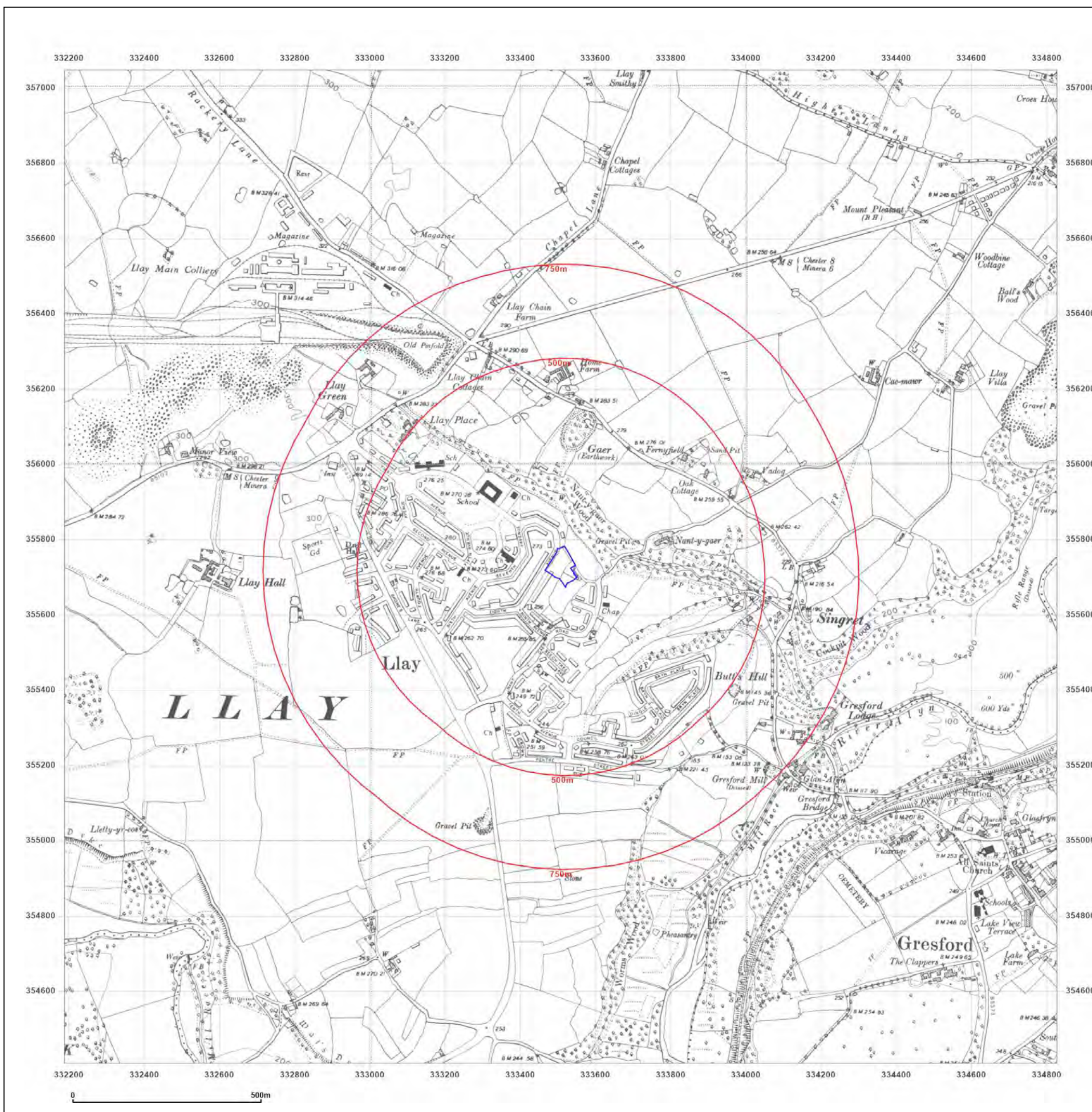


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Site Details:

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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: Provisional

Map date: 1960-1964

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1871
Revised 1960
Edition N/A
Copyright N/A
Levelled N/A

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

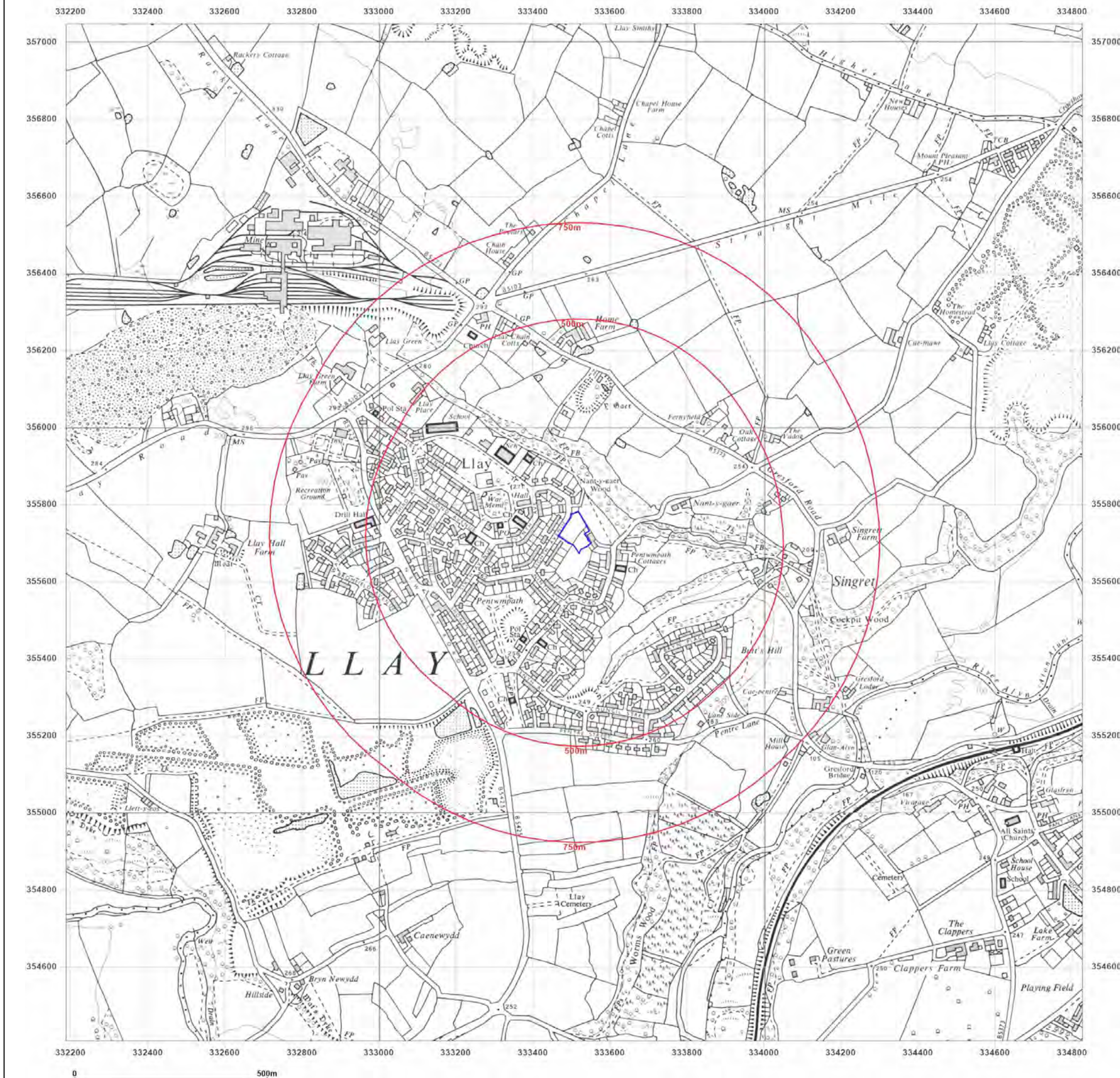


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Site Details:

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WREXHAM, LL12 0TT

Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: Provisional

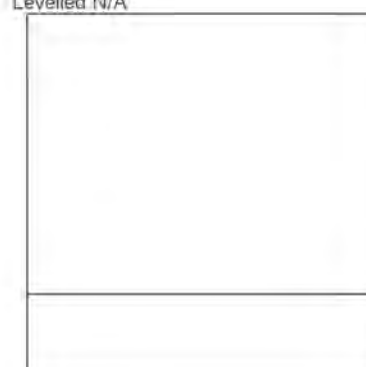
Map date: 1968

Scale: 1:10,560

Printed at: 1:10,560



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

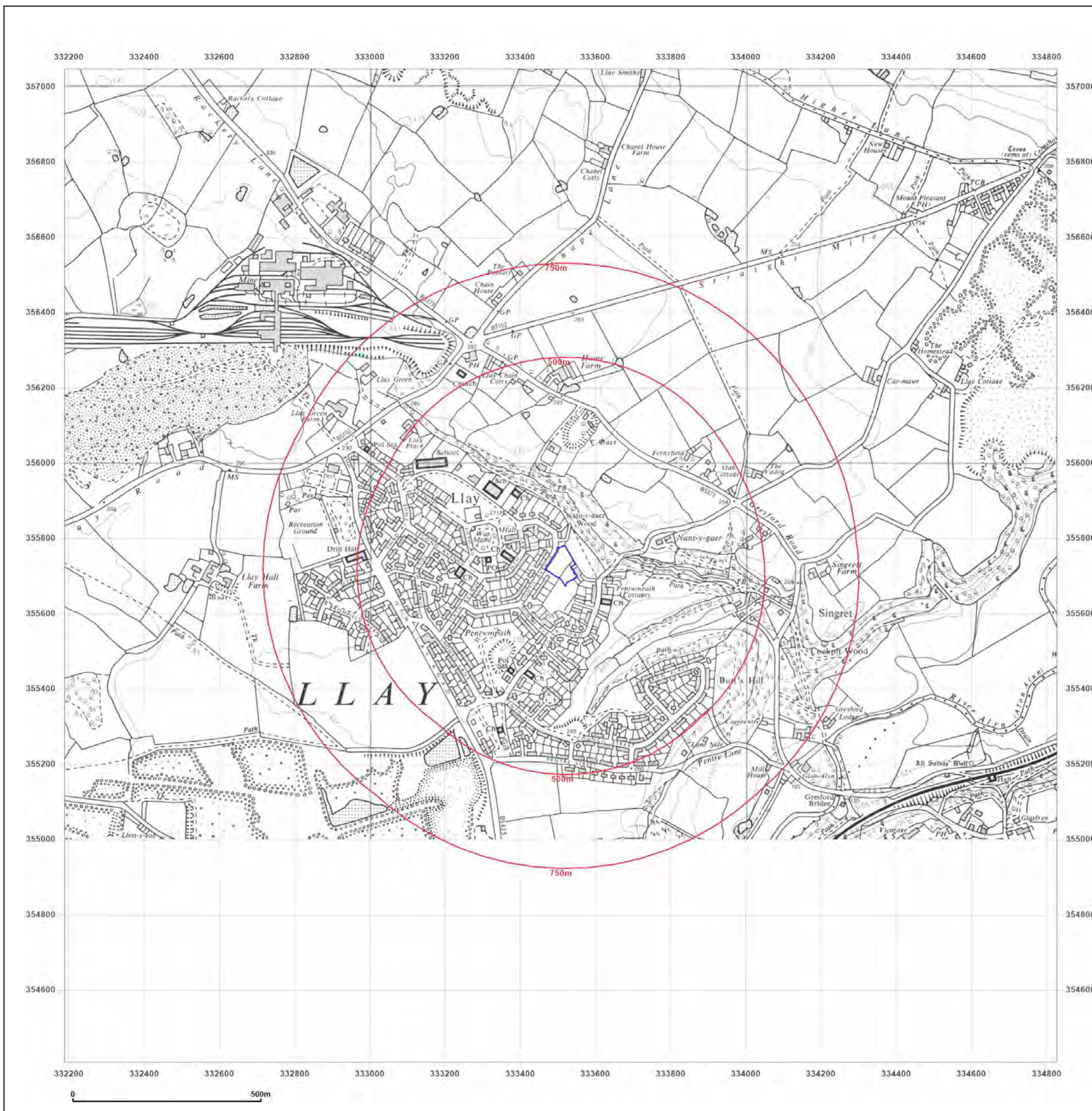


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Site Details:

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WREXHAM, LL12 0TT

Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1980-1981

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1974
Revised 1981
Edition N/A
Copyright 1981
Levelled 1976

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

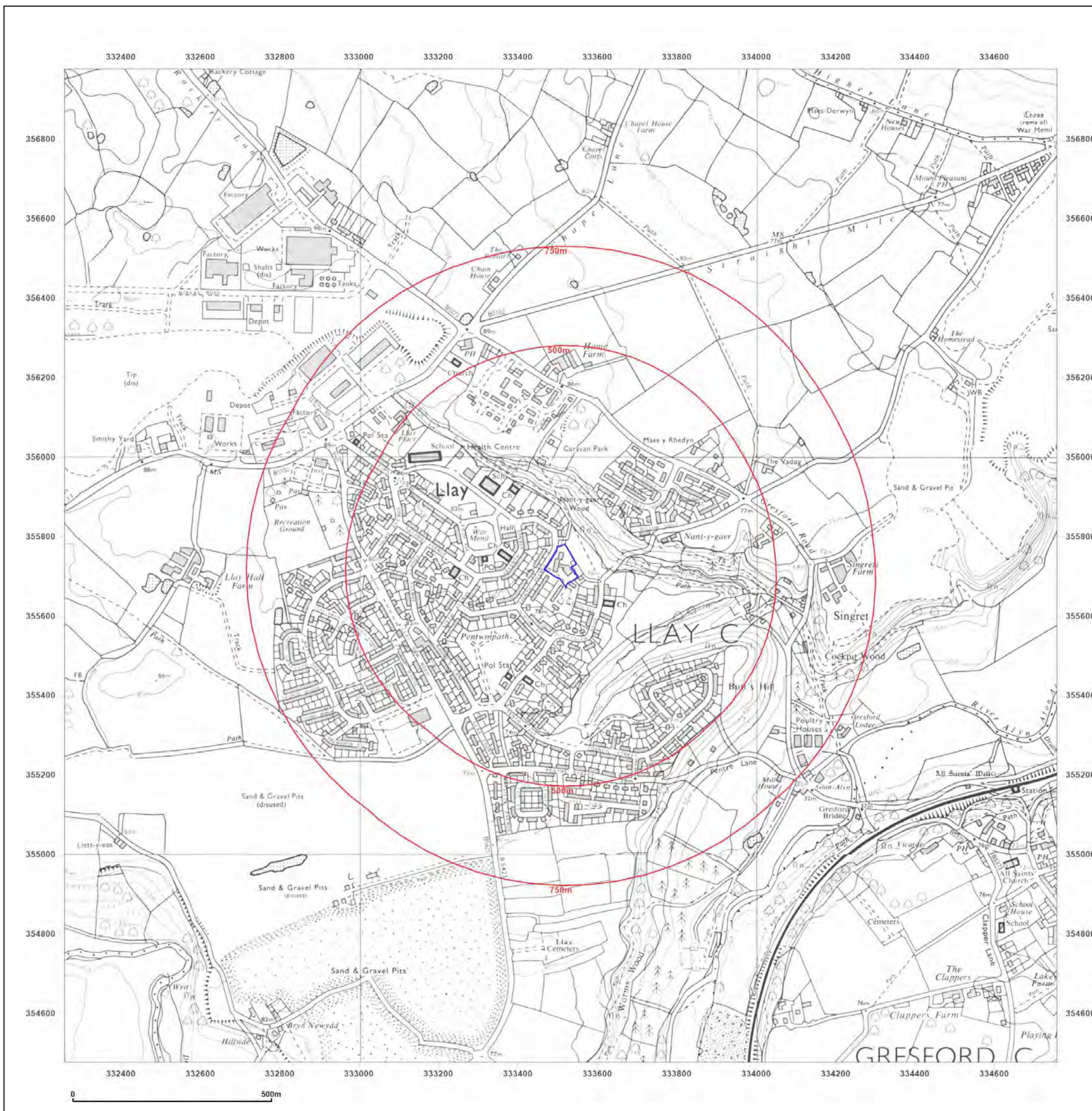


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Site Details:

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Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 1989-1992

Scale: 1:10,000

Printed at: 1:10,000



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

Surveyed 1985
Revised 1989
Edition N/A
Copyright N/A
Levelled N/A

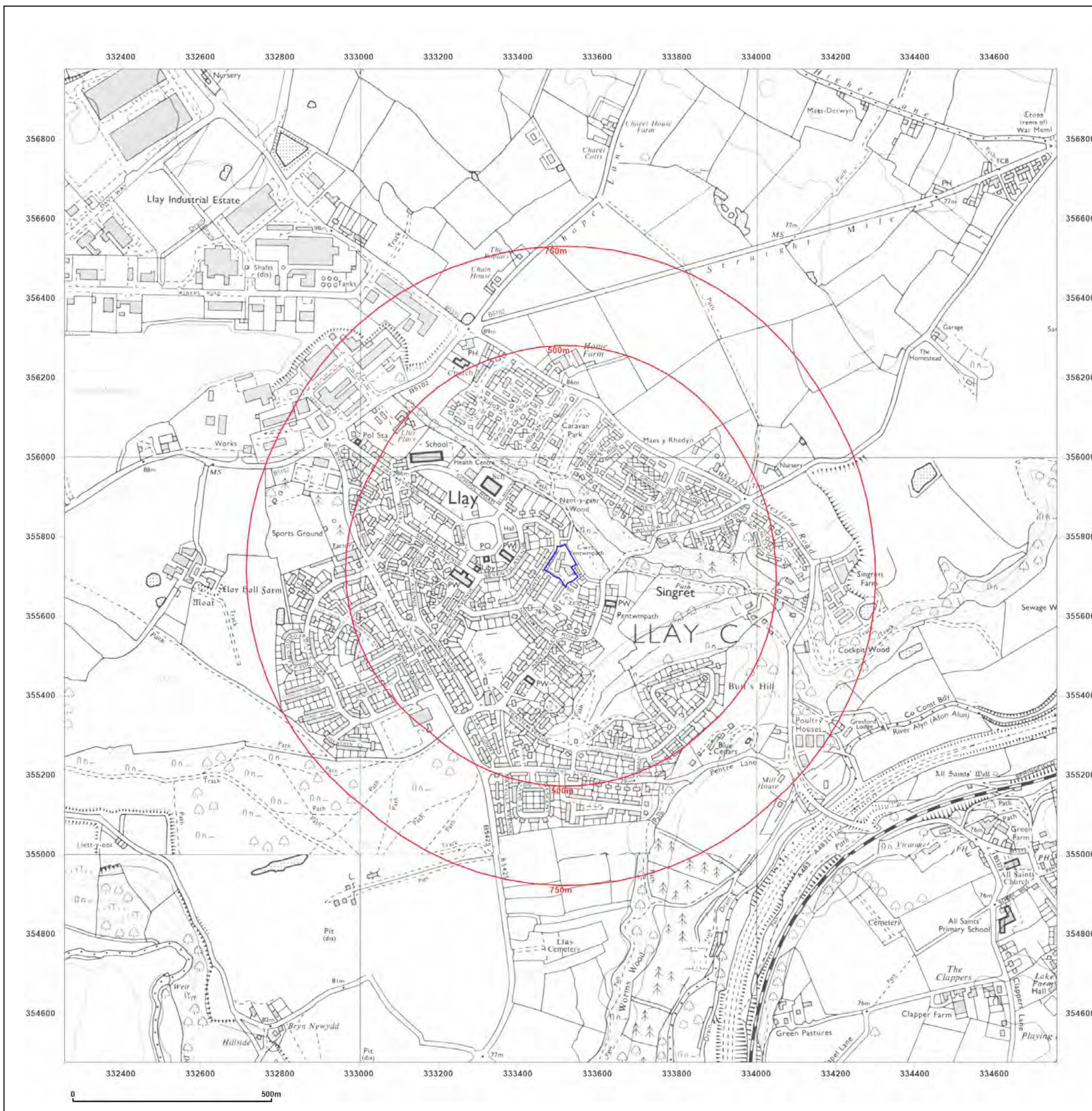


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Site Details:

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WREXHAM, LL12 0TT

Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 2001

Scale: 1:10,000

Printed at: 1:10,000

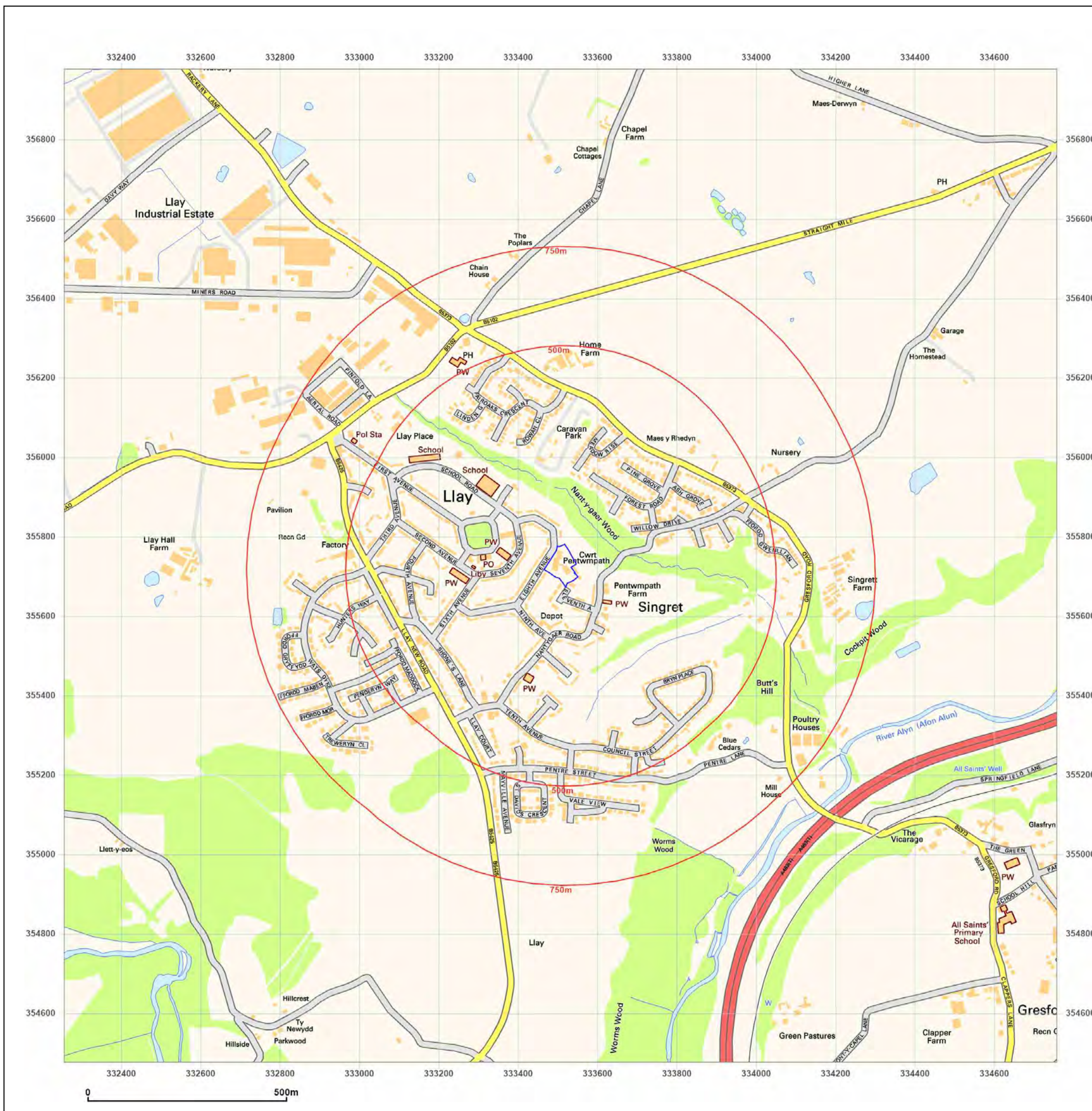


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Site Details:

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WREXHAM, LL12 0TT

Client Ref: 7962_-_PO_9543-JAL
Report Ref: GS-9191729
Grid Ref: 333507, 355727

Map Name: National Grid

Map date: 2022

Scale: 1:10,000

Printed at: 1:10,000

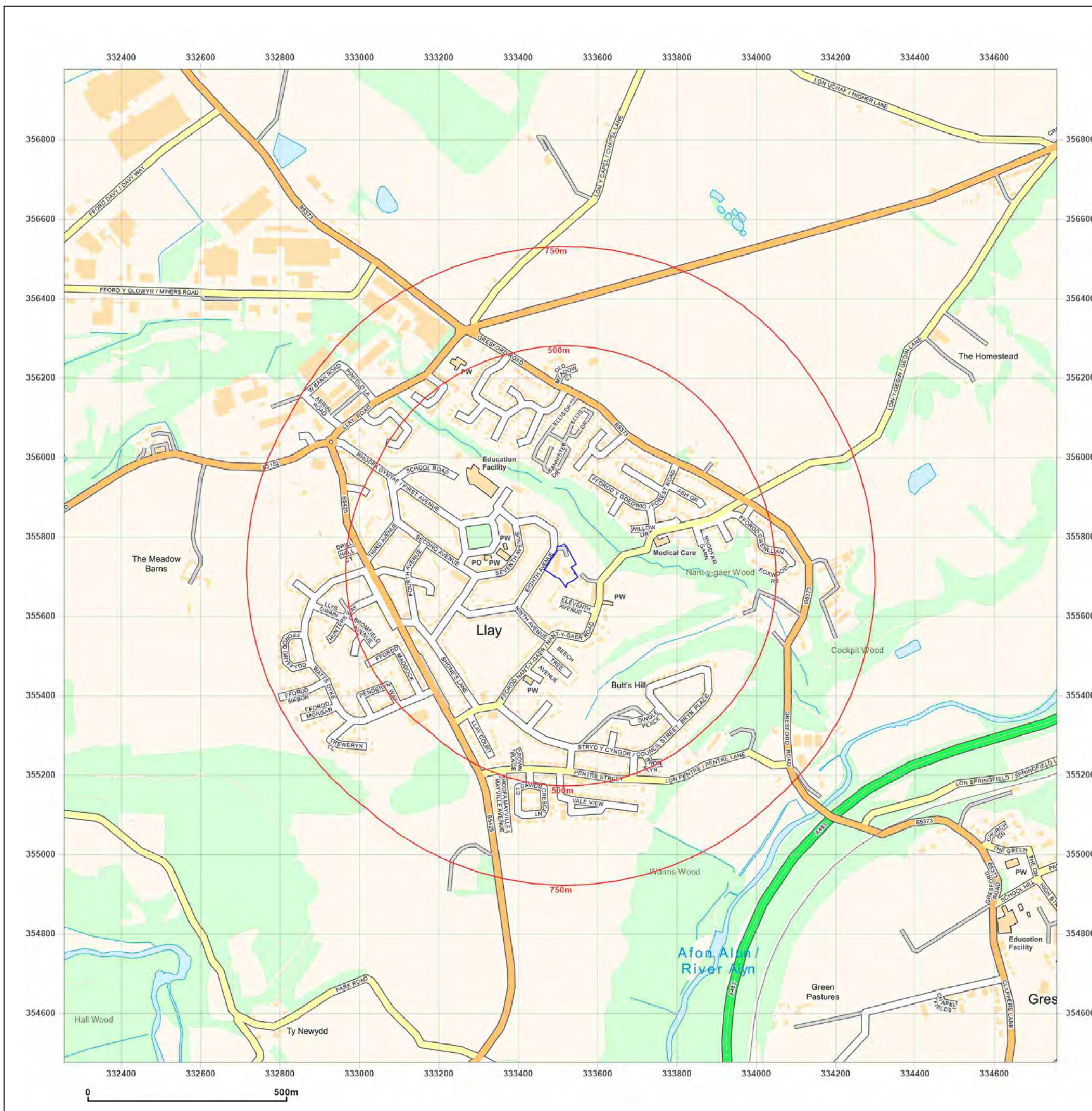


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Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 2

Groundsure Enviro+Geo Insight Report

CWRT PENTWMPATH, LLAY, WREXHAM, LL12 0TT

Order Details

Date: 11/11/2022
Your ref: 7962_-_PO_9543-JAL
Our Ref: GS-9191730

Site Details

Location: 333516 355718
Area: 0.47 ha
Authority: [Wrexham - Wrexham County Borough Council](#)



Summary of findings

p. 2

Aerial image

p. 8

OS MasterMap site plan

p.13

groundsure.com/insightuserguide

Contact us with any questions at:

info@groundsure.com

08444 159 000

Summary of findings

Page	Section	Past land use	On site	0-50m	50-250m	250-500m	500-2000m
14	1.1	<u>Historical industrial land uses</u>	0	0	6	14	-
15	1.2	Historical tanks	0	0	0	0	-
16	1.3	<u>Historical energy features</u>	2	0	2	9	-
16	1.4	Historical petrol stations	0	0	0	0	-
17	1.5	<u>Historical garages</u>	0	0	0	7	-
17	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
18	2.1	<u>Historical industrial land uses</u>	0	0	9	16	-
19	2.2	Historical tanks	0	0	0	0	-
20	2.3	<u>Historical energy features</u>	3	0	5	16	-
21	2.4	Historical petrol stations	0	0	0	0	-
21	2.5	<u>Historical garages</u>	0	0	0	10	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
22	3.1	Active or recent landfill	0	0	0	0	-
22	3.2	Historical landfill (BGS records)	0	0	0	0	-
23	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
23	3.4	<u>Historical landfill (EA/NRW records)</u>	0	0	0	1	-
23	3.5	Historical waste sites	0	0	0	0	-
23	3.6	Licensed waste sites	0	0	0	0	-
24	3.7	<u>Waste exemptions</u>	0	0	0	5	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
25	4.1	<u>Recent industrial land uses</u>	0	1	5	-	-
26	4.2	<u>Current or recent petrol stations</u>	0	0	0	2	-
26	4.3	Electricity cables	0	0	0	0	-
26	4.4	Gas pipelines	0	0	0	0	-
27	4.5	Sites determined as Contaminated Land	0	0	0	0	-



27	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
27	4.7	Regulated explosive sites	0	0	0	0	-
27	4.8	Hazardous substance storage/usage	0	0	0	0	-
27	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
28	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
28	4.11	<u>Licensed pollutant release (Part A(2)/B)</u>	0	0	0	1	-
28	4.12	Radioactive Substance Authorisations	0	0	0	0	-
28	4.13	<u>Licensed Discharges to controlled waters</u>	0	0	1	5	-
29	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
30	4.15	Pollutant release to public sewer	0	0	0	0	-
30	4.16	List 1 Dangerous Substances	0	0	0	0	-
30	4.17	List 2 Dangerous Substances	0	0	0	0	-
30	4.18	<u>Pollution Incidents (EA/NRW)</u>	0	0	3	16	-
32	4.19	Pollution inventory substances	0	0	0	0	-
33	4.20	Pollution inventory waste transfers	0	0	0	0	-
33	4.21	Pollution inventory radioactive waste	0	0	0	0	-
Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
34	5.1	<u>Superficial aquifer</u>	Identified (within 500m)				
36	5.2	<u>Bedrock aquifer</u>	Identified (within 500m)				
37	5.3	<u>Groundwater vulnerability</u>	Identified (within 50m)				
38	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
38	5.5	Groundwater vulnerability- local information	None (within 0m)				
39	5.6	<u>Groundwater abstractions</u>	0	0	0	0	1
40	5.7	<u>Surface water abstractions</u>	0	0	0	0	6
41	5.8	Potable abstractions	0	0	0	0	0
42	5.9	Source Protection Zones	0	0	0	0	-
42	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-
Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
43	6.1	<u>Water Network (OS MasterMap)</u>	0	0	1	-	-



44	6.2	<u>Surface water features</u>	0	0	3	-	-
44	6.3	<u>WFD Surface water body catchments</u>	1	-	-	-	-
44	6.4	<u>WFD Surface water bodies</u>	0	0	0	-	-
45	6.5	<u>WFD Groundwater bodies</u>	1	-	-	-	-
Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
46	7.1	Risk of flooding from rivers and the sea	None (within 50m)				
46	7.2	Historical Flood Events	0	0	0	-	-
46	7.3	Flood Defences	0	0	0	-	-
47	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
47	7.5	Flood Storage Areas	0	0	0	-	-
48	7.6	Flood Zone 2	None (within 50m)				
48	7.7	Flood Zone 3	None (within 50m)				
Page	Section	Surface water flooding					
49	8.1	<u>Surface water flooding</u>	1 in 30 year, 0.3m - 1.0m (within 50m)				
Page	Section	Groundwater flooding					
51	9.1	<u>Groundwater flooding</u>	Moderate (within 50m)				
Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
52	10.1	<u>Sites of Special Scientific Interest (SSSI)</u>	0	0	0	0	3
53	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
53	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
53	10.4	Special Protection Areas (SPA)	0	0	0	0	0
53	10.5	National Nature Reserves (NNR)	0	0	0	0	0
54	10.6	<u>Local Nature Reserves (LNR)</u>	0	0	0	0	1
54	10.7	<u>Designated Ancient Woodland</u>	0	1	1	1	47
56	10.8	Biosphere Reserves	0	0	0	0	0
56	10.9	Forest Parks	0	0	0	0	0
57	10.10	Marine Conservation Zones	0	0	0	0	0
57	10.11	Green Belt	0	0	0	0	0
57	10.12	Proposed Ramsar sites	0	0	0	0	0



57	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
57	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
58	10.15	Nitrate Sensitive Areas	0	0	0	0	0
58	10.16	<u>Nitrate Vulnerable Zones</u>	0	0	0	2	2
59	10.17	<u>SSSI Impact Risk Zones</u>	1	-	-	-	-
60	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
61	11.1	World Heritage Sites	0	0	0	-	-
61	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
61	11.3	National Parks	0	0	0	-	-
61	11.4	Listed Buildings	0	0	0	-	-
62	11.5	Conservation Areas	0	0	0	-	-
62	11.6	Scheduled Ancient Monuments	0	0	0	-	-
62	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
63	12.1	Agricultural Land Classification	None (within 250m)				
63	12.2	Open Access Land	0	0	0	-	-
63	12.3	Tree Felling Licences	0	0	0	-	-
63	12.4	Environmental Stewardship Schemes	0	0	0	-	-
64	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
65	13.1	Priority Habitat Inventory	0	0	0	-	-
65	13.2	Habitat Networks	0	0	0	-	-
65	13.3	Open Mosaic Habitat	0	0	0	-	-
65	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
66	14.1	<u>10k Availability</u>	Identified (within 500m)				
67	14.2	Artificial and made ground (10k)	0	0	0	0	-
68	14.3	<u>Superficial geology (10k)</u>	2	0	2	1	-



69	14.4	Landslip (10k)	0	0	0	0	-
70	14.5	<u>Bedrock geology (10k)</u>	1	0	0	1	-
71	14.6	<u>Bedrock faults and other linear features (10k)</u>	0	0	0	1	-
Page	Section	Geology 1:50,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
72	15.1	<u>50k Availability</u>	Identified (within 500m)				
73	15.2	Artificial and made ground (50k)	0	0	0	0	-
73	15.3	Artificial ground permeability (50k)	0	0	-	-	-
74	15.4	<u>Superficial geology (50k)</u>	3	1	3	0	-
75	15.5	<u>Superficial permeability (50k)</u>	Identified (within 50m)				
75	15.6	Landslip (50k)	0	0	0	0	-
75	15.7	Landslip permeability (50k)	None (within 50m)				
76	15.8	<u>Bedrock geology (50k)</u>	2	0	0	1	-
77	15.9	<u>Bedrock permeability (50k)</u>	Identified (within 50m)				
77	15.10	<u>Bedrock faults and other linear features (50k)</u>	0	0	0	1	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
78	16.1	BGS Boreholes	0	0	0	-	-
Page	Section	Natural ground subsidence					
79	17.1	<u>Shrink swell clays</u>	Very low (within 50m)				
80	17.2	<u>Running sands</u>	Very low (within 50m)				
81	17.3	<u>Compressible deposits</u>	Negligible (within 50m)				
82	17.4	<u>Collapsible deposits</u>	Very low (within 50m)				
83	17.5	<u>Landslides</u>	Very low (within 50m)				
84	17.6	<u>Ground dissolution of soluble rocks</u>	Negligible (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
85	18.1	Natural cavities	0	0	0	0	-
86	18.2	BritPits	0	0	0	0	-
86	18.3	<u>Surface ground workings</u>	0	0	6	-	-
86	18.4	<u>Underground workings</u>	0	0	0	0	5
87	18.5	Historical Mineral Planning Areas	0	0	0	0	-



87	18.6	Non-coal mining	0	0	0	0	0
87	18.7	Mining cavities	0	0	0	0	0
87	18.8	JPB mining areas	None (within 0m)				
88	18.9	<u>Coal mining</u>	Identified (within 0m)				
88	18.10	Brine areas	None (within 0m)				
88	18.11	Gypsum areas	None (within 0m)				
88	18.12	Tin mining	None (within 0m)				
88	18.13	Clay mining	None (within 0m)				
Page	Section	Radon					
89	19.1	<u>Radon</u>	Between 5% and 10% (within 0m)				
Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
90	20.1	<u>BGS Estimated Background Soil Chemistry</u>	5	2	-	-	-
90	20.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
91	20.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-
Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
92	21.1	Underground railways (London)	0	0	0	-	-
92	21.2	Underground railways (Non-London)	0	0	0	-	-
92	21.3	Railway tunnels	0	0	0	-	-
92	21.4	Historical railway and tunnel features	0	0	0	-	-
92	21.5	Royal Mail tunnels	0	0	0	-	-
93	21.6	Historical railways	0	0	0	-	-
93	21.7	Railways	0	0	0	-	-
93	21.8	Crossrail 1	0	0	0	0	-
93	21.9	Crossrail 2	0	0	0	0	-
93	21.10	HS2	0	0	0	0	-

Recent aerial photograph



Capture Date: 10/04/2020

Site Area: 0.47ha



Recent site history - 2017 aerial photograph



Capture Date: 07/05/2017

Site Area: 0.47ha



Recent site history - 2009 aerial photograph



Capture Date: 01/06/2009

Site Area: 0.47ha



Recent site history - 2003 aerial photograph



Capture Date: 04/08/2003

Site Area: 0.47ha



Recent site history - 2000 aerial photograph



Capture Date: 04/09/2000

Site Area: 0.47ha



OS MasterMap site plan



Site Area: 0.47ha



1 Past land use



- Site Outline
- Search buffers in metres (m)
- Historical industrial land uses
- Historical energy features
- Historical garages

1.1 Historical industrial land uses

Records within 500m

20

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 14**

ID	Location	Land use	Dates present	Group ID
B	168m E	Gravel Pit	1909	857414



ID	Location	Land use	Dates present	Group ID
B	169m E	Gravel Pit	1938	860592
B	169m E	Gravel Pit	1949	933438
2	207m SW	Unspecified Pit	1960 - 1968	875877
4	211m S	Gravel Hole	1872 - 1900	873988
C	247m SW	Police Station	1960 - 1979	978332
5	252m N	Earthwork	1909	811549
C	301m SW	Gravel Hole	1909	827130
F	346m S	Unspecified Heap	1960 - 1968	888054
9	437m N	Wind Pump	1909	837787
H	443m NE	Unspecified Pit	1872	838766
10	458m W	Unspecified Factory	1992	821311
H	460m NE	Sand Pit	1909	905836
H	462m NE	Sand Pit	1900	954004
H	465m NE	Sand Pit	1949	901058
11	465m E	Nursery	1992	831643
H	466m NE	Sand Pit	1938	852286
I	494m SE	Gravel Pit	1938	926234
I	496m SE	Gravel Pit	1900 - 1909	882576
I	497m SE	Gravel Pit	1949	897891

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m

0

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

This data is sourced from Ordnance Survey / Groundsure.



1.3 Historical energy features

Records within 500m

13

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 ungrouped 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 14**

ID	Location	Land use	Dates present	Group ID
A	On site	Electricity Substation	1980 - 1990	67010
A	On site	Electricity Substation	1983	80480
1	111m S	Electricity Substation	1969 - 1990	69434
3	210m W	Electricity Substation	1990	60076
D	251m NE	Electricity Substation	1980 - 1990	71859
D	253m NE	Electricity Substation	1983	83137
6	284m W	Electricity Substation	1969 - 1990	76659
E	343m SW	Electricity Substation	1983	60077
7	372m N	Electricity Substation	1990	60073
8	378m SE	Electricity Substation	1969 - 1990	65312
F	384m S	Electricity Substation	1983	60075
F	386m S	Electricity Substation	1980	82336
F	387m S	Electricity Substation	1969	83204

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 ungrouped 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

7

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 ungrouped 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 14**

ID	Location	Land use	Dates present	Group ID
E	321m SW	Garage	1983	23252
E	322m SW	Garage	1990	23787
E	334m SW	Garage	1980	23738
E	334m SW	Garage	1969	22867
E	335m SW	Garage	1961	21220
G	437m N	Garage	1959 - 1990	25942
G	437m N	Garage	1961 - 1974	24599

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



- Site Outline
- Search buffers in metres (m)
- Historical industrial land uses
- Historical energy features
- Historical garages

2.1 Historical industrial land uses

Records within 500m

25

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 18**

ID	Location	Land Use	Date	Group ID
C	168m E	Gravel Pit	1909	857414
C	169m E	Gravel Pit	1938	860592
C	169m E	Gravel Pit	1949	933438



ID	Location	Land Use	Date	Group ID
D	207m SW	Unspecified Pit	1968	875877
D	207m SW	Unspecified Pit	1960	875877
E	211m S	Gravel Hole	1872	873988
F	247m SW	Police Station	1968	978332
F	247m SW	Police Station	1979	978332
F	247m SW	Police Station	1960	978332
2	252m N	Earthwork	1909	811549
E	261m S	Gravel Hole	1900	873988
F	301m SW	Gravel Hole	1909	827130
J	346m S	Unspecified Heap	1968	888054
J	346m S	Unspecified Heap	1960	888054
4	437m N	Wind Pump	1909	837787
M	443m NE	Unspecified Pit	1872	838766
5	458m W	Unspecified Factory	1992	821311
M	460m NE	Sand Pit	1909	905836
M	462m NE	Sand Pit	1900	954004
M	465m NE	Sand Pit	1949	901058
6	465m E	Nursery	1992	831643
M	466m NE	Sand Pit	1938	852286
N	494m SE	Gravel Pit	1938	926234
N	496m SE	Gravel Pit	1909	882576
N	497m SE	Gravel Pit	1949	897891

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m

0

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'.



This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m

24

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 18**

ID	Location	Land Use	Date	Group ID
A	On site	Electricity Substation	1983	80480
A	On site	Electricity Substation	1980	67010
A	On site	Electricity Substation	1990	67010
B	111m S	Electricity Substation	1983	69434
B	111m S	Electricity Substation	1969	69434
B	112m S	Electricity Substation	1980	69434
B	112m S	Electricity Substation	1990	69434
1	210m W	Electricity Substation	1990	60076
G	251m NE	Electricity Substation	1980	71859
G	251m NE	Electricity Substation	1990	71859
G	253m NE	Electricity Substation	1983	83137
H	284m W	Electricity Substation	1983	76659
H	284m W	Electricity Substation	1969	76659
H	285m W	Electricity Substation	1980	76659
H	285m W	Electricity Substation	1990	76659
I	343m SW	Electricity Substation	1983	60077
3	372m N	Electricity Substation	1990	60073
K	378m SE	Electricity Substation	1980	65312
K	378m SE	Electricity Substation	1990	65312
K	380m SE	Electricity Substation	1983	65312
K	380m SE	Electricity Substation	1969	65312



ID	Location	Land Use	Date	Group ID
J	384m S	Electricity Substation	1983	60075
J	386m S	Electricity Substation	1980	82336
J	387m S	Electricity Substation	1969	83204

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

10

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'.

Features are displayed on the Past land use - un-grouped map on **page 18**

ID	Location	Land Use	Date	Group ID
I	321m SW	Garage	1983	23252
I	322m SW	Garage	1990	23787
I	334m SW	Garage	1980	23738
I	334m SW	Garage	1969	22867
I	335m SW	Garage	1961	21220
L	437m N	Garage	1990	25942
L	437m N	Garage	1959	25942
L	437m N	Garage	1984	25942
L	437m N	Garage	1961	24599
L	437m N	Garage	1974	24599

This data is sourced from Ordnance Survey / Groundsure.



3 Waste and landfill



- Site Outline
- Search buffers in metres (m)
- Historical landfill (EA/NRW)
- Waste exemptions

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 22**

ID	Location	Details		
1	472m E	Site Address: Singret Quarry Licence Holder Address: -	Waste Licence: Yes Site Reference: WMBC L63, NOW-514-L Waste Type: Inert, Industrial Environmental Permitting Regulations (Waste) Reference: WW1/L/BOD001 Licence Issue: 31/12/1983 Licence Surrender: 18/12/2003	Operator: Bodfari (quarries) Licence Holder: Tarmac First Recorded 31/12/1976 Last Recorded: 30/06/1998

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

3.5 Historical waste sites

Records within 500m	0
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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

5

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 22**

ID	Location	Site	Reference	Category	Sub-Category	Description
A	291m NE	Home Farm, Gresford Road, Wrexham, Wreccsam, LL12 ONW	NRW-WME000079	Using waste exemption	Waste Exemption - Agricultural and Non-Agricultural	Use of waste in construction
A	291m NE	Home Farm, Gresford Road, Wrexham, Wreccsam, LL12 ONW	NRW-WME000079	Using waste exemption	Waste Exemption - Agricultural and Non-Agricultural	Burning of waste as a fuel in a small appliance
A	291m NE	Home Farm, Gresford Road, Wrexham, Wreccsam, LL12 ONW	NRW-WME000079	Treating waste exemption	Waste Exemption - Agricultural	Aerobic composting and associated prior treatment
A	291m NE	Home Farm, Gresford Road, Wrexham, Wreccsam, LL12 ONW	NRW-WME000079	Disposing of waste exemption	Waste Exemption - Agricultural and Non-Agricultural	Burning waste in the open
A	291m NE	Home Farm, Gresford Road, Wrexham, Wreccsam, LL12 ONW	NRW-WME000079	Storing waste exemption	Waste Exemption - Agricultural	Storage of waste in a secure place

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



4 Current industrial land use



- Site Outline
- Search buffers in metres (m)
- Recent industrial land uses
- ▲ Current or recent petrol stations
- Licensed pollutant release (Part A(2)/B)
- Licensed Discharges to controlled waters
- Pollution Incidents (EA/NRW)

4.1 Recent industrial land uses

Records within 250m

6

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 25**

ID	Location	Company	Address	Activity	Category
1	1m NE	Electricity Sub Station	Clwyd, LL12	Electrical Features	Infrastructure and Facilities
A	106m S	S Hinchliffe Services Ltd	The Depot, Ninth Avenue, Llay, Wrexham, Clwyd, LL12 OSF	Vehicle Repair, Testing and Servicing	Repair and Servicing
2	111m S	Clearol Pest Control	29, Nant y Gaer Road, Llay, Wrexham, Clwyd, LL12 OSH	Pest and Vermin Control	Contract Services



ID	Location	Company	Address	Activity	Category
A	117m S	Electricity Sub Station	Clwyd, LL12	Electrical Features	Infrastructure and Facilities
4	134m SE	Optima	2, Laburnum Court, Llay, Wrexham, Clwyd, LL12 0SQ	Vehicle Hire and Rental	Hire Services
6	211m W	Electricity Sub Station	Clwyd, LL12	Electrical Features	Infrastructure and Facilities

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m

2

Open, closed, under development and obsolete petrol stations.

Features are displayed on the Current industrial land use map on **page 25**

ID	Location	Company	Address	LPG	Status
8	268m N	OBSOLETE	B5373, Llay, Wrexham, Wrexham, LL12 0NW	Not Applicable	Obsolete
10	359m SW	TEXACO	Shones Lane, Tenth Avenue, Llay, Wrexham, Wrexham, LL12 0PL	Not Applicable	Obsolete

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

0

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

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**1**

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.

Features are displayed on the Current industrial land use map on **page 25**

ID	Location	Address	Details	
11	363m SW	Waste Oil Burners, Llay Garage, Shones Lane, Llay, Wrexham, LL12 OPL	Process: Waste Oil Burner 0.4 MW Status: New Legislation Applies Permit Type: Part B	Enforcement: No Enforcement Notified. Date of enforcement: No Enforcement Notified. Comment: No Enforcement Notified.

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**6**

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

Features are displayed on the Current industrial land use map on **page 25**



ID	Location	Address	Details	
3	119m N	LLAY GRESFORD ROAD, GRESFORD ROAD	Effluent Type: UNSPECIFIED Permit Number: CM0065001 Permit Version: 1 Receiving Water: SINGRET BROOK	Status: CONSENT EXPIRED - TIME LIMIT Issue date: 24/05/1971 Effective Date: 24/05/1971 Revocation Date: 23/02/1995
G	461m E	LLAY SINGRET BOREEN CAM- SSO	Effluent Type: UNSPECIFIED Permit Number: CM0197701 Permit Version: 1 Receiving Water: SINGRET BROOK	Status: NEW CONSENT, BY APPLICATION (WRA 91, SECTION 88) Issue date: 20/10/1989 Effective Date: 20/10/1989 Revocation Date: 30/03/2005
G	471m E	LLAY SINGRET (BOREEN CAM) CSO, Back garden of Ivy Cottage, Singrett Hill Llay, Wrexham, LL12 ONS	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: CM0197701 Permit Version: 3 Receiving Water: SINGRET BROOK	Status: Effective Issue date: 11/10/2019 Effective Date: 11/10/2019 Revocation Date: -
F	475m NW	PUMPING STATION ON DEVELOPMENT LAND, OFF LLAY ROAD, WREXHAM, WALES, UNITED KINGDOM, LL12 OTX	Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - NOT WATER COMPANY Permit Number: CG0413901 Permit Version: 1 Receiving Water: SINGRET BROOK	Status: Effective Issue date: 22/01/2004 Effective Date: 22/01/2004 Revocation Date: -
G	492m E	LLAY SINGRET (BOREEN CAM) CSO, SINGRET HILL, LLAY, Wrexham, LL12 ONS	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: CM0197701 Permit Version: 2 Receiving Water: SINGRET BROOK	Status: Effective Issue date: 25/11/2004 Effective Date: 31/03/2005 Revocation Date: -
G	498m E	LLAY SINGRET SEWERAGE SYSTEM (S'CED, LLAY SINGRET SEWERAGE SYSTEM (S', SINGRET SEWERAGE SYSTEM (S'CED	Effluent Type: UNSPECIFIED Permit Number: CM0058601 Permit Version: 1 Receiving Water: SINGRET BROOK	Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY Issue date: 16/09/1969 Effective Date: 16/09/1969 Revocation Date: 17/02/1986

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

19

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

Features are displayed on the Current industrial land use map on **page 25**

ID	Location	Details	
5	144m NE	Incident Date: 05/10/2013 Incident Identification: 1165151 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: - Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
B	189m E	Incident Date: 02/09/2014 Incident Identification: 1275741 Pollutant: Sewage Materials Pollutant Description: Other Sewage Material	Water Impact: - Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)

ID	Location	Details	
B	194m E	Incident Date: 05/08/2009 Incident Identification: 704123 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: Category 2 (Significant) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
7	260m N	Incident Date: 21/08/2015 Incident Identification: 1367023 Pollutant: Contaminated Water Pollutant Description: Other Contaminated Water	Water Impact: - Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
C	264m NW	Incident Date: 06/02/2005 Incident Identification: 291717 Pollutant: Oils and Fuel Pollutant Description: Cutting Oils	Water Impact: Category 2 (Significant) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
C	291m NW	Incident Date: 20/05/2002 Incident Identification: 80015 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
9	337m N	Incident Date: 20/11/2013 Incident Identification: 1177422 Pollutant: Inert Materials and Wastes Pollutant Description: Construction and Demolition Materials and Wastes	Water Impact: - Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
D	360m NE	Incident Date: 19/05/2001 Incident Identification: 5973 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Other Atmospheric Pollutant or Effect	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
D	360m NE	Incident Date: 19/05/2001 Incident Identification: 5973 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Other Atmospheric Pollutant or Effect	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
E	390m E	Incident Date: 27/10/2009 Incident Identification: 727899 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: Category 2 (Significant) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
E	396m E	Incident Date: 01/12/2015 Incident Identification: 1391224 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: - Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)
F	444m NW	Incident Date: 27/12/2001 Incident Identification: 49674 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)



ID	Location	Details	
F	444m NW	Incident Date: 27/12/2001 Incident Identification: 49674 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
F	447m NW	Incident Date: 30/04/2001 Incident Identification: 3861 Pollutant: Sewage Materials Pollutant Description: Storm Sewage	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
12	450m E	Incident Date: 05/01/2015 Incident Identification: 1304273 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: - Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
H	473m NW	Incident Date: 11/05/2001 Incident Identification: 5234 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Sulphide Odour	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
H	473m NW	Incident Date: 11/05/2001 Incident Identification: 5234 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Sulphide Odour	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
G	489m E	Incident Date: 14/08/2003 Incident Identification: 182014 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: Category 3 (Minor) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
13	489m E	Incident Date: 15/12/2001 Incident Identification: 48343 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Landfill Odour	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)

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

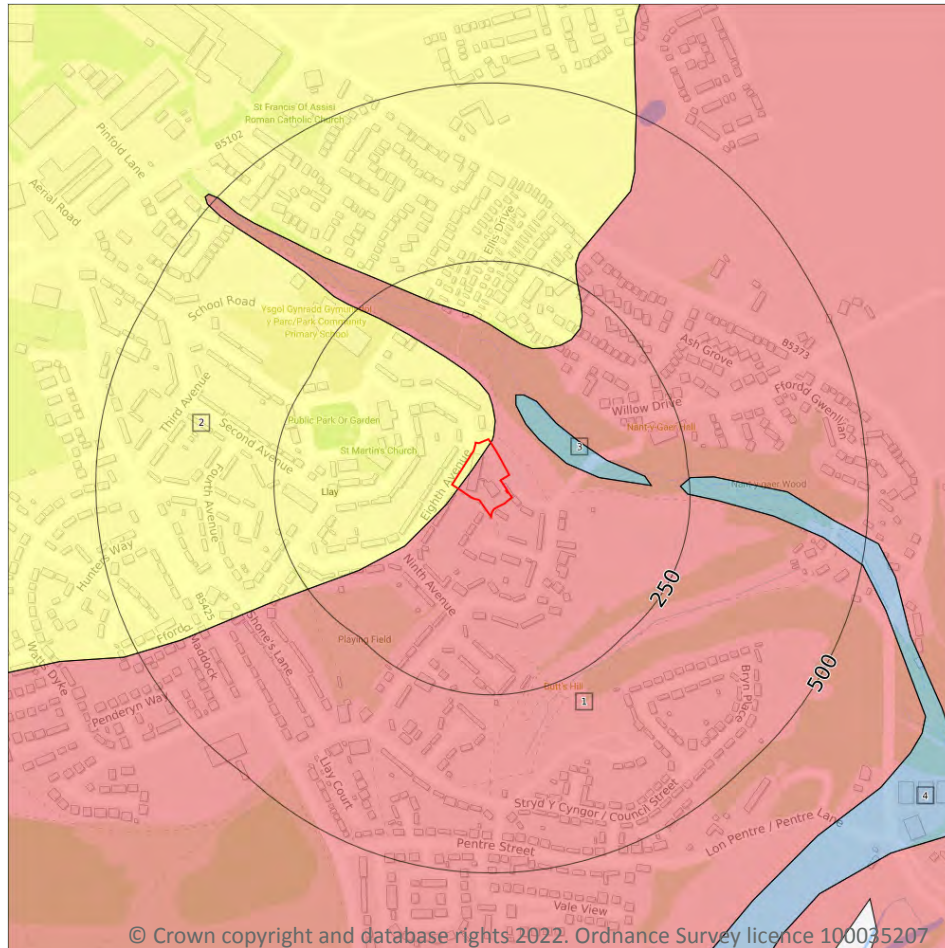
Records within 500m

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



- Site Outline**
- Search buffers in metres (m)**
- Principal
 - Secondary A
 - Secondary B
 - Secondary Undifferentiated
 - Unproductive
 - Unknown

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 34**

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
2	On site	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

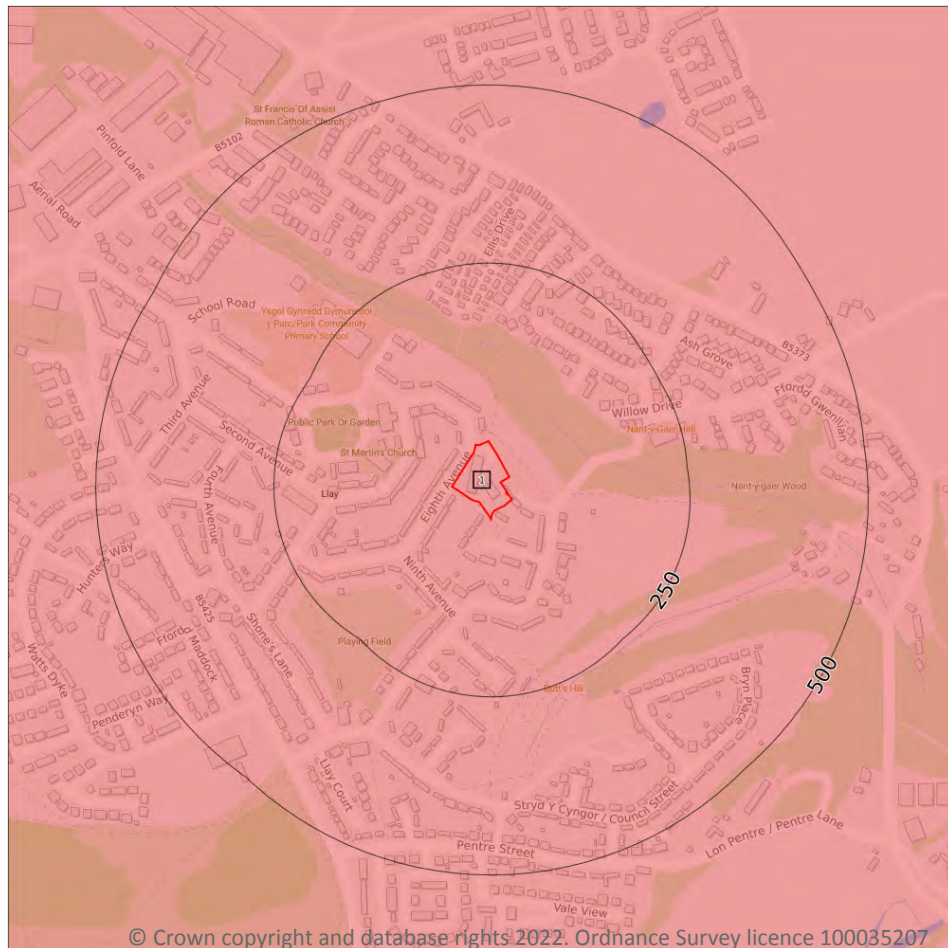


ID	Location	Designation	Description
3	56m NE	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
4	237m E	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

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



Bedrock aquifer



- Site Outline
- Search buffers in metres (m)
- Principal
 - Secondary A
 - Secondary B
 - Secondary Undifferentiated
 - Unproductive

5.2 Bedrock aquifer

Records within 500m

1

Aquifer status of groundwater held within bedrock geology.

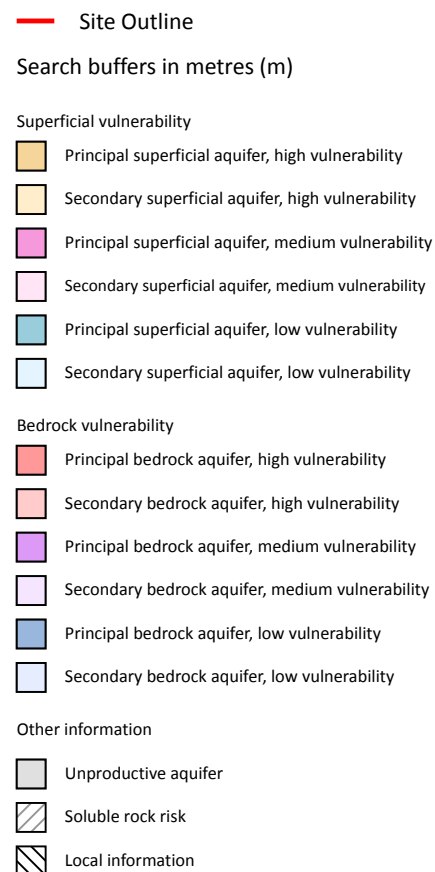
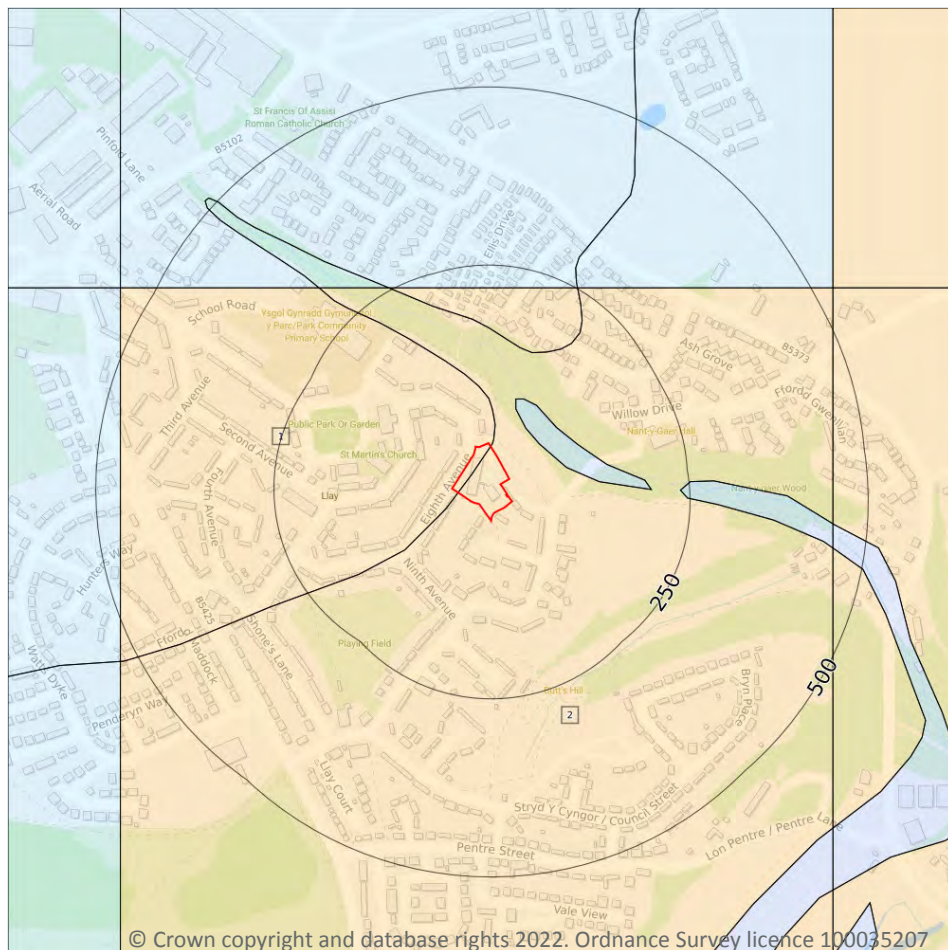
Features are displayed on the Bedrock aquifer map on **page 36**

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



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 37**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	On site	Summary Classification: Secondary superficial aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: High Infiltration value: >70% Dilution value: 300- 550mm/year	Vulnerability: High Aquifer type: Secondary Thickness: >10m Patchiness value: >90% Recharge potential: High	Vulnerability: Low Aquifer type: Secondary Flow mechanism: Well connected fractures
2	On site	Summary Classification: Secondary superficial aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: High Infiltration value: >70% Dilution value: 300- 550mm/year	Vulnerability: High Aquifer type: Secondary Thickness: >10m Patchiness value: >90% Recharge potential: High	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

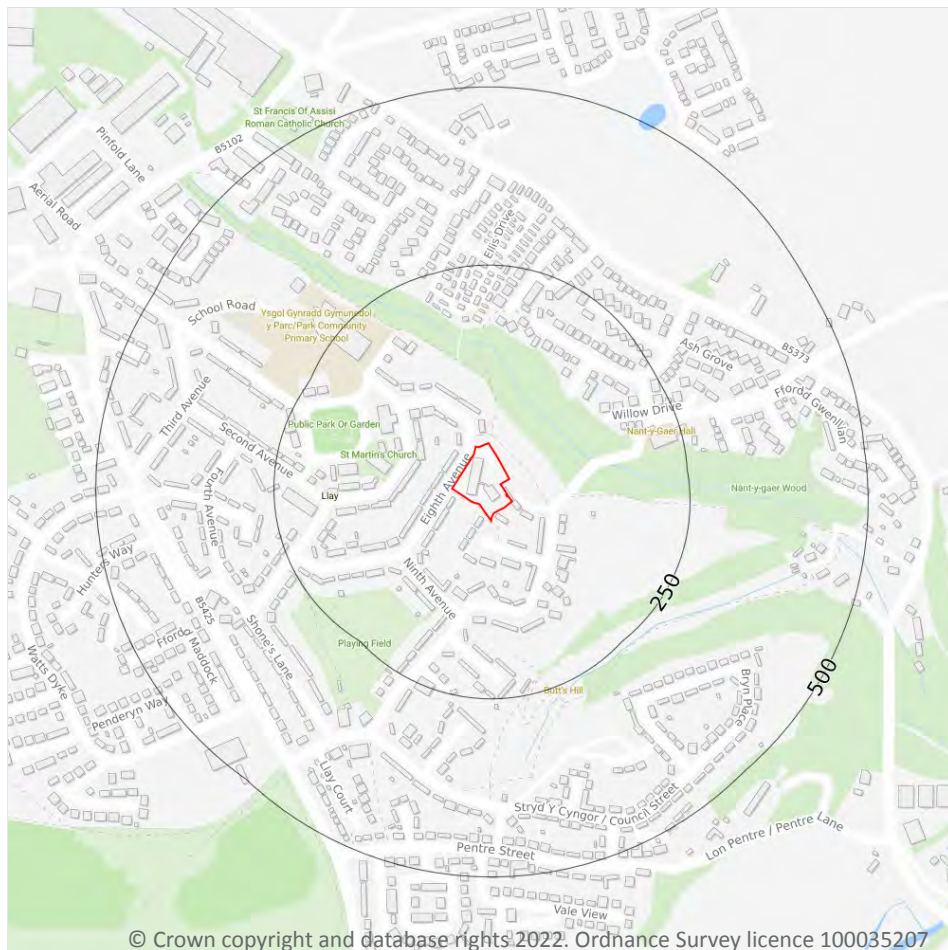
0

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
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

1

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 39**



ID	Location	Details	
-	1876m NE	Status: Historical Licence No: 24/67/9/0146 Details: General Farming & Domestic Direct Source: EAW Groundwater Point: BOREHOLE Data Type: Point Name: Lister Easting: 334500 Northing: 357380	Annual Volume (m ³): - Max Daily Volume (m ³): - Original Application No: - Original Start Date: 07/10/1974 Expiry Date: - Issue No: 100 Version Start Date: 07/10/1974 Version End Date: -

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

5.7 Surface water abstractions

Records within 2000m

6

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.

Features are displayed on the Abstractions and Source Protection Zones map on **page 39**

ID	Location	Details	
-	977m E	Status: Historical Licence No: 24/67/8/0052 Details: Mineral Washing Direct Source: EAW Surface Water Point: RIVER ALYN Data Type: Point Name: Tarmac Limited Easting: 334480 Northing: 355400	Annual Volume (m ³): 166929 Max Daily Volume (m ³): 545.52 Original Application No: - Original Start Date: 14/06/1968 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2008 Version End Date: -
-	1556m NE	Status: Historical Licence No: WA/067/0008/007 Details: Mineral Washing Direct Source: EAW Surface Water Point: LAGOON AT BALLSWOOD QUARRY Data Type: Point Name: DP Williams Holdings Ltd Easting: 334961 Northing: 356380	Annual Volume (m ³): 3800 Max Daily Volume (m ³): 138 Original Application No: - Original Start Date: 26/06/2015 Expiry Date: 31/03/2017 Issue No: 1 Version Start Date: 26/06/2015 Version End Date: -



ID	Location	Details	
-	1556m NE	Status: Historical Licence No: WA/067/0008/007 Details: Mineral Washing - Low Direct Source: - Point: - Data Type: Point Name: - Easting: 334961 Northing: 356380	Annual Volume (m ³): 3800 Max Daily Volume (m ³): - Original Application No: - Original Start Date: Jun 26 2015 12:00AM Expiry Date: Mar 31 2017 12:00AM Issue No: - Version Start Date: - Version End Date: -
-	1600m NE	Status: Historical Licence No: 24/67/8/0108 Details: Mineral Washing Direct Source: EAW Surface Water Point: LAGOON AT BALLSWOOD QUARRY WREXHAM Data Type: Point Name: DP Williams Holdings Ltd Easting: 335000 Northing: 356400	Annual Volume (m ³): 3800 Max Daily Volume (m ³): 138 Original Application No: - Original Start Date: 30/06/2006 Expiry Date: 31/03/2015 Issue No: 2 Version Start Date: 03/10/2012 Version End Date: -
-	1866m E	Status: Historical Licence No: 24/67/8/0086 Details: Spray Irrigation - Direct Direct Source: EAW Surface Water Point: RIVER ALYN Data Type: Line Name: H E Jones And Son Easting: 335530 Northing: 356760	Annual Volume (m ³): 6164.38 Max Daily Volume (m ³): 272.76 Original Application No: - Original Start Date: 16/06/1980 Expiry Date: - Issue No: 100 Version Start Date: 01/04/2007 Version End Date: -
-	1866m E	Status: Active Licence No: 24/67/8/0086 Details: Spray Irrigation - Direct - High Direct Source: - Point: - Data Type: Line Name: - Easting: 335530 Northing: 356760	Annual Volume (m ³): 6,164.38 Max Daily Volume (m ³): 654.48 Original Application No: - Original Start Date: Apr 1 2007 12:00AM Expiry Date: - Issue No: - Version Start Date: - Version End Date: -

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

5.8 Potable abstractions

Records within 2000m

0

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.

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

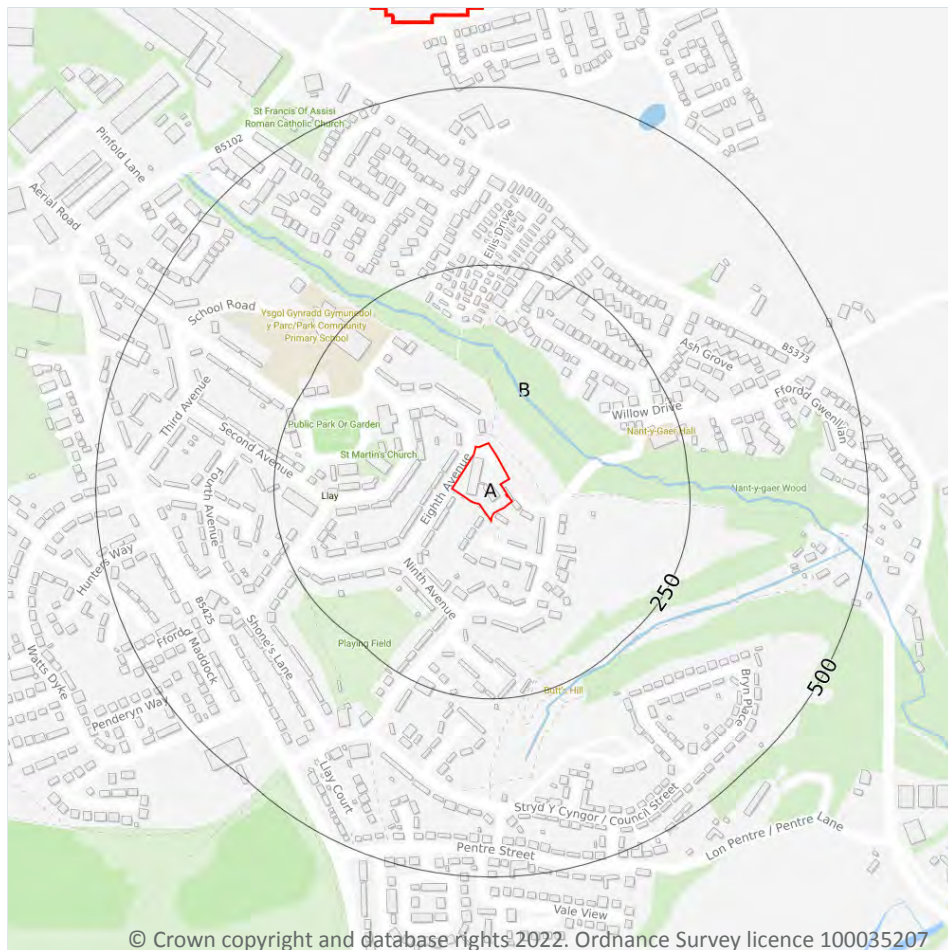
0

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

1

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 43**

ID	Location	Type of water feature	Ground level	Permanence	Name
B	82m NE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

This data is sourced from the Ordnance Survey.



6.2 Surface water features

Records within 250m

3

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 43**

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 43**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
A	On site	River WB catchment	Alyn - Hope to Dee	GB111067052173	Alyn	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 43**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
-	804m SE	River	Alyn - Hope to Dee	GB111067052173	Moderate	Good	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 43**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
A	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

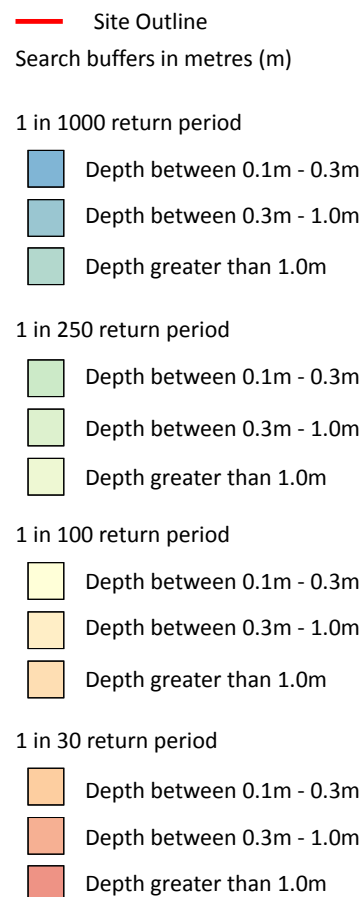
0

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

1 in 100 year, 0.1m - 0.3m

Highest risk within 50m

1 in 30 year, 0.3m - 1.0m

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.

Features are displayed on the Surface water flooding map on **page 49**

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.

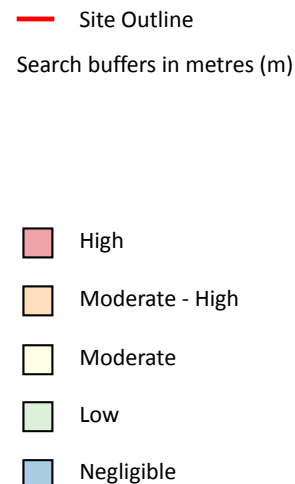
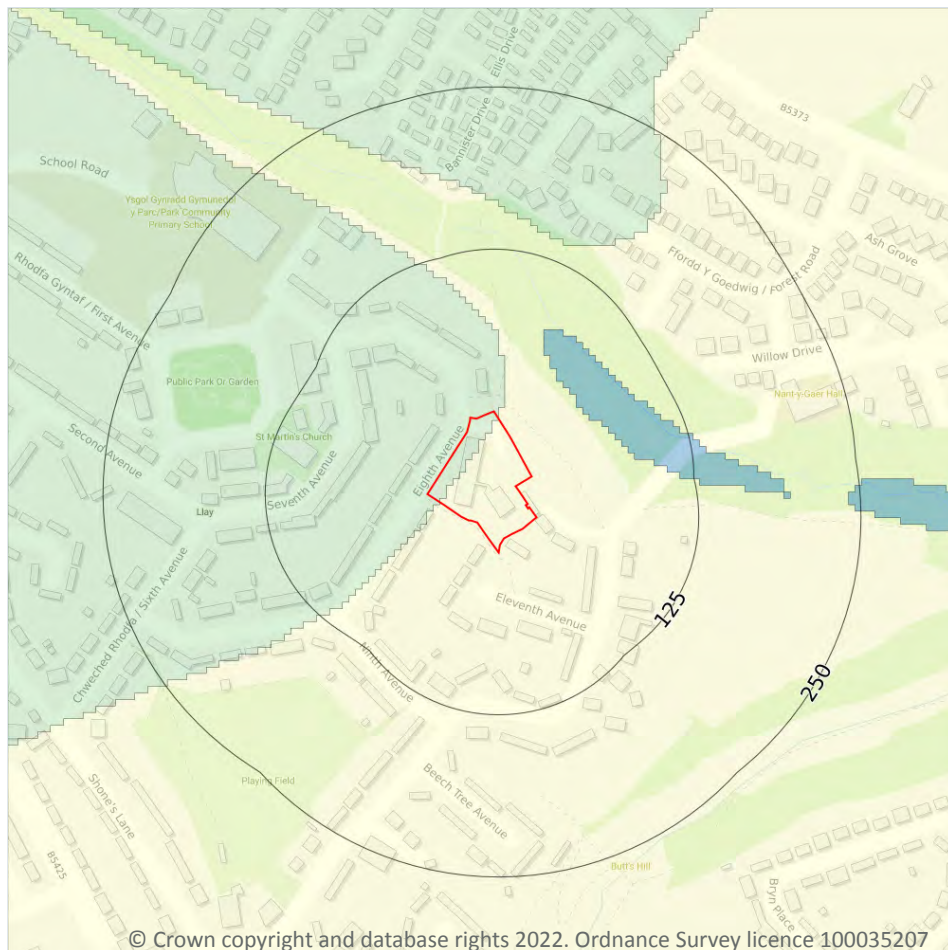
The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Between 0.3m and 1.0m
1 in 250 year	Between 0.1m and 0.3m
1 in 100 year	Between 0.1m and 0.3m
1 in 30 year	Negligible

This data is sourced from Ambiantal Risk Analytics.



9 Groundwater flooding



9.1 Groundwater flooding

Highest risk on site

Moderate

Highest risk within 50m

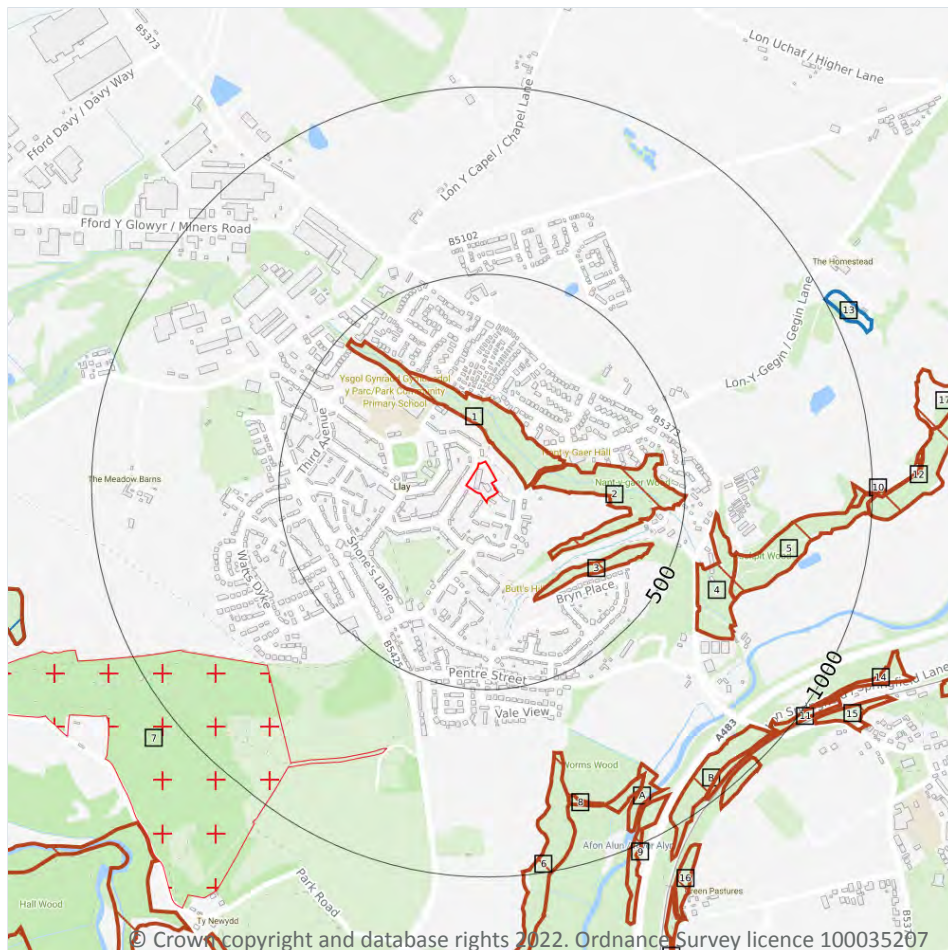
Moderate

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 51**

This data is sourced from Ambiantal Risk Analytics.

10 Environmental designations



- Site Outline
- Search buffers in metres (m)
- Sites of Special Scientific Interest (SSSI)
- + Local Nature Reserves (LNR)
- / Designated Ancient Woodland

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m

3

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 52**

ID	Location	Name	Data source
13	1002m NE	CHWAREL SINGRET	Natural Resources Wales



ID	Location	Name	Data source
C	1222m W	LLAY BOG	Natural Resources Wales
-	1892m E	MARFORD QUARRY	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

0

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.

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

1

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. Features are displayed on the Environmental designations map on **page 52**

ID	Location	Name	Data source
7	709m S	ALYN WATERS	Natural Resources Wales

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

10.7 Designated Ancient Woodland

Records within 2000m

50

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 52**

ID	Location	Name	Woodland Type
1	44m NE	Unknown	Ancient Semi Natural Woodland
2	95m E	Unknown	Ancient Semi Natural Woodland
3	275m SE	Unknown	Ancient Semi Natural Woodland
4	566m E	Unknown	Restored Ancient Woodland Site
5	655m E	Unknown	Restored Ancient Woodland Site
6	692m S	Unknown	Restored Ancient Woodland Site
A	811m SE	Unknown	Ancient Semi Natural Woodland
8	813m S	Unknown	Restored Ancient Woodland Site
A	839m SE	Unknown	Restored Ancient Woodland Site
B	899m SE	Unknown	Restored Ancient Woodland Site
9	912m SE	Unknown	Ancient Semi Natural Woodland



ID	Location	Name	Woodland Type
10	939m E	Unknown	Restored Ancient Woodland Site
B	949m SE	Unknown	Ancient Semi Natural Woodland
11	954m SE	Unknown	Restored Ancient Woodland Site
B	978m SE	Unknown	Ancient Semi Natural Woodland
12	988m E	Unknown	Ancient Semi Natural Woodland
14	1022m SE	Unknown	Ancient Semi Natural Woodland
15	1040m SE	Unknown	Restored Ancient Woodland Site
16	1068m SE	Unknown	Ancient Semi Natural Woodland
17	1136m E	Unknown	Restored Ancient Woodland Site
18	1150m SE	Unknown	Restored Ancient Woodland Site
C	1222m W	Unknown	Ancient Semi Natural Woodland
-	1230m S	Unknown	Restored Ancient Woodland Site
20	1258m SW	Unknown	Ancient Semi Natural Woodland
-	1264m E	Unknown	Ancient Semi Natural Woodland
-	1290m E	Unknown	Ancient Semi Natural Woodland
21	1291m SE	Unknown	Ancient Semi Natural Woodland
-	1346m N	Unknown	Ancient Semi Natural Woodland
-	1358m E	Unknown	Ancient Semi Natural Woodland
24	1365m SW	Unknown	Ancient Semi Natural Woodland
-	1372m E	Unknown	Ancient Semi Natural Woodland
-	1460m E	Unknown	Ancient Semi Natural Woodland
-	1474m S	Unknown	Ancient Semi Natural Woodland
-	1479m S	Unknown	Ancient Semi Natural Woodland
-	1480m E	Unknown	Ancient Semi Natural Woodland
-	1549m S	Unknown	Restored Ancient Woodland Site
-	1573m S	Unknown	Ancient Semi Natural Woodland
-	1586m E	Unknown	Ancient Semi Natural Woodland
32	1603m NE	Unknown	Ancient Semi Natural Woodland

ID	Location	Name	Woodland Type
-	1639m SW	Unknown	Ancient Semi Natural Woodland
-	1658m E	Unknown	Plantation on Ancient Woodland Site
35	1675m SW	Unknown	Ancient Semi Natural Woodland
-	1689m S	Unknown	Ancient Semi Natural Woodland
-	1689m E	Unknown	Ancient Semi Natural Woodland
-	1808m E	Unknown	Restored Ancient Woodland Site
-	1813m S	Unknown	Ancient Semi Natural Woodland
-	1895m S	Unknown	Ancient Semi Natural Woodland
-	1943m N	Unknown	Restored Ancient Woodland Site
-	1949m N	Unknown	Ancient Semi Natural Woodland
-	1989m S	Unknown	Ancient Semi Natural Woodland

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

4

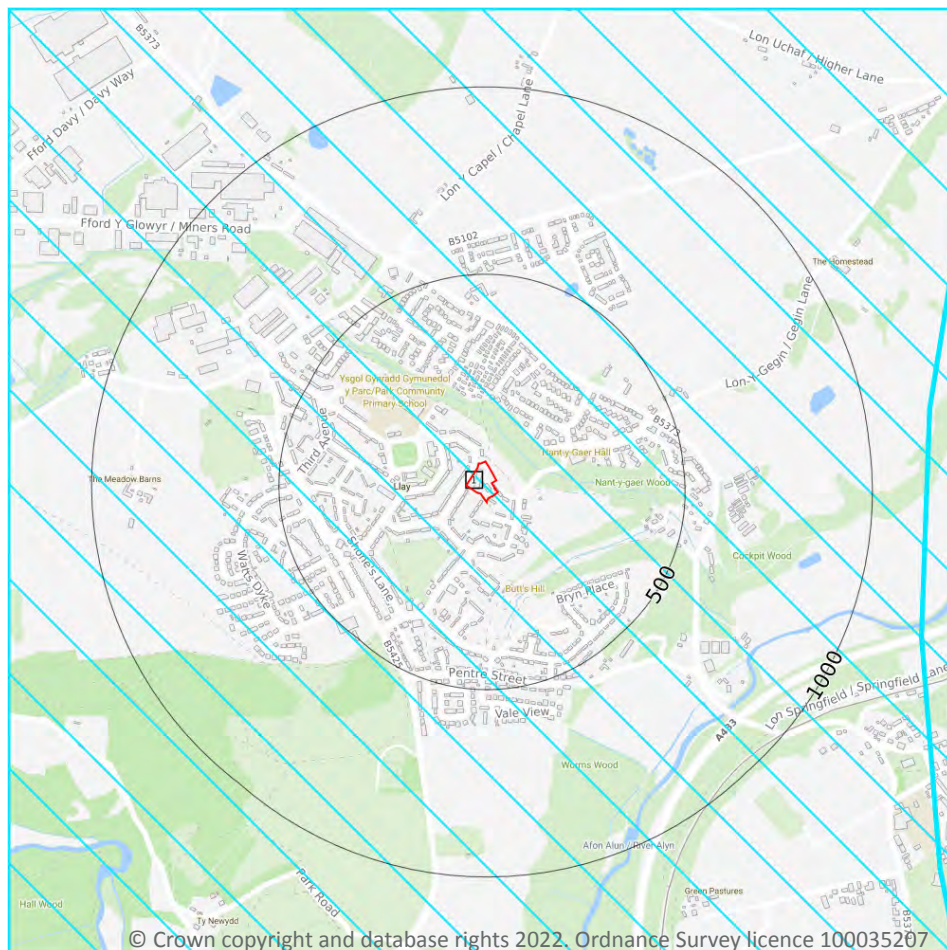
Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

Location	Name	Type	NVZ ID	Status
434m NE	-	Surface Water	707	New
436m NE	Pulford Brook NVZ	Surface Water	707	Existing
774m NE	Pulford Brook NVZ	Surface Water	707	Existing
808m NE	-	Surface Water	707	New

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



SSSI Impact Zones and Units



- Site Outline
- Search buffers in metres (m)
- SSSI Impact Risk Zones
- SSSI Units
- Not recorded
- Favourable
- Unfavourable - Recovering
- Unfavourable - No change
- Unfavourable - Declining
- Partially destroyed
- Destroyed

10.17 SSSI Impact Risk Zones

Records on site

1

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.

Features are displayed on the SSSI Impact Zones and Units map on **page 59**

ID	Location	Type of developments requiring consultation
1	On site	Air pollution - Livestock & poultry units with floorspace > 500m², slurry lagoons & digestate stores > 4000m². Combustion - General combustion processes >50mw energy input. incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.



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

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

0

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.



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

12.1 Agricultural Land Classification

Records within 250m

0

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.

This data is sourced from Natural Resources Wales.

12.2 Open Access Land

Records within 250m

0

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.

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

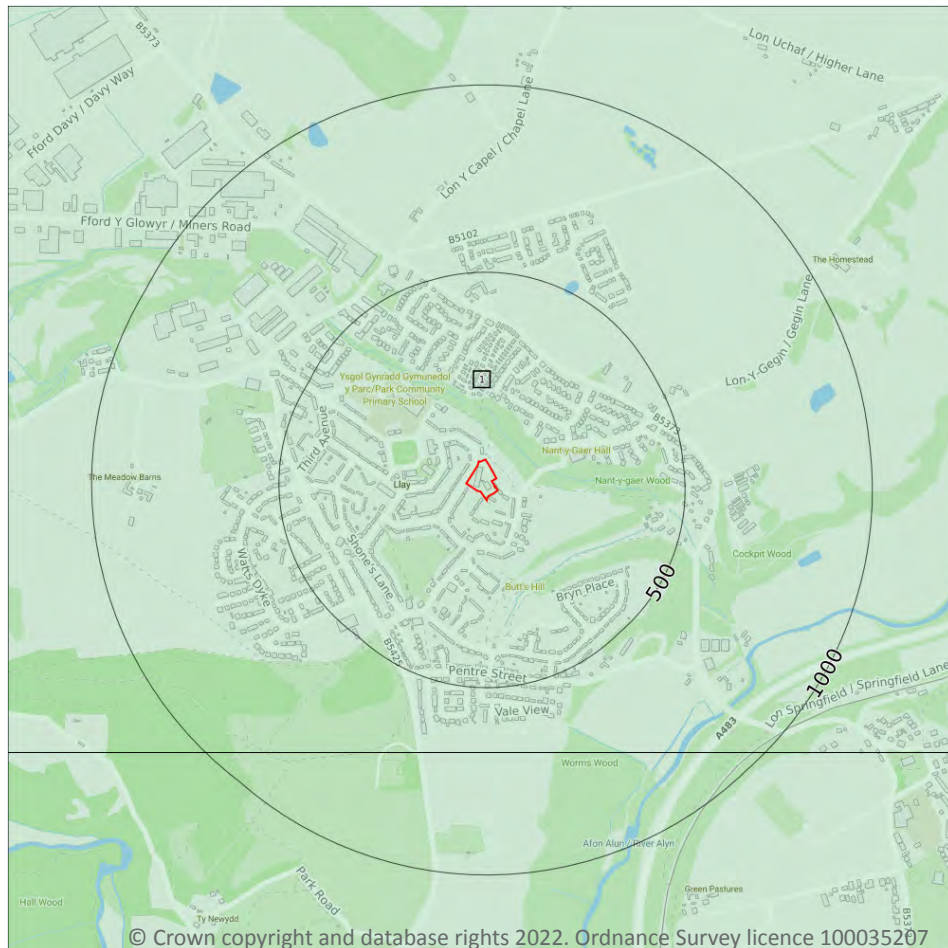
0

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



— Site Outline
Search buffers in metres (m)

- Full coverage
- Partial coverage
- No coverage

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 66**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	Full	SJ35NW

This data is sourced from the British Geological Survey.



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

14.2 Artificial and made ground (10k)

Records within 500m

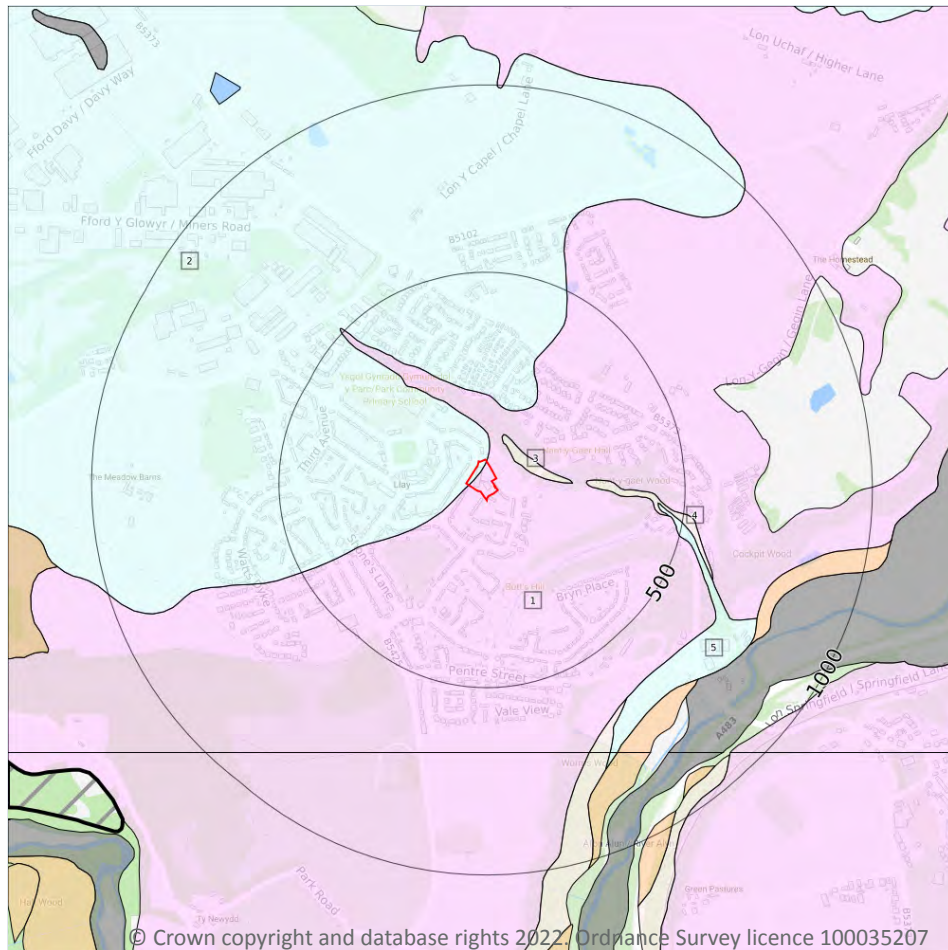
0

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.

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

5

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 68**

ID	Location	LEX Code	Description	Rock description
1	On site	GFDU-XSV	Glaciofluvial Deposits - Sand And Gravel	Sand And Gravel
2	On site	TILL-DMTN	Till - Diamicton	Diamicton
3	65m NE	GLLD-C	Glaciolacustrine Deposits - Clay	Clay
4	238m E	GLLD-C	Glaciolacustrine Deposits - Clay	Clay



ID	Location	LEX Code	Description	Rock description
5	430m E	TILL-DMTN	Till - Diamicton	Diamicton

This data is sourced from the British Geological Survey.

14.4 Landslip (10k)

Records within 500m

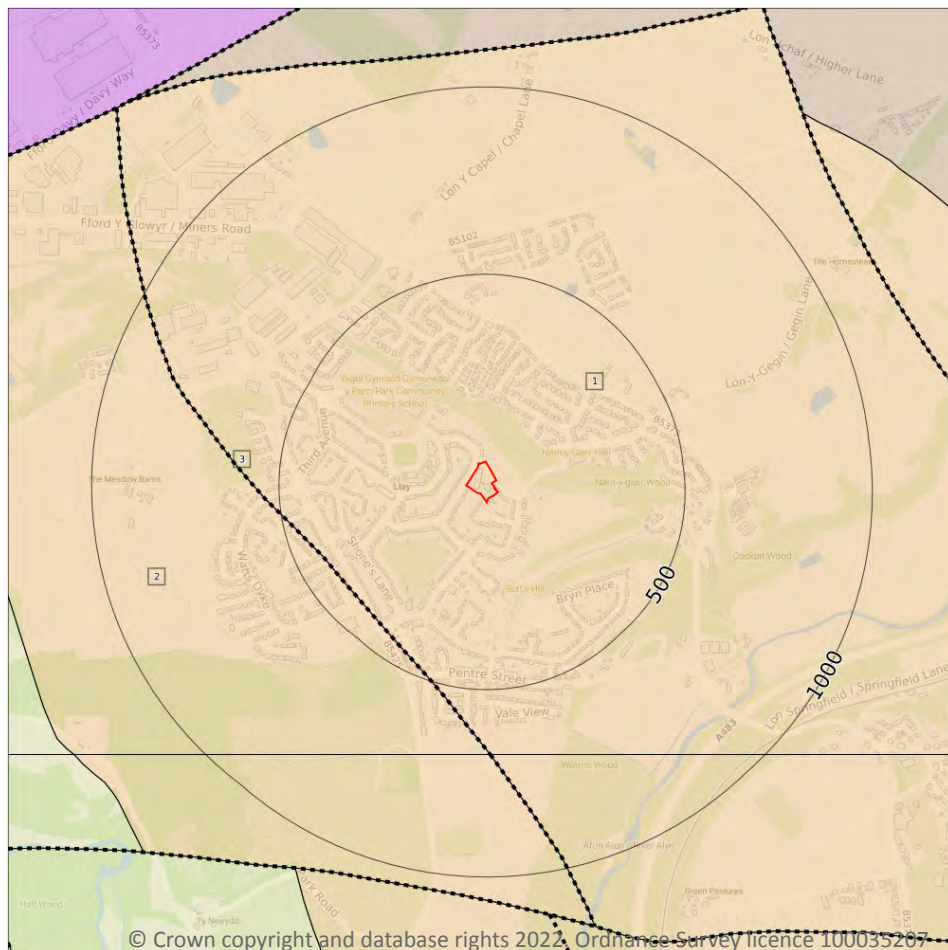
0

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

2

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 70**

ID	Location	LEX Code	Description	Rock age
1	On site	SAL-MDSC	Salop Formation - Mudstone, Sandstone And Conglomerate	Cisuralian Epoch - Westphalian D Sub-age
2	415m SW	SAL-MDSC	Salop Formation - Mudstone, Sandstone And Conglomerate	Cisuralian Epoch - Westphalian D Sub-age

This data is sourced from the British Geological Survey.



14.6 Bedrock faults and other linear features (10k)

Records within 500m

1

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.

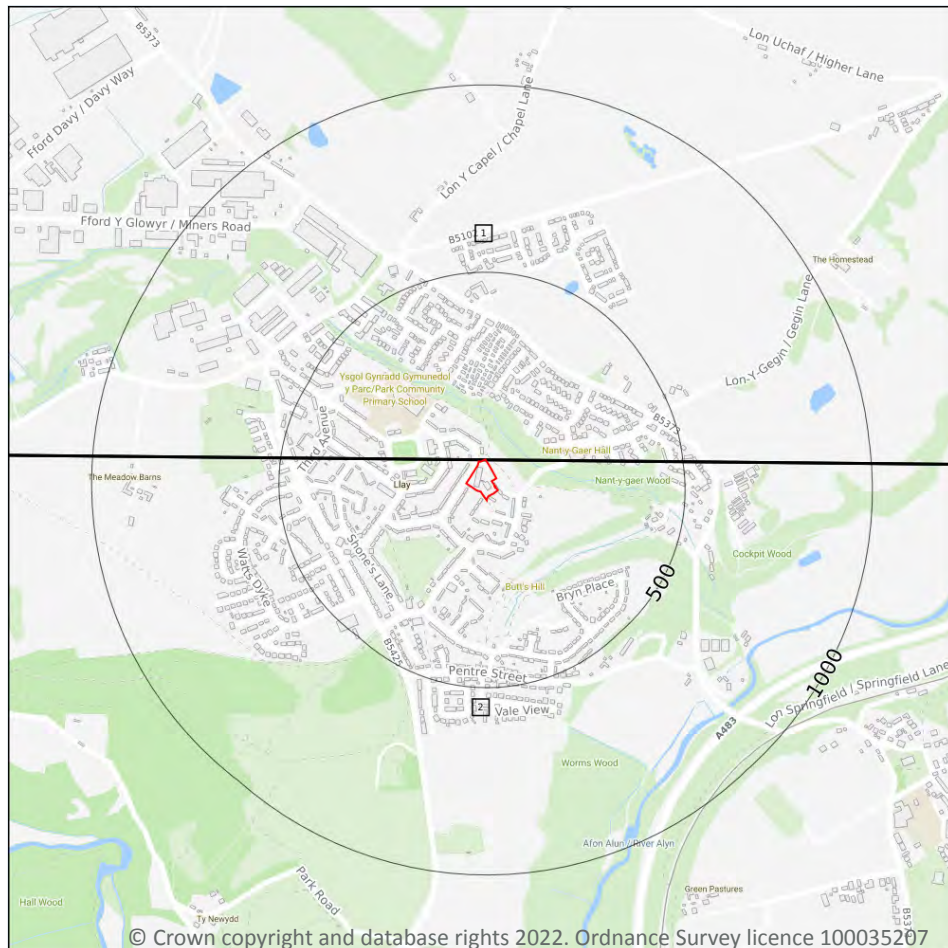
Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 70**

ID	Location	Category	Description
3	415m SW	FAULT	Normal fault, inferred

This data is sourced from the British Geological Survey.



15 Geology 1:50,000 scale - Availability



— Site Outline
Search buffers in metres (m)

☐ Geological map tile

15.1 50k Availability

Records within 500m

2

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 72**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	Full	EW108_flint_v4
2	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

0

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.

This data is sourced from the British Geological Survey.

15.3 Artificial ground permeability (50k)

Records within 50m

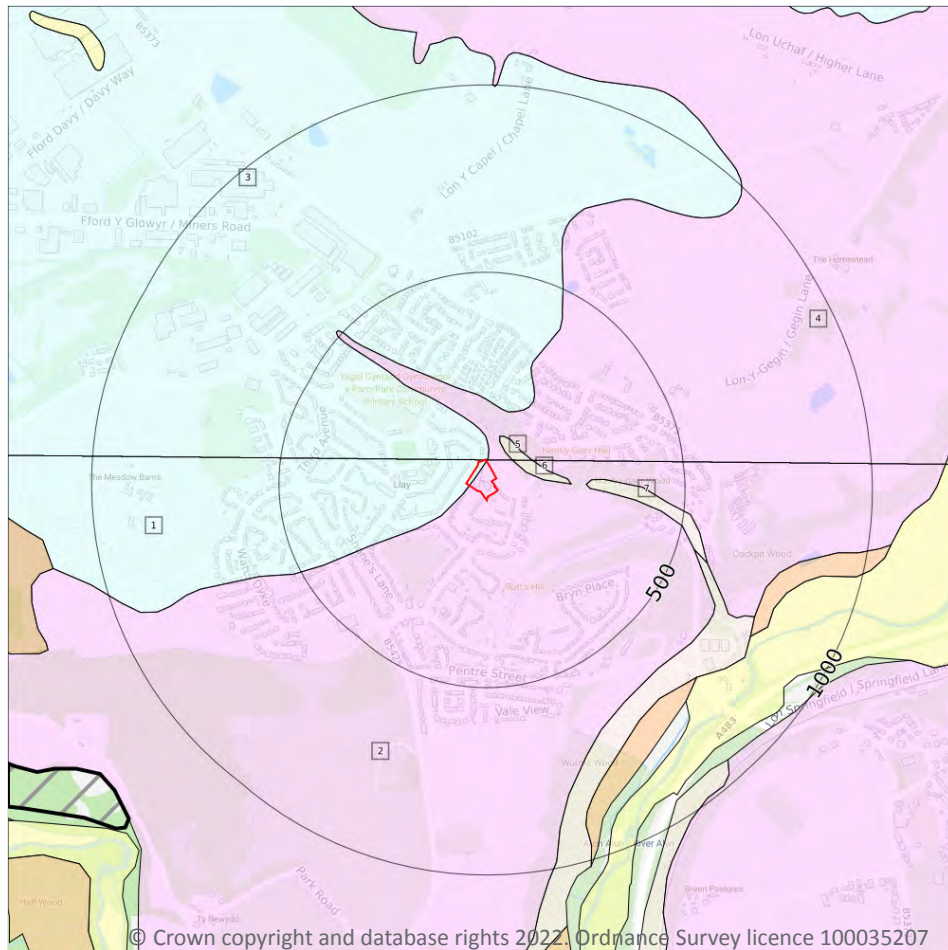
0

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 74**

ID	Location	LEX Code	Description	Rock description
1	On site	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
2	On site	GFDUD-XSV	GLACIOFLUVIAL DEPOSITS, DEVENSIAN	SAND AND GRAVEL
3	On site	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON



ID	Location	LEX Code	Description	Rock description
4	4m N	GFSDD-XSV	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN	SAND AND GRAVEL
5	56m NE	GLLDD-XCZ	GLACIOLACUSTRINE DEPOSITS, DEVENSIAN	CLAY AND SILT
6	61m NE	GLLDD-XCZ	GLACIOLACUSTRINE DEPOSITS, DEVENSIAN	CLAY AND SILT
7	237m E	GLLDD-XCZ	GLACIOLACUSTRINE DEPOSITS, DEVENSIAN	CLAY AND SILT

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	3
---------------------------	----------

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).

Location	Flow type	Maximum permeability	Minimum permeability
On site	Mixed	High	Low
On site	Intergranular	Very High	High
4m N	Intergranular	Very High	High

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)

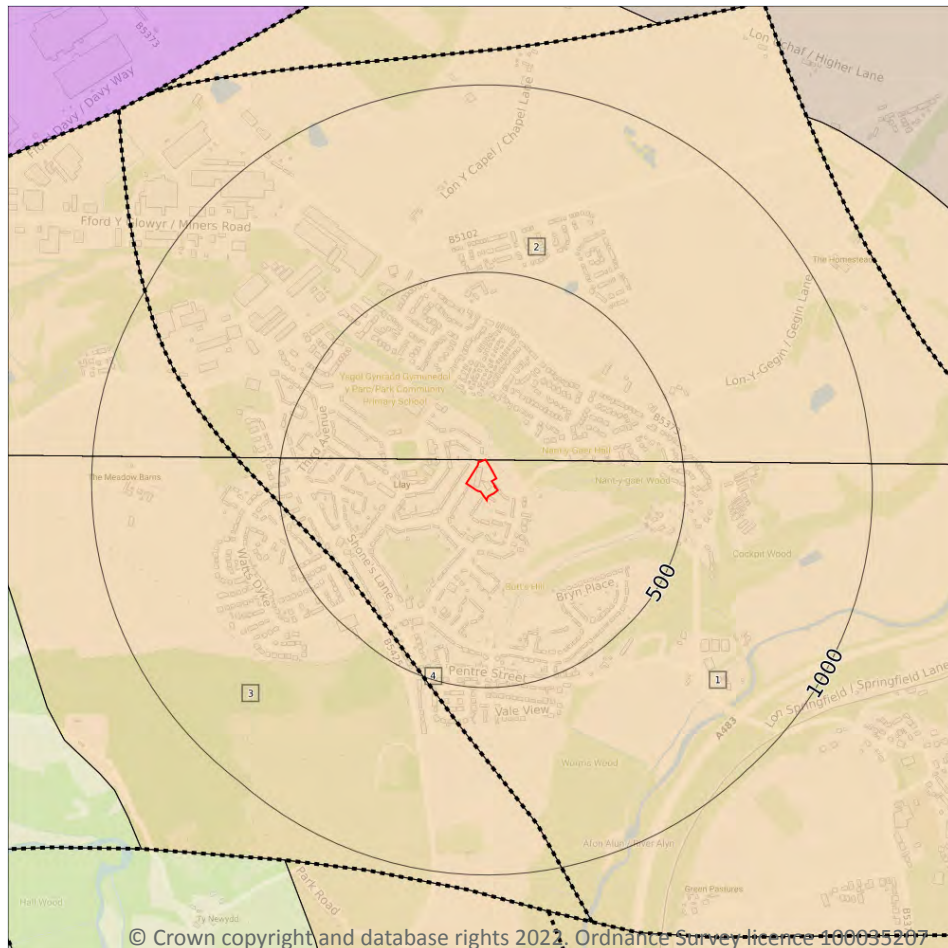
Records within 50m	0
---------------------------	----------

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

3

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 76**

ID	Location	LEX Code	Description	Rock age
1	On site	SAL-MDSC	SALOP FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE	WESTPHALIAN
2	On site	SAL-MDSC	SALOP FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE	WESTPHALIAN

ID	Location	LEX Code	Description	Rock age
3	399m SW	SAL-MDSC	SALOP FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE	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	Moderate	Low

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m	1
----------------------------	----------

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 76**

ID	Location	Category	Description
4	399m SW	FAULT	Fault, inferred, displacement unknown

This data is sourced from the British Geological Survey.

16 Boreholes

16.1 BGS Boreholes

Records within 250m

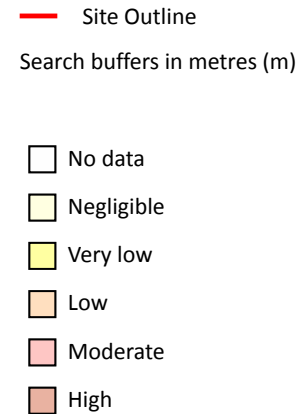
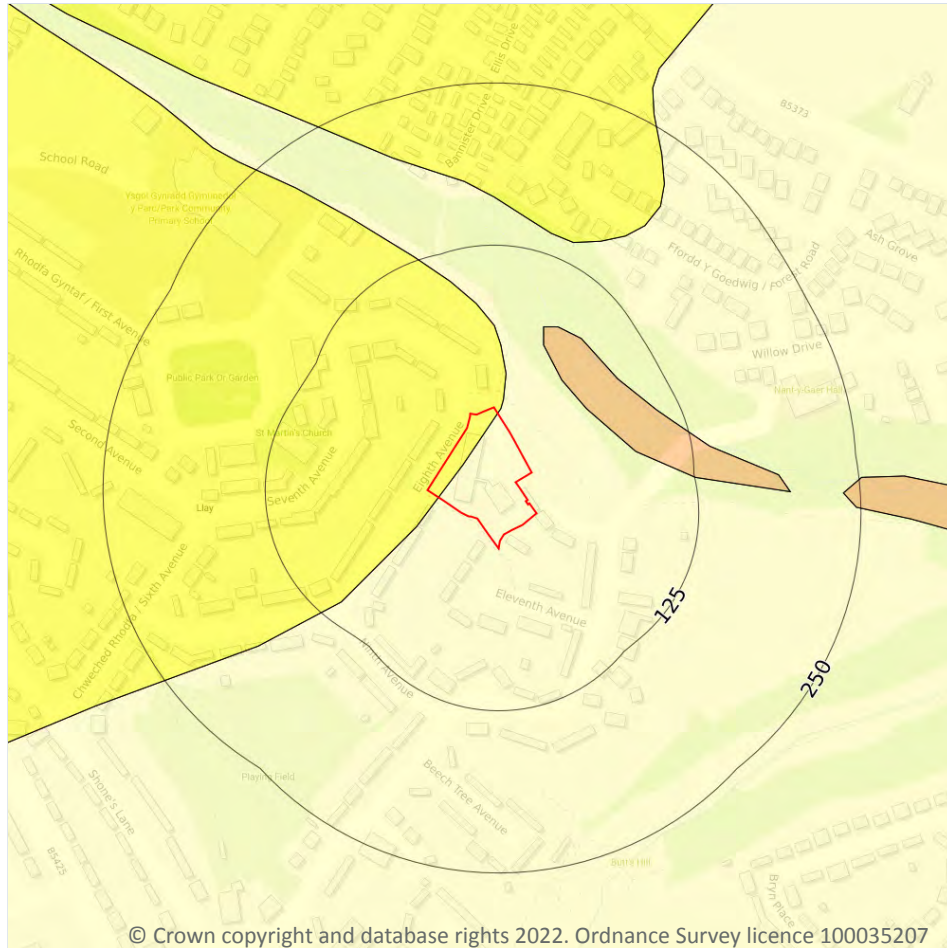
0

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.

This data is sourced from the British Geological Survey.



17 Natural ground subsidence - Shrink swell clays



17.1 Shrink swell clays

Records within 50m

2

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).

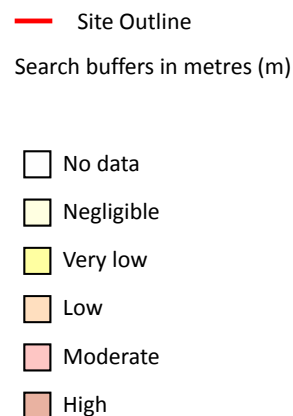
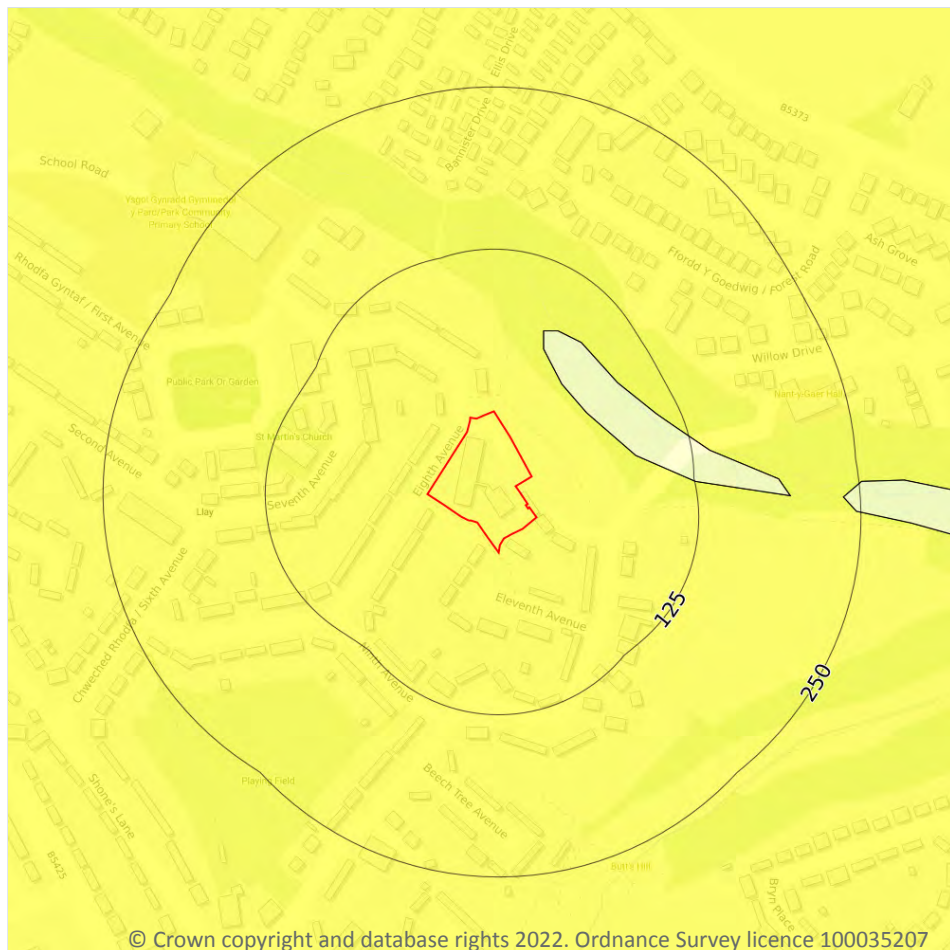
Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 79**

Location	Hazard rating	Details
On site	Negligible	Ground conditions predominantly non-plastic.
On site	Very low	Ground conditions predominantly low plasticity.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Running sands



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.

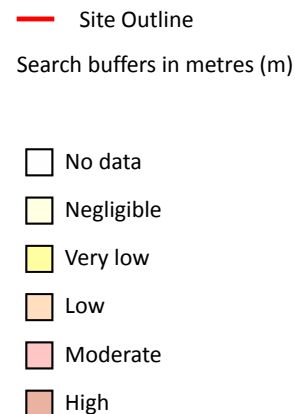
Features are displayed on the Natural ground subsidence - Running sands map on **page 80**

Location	Hazard rating	Details
On site	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Compressible deposits



17.3 Compressible deposits

Records within 50m

1

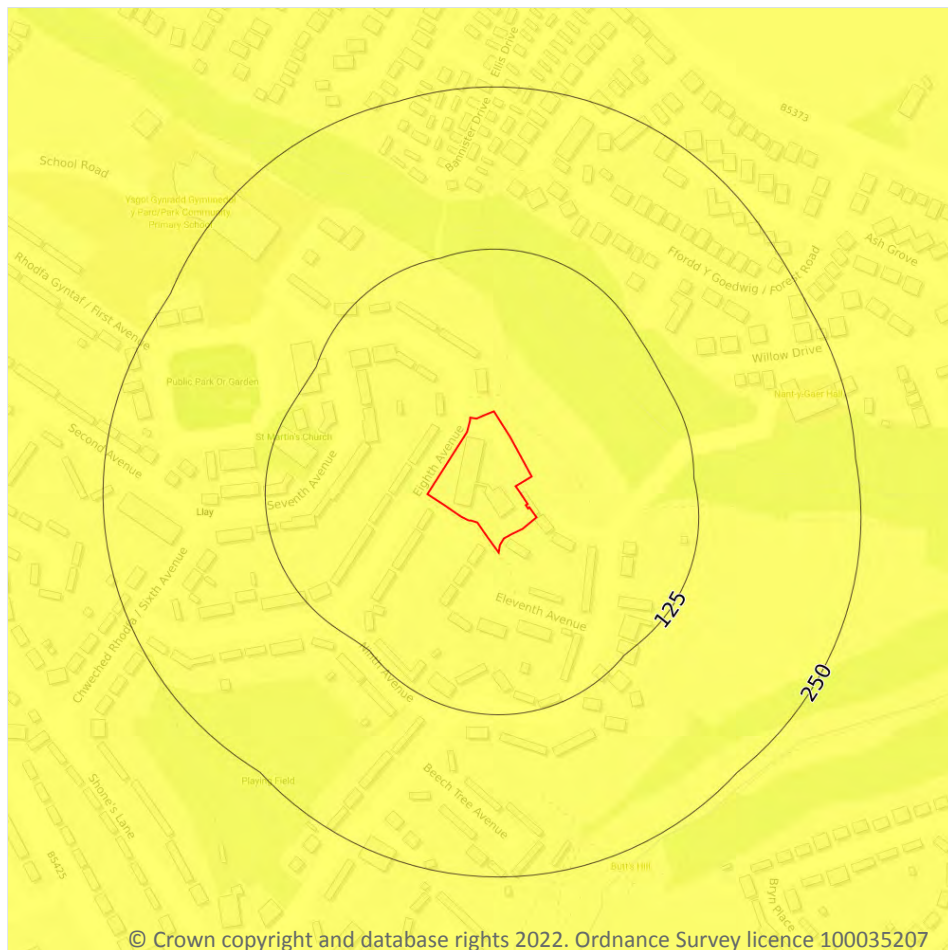
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 81**

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.

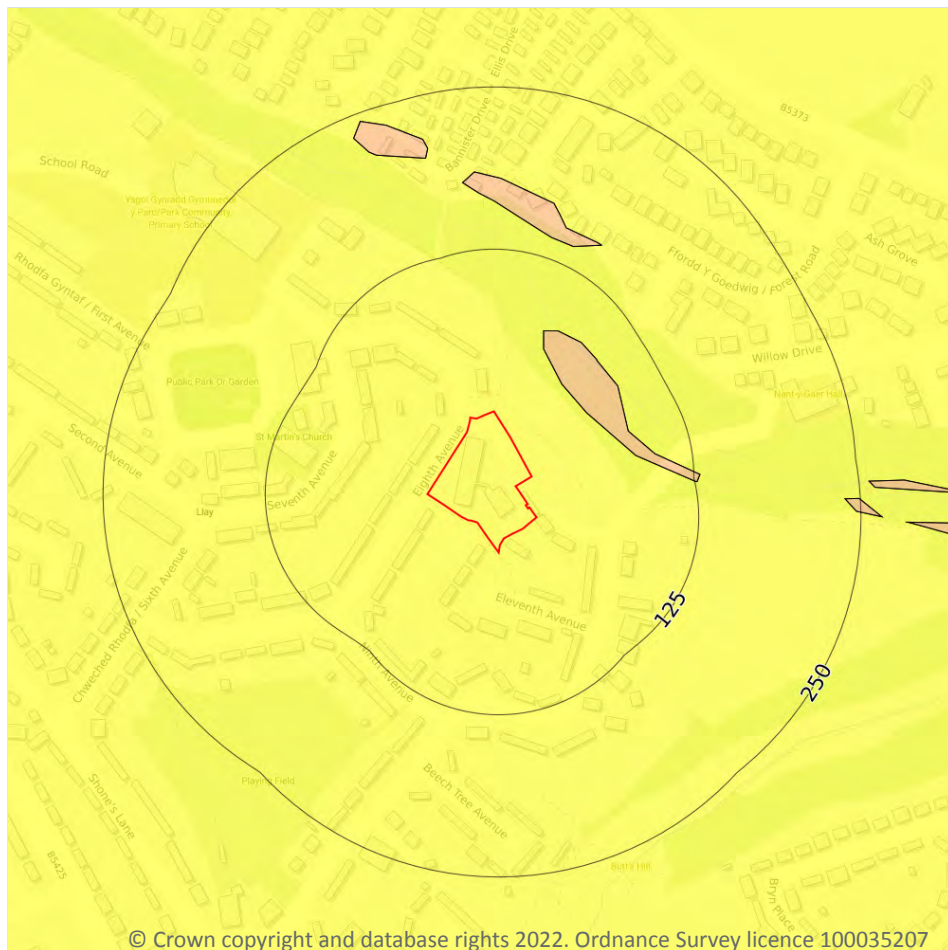
Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 82**

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



- Site Outline
- Search buffers in metres (m)
- ☐ No data
 - ☐ Negligible
 - ☐ Very low
 - ☐ Low
 - ☐ Moderate
 - ☐ High

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.

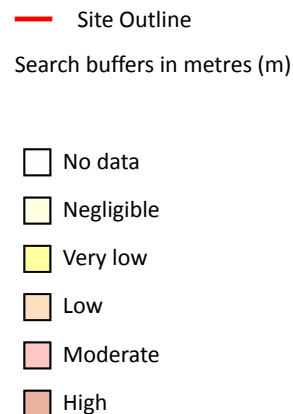
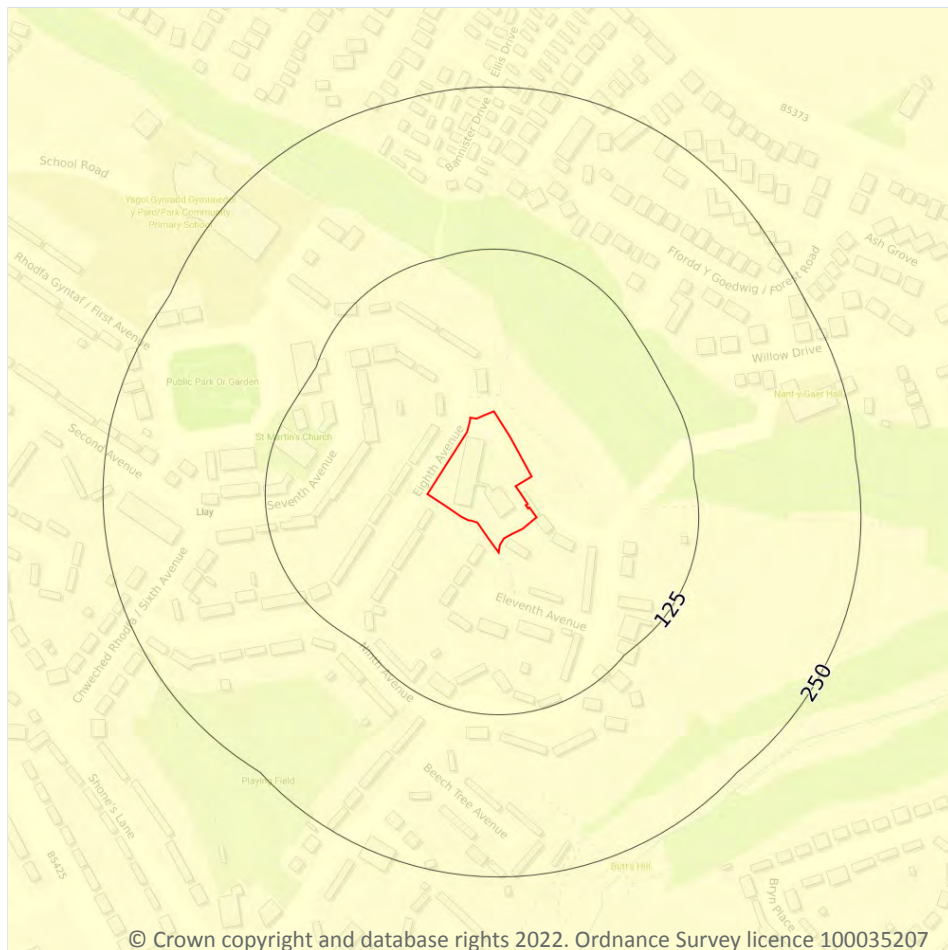
Features are displayed on the Natural ground subsidence - Landslides map on **page 83**

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



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.

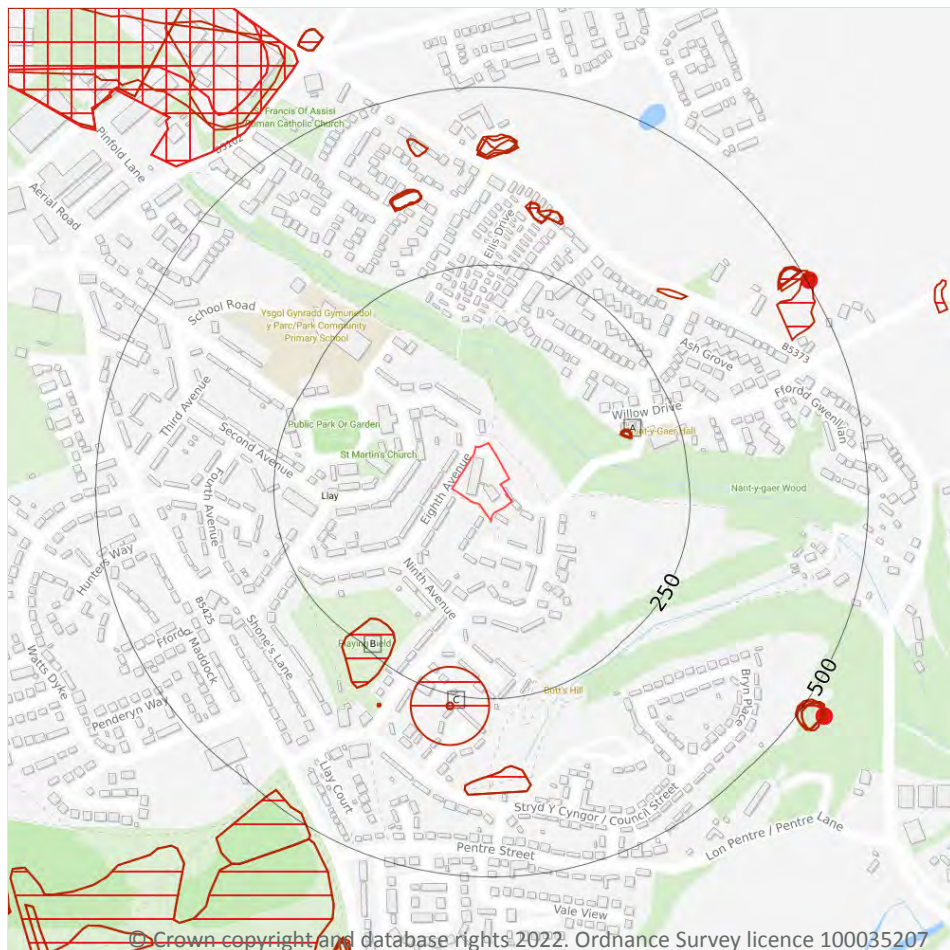
Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 84**

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, ground workings and natural cavities



- Site Outline
- Search buffers in metres (m)
- Natural cavities (Area)
- Natural cavities (Point)
- BritPits
- Surface ground workings
- Underground workings
- Historical Mineral Planning Areas
- Mining Cavities
- 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 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.

18.2 BritPits

Records within 500m

0

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.

This data is sourced from the British Geological Survey.

18.3 Surface ground workings

Records within 250m

6

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, ground workings and natural cavities map on **page 85**

ID	Location	Land Use	Year of mapping	Mapping scale
A	168m E	Gravel Pit	1909	1:10560
A	169m E	Gravel Pit	1938	1:10560
A	169m E	Gravel Pit	1949	1:10560
B	207m SW	Unspecified Pit	1968	1:10560
B	207m SW	Unspecified Pit	1960	1:10560
C	211m S	Gravel Hole	1872	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m

5

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, ground workings and natural cavities map on **page 85**

ID	Location	Land Use	Year of mapping	Mapping scale
3	547m NW	Colliery	1949	1:10560
N	582m NW	Unspecified Mine	1968	1:10560
N	582m NW	Unspecified Mine	1960	1:10560



ID	Location	Land Use	Year of mapping	Mapping scale
-	979m NW	Unspecified Disused Shafts	1992	1:10000
-	983m NW	Unspecified Disused Shafts	1979	1:10000

This data is sourced from Ordnance Survey/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

0

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).

This data is sourced from the British Geological Survey.

18.7 Mining cavities

Records within 1000m

0

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.

This data is sourced from Stantec UK Ltd.

18.8 JPB mining areas

Records on site

0

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

This data is sourced from Johnson Poole and Bloomer.



18.9 Coal mining

Records on site	1
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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.

18.10 Brine areas

Records on site	0
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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.

18.11 Gypsum areas

Records on site	0
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Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.12 Tin mining

Records on site	0
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Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

18.13 Clay mining

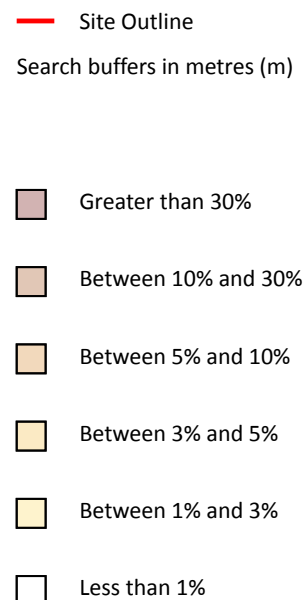
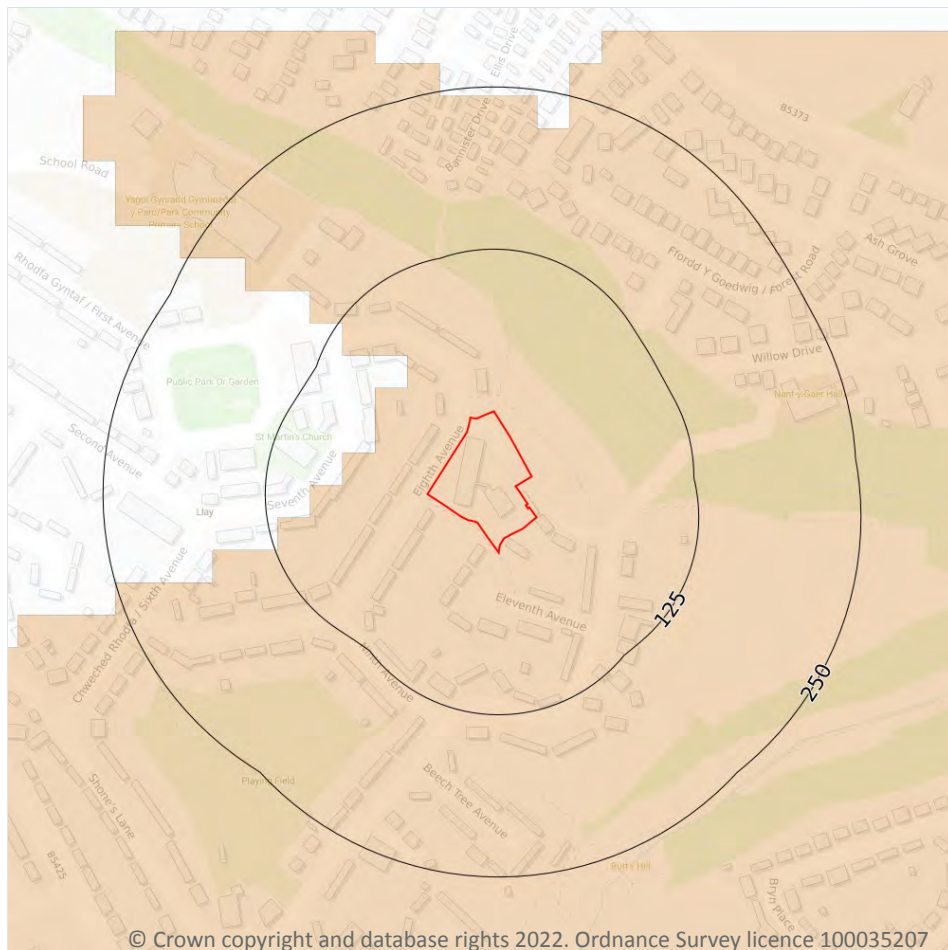
Records on site	0
-----------------	---

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 Radon



19.1 Radon

Records on site

1

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 89**

Location	Estimated properties affected	Radon Protection Measures required
On site	Between 5% and 10%	Basic

This data is sourced from the British Geological Survey and Public Health England.



20 Soil chemistry

20.1 BGS Estimated Background Soil Chemistry

Records within 50m

7

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 km². 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 km²; 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	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg
4m N	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg
4m N	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg

This data is sourced from the British Geological Survey.

20.2 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 km²).

This data is sourced from the British Geological Survey.



20.3 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 km².

This data is sourced from the British Geological Survey.



21 Railway infrastructure and projects

21.1 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.

21.2 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.

21.3 Railway tunnels

Records within 250m

0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

21.4 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.

21.5 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.

21.6 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.

21.7 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.

21.8 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.

21.9 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.

21.10 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: <https://www.groundsure.com/terms-and-conditions-jan-2020/>.



Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 3

Local Authority Correspondence

Sian Callister
Coopers
Park House, Sandpiper Court
Chester Business Park
Chester
CH4 9QU

Eich Cyf/Your Ref
Ein Cyf/Our ref
Dyddiad/Date
Gofynner am/Ask for
Rhif Cyswllt/Contact No
E-bost/E-mail

Search 1062
21 November 2022
Angela Guy
01978 298771
contaminatedland@wrexham.gov.uk

BY EMAIL ONLY

Dear Mr Callister

ENVIRONMENTAL SEARCH – CWRT PENTWMPATH, LLAY

Further to your email dated 14 November 2022 I can provide the following comments.

1. Does the Environmental Health Department hold records of any closed, operational or proposed landfill sites within 250 metres of our client's site? If so please advise us of the location and if possible, provide us with copies of relevant information including type of waste deposited, dates of operation, planning permission and licenses/permits, landfill gas and leachate monitoring results or other pertinent data which may be available.

This Authority does not yet have a comprehensive database regarding historic land use or contamination, however the limited information available to the Contaminated Land Team does not indicate the presence of any closed, operational or proposed landfill within 250m of the site.

2. Does the Environmental Health Department hold records of any former or existing land uses/developments on the proposed development site or adjacent to the site, which have been subject to site investigations submitted in support of a planning application. Have any site investigations been undertaken or proposed in accordance with Part 2A of the Environmental Protection Act 1990.

From the limited information available to the Contaminated Land Team an electricity substation is noted as being within the area of the proposed development. No other former or existing land uses/developments which are potentially contaminative are present on or adjacent to the site and we are not aware of any past site investigations on or adjacent to the site. A recent planning application (P/2022/0914) has been submitted, this Team advised a condition requiring a contamination assessment and remediation (if required) be applied to any permission granted, at this time I understand the application is pending a decision, the planning portal can be checked for further details. The conditions were advised because of the electricity substation.

3. Does the Environmental Health Department have records of any private groundwater abstractions within 2000m of the vicinity of the proposed development site? If so, please provide details regarding location, uses of abstracted waters, depth to abstraction source, and abstraction rates if available.

The Environmental Protection Team have confirmed that they have no records and are not aware of any private water supplies within 2km of the site.

Should you have any queries then please do not hesitate to contact me on the above number.

Yours sincerely

A handwritten signature in black ink, appearing to read 'A. Guy', with a stylized flourish at the end.

Ms Angela Guy
Contaminated Land Officer

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 4

Tree Survey

TREE SURVEY SCHEDULE (BS5837: 2012)

SITE:	CWRT PENTWMPATH, EIGHTH AVE, LLAY, WREXHAM
CLIENT:	WALES & WEST HOUSING
BRIEF:	ARBORICULTURAL IMPACT ASSESSMENT

SURVEYOR:	A. HENDERSON
ASSESSMENT DATE:	17/09/2021
VIEWING CONDITIONS:	CLEAR
JOB REFERENCE:	21/AIA/WXM/289

TREE NO. T - Tree G - Group H - Hedge	SPECIES (COMMON NAME)	AGE	HEIGHT (m) + CROWN CLEARANCE/ DIRECTION OF GROWTH (N.S.E.W)	RADIAL CROWN SPREAD (m)				STEM/ MULTI-STEM* DIA. (mm)	VITALITY	COMMENTS	MANAGEMENT	CATEGORY & SUB-CATEGORY GRADING BS 5837	BS 5837 RADIUS (m) RPA (m²)
				N	S	E	W						
T1	Oak	M	18 1E	6	7	7	5.5	990	G	- Large prominent tree - Past limb failures leaving tear out wound – not significant - Offsite tree - E.R.C. 40	No works	A2	12 443m²
T2	Oak	SM	7	1.5	3.5	4	4.5	350	G	- Low suppressed form due to location beneath T1 - E.R.C. 10	No works	C1	4.2 55m²
T3	Hawthorn	M	4 1N	1.5	2	1.5	1	200	M	- Low grade hedger plant - Entirely Ivy clad - E.R.C. 0	No works	C1	2.4 18m²
T4	Ash	SM	5 0	1.5	1.5	1.5	1.5	160	M	- Young tree within boundary hedgerow - Liable to Chalara Ash Dieback (ADB) - E.R.C. <10	No works	C1	1.9 12m²
T5	Oak	SM	4.5 2S	0	2.5	1.5	1.5	200	M	- All crown bias south - Small insignificant tree - E.R.C. 0	Remove if required	C1	2.4 55m²
T6	Cherry	M	5.5 1N	3.5	2	2	0.5	320	M	- Closed canopy with T8 - Offers amenity value - E.R.C. 10	No works	C2	3.8 46m²
T7	Cherry	M	6.5	3.5	4	2	1.5	350	M	As T6	Remove for development	C1	4.2 55m²

HEADINGS & ABBREVIATIONS

TREE NO.
SPECIES:
AGE RANGE/LIFE STAGE:
HEIGHT:
CROWN SPREAD:
CROWN CLEARANCE & DIRECTION OF GROWTH:
STEM DIA/MULTI-STEM DIA:
VITALITY:
E.R.C. = ESTIMATED REMAINING CONTRIBUTION:
BS 5837 CATEGORY & SUB-CATEGORY GRADING:
BS 5837 RADIUS & BS 5837 RPA:

REFERENCE NUMBER. REFER TO PLAN OR NUMBERED TAGS WHERE APPLICABLE (T = TREE, G = GROUP, H = HEDGE)
 COMMON NAME (LATIN NAMES AVAILABLE ON REQUEST)
 Y = YOUNG, SM = SEMI MATURE, EM = EARLY MATURE, M = MATURE, PM = POST MATURE
 ESTIMATED AND RECORDED IN METRES. APPROXIMATELY 1 IN 10 TREES ARE MEASURED USING A CLINOMETER AND THE REMAINDER ESTIMATED AGAINST THE MEASURED TREES
 MAXIMUM CROWN RADIUS MEASURED TO THE FOUR CARDINAL COMPASS POINTS FOR SINGLE SPECIMENS ONLY (MEASUREMENT FOR TREE GROUPS - MAXIMUM RADIUS OF THE GROUP)
 HEIGHT IN METERS OF CROWN CLEARANCE ABOVE ADJACENT GROUND LEVEL (TO INFORM ON GROUND CLEARANCE, CROWN/STEM RATIO AND SHADING)
 STEM DIAMETER - MEASURED AT APPROXIMATELY 1.5 METRES ABOVE GROUND LEVEL OR A COMBINATION OF STEMS FOR MULTI-STEMMED TREES
 A MEASURE OF PHYSIOLOGICAL CONDITION. D = DEAD, MD = MORIBUND, P = POOR, M = MODERATE, G = GOOD
 RELATIVE USEFUL LIFE EXPECTANCY (YEARS)
 A = HIGH QUALITY AND VALUE, B = MODERATE QUALITY AND VALUE, C = LOW QUALITY AND VALUE, U = UNSUITABLE FOR RETENTION (SUB-CATEGORY REFERS TO ARBORICULTURAL, LANDSCAPE AND CULTURAL/CONSERVATION VALUES)
 PROTECTIVE DISTANCE - RADIUS FROM THE CENTRE OF THE STEM TO THE LINE OF TREE PROTECTION (CONSTRUCTION EXCLUSION ZONE - CEZ) AND PROTECTIVE BARRIER ROOT PROTECTION AREA - BS 5837 (2012) ANNEX D (THE RECOMMENDATIONS STATE THAT THE RPA SHOULD BE CAPPED AT 707 M²) NOTE – ALL CALCULATIONS ROUNDED TO NEAREST DECIMAL

TREE SURVEY SCHEDULE (BS5837: 2012)

Tree Solutions

Arboricultural Consultants

SITE:	CWRT PENTWMPATH, EIGHTH AVE, LLAY, WREXHAM
CLIENT:	WALES & WEST HOUSING
BRIEF:	ARBORICULTURAL IMPACT ASSESSMENT

SURVEYOR:	A. HENDERSON
ASSESSMENT DATE:	17/09/2021
VIEWING CONDITIONS:	CLEAR
JOB REFERENCE:	21/AIA/WXM/289

PAGE 1 OF 4

TREE NO. T - Tree G - Group H - Hedge	SPECIES (COMMON NAME)	AGE	HEIGHT (m) + CROWN CLEARANCE/ DIRECTION OF GROWTH (N.S.E.W)	RADIAL CROWN SPREAD (m)				STEM/ MULTI-STEM* DIA. (mm)	VITALITY	COMMENTS	MANAGEMENT	CATEGORY & SUB-CATEGORY GRADING BS 5837	BS 5837 RADIUS (m) RPA (m²)
				N	S	E	W						
T8	Variegated Sycamore	EM	12 1.5E	5	1	4.5	4.5	380	G	- Topped at 6m – secondary crown formed above - E.R.C. 20	Remove for development	B2	4.5 65m²
T9	Cherry	M	10 1N	3	5	3	4	550	G	- Part of small, landscaped group associated with current use - E.R.C. 20	No works	B2	6.6 137m²
T10	Cherry	M	8	4	4	4.5	3	400	M	- Ganoderma at base - Roots displacing footpath - Screened by T9 – loss mitigated - E.R.C. 20	Remove for development	B2	4.8 72m²
T11	Apple	EM	6	3	4	3	2	220	G	- Poor structural crown form - Tree of little importance and easily replaced by new planting - E.R.C. 10	Remove for development	C2	2.6 22m²
T12	Purple Maple (Crimson King)	EM	9	3	1.5	2.5	2.5	400	G	- Badly topped at 4m in past - Secondary crown above - E.R.C. 20	Remove for development	B2	4.8 72m²
T13	Sycamore	EM	15	3	4	2.5	4	350 210 (408)	G	- Located offsite with no access to survey - Twin stem from base - E.R.C. 20	3rd party tree – N/A	B2	5 75m²
T14	Sycamore	EM	16	7	3	4	3.5	500 400 (640)	G	- As T13 - Roots displacing footpath	3rd party tree – N/A	B2	7.7 185m²
T15	Cherry	M	4 0	3	2	2	2	340	M	Low-grade tree of little value	Remove & replace with better quality specimen tree	C2	4 52m²

TREE SURVEY SCHEDULE (BS5837: 2012)

Tree Solutions

Arboricultural Consultants

SITE:	CWRT PENTWMPATH, EIGHTH AVE, LLAY, WREXHAM
CLIENT:	WALES & WEST HOUSING
BRIEF:	ARBORICULTURAL IMPACT ASSESSMENT

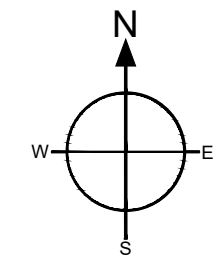
SURVEYOR:	A. HENDERSON
ASSESSMENT DATE:	17/09/2021
VIEWING CONDITIONS:	CLEAR
JOB REFERENCE:	21/AIA/WXM/289

PAGE 1 OF 4

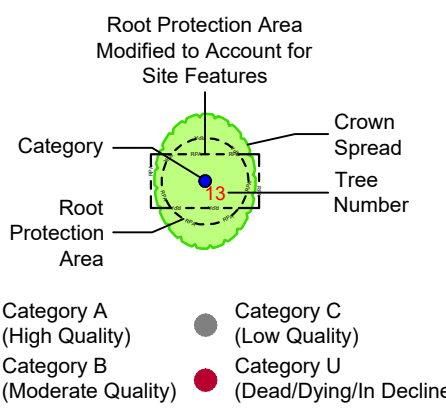
TREE NO. T - Tree G - Group H - Hedge	SPECIES (COMMON NAME)	AGE	HEIGHT (m) + CROWN CLEARANCE/ DIRECTION OF GROWTH (N.S.E.W)	RADIAL CROWN SPREAD (m)				STEM/ MULTI-STEM* DIA. (mm)	VITALITY	COMMENTS	MANAGEMENT	CATEGORY & SUB- CATEGORY GRADING BS 5837	BS 5837 RADIUS (m) RPA (m²)
				N	S	E	W						
T16	Sycamore	M	13	5.5	3.5	4	4	520	G	- No visual defects - Located close to existing building - E.R.C. 20	Remove for development	B2	6.2 122m²
T17	Cherry	M	13	5.5	5.5	2	4	670	G	- Crown reduced to SE to clear BT lines - No significant defects - E.R.C. 20	Remove for development	B2	8 203m²
T18	Cherry	M	18 1.5N	5	4.5	4	5.5	200x5 (447)	G	- Multi-stem from 0.5m - Exposed surface roots - E.R.C. 20	Remove for development	B2	5.4 90m²
T19	Cherry	M	4.5 1.5S	4	2	3	2	150x4 (300)	M	- Exposed roots starting to displace paving at entrance - E.R.C. 10	Remove for development	C2	3.6 41m²
T20	Walnut	SM	4.5	2	2	2	2	170	G	- Small tree planted in wrong location due to insufficient space to develop to maturity - E.R.C. 10	Remove for development	C2	2 13m²
T21	Sycamore	EM	13	3	4.5	4.5	3	360	G	- Offsite tree with no access to survey - Forms closed canopy with T22 - E.R.C. 20	3 rd party tree – N/A	B2	4.3 59m²
T22	Sycamore	EM	14	4	4	3.5	3.5	350x4 (700)	G	- Multi-stem from past coppice - E.R.C. 20	No works	B2	3.6 41m²
G1	Holly Hawthorn	M	9 0	2	2	2	3	≤200	G	Overgrown hedge	No works	C2	8.4 222m²
G2	Sycamore	SM	≤10	2	3	4	2.5	≤150	G	Mass of shoots from past removed tree	Remove	C3	1.8 10m²
G3	Cherry	SM	4 0	1	1.5	1.5	1.5	150	G	2 small insignificant trees - E.R.C. 0	Remove	C3	1.8 10m²

Table 1 Cascade chart for tree quality assessment

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	- Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) - Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline - Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality <i>NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see 4.5.7.</i>			See Table 2
	1 Mainly arboricultural qualities	2 Mainly landscape qualities	3 Mainly cultural values, including conservation	
Trees to be considered for retention				
Category A Trees of high quality with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	See Table 2
Category B Trees of moderate quality with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	See Table 2
Category C Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	See Table 2



Legend



NOTE: Tree/group numbers marked with an * have approximate locations.

Client: Wales & West Housing

Project: Cwrt Pentwmpath, Eighth Avenue, Llay, Wrexham

Title: Preliminary Tree Constraints Plan

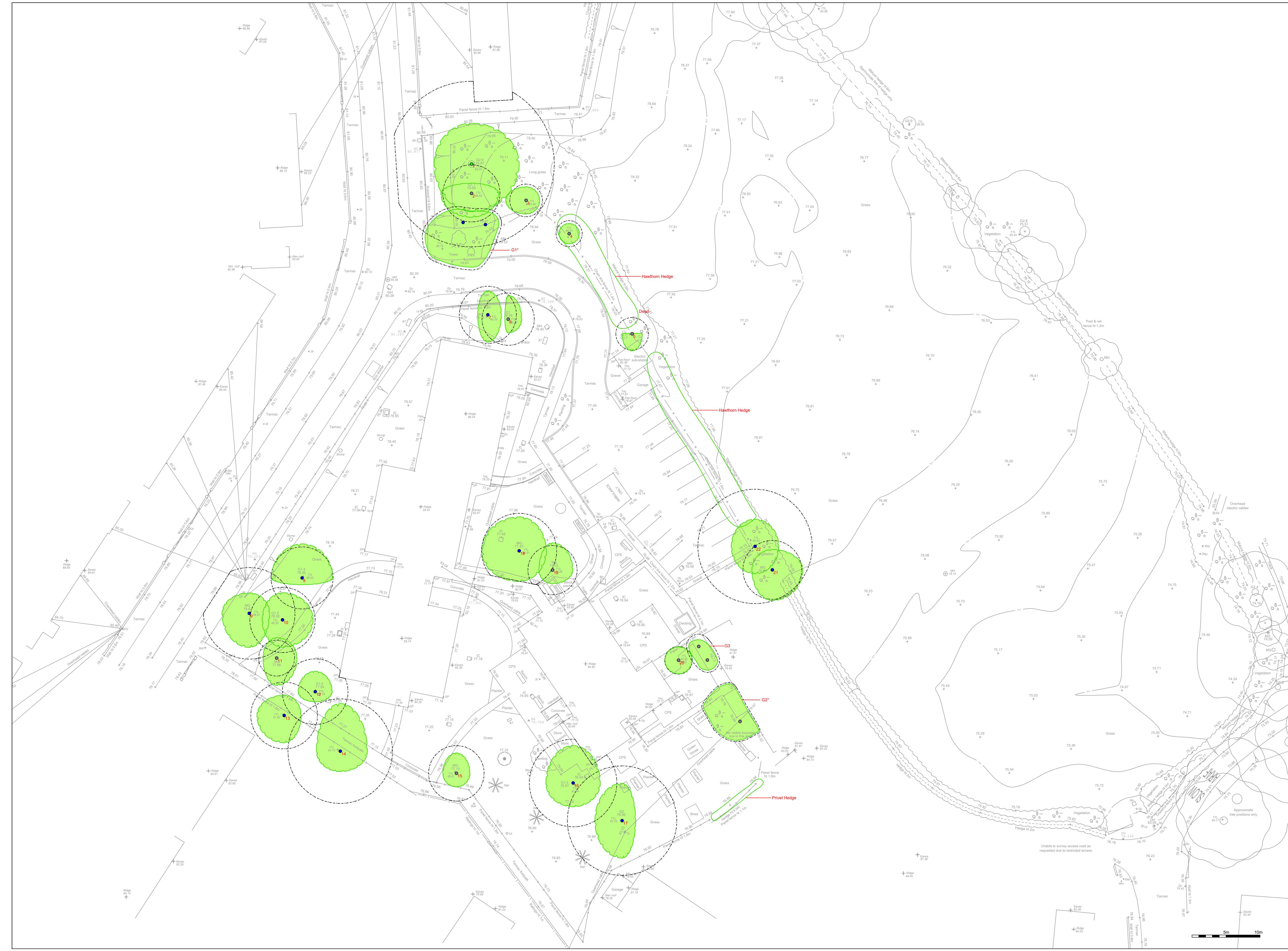
Scale: 1:250 @ A1 Date: September 2021

Drawn By: NB Revision: -

Job Ref: 21/AIA/WXM/289 Drawing No: 01

Do not scale from this drawing all dimensions to be checked on site.

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Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 5

BGS Borehole Logs



**British
Geological
Survey**

Version 2.0.6.6

BGS ID: 154210 : BGS Reference: SJ35NW6
British National Grid (27700) : 333040,355770

[Report an issue with this borehole](#)

<<

< Prev

Page 1 of 24 ▼

Next >

>>

SJ 35 NW 6

Denner
Hall
Nesbitt
for Wretham & Acton B.H.

6' Benlough 21 SE
1' 121. / 6
SJ 35 NW 6

(New Series)

Hall
Clay Borehole, Wretham

communicated by Mr. E. T. Brown
In part detailed in Ep. P. Mem. 1" 121. pp. 112, 122-3.

Description	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Gravel	37.49	123	123	44.50	2.67	8.9	410 314.89
Boulder Clay	7.01	27	146.0	48.31	1.52	57.0	419 315.42
Red Marl	3.81	12.6	158	50.44	3.28	10.9	426 319.69
Strong blue marl	2.13	7.0	166.0	61.72	1.83	6.0	432 321.52
Variegated marl	11.28	37.0	203.0	67.21	12.19	40.0	437 323.71
Purple marl	5.49	18.0	221	69.95	3.20	6	442 326.91
Light blue shale	2.74	9.0	230.0	76.50	0.46	1.6	448 328.37
Strong grey sandstone	6.55	21.6	251.6	76.96	0.53	1.9	449 329.90
Dark Warrant	0.46	1.6	253.0	79.25	0.13	5	450 330.03
Light blue shale	2.29	7.0	260.6	80.16	1.32	4.4	451 331.35
Dark Warrant with Carb. Horse	0.91	3.0	263.6	85.19	0.05	2	452 332.40
Light blue shale	5.03	16.6	280	87.63	0.38	1.3	453 333.78
Dark Warrant with sand. shale	2.44	8.0	288.0	87.68	2.13	7.0	455 335.92
Coal	0.05	2	288.2	88.44	0.38	1.3	456 337.30
Blue shale	0.76	2.6	290.8	90.68	0.91	3.0	457 338.21
Strong blue shale	2.24	7.4	297.2	91.90	2.34	7.8	459 340.55
Strong grey sandstone with pyrite	1.22	4.0	301.2	95.55	2.59	8.6	461 343.14
Dark Warrant	0.61	2.0	303	97.51	1.12	4.0	462 344.26
Strong blue sandstone	3.05	10.0	313	97.77	4.65	15.3	466 348.91
Greenish blue shale	1.22	4.0	317	97.38	0.10	4	467 349.31
Red marl	0.61	2.0	320	100.89	0.05	2	468 350.36
Strong grey sandstone calcareous	3.51	11.6	334.6	105.77	0.28	1.1	469 351.64
Blue arenaceous shale	2.44	8.0	342.6	109.12	1.12	4.0	470 352.76
Variegated marls	2.44	8.0	347.6	112.34	3.46	12.0	474 356.22
Red marl	3.35	11.0	361.6	115.37	0.13	5	475 356.35
Dark blue shale	0.46	1.6	362.0	120.09	0.30	1.0	476 356.65
Blue sandstone	0.76	2.6	364.6	122.22	0.13	5	477 356.78
Blue shale	5.03	16.6	379.0	124.6	1.52	5.0	478 358.30
Variegated marl	4.72	15.0	397.0	124.6	8.53	28.0	486 366.83
Blue shale	2.13	7.0	404.6	124.6	1.91	6.3	488 368.74
Dark Warrant	4.01	13.0	417.6	124.6	0.01	0.01	488 368.75

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 6

Coal Authority Report



The Coal
Authority

CON29M

coal mining report

CWRT PENTWMPATH, LLAY, WREXHAM, LL12 0TT



Known or potential coal mining risks

Past underground coal mining	Page 3
Future underground coal mining	Page 3



Further action

No further reports from the Coal Authority are required. Further information on any next steps can be found in our Professional opinion.

For more information on our reports please visit
www.groundstability.com



Professional opinion

According to the official mining information records held by the Coal Authority at the time of this search, evidence of, or the potential for, coal mining related features have been identified. It is unlikely that these features will impact on the stability of the enquiry boundary.

Your reference: **7962 - 9546 - JAL**
Our reference: **51003324171001**
Date: **11 November 2022**

Client name:
COOPERS

If you require any further assistance please
contact our experts on:
0345 762 6848
groundstability@coal.gov.uk



The Law
Society

Enquiry boundary

Key

Approximate position of enquiry boundary shown



We can confirm that the location is
on the coalfield



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This report is prepared in accordance with the latest Law Society's Guidance Notes 2018, the User Guide 2018 and the Coal Authority's Terms and Conditions applicable at the time the report was produced.



Accessibility

If you would like this information in an alternative format, please contact our communications team on 0345 762 6848 or email communications@coal.gov.uk.

Detailed findings

Information provided by the Coal Authority in this report is compiled in response to the Law Society's CON29M Coal Mining enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL.

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1 Past underground coal mining

The property is in a surface area that could be affected by underground mining in 5 seams of coal at 680m to 910m depth, and last worked in 1966.

Any movement in the ground due to coal mining activity associated with these workings should have stopped by now.

2 Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3 Future underground coal mining

The property is not in an area where the Coal Authority has received an application for, and is currently considering whether to grant a licence to remove or work coal by underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

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

4 Mine entries

There are no recorded coal mine entries known to the Coal Authority within, or within 20 metres, of the boundary of the property.

5 Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6 Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7 Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8 Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9 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.

10 Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11 Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

12 Withdrawal of support

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.

13 Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14 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.

Statutory cover



Coal mining subsidence

In the unlikely event of any coal mining related subsidence damage, the Coal Authority or the mine operator has a duty to take remedial action in respect of subsidence caused by the withdrawal of support from land or property in connection with lawful coal mining operations.

When the works are the responsibility of the Coal Authority, our dedicated public safety and subsidence team will manage the claim. The house or land owner ("the owner") is covered for these works under the terms of the Coal Mining Subsidence Act 1991 (as amended by the Coal Industry Act 1994). Please note, this Act does not apply where coal was worked or gotten by virtue of the grant of a gale in the Forest of Dean, or any other part of the Hundred of St. Briavels in the county of Gloucester.

If you believe your land or property is suffering from coal mining subsidence damage and you need more information on what to do next, please use the following link to our website which sets out what your rights are and what you need to consider before making a claim.

www.gov.uk/government/publications/coal-mining-subsidence-damage-notice-form



Coal mining hazards

Our public safety and subsidence team provide a 24 hour a day, 7 days a week hazard reporting service, to help protect the public from hazards caused by past coal workings, such as a mine shaft or shallow working collapse. To report any hazards please call **0800 288 4242**. Further information can be found on our website: www.gov.uk/coalauthority.

Glossary



Key terms

adit - horizontal or sloped entrance to a mine

coal mining subsidence - ground movement caused by the removal of coal by underground mining

Coal Mining Subsidence Act 1991 - the Act setting out the duties of the Coal Authority to repair damage caused by coal mining subsidence

coal mining subsidence damage - damage to land, buildings or structures caused by the removal of coal by underground mining

coal seams - bed of coal of varying thickness

future opencast coal mining - a licence granted, or licence application received, by the Coal Authority to excavate coal from the surface

future underground coal mining - a licence granted, or licence application received, by the Coal Authority to excavate coal underground. Although it is unlikely, remaining coal reserves could create a possibility for future mining, which would be licensed by the Coal Authority

mine entries - collective name for shafts and adits

payments to owners of former copyhold land - historically, copyhold land gave rights to coal to the copyholder. Legislation was set up to allow others to work this coal, but they had to issue a notice and pay compensation if a copyholder came forward

shaft - vertical entry into a mine

site investigation - investigations of coal mining risks carried out with the Coal Authority's permission

stop notice - a delay to repairs because further coal mining subsidence damage may occur and it would be unwise to carry out permanent repairs

subsidence claim - a formal notice of subsidence damage to the Coal Authority since it was established on 31 October 1994

withdrawal of support - a historic notice informing landowners that the coal beneath their property was going to be worked

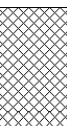
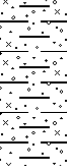
working facilities orders - a court order which gave permission, restricted or prevented coal mine workings

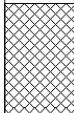
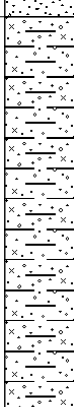
Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 7

Coopers Machine Dug Trial Pit Logs

 coopers chartered consulting engineers				Coopers (Chester) Ltd tel: 01244 684 910 web: www.coopers.co.uk email: admin@coopers.co.uk				Site CWRT PENTWMPATH, LLAY		Trial Pit Number TP01		
Excavation Method PRS		Dimensions 2.00 x 0.60 x 2.80m		Ground Level (mOD)		Client Castlemead Group Ltd				Job Number 7962		
		Location (Observed measurements)		Dates 23/11/2022		Engineer Coopers (Chester) Ltd				Sheet 1/1		
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description				Legend	Water	
0.10 0.10 0.25 0.25 0.40	B JV B JV B		Seepage during excavation(1) at 0.90m.		(0.20) 0.20 (0.10) 0.30	MADEGROUND (similar to topsoil). Grass over dark brown, slightly gravelly, sandy SILT. Sand is fine to to coarse. Gravel is angular to sub-angular, fine to coarse of various lithologies including brick fragments. Contains rootlets and rare coarse roots throughout.						
					(0.60)	MADEGROUND. Grey, slightly silty, sandy, angular to sub-angular, fine to coarse GRAVEL of limestone and mudstone. Sand is fine to coarse. *Assumed as medium dense.						
					0.90	Brown, slightly silty, clayey, gravelly, fine to coarse (predominantly fine to medium) SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. *Assumed as loose to medium dense.						
1.00	B					Firm, reddish brown mottled grey, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. Contains sand pockets.						
1.10	SV 90kPa					From 1.10m: Firm to stiff, high strength						
1.40	SV 120kPa					(1.20)	From 1.40m: Stiff					
												
												
												
												
2.20	B				2.10 (0.70)	Light brown, slightly silty, gravelly, fine to coarse (predominantly fine to medium) SAND. Moderate cobble content. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. *Assumed as loose to medium dense.						
					2.80	Complete at 2.80m						
						Remarks Location CAT scanned prior to excavation. Spalling below 2.10m. Minor collapses below 2.50m. Minor seepage at 0.90m during excavation. *Based upon trenchside stability characteristics. Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy. A shallow service was encountered on the east face of the trial pit. Moved over 1.00m to the west. The service trended to the north east and comprised a hollow plastic pipe, approximately 100mm diameter. Backfilled upon completion.						
						Scale (approx) 1:25		Logged By ST		Checked By PRS		

 coopers chartered consulting engineers				Coopers (Chester) Ltd tel: 01244 684 910 web: www.coopers.co.uk email: admin@coopers.co.uk			Site CWRT PENTWMPATH, LLAY		Trial Pit Number TP02	
Machine : JCB 3CX Method : Mechanical Excavation		Dimensions 2.00 x 0.60 x 2.80m		Ground Level (mOD)		Client Castlemead Group Ltd			Job Number 7962	
		Location (Observed measurements)		Dates 23/11/2022		Engineer Coopers (Chester) Ltd			Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description			Legend	Water
0.10	B				(0.40)	MADEGROUND (similar to topsoil). Grass over dark brown, slightly gravelly, sandy SILT. Sand is fine to to coarse. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. Contains rootlets throughout.				
					0.40	MADEGROUND. Dark greyish brown, clayey, gravelly, fine to coarse SAND with a low cobble content of brick. Gravel is angular to sub-angular, fine to coarse of various lithologies including glass, brick and natural stone. *Assumed as loose to medium dense.				
0.60	B JV B				0.70	Firm, reddish brown, slightly silty, slightly gravelly, very sandy CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. Contains sand pockets throughout.				
0.60										
0.70					(0.60)					
1.40	B				1.30	Light reddish brown, slightly clayey, sub-angular to sub-rounded, fine to coarse SAND and GRAVEL. *Assumed as loose to medium dense.				
					(1.40)					
2.40	B									
2.80	B				2.70	Firm, brown mottled grey, slightly silty, sandy CLAY. Thinly laminated. Sand is fine to medium.				
					(0.10)					
					2.80	Complete at 2.80m				
					Remarks					
					Location CAT scanned prior to excavation. Sides stable during excavation. No groundwater encountered during excavation. *Based upon trenchside stability characteristics. Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy. Unable to take shear vane due to high sand content in clay. Backfilled upon completion.					
					Scale (approx)		Logged By		Checked By	
					1:25		ST		PRS	

 chartered consulting engineers				Coopers (Chester) Ltd tel: 01244 684 910 web: www.coopers.co.uk email: admin@coopers.co.uk				Site CWRT PENTWMPATH, LLAY		Trial Pit Number TP03			
Machine : JCB 3CX Method : Mechanical Excavation		Dimensions 2.00 x 0.60 x 2.60m		Ground Level (mOD)		Client Castlemead Group Ltd		Job Number 7962					
		Location (Observed measurements)		Dates 23/11/2022		Engineer Coopers (Chester) Ltd		Sheet 1/1					
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water				
0.10 0.10	B JV				(0.40)	MADEGROUND (similar to topsoil). Grass over dark brown, slightly gravelly, sandy SILT. Sand is fine to coarse. Gravel is angular to sub-angular, fine to coarse of various lithologies including brick and glass. Contains numerous fine to coarse roots and rootlets throughout.							
0.60	B				0.40 (0.90)	Light brown, slightly silty, slightly clayey, gravelly, fine to coarse SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. *Assumed as loose to medium dense. Contains occasional fine to medium roots throughout. From 1.00 - 1.30m: Sand appears dry, desiccated							
1.40 1.40	SV 150kPa B				1.30 (1.30)	Very stiff, reddish brown mottled grey, slightly sandy, slightly gravelly, silty desiccated CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. At 1.40m: High strength							
2.00	SV 182kPa												
2.40	B				2.60	Complete at 2.60m							
													
										Remarks			
										Location CAT scanned prior to excavation. Sides stable during excavation. No groundwater encountered during excavation. *Based upon trenchside stability characteristics. Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy. Backfilled upon completion.			
Scale (approx)				Logged By		Checked By							
1:25				ST		PRS							

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.10 0.10	B JV				(0.50)	MADEGROUND (similar to topsoil). Grass over dark brown, slightly gravelly, sandy SILT. Sand is fine to coarse. Gravel is angular to sub-angular, fine to coarse of various lithologies including brick fragments. Contains numerous fine to coarse roots and rootlets throughout.	
0.70	B				0.50 (1.30)	Brown, slightly gravelly, slightly silty, very clayey, fine to coarse (predominantly fine to medium) SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. Contains rare, fine to medium roots throughout. *Assumed as loose to medium dense.	
1.90	B				1.80 (1.00)	Light brown, slightly silty, gravelly, fine to medium SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. *Assumed as loose to medium dense.	
2.60	B				2.80	Complete at 2.80m	



Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Backfilled upon completion.

1:25

ST

PRS

 Coopers (Chester) Ltd tel: 01244 684 910 web: www.coopers.co.uk email: admin@coopers.co.uk				Site CWRT PENTWMPATH, LLAY				Trial Pit Number TP05	
Machine : JCB 3CX Method : Mechanical Excavation		Dimensions 2.00 x 0.60 x 1.30m		Ground Level (mOD)		Client Castlemead Group Ltd		Job Number 7962	
		Location (Observed measurements)		Dates 23/11/2022		Engineer Coopers (Chester) Ltd		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
0.10	B				(0.20) 0.20	MADEGROUND (similar to topsoil). Grass over dark brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine to coarse. Gravel is angular to sub-angular, fine to coarse of various lithologies including brick and plastic. Contains occasional fine to coarse roots and rootlets throughout.			
0.40 0.40	B JV				(1.10)	MADEGROUND. Brown and grey, slightly gravelly, slightly clayey, fine to coarse SAND. Gravel is angular to sub-angular, fine to coarse of various lithologies including brick fragments and plastic. Low boulder content of concrete.			
1.00	B				1.30	Complete at 1.30m			
					Remarks Location CAT scanned prior to excavation. Sides stable during excavation. No groundwater encountered during excavation. Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy. Trial pit terminated at 1.30m due to unknown obstruction. Obstruction was CAT scanned and returned a positive reading on radio mode. Backfilled upon completion.				
					Scale (approx) 1:25		Logged By ST		Checked By PRS

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 8

Coopers Infiltration Test Pit Logs

 coop ers chartered consulting engineers				Coopers (Chester) Ltd tel: 01244 684 910 web: www.coopers.co.uk email: admin@coopers.co.uk			Site CWRT PENTWMPATH, LLAY		Trial Pit Number ITP01	
Machine : JCB 3CX Method : Mechanical Excavation		Dimensions 2.00 x 0.60 x 1.80m		Ground Level (mOD)		Client Castlemead Group Ltd			Job Number 7962	
		Location (Observed measurements)		Dates 23/11/2022		Engineer Coopers (Chester) Ltd			Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description			Legend	Water
0.10 0.10	B JV				(0.20) 0.20	MADEGROUND (similar to topsoil). Grass over dark brown, slightly gravelly, sandy SILT. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of various lithologies including brick and glass fragments.				
0.30 0.30	B JV				(0.20) 0.40	MADEGROUND. Greyish brown, slightly clayey, gravelly, fine to coarse SAND. Gravel is angular to sub-angular, fine to coarse of various lithologies including brick.				
0.50	B				(0.50)	Brown, slightly silty, clayey, gravelly, fine to coarse (predominantly fine to medium) SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. *Assumed as loose to medium dense.				
1.00 1.10	B SV 98kPa				0.90 (0.80)	Firm, reddish brown mottled grey, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. From 1.10m: Firm to stiff, high strength				
1.80	B				1.70 (0.10) 1.80	Light brown, slightly silty, very gravelly, fine to coarse (predominantly fine to medium) SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. *Assumed as loose to medium dense.				
						Complete at 1.80m				
						Remarks CAT scanned prior to excavation. Minor spalling from 0.40 - 0.90m during excavation. No groundwater encountered during excavation. *Based upon trenchside stability characteristics. Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy. Trial pit excavated to install infiltration test pit, therefore backfilled with single sized stone and slotted pipe.				
						Scale (approx) 1:25		Logged By ST		Checked By PRS

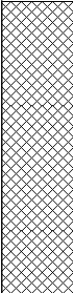
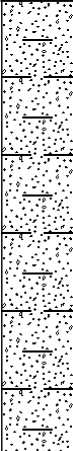
 Coopers (Chester) Ltd tel: 01244 684 910 web: www.coopers.co.uk email: admin@coopers.co.uk				Site CWRT PENTWMPATH, LLAY		Trial Pit Number ITP02						
Machine : JCB 3CX Method : Mechanical Excavation		Dimensions 2.00 x 0.60 x 2.50m		Ground Level (mOD)		Client Castlemead Group Ltd		Job Number 7962				
		Location (Observed measurements)		Dates 23/11/2022		Engineer Coopers (Chester) Ltd		Sheet 1/1				
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water			
0.20	B	Seepage during excavation(1) at 1.00m.			(0.10)	MADEGROUND. Tarmacadam.						
0.40	JV			(0.20)	MADEGROUND. Light grey, slightly sandy, angular to sub-angular, fine to coarse GRAVEL of various lithologies (predominantly limestone). *Assumed as medium dense.							
0.60	B			(0.20)	MADEGROUND (similar to topsoil). Dark brown, slightly gravelly, clayey, sandy SILT. Sand is fine to coarse. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies.							
				(0.50)	Light reddish brown, slightly gravelly, clayey, fine to coarse (predominantly fine to medium) SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. *Assumed as loose to medium dense.							
1.20	B			1.00	Firm, reddish brown mottled grey, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies.							
1.30	SV 78kPa			(0.40)	From 1.30m: Firm to stiff, high strength							
1.60	B			1.40	Light orangish brown, clayey, very gravelly, fine to coarse (predominantly fine to medium) SAND. Gravel is sub-angular to sub-rounded, fine to coarse (predominantly fine to medium) of various lithologies. Low cobble content. *Assumed as loose to medium dense.							
				(1.10)								
2.40	B			2.50	Complete at 2.50m							
						Remarks						
						CAT scanned prior to excavation. Spalling from 0.50 - 1.00m. Minor collapses from 1.40 - 2.50m. Minor seepage at 1.00m during excavation from running sand pocket. *Based upon trenchside stability characteristics. Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy. Trial pit excavated to install infiltration test pit, therefore backfilled with single sized stone and slotted pipe.						
Scale (approx)						Logged By		Checked By				
1:25						ST		PRS				

 Coopers (Chester) Ltd tel: 01244 684 910 web: www.coopers.co.uk email: admin@coopers.co.uk				Site CWRT PENTWMPATH, LLAY		Trial Pit Number ITP03				
Machine : JCB 3CX Method : Mechanical Excavation		Dimensions 1.20 x 0.60 x 1.00m		Ground Level (mOD)		Client Castlemead Group Ltd		Job Number 7962		
		Location (Observed measurements)		Dates 23/11/2022		Engineer Coopers (Chester) Ltd		Sheet 1/1		
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water	
0.10	B				(0.30)	MADEGROUND (similar to topsoil). Grass over dark brown, slightly clayey, slightly gravelly, sandy SILT. Sand is fine to coarse. Gravel is angular to sub-angular, fine to coarse of various lithologies including ceramic.				
0.40	JV				0.30 (0.20)	MADEGROUND. Greyish brown, slightly gravelly, slightly clayey, fine to coarse SAND. Gravel is angular to sub-angular, fine to coarse of various lithologies including brick, plastic and glass. Low cobble content of brick. *Assumed as loose to medium dense.				
					0.50 (0.50)	Brown, slightly gravelly, very clayey, fine to coarse (predominantly fine to medium) SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. *Assumed as loose to medium dense.				
					1.00	Complete at 1.00m				
Plan 					Remarks CAT scanned prior to excavation. Sides stable during excavation. No groundwater encountered during excavation. *Based upon trenchside stability characteristics. Backfilled upon completion.					
					Scale (approx) 1:25		Logged By ST		Checked By PRS	

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 9

Coopers Hand Dug Trial Pit Log

 Coopers (Chester) Ltd tel: 01244 684 910 web: www.coopers.co.uk email: admin@coopers.co.uk				Site CWRT PENTWMPATH, LLAY		Trial Pit Number HOTP01			
Machine : Hand Dug Trial Pit Method : Manual Excavation		Dimensions 0.50 x 0.50 x 1.00		Ground Level (mOD)		Client Castlemead Group Ltd		Job Number 7962	
		Location (Observed measurements)		Dates 23/11/2022		Engineer Coopers (Chester) Ltd		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.20	JV				(0.40) 0.40 (0.60) 1.00	MADEGROUND (similar to topsoil). Grass over dark brown, slightly gravelly, sandy SILT. Gravel is angular to sub-angular, fine to coarse of various lithologies including glass and plastic. Sand is fine to coarse. Brown, slightly gravelly, clayey, fine to coarse SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies. Complete at 1.00m	 		
					Remarks Sides stable during dig. No groundwater encountered. Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy. Backfilled upon completion.				
					Scale (approx) 1:10		Logged By ST		Checked By PRS

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 10

Coopers Dynamic Cone Penetrometer Test Log

 coopers chartered consulting engineers		Coopers (Chester) Ltd tel: 01244 684 910 web: www.coopers.co.uk email: admin@coopers.co.uk		Site CWRT PENTWMPATH, LLAY	Probe Number DCP01
Method Dynamic Probing		Cone Dimensions	Ground Level (mOD)	Client Castlemead Group Ltd	Job Number 7962
		Location (Observed measurements)	Dates 23/11/2022	Engineer Coopers (Chester) Ltd	Sheet 1/1
Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment
0.00-0.10	0			0.00	
0.10-0.18	1				
0.18-0.25	1				
0.25-0.63	1				
				0.50	
0.63-0.70	1				
0.70-0.78	1				
0.78-0.93	1				
				1.00	
0.93-1.00	1				
1.00-1.08	1				
1.08-1.15	3				
1.15-1.23	2				
1.23-1.30	4				
1.30-1.38	7				
				1.50	
1.38-1.45	11				
1.45-1.53	8				
1.53-1.60	7				
1.60-1.68	8				
1.68-1.75	10				
1.75-1.83	8				
				2.00	
1.83-1.90	3				
1.90-1.98	5				
1.98-2.05	3				
2.05-2.13	3				
				2.50	
2.13-2.20	5				
2.20-2.28	5				
2.28-2.35	4				
2.35-2.43	3				
2.43-2.50	4				
2.50-2.58	4				
				3.00	
2.58-2.65	4				
2.65-2.73	4				
				3.50	
				4.00	
				4.50	
				5.00	
Remarks 8 kg hand held hammer. Cone angle: 60 degrees. Drop height of hammer: 575mm.					Scale (approx) 1:25
					Logged By ST
					By PRS

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 11

Justification for Human Health Risk Assessment



Tier 1 Threshold Values

Legislation Framework Which Drives the Contamination Assessment of Land in England and Wales

Foreward

In the UK, historical contaminated land is regulated by the planning and development control system and the contaminated land regime set out in Part IIA of the Environmental Protection Act 1990. The Water Act 2003 amended the Part IIA legislation in respect of controlled waters.

When considering an application for development, the potential for the land to be contaminated is a material consideration, and the planning authority should satisfy itself that any contamination is properly assessed and adequately remediated, based on a suitable for use approach. This is to ensure that the land is made suitable for its proposed new use.

For development sites which introduce new potential sources of pollution on site and these are either suspected of, or known to be causing environmental damage, a remediation notice may be placed on the operator under the Environmental Damages (Prevention and Remediation) Regulations, as applicable to England or Wales. The legislation aims to deter pollution events from occurring. When pollution events do occur, apportionment of the 'blame' for the pollution event follows a specific protocol to assess which party, assuming multiple parties have utilised the site, is responsible. The operator deemed responsible for the pollution will then be expected to clean up the pollution ideally voluntarily, or a remediation notice is served enforcing the polluter to undertake the works, assuming an appeal made is unsuccessful.

As such, developers should give due consideration to the Environmental Damages (Prevention and Remediation) Regulations during management of their site activities, for which they are responsible. Fuel tanks are often on site for the refuelling of plant, providing a potential point source of pollution at one or a number of locations about the site, as they are relocated. In addition, soils (generic term for all non-construction materials) used to raise site levels, form engineering platforms (i.e. piling and roads) and for use in garden areas are imported to site.

The legislation is complex and often is interchangeable and may depend upon the time the contamination was released into the environment and the receptors which have been/may be detrimentally affected by the contamination. A summary of the most relevant legislation and guidance is noted below.

Developers should not take on liability for all previous pollution the vendor and previous owners have left on the site. If some liability has to be taken to progress the sale of the site, a full appreciation of the liabilities of the contamination must be understood. It is common during the course of the ground investigation that all sources of historical contamination are not revealed and hence it is prudent to keep liability for these unknown events with the previous operators.

Interaction of the Planning Regime with the Environmental Protection Act 1990 – Part IIA

Current guidance/legislation applicable to England has been published by the Ministry of Housing, Communities and Local Government, the ‘*National Planning Policy Framework*’, February 2019, and by the Department of Environment, Food and Rural Affairs (DEFRA), the ‘*Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance*’, April 2012. The Welsh Government has published ‘*Planning Policy Wales, Edition 11*’, February 2021 and ‘*Contaminated Land Statutory Guidance for Wales 2012*’, 2013. Both planning policies continue to promote the ‘suitable for use approach’, with the emphasis related to ensuring that the future use or development being undertaken would not be designated as contaminated land under Part IIA of the Environmental Protection Act 1990. Where remediation is required this should be undertaken in such a manner that it would not have an adverse impact on the environment.

In order for a planning decision to be made, a site investigation carried out by a specialist must be provided, which assesses the potential hazards to future site users and the local environment arising from past activities or natural factors. Where remediation is required to mitigate these impacts, the remediation scheme must show that the land would not be designated as contaminated land under Part IIA of the Environmental Protection Act 1990. If contamination cannot be overcome satisfactorily, the authority may refuse planning permission.

The responsibility for ensuring the development is undertaken in such a manner lies with the developer/land owner.

The definition of contaminated land is presented in the Environmental Protection Act 1990 as follows: ‘*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) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused;....’

Before the local authority can conclude that land appears to be contaminated land, the authority must assess the risk that a significant pollutant linkage exists.

This means that each of the following has to be present:

- (a) a **contaminant**;
- (b) a **receptor**; and
- (c) a **pathway**.

Guidance defines the risk as the combination of:

- ‘*(a) the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land; and*
- (b) the scale and seriousness of such harm or pollution if it did occur*’.

Legislation Framework Which Drives the Contamination Assessment of Land in England and Wales

The Statutory Guidance under Part IIA of the Environmental Protection Act 1990 both in England and Wales promotes the application of a four category test to assess whether land is contaminated or not. Category 1 sites are sites which have a high likelihood of contamination and would be considered as a significant problem. Category 4 sites are sites which are obviously not contaminated on the basis of either desktop information or a basic intrusive investigation. Categories 2 and 3 lie between the obviously uncontaminated and contaminated sites, with the division between these categories being considered as contaminated land under Part IIA. Risk assessment will be required to assess whether a site lies within Category 2 or 3. The risk assessment will initially be determined by health risks, then by socio-economic factors should health risks be uncertain, with a default decision of contaminated should the tests not be adequately met (refer to Figure 1).

For the purpose of determining whether a site may be classified as contaminated land, soil guideline values (SGV)/generic assessment criteria (GAC) should not be utilised as determining factors. These may be applied to confirm Category 4 sites, these showing categorically that it is considered there is no risk of harm to human health on such sites. However, SGV and GAC threshold values are conservative, indicating that there is no risk at all to human health or very minimal risk. As such, these should not be considered to act as threshold values between Category 3 and Category 4 sites. The Statutory Guidance has made provision for generic screening values to be derived, termed as Category 4 Screening Levels (C4SL), which still provide a cautious assessment but relate the risk associated with normal ambient levels of contaminants, termed the low observed adverse effect level (LOAEL), making for a more pragmatic approach to risk assessment. C4SLs may be applied to site investigations undertaken in support of a planning application. To date C4SLs have been derived arsenic, cadmium, chromium (VI), lead, benzo(a)pyrene and benzene and represent. It has been proposed to derive twenty additional C4SLs including the inorganic and organic contaminants. As C4SLs will result in levels of contaminant concentrations in soils that will still be considered to be acceptable in terms of level of risk in relation to the Part IIA of the Environmental Protection Act 1990.

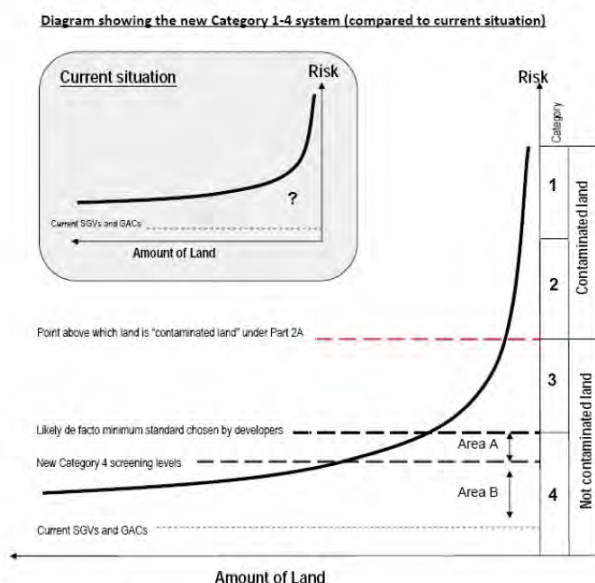


Figure 1: The New Four Category System

Environmental Protection Act 1990 – Part III

It should be noted that under the Environmental Protection Act 1990, the statutory nuisance regime applies to ‘*premises which may be prejudicial to health or a nuisance*’. In this case the term ‘*health*’ does not apply to contaminated land issues. However, nuisance may apply where the effects of deposits of substances on land cause offence to human senses (such as stench).

Environmental Damage (Prevention and Remediation) Regulations

The following legislation made in England and Wales respectively, is designed to control new contamination events.

- *The Environmental Damage (Prevention and Remediation) (England) Regulations 2015* (revoking the 2009 Regulations).
- *The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009*, as amended by *The Environmental Damage (Prevention and Remediation) (Amendment) (Wales) Regulations 2015*.

The meaning of ‘environmental damage’ has been detailed by DEFRA’s guidance document applicable to these Regulations as shown below:

‘An important point to note is that the Regulations are a ‘backstop’, only applying when something has gone wrong and there is an imminent threat or actual ‘environmental damage’ within the scope of the Regulations. The emphasis should be on proactively putting in place appropriate pollution prevention measures to reduce risks to the environment. Those running businesses and other operations can reduce the likelihood of ever being caught by the Regulations’ requirements by minimising risks to the natural resources covered by the Regulations. This means that businesses should be aware, in particular, where they:

- *Operate within or near areas of high biodiversity value, especially Sites of Special Scientific Interest (SSSIs);*
- *Operate near water bodies; and/or*
- *Carry out activities with potential risks to human health*
- *This is so they can take the necessary steps to manage the relevant risks effectively, including implementing and monitoring appropriate pollution prevention measures.*

The Regulations do not cover all types of damage to the environment. They only cover ‘environmental damage’ which is one or more of damage to:

- *protected species and natural habitats or to a site of special scientific interest (these are referred to collectively in the guidance as **damage to species and habitats**);*
- *surface water or groundwater (these are referred to collectively in the guidance as **damage to water**); and,*
- *land. (Damage to land is contamination of land by substances, preparations, organisms or micro-organisms that results in a significant risk of adverse effects on human health.*

Legislation Framework Which Drives the Contamination Assessment of Land in England and Wales

Both the England and Wales Regulations state they do not apply in relation to:

- damage that occurred before the Regulations originally came into force in 2009, but for marine waters July 2015
- damage that occurs or occurred after these dates, or is or was threatened after these dates, but is caused by an incident, event or emission that took place before these dates; or
- damage caused by an incident, event or emission that takes or took place after these dates, if derived from an activity that took place and finished before these dates.
- environmental damage caused by pollution of a diffuse character if the causal link between the damage and specific activities cannot be defined.

The Regulations state where an operator of an activity has caused environmental damage, or where there is sufficient evidence to indicate that environmental damage will eventually occur, the operator must immediately

- take all practicable steps to prevent further damage; and
- notify all relevant details to the relevant enforcing authority.

Soil Tier 1 Threshold Values (mg/kg) Residential and POS

		Elements and compounds	S4UL	Small Terrace	Med/Large Terrace	Semi-detached	Detached	Residential (without Veg)	POS (Resi)	POS (Park)		
				White, yellow & green values are NOAEL with orange values C4SL				C4SL (S4UL) (1% SOM)				
Silty clay	Metals/Semi-metals	Arsenic	37	37 (32.4 CLEA)				40 (40)	79 (79)	168 (170)		
		Beryllium	1.7 (inh.)	51 (to be used with caution and superseded)				(1.7)	(2.2)	(63)		
		Boron	290	291				(11,000)	(21,000)	(46,000)		
		Cadmium	11	22 (11 CLEA)				150 (85)	220 (120)	880 (532)		
		Chromium (III)	910	3000				(910)	(1,500)	(33,000)		
		Chromium (VI)	6	21 (4.3)				21 (6)	51 (7.7)	250 (220)		
		Copper	2,400	2,330 (Phytotoxic pH <6 = 100, pH6-7 = 135, pH >7 = 200)				(7,100)	(12,000)	(44,000)		
		Lead	-	200				310	630	1,300		
		Mercury (methyl)	11	7.4 (SGV withdrawn)				(15)	(40)	(68)		
		Mercury (inorganic)	40	169 (SGV withdrawn)				(56)	(120)	(240)		
		Mercury (Hg)	1.2	1.2 (SGV withdrawn)				(1.2)	(16)	(30vap (25.8))		
		Nickel	130	(130 S4UL) (Phytotoxic pH <6 = 60, pH6-7 = 75, pH >7 = 110)				(180)	(230)	(800)		
		Selenium	250	351				(430)	(1,100)	(1,800)		
		Vanadium	410	79				(1,200)	(2,000)	(5,000)		
		Zinc	3,700	3,750 (Phytotoxic pH <6 = 200, pH6-7 = 200, pH >7 = 300)				(40,000)	(81,000)	(170,000)		
	PAH	Acenaphthene	210	205				(3,000 – 57 s)	(15,000)	(29,000)		
		Acenaphthylene	170	168				(2,900 – 86.1 s)	(15,000)	(29,000)		
		Anthracene	2,400					(31,000 – 1.17 v)	(74,000)	(150,000)		
		Benzo(a)anthracene	7.2	3.1				(11)	(29)	(49)		
		Benzo(a)pyrene	2.2	5 (6% SOM) (0.83 CLEA)				5.3 (3.2)	10 (5.7)	21 (11)		
		Benzo(b)fluoranthene	2.6	5.56				(3.9)	(7.1)	(13)		
		Benzo(ghi)perylene	320	10.7				(360)	(640)	(1,400)		
		Benzo(k)fluoranthene	7.7	8.5				(110)	(190)	(370)		
		Chrysene	15	6.0				(30)	(57)	(93)		
		Dibenz(ah)anthracene	0.24	0.76				(0.31)	(0.57)	(1.1)		
		Fluoranthene	280	257				(1,500)	(3,100)	(6,300)		
		Fluorene	170	163				(2,800 – 30.9 s)	(9,900)	(20,000)		
		Indeno(123-cd)pyrene	27	3.18				(45)	(82)	(150)		
		Phenanthrene	95	91.8				(1,300 – 36 s)	(3,100)	(6,200)		
		Pyrene	620	563				(3,700)	(7,400)	(15,000)		
		Sandy loam	BTEx	Naphthalene	2.3	1.54	1.71	1.7	1.97	(2.3)	(4,900)	(1,200 – 76.4 s)
				Benzene	0.087	0.2 (1%) (0.079 CLEA)	0.082	0.082	0.085	0.89 (0.38)	140 (72)	190 (90)
Toluene	130			119	122	122	125	(869)	(56,000)	(87,000 v)		
Ethylbenzene	47			62.5	68	67.9	71.6	(83)	(24,000)	(17,000 v)		
Xylene (based on p)	56			41.7	45.5	45.3	50.9	(70)	(41,000)	(17,000 v)		
	Phenol		280	184	207	206	224	(750)	(760)	(760)		
Aliphatic	5-6		42	30				(42)	(570,000 – 304 s)	(95,000 – 304 s)		
	6-8		100	73				(100)	(600,000)	(150,000 – 144 s)		
	8-10		27	19				(27)	(13,000)	(14,000 – 78 s)		
	10-12		130 (48)	93 (48) ^{vap}				(130 – 48 v)	(13,000)	(21,000 – 48 s)		
	12-16		1,100 (24)	740 (24) ^{sol}				(1,100 - 24 v)	(13,000)	(25,000 – 24 s)		
	16-35		65,000 (8.48)	45,000 (8.48) ^{sol}				(65,000)	(250,000)	(450,000)		
	35-44		65,000 (8.48)	45,000 (8.48) ^{sol}				(65,000)	(250,000)	(450,000)		
Aromatic	8-10		34	27				(47)	(5,000)	(7,200 – 613 v)		
	10-12		74	69				(250)	(5,000)	(9,200 – 364 s)		
	12-16	140	140				(1,800)	(5,100)	(10,000)			
	16-21	260 (	250				(1,900)	(3,800)	(7,600)			
	21-35	1,100	890				(1,900)	(3,800)	(7,600)			

Notes:

The soil organic matter has been assumed to be 1% as this is the most conservative value for organic compounds. Inorganic compounds unaffected by this parameter.

Silty clay strata appears to prove more conservative threshold values for metals, semi-metals and several PAH compounds. Sandy loam strata appears to prove more conservative threshold values for TPH compounds, phenol and naphthalene.

The assessment of hydrocarbon fractions should be completed additively to determine the total risk of the whole range of compounds present as well as by single TPH fractional units, however this should be undertaken on a sample by sample basis where significant hydrocarbon concentrations have been encountered to derive a compound TPH concentration.

Although benzene has a C4SL value, this has been calculated for small terraced housing and not other housing stock, therefore other housing stock should either adopt the more conservative CLEA thresholds or that of a small terraced property. All thresholds not coloured orange (C4SL) for different housing stock have utilised LQM/CIEH Generic Assessment Criteria for Human Health Risk assessment, 2nd edition, 2009. CLEA values in brackets where C4SL values are available.

Vap denotes where the threshold is exceeded beyond the vapour saturation limit. Sol denotes where the threshold is exceeded beyond the solubility saturation limit.

It should be noted that these threshold values only relate to human health risk assessment and an assessment for potential groundwater risk should be undertaken as a separate risk assessment.

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 12

Chemical Analysis Results



Certificate of Analysis

Certificate Number 22-24508

Issued: 06-Dec-22

Client Coopers (Chester) Ltd
Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU

Our Reference 22-24508

Client Reference 7962

Order No 9557-ST

Contract Title (7962) Cwrt Pentwmpath, Llay

Description 11 Soil samples.

Date Received 29-Nov-22

Date Started 30-Nov-22

Date Completed 06-Dec-22

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

A handwritten signature in black ink, appearing to read "K. Bridgewood".

Kirk Bridgewood
General Manager



Summary of Chemical Analysis

Matrix Descriptions

Our Ref 22-24508

Client Ref 7962

Contract Title (7962) Cwrt Pentwmpath, Llay

Sample ID	Depth	Lab No	Completed	Matrix Description
TP01	0.25	2091643	06/12/2022	Brown gravelly, sandy CLAY
TP02	0.1	2091644	06/12/2022	Brown sandy CLAY
TP02	0.6	2091645	06/12/2022	Brown gravelly, sandy CLAY
TP02	0.8	2091646	06/12/2022	Brown sandy CLAY
TP03	0.6	2091647	06/12/2022	Brown gravelly, clayey SAND
TP04	0.1	2091648	06/12/2022	Brown gravelly, sandy CLAY
TP05	0.1	2091649	06/12/2022	Brown gravelly, sandy CLAY
TP05	0.4	2091650	06/12/2022	Brown gravelly, sandy CLAY
HDTP01	0.6	2091651	06/12/2022	Brown sandy CLAY
ITP03	0.2	2091653	06/12/2022	Brown gravelly, sandy CLAY

Summary of Chemical Analysis

Soil Samples

Our Ref 22-24508

Client Ref 7962

Contract Title (7962) Cwrt Pentwmpath, Llay

Lab No	2091643	2091644	2091645	2091646	2091647	2091648
Sample ID	TP01	TP02	TP02	TP02	TP03	TP04
Depth	0.25	0.10	0.60	0.80	0.60	0.10
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	23/11/2022	23/11/2022	23/11/2022	23/11/2022	23/11/2022	23/11/2022
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	6.2	12	13	7.4	7.3	8.2
Beryllium	DETSC 2301#	0.2	mg/kg	0.2	0.6	0.5	0.6	0.4	0.4
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.3	0.4	0.6	0.3	0.2	0.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	0.4	0.5	< 0.1	0.1	0.5
Chromium	DETSC 2301#	0.15	mg/kg	8.5	19	19	20	18	14
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	18	24	27	21	15	20
Lead	DETSC 2301#	0.3	mg/kg	35	64	58	17	17	50
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.06	0.09	< 0.05	< 0.05	0.05
Nickel	DETSC 2301#	1	mg/kg	7.7	15	17	20	19	14
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	0.6	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	13	29	28	25	23	21
Zinc	DETSC 2301#	1	mg/kg	58	93	130	46	50	72
Inorganics									
pH	DETSC 2008#		pH	7.9	6.3	7.4	6.8	7.4	7.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.3	0.3	< 0.1	0.2	0.2
FOC	DETSC 2002	0.001		0.011	0.009	0.005	0.008	0.007	0.029
Total Organic Carbon	DETSC 2002	0.1	%	1.1	0.9	0.5	0.8	0.7	2.9
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	14	13	14	11	14	< 10
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.06	0.06	0.07	0.02	0.02	0.05
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.04	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.07	0.45	0.54	< 0.03	< 0.03	0.09
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	0.06	0.07	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.22	1.5	1.3	< 0.03	< 0.03	0.27
Pyrene	DETSC 3303#	0.03	mg/kg	0.20	1.4	1.1	< 0.03	< 0.03	0.24
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.08	0.47	0.30	< 0.03	< 0.03	0.08
Chrysene	DETSC 3303	0.03	mg/kg	0.11	0.55	0.39	< 0.03	< 0.03	0.14
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.10	0.51	0.30	< 0.03	< 0.03	0.10
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.04	0.20	0.13	< 0.03	< 0.03	0.04
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.05	0.32	0.18	< 0.03	< 0.03	0.05
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.04	0.15	0.10	< 0.03	< 0.03	0.05
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.04	0.14	0.09	< 0.03	< 0.03	0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	0.96	5.8	4.5	< 0.10	< 0.10	1.1
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	0.4

Summary of Chemical Analysis

Soil Samples

Our Ref 22-24508

Client Ref 7962

Contract Title (7962) Cwrt Pentwmpath, Llay

Lab No	2091649	2091650	2091651	2091653
Sample ID	TP05	TP05	HDTP01	ITP03
Depth	0.10	0.40	0.60	0.20
Other ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sampling Date	23/11/2022	23/11/2022	23/11/2022	23/11/2022
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg	8.4	9.0	6.8	10
Beryllium	DETSC 2301#	0.2	mg/kg	0.5	0.4	0.5	0.5
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.6	0.5	0.3	0.5
Cadmium	DETSC 2301#	0.1	mg/kg	0.5	0.4	0.1	0.3
Chromium	DETSC 2301#	0.15	mg/kg	17	17	17	16
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	26	19	16	20
Lead	DETSC 2301#	0.3	mg/kg	57	46	30	50
Mercury	DETSC 2325#	0.05	mg/kg	0.22	< 0.05	< 0.05	0.06
Nickel	DETSC 2301#	1	mg/kg	15	13	12	12
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	0.7	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	24	24	25	25
Zinc	DETSC 2301#	1	mg/kg	110	76	58	76
Inorganics							
pH	DETSC 2008#		pH	7.3	6.0	6.9	6.2
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.3	0.3	0.2	0.3
FOC	DETSC 2002	0.001		0.019	0.023	0.015	0.008
Total Organic Carbon	DETSC 2002	0.1	%	1.9	2.3	1.5	0.8
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	21	22	12	24
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.08	0.06	0.04	0.07
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	< 0.03	0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.04	0.04	< 0.03	0.04
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.58	0.82	0.09	0.95
Anthracene	DETSC 3303	0.03	mg/kg	0.09	0.13	< 0.03	0.17
Fluoranthene	DETSC 3303#	0.03	mg/kg	1.4	2.9	0.27	2.9
Pyrene	DETSC 3303#	0.03	mg/kg	1.3	2.6	0.24	2.6
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.43	1.2	0.08	1.2
Chrysene	DETSC 3303	0.03	mg/kg	0.51	1.3	0.11	1.2
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.44	1.5	0.09	1.4
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.20	0.65	0.03	0.58
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.29	1.0	0.04	1.0
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.16	0.57	0.04	0.49
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.03	0.13	< 0.03	0.12
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.15	0.59	< 0.03	0.48
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	5.6	13	0.96	13
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	0.5	< 0.3	< 0.3

Summary of Asbestos Analysis Soil Samples

Our Ref 22-24508

Client Ref 7962

Contract Title (7962) Cwrt Pentwmpath, Llay

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2091643	TP01 0.25	SOIL	NAD	none	Ben Rose
2091644	TP02 0.10	SOIL	NAD	none	Ben Rose
2091645	TP02 0.60	SOIL	NAD	none	Ben Rose
2091648	TP04 0.10	SOIL	NAD	none	Ben Rose
2091649	TP05 0.10	SOIL	NAD	none	Ben Rose
2091650	TP05 0.40	SOIL	NAD	none	Ben Rose
2091652	ITP02 0.20	SOIL	NAD	none	Ben Rose
2091653	ITP03 0.20	SOIL	NAD	none	Ben Rose

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 22-24508
 Client Ref 7962
 Contract (7962) Cwrt Pentwmpath, Llay

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2091643	TP01 0.25 SOIL	23/11/22	GJ 250ml x2, GJ 60ml		
2091644	TP02 0.10 SOIL	23/11/22	PG		
2091645	TP02 0.60 SOIL	23/11/22	GJ 250ml x2, GJ 60ml		
2091646	TP02 0.80 SOIL	23/11/22	PG		
2091647	TP03 0.60 SOIL	23/11/22	PG		
2091648	TP04 0.10 SOIL	23/11/22	GJ 250ml x2, GJ 60ml		
2091649	TP05 0.10 SOIL	23/11/22	GJ 250ml x2, GJ 60ml		
2091650	TP05 0.40 SOIL	23/11/22	GJ 250ml x2, GJ 60ml		
2091651	HDP01 0.60 SOIL	23/11/22	PG		
2091652	ITP02 0.20 SOIL	23/11/22	GJ 250ml, GJ 60ml		
2091653	ITP03 0.20 SOIL	23/11/22	GJ 250ml x2, GJ 60ml		

Key: G-Glass J-Jar P-Plastic G-Bag

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO ₄	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO ₄	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

End of Report

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 13

Geotechnical Test Results

TEST REPORT

Client Coopers (Chester) Ltd

Address Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU

Contract 7962 -
Cwrt Pentwmpath, Llay

Order Number 9558-ST
Job Number MRN 4279/30
Date of Issue 13 December 2022
Page 1 of 4

Approved Signatories

S J Hutchings, O P Davies

Notes

- 1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.
- 2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.
- 3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.
- 4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.
- 5 The results included within the report are representative of the samples submitted for analysis.
- 6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.



Andrew House, Hadfield Street, Dukinfield, Cheshire SK16 4QX Tel: 0161 475 0870
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Also at: London: 020 8523 1999

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MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014

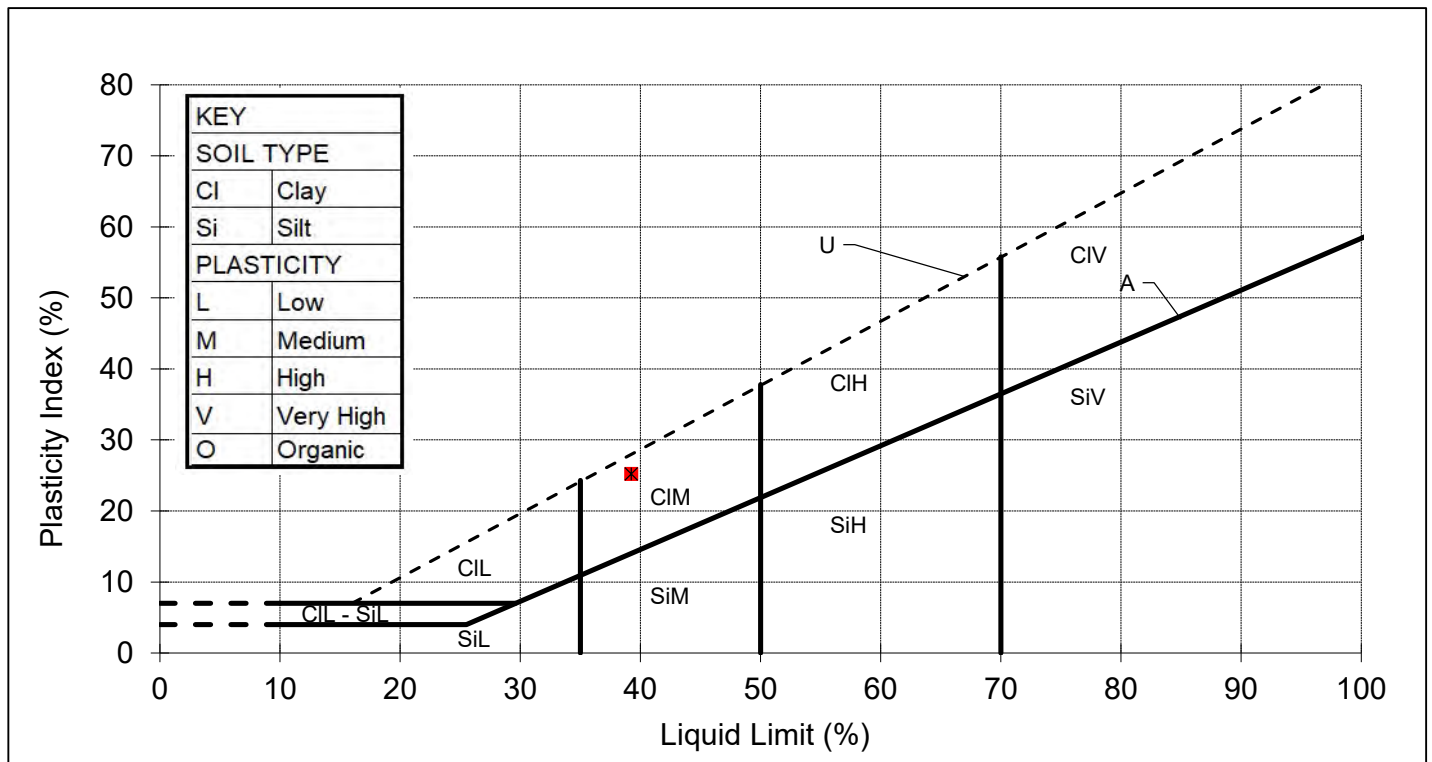
CLIENT	Coopers (Chester) Ltd
SITE	7962 - Cwrt Pentwmpath, Llay
JOB NUMBER	MRN 4279/30

SAMPLE LABEL	TP02 0.8	DATE SAMPLED	Not advised
SAMPLE No.	119308	DATE RECEIVED	28-Nov-22
DATE TESTED	29-Nov-22	SAMPLED BY	Client

MATERIAL	Stiff orange brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	18.7	38.2	1.028	
Determination 2 (avg)	18.2	38.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
16.0	39	14	25	85



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

13-Dec-22

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014

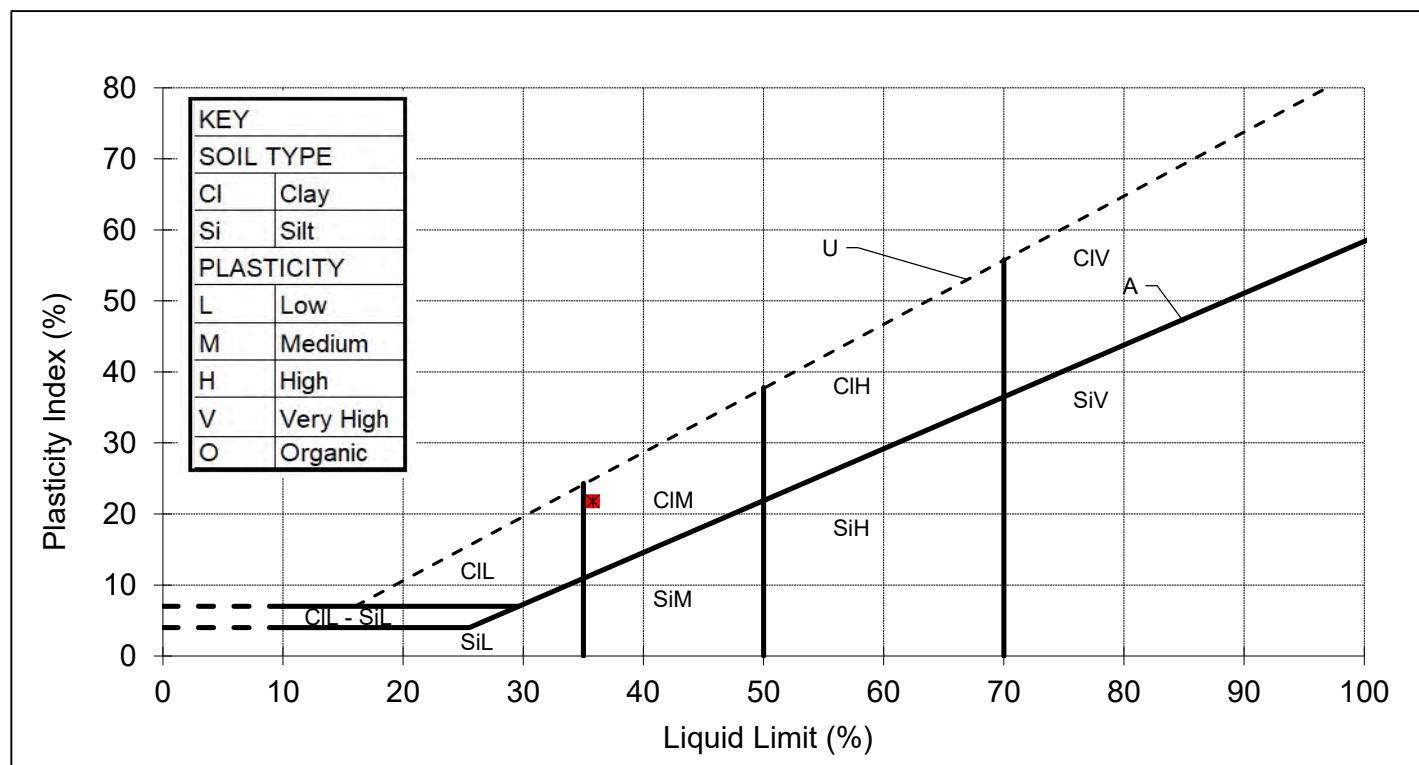
CLIENT	Coopers (Chester) Ltd
SITE	7962 - Cwrt Pentwmpath, Llay
JOB NUMBER	MRN 4279/30

SAMPLE LABEL	TP03 1.4	DATE SAMPLED	Not advised
SAMPLE No.	119309	DATE RECEIVED	28-Nov-22
DATE TESTED	29-Nov-22	SAMPLED BY	Client

MATERIAL	Stiff orange brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	19.1	35.0	1.017	
Determination 2 (avg)	19.2	35.4		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
13.5	36	14	22	72



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

13-Dec-22

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014

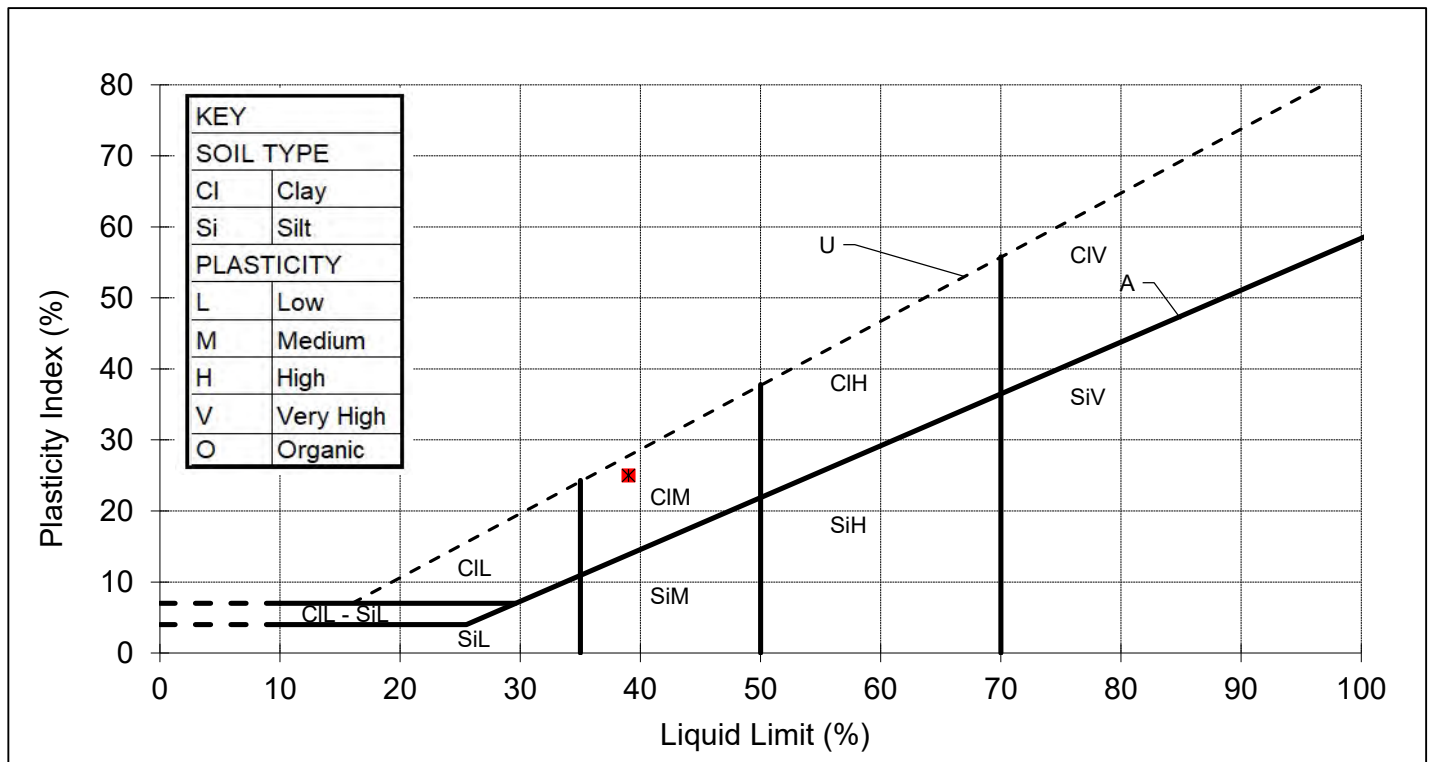
CLIENT	Coopers (Chester) Ltd
SITE	7962 - Cwrt Pentwmpath, Llay
JOB NUMBER	MRN 4279/30

SAMPLE LABEL	ITP01 1.0	DATE SAMPLED	Not advised
SAMPLE No.	119310	DATE RECEIVED	28-Nov-22
DATE TESTED	29-Nov-22	SAMPLED BY	Client

MATERIAL	Stiff orange brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	21.2	39.8	0.981	
Determination 2 (avg)	21.2	39.7		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
17.6	39	14	25	80



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

13-Dec-22

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 14

Infiltration Test Pit Results

CWRT PENTWMPATHINFILTRATION TEST PIT No 1 (Test 1 - Extrapolated Results)

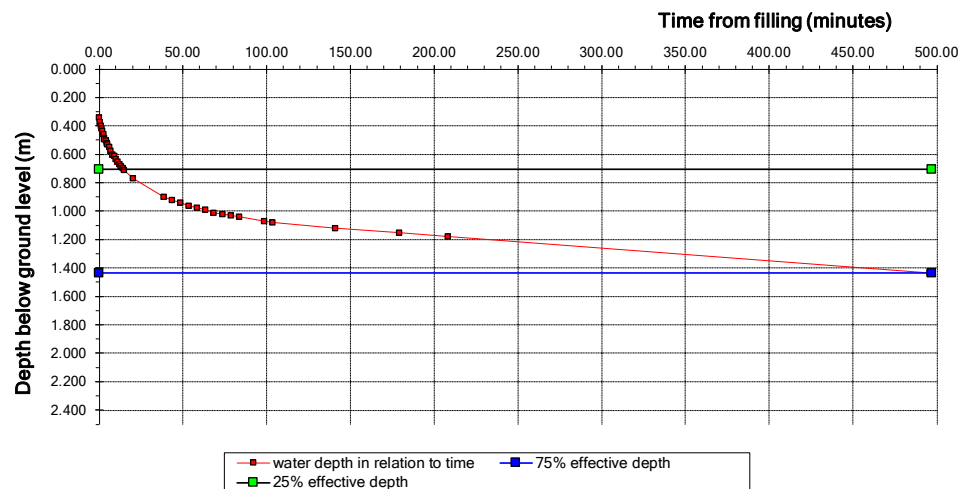
Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	0.340
0	00	30	0.50	0.370
0	01	00	1.00	0.400
0	01	30	1.50	0.415
0	02	00	2.00	0.435
0	02	30	2.50	0.460
0	03	00	3.00	0.485
0	03	03	3.05	0.495
0	04	00	4.00	0.505
0	04	30	4.50	0.520
0	05	00	5.00	0.530
0	06	00	6.00	0.550
0	07	00	7.00	0.575
0	08	00	8.00	0.600
0	09	00	9.00	0.610
0	10	00	10.00	0.635
0	11	00	11.00	0.650
0	12	00	12.00	0.670
0	13	00	13.00	0.685
0	14	00	14.00	0.695
0	15	00	15.00	0.710
0	20	00	20.00	0.770
0	38	30	38.50	0.900
0	43	30	43.50	0.920
0	48	30	48.50	0.940
0	53	30	53.50	0.960
0	58	30	58.50	0.975
1	03	30	63.50	0.990
1	08	30	68.50	1.010
1	13	30	73.50	1.020
1	18	30	78.50	1.030
1	23	30	83.50	1.040
1	38	30	98.50	1.070
1	43	30	103.50	1.080
2	21	00	141.00	1.120
2	59	00	179.00	1.150
3	28	00	208.00	1.180
			495.75	1.435

Test Pit Dimensions

Test Pit Length	2.00 m
Test Pit Width	0.60 m
Test Pit Depth	1.80 m
Standing Water Level	m

Infiltration Parameters

Total Depth	1.460 m
Total Effective Depth	1.460 m
25% Depth	0.705 m
75% Depth	1.435 m
25% Time	14.67 min
75% Time	495.75 min
Free Volume	0.2628 cu.m
Surface Area	4.996 sq.m
Time of Outflow	481.08 min

INFILTRATION TEST PIT No 1 (Test 1 - Extrapolated Results)**Soil infiltration Rate****6.56E-03 m/hr****1.82E-06 m/sec**

CWRT PENTWMPATH
INFILTRATION TEST PIT No 2 (Test 1)

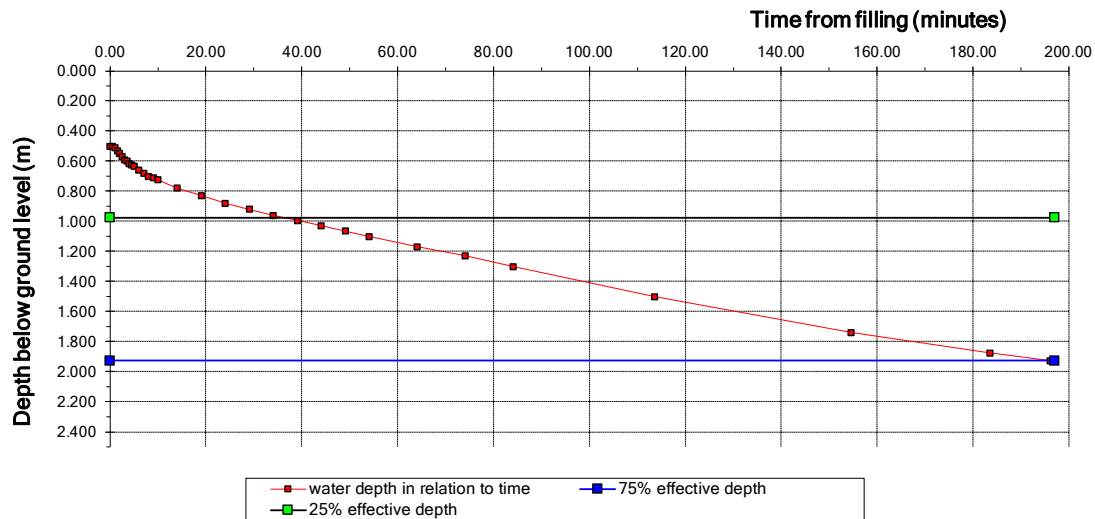
Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	0.500
0	00	30	0.50	0.500
0	01	00	1.00	0.510
0	01	30	1.50	0.530
0	02	00	2.00	0.550
0	02	30	2.50	0.570
0	03	00	3.00	0.590
0	03	30	3.50	0.600
0	04	00	4.00	0.615
0	04	30	4.50	0.625
0	05	00	5.00	0.635
0	06	00	6.00	0.660
0	07	00	7.00	0.680
0	08	00	8.00	0.700
0	09	00	9.00	0.710
0	10	00	10.00	0.725
0	14	00	14.00	0.780
0	19	00	19.00	0.830
0	24	00	24.00	0.880
0	29	00	29.00	0.920
0	34	00	34.00	0.960
0	39	00	39.00	0.995
0	44	00	44.00	1.030
0	49	00	49.00	1.065
0	54	00	54.00	1.100
1	04	00	64.00	1.170
1	14	00	74.00	1.230
1	24	00	84.00	1.300
1	53	30	113.50	1.500
2	34	30	154.50	1.740
3	03	30	183.50	1.875
3	16	00	196.00	1.925

Test Pit Dimensions

Test Pit Length	2.00 m
Test Pit Width	0.60 m
Test Pit Depth	2.40 m
Standing Water Level	m

Infiltration Parameters

Total Depth	1.900 m
Total Effective Depth	1.900 m
25% Depth	0.975 m
75% Depth	1.925 m
25% Time	36.14 min
75% Time	196.00 min
Free Volume	0.342 cu.m
Surface Area	6.14 sq.m
Time of Outflow	159.86 min

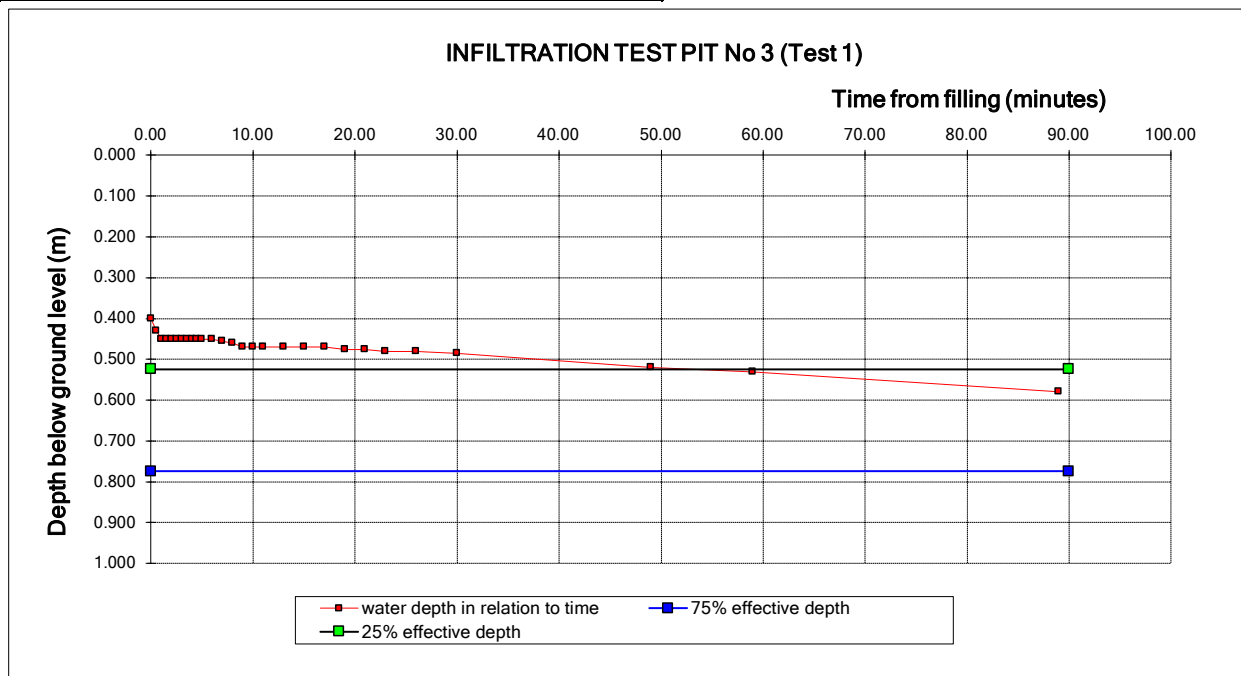
INFILTRATION TEST PIT No 2 (Test 1)**Soil infiltration Rate****2.09E-02****m/hr****5.81E-06****m/sec**

CWRT PENTWMPATH
INFILTRATION TEST PIT No 3 (Test 1)

Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	0.400
0	00	30	0.50	0.430
0	01	00	1.00	0.450
0	01	30	1.50	0.450
0	02	00	2.00	0.450
0	02	30	2.50	0.450
0	03	00	3.00	0.450
0	03	30	3.50	0.450
0	04	00	4.00	0.450
0	04	30	4.50	0.450
0	05	00	5.00	0.450
0	06	00	6.00	0.450
0	07	00	7.00	0.455
0	08	00	8.00	0.460
0	09	00	9.00	0.470
0	10	00	10.00	0.470
0	11	00	11.00	0.470
0	13	00	13.00	0.470
0	15	00	15.00	0.470
0	17	00	17.00	0.470
0	19	00	19.00	0.475
0	21	00	21.00	0.475
0	23	00	23.00	0.480
0	26	00	26.00	0.480
0	30	00	30.00	0.485
0	49	00	49.00	0.520
0	59	00	59.00	0.530
1	29	00	89.00	0.580

Test Pit Dimensions	
Test Pit Length	1.20 m
Test Pit Width	0.60 m
Test Pit Depth	0.90 m
Standing Water Level	m

Infiltration Parameters	
Total Depth	0.500 m
Total Effective Depth	0.500 m
25% Depth	0.525 m
75% Depth	0.775 m
25% Time	54.00 min
75% Time	FAIL min
Free Volume	FAIL cu.m
Surface Area	FAIL sq.m
Time of Outflow	FAIL min



Soil infiltration Rate	N/A	m/hr
	N/A	m/sec

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 15

CDM Information

Client : Castlemead Group Limited
 Project : Cwrt Pentwmpath, Llay
 Project No : 7962

DESIGN RISK ASSESSMENTS FOR FOUNDATION OPTIONS

ACTIVITY/ELEMENT OF DESIGN	HAZARD (ie slips, trips, falls, manual handling, use of mobile plant, chemicals etc.)	RISK ASSESSMENT								HAZARD AVOIDANCE MEASURES (specify measures required to avoid or minimize risk using hierarchy of controls)
		Construction Phase				Operational/Maintenance Phase				
		High	Med	Low	N/A	High	Med	Low	N/A	
Foundations <1200mm deep and House Drainage (ie Traditional & Nominally Reinforced Strip Footings)	Falls/slips/trips		✓						✓	Provide information and training on working in excavations. Use daily inspections by competent person prior to entry into trench and recording on Excavation Register
	Trench Collapse			✓					✓	Ensure excavation sides battered back to a safe angle of repose. Provide information and training on working in excavations. Use daily inspections by competent person.
Breaking out existing foundations	Noise /vibration		✓						✓	Identify existing foundations and dig out using mechanical excavator. If not possible break out using hand held breakers. Minimise vibration in breakers by maintenance. Ensure use of thick gloves/appropriate PPE
	Contamination			✓					✓	Removal of contaminated material to a licensed landfill site or use of inert cover over contaminated strata . Use of PPE by groundworkers. Enforcement of good hygiene rules and provision of welfare facilities.
Handling of blocks/bricks and steel mesh	Musculo-Skeletal Injury		✓						✓	Use of mechanical handling plus manual handling risk assessment. Certificate required for mechanical handling. Designer to specify use of blocks/bricks and mesh of suitable unit weight for manual handling. Contractor to ensure mesh lengths take into account manual handling. Mechanical handling where possible.
Concrete pouring/mortars	Skin Irritation/Eczema		✓						✓	Contractor to ensure proper use of barrier cream/PPE. Designer to ensure suitable mortar additives. Contractor to carry out COSHH assessments.
	Existing services		✓						✓	Contact utilities management companies to confirm existence or absence of live services. Provide utilities plans to Contractor. Use of Cat and Genny during excavation and proceed with care. Hand dug excavations where necessary.
Foundations >1200mm deep and Drains/Services (ie Deep Strip footings or Mass Concrete Trench Fill	Trench collapse	✓							✓	Ensure excavation sides supported by propping/trench sheeting, or battered back to a safe angle of repose. Provide information and training on working in excavations. Use daily inspections by competent person. Added risk in areas of groundwater. Ensure that excavation pumped dry at all times.
	Slips/trips/falls	✓							✓	Provide information and training on working in excavations. Use daily inspections by competent person prior to entry into trench and recording on Excavation Register
	Contamination			✓					✓	Removal of contaminated material to a licensed landfill site or use of inert cover over contaminated strata. Use of PPE by groundworkers. Enforcement of good hygiene rules and provision of welfare facilities.
	Existing Services			✓					✓	Contact utilities management companies to confirm existence or absence of live services. Provide utilities plans to Contractor. Use of Cat and Genny during excavation and proceed with care. Hand dug excavations where necessary.

Client : Castlemead Group Limited
 Project : Cwrt Pentwmpath, Llay
 Project No : 7962

DESIGN RISK ASSESSMENTS FOR FOUNDATION OPTIONS

ACTIVITY/ELEMENT OF DESIGN	HAZARD (ie slips, trips, falls, manual handling, use of mobile plant, chemicals etc.)	RISK ASSESSMENT								HAZARD AVOIDANCE MEASURES (specify measures required to avoid or minimize risk using hierarchy of controls)
		Construction Phase				Operational/Maintenance Phase				
		High	Med	Low	N/A	High	Med	Low	N/A	
Foundations >1200mm deep and Drains/Services	Continued									
Installation of polystyrene sheets for heave protection requiring manned entry to unsupported excavations	Trench collapse Slips/trips/falls	✓							✓	Install inaccordance with approved method statement and to include edge protection and adequate cross over points. Alternatively consider integral raft foundation with stone blanket.
Concrete pouring/mortars	Skin Irritation/Eczema	✓							✓	Contractor to ensure proper use of barrier cream/PPE. Designer to ensure suitable mortar additives. Contractor to carry out COSHH assessments.
Handling of blocks/bricks and steel mesh	Musculo-Skeletal injury		✓						✓	Use of mechanical handling plus manual handling risk assessment. Certificate required for mechanical handling. Designer to specify use of blocks/bricks and mesh of suitable unit weight for manual handling. Contractor to ensure mesh lengths take into account manual handling. Mechanical handling where possible.
	Asphyxia and confirmed space working	✓							✓	Confined space procedures for working in deep excavations/manholes. Ensure fumes from mechanical plant, such as pumps, are well controlled.
Breaking out existing foundations	Noise/Vibration			✓					✓	Identify existing foundations and dig out using mechanical excavator. If not possible break out using hand held breakers. Minimise vibration in breakers by maintenance. Ensure use of thick gloves/appropriate PPE
Raft Foundations with Integral floor slab	Slips/trips/falls		✓						✓	Provide information and training on working in excavations. Use daily inspections by competent person prior to entry into trench and recording on Excavation Register
Strip existing fill material and remove to approved bearing strata. Backfill with approved consolidated granular fill.	Trench collapse	✓							✓	Ensure excavation sides supported by propping/trench sheeting, or battered back to a safe angle of repose. Provide information and training on working in excavations. Use daily inspections by competent person. Added risk in areas of groundwater. Ensure that excavation pumped dry at all times.
	Contamination			✓					✓	Removal of contaminated material to a licensed landfill site or use of inert cover over contaminated strata. Use of PPE by groundworkers. Enforcement of good hygiene rules and provision of welfare facilities.

Client : Castlemead Group Limited
 Project : Cwrt Pentwmpath, Llay
 Project No : 7962

DESIGN RISK ASSESSMENTS FOR FOUNDATION OPTIONS

ACTIVITY/ELEMENT OF DESIGN	HAZARD (ie slips, trips, falls, manual handling, use of mobile plant, chemicals etc.)	RISK ASSESSMENT								HAZARD AVOIDANCE MEASURES (specify measures required to avoid or minimize risk using hierarchy of controls)
		Construction Phase				Operational/Maintenance Phase				
		High	Med	Low	N/A	High	Med	Low	N/A	
Raft Foundations with Integral floor slab	Continued									
Construction of granular blanket beneath raft for heave precautions, depth <1200mm.	Trench collapse Slips/trips/falls			✓					✓	Ensure excavation sides battered back to a safe angle of repose. Provide information and training on working in excavations. Use daily inspections by competent person. Use daily inspections by competent person prior to entry into trench and recording on Excavation Register.
Breaking out existing foundations	Noise/Vibration			✓					✓	Identify existing foundations and dig out using mechanical excavator. If not possible break out using hand held breakers. Minimise vibration in breakers by maintenance. Ensure use of thick gloves/appropriate PPE
	Existing Services			✓					✓	Contact utilities management companies to confirm existence or absence of live services. Provide utilities plans to Contractor. Use of Cat and Genny during excavation and proceed with care. Hand dug excavations where necessary.
	Backfilling			✓					✓	Use mechanical excavators to place approved granular fill in layers and lightly compact. Geotextile wrap fills in 1m max. lift heights and use graded granular material with good self compacting properties. Compaction with plant only when excavation depth <1200mm deep.
Steel Fixing	Musculo-Skeletal injury		✓						✓	Designer to schedule bars to take into account manual handling. Avoid long large diameter bars. Use of mechanical handling where possible plus manual handling risk assessment. Certificate required for machanical handling
Concrete pouring/mortars	Skin Irritation/Eczema	✓							✓	Contractor to ensure proper use of barrier cream/PPE. Designer to ensure suitable mortar additives. Contractor to carry out COSHH assessments.
Foundations-piled										
Mobilisation of plant	Sequencing of piling work with other construction to avoid unsafe conditions		✓						✓	Tender documents to include site investigation report and current services information. Contractor to plan site access. Provision of stone support blanket where required to protect buried services. Design of piling platform to BR470. Agree working clearances with highway authority
	Damage to buried services		✓						✓	
	Rig overturning		✓						✓	

Client : Castlemead Group Limited
 Project : Cwrt Pentwmpath, Llay
 Project No : 7962

DESIGN RISK ASSESSMENTS FOR FOUNDATION OPTIONS

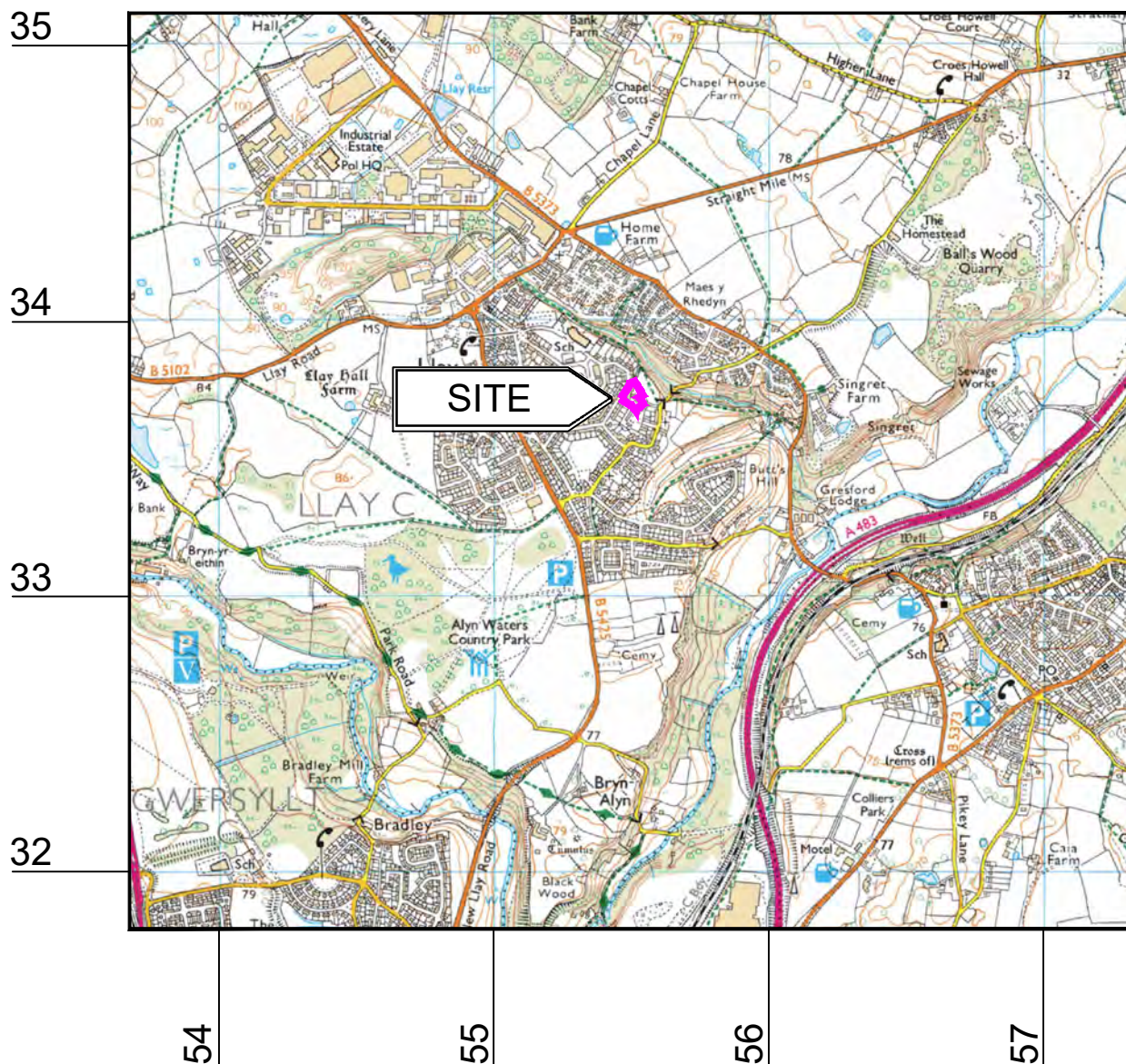
ACTIVITY/ELEMENT OF DESIGN	HAZARD (ie slips, trips, falls, manual handling, use of mobile plant, chemicals etc.)	RISK ASSESSMENT								HAZARD AVOIDANCE MEASURES (specify measures required to avoid or minimize risk using hierarchy of controls)
		Construction Phase				Operational/Maintenance Phase				
		High	Med	Low	N/A	High	Med	Low	N/A	
Foundations-piled	Continued									
Pile driving - CFA	Hearing loss		✓						✓	Contractor to establish closed working zone inside which PPE to be mandatory (ear defenders, etc)
	Contamination		✓						✓	Any arisings from pile excavation to be segregated and disposed of as controlled waste. Operatives to be provided with adequate welfare provisions for washing and eating.
-CFA auger changes	Musculo-skeletal injury		✓						✓	Limit number of pile sizes to struicture.
- Steel fixing	Musculo-skeletal injury		✓						✓	Schedule bars to take into account manual handling. Avoid long large diameter bars whose weight would exceed 20kgs. Consider automated cage reinforcement equipment.
-Reinforcement lifting	Injury from falling steel bars		✓						✓	Design of reinforcement cages to be robust enough for lifting.
- Concrete pouring	Skin irritation/ eczema		✓						✓	Contractor to ensure proper use of barrier cream/ PPE
Pile driving - precast concrete segmental	Hearing loss	✓							✓	Contractor to establish closed working zone inside which PPE to be mandatory (ear defenders, etc)
	Musculo-skeletal injury	✓							✓	Contractor to prepare Method Statement. Provide information and training in handling and jointing piles. COSHH assessment of adhesives used in pile jointing..
	Trapping/ crushing									Use of PPE.
Pile trimming to cut-off level and expose reinforcement. - Scabbling pile surface	Noise/Vibration Musculo-skeletal injury Trapping/ crushing Cuts & abrasions		✓						✓	Correct use of mechanical pile croppers or other means of trimming that do not involve excessive use of hand held tools. Minimise vibration in hand held breakers by maintenance. Ensure use of thick gloves/appropriate PPE. Use protection caps on exposed bars after trimming.
Ground Beams										
Retained ground "fill": excavation < 1.2m	Trench collapse		✓						✓	Ensure excavation sides battered back to angle of safe repose. Provide information and training on working in excavations. Use "permit to work" system and daily inspections by competent person.
Retained ground "fill": excavation > 1.2m	Trench collapse/ trips/ falls	✓							✓	Ensure excavation sides supported by propping/ trench sheeting, or battered back to angle of safe repose. Provide information and training on working in excavations. Use "permit to work" system and daily inspections by competent person.
Steel fixing	Musculo-skeletal injury		✓						✓	Schedule bars to take into account manual handling. Avoid long large diameter bars whose weight would exceed 20kgs.
Concrete pouring	Skin irritation/ eczema		✓						✓	Contractor to ensure proper use of barrier cream/ PPE

Site Investigation Report for land at Cwrt Pentwmpath, Llay

Appendix 16**Reference Drawings**

<u>Drawing No.</u>	<u>Revision</u>	<u>Title</u>
7962/L1	-	Site Location Plan
7962/AP	-	Aerial Photograph
P-105	B	Site Layout (Option B)
7962/01	-	Site Plan
7962-LRH&HRH-BR-PC-RA-G-01	-	Typical Basic Radon Precaution Detail for Residential Building with Precast Concrete Slab with Thermal Block and a Vented Void
7962/FDZ	-	Foundation Zone Plan
7962/Tf/01	-	Typical Details for Trench Fill Foundation with Suspended Slab (No Heave Precautions)
7796/TfH/01	-	Typical Details for Trench Fill Foundation Affected by Existing Trees Requiring Heave Precautions.


 National Grid reference
 of the proposed site.

SJ 335 557


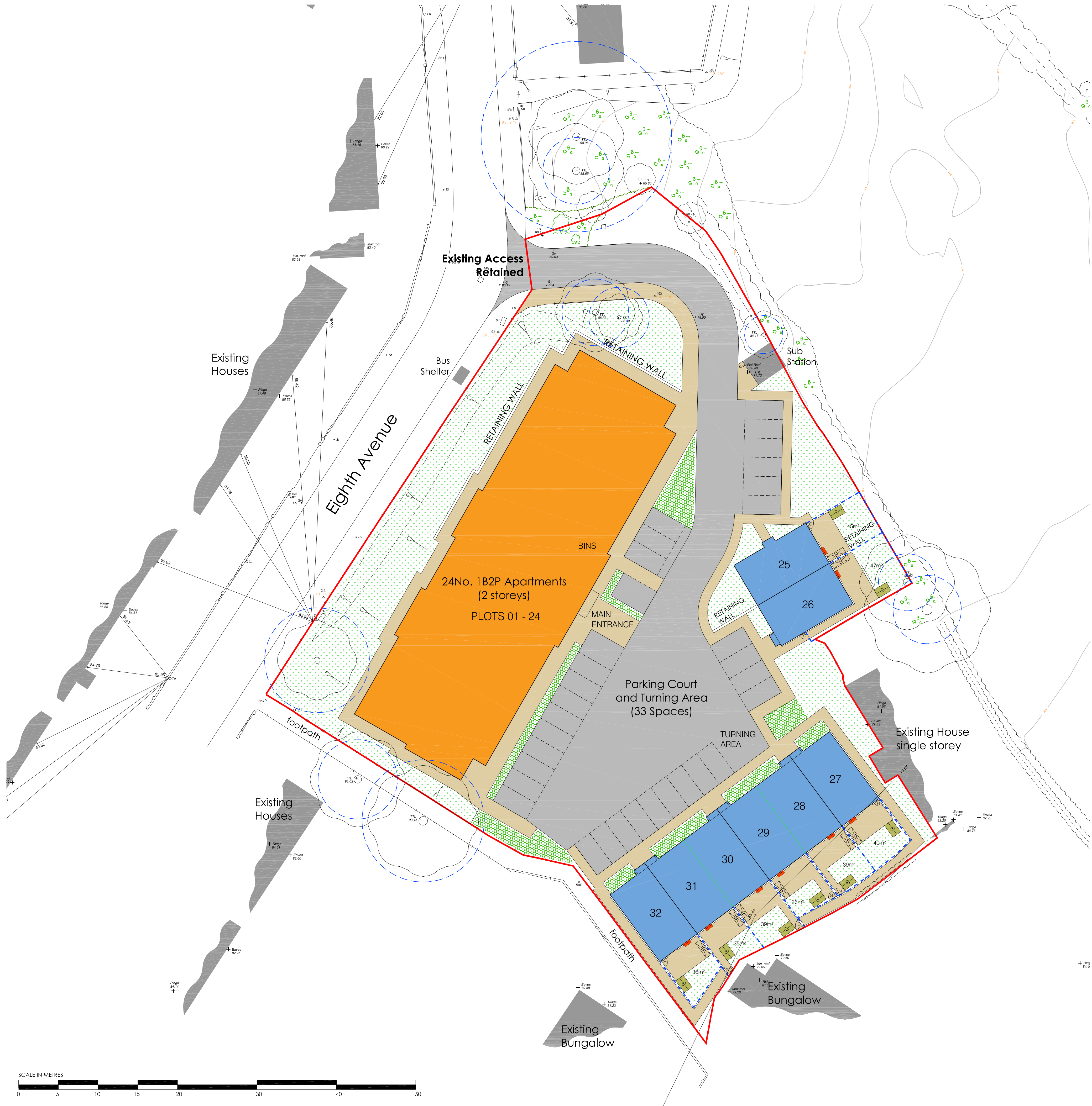
0 200 400 600 800 1000 1500 2000

SCALE BAR (m)


KEY
 Site boundary


0 5 10 20 30 40 50 60 70 80 90 100

SCALE BAR (m)



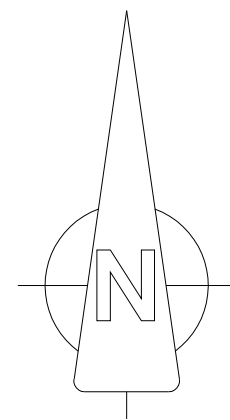
LEGEND

- 1.8m high timber hit and miss fencing with concrete posts and gravel boards
- 1.8m high personnel gate to match fencing. Lockable to SBD standard.
- Concrete paving slabs to private paving. Paths to be 900mm wide (minimum) or 1200mm wide (minimum) to shared or communal areas.
- 6'X4' shed securely fixed to concrete base.
- Area identified for storage of refuse and recycling bins and trolley.
- Air source heat pump unit.
- Soft landscaping

Schedule of Accommodation	
8	1B2P bungalows
24	1B2P apartments
32	total

Site Area 4744m² approx

NOTES:
ALL DIMENSIONS TO BE CHECKED AND CONFIRMED ON SITE PRIOR TO ANY WORKS OR FABRICATION.
DO NOT SCALE OFF THIS DRAWING.
ANY ERRORS, OMISSIONS OR DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF MUNRO ASSOCIATES IMMEDIATELY.



B	Feb 22	Apartment building updated in line with revised floor plan	PO
A	Jan 22	Alterations to car parking spaces	MC
REV	DATE	DESCRIPTION	BY

Drawing Status
PRELIMINARY



CHARLTON HOUSE DRAYTONS PASSAGE
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T: 01743 341438
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Client	Wales and West Housing		
Project	Cwrt Pentwmpath Eighth Avenue Lloy Wrexham LL12 0TT		
Scale	1:250 @ A1	Date	November 2021
		Drawn	PCO

Drawing Title
**Site Layout
(Option B)**

Project No.	Drawing No.	Revision
20.211	P-105	B

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Munro Associates (Architectural Services) Limited
Registered Office: Charlton House, Drayton's Passage,
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Registered in England and Wales
Registration No. 08117820 Vat No. 650 8829 15

KEY TO EXPLORATORY HOLES

(All positions are approximate unless otherwise stated)

- DCP locations DCP01 by Coopers on 23 November 2022
- Trial pits TP01 - TP05 excavated by Coopers on 23 November 2022
- Hand dug trial pit HDTP01 excavated by Coopers on 23 November 2022
- Infiltration pits ITP01 - ITP03 excavated by Coopers on 23 November 2022

THIS DRAWING SHOULD ONLY
BE PRINTED IN COLOUR



KEY TO EXISTING FEATURES

(All positions are approximate unless otherwise stated)

- Surveyed building (taken from ref. a)
- Surveyed substation (taken from ref. a)
- Surveyed tree (taken from ref. a)
- Surveyed hedgeline (taken from ref. a)
- Surveyed fence line (taken from ref. a)
- Surveyed top of bank (taken from ref. a)
- Surveyed bottom of bank (taken from ref. a)
- Site boundary (taken from ref. b)

KEY TO FORMER FEATURES

(All positions are approximate unless otherwise stated)

- Former buildings (taken from ref. e)
- Former hedgeline (taken from ref. e)
- Former area of dense vegetation (taken from ref. e)

KEY TO CONJECTURED SERVICES

(All positions are approximate unless otherwise stated)

- BT lines (taken from ref. c)
- High voltage electricity lines (taken from ref. c)
- Low voltage electricity lines (taken from ref. c)
- Gas lines (taken from ref. c)
- Potable water lines (taken from ref. c)
- Foul sewer line (taken from ref. c & d)
- Surveyed overhead cables (taken from ref. a)
- Surface water lines
- Surveyed soakaway locations (taken from ref. a)

Note:
Only above services available to Coopers at time of drawing production.

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Client

CASTLEMEAD GROUP LTD

Project

Cwrt Pentwmpath, Llay.

Title

SITE PLAN

DRAWING NUMBER

7962 / 01

SCALE at A2 1:500

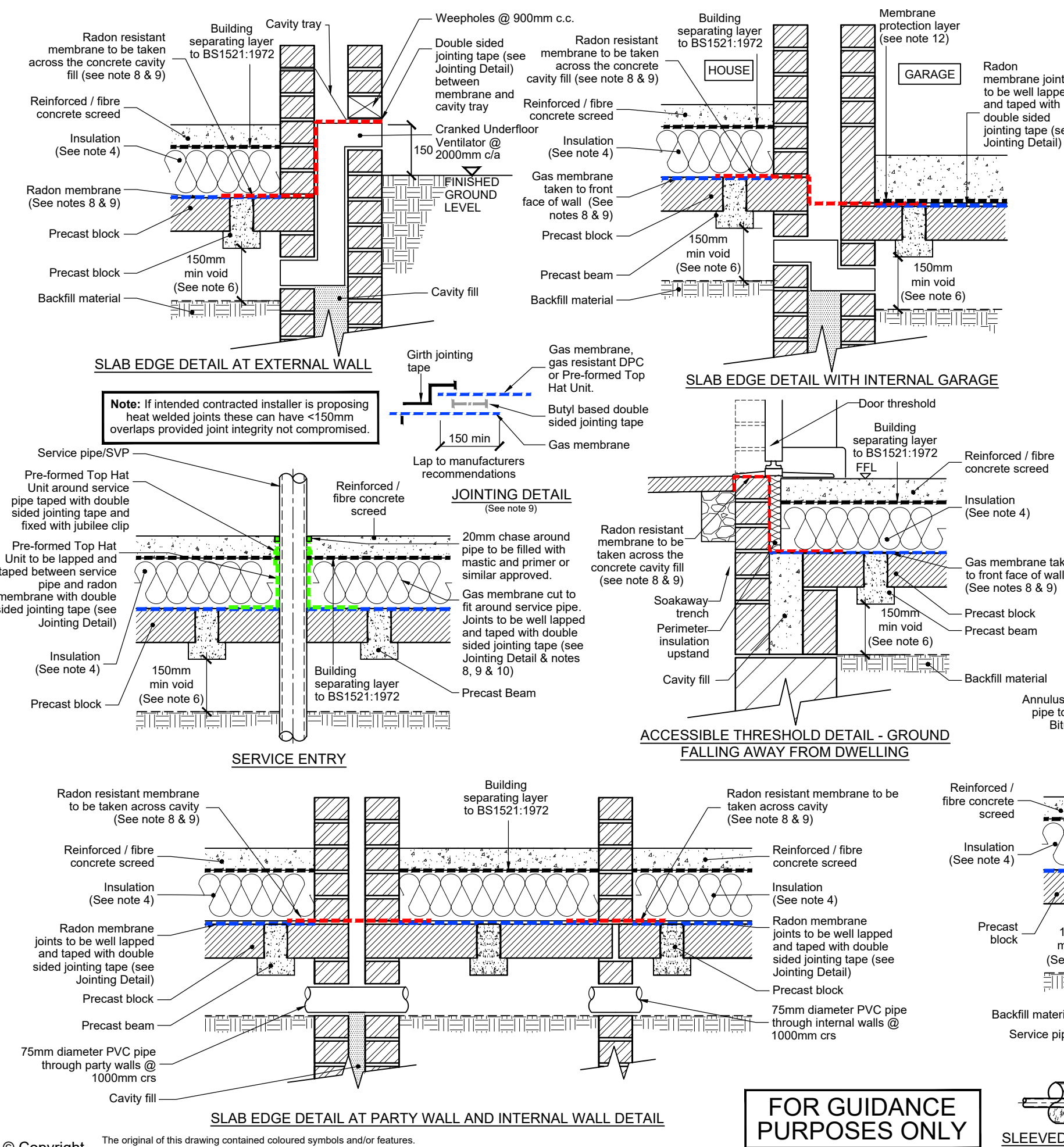
DATE	21.12.22	REVISION	
DRAWN	OS / AH		
CHECKED	JL		

This drawing is to be read in conjunction with the following:-

- The Survey House, Eight Avenue, Llay, Wrexham, Topographical Survey, ref. 3626_0001, dated 19 May 2020.
- Munro Associates, Cwrt Pentwmpath, Eighth Avenue, Llay, Wrexham, Site Layout, ref. 20.211_p-105, rev. 1 dated 04 July 2022.
- UCML, Cwrt Pentwmpath, Utility Study, dated 21 February 2022.
- PDF referenced 'Castlemead Plan' received by Coopers showing foul water.
- Groundsure, Cwrt Pentwmpath, Llay, ref. GS-9191729, dated November 2022.

0 5 10 15 20 25 30 35 40 45 50
SCALE BAR (m)

THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE RELEVANT HOUSE TYPE DRAWINGS, FOUNDATION PLAN & SCHEDULE AND THE SITE SPECIFIC GROUND GAS & SITE INVESTIGATION REPORTS



- NOTES**
- Coopers take no responsibility for the inappropriate use of this detail on a development. It is the responsibility of the Developer to commission a suitably qualified geo-environmental consultant to assess the relevant ground gas conditions to determine the relevant radon protection measures required, based upon the findings of a site investigation.
 - Coopers drawing is in accordance with current best practice with respect to design of measures and specification of membranes for the adequate protection of dwellings from the ingress of radon. The details contained on this drawing are generic and for guidance purposes only. Any proposed amendments to the detail due to variations on specific house types should be referred back to Coopers for review and approval prior to implementation on site.
 - This drawing was prepared for the purpose stated. New products, improved practices and legislation may necessitate an alteration to this drawing in whole or in part after its submission. It is recommended that this drawing is referred to Coopers for reappraisal no later than one year from the date on this drawing. Continued use of this drawing beyond this date is at the Developers own risk.
 - Reference needs to be made to specific design drawings for the relevant housetype for robust details, specifics for the floor slab type, insulation details, acoustic protection etc. as applicable.
 - For details of proposed foundations refer to site specific foundation plan and site investigation report.
 - Basic radon protection is defined in BRE Report 211. Radon: Guidance on Protective Measures For New Dwellings.
 - Independent third party inspection of the radon membrane installation is recommended in accordance with BRE Report 211 & BS8485:2015+ A1:2019.
 - The radon membrane should be a minimum 1600 gauge (400µm) first generation, high quality polyethylene membrane which has low permeability to radon and acts as a damp proof membrane. Some manufacturers may stipulate the use of a protective layer, such as a non-woven polypropylene protection fleece below the reinforced concrete, where there is a high risk of potential damage. Alternatively a 2400 gauge (600µm) first generation, high quality polyethylene radon may be used in place of the 1600 gauge (400µm) plus protective layer. The specification of the radon membrane should be submitted to Coopers for approval prior to use.
 - All radon membranes should be installed to the manufacturer's guidelines and recommendations. Special care must be taken to ensure that the radon membrane is not snagged, torn, punctured, stretched or in any way damaged during construction. All damaged areas of the radon membrane must be replaced or repaired to manufacturers recommendations.
 - Joints between sheets of radon membrane should be well lapped (150mm min) and taped between sheets with a double sided butyl based tape in accordance with the manufacturer's recommendations. Depending on the manufacturer, an optional girth jointing strap can be provided for additional security.
 - An alternative to taking the radon membrane across the cavity would be to use a radon resistant DPC. The radon resistant DPC should be lapped and sealed to the radon membrane as detailed above.
 - All service entry points should be fitted with pre-formed radon resistant top hats. Tophats should be sealed to the pipe and radon membrane using butyl based double sided tape and fixed to the pipe with a jubilee clip.

This typical detail is provided as a guide for construction of radon membrane installation only. House type specific variations are required to account for slopes on garage floor slabs, stepped slab levels, full building level access, party wall temporary shuttering, corner unit construction, cloaking units around doors, piers, and other similar specific considerations. We would advocate the contractors hold pre-construction discussions with Coopers (and the verification consultants if another consultant) on the approaches and considerations for specific house type construction prior to commencing installation. Should variations be constructed without prior consent these will be deemed by Coopers as a defect and not suitable for construction or approval by us or third parties.

CDM HIGH RISK ASSESSMENT

FOR ALL RISKS REFER TO DESIGN RISK ASSESSMENT

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CLIENT

CASTLEMEAD GROUP LTD

PROJECT **Cwrt Pentwmpath, Llay.**

TITLE **Typical Basic Radon Precaution Detail for Residential Building with Precast Concrete Slab with Thermal Block and a Vented Void**

DRAWN BY	OS
DATE	15.12.2022
SCALE(S)	NTS
DRAWING NUMBER	7962-LRH&HRH-BR-PC-RA-G-01
REVISION	

INSTALLATION, INSPECTION AND TESTING

- A Ciria C735 compliant verification strategy is likely to be required, subject to approval by the Local Authority and NHBC.

FOR GUIDANCE PURPOSES ONLY

KEY TO EXISTING FEATURES

(All positions are approximate unless otherwise stated)

-  Surveyed building (taken from ref. a)
-  Surveyed substation (taken from ref. a)
-  Surveyed tree (taken from ref. a & e)
-  Surveyed hedgeline (taken from ref. a)
-  Surveyed fence line (taken from ref. a)
-  Surveyed top of bank (taken from ref. a)
-  Surveyed bottom of bank (taken from ref. a)
-  Surveyed soakaway locations (taken from ref. a)
-  Site boundary (taken from ref. b)

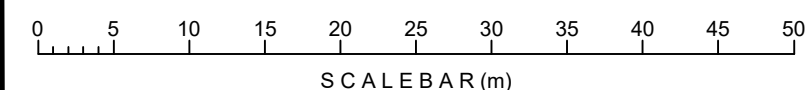
KEY TO FORMER FEATURES

(All positions are approximate unless otherwise stated)

-  Former buildings (taken from ref. c)
-  Former hedgeline (taken from ref. c)
-  Former area of dense vegetation (taken from ref. c)

NOTES

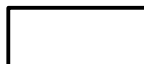
1. This drawing takes no account of regrading, ground gas, invasive species or contamination issues and should be used for guidance purposes only.
2. This drawing is based on limited fieldwork and is subject to amendment, modification and updating based on the findings of additional trial pitting and should be used for guidance purposes only.
3. The drawing takes a generalised assessment of the effects of existing and recently felled trees and is subject to amendment based on potential future updates to the detailed arboricultural report findings, and should be used for guidance purposes only.
4. The above foundation options are for properties not exceeding two storeys in height. Footings for apartment blocks with more than two storeys may need to be specifically designed by a Structural Engineer and be founded in firm to stiff and stiff clays and dense and very dense sands.



THIS DRAWING SHOULD ONLY
BE PRINTED IN COLOUR



KEY TO CONJECTURED ZONES

-  Rn - Nominally reinforced strip foundations on mixed bearing strata of sand & clay
-  Tf & TfH - Mass Concrete Trenchfill and heave precautions, where specified, for proposed building footprints.
-  Tf - Mass concrete trenchfill foundations due to presence of underlying clay subject to tree influence.
-  Tf - Mass concrete trenchfill foundations requiring heave precautions due to presence of underlying clay subject to tree influence.
-  PH - Driven piled foundations with heave precautions required due to underlying clay subject to tree influence.
-  Indicates 1200mm depth of foundation required in areas affected by existing trees/hedgerows with a CLAY subsoil (TREES RETAINED). Not applicable to foundations in a granular subsoil. (NHBC Standards Chapter 4.2)
-  Denotes 1.5m foundation depth contour of existing tree height - for heave precautions. (NHBC Standards Chapter 4.2)
-  Cast foundations within this zone would require prior agreement with NHBC, subject to site specific assessments of tree influence >2.5m.

KEY TO EXPLORATORY HOLES

(All positions are approximate unless otherwise stated)

-  DCP locations DCP01 by Coopers on 23 November 2022
-  Trial pits TP01 - TP05 excavated by Coopers on 23 November 2022
-  Hand dug trial pit HDTP01 excavated by Coopers on 23 November 2022
-  Infiltration pits ITP01 - ITP03 excavated by Coopers on 23 November 2022

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Project

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Title

FOUNDATION ZONE PLAN

DRAWING NUMBER

7962 / FDZ

SCALE at A2 1:500

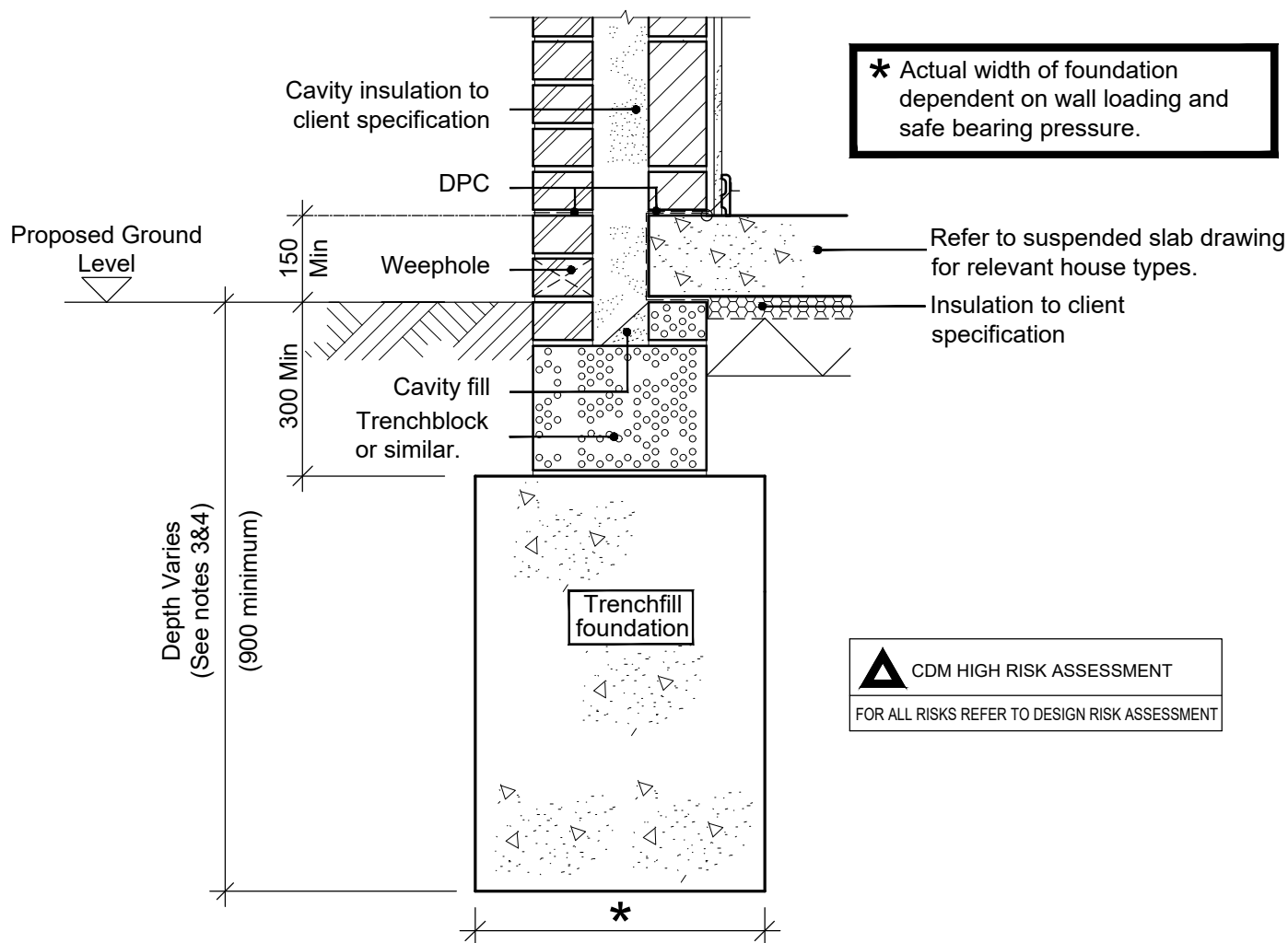
DATE	20.12.22	REVISION	
DRAWN	OS		
CHECKED	JL		

**SHRINKAGE
POTENTIAL: Medium**

**FOR GUIDANCE
PURPOSES ONLY**

This drawing is to be read in conjunction with the following:-

- a) The Survey House, Eighth Avenue, Llay, Wrexham, Topographical Survey, ref. 3626_0001, dated 19 May 2020.
- b) Munro Associates, Cwrt Pentwmpath, Eighth Avenue, Llay, Wrexham, Site Layout, ref. 20.211_p-105, rev. 1 dated 04 July 2022.
- c) Groundsure, Cwrt Pentwmpath, Llay, ref. GS-9191729, dated November 2022.
- d) Tree Solutions, Cwrt Pentwmpath, Llay, Arboricultural Impact Assessment, ref. 21/AIA/WXM/289, dated 17 September 2021.



TRENCH FILL FOUNDATION WITH SUSPENDED GROUND FLOOR SLAB (NO HEAVE PRECAUTIONS).

NOTES

1. This drawing is to be read in conjunction with Coopers Site Investigation Report Ref: 7962si.
2. The safe bearing pressure on strata limited to that indicated in the site investigation report referred to in Note 1 above.
3. Minimum foundation depths for those dwellings affected by trees is to be taken down to a moisture stable strata as determined by the NHBC Standards Chapter 4.2.
4. For foundations unaffected by existing or proposed trees, the mass concrete trenchfill is to be taken down to an approved bearing strata to be determined on site during construction.
5. All backfill material to the foundation excavations and floor voids to be inert, non-biodegradable and free of all harmful contaminants in accordance with Approved Document C/1/2/3 of the Building Regulations (1992).
6. All wall cavities below ground to be filled with GEN 1 concrete to BS 5328 (max. agg. size 10mm). Wall cavities to be filled prior to the commencement of backfill to the foundation excavations and/or the floor voids. All backfilling to be completed in a uniform manner to prevent horizontal forces being applied to the foundation walls.
7. For Concrete, Blockwork/Brickwork and Mortar below DPC refer to the information contained in the Site Investigation Report referred to in Note 1 above.

REVISIONS

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CLIENT

CASTLEMEAD GROUP LTD

PROJECT

Cwrt Pentwmpath, Llay.

TITLE

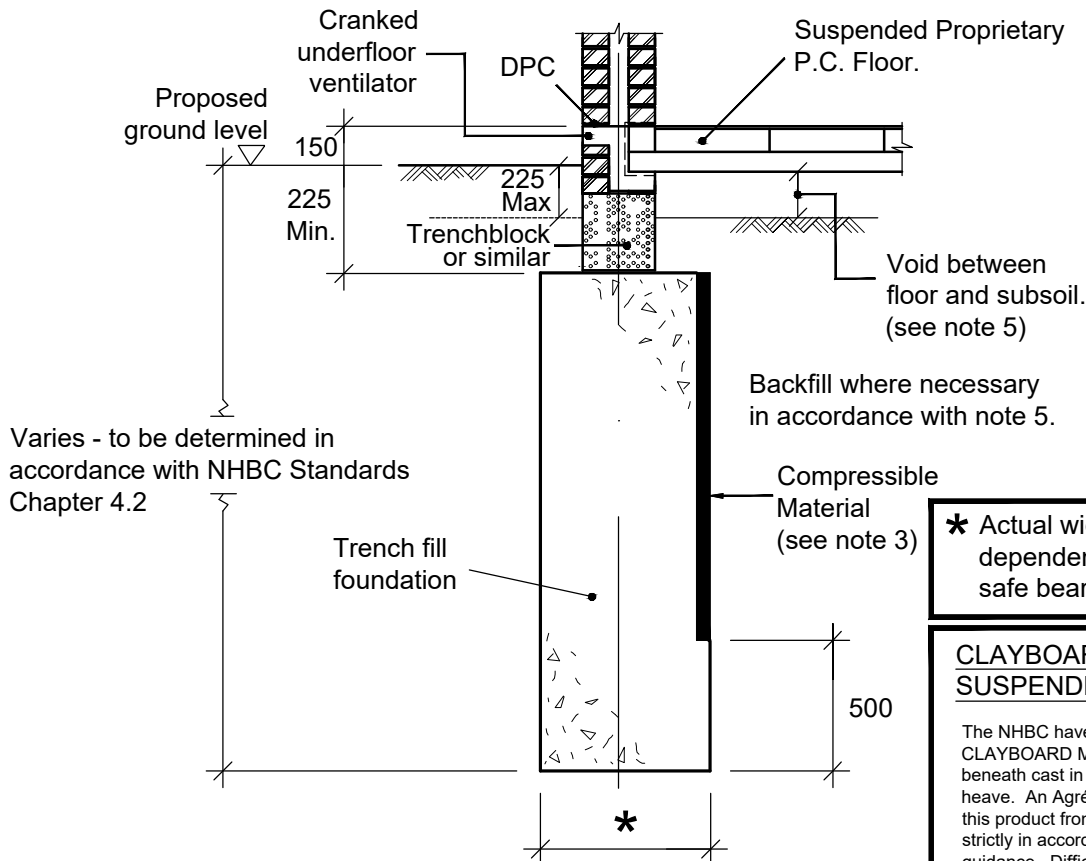
**Typical Details
for Trenchfill Foundation with
Suspended Slab
(No Heave Precautions)**

DRAWN BY	OS
DATE	20.12.22
SCALE(S)	NTS
DRAWING NUMBER	REVISION

7962/Tf/01

-

THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE RELEVANT HOUSE TYPE DRAWINGS, FOUNDATION PLAN & SCHEDULE AND THE SITE SPECIFIC SITE INVESTIGATION REPORTS



TRENCH FILL FOUNDATION AFFECTED BY EXISTING TREES REQUIRING HEAVE PRECAUTIONS (MEDIUM SHRINKAGE POTENTIAL)

NOTES

1. This drawing is to be read in conjunction with Coopers Site Investigation Report Ref: 7962Si.
2. The safe bearing pressure on strata limited to that indicated in the Site Investigation Report referred to in Note 1 above.
3. Claymaster or similar approved to be provided against internal face of perimeter foundations.
4. All backfill material to the foundation excavations and floor voids to be inert, non-biodegradable and free of all harmful contaminants in accordance with Approved Document C/1/2/3 of the Building Regulations (1992).
5. The minimum clear void below the suspended precast concrete ground floor is to be 900mm and should be adequately ventilated in accordance with the Building Regulations (1992) and NHBC Standards Chapter 4.2 S4(d) table 10. The level of backfill to the floor voids is to be within 225mm of the adjoining outer ground level, with the backfill material being effectively drained.
6. All wall cavities below ground to be filled with GEN 1 concrete to BS 5328 (max. agg. size 10mm). Wall cavities to be filled prior to the commencement of backfill to the foundation excavations and/or the floor voids. All backfilling to be completed in a uniform manner to prevent horizontal forces being applied to the foundation walls.
7. Refer to proprietary precast concrete floor manufacturers specialist drawing for all P.C. floor details.
8. For Concrete, Blockwork/Brickwork and Mortar below DPC refer to the information contained in the Site Investigation Report referred to in Note 1 above.

* Actual width of foundation dependent on wall loading and safe bearing pressure.

CLAYBOARD & CAST IN SITU SUSPENDED SLABS

The NHBC have permitted the use of the new CLAYBOARD MARK 2 KN30 VOID SYSTEM beneath cast in situ suspended slabs to cater for heave. An Agrément Certificate is available for this product from the BBA. Installation must be strictly in accordance with the manufacturers guidance. Difficulties in installation may be experienced and use of this product is at the house builders discretion. Minimum void former dimension beneath suspended slab in accordance with NHBC Standards Chapter 4.2 S4(d) Table 9.



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PROJECT

Cwrt Pentwmpath,
Llay.

TITLE

Typical Details for
Trenchfill Foundation Affected
by Existing Trees Requiring
Heave Precautions

DRAWN BY	OS
DATE	15.12.22
SCALE(S)	NTS
DRAWING NUMBER	7962/TfH/01
REVISION	-