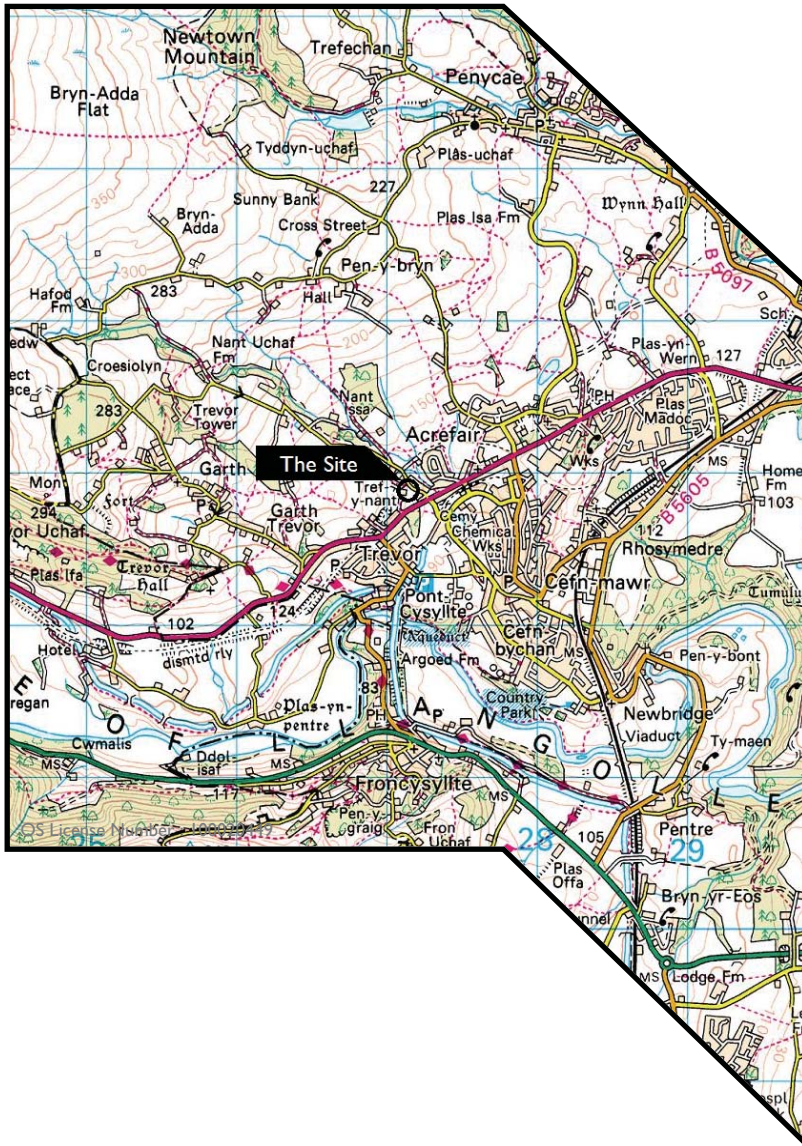


Ground Investigation



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THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM

Coal Mining Risk Assessment

for
Ms Ruth Roberts

Engineer : CB Architectural Design
Limited

Project Number PN193948

May 2019

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for

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WREXHAM**

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1.0 INTRODUCTION

On 19th March 2019, a Phase I Geo-environmental Desk Study Report was issued by Geotechnics Ltd for a site at off Tower Hill, at the rear of The Towers Day Nursery Ltd, Llangollen Road, Acrefair, Wrexham, LL14 3SG. The development proposals comprise the erection of a detached garage with WC, with an office area on an upper floor. Construction of the garage building has already commenced but it has been put on hold until appropriate planning permission has been granted. Hence, the Phase I Geo-environmental Desk Study was submitted as part of a partly-retrospective Planning Application: P/2019/0151.

In their response to Wrexham County Borough Council, as statutory regulators, the Coal Authority pointed out that the Phase I Desk Study submitted only provides a contamination risk assessment and does not adequately address the impact of coal mining legacy features on the application site and proposed development.

The Coal Authority expressed a *Substantive Concern* as the application site lies within a defined Development High Risk Area, meaning that within the application site and surrounding area there are coal mining features and hazards which need to be considered in relation to the determination of the planning application.

Furthermore, based on a review of their available records, The Coal Authority note that probable unrecorded coal mining at shallow depth is likely to [have occurred] beneath the application site.

In their response to Planning Application P/2019/0151, The Coal Authority require that a Coal Mining Risk Assessment (CMRA) be submitted as part of the application (Refer to The Brief in Appendix I).

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

It is intended that the findings of the CMRA, used in conjunction with the geological data obtained from the Phase I Geo-environmental Desk Study, should be used to assess whether or not past mining activity poses any risk to the development proposal, and if necessary, propose mitigation measures to address any issues of land instability.

This desk study work has been carried out within the limitations posed by the incomplete, and in some cases inaccurate, nature of historic coal mining records and related desk study materials.

3.0 PRESENTATION

This CMRA has been prepared by a suitably qualified “competent” person in accordance with The Coal Authority’s *Risk based approach to development management – Guidance for developers*; Version 4 – 2017. It also generally follows the Model Report Template providing the expected scope and contents of a Coal Mining Risk Assessment contained within the above guidance document.

A detailed description of the site is given in Section 4 and the Site Location Plan, Site Layout Drawing and Site Photographs are presented in Appendices 2 to 4, respectively.

Further photographs of the local environs along Llangollen Road and Tref-y-nant Brook are presented in Appendices 5 and 6.

The available information used in the CMRA is listed in Section 5.

A history of coal mining features at the site and its immediate surroundings based on available historical maps and other evidence, such as historical paintings and historical photographs is presented in Section 6. An historical painting is presented in Appendix 7, with historical maps and photographs presented in Appendices 8 and 9, respectively.

An interpretation of the available geological information is given in Section 7. BGS Geological Information provided by the Landmark Information Group is presented in Appendix 10. Coverage of the BGS 1:10,000 scale geological map series is presented in Appendix 11. Maps showing previous BGS Borehole Records in the area surrounding the site are presented in Appendix 12.

A summary of the available coal mining records held by The Coal Authority is given in Section 8. A copy of The Coal Authority's CON29M Coal Mining Report is presented in Appendix 13, with an excerpt of The Coal Authority Interactive Map being presented in Appendix 14. Other Mining and Ground Stability Information provided by the Landmark Information Group is presented in Appendix 15.

A summary of previous mine stabilisation works is given in Section 9. Details of these remediation works are presented in Appendices 16 and 17.

A discussion of the mechanisms of potential coal mining subsidence is provided in Section 10.

An assessment of the risk relating to the presence of shallow coal workings at the site is provided in Section 11 with a discussion of the stabilisation works required being given in Section 12.

Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 18 to aid an understanding of the procedures followed and the context in which the report should be read.

4.0 THE SITE

4.1 Site Location

The site is located off the south-western side of Tower Hill, a minor road heading north-west, up from its junction with the A539 Llangollen Road, in the Tref-y-nant area of Wrexham County Borough. The site lies about 25m south of Tref-y-nant Brook, a south-easterly flowing tributary stream of the River Dee. Nearby the Tref-y-nant Bridge carries the A539 Llangollen Road across the brook. Tref-y-nant lies midway between the villages of Acrefair to the north-west and Trevor to the south-east, and about 10 kilometres to the south-west of Wrexham Town Centre. The approximate National Grid Reference for the centre of the site is SJ 272 428. A Site Location Plan and a Site Layout Drawing are presented in Appendices 2 and 3, respectively.

4.2 Site Description

The site measures approximately 0.06 hectares (Ha) in total, and is situated to the rear of the existing "The Towers" Day Nursery. The site was visited by Mr. John Knowles of Geotechnics Ltd on 1st May 2019. Photographs of the site taken during this visit are presented in Appendix 3.

The site is roughly rectangular in shape and measures approximately 30m from WSW to ENE and approximately 20m from WNW to ESE. The ground slopes up gently towards the north and west. It was noted during the site visit that construction of the new garage building had already commenced, with the main building works (including excavations, foundations and brickwork) having already been completed. The remainder of the site remains undeveloped and comprises a car park area surfaced in crushed limestone gravel.

4.3 Surrounding Area

The site is bordered by residential properties to the north-west and south-east; to the south-west (rear) the land rises up into a grassed field used for grazing horses. Further residential properties line the opposite side of the road, their rear gardens backing on to Tref-y-nant Brook. Further afield, the local area was historically dominated by industrial premises (Terracotta and Brickworks) which have since ceased trading, although evidence of their former presence is still visible. The Pontcysyllte Aqueduct, a Grade I listed structure, is situated roughly 850m to the south of the site.

4.4 Llangollen Road

Near to the site, off the southern side of Llangollen Road, the site of the former Tref-y-Nant Fire Clay Works, latterly known as the J. C. Edwards Terracotta Works, lies densely wooded and overgrown, fenced off and inaccessible, with several "Keep Out" signs posted around its perimeter. As the road rises up towards Trevor to the south-west, the ornamental brickwork of the entrance to the former offices of the terracotta works can be seen on the south-eastern side of the road.

The shallow depth of the Coal Measures bedrock in the area is evident by an outcrop below two trees on the north-western side of the road. Photographs of Llangollen Road taken during the visit on 1st May 2019 are presented in Appendix 5.

4.5 Tref-y-nant Brook

A public footpath runs along the eastern bank of the Tref-y-nant Brook, from a bridge near to the Duke of Wellington public house up to an old culvert, that allows the stream to flow south-eastwards below an embankment that once carried the *now-dismantled* Vale of Llangollen Section of the Great Western Railway. This narrow stream valley provides some exposure of the local lithologies.

Sandstone was noted in the bed of the brook in several places, whilst elsewhere, dark grey laminated mudstone was evident. Photographs of various outcrops along the Tref-y-nant Brook taken during the visit on 1st May 2019 are presented in Appendix 6.

5.0 AVAILABLE COAL MINING DESK STUDY INFORMATION

5.1 General

Geotechnics Ltd have obtained and/or viewed a selection of relevant historical maps, texts and other documentary evidence relating to the site. Whilst every effort has been made to obtain all the readily available extant information this will be only a subset of all the information available. It should also be noted that when dealing with old historical records, particularly with respect to coal mining, there may be inherent inaccuracies within the available data. Such inaccuracies may have arisen from technical deficiencies associated with the working methods employed in the past or potentially in some cases due to deliberate fraud (tax evasion, etc).

5.2 Geological Information

Information published by the British Geological Survey (BGS) on geological maps of the area and from geological memoirs and other relevant literature was consulted. Reference has been made below to the following geological information:

- Geological Survey map of Wrexham (Sheet 121 - Solid and Drift Edition) at a scale of 1:50,000 dated 1994.
- Memoirs of the Geological Survey England and Wales. Explanation of Sheet 121 - Geology of the country around Wrexham, Part II. Coal Measures & Newer

Formations, 1928.

- British Regional Geology - North Wales (Third Edition), HMSO, 1961.
- British Geological Survey, 1:100,000 Hydro-geological Map of Clwyd and the Cheshire Basin, dated 1989.
- <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> (using Surface Geology and Borehole Scans tabs).
- The Coal Authority 1:70,000 scale Coal Mining Development Referral Area Plan for Wrexham (Last updated 13/09/2010).
- <http://mapapps2.bgs.ac.uk/coalauthority/home.html>
- Previous mining investigation reports for the neighbouring properties of Sara and Hafan (used with kind permission of Mr Anthony Roberts).
- Internet-based sources of information.

5.3 1:10,000 Scale Geological Map

Based on a search of the BGS 1:10,000 scale series catalogue of geological maps (See Geoindex Onshore website below), there is no coverage of the geological mapping of the area at this scale.

<http://mapapps2.bgs.ac.uk/geoindex/home.html>

Excerpts of the coverage of these geological maps are presented in Appendix 11.

6.0 SITE HISTORY IN RELATION TO COAL MINING FEATURES

6.1 Historical Painting (1794 Acrefair Mining)

A painting/engraving held in the National Library of Wales dated 1794 illustrates what may be a typical mining arrangement at this time for small scale coal workings in Acrefair. This painting/engraving shows a horse-gin in a field, but with no evidence of a building or surface works around the colliery shaft (*heapstead*) or other facilities. This illustration is the only known evidence for a mine at this particular location in the late eighteenth century.

A copy of the 1794 Acrefair Mining painting/engraving is presented in Appendix 7.

6.2 Historical Maps

Historical maps of the local area have been examined for evidence of coal mining features (and associated extractive industries) on, and/or in the vicinity of the site.

Copies of extracts from relevant historical maps of the site and surrounding area have been obtained from the Landmark Group and are included in Appendix 8. The coal mining history of the site and the surrounding area based on the available Ordnance Survey map data is summarised as follows:

1874 and 1879 OS Maps

The earliest OS map included in this report is dated 1874 at a scale of 1:2,500. It shows the site as occupying part of the western corner of a large agricultural field, off the south-western side of Tower Hill and to the north-west of Llangollen Road. The site is undeveloped at this time and there is no surface evidence for any coal mining at the site.

However, the site lies between two areas of coal workings and fire clay extraction, namely,

- 1) An *Old Brick Works* located about 270m to the north-west of the site, up Tower Hill, beyond the site of a former bridge that once carried the *now-dismantled* Vale of Llangollen Section of the Great Western Railway. Along with rectangular brickworks buildings and circular brick-kilns, a coal *shaft* is evident. There is also evidence for mine waste having been tipped downslope to the south and east, away from the *shaft* and brickworks.

This mine shaft is documented on the following website:

<https://www.coflein.gov.uk/en/site/408115/details/tref-y-nant-mine-shaft>

- 2) The *Tref-y-nant Fire Clay Works*, located about 40m to the south-east of the site, on the far side of Llangollen Road. This clay works was built before 1858 and was acquired by James Coster Edwards in the 1860's. It is a more extensive operation than the Old Brick Works at the top of Tower Hill, with many more buildings and circular brick-kilns evident. This clay works was connected via a siding to the local railway network.

This clay works includes two coal *shafts* and a *Clay Pit* with a tramway leading back to the clay works buildings.

The Tref-y-nant Fire Clay Works is documented on the following website:

<https://www.coflein.gov.uk/en/site/408088/details/tref-y-nant-fire-clay-works-acrefair>

Details of one of the *shafts* at the Tref-y-nant Fire Clay Works is also documented on the following website:

<https://www.coflein.gov.uk/en/site/408117/details/shaft-tref-y-nant-fire-clay-works-acrefair>

As mentioned in Section 4.4, the site of the former J.C. Edwards Terracotta Works is not accessible so the photographs presented on the above websites provide useful additional information.

On page 75 of the geological memoir, it is stated that

“At the (adjacent) Trefynant Fireclay Works...the depth of the Llwyneinion Half-Yard coal, there worked with its underclay in three shafts” as follows:

Llwyneinion Half-Yard coal at Tref-y-nant	
Depth	Location from Trevor Station
9.14m (30ft)	311m (340yds) due East
24.38m (80ft)	475m (520yds) due East-North-East
9.14m (30ft)	521m (570yds) due North-North-East

On page 173 of the geological memoir, it is stated that

“at the Trefynant Works, Trevor, the underclay of the Llwyneinion Half-Yard Coal is mined as a refractory clay”.

In the wider Wrexham area, this seam of underclay is recorded as comprising the following materials:

Material Description	Thickness	
	Ft.	m
Black flaky clay (cross-bedded shale)	4	1.23
Black clay with plant remains		
Grey clay		
Blue clay	3	0.93

The first three materials were used for firebrick and enamelled goods; the last for buff bricks.

Of local interest, there is a house called “Chwarele” near to Trevor Station in the south-western corner of the OS map. It is understood from Page 75 of the

geological memoir that this house gives its name to the Chwarelau Coal (also known as the Aqueduct Coal), presumably first worked near to this locality. The Chwarelau Coal lies at the base of the Middle Coal Measures and is the next coal in the sequence below the Llwyneinion Half Yard coal.

1899 OS Map

The north-eastern part of the site is partitioned off from the field but remains undeveloped at this time and there is no surface evidence for any coal mining at the site.

The 1899 OS map no longer shows the shaft, *Old Brick Work* buildings or brick-kilns at the top of Tower Hill. These presumably having been backfilled and cleared to leave just a remnant spoil heap. However, about 140m to the north-north-west of the site between the roadway of Tower Hill and Tref-y-nant Brook an *Old Shaft (Coal)* is now labelled. (This area is currently densely wooded).

To the south, the expansion of the *Tref-y-nant Fire Clay Works* is evident, with new *shafts* shown and the *Clay Pit* extended.

By 1899, the red brick building housing the present-day “The Towers” Day Nursery had been constructed. This was subsequently named as Ty-Coch (or “Red House”) on the 1963 map.

1912 OS Map

The site remains undeveloped at this time and there is no surface evidence for any coal mining at the site.

About 140m to the north-north-west of the site between the roadway of Tower Hill and Tref-y-nant Brook *Old Shafts (Coal)* are now labelled, indicating more than one mine entry in this area.

1938 – 2019 OS Maps

Subsequent OS mapping shows no further evidence for coal mining features either on, or in the immediate vicinity of the site. The 1963 OS map shows the Tref-y-nant Fire Clay Works (aka J. C. Edwards Terracotta Works) to have been demolished and its former site cleared to leave only its office building off Llangollen Road. By 1988, these offices had also been demolished.

6.3 Historical Photographs

Using GoogleEarth Streetview, it is noted that in June 2009 as part of the groundworks for Hafan, a two-storey dwelling a short distance to the north-west of the site, an excavation had been made into

the hillside. This shallow cutting clearly shows the lack of any significant superficial deposits and the dark coloured, possibly coaly nature of the strata revealed.

Copies of photographs of this cutting dated June 2009 and of the same location taken on 1st May 2019 (Present-day) are included in Appendix 9

7.0 GEOLOGICAL INTERPRETATION

BGS Geological Information provided by the Landmark Group is presented in Appendix 10.

7.1 Drift Geology

The BGS 1:50,000 scale Solid and Drift Edition geological map (Sheet 121 - Wrexham) shows the site as lying in an area where drift is either absent, or of such an insignificant thickness as not to be shown on the mapping.

A short distance to the east and west of the site, Glacial Till is indicated.

7.2 Solid Geology

The underlying bedrock is indicated to comprise Westphalian (Middle Coal Measures) strata of the Bettisfield Formation which is Carboniferous age. These rocks typically consist of “grey and dark grey mudstones with subsidiary feldspathic sandstones, siltstones, seatearths (fireclays) and coal seams” and form part of the Productive Coal Measures.

An ESE-WNW trending fault runs near to the site, to the rear of the houses on the north-eastern side of Tower Hill. The strata on the north-western side of this fault are shown to be downthrown.

Close to the site’s south-western boundary, a SE-NW trending fault is shown that terminates against the previously-mentioned ESE-WNE trending fault, at its northern end. In this case, the throw is difficult to ascertain based on the mapping.

Immediately south of the site, and to the west, beyond the SE-NW trending fault, a sandstone unit, known as the Cefn Rock is indicated (labelled as “CF”). The Cefn Rock is described as a “massive, quartzose sandstone with subordinate and impersistent beds of mudstone and coal”.

Based on the 1:50,000 scale BGS map, the broadly north to south trending outcrops of three coal seams are indicated on both sides of the previously mentioned ESE-WNW trending fault. From west to east, these become progressively younger as the strata dip to the east, comprising the following seams:

- **Llwyneinion Half-Yard coal (West)**
- **Premier coal**
- **Ruabon Yard coal (East)**

These seams are labelled as LLy, P and RY, respectively.

On the same (upthrown, south-western) side of the fault as the site, these seams are located as follows:

Coal Seam	Distance and direction from Site
Ruabon Yard	400m to the east-south-east
Premier	110m to the east-south-east
Llwyneinion Half-Yard	160m to the west

In the area immediately to the south of the site the 1:50,000 scale geological map indicates that the outcrops of the Llwyneinion Half-Yard coal and the Ruabon Yard coal seams lie about 560m apart. The 1cm : 200m scale Generalized Vertical Section of Strata included with the geological map shows these seams to be typically separated by about 50m of strata. Such geometry would be consistent with a dip angle for the strata of 5.1°.

Based on 1:25,000 scale OS mapping, the site is at an elevation of about 113m OD, whereas the location of the outcrop of the Llwyneinion Half-Yard coal seam to the west-north-west of the site, 200m away, lies at about 125m OD. Hence, allowing for a difference in elevation of 12m, but not allowing for the intervention of any faulting, and assuming a consistent dip angle of 5.1°, the Llwyneinion Half-Yard coal seam is estimated to lie at about 6m depth beneath the site.

The BGS Geology of Britain viewer website, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> generally confirms the geology presented on the 1994 geological map. However, coal seams are not shown and the Bettisfield Formation is referred to as the Pennine Lower Coal Measures Formation.

7.3 BGS Memoir

The 1928 BGS Memoir states the following typical seam thicknesses for the coals of the Middle Coal Measures of the Wrexham area:

Coal Seam	Maximum Thickness (m)	Minimum Thickness (m)
Ruabon Yard	1.07	0
Premier	1.82	0.61
Llwyneinion Half-Yard	0.76	0.46

Thicknesses converted from Imperial units.

In the BGS memoir it is also noted that the Llwyneinion Half-Yard coal is described as follows: *“Good steam-coal, but used chiefly for firing the associated clay, and formerly for smelting iron-ore”*.

The thickness of mine workings could vary depending on how much of the coal and its associated underclay were extracted.

7.4 BGS Borehole Records

There are no relevant previous BGS Borehole Records at, or in the vicinity, of the site. Maps showing the location of the BGS Boreholes are presented in Appendix 12. These include a map from the Envirocheck Report provided by the Landmark Information Group and the BGS Borehole Scans as presented on the BGS Geology of Britain viewer website.

8.0 COAL AUTHORITY RECORDS

8.1 CON29M Coal Mining Report

A copy of the CON29M Coal Mining Report obtained for the site is presented in Appendix 13.

The site lies within an area where the Coal Authority believes there to be coal at or close to the surface which could have been mined at some time in the past.

The Coal Authority also states that *“There are no known coal mine entries within, or within 20 metres of, the boundary of the property”*. It warns that *“There may however be mine entries/additional mine entries in the local area which the Coal Authority has no knowledge of”*.

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

In later Coal Authority Search Correspondence (refer to Appendix 8) the Coal Authority states that the nearest recorded workings to the site are in the Yard Seam, located some 430m to the south.

Hence, it must be realised that there may be historical coal workings of which there are no plans/records available and of which the Coal Authority has no knowledge.

8.2 Coal Authority Search Visit

Given that the Coal Authority stated in its CON29m Coal Mining Report that it had no records relating to mine workings or mine entries at the site, a visit to the Coal Authority records office is not deemed necessary.

8.3 Coal Authority Interactive Map

The Coal Authority's 1:70,000 scale Coal Mining Development Referral Area Plan for Wrexham shows the site as being located within a referral area of coal mining affected land.

The excerpt of the Coal Authority Interactive Map presented in Appendix 14 shows the site as being located within an area of *Probable Shallow Coal Mine Workings*.

9.0 PREVIOUS LOCAL DRILL AND GROUT STABILISATION WORKS

Previous mining investigation reports for the neighbouring properties of Sara and Hafan have been provided by Mr Anthony Roberts.

9.1 Coal Workings at Sara, Tower Hill, Acrefair

In February 2005, Nkc Geotech Ltd were commissioned by Mr. Anthony Roberts to undertake a mining investigation with subsequent remedial grouting work over the footprint of the residential dwelling known as "Sara". A record of this work is presented in the mining investigation report presented in Appendix 16.

At Sara, within a 30m deep borehole (BH1), a 1.5m thick cavity was recorded at 10.00m below ground level, reported to be "old workings in the Llywneinion Half-Yard coal". Within a further seven (7 No.) 18m deep boreholes the depth to the seam/mine working/cavity generally ranged between 9.0m and 10.2m below ground level. At Borehole BH2, at the higher, western corner of the plot, the depth to the seam/mine working/cavity was recorded as 11.5m below ground level.

Details of the grout take of the boreholes is given in the report.

No methane or carbon dioxide emissions were detected during the drilling of Borehole BH1.

9.2 Coal Seam and Fault at Hafan, Tower Hill, Acrefair

In January 2010, Nkc Geotech Ltd were commissioned by Mr. Anthony Roberts to undertake a mining investigation with subsequent remedial grouting work over the footprint of the residential dwelling known as "Hafan". A record of this work is presented in the mining investigation report presented in Appendix 17.

At Hafan, a series of six (6 No.) boreholes were drilled, three down the western side of the proposed building and three down the eastern side. These boreholes all intercepted a seam as follows:

Western Side		FAULT	Eastern Side	
15m deep	Seam Depth		18m deep	Seam Depth
BH1	9.2m		BH6	12.5m
BH2	8.7m		BH5	14.0m
BH3	9.6m		BH4	13.1m

The difference in depth to the seam/mine working/cavity between the western and eastern sides of the drill plot is taken as proof of a fault, with the strata to the east downthrown in the region of 4m or so.

This fault probably relates to the SE-NW trending fault shown on the BGs geological map, terminating against the more extensive ESE-WNE trending fault at its northern end (Refer back to Section 7.2).

Details of the grout take of the boreholes is given in the report. Here, the coal was solid and no grout take was recorded.

10.0 POTENTIAL COAL MINING SUBSIDENCE

10.1 General

Risks to new developments in mining areas arise from the following potential difficulties:

- (1) Failure of ground affected by the presence of former mine entries (shafts or adits).
- (2) Crown hole collapse of shallow abandoned mining voids
- (3) Subsidence due to longwall mining

10.2 Shaft and Adit Collapse

Collapses of former mine entrances can be particularly problematic. In this case the Coal Authority does not record the presence of any mine entries either on, or in close proximity to, the site. The absence of recorded shafts does not remove the possibility of their being old unrecorded shafts present. Where coal occurs at very shallow depth, such shafts may take the form of “bell-pits”.

10.3 Crown Hole Collapse

This occurs when long-abandoned mining voids (rooms in the room and pillar type of workings) migrate to the surface either as a result of roof failure, or in combination with pillar collapse or punching of the pillar footing into a weak seatearth horizon.

The usual approach to establishing the level of risk in these circumstances is to utilise an empirical rule of thumb which states that at 10 times the seam thickness of rock strata there is sufficient roof cover to preclude collapse affecting the surface.

Whilst the Llwyneinion Half-Yard seam is recorded as having a maximum thickness of 0.76m, the thickness of its workings could vary depending on how much of the coal and its associated underclay were extracted.

Based on a potential worked thickness of 1.5m, in the region of 15m of solid rock strata above any workings would be required so as to preclude void migration from causing crown hole subsidence at the surface.

10.4 Longwall Mining

Subsidence caused by longwall mining takes the form of a wave of settlement at the surface resulting from the extraction of ground support due to coal seam mining over wide areas. This is generally associated with 20th Century mining activity and is therefore generally well recorded in the archive material available to the Coal Authority. The subsidence is generally complete within 10-15 years after the cessation of mining.

The Coal Authority has no evidence for this form of mining having occurred below the site.

11.0 IDENTIFICATION AND ASSESSMENT OF SITE SPECIFIC COAL MINING

The table below summarises the potential risks associated with coal mining legacy issues for the proposed development site:

Coal Mining Issue	Yes/No	Risk Assessment
Underground coal mining (recorded at shallow depths)	Yes (adjacent to site)	High risk
Underground coal mining (probable at shallow depths)	Yes	High risk
Mine entries (shafts and adits)	No	Low risk
Coal mining geology (fissures)	No	Low risk
Record of past mine gas emissions or potential	No	Low risk
Recorded coal mining surface hazard	No	Very low risk
Surface mining (opencast workings)	No	Very low risk

There may be historical coal workings beneath the site of which there are no plans/records available and of which the Coal Authority has no knowledge. Based on the available evidence, the presence of coal workings beneath the site would appear to be likely.

It must however be realised that whilst unlikely, the possibility of crown hole subsidence due to collapse of unrecorded mine entries cannot be totally discounted

12.0 MITIGATION STRATEGY PROPOSED

Such uncertainties regarding the potential for mined out voids below the site could only be removed (or reduced) by either drilling exploratory boreholes and/or undertaking a proof drilling and grouting exercise.

Probe drilling to a depth of at least 30m below rockhead would initially be required to provide a greater degree of confidence on this matter.

It is recommended that advice is sought from specialist mine stabilisation contractors so that appropriate exploratory/remedial works can be planned.

Given the fact that the new garage building has already been constructed inclined drilling techniques may be required order to grout up any mine voids present directly below the building footprint.

On completion, of any necessary mine stabilisation works, the design and construction of the foundation of the new garage building should be reviewed by a structural engineer to ensure that it has sufficient stiffness to tolerate any local residual ground movements.

Written By: 
John Knowles, BSc (Hons), PGCE, MSc, C.Geol, FGS
RoGEP UK Registered Ground Engineering Adviser
Principal Engineer

Reviewed By: 
John Booth, BSc (Hons), MSc, C.Sci., C.Geol, FGS
UK Registered Ground Engineering Advisor (RoGEP)
Managing Director
for **GEOTECHNICS LIMITED - North West Office**

APPENDIX I

The Brief - Coal Authority Response to Planning Application P/2019/0151



The Coal
Authority



INVESTOR IN PEOPLE



RTPI
Learning Partner

200 Lichfield Lane
Berry Hill
Mansfield
Nottinghamshire
NG18 4RG

Tel: 01623 637 119 (Planning Enquiries)

Email: planningconsultation@coal.gov.uk

Web: www.gov.uk/coalauthority

For the Attention of: Sharon Holman Case Officer
Wrexham County Borough Council

[By Email: planning@wrexham.gov.uk]

15 April 2019

Dear Sharon Holman

PLANNING APPLICATION: P/2019/0151

Erection Of Detached Garage, WC With Office Area Over (In Part Retrospect); The Towers Day Nursery, Llangollen Road, Trevor, Llangollen, Wrexham, LL14 3SG

Thank you for your consultation letter of 28 March 2019 seeking the views of The Coal Authority on the above planning application.

The Coal Authority is a non-departmental public body sponsored by the Department of Business, Energy & Industrial Strategy. As a statutory consultee, The Coal Authority has a duty to respond to planning applications and development plans in order to protect the public and the environment in mining areas.

The Coal Authority Response: Substantive Concern

I have reviewed the proposals and confirm that the application site falls within the defined Development High Risk Area; therefore within the application site and surrounding area there are coal mining features and hazards which need to be considered in relation to the determination of this planning application.

The applicant has submitted a Phase 1 Desk Study (Geotechnics, 19 March 2019). However, this report only provides a contamination risk assessment and does not adequately address the impact of coal mining legacy features on the application site and proposed development.

Having reviewed The Coal Authority records I can note that probable unrecorded coal mining at shallow depth is likely to be present beneath the application site. The submitted report does not address this concern.

The Coal Authority **objects** to this planning application, as the required Coal Mining Risk Assessment Report, or equivalent, has not been submitted as part of the application.

It is a requirement of the National Planning Policy Framework, paragraphs 178-179 that the applicant demonstrates to the satisfaction of the LPA that the application site is safe, stable and suitable for development. In addition the National Planning Practice Guide in section 45 makes it clear that planning applications in the defined Development High Risk Area must be accompanied by a Coal Mining Risk Assessment.

The Coal Authority Recommendation to the LPA

In accordance with the agreed risk-based approach to development management in the defined Development High Risk Areas, the applicant should be informed that they need to submit a Coal Mining Risk Assessment Report as part of this application, prepared by a suitably qualified person. Without such a risk assessment, the Coal Authority does not consider that the LPA has sufficient information to determine this planning application and therefore **objects** to this proposal.

The applicant has simply submitted a Phase 1 Desk Study in support of this planning application which does not provide an assessment of the risks to any proposed new development on the site. Attached to the Desk Study is a CON29M which states coal is at or close to the surface that may have been subject to historic unrecorded mining. This potential for probable unrecorded coal mining is what needs to be addressed.

The applicant should use this coal mining information to assess whether or not past mining activity poses any risk to their development proposal and, where necessary, propose mitigation measures to address any issues of land instability. This could include further intrusive site investigation to ensure that the LPA has sufficient information to determine the planning application.

The Coal Authority would be very pleased to receive for further consultation and comment any additional information prepared and submitted by the applicant.

Please do not hesitate to contact me if you would like to discuss this matter further.

Yours Sincerely,

George Weightman

George Weightman | BSc (Hons), MSc
Trainee Planning Liaison Manager

General Information for the Applicant

The coal mining information within the Coal Mining Report (such as a Non-Residential Coal Mining Report, an Enviro-All-in-One Report or other factual report) already obtained

should be used as the basis for a Coal Mining Risk Assessment Report (CMRA). The CMRA should assess whether or not past mining activity poses any risk to the development proposal and, if necessary, propose mitigation measures to address any issues of land instability. This could include further intrusive investigation on site to ensure that the Local Planning Authority has sufficient information to determine the planning application.

The need for a Coal Mining Risk Assessment is set out in the National Planning Practice Guide at:

<http://planningguidance.planningportal.gov.uk/blog/guidance/land-stability/land-stability-guidance/>

The Coal Mining Risk Assessment should be prepared by a “competent body”. Links to the relevant professional institutions of competent bodies can be found at:

<https://www.gov.uk/planning-applications-coal-mining-risk-assessments>

Guidance on how to produce a Coal Mining Risk Assessment and a template which the “competent body” can utilise is also contained at:

<https://www.gov.uk/planning-applications-coal-mining-risk-assessments>

As the coal mining legacy issue that needs further consideration in this particular case is potential historic shallow mining the British Geological Survey (BGS) may prove a useful source of geological and mining information: www.bgs.ac.uk

Disclaimer

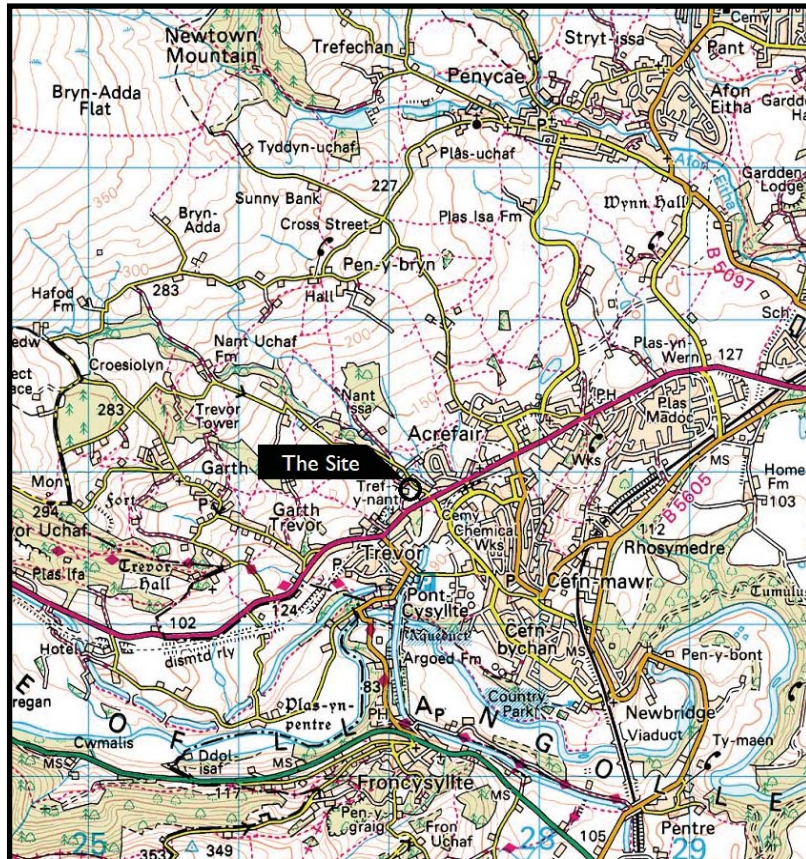
The above consultation response is provided by The Coal Authority as a Statutory Consultee and is based upon the latest available data on the date of the response, and electronic consultation records held by The Coal Authority since 1 April 2013. The comments made are also based upon only the information provided to The Coal Authority by the Local Planning Authority and/or has been published on the Council's website for consultation purposes in relation to this specific planning application. The views and conclusions contained in this response may be subject to review and amendment by The Coal Authority if additional or new data/information (such as a revised Coal Mining Risk Assessment) is provided by the Local Planning Authority or the Applicant for consultation purposes.

In formulating this response The Coal Authority has taken full account of the professional conclusions reached by the competent person who has prepared the Coal Mining Risk Assessment or other similar report. In the event that any future claim for liability arises in relation to this development The Coal Authority will take full account of the views, conclusions and mitigation previously expressed by the professional advisers for this development in relation to ground conditions and the acceptability of development.

APPENDIX 2

Site Location Plan

SITE LOCATION PLAN



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Coal Mining Risk Assessment
for
THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR,
WREXHAM
for
Ms Ruth Roberts

GEOTECHNICS
geotechnical and geoenvironmental specialists

APPENDIX 3

Site Layout Drawing



Client:
Ms. RUTH ROBERTS

Project:
THE TOWERS DAY NURSERY LTD,
LLANGOLLEN ROAD, ACREFAIR, WREXHAM,
LL14 3SG

Drawing Title:
EXISTING SITE LAYOUT PLAN

Scale:
1:400 Approx.

Date:
MAY 2019

Project No:
PN193948

geotechnics

APPENDIX 4

Site Photographs

Project Number : PN193948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



1) The Towers Day Nursery off Llangollen Road



2) New Building at the Site at rear of The Towers Day Nursery

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



3) Zig-zag footpath to the Site from the Nursery



4) Site Entrance from Tower Hill

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



5) Eastern Corner of the Site



6) Southern Corner of the Site

Project Number : PN193948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



7) The New Garage Building



8) Western Corner of the Site

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



9) North-east part of Site



10) Looking up Tower Hill to Sara and Hafan

Project Number : PN193948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



11) The Driveway of Sara adjacent to the Site



12) Hafan, Sara and the New Building at the Site viewed from Llangollen Road

Project Number : PN193948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



13) New Building at the Site viewed from the North-west



14) New Building at the Site

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



15) Mound at Tower Hill Barns viewed from Llangollen Road



16) Mound at Tower Hill Barns viewed from footpath near Tower Hill

APPENDIX 5

Llangollen Road Photographs

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



1) New Building at the Site viewed from Llangollen Road



2) Former Site of J. C. Edwards Terracotta Works

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



3) Keep Out Sign



4) Former Entrance to J. C. Edwards Offices

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



5) Former Entrance to J. C. Edwards Offices



6) Ornamental Brickwork

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



7) Rock Outcrop below Trees along Llangollen Road



8) Rock Outcrop below Trees along Llangollen Road

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



9) Information Sign for J. C. Edwards Terracotta Works

APPENDIX 6

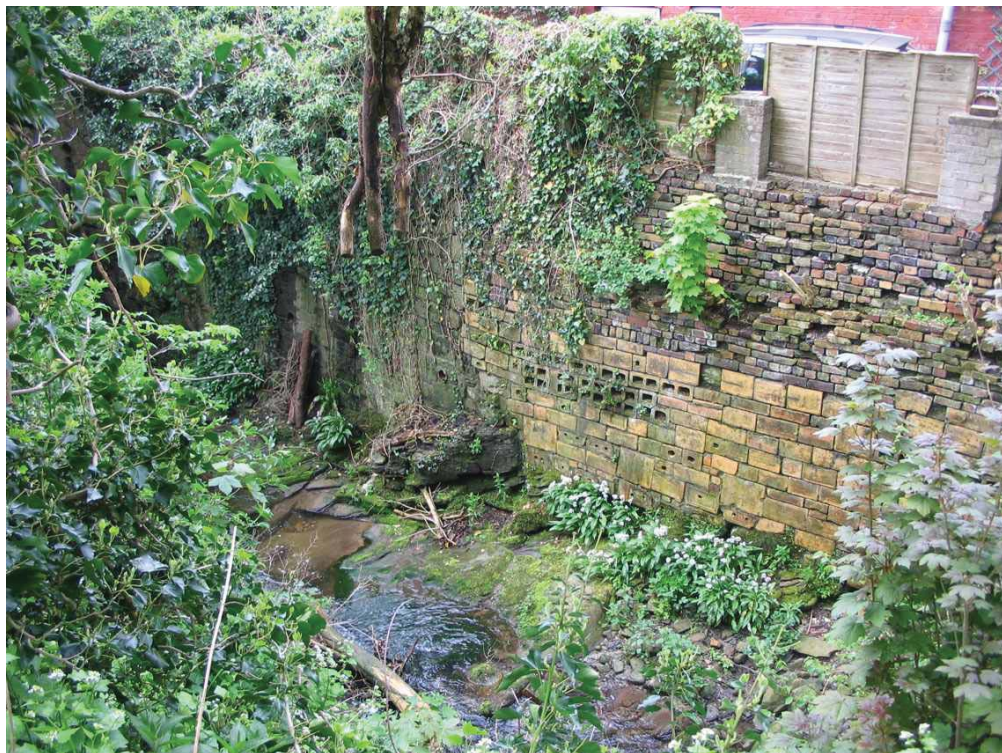
Tref-y-nant Brook Photographs

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



1) Sandstone on the bed of Tref-y-nant Brook near Duke of Wellington pub



2) Sandstone on the bed of the brook

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



3) Sandstone on the bed of the brook



4) Dark grey laminated mudstone along footpath on the Eastern side of Tref-y-nant Brook

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



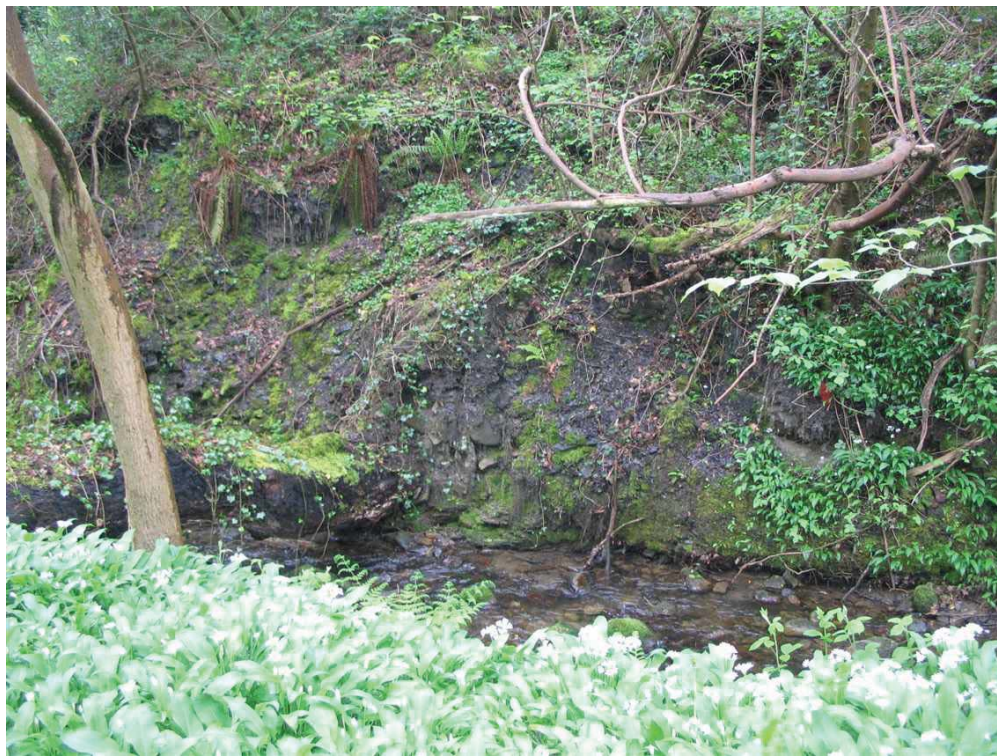
5) Close-up of dark grey laminated mudstone



6) Dark grey laminated mudstone in hillside

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



7) Dark grey laminated mudstone by fallen tree



8) Dark grey laminated mudstone by fallen tree

APPENDIX 7

Historical Painting (1794 Acrefair Mining)



1870. The River, with a view of the distant mountains. Painted by J. M. W. Turner. The river is the River of the South, and the mountains are the mountains of the South. The painting is a study of light and color, and is a fine example of Turner's work.

APPENDIX 8

Historical Maps

Historical Mapping Legends

Ordnance Survey County Series and
Ordnance Survey Plan 1:2,500

Quarry	Gravel Pit	Sand Pit	Refuse Heap	Flat Rock
Clay Pit	Shingle			
Sloping Masonry				
Marsh	Reeds	Osiers	Wood	
Rough Pasture	Furze			
Mixed Wood	Brushwood	Orchard	Sleeping Stones	Lock
Fir	Ford	Waterfall		
Ferry				
Trig. Station	507 Δ	Altitude at Trig. Station		
B.M. 325.9	↑	Bench Mark		
Arrow denotes flow of water				
Antiquities (site of)				
Cutting				
Embankment				
Railway crossing Road				
Road crossing Railway				
Level Crossing				
Road over single stream				
Road over River or Canal				
County Boundary (Geographical)				
County & Civil Parish Boundary				
Administrative County & Civil Parish Boundary				
County Borough Boundary (England)				
County Borough Boundary (Scotland)				
B.P.B.S. Boundary Post or Stone	P.C.B.	Police Call Box		
B.R.R. Bridge Road	P	Pump		
E.P. Electricity Pylon	S.P.	Signal Post		
F.B. Foot Bridge	S.L.	Sluice		
F.P. Foot Path	S.P.	Spring		
G.P. Guide Post or Board	T.C.B.	Telephone Call Box		
M.S. Mile Stone	T.T.	Trough		
M.P.M.R. Mooring Post or Ring	W	Well		

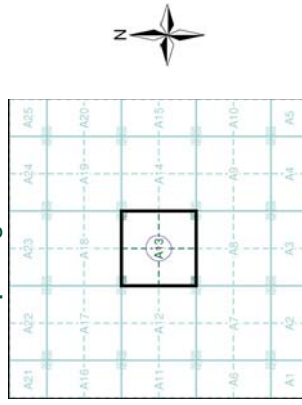
Ordnance Survey Plan, Additional SIMs and
Supply of Unpublished Survey Information
1:2,500 and 1:1,250

Inactive Quarry, Chalk Pit or Clay Pit	Active Quarry, Chalk Pit or Clay Pit	Boulders	Slopes	Top
Rock				
Cliff				
Roofed Building				
Sloping Masonry				
Non-Coniferous Tree (surveyed)	Non-Coniferous Tree (not surveyed)	Orchard Tree	Scrub	Bracken
Copice, Osier		Reeds	Marsh, Saltings	
Rough Grassland		Heath		
Direction of water flow		Bench Mark		
Cave Entrance		Triangulation Station		
Electricity Transmission Line				
County Boundary (Geographical)				
County & Civil Parish Boundary				
Civil Parish Boundary				
Admin. County or County Bor. Boundary				
London Borough Boundary				
Symbol marking point where boundary mereing changes				
BH Beer House	P	Pillar, Pole or Post		
BP, BS Boundary Post or Stone	PO	Post Office		
Cn, C Capstan, Crane	PC	Public Convenience		
Chy Chimney	PH	Public House		
D.Fn Drinking Fountain	Pp	Pump		
Ei P Fire Alarm Pillar	SB, S Br	Signal Box or Bridge		
FAP Foot Bridge	SP, SL	Signal Post or Light		
FB Foot Bridge	Spr	Spring		
GP Guide Post	Tk	Tank or Track		
H Hydrant or Hydraulic	TCP	Telephone Call Box		
LC Level Crossing	TCB	Telephone Call Post		
MH Manhole	Tt	Trough		
MP Mile Post or Mooring Post	W.P.T. W.T.	Water Point, Water Tap		
MS Mile Stone	W	Well		
N.T. Normal Tidal Limit	Wd Pp	Wind Pump		

Large-Scale National Grid Data 1:2,500 and
1:1,250

Cliff	Slopes	Top	Rock	Boulders	Positioned Boulder	Non-Coniferous Tree (surveyed)	Non-Coniferous Trees (not surveyed)	Orchard Tree	Scrub	Copice, Osier	Rough Grassland	Direction of water flow	Triangulation Station	Electricity Transmission Line	Electricity Pylon	Bench Mark	Roofed Building	Glazed Roof Building	Civil parish/community boundary	District boundary	County boundary	Boundary post/stone	Boundary mering symbol (note: these always appear in opposed pairs or groups of three)	Bks Barracks	Bty Battery	Cem Cemetery	Chy Chimney	Cis Cistern	Dismd Rly Dismantled Railway	Ei Gen Sta Electricity Generating Station	Ei P Electricity Pole, Pillar	Ei Sub Sta Electricity Sub Station	FB Filter Bed	Fni D Fn Fountain / Drinking Ftn	Gas Gov Gas Governor	GVC Gas Valve Compound	GP Guide Post	MH Manhole	MP MS Mile Post or Mile Stone	P Pillar, Pole or Post	PO Post Office	PC Public Convenience	Pp Pump	Ppg Sta Pumping Station	PW Place of Worship	Sewage Ppg Sta Sewage Pumping Station	SB, S Br Signal Box or Bridge	SP, SL Signal Post or Light	Spr Spring	Tk Tank or Track	Tt Trough	Wd Pp Wind Pump	W.P.T. W.T. Water Point, Water Tap	Wks Works (building or area)	W Well
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Historical Map - Segment A13



Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 100

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair,
WREXHAM, LL14 3SG

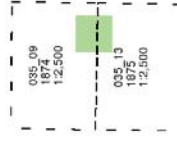
Denbighshire

Published 1874 - 1875

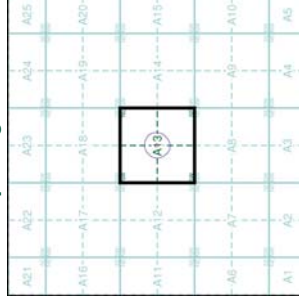
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the Ordnance Survey, which were adopted for England, Wales and Scotland in the 1940s. In 1854, the Ordnance Survey was created by an Act of Parliament, and its maps covered the whole of what was then considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

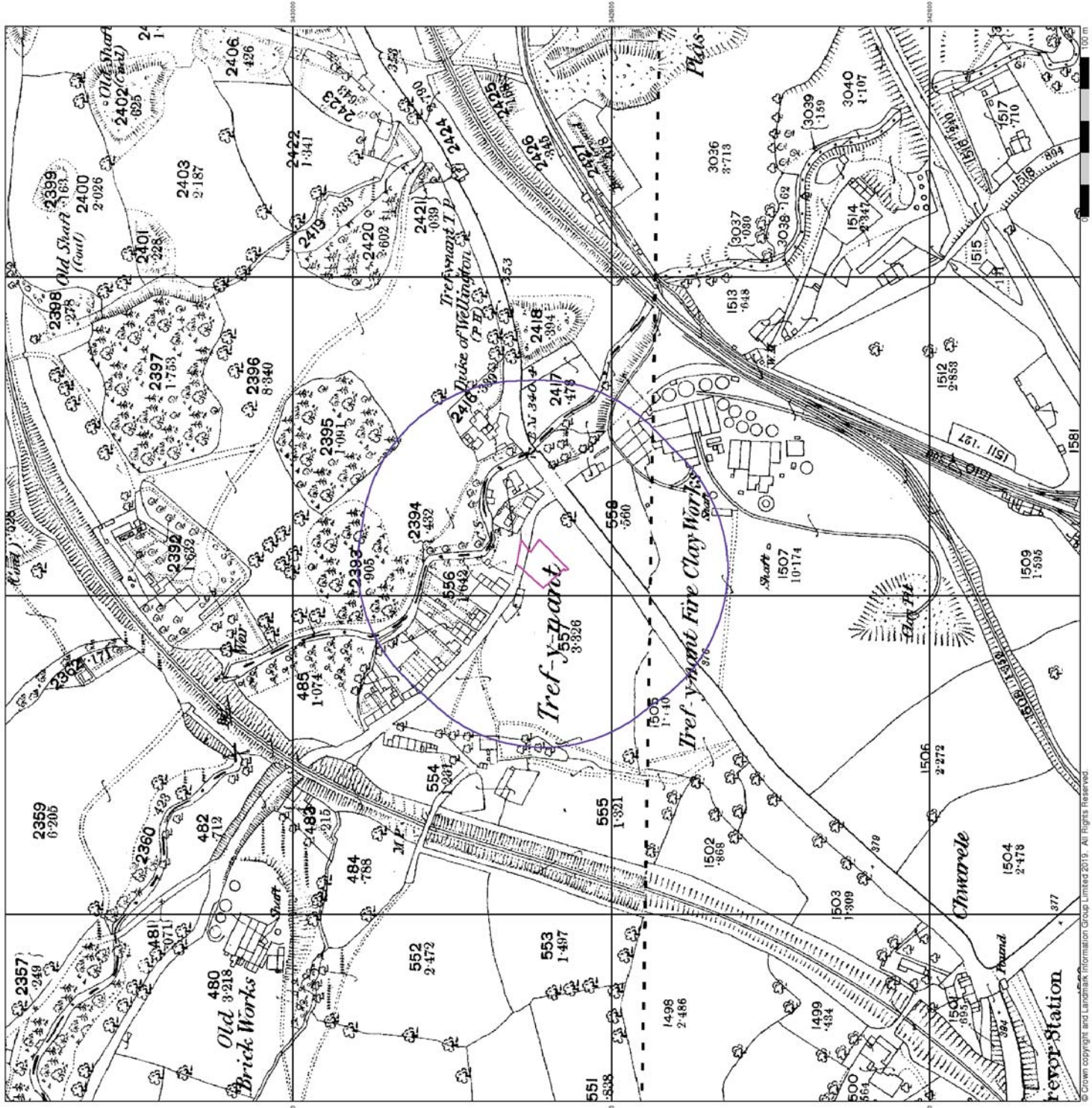


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Site Area (Ha): 0.06
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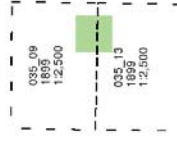
Denbighshire

Published 1899

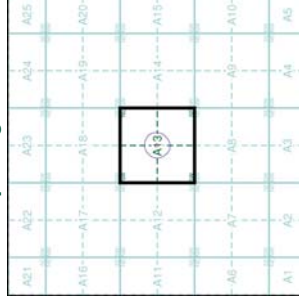
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at 1:2,500 scale for England, Wales and Scotland in the 1940s. In 1854, the Ordnance Survey (OS) was established and its first map of Great Britain was published. The OS maps were considered to be the most accurate maps of the whole of what was then considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938 all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

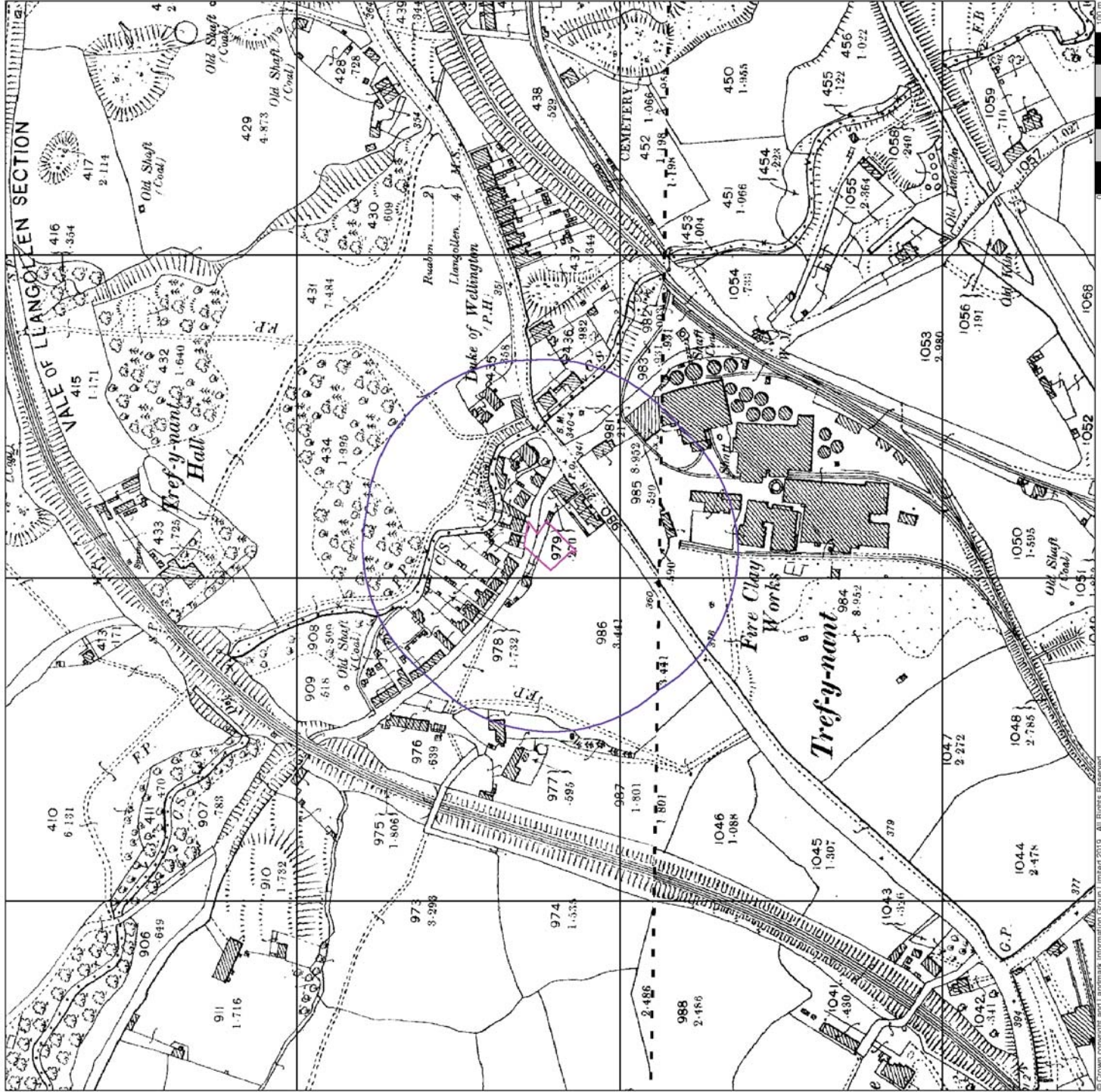


Order Details

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Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 100

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair,
WREXHAM, LL14 3SG



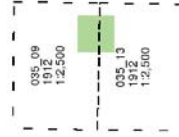
Denbighshire

Published 1912

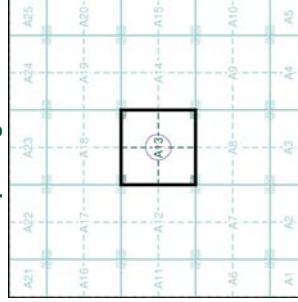
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at a 1:2,500 scale for England, Wales and Scotland in the 1940s. 1854 was adopted for England, Wales and Scotland, and 1896 for Scotland. The whole of what was considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938 all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

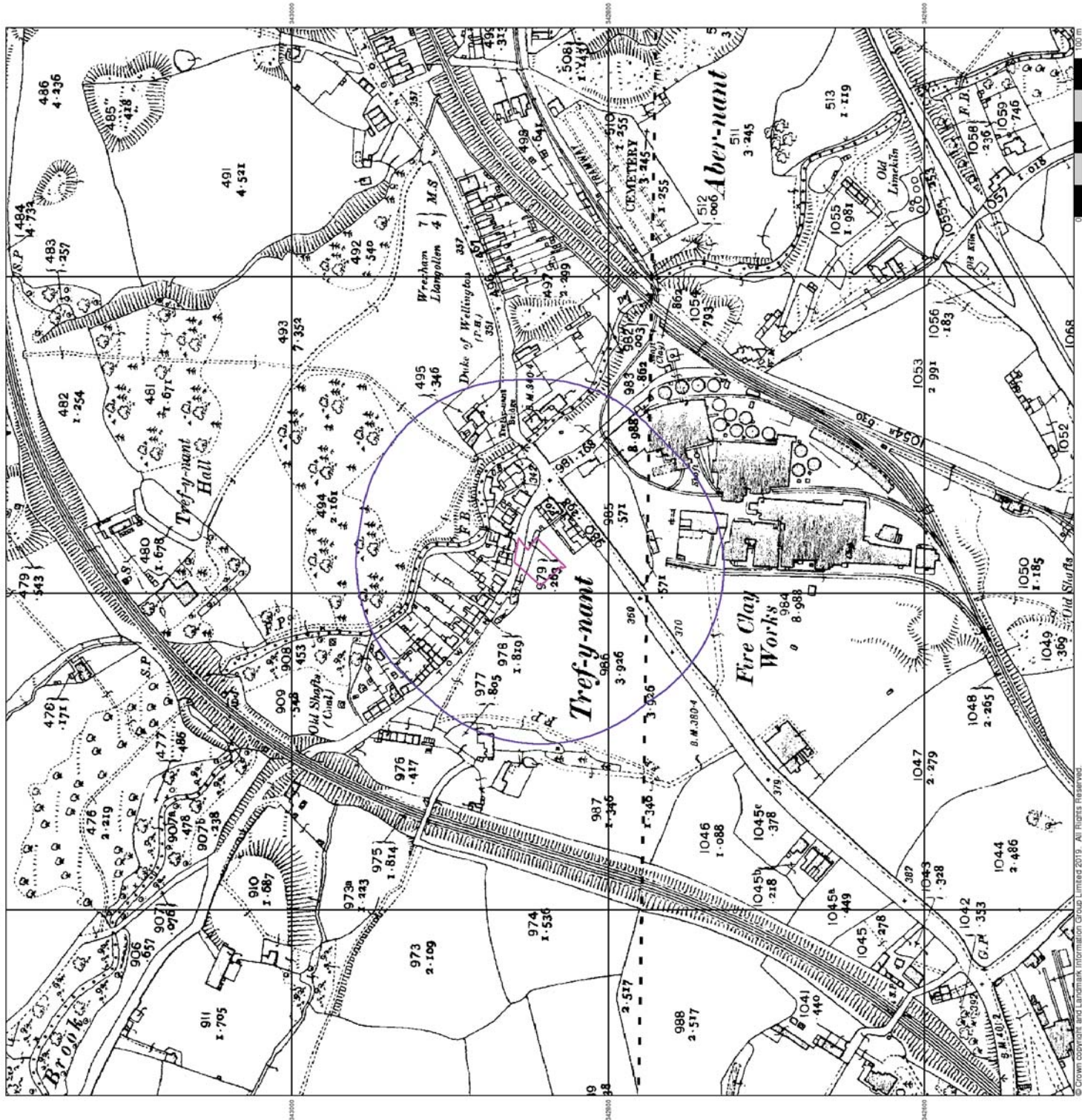


Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 100

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG



Additional SIMS

Published 1962 - 1963

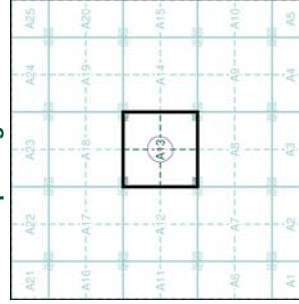
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further information mapping which were produced and published from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

S.0743	1962	12,500
S.0742	1963	12,500

Historical Map - Segment A13

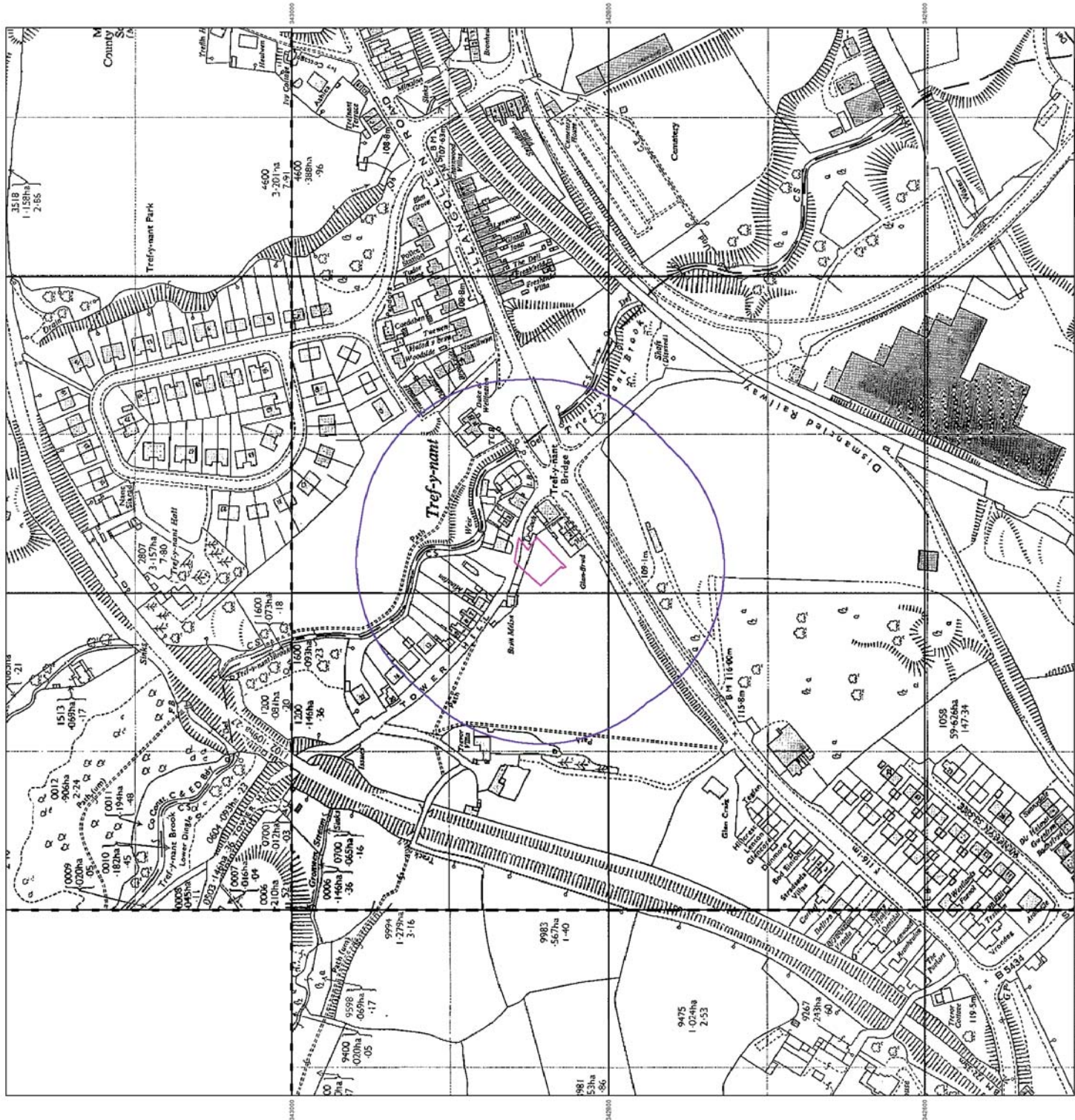


Order Details

Order Number: 191649715_1_1
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 National Grid Reference: 327220, 342840
 Slice: A
 Site Area (Ha): 0.06
 Search Buffer (m): 100

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG



Additional SIMs

Published 1988 - 1991

Source map scale - 1:2,500

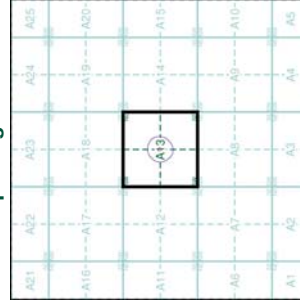
The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further editions of mapping which were produced as a public utility in 1947 to help the public to find out more about the land in their area. The maps, produced between 1947 and 1991, contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

---	SJ2743
---	1981
---	1:2,500

---	SJ2742
---	1988
---	1:2,500

Historical Map - Segment A13

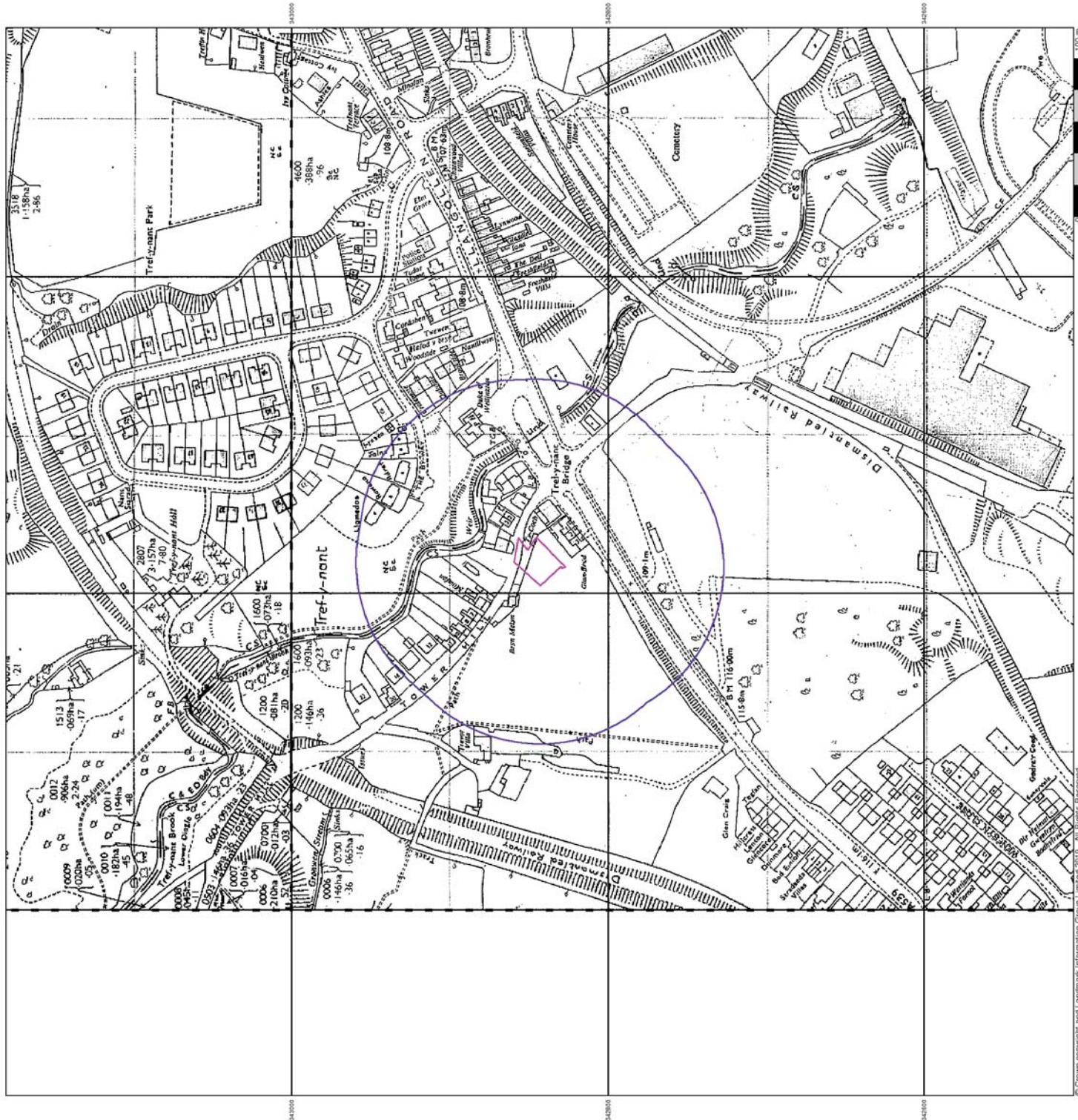


Order Details

Order Number: 191649715_1_1
 Customer Ref: PN193946
 National Grid Reference: 327220, 342840
 Slice: A
 Site Area (Ha): 0.06
 Search Buffer (m): 100

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG



Additional SIMs

Published 1992

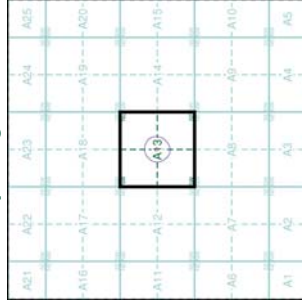
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further information mapping which were produced as a public domain resource. The first edition of the SIM cards was published in 1947 to 1954, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

---	SJ2743	1982	1:2,500
---	SJ2742	1992	1:2,500

Historical Map - Segment A13



Order Details

Order Number: 191649715_1_1
 Customer Ref: PN193946
 National Grid Reference: 327220, 342840
 Slice: A
 Site Area (Ha): 0.06
 Search Buffer (m): 100

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG



Large-Scale National Grid Data

Published 1994

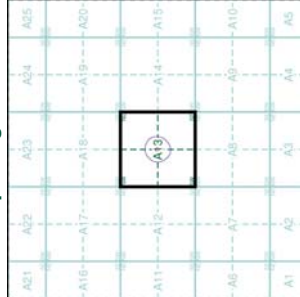
Source map scale - 1:2,500

Large Scale National Grid Data superseded SIM cards (Ordnance Survey's Survey Information on Microfilm) in 1992, and continued to be produced until 1999. The maps are produced on a grid of 100m squares and provide detailed information on houses and roads, but tend to lack topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

S2643	S2743
1994	1994
12,500	12,500
S2642	S2742
1994	1994
12,500	12,500

Historical Map - Segment A13



Order Details

Order Number: 191649715_1_1
 Customer Ref: PN193946
 National Grid Reference: 327220, 342840
 Slice: A
 Site Area (Ha): 0.06
 Search Buffer (m): 100

Site Details

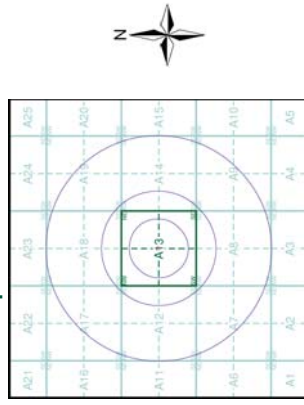
The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Denbighshire	1:10,560	1879	2
Denbighshire	1:10,560	1879	3
Denbighshire	1:10,560	1900	3
Denbighshire	1:10,560	1914	4
Denbighshire	1:10,560	1938	5
Denbighshire	1:10,560	1954	6
Ordnance Survey Plan	1:10,000	1963	7
Ordnance Survey Plan	1:10,000	1977	8
Ordnance Survey Plan	1:10,000	1986	9
Ordnance Survey Plan	1:10,000	1995	10
10K Raster Mapping	1:10,000	2000	11
Street View	Variable		12

Historical Map - Slice A



Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840

Slice:	A
Site Area (Ha):	0.06
Search Buffer (m):	1000

Site Details

**The Towers Day Nursery Ltd, Llangollen Road, Acrefair,
WREXHAM, LL14 3SG**

Ordnance Survey County Series 1:10,560

Ordnance Survey Plan 1:10,000

1:10,000 Raster Mapping

Sand Pit	Shingle	Reeds						
Furze								
Rough Pasture								
Trigonometrical Station								
Bench Mark								
Well, Spring, Boundary Post								
Surface Level								
Sketched Contour								
Main Roads								
Minor Roads								
Sunken Road								
Road over Railway								
Railway over Road								
Road over River or Canal								
Road over Stream								
County Boundary (Geographical)								
County & Civil Parish Boundary								
Administrative County & Civil Parish Boundary								
County Borough Boundary (England)								
County Burgh Boundary (Scotland)								
Rural District Boundary								
Civil Parish Boundary								

								
Chalk Pit, Clay Pit or Quarry	Gravel Pit	Disused Pit or Quarry	Lake, Loch or Pond	Boulders	Non-Coniferous Trees	Coppice	Rough Grassland	Saltings
								
Sand Pit	Refuse or Slag Heap	Dunes	Coniferous Trees	Orchard	Bracken	Marsh	Building	Glasshouse
								
Sloping Masonry	Pylon	Standard Gauge Multiple Track	Single Gauge Single Track	Sliding, Tramway or Mineral Line	Narrow Gauge	Geographical County or County of City	Municipal Borough, Urban or Rural District, Borough, Burgh or County Constituency	Civil Parish
								
Road Under	Road Over	Level Crossing	Foot Bridge	Embankment	Cutting	Direction of Flow of Water	Shaded area	Shaded area
								
Boundary Post or Stone	Police Station	Post Office	Public Convenience	Signal Box	Spring	Telephone Call Box	Telephone Call Post	Well

	Gravel Pit		Refuse tip or slag heap
	Rock		Rock (scattered)
	Boulders		Boulders (scattered)
	Shingle		Mud
	Sand		Sand Pit
	Slopes		Top of cliff
	General detail		Underground detail
	Overhead detail		Narrow gauge railway
	Multi-track railway		Single track railway
	County boundary (England only)		Civil, parish or community boundary
	District, Unitary, Metropolitan, London Borough boundary		Constituency boundary
	Area of wooded vegetation		Non-coniferous trees
	Non-coniferous trees (scattered)		Coniferous trees
	Coniferous trees (scattered)		Positioned tree
	Orchard		Coppice or Osiers
	Rough Grassland		Heath
	Scrub		Marsh, Salt Marsh or Reeds
	Water feature		Flow arrows
	Mean high water (springs)		Mean low water (springs)
	Telephone line (where shown)		Electricity transmission line (with poles)
	Bench mark (where shown) BM 123.45 m		Triangulation station
	Point feature (e.g. Guide Post or Mile Stone)		Pylon, flare stack or lighting tower
	Site of (antiquity)		Glasshouse
	General Building		Important Building

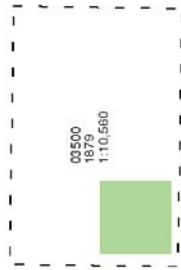
Denbighshire

Published 1879

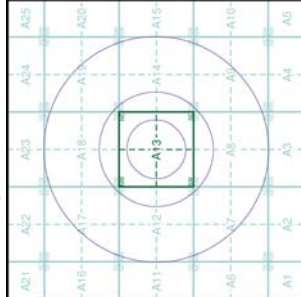
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at 1:2,500 adopted for England, Wales and Scotland in the 1840's. In 1854 the Ordnance Survey published the first 1:10,560 map. These maps were used to update the 1:10,560 maps. The published date is then therefore often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG

Denbighshire

Published 1900

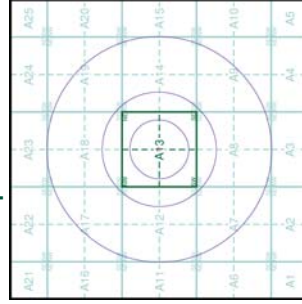
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at a 1:2,500 scale for England, Wales and Scotland in the 1840's. In 1854 the Ordnance Survey (OS) began to publish maps at a 1:10,560 scale. These maps were used to update the 1:2,500 maps. The published date 1900 is the date the maps were first published. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

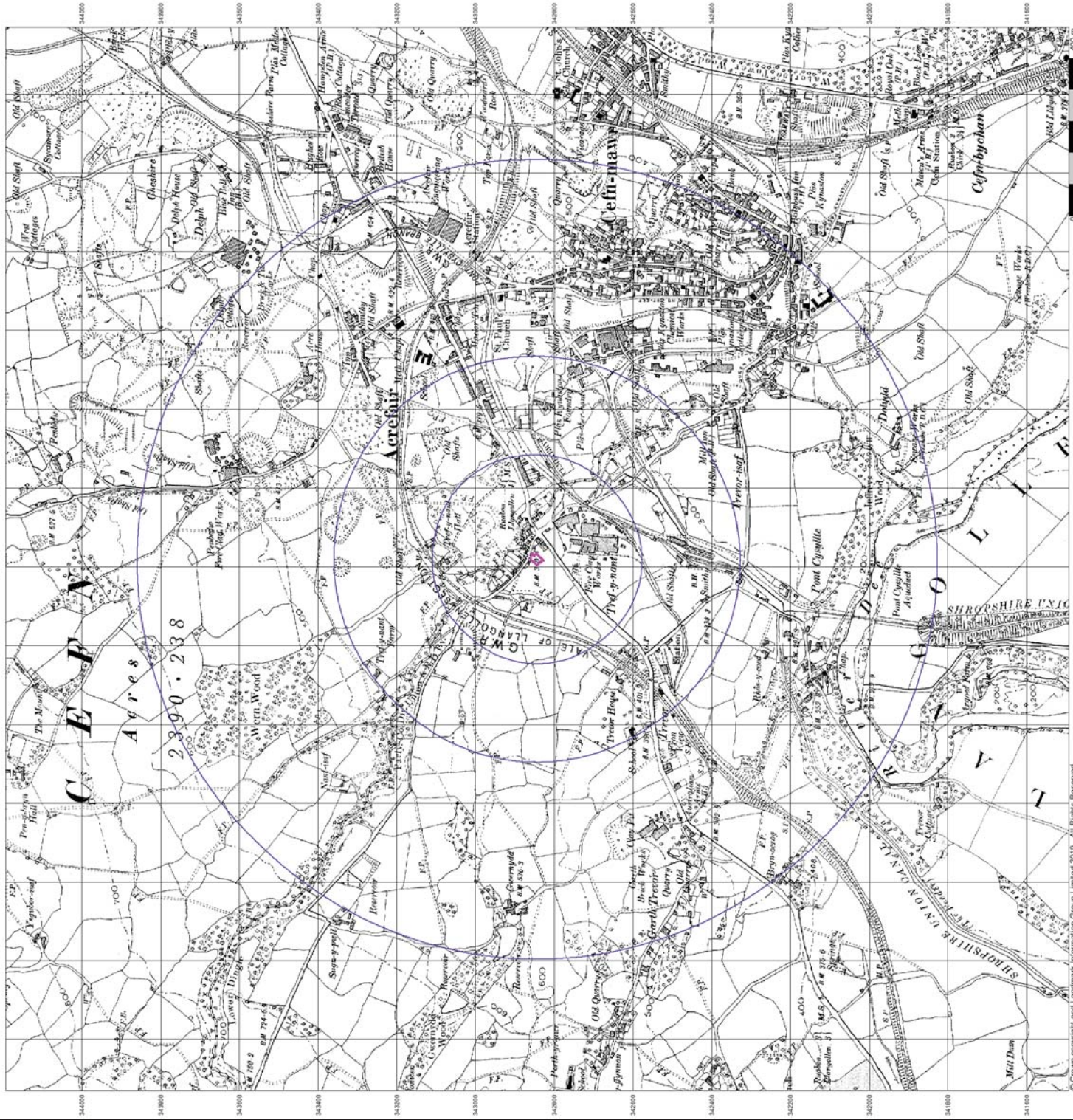


Order Details

Order Number: 191649715_1_1
 Customer Ref: PN193946
 National Grid Reference: 327220, 342840
 Slice: A
 Site Area (Ha): 0.06
 Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG



035SW
1914
1:10,560

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details
The Towers Day Nursery Ltd, Llangollen Road, Acrefair,
WREXHAM, LL14 3SG

Denbighshire

Published 1938

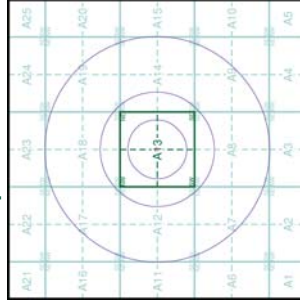
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at 1:25,000 scale adopted for England, Wales and Scotland in the 1840's. In 1854 the Ordnance Survey began to publish maps at 1:50,000 scale. These maps were used to update the 1:10,560 maps. The published date 1938, then there are often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

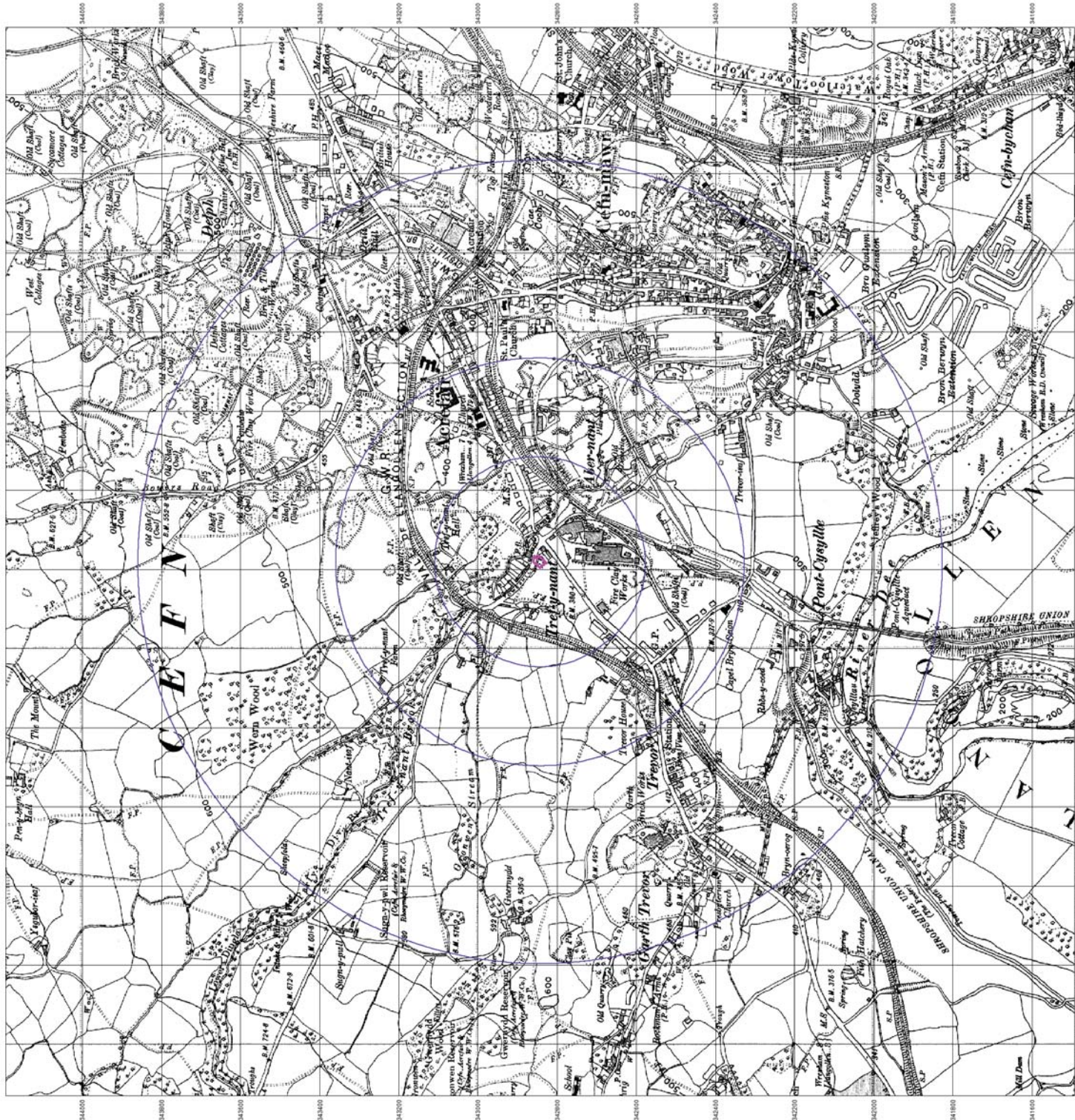


Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG



Denbighshire

Published 1954

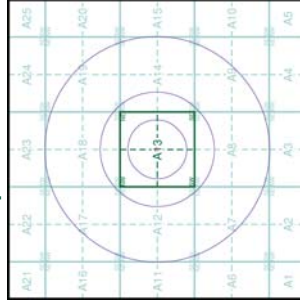
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at a 1:25,000 scale, adopted for England, Wales and Scotland in the 1840's. In 1854, the Ordnance Survey (OS) was established and the first 1:25,000 scale maps were used to update the 1:10,560 maps. The published date of the 1:10,560 maps are often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys in outlying county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

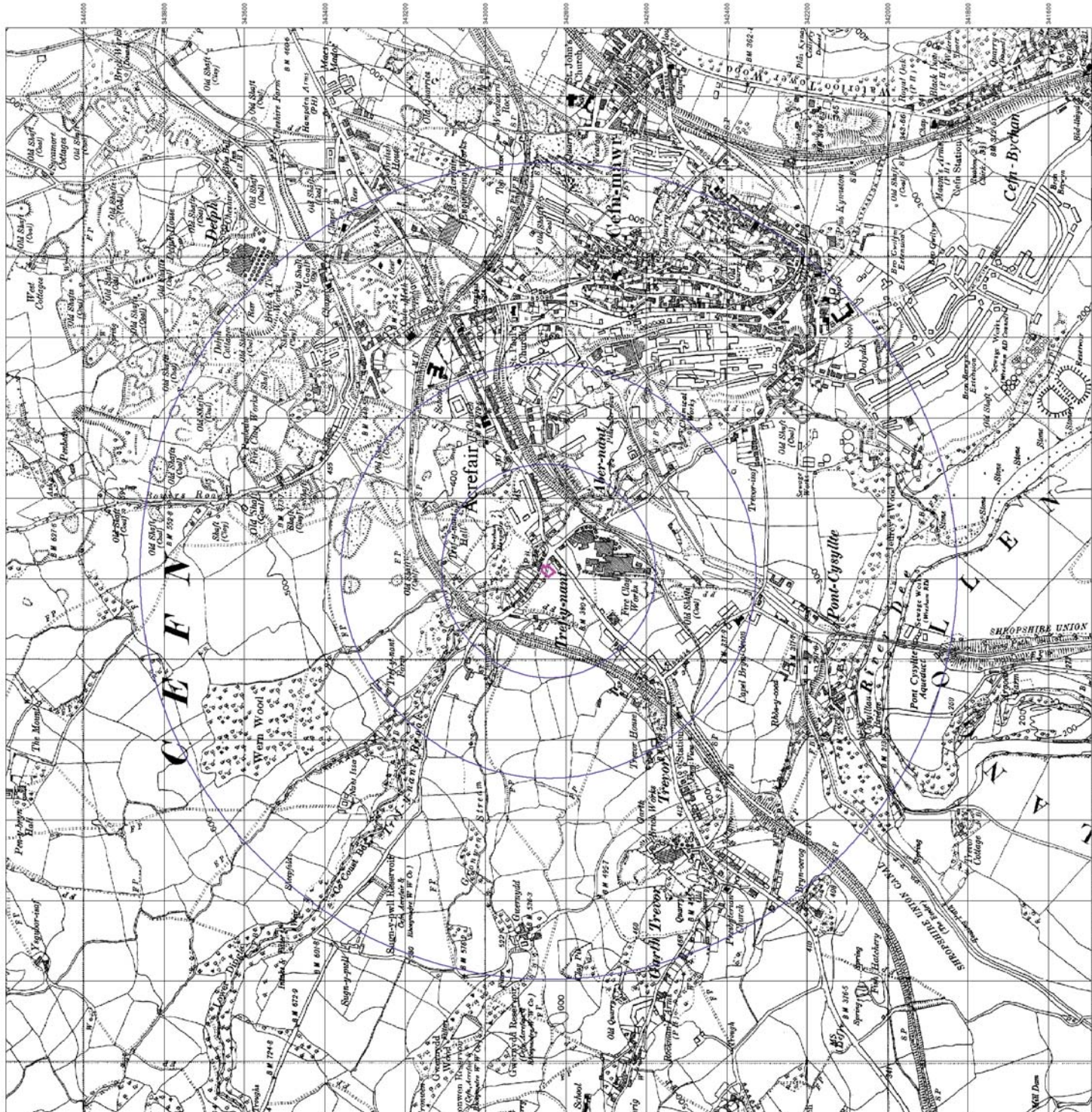


Order Details

Order Number: 191649715_1_1
 Customer Ref: PN193946
 National Grid Reference: 327220, 342840
 Slice: A
 Site Area (Ha): 0.06
 Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG



Ordinance Survey Plan Published 1963

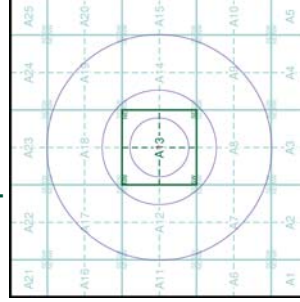
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at 1:25,000 scale adopted for England, Wales and Scotland in the 1840's. In 1854, the Ordnance Survey was established and the 1:25,000 maps were used to update the 1:10,000 maps. The published date is then therefore often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

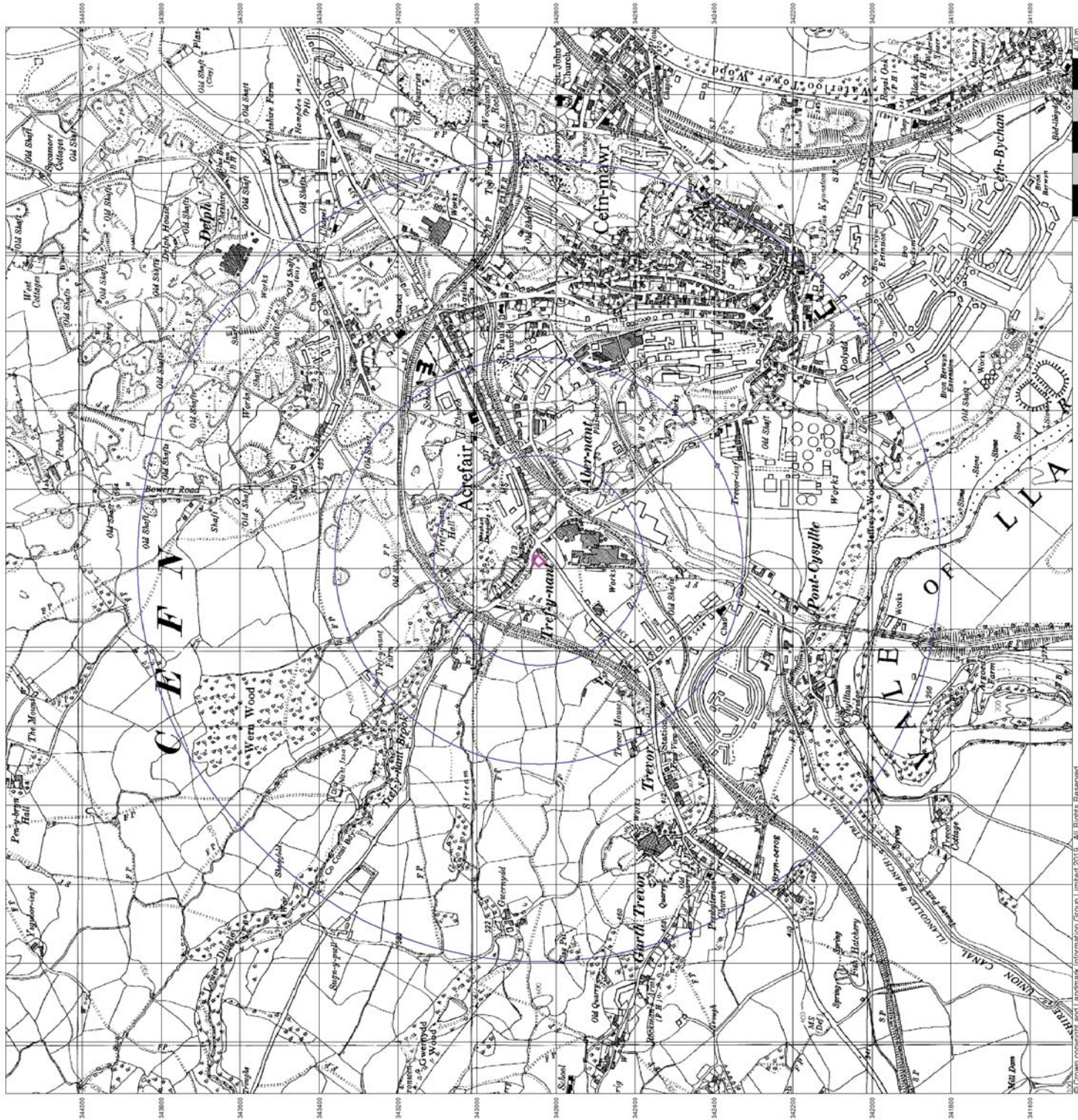


Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair,
WREXHAM, LL14 3SG

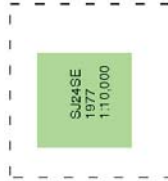


Ordnance Survey Plan Published 1977

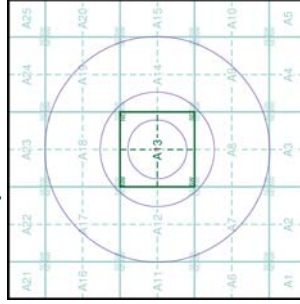
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at a 1:25,000 scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:25,000 scale maps were revised and the 1:10,000 scale maps were used to update the 1:10,000 maps. The published date is then therefore often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

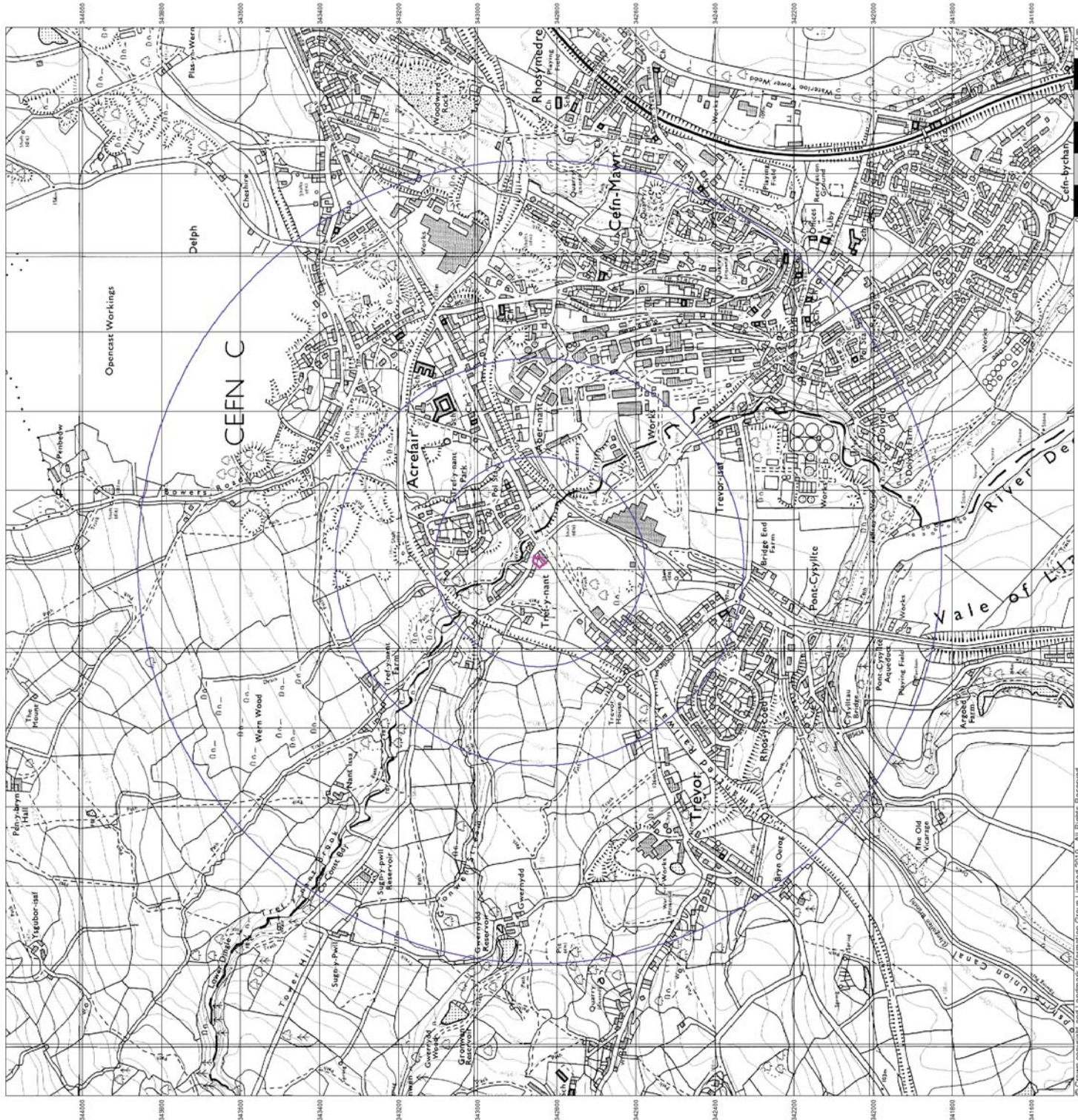


Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair,
WREXHAM, LL14 3SG

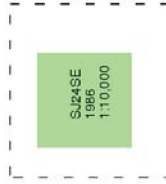


Ordnance Survey Plan Published 1986

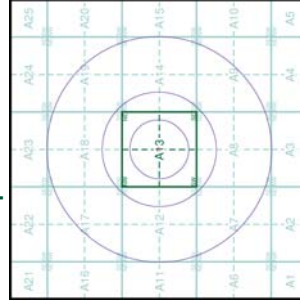
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at a 1:2,500 scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale maps were reissued and the 1:10,000 scale maps were used to update the 1:2,500 maps. The published date is then therefore often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

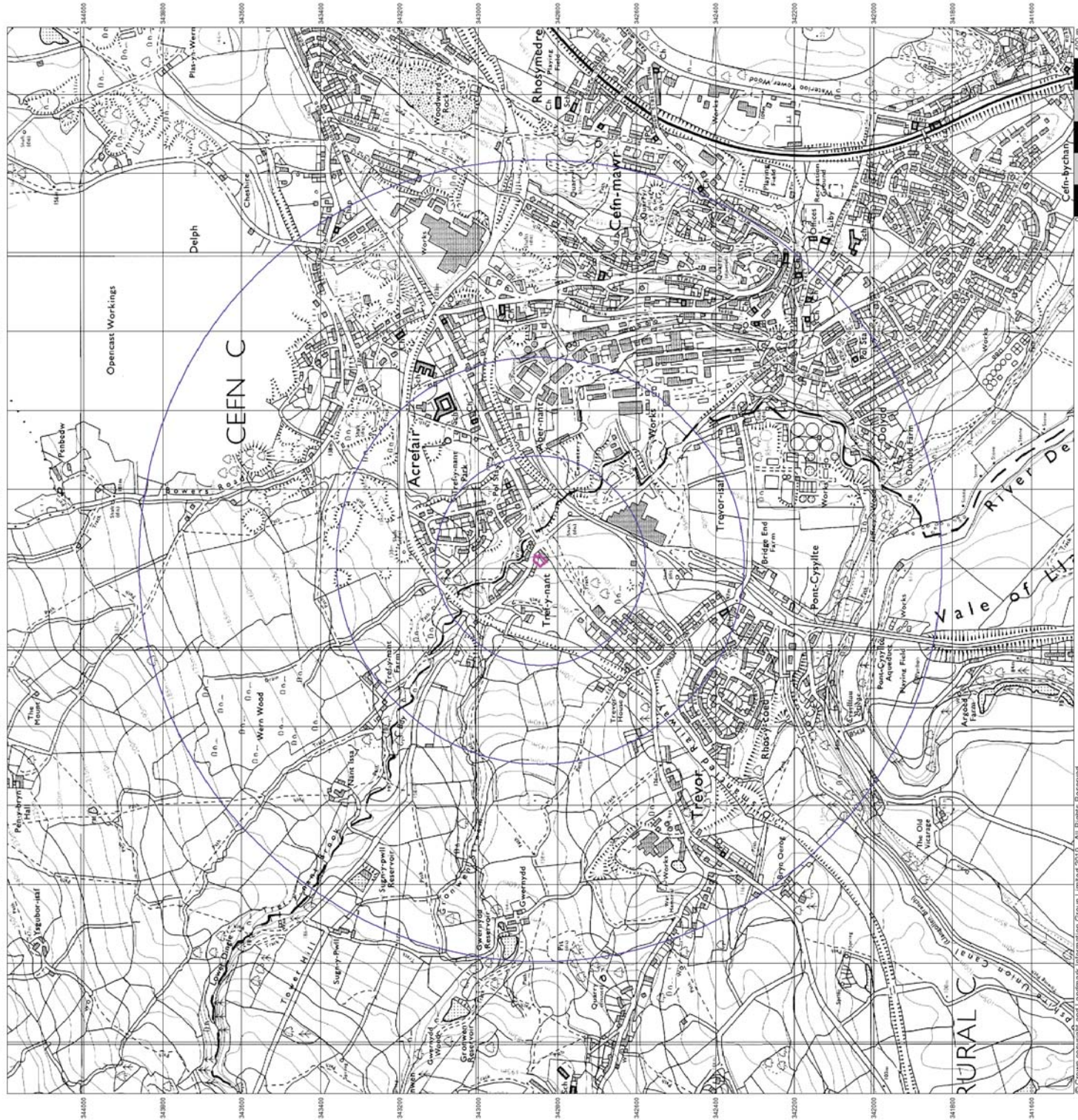


Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair,
WREXHAM, LL14 3SG



Ordnance Survey Plan Published 1995

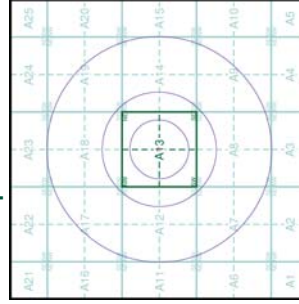
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at a scale adopted for England, Wales and Scotland in the 1840's. In 1854 a 1:2,500 scale map of the area was published. This map was then used to update the 1:10,000 maps. The published date is then therefore often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear 'unfinished' - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

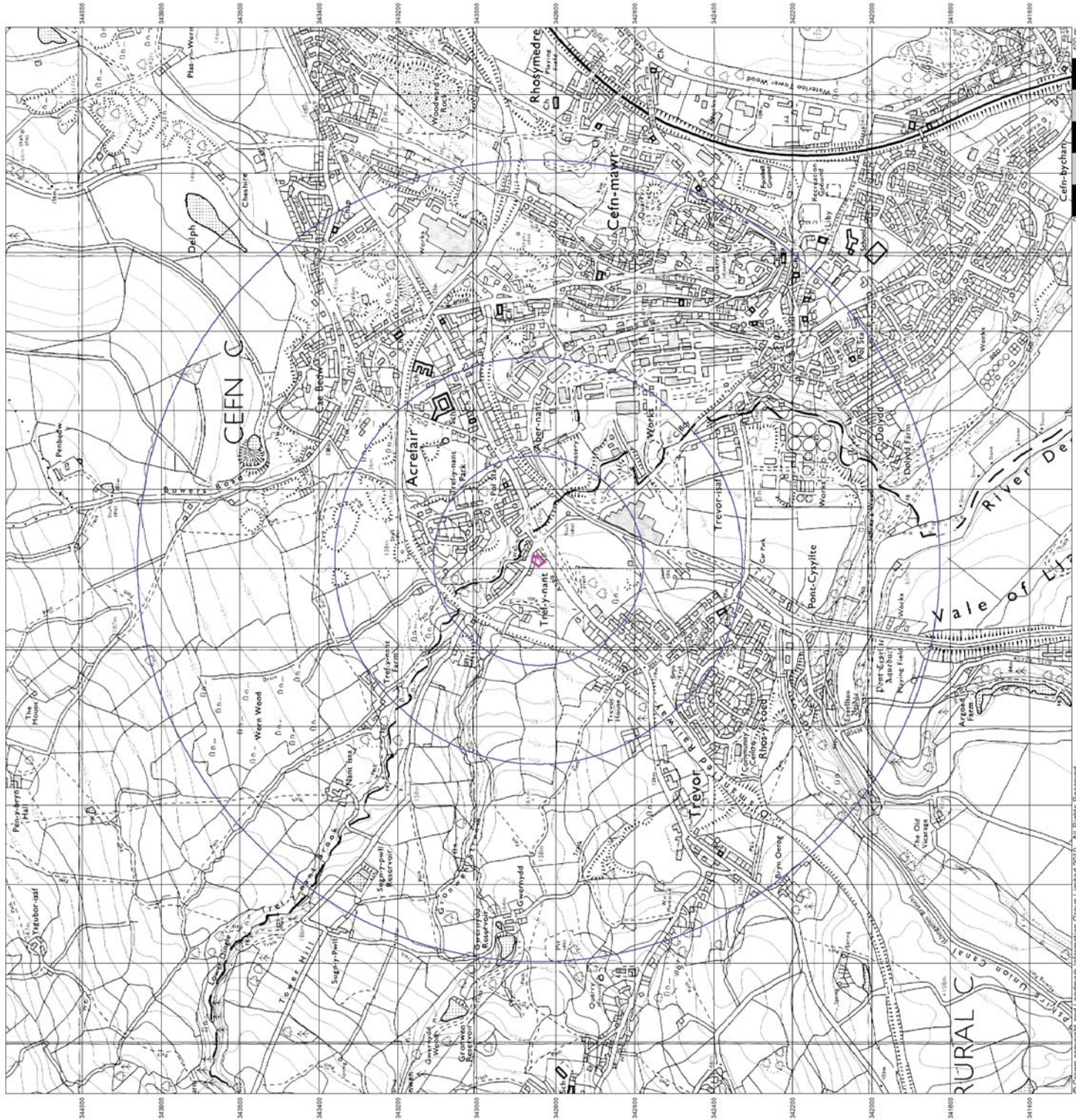


Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair,
WREXHAM, LL14 3SG



10k Raster Mapping

Published 2000

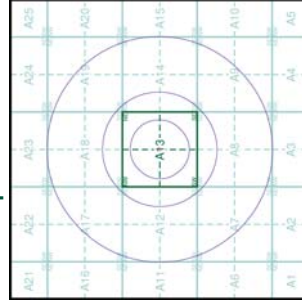
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster map. These maps are derived from the data which was digitised from the original maps published in 1970. The data is highly detailed showing buildings, roads and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)



Historical Map - Slice A

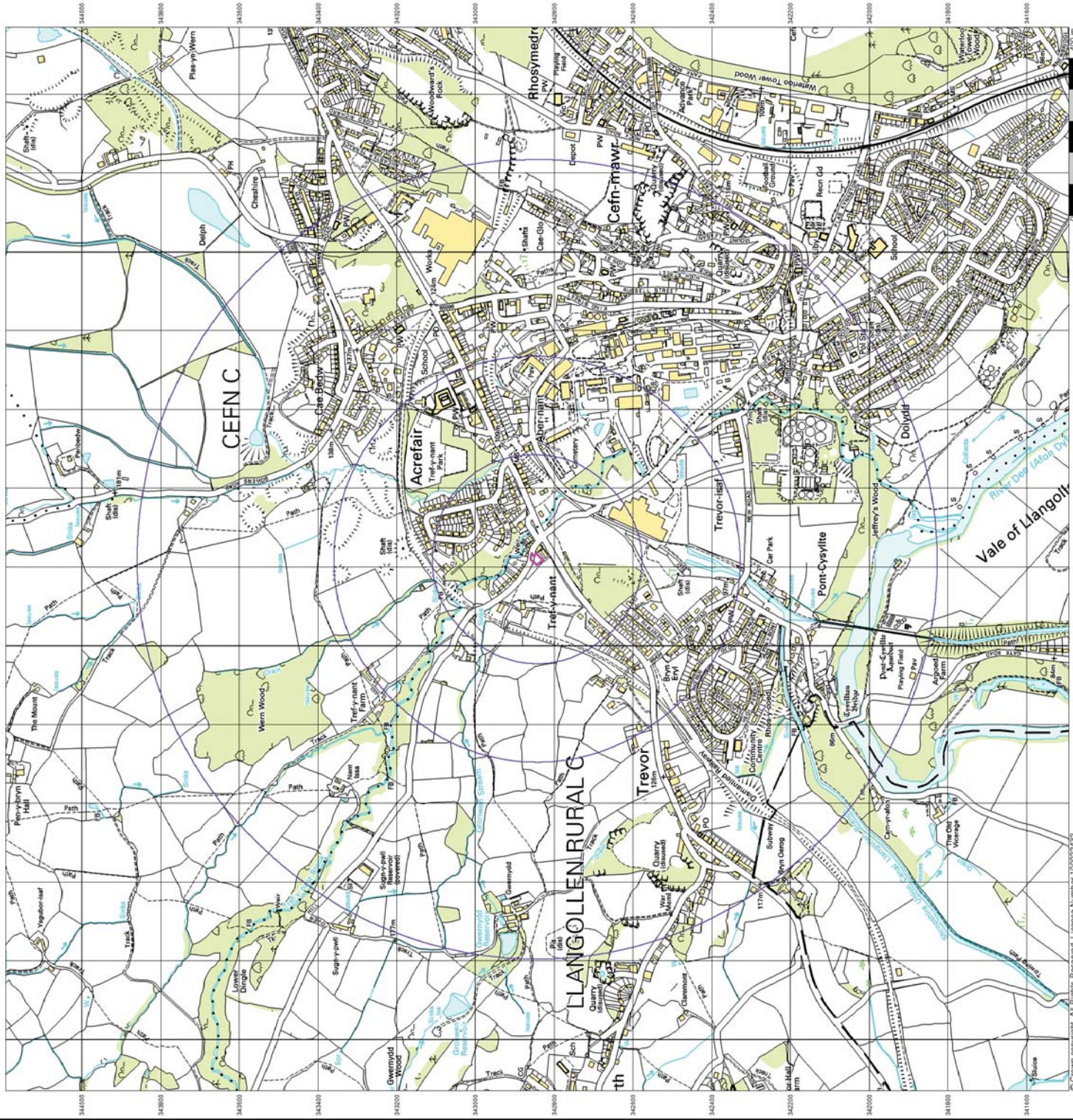


Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details

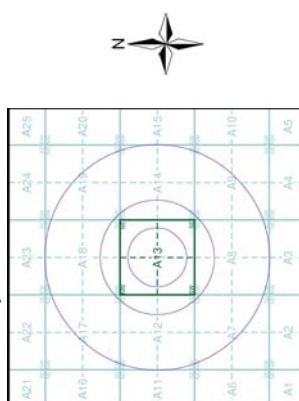
The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG



Map Name(s) and Date(s)



Street View Map - Slice A



Order Details

Order Number: 191649715_1_1

Customer Ref: PN193946

National Grid Reference: 327220, 342840

Slice: A

Site Area (Ha): 0.06

Site Area (Ha): 0.00
Search Buffer (m): 1000

Site Details

Site Details
The Towers Day Nursery Ltd, Llangollen Road, Acrefair,
WREXHAM, LL14 3SG

APPENDIX 9

June 2009 Historical Photographs of Former Rock Cutting (and Present-day Photographs)





© 2018 Google
© 2019 Google



Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



I) Site of a Former Rock Cutting - 1st May 2019

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



2) View down Tower Hill from the site of a Former Rock Cutting - 1st May 2019

APPENDIX 10

BGS Geological Information

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	WGR	Worked Ground (Undivided)	Void	Not Supplied - Holocene

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	TILLD	Till, Devensian	Diamicton	Not Supplied - Devensian
	GFSD	Glaciofluvial Sheet Deposits, Devensian	Sand and Gravel	Not Supplied - Devensian
	GFDUD	Glaciofluvial Deposits, Devensian	Sand and Gravel	Not Supplied - Devensian
	RTDU	River Terrace Deposits (Undifferentiated)	Sand and Gravel	Not Supplied - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	CF	Cefn Rock	Sandstone	Not Supplied - Westphalian
	PLMC	Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation (Undifferentiated)	Mudstone, Siltstone and Sandstone	Not Supplied - Westphalian
	PLMC	Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation (Undifferentiated)	Sandstone	Not Supplied - Westphalian
	ETM	Etruria Formation	Mudstone	Not Supplied - Westphalian
	GS	Gwespwy Sandstone	Sandstone and [Subequal/subordinate] Argillaceous Rocks, Interbedded	Not Supplied - Namurian
	CFS	Cefn-Y-Fedw Sandstone Formation	Sandstone and [Subequal/subordinate] Argillaceous Rocks, Interbedded	Not Supplied - Visean
	CFS	Cefn-Y-Fedw Sandstone Formation	Chert	Not Supplied - Visean
	MRF	Minera Formation	Limestone and [Subequal/Subordinate] Sandstone,	Not Supplied - Visean

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	BSG	Bowland Shale Formation	Interbedded	Not Supplied - Visean
	LGH	Loggerheads Limestone Formation	Limestone	Not Supplied - Visean
	CFML	Cefn Mawr Limestone Formation	Limestone and [Subequal/subordinate] Argillaceous Rocks, Interbedded	Not Supplied - Visean
	DBG	Dinas Bran Formation	Mudstone and Sandstone, Interbedded	Not Supplied - Ludlow
	EY	Elwy Formation	Mudstone, Siltstone and Sandstone	Not Supplied - Ludlow
		Faults		
		Rock Segments		

Geology 1:50,000 Maps

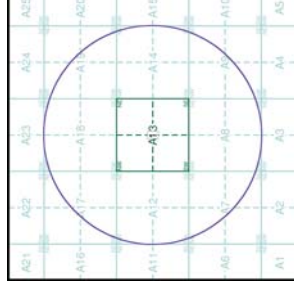
This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.

The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100
Map Sheet No:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100
Map Name:	Wrexham
Map Date:	1993
Bedrock Geology:	Available
Superficial Geology:	Available
Artificial Geology:	Available
Faults:	Not Supplied
Landslip:	Available
Rock Segments:	Not Supplied

Geology 1:50,000 Maps - Slice A

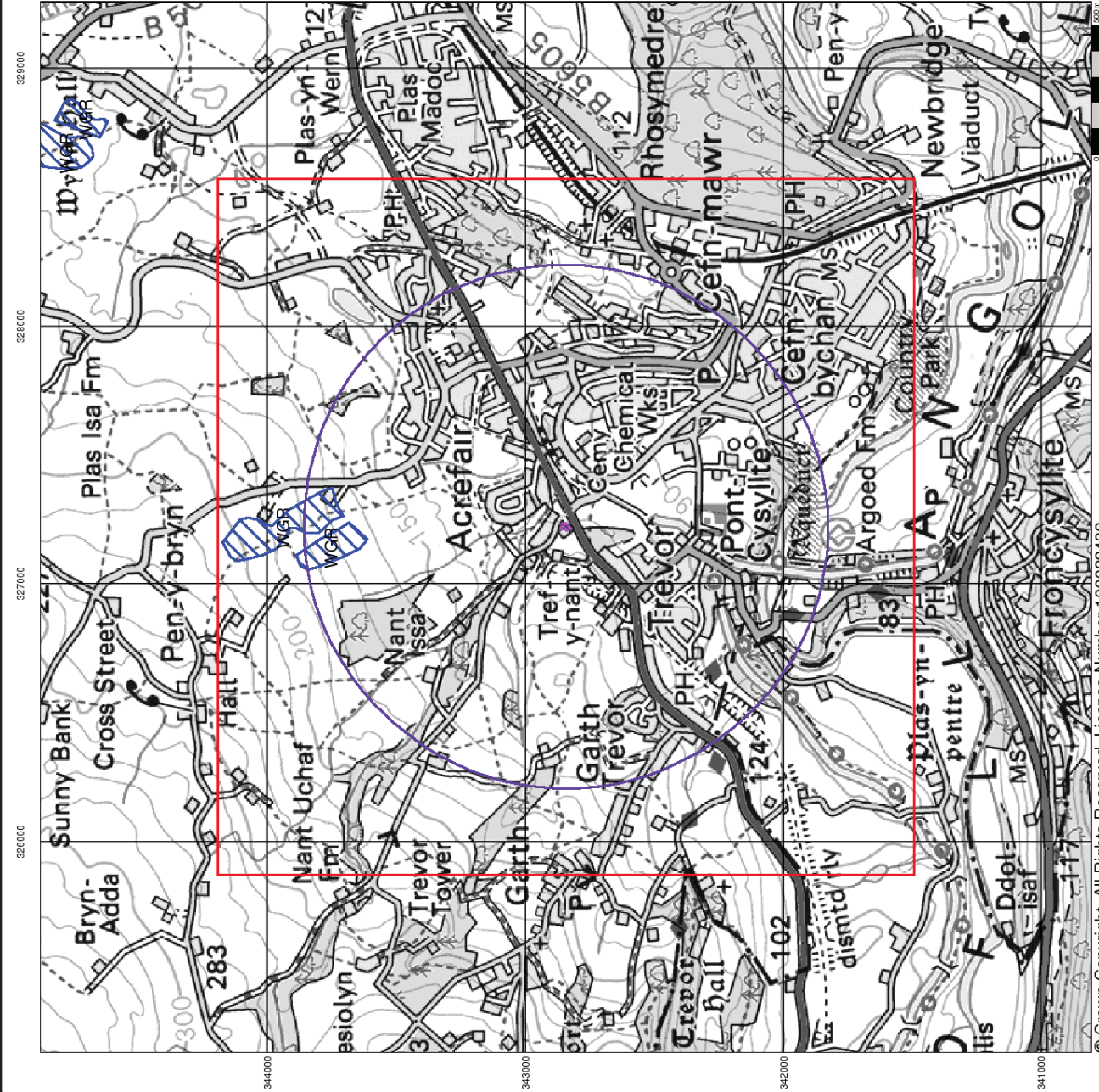


Order Details:

Order Number: 191649715_1_1
 Customer Reference: PN193946
 National Grid Reference: 327220, 342940
 Slice: A
 Site Area (Ha): 0.06
 Search Buffer (m): 1000

Site Details:

The Towers Day Nursery Ltd, Llangollen Road, Acrefair, WREXHAM, LL14 3SG



geotechnics

Artificial Ground and Landslip

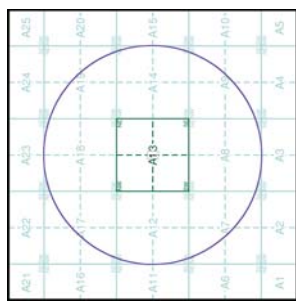
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- In-filled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



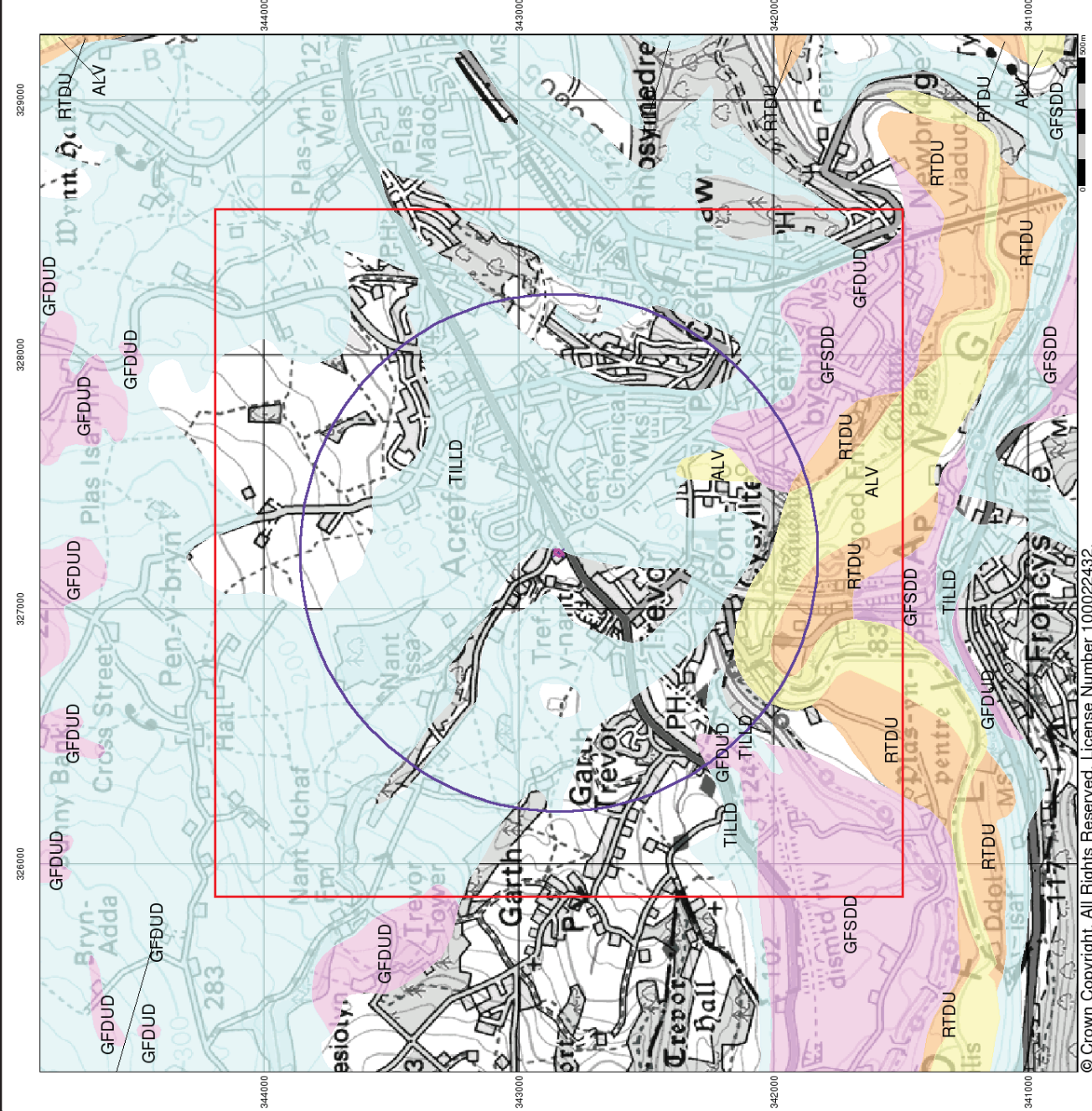
Order Details:

Order Number: 191649715_1_1
Customer Reference: PN193946
National Grid Reference: 327220, 342940
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details:

The Towers Day Nursery Ltd, Llangollen Road, Acrefair, WREXHAM, LL14 3SG





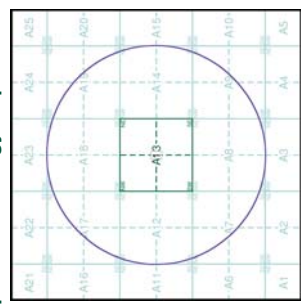
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



Order Details:

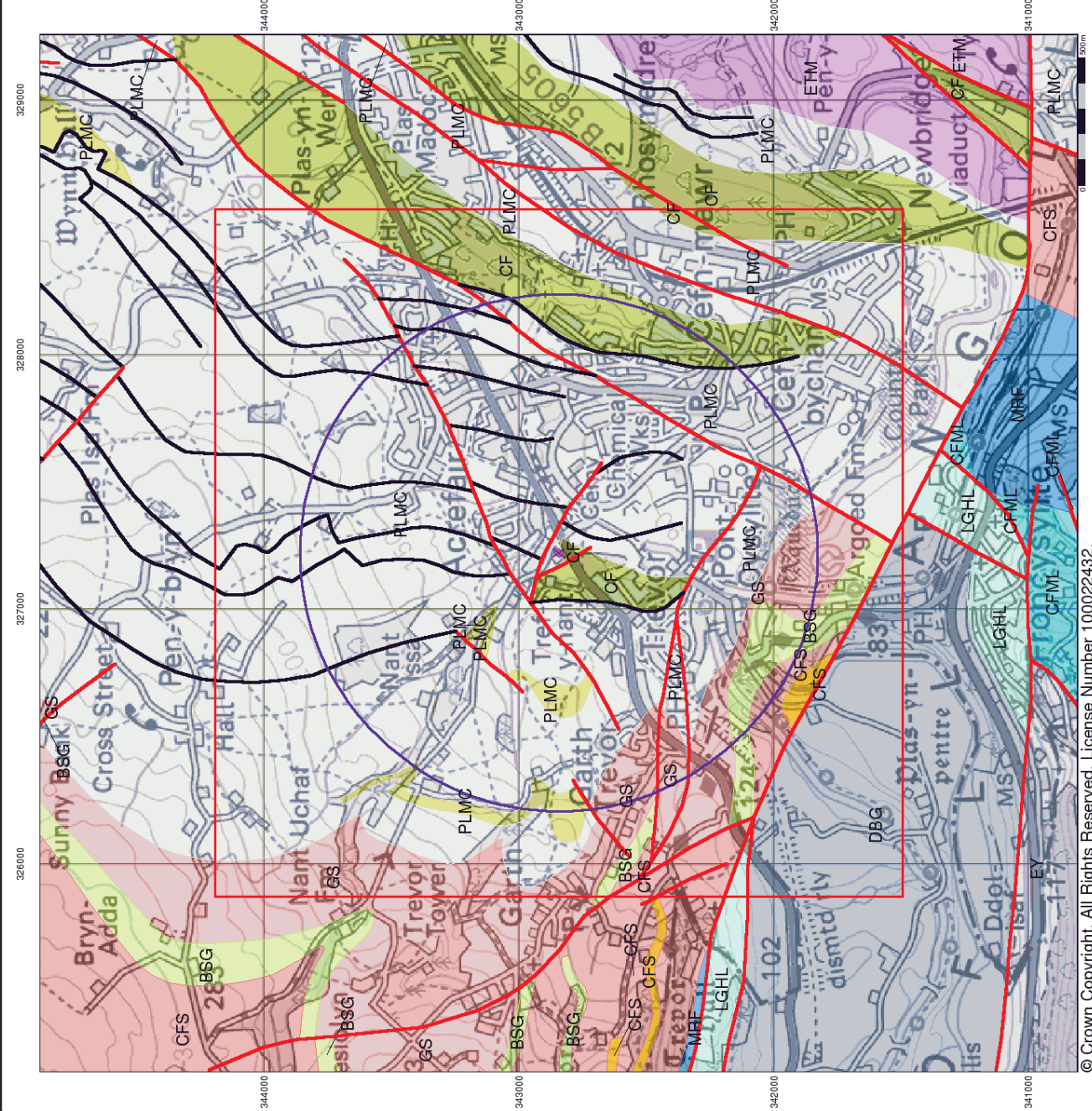
Order Number: 191649715_1_1
Customer Reference: PN193946
National Grid Reference: 327220, 342940
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details:

The Towers Day Nursery Ltd, Llangollen Road, Acrefair, WREXHAM, LL14 3SG



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.enwrock.co.uk



geotechnics

Bedrock and Faults

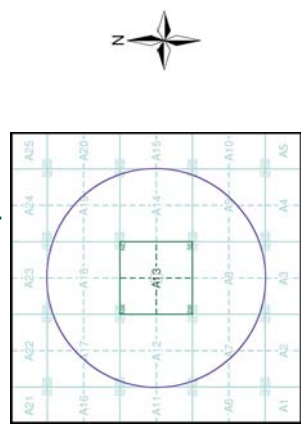
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A

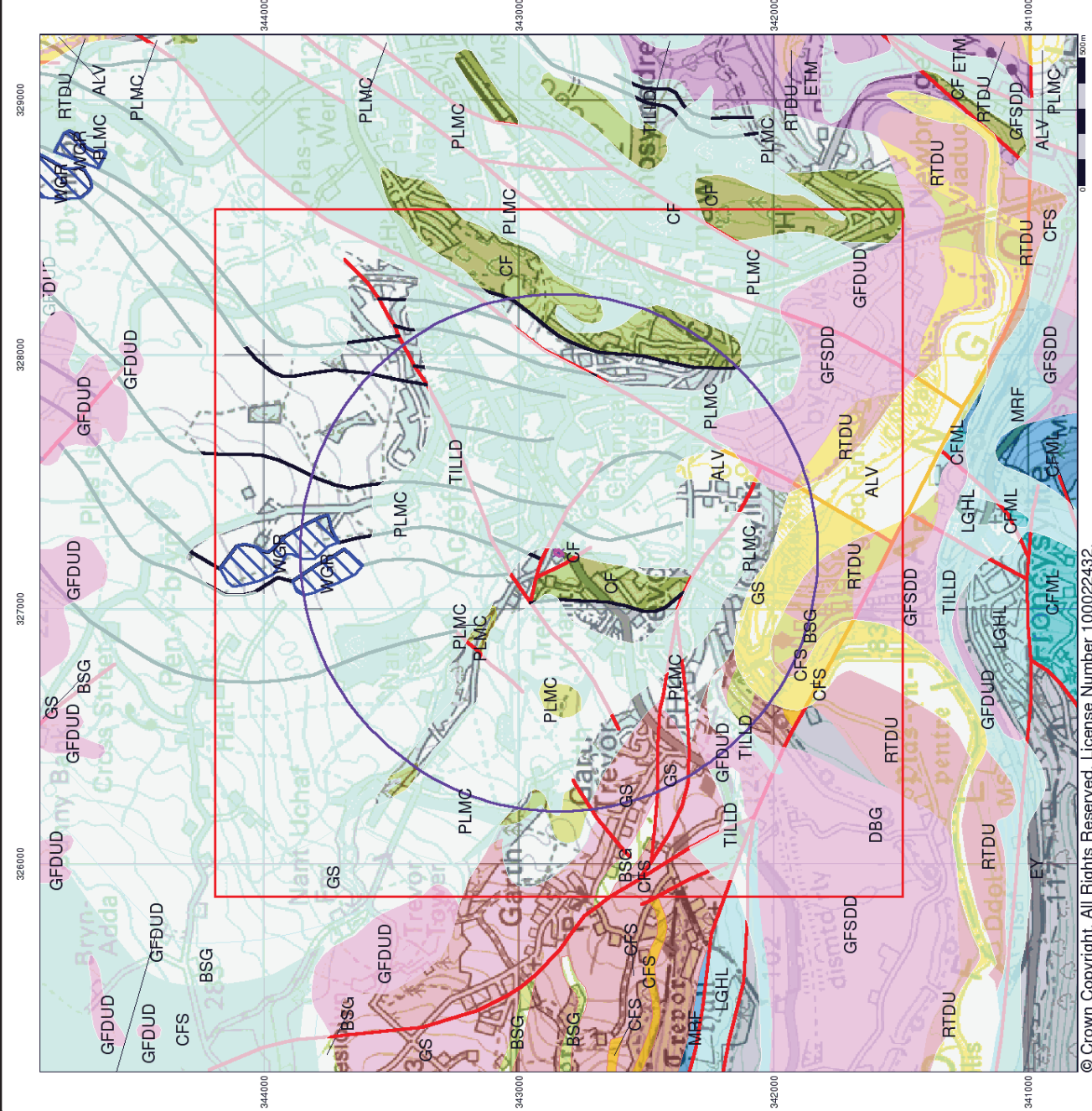


Order Details:

Order Number: 191649715_1_1
Customer Reference: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details:

The Towers Day Nursery Ltd, Llangollen Road, Acrefair, WREXHAM, LL14 3SG



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Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

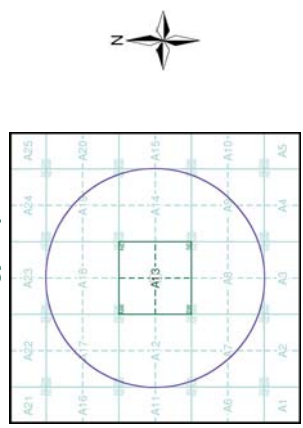
Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the "BGS Lexicon of Named Rock Units". This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



Order Details:

Order Number: 191649715_1_1
Customer: PN193946
National Grid Reference: 327220, 342940
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details:

The Towers Day Nursery Ltd, Llangollen Road, Acrefair, WREXHAM, LL14 3SG



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.enwrock.co.uk

APPENDIX II

BGS 1:10,000 Scale Geological Map Coverage



GEOINDEX ONSHORE

Enter location



Data



Search



Print



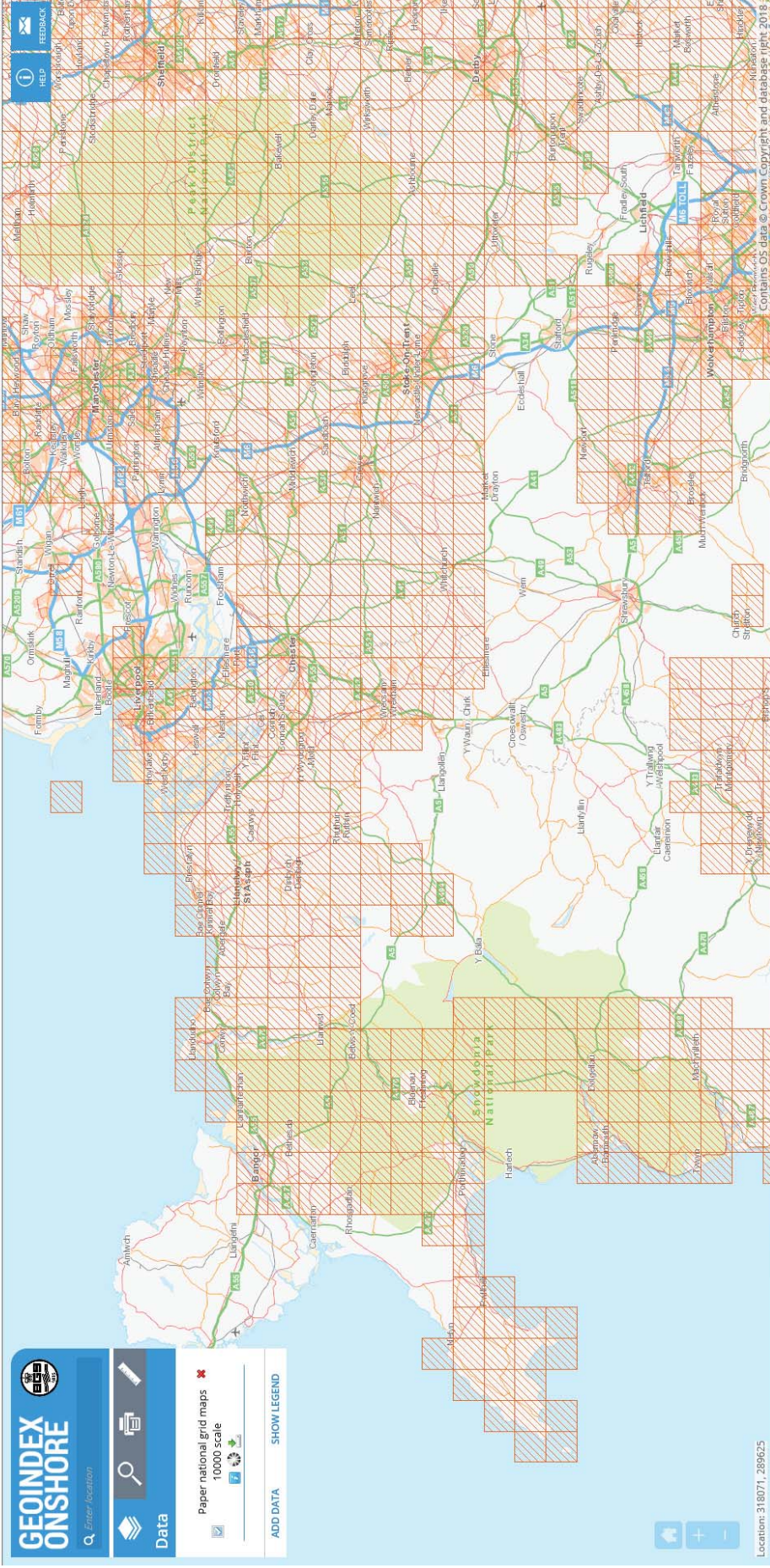
Layers

Paper national grid maps

10000 scale

ADD DATA

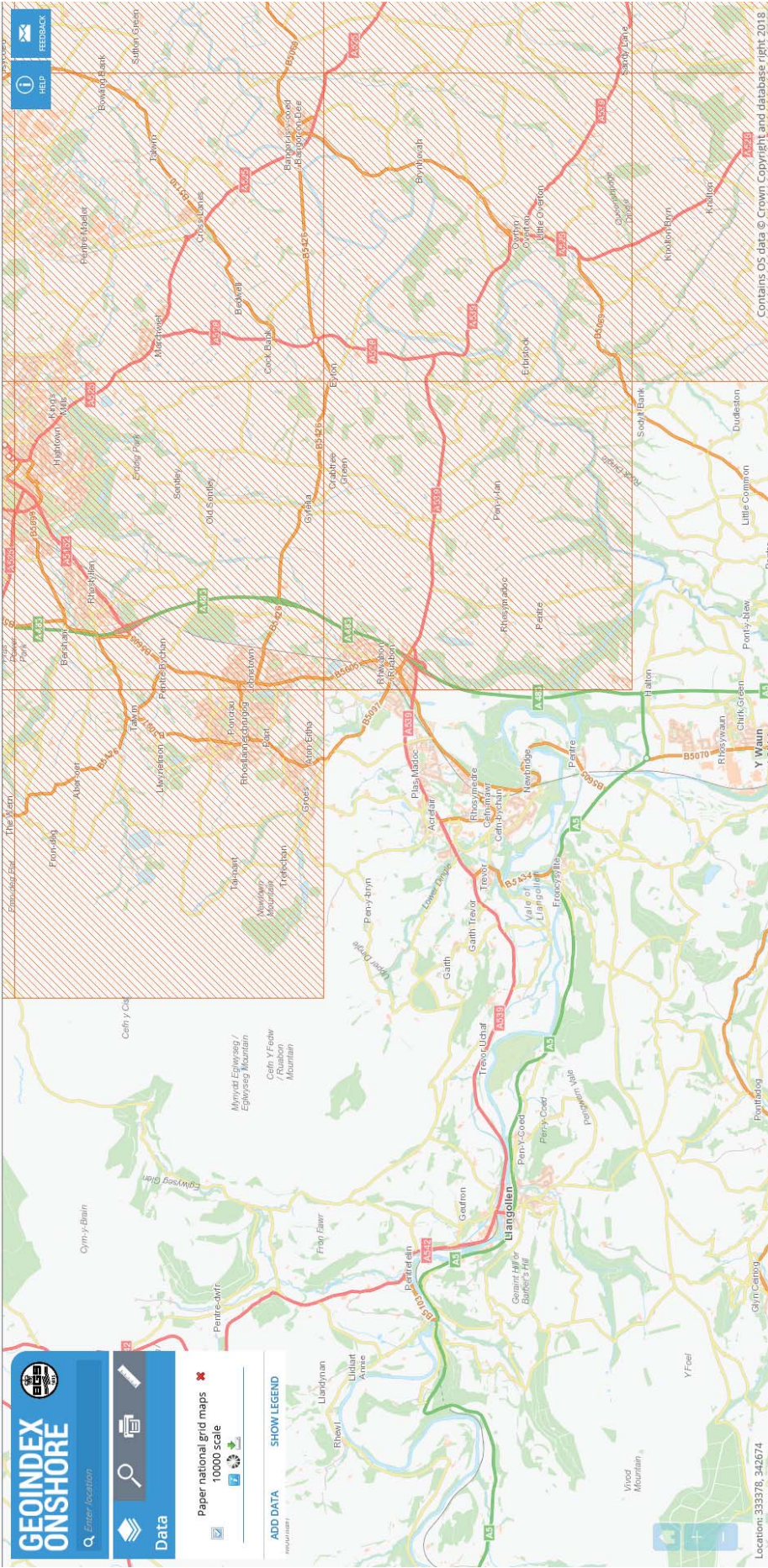
SHOW LEGEND



Location: 318071, 289625

Type here to search

1406 29/04/2019



APPENDIX 12

BGS Borehole Records Maps

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

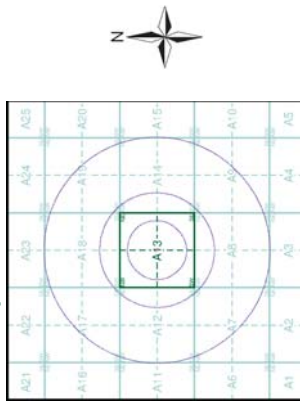
Agency and Hydrological (Boreholes)

- BGS Borehole Depth 0 - 10m
- BGS Borehole Depth 10 - 30m
- BGS Borehole Depth 30m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A

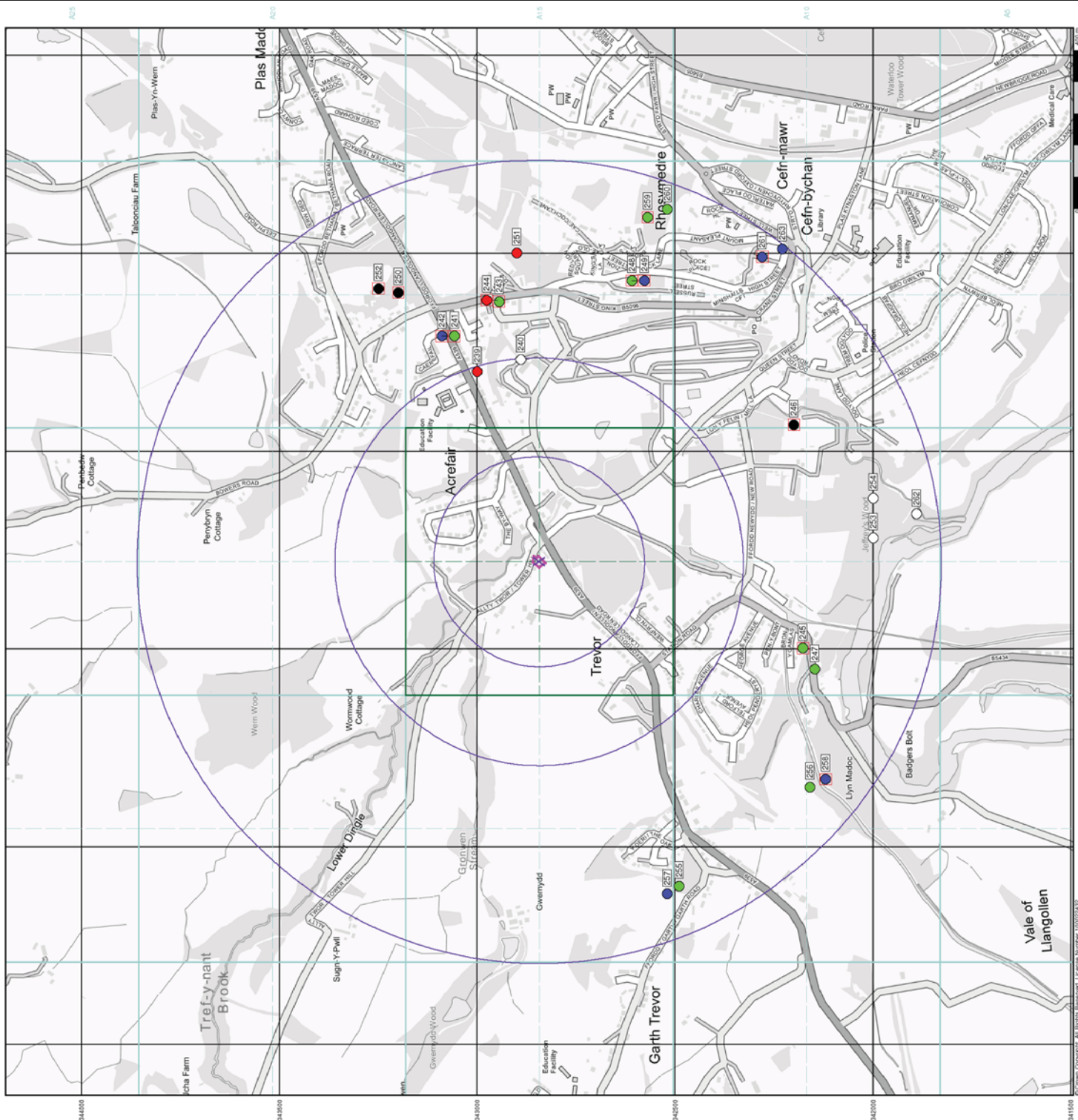


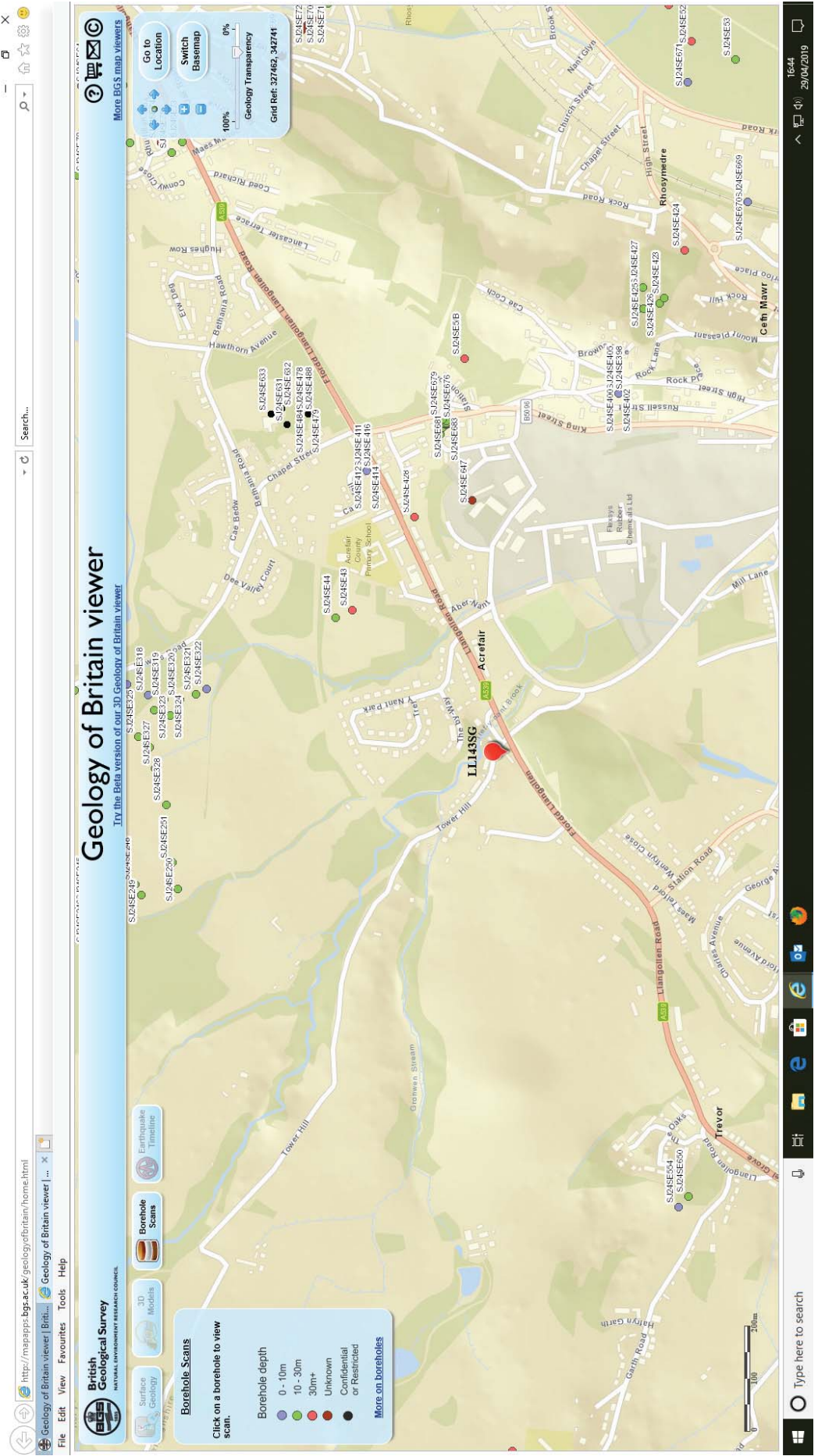
Order Details

Order Number: 191649715_1_1
 Customer Ref: PN193946
 National Grid Reference: 327220, 342840
 Slice: A
 Site Area (Ha): 0.06
 Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Llangelan Road, Acrefair, WREXHAM, LL14 3SG





APPENDIX 13

Coal Authority CON29M Non-Residential Mining Report



The Coal
Authority

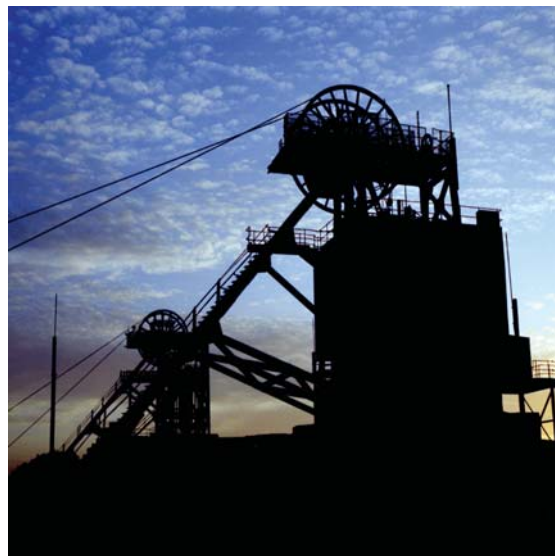
Resolving the **impacts** of mining

CON29M Non-Residential Mining Report

THE TOWERS DAY NURSERY LTD
LLANGOLLEN ROAD
ACREFAIR
WREXHAM

Date of enquiry: 21 January 2019
Date enquiry received: 21 January 2019
Issue date: 21 January 2019

Our reference: 51001993197001
Your reference: 191649715_2|



CON29M Non-Residential Mining Report

This report is based on, and limited to, the records held by the Coal Authority, at the time we answer the search.

Client name

LANDMARK INFORMATION GROUP LIMITED

Enquiry address

THE TOWERS DAY NURSERY LTD, LLANGOLLEN
ROAD, ACREFAIR, WREXHAM

How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

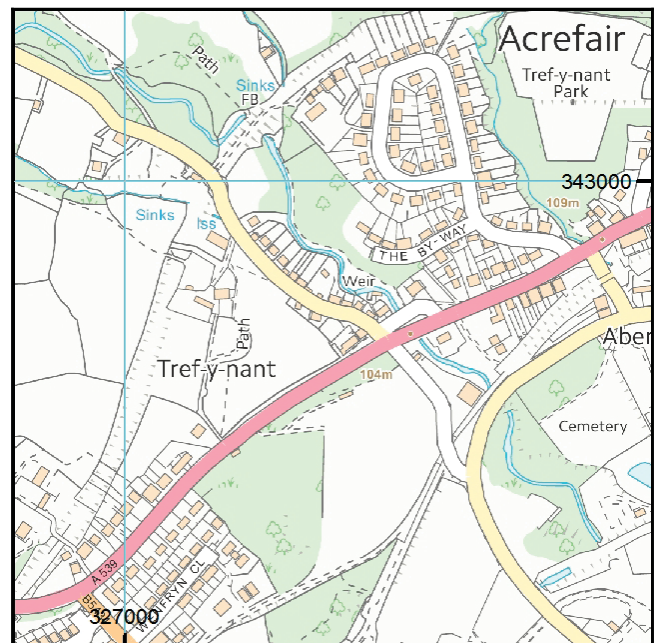
200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

 /company/the-coal-authority

 /thecoalauthority

 /coalauthority



Approximate position of property



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Summary

Has the search report highlighted evidence or potential of		
1	Past underground coal mining	Yes
2	Present underground coal mining	No
3	Future underground coal mining	Yes
4	Mine entries	Yes
5	Coal mining geology	No
6	Past opencast coal mining	No
7	Present opencast coal mining	No
8	Future opencast coal mining	No
9	Coal mining subsidence	No
10	Mine gas	No
11	Hazards related to coal mining	No
12	Withdrawal of support	No
13	Working facilities order	No
14	Payments to owners of former copyhold land	No

For detailed findings, please go to page 4.

Detailed findings

1. Past underground coal mining

The property is not within a surface area that could be affected by any past recorded underground coal mining.

However the property is in an area where the Coal Authority believes there is coal at or close to the surface. This coal may have been worked at some time in the past. The potential presence of coal workings at or close to the surface should be considered, particularly prior to any site works or future development activity, as ground movement could still be a risk. Your attention is drawn to the Comments on the Coal Authority information section of the report.

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 known coal mine entries within, or within 20 metres of, the boundary of the property.

There may however be mine entries/additional mine entries in the local area which the Coal Authority has no knowledge of.

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.

Comments on the Coal Authority information

The Coal Authority own the copyright in this report and the information used is protected by our database right.

In view of the mining circumstances a prudent developer would seek appropriate technical advice before any works are undertaken.

Therefore if development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply good engineering practice developed for mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or mines of coal without the permission of the Coal Authority. Developers should be aware that the investigation of coal seams/former mines of coal may have the potential to generate and/or displace underground gases and these risks both under and adjacent to the development should be fully considered in developing any proposals. The need for effective measures to prevent gases entering into public properties either during investigation or after development also needs to be assessed and properly addressed. This is necessary due to the public safety implications of any development in these circumstances.

Additional remarks

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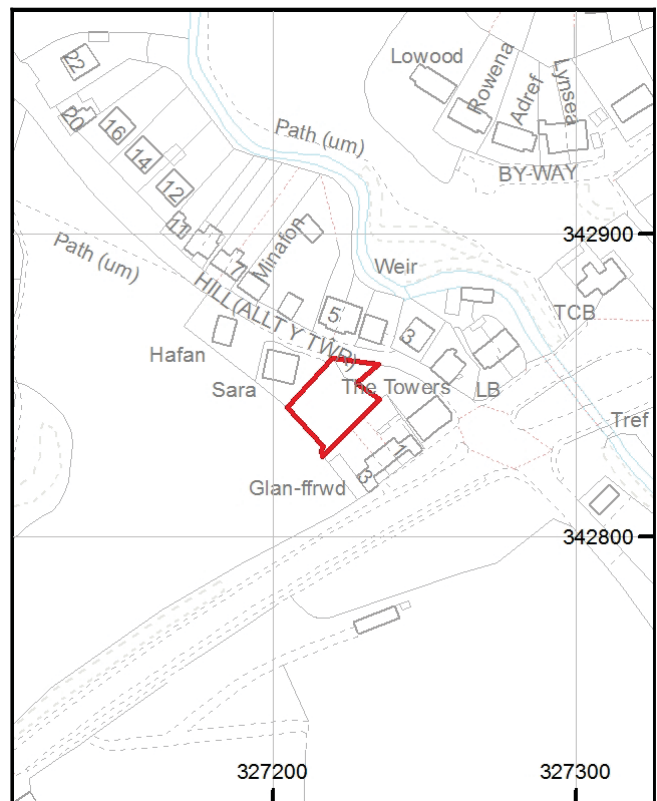
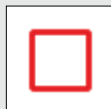
Alternative formats

If you would like this report in an alternative format, please contact our communications team.

Enquiry boundary

Key

Approximate position of enquiry boundary shown



How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

 /company/the-coal-authority

 /thecoalauthority

 /coalauthority

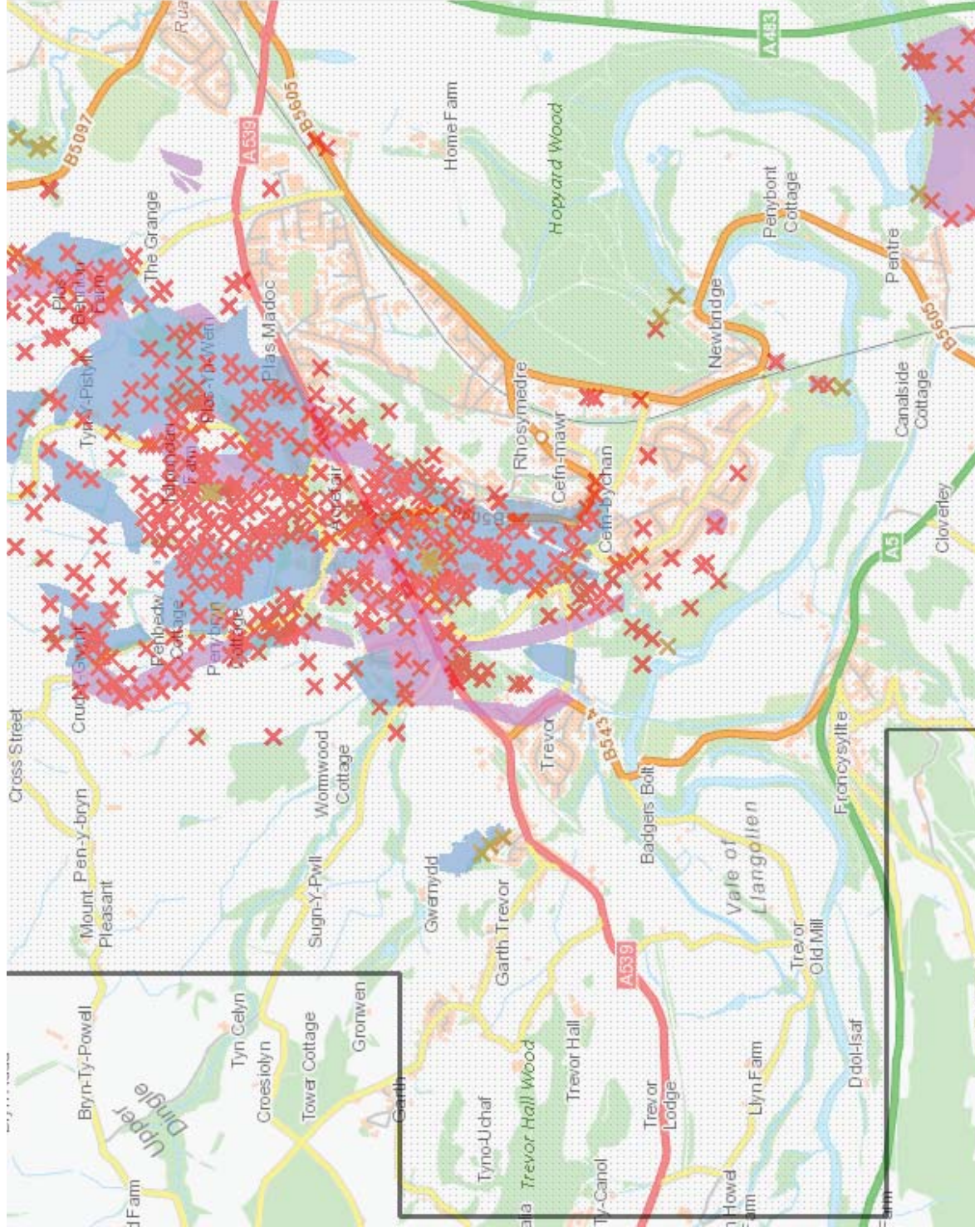


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APPENDIX I 4

Coal Authority Interactive Map Excerpt



Planning

Grey layers cannot be viewed at this scale
Click on a layer name for layer information

- ☒ Mine Entry
- ☐ Abandoned Mines Catalogue
- ☐ Development High Risk Area
- ☐ Surface Coal Resource Areas
- ☐ Mine Entry Potential Zone of Influence
- ☐ Fissures and Breaklines
- ☐ Surface Mining (Past and Current)
- ☒ Past Shallow Coal Mine Workings
- ☒ Probable Shallow Coal Mine Workings
- ☐ Coal Outcrops
- ☐ NE Mining & Groundwater Constraints
- ☒ Coal Mining Reporting Area



100% 0%

Transparency

Help

APPENDIX 15

Mining and Ground Stability Information

Historical Land Use Information (1:10,000)

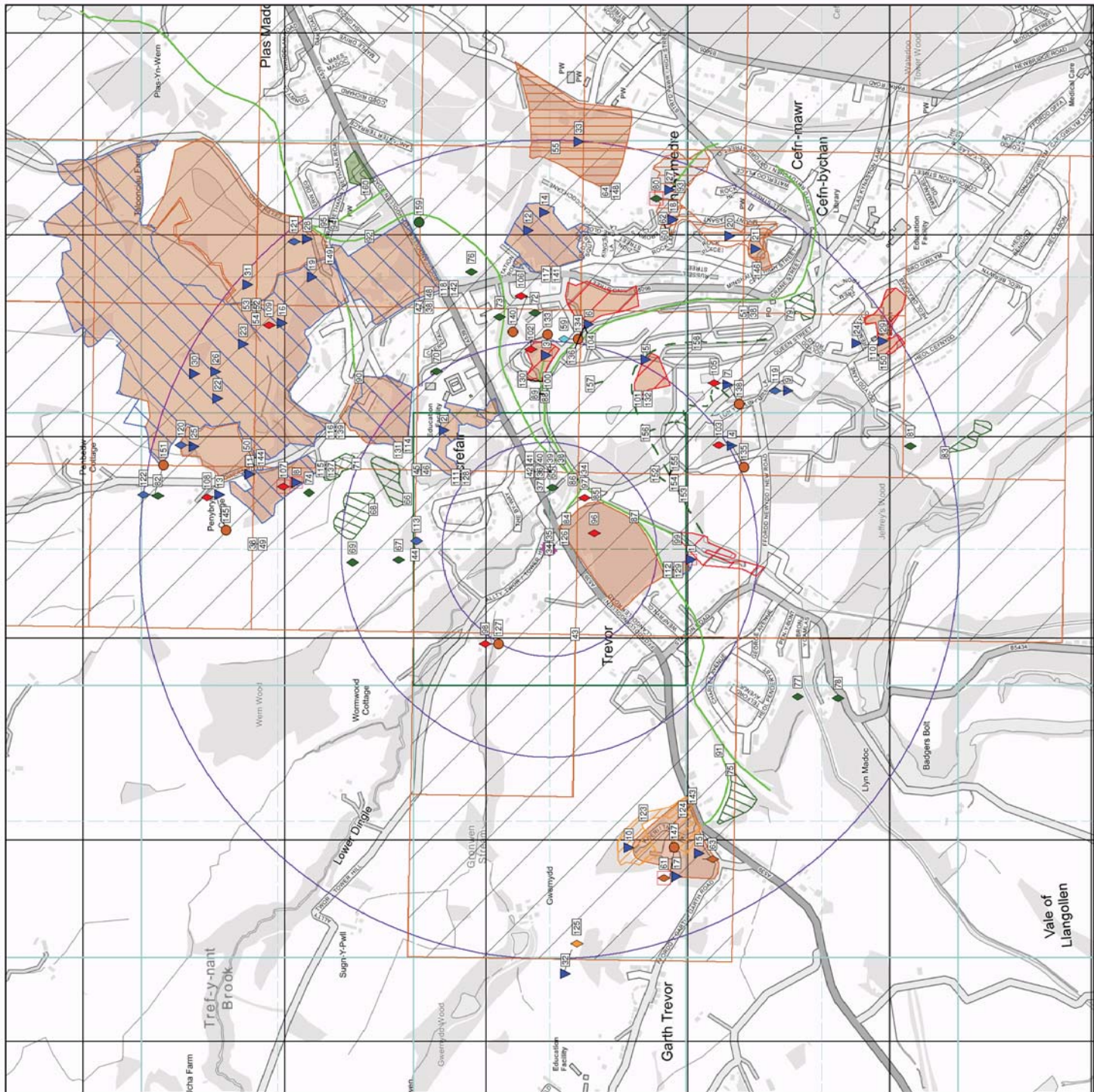
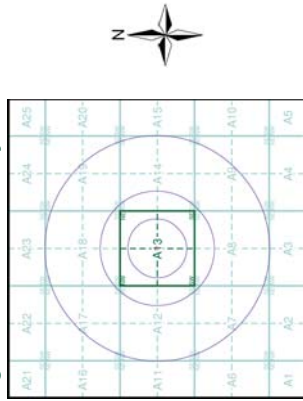
- General**
- Specified Site
 - Specified Buffer(s)
 - Bearing Reference Point
 - Map ID
 - Several of Type at Location
- Potentially Contaminative Industrial Uses (Past Land Uses - Mining)**
- Air Shafts
 - Disturbed Ground
 - General Quarrying
 - Heap, unknown constituents
 - Mineral Railway
 - Mining and Quarrying General
 - Mining of Coal & Lignite
 - Mining of Sand and Clay, Operation of Sand and Gravel Pits

- Historical Land Use**
- Potentially Infilled Land (Non-Water)
 - Potentially Infilled Land (Water)
 - Former Marsh
- Mining Data**
- Potential Mining Area
 - BCS Recorded Mineral Site

- Order Details**
- Order Number: 191649715_1_1
 Customer Ref: PN193946
 National Grid Reference: 327220, 342840
 Slice: A
 Site Area (Ha): 0.06
 Search Buffer (m): 1000

- Site Details**
- The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM, LL14 3SG

Mining and Ground Stability - Slice A



Ground Stability Data (1:50,000)

General

- | Specified Site | Specified Buffer(s) | Bearing Reference Point |
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Potential for Compressible Ground Stability Hazards

-

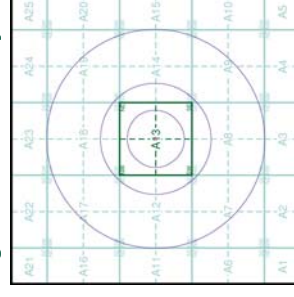
Potential for Collapsible Ground Stability Hazards

-

Brine Pumping and Salt Mining

- | Brine Pumping Related Feature | Salt Mining Related Feature |
|---|---|
| | |
| | |

Mining and Ground Stability - Slice A

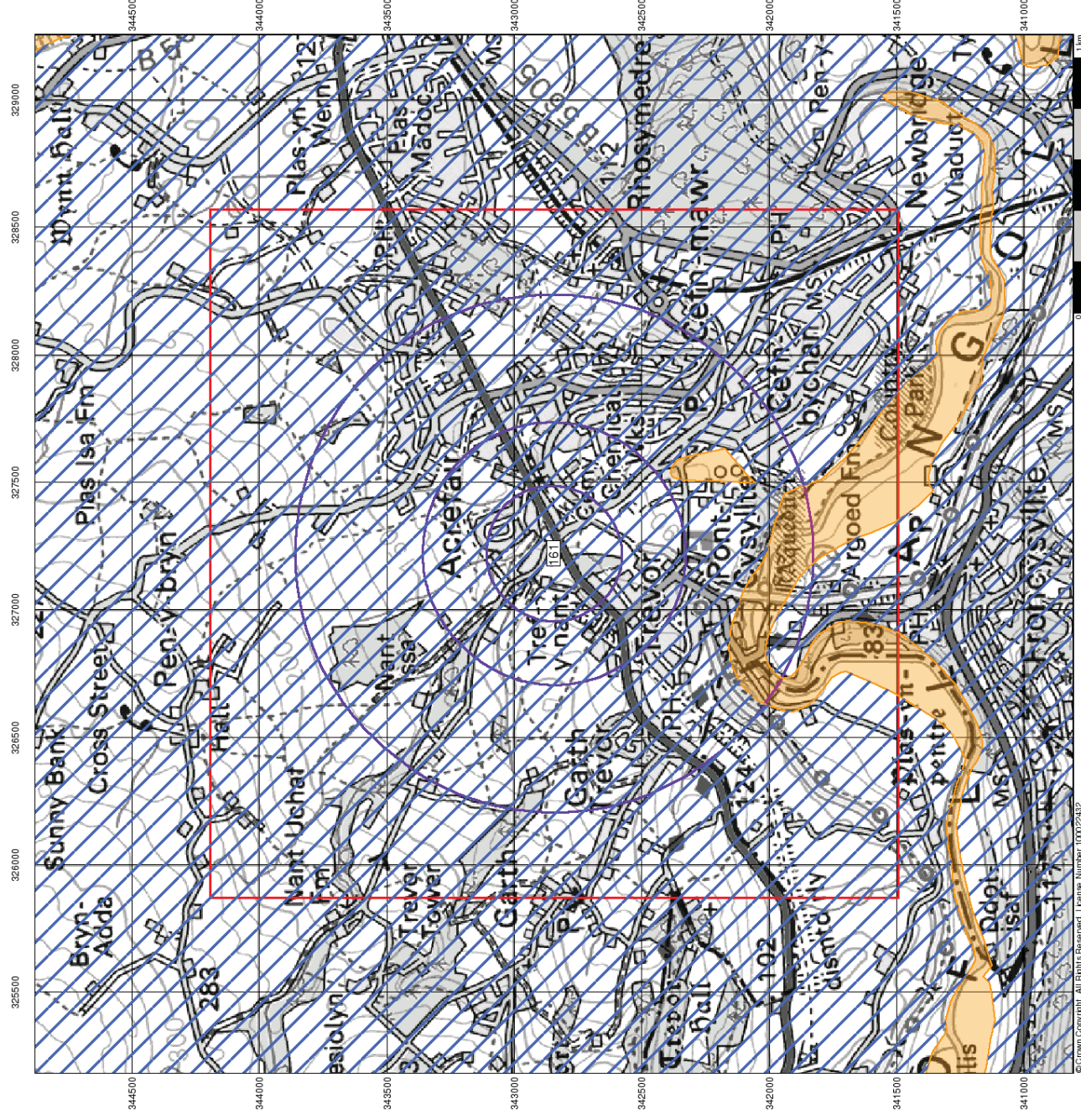


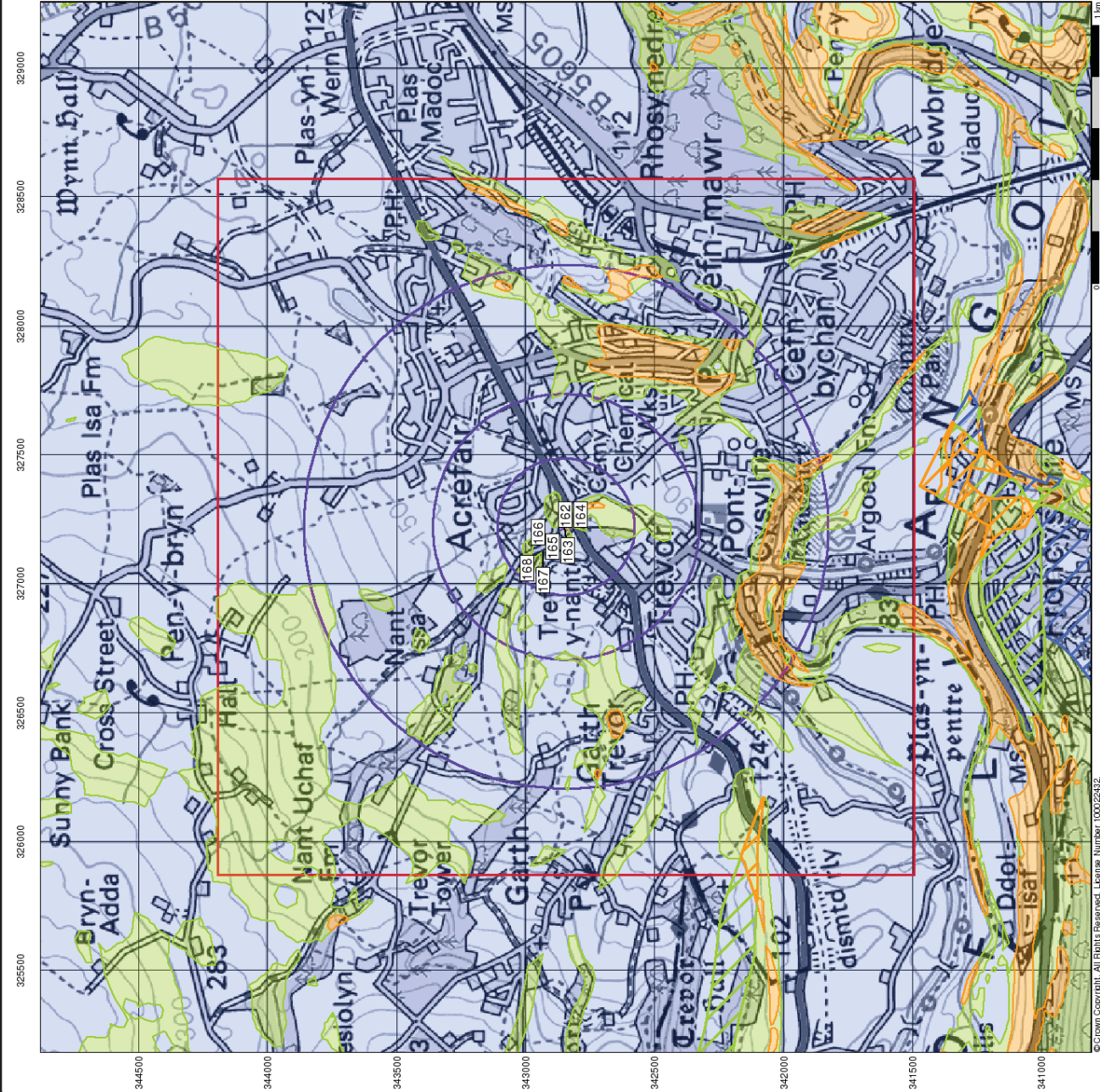
Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair, WREXHAM,
LL14 3SG





Ground Stability Data (1:50,000)

General
Specified Site
Specified Buffer(s)
Map ID
Bearing Reference Point

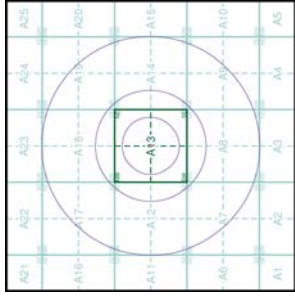
Potential for Landslide Ground Stability Hazards

High
Moderate
Low
Very Low

Potential for Ground Dissolution Stability Hazards

High
Moderate
Low
Very Low

Mining and Ground Stability - Slice A



Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342940
Site: A
Site Area (Ha): 0.06
Search Buffer (m): 1000

Site Details

The Towers Day Nursery Ltd, Llangollen Road, Acrefair, WREXHAM, LL14 3SG



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.enwreck.co.uk

Envirocheck[®] Report:

Mining and Ground Stability Datasheet

Order Details:

Order Number:

191649715_1_1

Customer Reference:

PN193946

National Grid Reference:

327220, 342840

Slice:

A

Site Area (Ha):

0.06

Search Buffer (m):

1000

Site Details:

The Towers Day Nursery Ltd, Llangollen Road
Acrefair
WREXHAM
LL14 3SG

Client Details:

Mr J Booth
Geotechnics Ltd
The Geotechnical Centre
Unit 1 Borders Industrial Park
River Lane
Saltney
CH4 8RJ

Report Section and Details	Page Number
Summary	-
The Summary section provides an overview of the data contained within the report, detailing the number of data set features or the existence of a data set in relation to the buffer selected. For ease of reference, the report is broken down into 4 sections of data; Mining and Natural Cavities Data, Historical Land Use Information (1:2,500), Historical Land Use Information (1:10,000) and Ground Stability Data (1:50,000).	
Mining and Natural Cavities Data	1
The Mining and Natural Cavities Data section features data sets related to the existence of mining areas and their potential hazards; and details of naturally formed cavities. Data sets within this section are not plotted, with the exception of BGS Recorded Mineral Sites and Potential Mining Areas which feature on the Historical Land Use Information (1:10,000) map.	
Historical Land Use Information (1:2,500)	11
The Historical Land Use Information (1:2,500) section contains data captured from analysis carried out by Landmark of 1:1,250 and 1:2,500 scale historical Ordnance Survey mapping, identifying areas where, historically, the land uses were potentially contaminative. For the purpose of this Envirocheck module, only historical data relating to mining and ground stability has been included and plotted on the corresponding Historical Land Use Information (1:2,500) map. This section also includes the Subterranean Features data set, which details various man-made and man-used underground spaces obtained from the Subterranea Britannica society.	
Historical Land Use Information (1:10,000)	12
The Historical Land Use (1:10,000) section covers data captured from the systematic analysis carried out by Landmark of 1:10, 560 and 1:10,000 scale historical Ordnance Survey mapping dating back to the mid-19th century, identifying potentially contaminative past industrial land uses. For the purpose of this Envirocheck module, only data relating to mining and ground stability has been included and plotted on the accompanying Historical Land Use Information (1:10,000) map.	
Ground Stability Data (1:50,000)	17
The Ground Stability (1:50,000) section includes the BGS Geosure data suite, reporting features to 250m and plotted onto 3 separate maps. Also reported is brine subsidence, brine mining and salt mining data sets, of which Brine Pumping and Salt Mining Related Features are plotted, and subsidence insurance claims and insurance investigations data, which is not plotted.	
Historical Map List	18
The Historical Map List section details the historical mapping that has been analysed for your site, in relation to the Historical Land Use Information sections.	
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The brine subsidence data relating to the Droitwich area as provided in this report is derived from JPB studies and physical monitoring undertaken annually over more than 35 years. For more detailed interpretation contact enquiries@jpb.co.uk. JPB retain the copyright and intellectual rights to this data and accept no liability for any loss or damage, including in direct or consequential loss, arising from the use of this data.

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Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m
Mining and Natural Cavities Data					
BGS Recorded Mineral Sites	pg 1			5	31
Coal Mining Affected Areas	pg 7	Yes	n/a	n/a	n/a
Man Made Mining Cavities					
Mining Instability	pg 7	Yes	n/a	n/a	n/a
Natural Cavities					
Non Coal Mining Areas of Great Britain	pg 7	Yes		n/a	n/a
Potential Mining Areas	pg 7	2	8	3	9
Historical Land Use Information (1:2,500)					
Extractive Industries or Potential Excavations from 1855-1909 (100m)	pg 11		1	n/a	n/a
Extractive Industries or Potential Excavations from 1893-1915 (100m)	pg 11		1	n/a	n/a
Extractive Industries or Potential Excavations from 1906-1937 (100m)	pg 11		1	n/a	n/a
Extractive Industries or Potential Excavations from 1924-1949 (100m)				n/a	n/a
Extractive Industries or Potential Excavations from 1950-1980 (100m)				n/a	n/a
Subterranean Features (100m)				n/a	n/a
Historical Land Use Information (1:10,000)					
Air Shafts	pg 12				1
Disturbed Ground					
General Quarrying	pg 12				6
Heap, unknown constituents	pg 12		1	4	15
Mineral Railway	pg 13		4	2	6
Mining & quarrying general	pg 13		2	4	10
Mining of coal & lignite	pg 14			4	8
Quarrying of sand & clay, operation of sand & gravel pits	pg 15				3
Former Marshes					
Potentially Infilled Land (Non-Water)	pg 15		1	6	19
Potentially Infilled Land (Water)	pg 16			6	3

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m
Ground Stability Data (1:50,000)					
CBSCB Compensation District			n/a	n/a	n/a
Brine Pumping Related Features					
Brine Subsidence Solution Area					
Potential for Collapsible Ground Stability Hazards	pg 17	Yes		n/a	n/a
Potential for Compressible Ground Stability Hazards	pg 17	Yes		n/a	n/a
Potential for Ground Dissolution Stability Hazards	pg 17	Yes		n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 17	Yes	Yes	n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 17	Yes		n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 17	Yes		n/a	n/a
Salt Mining Related Features					
Subsidence Insurance Claims				n/a	n/a
Subsidence Investigations	pg 17		1	n/a	n/a

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Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	BGS Recorded Mineral Sites Site Name: Tref-Y-Nant Location: Cefn-Mawr, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185696 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A13SW (S)	302	1	327187 342527
1	BGS Recorded Mineral Sites Site Name: Tref-Y-Nant Location: Cefn-Mawr, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185695 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A8NW (S)	332	1	327194 342496
2	BGS Recorded Mineral Sites Site Name: Tre-Y-Nant Hall Location: Cefn-Mawr, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185691 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A13NE (NE)	377	1	327514 343109
3	BGS Recorded Mineral Sites Site Name: Edward'S Clay Pit Location: Cefn-Mawr, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 98661 Type: Opencast Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Common Clay and Shale Positional Accuracy: Located by supplier to within 10m	A14NW (E)	465	1	327700 342855
3	BGS Recorded Mineral Sites Site Name: Plas Kynaston Location: Cefn-Mawr, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185699 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A14NW (E)	472	1	327706 342875

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
4	BGS Recorded Mineral Sites Site Name: Mill Inn Location: Cefn-Mawr, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185694 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A8NE (SE)	504	1	327476 342395
5	BGS Recorded Mineral Sites Site Name: Plas Kynaston Location: Cefn-Mawr, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185692 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A14SW (SE)	513	1	327690 342609
6	BGS Recorded Mineral Sites Site Name: Plas-Aber-Nant Location: Cefn-Mawr, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185698 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A14SW (E)	551	1	327777 342750
7	BGS Recorded Mineral Sites Site Name: Mill Inn Location: Cefn-Mawr, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185693 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A9NW (SE)	589	1	327628 342406
8	BGS Recorded Mineral Sites Site Name: Penbedw Fireclay Works Coal Pit Location: Acrefair, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 98680 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Coal Measures Group Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A18SE (N)	612	1	327385 343450

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
8	BGS Recorded Mineral Sites Site Name: Penbedw Fireclay Works Location: Acrefair, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 14102 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Fireclay Positional Accuracy: Located by supplier to within 10m	A18SE (N)	637	1	327385 343475
9	BGS Recorded Mineral Sites Site Name: Trevor-Isaf Location: Garth, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185711 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A9NW (SE)	696	1	327613 342256
10	BGS Recorded Mineral Sites Site Name: Garth Brickworks Location: Trevor, Llangollen, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 7086 Type: Opencast Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Coal Measures Group Commodity: Common Clay and Shale Positional Accuracy: Located by supplier to within 10m	A12SW (W)	750	1	326480 342650
11	BGS Recorded Mineral Sites Site Name: Penbedw Fireclay Works Coal Pit Location: Acrefair, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 98681 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Coal Measures Group Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A18NE (N)	753	1	327405 343590
12	BGS Recorded Mineral Sites Site Name: Caeglo Colliery, Bye Pit Location: Cefn-Mawr, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 98670 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Coal Measures Group Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A14NE (E)	777	1	328010 342900
13	BGS Recorded Mineral Sites Site Name: Penbedw Fireclay Works Location: Acrefair, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 98676 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Coal Measures Group Commodity: Fireclay Positional Accuracy: Located by supplier to within 10m	A18NE (N)	818	1	327355 343665

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
14	BGS Recorded Mineral Sites Site Name: Caeglo Colliery, Wards Deep Engine Pit Location: Cefn-Mawr, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 98671 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Coal Measures Group Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A14NE (E)	820	1	328055 342860
15	BGS Recorded Mineral Sites Site Name: Garth Trevor Quarry Location: Ruabon, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 242273 Type: Opencast Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Gwespys Sandstone Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A7NW (SW)	825	1	326466 342476
16	BGS Recorded Mineral Sites Site Name: Penbedw Fireclay Works Location: Acrefair, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 98677 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Coal Measures Group Commodity: Fireclay Positional Accuracy: Located by supplier to within 10m	A19SW (NE)	851	1	327780 343510
17	BGS Recorded Mineral Sites Site Name: Garth Trevor Quarry Location: Ruabon, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 5649 Type: Opencast Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Gwespys Sandstone Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A12SW (W)	856	1	326408 342532
18	BGS Recorded Mineral Sites Site Name: Cefn Stone Quarries Location: Cefn Mawr, Ruabon, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 198579 Type: Opencast Status: Ceased Operator: Individual'S Name Withheld Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Cefn Rock Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A14SE (E)	858	1	328037 342541
19	BGS Recorded Mineral Sites Site Name: Delph Location: Ruabon, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185703 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A19SW (NE)	878	1	327894 343436

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
20	BGS Recorded Mineral Sites Site Name: Cefn Mawr Location: Cefn Mawr, Ruabon, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 8455 Type: Opencast Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Cefn Rock Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A9NE (SE)	882	1	327996 342400
21	BGS Recorded Mineral Sites Site Name: Cefn Stone Quarries Location: Cefn Mawr, Ruabon, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 198580 Type: Opencast Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Cefn Rock Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A9NE (SE)	890	1	327964 342336
22	BGS Recorded Mineral Sites Site Name: Penbedw Location: Ruabon, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185702 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A19NW (NE)	894	1	327597 343674
23	BGS Recorded Mineral Sites Site Name: Delph Cottages Location: Ruabon, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185679 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A19NW (NE)	898	1	327728 343607
24	BGS Recorded Mineral Sites Site Name: Cefn Colliery Location: Cefn-Mawr, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 98673 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Coal Measures Group Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A9SW (SE)	903	1	327730 342085

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
25	BGS Recorded Mineral Sites Site Name: Penbedw Location: Ruabon, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185687 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A18NE (N)	905	1	327474 343729
26	BGS Recorded Mineral Sites Site Name: Penbedw Fireclay Works Location: Acrefair, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 98678 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Coal Measures Group Commodity: Fireclay Positional Accuracy: Located by supplier to within 10m	A19NW (NE)	923	1	327660 343675
27	BGS Recorded Mineral Sites Site Name: Cefn Stone Quarries, No. 1 Location: Cefn-Mawr, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 14103 Type: Opencast Status: Ceased Operator: Individual'S Name Withheld Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Cefn Rock Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A14SE (E)	924	1	328110 342550
28	BGS Recorded Mineral Sites Site Name: Delph Location: Ruabon, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185704 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A19SE (NE)	958	1	327988 343448
29	BGS Recorded Mineral Sites Site Name: Cefn Colliery, Cae Gwily Pit Location: Cefn-Mawr, Ruabon, Wrexham, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 98672 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Coal Measures Group Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A9SW (SE)	960	1	327735 342020

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
30	BGS Recorded Mineral Sites Site Name: Delph Cottages Location: Ruabon, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185690 Type: Underground Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation And Pennine Middle Coal Measures Formation (Undifferentiated) Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A19NW (NE)	966	1	327654 343727
31	BGS Recorded Mineral Sites Site Name: Delph Brick & Tile Works Location: Delph, Ruabon, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 14106 Type: Opencast Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Common Clay and Shale Positional Accuracy: Located by supplier to within 10m	A19NW (NE)	978	1	327875 343595
32	BGS Recorded Mineral Sites Site Name: Gwernydd Clay Pit Location: Garth, Wrexham, Denbighshire Source: British Geological Survey, National Geoscience Information Service Reference: 185713 Type: Opencast Status: Ceased Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Quaternary Geology: Till, Devensian Commodity: Common Clay and Shale Positional Accuracy: Located by supplier to within 10m	A12SW (W)	980	1	326227 342788
33	BGS Recorded Mineral Sites Site Name: Cefn Stone Quarries, No. 2 Location: Cefn-Mawr, Ruabon, Clwyd Source: British Geological Survey, National Geoscience Information Service Reference: 14104 Type: Opencast Status: Ceased Operator: Individual'S Name Withheld Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Cefn Rock Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A14SE (E)	998	1	328230 342775
	Coal Mining Affected Areas Description: In an area which may be affected by coal mining activity. It is recommended that a coal mining report is obtained from the Coal Authority. Contact details are included in the Useful Contacts section of this report.	A13NE (E)	0	2	327221 342844
	Mining Instability Mining Evidence: Inconclusive Coal Mining Source: Ove Arup & Partners Boundary Quality: As Supplied	A13NE (E)	0	3	327221 342844
	Non Coal Mining Areas of Great Britain Risk: Highly Unlikely Source: British Geological Survey, National Geoscience Information Service	A13NE (E)	0	1	327221 342844
34	Potential Mining Areas Name: Llangollen Rural Ceased Operation: Not Supplied Commodity: Coal and Lead Ore Reference: Not Supplied Alternate: Not Supplied Name/Mine: Not Supplied Custodian: Not Supplied	A13NE (E)	0	4	327221 342844

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
35	Potential Mining Areas Name: Trefynant Ceased Operation: 1911 Commodity: Fireclay; Seam under the Lower Half Yard Reference: 5694 Alternate: Nos. 1, 2, 3 Name/Mine: Custodian: Not Supplied	A13NE (E)	0	4	327221 342844
36	Potential Mining Areas Name: Abernant Ceased Operation: 1912 Commodity: Coal and Fireclay; Half Yard Bench; New Reference: 5974 Alternate: Not Supplied Name/Mine: Custodian: Not Supplied	A13SE (E)	177	4	327412 342841
37	Potential Mining Areas Name: Acrefair Ceased Operation: 1889 Commodity: Coal and Fireclay; Half Yard; Firedamp Reference: 2334 Alternate: Blacksmith Name/Mine: Alternate: Nos. 7, 8, 9, 10 Name/Mine: Custodian: Not Supplied	A13SE (E)	177	4	327412 342841
38	Potential Mining Areas Name: Cefn Ceased Operation: Not Supplied Commodity: Coal Reference: Not Supplied Alternate: Not Supplied Name/Mine: Custodian: Not Supplied	A13SE (E)	177	4	327412 342841
39	Potential Mining Areas Name: Caeglo Ceased Operation: Not Supplied Commodity: Coal; New; Three Yard or Main; Nant or Big; Yard; Wall and Bench; Lwynennion; Ironstone Reference: Not Supplied Alternate: Not Supplied Name/Mine: Custodian: E. Lloyd Jones, Plas-Isa, Rhosymedre, Wrexham.	A13SE (E)	177	4	327412 342841
40	Potential Mining Areas Name: Cefn Ceased Operation: 1862 Commodity: Coal; Warras; Dirty; New or Quaker; Main or Three Yard and Bind; Stone; Cefn; Top Yard; Lower Yard; Cannel; Wall and Bench; Ironstone Reference: Not Supplied Alternate: Not Supplied Name/Mine: Custodian: E. Lloyd Jones, Plas-Isa, Rhosymedre, Wrexham.	A13SE (E)	177	4	327412 342841
41	Potential Mining Areas Name: Cefn and Caeglo Ceased Operation: 1868 Commodity: Coal; Dirty; New or Quaker; Main; Stone; Yard; Wall and Bench; Ironstone Reference: Not Supplied Alternate: Not Supplied Name/Mine: Custodian: E. Lloyd Jones, Plas-Isa, Rhosymedre, Wrexham.	A13SE (E)	177	4	327412 342841
42	Potential Mining Areas Name: Plaskynaston Ceased Operation: 1927 Commodity: Coal; Seven Feet; Quaker; Main; Cannel or Lower Yard Reference: 9549 Alternate: Caeglo Name/Mine: Alternate: Cefn Name/Mine: Alternate: Nos. 1, 2 Name/Mine: Custodian: Not Supplied	A13SE (E)	177	4	327412 342841

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
43	Potential Mining Areas Name: Garth Ceased Operation: 1951 Commodity: Fireclay; Ganister Reference: 15060 Alternate: Not Supplied Name/Mine: Not Supplied Custodian: Not Supplied	A13SW (W)	207	4	327009 342779
44	Potential Mining Areas Name: Acrefair Ceased Operation: 1911 Commodity: Coal and Fireclay; Yard Reference: 5646 Alternate: Nos. 1, 2, 3 Name/Mine: Not Supplied Custodian: Not Supplied	A13NE (N)	318	4	327226 343177
45	Potential Mining Areas Name: Acrefair Ceased Operation: Not Supplied Commodity: Coal; Two Yard; Lower Yard; Wall and Bench Reference: Not Supplied Alternate: Not Supplied Name/Mine: Not Supplied Custodian: E. Lloyd Jones, Plas-Isa, Rhosymedre, Wrexham.	A13NE (NE)	366	4	327417 343174
46	Potential Mining Areas Name: Penbedw Ceased Operation: 1912 Commodity: Coal and Fireclay; Half Yard; Stone Reference: 5916 Alternate: Not Supplied Name/Mine: Not Supplied Custodian: Not Supplied	A13NE (NE)	366	4	327417 343174
47	Potential Mining Areas Name: Acrefair Ceased Operation: 1825 Commodity: Coal; Seam unnamed Reference: Not Supplied Alternate: Not Supplied Name/Mine: Not Supplied Custodian: Black Park Colliery Co. Ltd., Chirk, Wrexham.	A14NW (NE)	662	4	327819 343167
48	Potential Mining Areas Name: Plasmadoc Ceased Operation: 1867 Commodity: Coal; Red; Stone; Upper Yard or Crank; Lower Yard; Half Yard and Firedamp; Three Yard; Two Yard; Wall and Bench; Ironstone Reference: Not Supplied Alternate: Coed Mawr Name/Mine: Room Alternate: Room Name/Mine: Room Custodian: E. Lloyd Jones, Plas-Isa, Rhosymedre, Wrexham.	A14NW (NE)	662	4	327819 343167
49	Potential Mining Areas Name: Penbedw Ceased Operation: 1879 Commodity: Coal; Nant Reference: 1052 Alternate: Nos. 1, 3 Name/Mine: Not Supplied Custodian: Not Supplied	A18NE (N)	721	4	327233 343579
50	Potential Mining Areas Name: Delf Ceased Operation: 1850 Commodity: Coal; Stone; Big; Wall and Bench; Ironstone Reference: Not Supplied Alternate: Nos. 1 to 35 Name/Mine: Not Supplied Custodian: E. Lloyd Jones, Plas-Isa, Rhosymedre, Wrexham.	A18NE (N)	744	4	327424 343576

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
51	Potential Mining Areas Name: Newbridge Ceased Operation: Not Supplied Commodity: Coal Reference: Not Supplied Alternate: Cefn Name/Mine: Coach House Alternate: Field Name/Mine: E. Lloyd Jones, Plas-Isa, Rhosymedre, Wrexham. Custodian:	A9NW (SE)	748	4	327806 342363
52	Potential Mining Areas Name: Cheshire Ceased Operation: 1867 Commodity: Coal; Upper Yard; Two Yard or Nant; Red; Lower Yard; New; Half Yard and Firedamp; Wall and Bench Reference: Not Supplied Alternate: Not Supplied Name/Mine: E. Lloyd Jones, Plas-Isa, Rhosymedre, Wrexham. Custodian:	A19NW (NE)	926	4	327826 343569
53	Potential Mining Areas Name: Delph Ceased Operation: 1950 Commodity: Fireclay; New Reference: 15059 Alternate: Not Supplied Name/Mine: Not Supplied Custodian:	A19NW (NE)	927	4	327826 343571
54	Potential Mining Areas Name: Delph Ceased Operation: 1936 Commodity: Fireclay; Lower Yard; New or Buff Reference: 12023 Alternate: Plas Isaf Name/Mine: Not Supplied Custodian:	A19NW (NE)	927	4	327826 343571
55	Potential Mining Areas Name: Wynnstay Ceased Operation: 1927 Commodity: Coal; New or Cefn; Peacock; Quaker; Main; Upper Yard; Lower Yard; Upper Stone; Lower Stone; Wall and Bench Reference: 9550 Alternate: Nos. 1, 2, 3 Name/Mine: Not Supplied Custodian:	A14SE (E)	982	4	328216 342828

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
56	Extractive Industries or Potential Excavations from 1855-1909 Use: Tref-y-nant Fire Clay Works First Map Published 1874 Date: Last Map Published 1875 Date:	A13SE (SE)	32	-	327247 342811
57	Extractive Industries or Potential Excavations from 1893-1915 Use: Fire Clay Works First Map Published 1899 Date: Last Map Published 1899 Date:	A13SW (S)	53	-	327204 342776
58	Extractive Industries or Potential Excavations from 1906-1937 Use: Fire Clay Works First Map Published 1912 Date: Last Map Published 1912 Date:	A13SW (S)	51	-	327204 342778

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
59	Air Shafts Use: Not Supplied Date of Mapping: 1900	A14SW (E)	507	-	327741 342807
60	General Quarrying Use: Not Supplied Date of Mapping: 1879 - 1914	A14SE (E)	819	-	328001 342557
61	General Quarrying Use: Not Supplied Date of Mapping: 1963	A12SW (SW)	832	-	326441 342515
61	General Quarrying Use: Not Supplied Date of Mapping: 1879	A12SW (W)	854	-	326405 342545
62	General Quarrying Use: Not Supplied Date of Mapping: 1879 - 1963	A14SE (E)	835	-	328018 342555
63	General Quarrying Use: Not Supplied Date of Mapping: 1879	A7NW (SW)	843	-	326452 342465
64	General Quarrying Use: Not Supplied Date of Mapping: 1879 - 1963	A14SE (E)	884	-	328108 342705
65	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A13SE (E)	138	-	327372 342837
66	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A18SE (N)	357	-	327344 343196
67	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A18SW (N)	360	-	327193 343217
68	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A18SE (N)	432	-	327319 343280
69	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A18SW (N)	475	-	327187 343332
70	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A14NW (NE)	503	-	327660 343124
71	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A18SE (NE)	506	-	327433 343322
72	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A14NW (E)	571	-	327805 342880
73	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A14NW (E)	572	-	327796 342968
74	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1914	A18SE (N)	609	-	327360 343452
75	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1995	A7NE (SW)	694	-	326674 342395
76	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A14NE (E)	696	-	327906 343037
77	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A7NE (SW)	700	-	326854 342229
78	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A7SE (SW)	789	-	326851 342128

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
79	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879 - 1914	A9NW (SE)	825	-	327803 342248
80	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1995	A14SE (E)	903	-	328088 342549
80	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1995	A14SE (E)	951	-	328138 342548
81	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1914	A8SE (S)	916	-	327476 341949
82	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A18NE (N)	965	-	327352 343815
83	Heap, unknown constituents Use: Not Supplied Date of Mapping: 1879	A8SE (S)	996	-	327460 341862
84	Mineral Railway Use: Not Supplied Date of Mapping: 1879 - 1938	A13SE (SE)	75	-	327296 342801
85	Mineral Railway Use: Not Supplied Date of Mapping: 1879 - 1963	A13SE (SE)	164	-	327357 342736
86	Mineral Railway Use: Not Supplied Date of Mapping: 1879 - 1938	A13SE (SE)	174	-	327392 342773
87	Mineral Railway Use: Not Supplied Date of Mapping: 1879 - 1938	A13SE (S)	211	-	327301 342634
88	Mineral Railway Use: Not Supplied Date of Mapping: 1879	A14NW (E)	364	-	327599 342855
89	Mineral Railway Use: Not Supplied Date of Mapping: 1900 - 1938	A14NW (E)	370	-	327605 342859
90	Mineral Railway Use: Not Supplied Date of Mapping: 1879	A19SW (NE)	617	-	327647 343315
91	Mineral Railway Use: Not Supplied Date of Mapping: 1900 - 1963	A7NE (SW)	641	-	326720 342422
92	Mineral Railway Use: Not Supplied Date of Mapping: 1879 - 1938	A19SE (NE)	876	-	327996 343290
93	Mineral Railway Use: Not Supplied Date of Mapping: 1879 - 1938	A14SE (E)	937	-	328119 342537
94	Mineral Railway Use: Not Supplied Date of Mapping: 1900 - 1914	A19SE (NE)	947	-	328025 343378
95	Mineral Railway Use: Not Supplied Date of Mapping: 1879 - 1900	A19SE (NE)	955	-	328032 343382
96	Mining & quarrying general Use: Not Supplied Date of Mapping: 1879	A13SE (S)	104	-	327259 342733
97	Mining & quarrying general Use: Not Supplied Date of Mapping: 1914	A13SE (SE)	143	-	327347 342757
98	Mining & quarrying general Use: Not Supplied Date of Mapping: 1879	A13NW (NW)	272	-	326986 343003

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
99	Mining & quarrying general Use: Not Supplied Date of Mapping: 1879 - 1938	A13SE (S)	302	-	327247 342527
100	Mining & quarrying general Use: Not Supplied Date of Mapping: 1900	A14NW (E)	403	-	327637 342864
101	Mining & quarrying general Use: Not Supplied Date of Mapping: 1879	A14SW (SE)	421	-	327593 342625
102	Mining & quarrying general Use: Not Supplied Date of Mapping: 1914	A14NW (E)	502	-	327736 342891
103	Mining & quarrying general Use: Not Supplied Date of Mapping: 1900	A8NE (SE)	508	-	327477 342391
104	Mining & quarrying general Use: Not Supplied Date of Mapping: 1900	A14SW (E)	546	-	327773 342756
105	Mining & quarrying general Use: Not Supplied Date of Mapping: 1900	A9NW (SE)	594	-	327631 342402
106	Mining & quarrying general Use: Not Supplied Date of Mapping: 1914	A14NW (E)	614	-	327847 342899
107	Mining & quarrying general Use: Not Supplied Date of Mapping: 1914 - 1963	A18SE (N)	617	-	327386 343454
107	Mining & quarrying general Use: Not Supplied Date of Mapping: 1914 - 1938	A18SE (N)	636	-	327375 343477
108	Mining & quarrying general Use: Not Supplied Date of Mapping: 1914 - 1963	A18NE (N)	820	-	327348 343668
109	Mining & quarrying general Use: Not Supplied Date of Mapping: 1914 - 1938	A19SW (NE)	849	-	327775 343511
110	Mining & quarrying general Use: Not Supplied Date of Mapping: 1879 - 1900	A9SW (SE)	934	-	327708 342033
111	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1879	A13NE (NE)	274	-	327400 343075
112	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1900	A13SW (S)	282	-	327169 342550
113	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1879	A13NE (N)	315	-	327240 343173
114	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1879	A18SE (NE)	417	-	327479 343194
115	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1879	A18SE (N)	584	-	327419 343411
116	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1879 - 1963	A18SE (NE)	600	-	327514 343387
117	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1879	A14NE (E)	668	-	327902 342852
118	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1879	A14NW (E)	679	-	327866 343106

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
119	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1914	A9NW (SE)	694	-	327612 342257
120	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1900	A18NE (N)	908	-	327477 343731
121	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1914	A19SE (NE)	955	-	327983 343449
122	Mining of coal & lignite Use: Not Supplied Date of Mapping: 1914	A18NE (N)	975	-	327354 343824
123	Quarrying of sand & clay, operation of sand & gravel pits Use: Not Supplied Date of Mapping: 1963	A12SE (W)	679	-	326567 342610
124	Quarrying of sand & clay, operation of sand & gravel pits Use: Not Supplied Date of Mapping: 1879	A12SE (SW)	711	-	326576 342513
125	Quarrying of sand & clay, operation of sand & gravel pits Use: Not Supplied Date of Mapping: 1914 - 1995	A12SW (W)	966	-	326242 342776
126	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A13SE (SE)	37	-	327250 342806
127	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A13NW (NW)	272	-	326986 343003
128	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A13NE (NE)	274	-	327400 343075
129	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A13SW (S)	282	-	327169 342550
130	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A14NW (E)	403	-	327637 342864
131	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A18SE (NE)	414	-	327467 343199
132	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A14SW (SE)	421	-	327593 342625
133	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A14NW (E)	502	-	327736 342891
134	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A14SW (E)	507	-	327741 342807
135	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A8NE (SE)	508	-	327477 342391
136	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A14SW (E)	546	-	327773 342756
137	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A18SE (N)	584	-	327419 343411
138	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A9NW (SE)	594	-	327631 342402
139	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A18SE (NE)	600	-	327514 343387

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
140	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A14NW (E)	614	-	327847 342899
141	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A14NE (E)	668	-	327902 342852
142	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A14NW (E)	679	-	327866 343106
143	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A7NE (SW)	686	-	326609 342503
144	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A18NE (N)	748	-	327447 343573
145	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A18NE (N)	820	-	327348 343668
146	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A9NE (SE)	852	-	327912 342329
147	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A12SW (W)	854	-	326405 342545
148	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A14SE (E)	884	-	328108 342705
149	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A19SE (NE)	889	-	327947 343388
150	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A9SW (SE)	934	-	327708 342033
151	Potentially Infilled Land (Non-Water) Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1995	A18NE (N)	975	-	327354 343824
152	Potentially Infilled Land (Water) Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1938	A13SE (SE)	311	-	327406 342581
153	Potentially Infilled Land (Water) Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1963	A13SE (SE)	336	-	327357 342522
154	Potentially Infilled Land (Water) Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1938	A13SE (SE)	338	-	327385 342535
155	Potentially Infilled Land (Water) Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1963	A13SE (SE)	338	-	327404 342546
156	Potentially Infilled Land (Water) Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1963	A13SE (SE)	364	-	327508 342606
157	Potentially Infilled Land (Water) Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1963	A14SW (E)	408	-	327630 342743
158	Potentially Infilled Land (Water) Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1938	A9NW (SE)	620	-	327734 342479
159	Potentially Infilled Land (Water) Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1963	A14NE (E)	854	-	328030 343167
160	Potentially Infilled Land (Water) Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1963	A19SE (NE)	990	-	328119 343300

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	CBCSB Compensation District The site does not fall within the brine compensation area.				
	Brine Subsidence Solution Area The site does not fall within the brine subsidence solution area.				
161	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (E)	0	1	327221 342844
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (E)	0	1	327221 342844
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (E)	0	1	327221 342844
162	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NE (E)	0	1	327221 342844
163	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (N)	0	1	327221 342847
164	Potential for Landslide Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	65	1	327268 342786
165	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (NW)	80	1	327143 342893
166	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	83	1	327200 342939
167	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (NW)	120	1	327123 342931
168	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (NW)	209	1	327059 342993
169	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	0	1	327231 342841
	Potential for Running Sand Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (E)	0	1	327221 342844
170	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (E)	0	1	327221 342844
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SE (S)	0	1	327222 342834
	Subsidence Investigations Site Investigation Date: 11th April 2011 Root Survey: Yes CCTV Drain Survey: No Depth of Foundation: Not Supplied Footings: Not Supplied Soil Classification: Not Supplied			-	

The following mapping has been analysed for Historical Land Use Information (1:2,500):

1:2,500	Mapsheet	Published Date
Denbighshire	035_09	1874
Denbighshire	035_13	1875
Denbighshire	035_09	1899
Denbighshire	035_13	1899
Denbighshire	035_09	1912
Denbighshire	035_13	1912
Ordnance Survey Plan	SJ2643	1962
Ordnance Survey Plan	SJ2743	1962
Ordnance Survey Plan	SJ2642	1963
Ordnance Survey Plan	SJ2742	1963

The following mapping has been analysed for Historical Land Use Information (1:10,000):

1:10,560	Mapsheet	Published Date
Denbighshire	035_00	1879
Denbighshire	035_SW	1900
Denbighshire	035_SW	1914
Denbighshire	035_SW	1938
Ordnance Survey Plan	SJ24SE	1963
1:10,000	Mapsheet	Published Date
Ordnance Survey Plan	SJ24SE	1995

Mining and Cavities Data	Version	Update Cycle
BGS Recorded Mineral Sites British Geological Survey - National Geoscience Information Service	November 2018	Bi-Annually
Coal Mining Affected Areas The Coal Authority - Property Searches	March 2014	Annual Rolling Update
Man Made Mining Cavities Peter Brett Associates	October 2018	Bi-Annually
Mining Instability Ove Arup & Partners	October 2000	Not Applicable
Natural Cavities Peter Brett Associates	October 2018	Bi-Annually
Non Coal Mining Areas of Great Britain British Geological Survey - National Geoscience Information Service	May 2015	Not Applicable
Historical Land Use Information (1:2,500)	Version	Update Cycle
Subterranean Features Landmark Information Group Limited	August 2018	Bi-Annually
Ground Stability Data (1:50,000)	Version	Update Cycle
CBSCB Compensation District Cheshire Brine Subsidence Compensation Board (CBSCB)	August 2011	Not Applicable
Potential for Collapsible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Potential for Compressible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Potential for Ground Dissolution Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Potential for Landslide Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Potential for Running Sand Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Potential for Shrinking or Swelling Clay Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Subsidence Insurance Claims SP Property Services	October 2018	Quarterly
Subsidence Investigations CET Structures Ltd	July 2018	Quarterly
Brine Subsidence Solution Area Johnson Poole & Bloomer	January 2015	Annual Rolling Update

A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	
British Geological Survey	 British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL
The Coal Authority	 The Coal Authority
Ove Arup	
Peter Brett Associates	
Wardell Armstrong	 wardell armstrong your earth our world
Johnson Poole & Bloomer	

Contact	Name and Address	Contact Details
1	British Geological Survey - Enquiry Service British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
2	The Coal Authority - Property Searches 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG	Telephone: 0345 762 6848 Fax: 01623 637 338 Email: groundstability@coal.gov.uk Website: www2.groundstability.com
3	Ove Arup & Partners Central Square, Forth Street, Newcastle upon Tyne, Tyne and Wear, NE1 3PL	Telephone: 0191 261 6080 Fax: 0191 261 7879
4	Landmark Information Group Limited Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9960 Fax: 0844 844 9951 Email: customerservice@promap.co.uk Website: www.landmarkinfo.co.uk
-	Landmark Information Group Limited Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

General

Specified Site
Bearing Reference Point
Several or Type at Location
Map ID

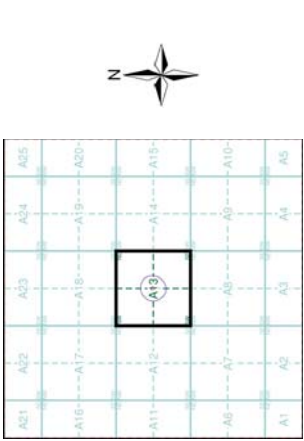
**Potentially Contaminative Industrial Uses
(Extractive Industries Activity)**

Extractive Industries Activity from 1855 - 1909
Extractive Industries Activity from 1893 - 1915
Extractive Industries Activity from 1906 - 1927
Extractive Industries Activity from 1924 - 1949
Extractive Industries Activity from 1950 - 1980

Subterranean Features

Subterranean Features

Mining and Ground Stability - Segment A13

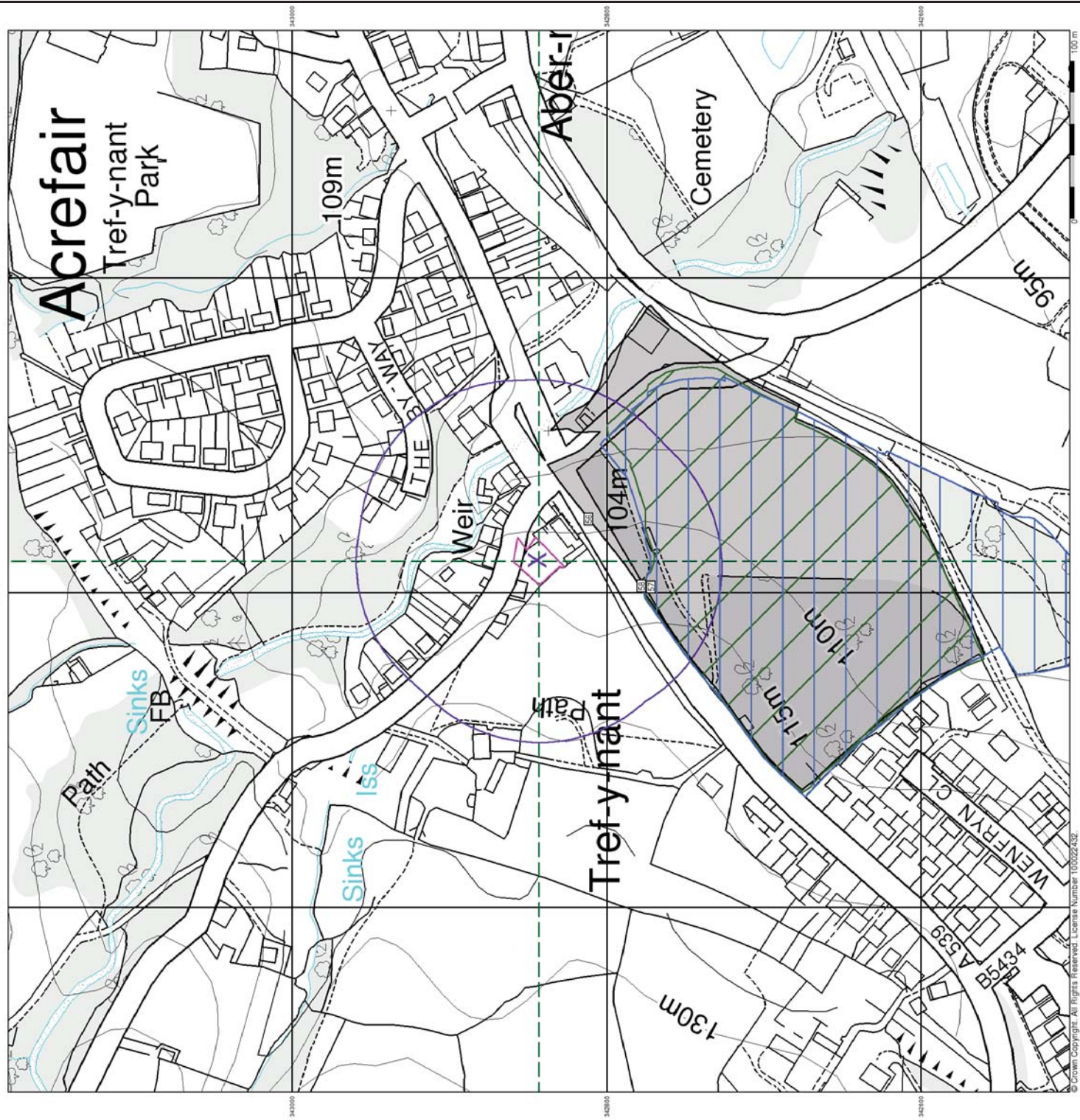


Order Details

Order Number: 191649715_1_1
Customer Ref: PN193946
National Grid Reference: 327220, 342840
Slice: A
Site Area (Ha): 0.06
Plot Buffer (m): 100

Site Details

The Towers Day Nursery Ltd, Liangollen Road, Acrefair,
WREXHAM, LL14 3SG



APPENDIX 16

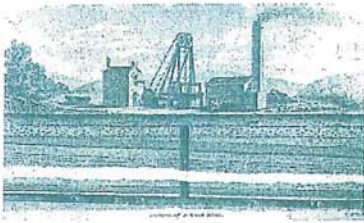
**Previous Mine Stabilisation Documentation for
Sara, Tower Hill, Acrefair, Wrexham, LL14 3ST**

Project Number : PNI93948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



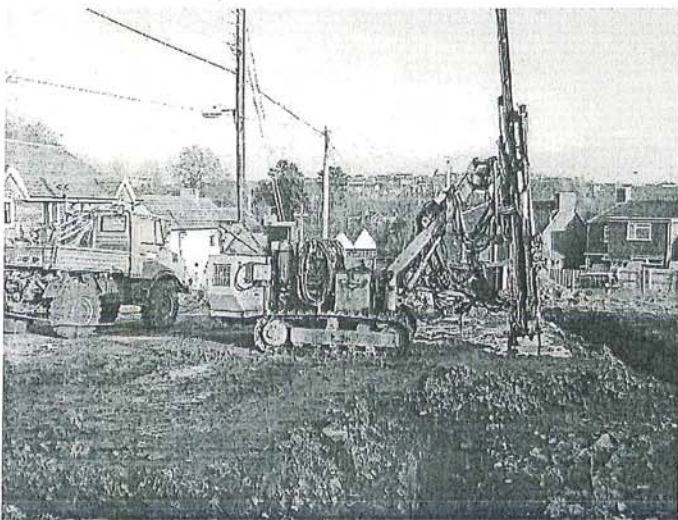
Sara



Nkc Geotech Ltd
25 Grosvenor Road
Wrexham
LL11 1BT

tel
01352 762080
fax
01352 762081
email
neil@nkc.co.uk

Mining Investigation Report

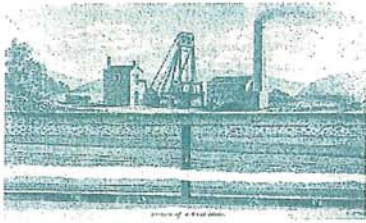


Tower Hill, Acrefair

0506
1 March 2005

Anthony Roberts
Plas Wynfa
Plas Kynaston Lane
Cefn Mawr
LL14 3AT
3 0506 1 March 2005





contents

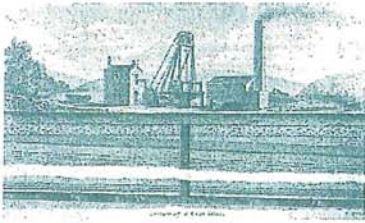
- 5 site description and investigation results
- 6 management of geotechnical hazards
- 7 borehole plan
- 8 results of remedial work
- 9 drilling logs and section
- 10 method statement

extract

This report meets NHBC D5 and D6 requirements

The site is undermined by old workings which have been stabilised by grouting





Site

A plot for one dwelling at Tower Hill, Acrefair.

Investigation and site work by

Neil Catlow B.Sc F.G.S Engineering geologist.

Records inspected

Coal Authority at Mansfield.

Geological Survey.

My previous investigations in this vicinity.

Investigation results

Ground level

Unchanged throughout the investigation.

Site history

The site was formerly a cottage with domestic gardens to the rear.

Gas testing

There were no methane or carbon dioxide emissions during the investigation period. See borehole logs for gas testing results.

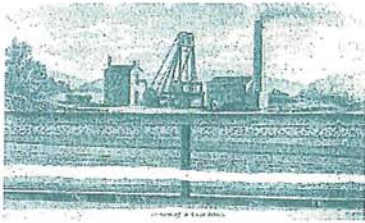
Radon

The site lies in an area susceptible to radon. Radon can only be accurately detected over a three month test period, beyond the scope of this investigation. Precautions against radon accumulation should be taken in the absence of evidence of no radon presence.

Foundation soils

Brown sandstone rockhead is exposed at ground level in the northern part of the site, but there is a clay and gravel periglacial deposit which increases to 1.5m in thickness to the south. See borehole log for SPT testing results.





Shallow mineworkings

Predominantly collapsed pillar & stall workings in the Half Yard Coal at 10.0m. There is also a thinner, unnamed and unworked, coal seam at 15.5m.

See log for Bh1.

Disused mineshafts

There are no records of any shafts on the site, but the Half Yard Coal workings are so shallow that old unrecorded shafts might be present.

Hazard management

There are old and unrecorded mineworkings present in the Half Yard Coal. Subsidence of these workings could cause crown holes to be formed on the site, with dimensions of upto 1.4m deep and 2.0m diameter. There may also be old and unrecorded mineshafts upto 1.9m in diameter present under the site.

Ground improvement

Stabilise the mineworkings by grouting to prevent further void migration under the proposed buildings. I have personally carried out this remedial work - see results of remedial work.

Specialist foundations

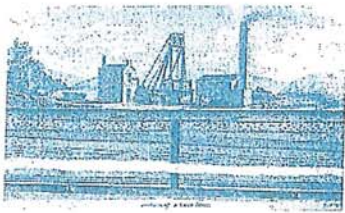
Use a structural foundation designed to span 3.0m in case there are old infilled crown holes and unrecorded shafts present.

For Nkc Geotech Ltd

Neil Catlow, B.Sc, F.G.S

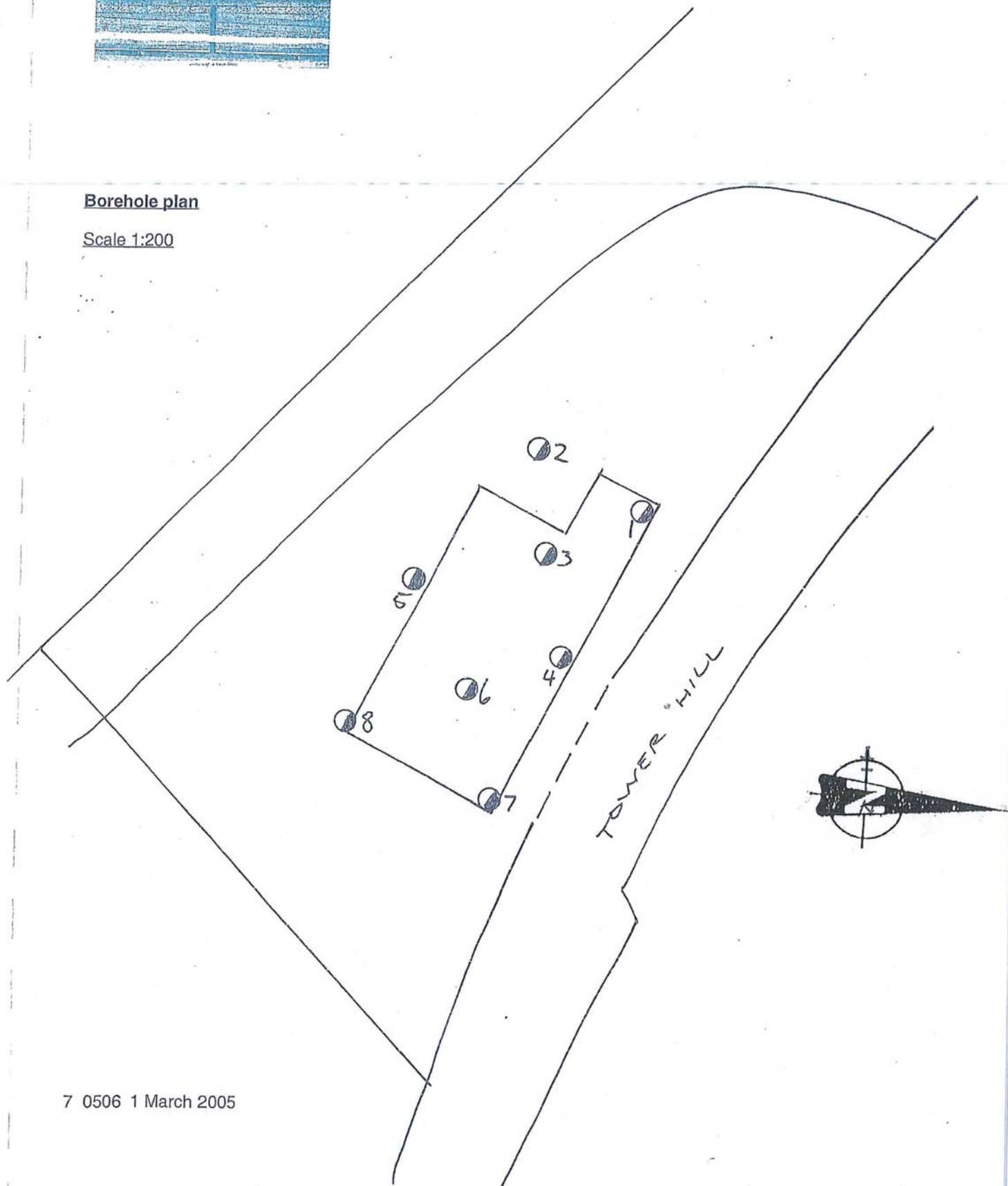
6 0506 1 March 2005





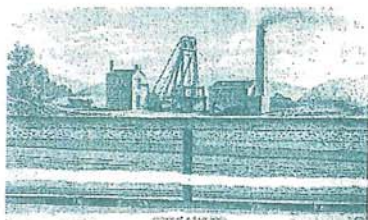
Borehole plan

Scale 1:200



7 0506 1 March 2005





Results of remedial work

hole	seam depth*	hole depth	grout take	status code	comments
Bh 1	10.0	30.0	3.6	vd	see log
Bh 2	11.5	18.0	0.0	sd	
Bh 3	9.4	18.0	1.0	cd	
Bh 4	9.0	18.0	0.0	sd	
Bh 5	10.0	18.0	1.0	cd	
Bh 6	9.5	18.0	2.7	vd	
Bh 7	9.6	18.0	1.0	cd	
Bh 8	10.2	18.0	0.6	cd	

Grout mix 4:1 rockdust/PFA/cement and measured in dry tonnes

Injection pressure <150kN/m²

All work carried out by Neil Catlow B.Sc, F.G.S

Total grout take dry tonnes 9.9 tonnes

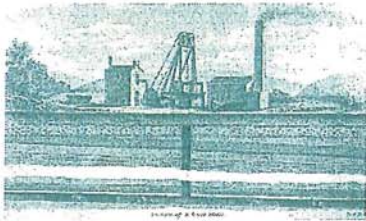
* or depth to mineworkings or migrating cavity

Status codes **sd** solid **cd** collapsed **cn** cavitation **vd** void

Borehole numbers with a i suffix are inclined

8 0506 1 March 2005





Bh 1

REF 0506
Bh 1

SITE CLIENT

Tower Hill, Acrefair
Anthony Roberts

DATE
SCALE
OSGN

23 February 2005
1:200

TITLE

n/a

ORIENTATION
FLUSH
BIT

vertical
water
t/c 75mm

ORIGIN

printout direct from rig on site
drilled & logged by Neil Catlow

SPT
N value

SECTION

DEPTH	STRATA	GRAPHIC	DESCRIPTION	SECTION
0.0	0.0	clay	brown, sandy	ground level
0.5				
1.0	1.2	sandstone	brown, hard drilling	rockhead
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
4.5				
5.0				
5.5				
6.0				
6.5	6.5	shale	dark grey, firm drilling	
7.0				
7.5				
8.0				
8.5				
9.0	9.3	shale	black, very soft drilling	
9.5				
10.0	10.0	cavity		
10.5				
11.0				
11.5	11.5	shale	dark grey, firm drilling	old workings in Llwyneinion Half Yatd Coal
12.0				
12.5				
13.0				
13.5				
14.0				
14.5				
15.0				
15.5	15.5	shale	black, soft drilling with coal layers	
16.0				
16.5				
17.0				
17.5				
18.0				
18.5	18.3	shale	dark grey, firm drilling	
19.0				
19.5				
20.0				
20.5				
21.0				
21.5				
22.0				
22.5				
23.0	23.0	sandstone	grey, hard drilling	
23.5				
24.0				
24.5				
25.0				
25.5				
26.0				
26.5				
27.0				
27.5				
28.0				
28.5				
29.0				
29.5				
30.0	30.0		bottom of hole	

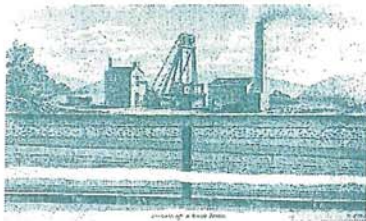
IN HOLE GAS TESTING

% oxygen	20.7
% methane	0.0
% carbon dioxide	0.0
% LEL	0.0

Nkc Geotech Ltd
25 Grosvenor Road
Wrexham
LL11 1BT

www.nkc.co.uk





Method statement for remedial works

Stabilisation of mineworkings by grouting

This work follows an initial investigation of a site which has shown that a coal seam of economic importance is present at shallow depth and has been mined. There are therefore geotechnical hazards present.

Shallow mineworkings are stabilised by drilling a grid of holes 65mm or 75mm diameter down through the coal seam on an initial 6.0m grid pattern over the bearing area of the proposed building, reducing to 3.0m spacing when open workings are encountered. The workings are grouted using 4:1:1 sand/PFA/cement ready-mixed grout injected by casing to the bottom of the hole, and pressurised to 150 - 200kN/m² when filled.

I carry out all this site work personally, and keep full records of each hole.

The report is submitted on completion is required for NHBC Validation D7.

9 0506 1 March 2005



The Coal Authority,
Mining Reports Office,
200 LICHFIELD LANE,
BERRY HILL,
MANSFIELD,
NOTTINGHAMSHIRE,
NG18 4RG
Telephone: 0845 762 6848
DX 716176 MANSFIELD 5
On-Line Service: www.coalminingreports.co.uk

The
COAL
AUTHORITY



The Coal Authority
Cost: £38.30
Plus V.A.T. £6.70
Total Received: £45.00
V.A.T. Reg Number 598 5850 68

STANLEY WILLIAMS & CO,
DX 26652 WREXHAM

This matter is being dealt with by Simon Leeming

Our Ref: **10318257-04**

Your Ref:

Electronic Ref:

RRUID: 007.00003922340001

Date: 28 October 2004

28 OCT 2004

Dear Sir,

Coal Mining Report
LAND AT, TOWER HILL, ACREFAIR, WREXHAM, CLWYD

I refer to the enquiry dated 27th October 2004, received 28th October 2004, in connection with the above.

This report is based on and limited to the records in the possession of The Coal Authority at the time the search is answered.

Ordnance Survey (O.S.) is undertaking a Positional Accuracy Improvement Programme of its mapping data. The Coal Authority (CA) has no control over the timing of issue of Positionally Improved mapping data by O.S. or over users of that data. In some instances the relative position between surface features and coal mining features may alter as a consequence of this programme. The CA will ensure that the integrity of its database is maintained by replotting some mining information to sustain the relationship between that mining information and the improved O.S. surface positions, some of which are now being released. However, mining reports are currently being produced against pre improved O.S. mapping whilst the Authority updates its database in line with the O.S. changes.

Past Underground Mining

According to the records in our possession, the property is not within the zone of likely physical influence on the surface from past underground coal workings.

However you may wish to know that the property is in an area where coal is believed to exist at or close to the surface that may have been worked at some time in the past.

Present Underground Mining

The property is not within the zone of likely physical influence on the surface from any present underground coal workings.

Future Underground Mining

The property is not within a geographical area for which a licence to extract coal by underground methods is awaiting determination by the Coal Authority.

The property is not within a geographical area for which a licence to extract coal by underground methods has been granted.

The property is not within the zone of likely physical influence at the surface from plans of future workings in our possession.

However reserves of coal exist in the locality which could be worked at some time in the future subject to feasibility, licences, and planning consents.

We have no record of any notice of the risk of the land being affected by subsidence being given under S.46 of the Coal Mining Subsidence Act 1991.

Shafts and Adits

We have no knowledge of any mine entries within, or within 20 metres of, the boundary of the property.

The records held by the Coal Authority may be incomplete. Consequently, there may exist in this locality mine entries of which we have no knowledge.

Surface Geology

Records in our possession do not disclose any fault or other line of weakness at the surface as having affected the stability of the property.

Past Opencast Mining

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

Present Opencast Mining

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

Future Opencast Mining

The property is not within 800 metres of the geographical boundary of an opencast site for which a licence to extract coal by opencast methods is awaiting determination.

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

Subsidence

The records in our possession do not disclose any damage notice or claim having been given, made or pursued in respect of the property since 1 January 1984.

The records in our possession do not disclose any current "Stop Notice" affecting the property.

The records in our possession do not show any request having been made to execute preventative works under S.33 of the Coal Mining Subsidence Act 1991.

Withdrawal of Support

The property does not lie within a geographical area in respect of which a notice of entitlement to withdraw support has been published.

The property does not lie within a geographical area in respect of which a notice has been given under S.41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

Working Facilities Orders

The property is not within a geographical area that is the subject of an Order made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to Owners of Former Copyhold Land

The property is not within an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Additional Remarks

In view of the mining circumstances a prudent developer would seek appropriate technical advice before works are undertaken on site. All proposals should have regard to good engineering practice in mining areas as identified in authoritative publications on mining stability problems. In any event, no activities should be undertaken that intersect, disturb, or interfere with any coal or mines of coal without permission of the Coal Authority.

These replies are prepared in accordance with the 2003 editions of the Coal Authority's Terms and Conditions, User Guide and the Law Society's Guidance Notes.

Copyright in coal mining reports and certificates belongs to the Coal Authority. Information used to compile this report is protected by the Coal Authority's database right. All rights are reserved and unauthorised use is prohibited. Copyright and other intellectual property is not transferred to external parties by possession of a mining report or certificate, however those for whom the report is supplied have the right to use it.

We acknowledge the receipt of your remittance in payment of our fee.

Yours faithfully



Albert Schofield

Director of Mining Information and Services



Crown Copyright.

PLAN NOT TO SCALE

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This is a plan of the boundaries of the property in respect of which this report has been prepared. It is the responsibility of the user to ensure that the boundaries shown correspond with those of the property.

APPROXIMATE POSITION OF ENQUIRY BOUNDARY SHOWN



—
—
—

APPENDIX 17

**Previous Mine Stabilisation Documentation for
Hafan, Tower Hill, Acrefair, Wrexham, LL14 3SG**

Project Number : PN193948

Project : THE TOWERS DAY NURSERY LTD, LLANGOLLEN ROAD, ACREFAIR, WREXHAM



Hafan

Mining Investigation Report

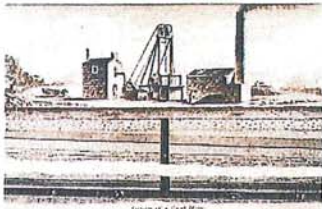


Sara, Tower Hill, Acrefair

Anthony Roberts
Sara
Tower Hill
Acrefair
Wrexham LL14 3ST

1003

Nkc Geotech Ltd
25 Grosvenor Road
Wrexham
LL11 1BT



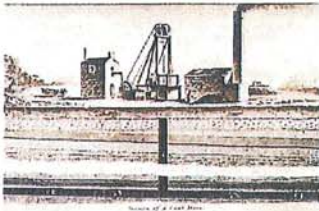
NKC Geotech Ltd

contents

- 3 site description and previous investigation results
current remedial programme
- 4 borehole plan
- 5 drilling results

extract

The plot is undermined by solid coal with no evidence of past mining



NKC Geotech Ltd

Site

A plot for one dwelling at Tower Hill, Acrefair.

Stabilisation and site work by

Neil Catlow B.Sc F.G.S Engineering geologist.

Investigation work

Previous detailed investigation

Investigated by myself in February 2005, when shallow mineworkings were proved under the site in the Half Yard Coal and Fireclay at a depth of 10.0m. There was no evidence of any fill on the site, and the foundation soils were firm sandy clays in the south and sandstone in the north. There were no gas emissions.

Current investigation work

A total of 6 holes were drilled into the Half Yard Coal and the underlying fireclay. All 6 holes encountered solid coal, but the strata is faulted 4m down to the south through the plot. See appended results of the drilling work.

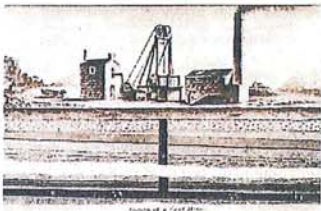
As residential properties are present within 20m of the proposed development, two gas testing holes were drilled on the site periphery to monitor gas levels as the work progressed.

Specialist foundations

Use a structural foundation designed to span 2.0m in case there are old infilled crown holes and unrecorded shafts present immediately adjacent to the plot, and because of the 4m fault traversing the proposed building.

For Nkc Geotech Ltd

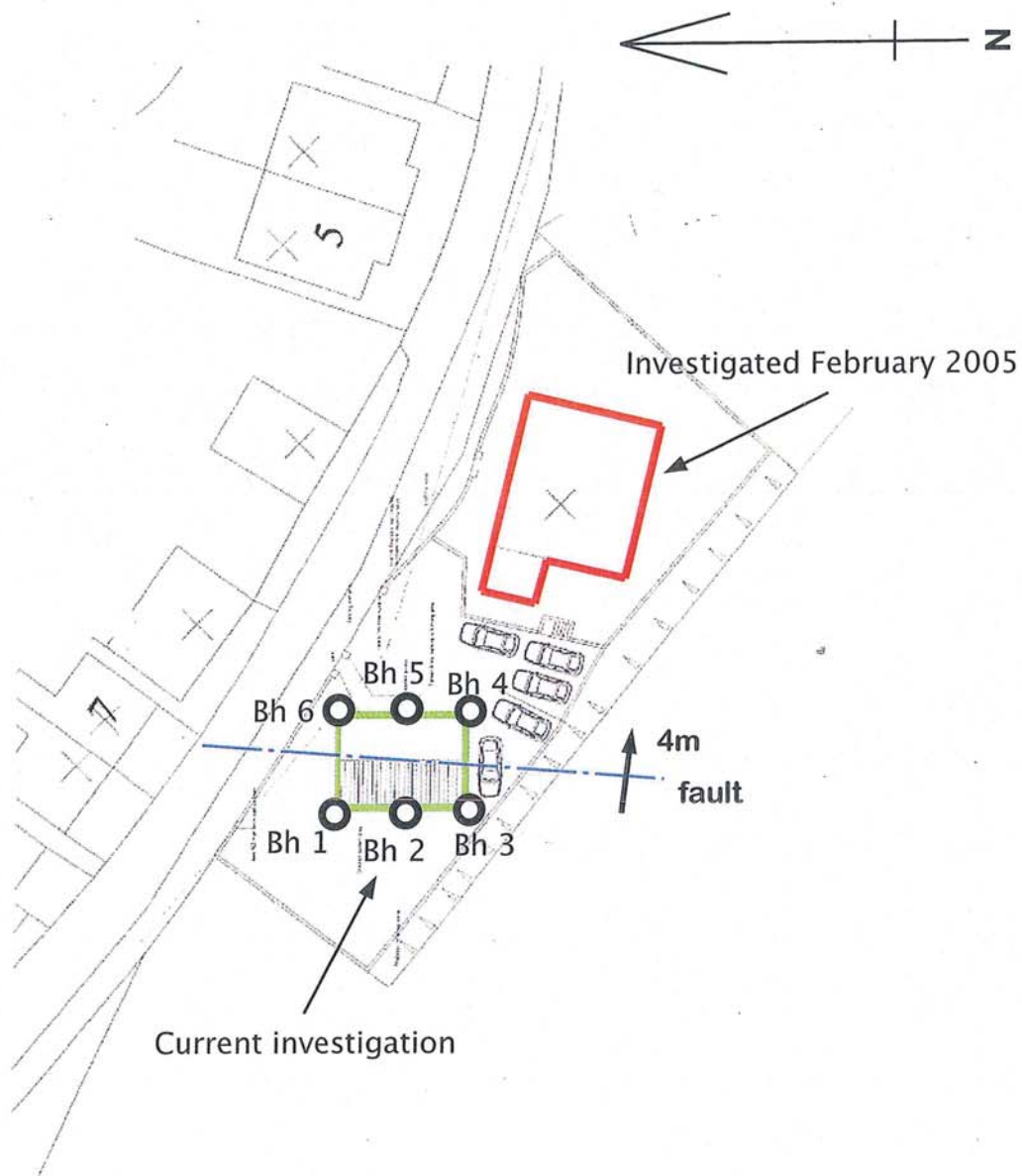
Neil Catlow, B.Sc, F.G.S

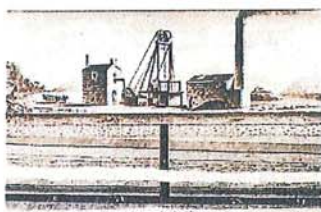


NKC Geotech Ltd

Borehole plan

Scale 1:500





NKC Geotech Ltd

Results of remedial work

hole	seam* depth	hole depth	grout take	status code**	comments
Bh 1***	9.2	15.0	0.0	sd	
Bh 2	8.7	15.0	0.0	sd	
Bh 3	9.6	15.0	0.0	sd	
Bh 4	13.1	18.0	0.0	sd	
Bh 5	14.0	18.0	0.0	sd	
Bh 6	12.5	18.0	0.0	sd	

Grout mix for gas sealing 4:1:1 rockdust/cement/PFA and measured in dry tonnes
Injection pressure <150kN/m²

* or depth to mineworkings or migrating cavity

** status codes **sd** solid **cd** collapsed **cn** cavitation **vd** void

*** borehole numbers with a **i** suffix are inclined

All work carried out by Neil Catlow

andrew hannett limited

civil | structural | architectural



4 Dawn Close Buckley Flintshire CH7 2SA
t. 01244 543181 m. 07761 34654 e. ah.ltd@talktalk.net

Land adjacent to 'Sara', Tower Hill, Acrefair

New Dwelling

Structural Calculations

January 2010

SCHEME

land adj Sara, Tower Hill, Acrefair

Preamble to Calculations

PAGE No.

00

Initials Dal

Prepared by

Aut 01/10

Checked by

Scope of Calculations

These calculations have been prepared at the request of the owner of the above property. The calculations cover the structural design of reinforced strip footings to support proposed new dwelling.

No warranty is given by the issue of the calculations to the structural integrity of any other part of the proposed building for which calculations or structural advice has not been specifically requested or given

Building Regulations Approval

The owners of the property are advised that the approval of the Local Planning Authority should be obtained to the calculations prior to any ordering of materials or fabrication. No responsibility is accepted for any changes that may be required as a result of work having proceeded before such approvals have been obtained.

Measurements and Dimensions

Dimensions and details for the purpose of the calculations have been taken from Architectural Drawing No. 1A/1 provided by the Client. Where necessary, the drawing has been scaled.

The person responsible for carrying out the Works should ensure that the dimensions used in the calculations are checked on site before ordering of materials or fabrication. Any discrepancies or dimensions found to be significantly different from that assumed should be brought to the attention of the undersigned, so that such discrepancy can be checked, and if necessary, the calculations amended.

Design References

Structural design has been based on any or all of the following British Standards and Regulations:

- Building Regulations – Approved Document A
- BS6399 for dead, imposed and wind loadings
- BS5950 for steelwork design
- BS8110 for reinforced concrete design
- BS5628 for masonry design
- BS5268 for timber design

Liability

Nothing in the Contract confers nor purports to confer on any third party any benefit nor any right to enforce any terms of this Contract pursuant to the Contracts (Rights of Third Parties) Act 1999.

Calculation Pages, Sketches and Drawings contained herein:

Calculation pages 01 to 05 inclusive.

Sketches SK01, 02 and 03 including Notes.

Signed:



Andrew Hannett. B.Eng(Hons), C.Eng, MICE

Date:

23 Jan. 10

SCHEME

land adj Sara, Tower Hill, Acrefair
New Dwelling

PAGE No.

01

Initials Da

Prepared by

at 01/h

Checked by

NEW DWELLING

Provide calculations in support of structural design of reinforced strip footings to support proposed new dwelling.

Property is known to be in an area of previous mining activity and suitable reinforced strip footings will be provided. Raft will be designed to span crown holes in accordance with the following requirements as advised by NKC Geotech.

Edge Strips - 2m simply supported span
- 1.0m cantilever
Slab - 2m simply supported span

Loadings

Roof

Slates/Tiles	0.55		
Battens	0.05		
Felt	0.03		
Trusses	0.15		
	<u>0.78 kN/m²</u>	=	<u>0.78</u>
	(slope)		cos 35
		=	<u>0.95 kN/m² (plan)</u>

Snow Load = 0.75 kN/m²

Ceiling

Ties	0.10		
Insulation	0.05		
P'board & skim	0.18		
	<u>0.33 kN/m²</u>		

Imposed = 0.25 kN/m²

Floor

Boards	0.15		
Joists	0.15		
Ceiling	0.18		
Partitions	0.25		
	<u>0.73 kN/m²</u>		

Imposed = 1.5 kN/m²

Walls

Block & plaster	<u>1.2 kN/m²</u>
Brick	<u>2.1 kN/m²</u>

Strips

Self weight added within calculations.

Ground Floor Slab

SW = 24*0.15 + 1.2 (finishes) = 4.8 kN/m²
Imposed = 1.5 kN/m²

SCHEME

land adj Sara, Tower Hill, Acrefair
New Dwelling

PAGE No.

02

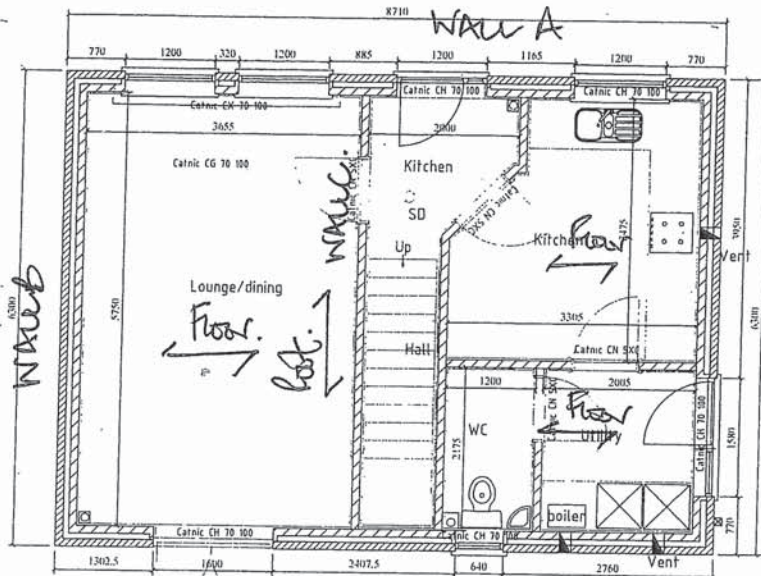
Initials Da

Prepared by

Art 01

Checked by

Sketch Layout - for calculation purposes only



PROPOSED GROUND FLOOR PLAN

Loads to strip footings

Wall A

$$\text{loads} - G_k = 0.95 \times \frac{7}{2} + 0.33 \times \frac{6}{2} + (2.41 \times 2) \times 5.5 + 4.8 \times 1.0 = 27.3 \text{ kN/m}$$

$$Q_k = 0.75 \times \frac{7}{2} + 0.25 \times \frac{6}{2} + 1.5 \times 1.0 = 4.9 \text{ kN/m}$$

$$\text{Bearing Pressure} = \frac{(27.3 + 4.9)}{0.6} = 54 \text{ kN/m}^2$$

$$U_L = 46.1 \text{ kN/m}$$

Wall B

$$\text{loads} - G_k = 0.95 \times 0.6 + 0.33 \times 0.3 + 3.3 \times 2.0 + 0.73 \times 3.8 \frac{1}{2} + 4.8 \times 1.0 = 30.0 \text{ kN/m}$$

$$Q_k = 0.75 \times 0.6 + 0.25 \times 0.3 + 1.5 \times 3.8 \frac{1}{2} + 1.5 = 4.9 \text{ kN/m}$$

$$B_f = \frac{34.9}{0.6} = 58.2 \text{ kN/m}^2 \quad \text{OK}$$

$$U_L = 49.8 \text{ kN/m}$$

SCHEME

land adj Sara, Tower Hill, Acrefair
New Dwelling

PAGE No.

03

Initials Da

Prepared by

CAH 01

Checked by

Wall C

$$\text{loads} - E_{lc} = 0.73 \times 6 \frac{1}{2} + 1.2 \times 3.5 + 4.8 \times 1.0 = 11.2 \text{ kN/m}$$

$$Q_{lc} = 1.5 \times 6 \frac{1}{2} + 1.5 \times 1.0 = 6 \text{ kN/m}$$

$$B_f = 17.2 \div 0.45 = 38 \text{ kN/m}^2$$

$$u_T = 25.3 \text{ kN/m}$$

∴ Wall B critical

Reinforced Strips

$$\text{try } 600 \text{ mm} \times 300 \text{ dp. } S_L = 4.3 \text{ kN/m } u_T = 6.0 \text{ kN/m}$$

$$\text{Moment } M = (49.8 + 6.0) \times 2 \frac{1}{8} = 27.9 \text{ kNm}$$

$$V = (49.8 + 6.0) \times 2 \frac{1}{2} = 55.8 \text{ kN}$$

$$\text{Strip } b = 600 \text{ mm } h = 300 \text{ mm } \text{cover} = 50 \text{ mm } d = 300 - 50 - 10 \frac{1}{2} = 245 \text{ mm}$$

$$f_m = 35 \text{ N/mm}^2$$

$$\frac{M}{bd^2 f_m} = \frac{27.9 \text{ kNm}}{600 \times 245^2 \times 35} = 0.022 \quad \therefore z = 0.95d = 233 \text{ mm}$$

$$A_{s \text{ reqd}} = \frac{27.9 \text{ kNm}}{0.87 \times 500 \times 233} = 275 \text{ mm}^2$$

$$A_{s \text{ min}} = 0.13\% bh = 234 \text{ mm}^2$$

try 5 F 10 bars @ 85 mm

$$A_{s \text{ prov}} = 383 \text{ mm}^2$$

SCHEME

land adj Sara, Tower Hill, Acrefair
New Dwelling

PAGE No.

04

Initials Da

Prepared by

cat 0%

Checked by

$$\text{Shear stress} = \frac{55.8 \text{ E3}}{600 \times 245} = 0.38 \text{ N/mm}^2$$

$$\frac{100 A_s}{b d} = \frac{100 \times 393}{600 \times 245} = 0.27\% \quad \therefore v_c = 0.52 \text{ N/mm}^2$$

∴ provide nominal links

$$A_{s \text{ reqd}} = 0.4 \text{ bsv} / 0.87 f_y = \frac{0.4 \times 600 \times 175\%}{0.87 \times 500} = 97 \text{ mm}^2$$

— use Blotlinks @ 175%

$$(A_{s \text{ prov}} = 157 \text{ mm}^2)$$

use 5F Blotlinks T+B with Blotlinks @ 175% — provide footings

$$\text{Span/depth ratio} = 2000/245 = 8.2 < 20 \text{ for beam OK}$$

$$= 1000/245 = 4.1 < 7 \text{ for cantilever OK}$$

SCHEME

land adj Sara, Tower Hill, Acrefair
New Dwelling

PAGE No.

05

Initials Da

Prepared by

att

01/1

Checked by

Floor Slab.

$$\text{At ULS, } w = 4.8 \times 1.4 + 1.5 \times 1.6 = 9.1 \text{ kN/m}^2$$

$$\text{For 2m span } M = 9.1 \times 2^2 / 8 = 4.5 \text{ kNm}$$

$$V = 9.1 \text{ kN}$$

$$\text{For slab } b = 1000 \text{ mm } h = 150 \text{ mm } \text{cover} = 25 \text{ mm } d = 150 - 25 - \frac{5}{2} = 120 \text{ mm}$$

$$\frac{M}{b d^2 f_m} = \frac{4.5 \text{ kNm}}{1000 \times 120^2 \times 35} = 0.009 \quad z = 0.95 d = 114 \text{ mm}$$

$$A_{s \text{ reqd}} = \frac{4.5 \text{ kNm}}{0.87 \times 500 \times 114} = 91 \text{ mm}^2/\text{m}$$

$$A_{s \text{ min}} = 0.132 b h = 195 \text{ mm}^2/\text{m}$$

try A252 mesh.

$$\text{Shear stress} = \frac{9.1 \text{ kN}}{1000 \times 120} = 0.008 \text{ N/mm}^2 \text{ - negligible.}$$

∴ Use A252 mesh.

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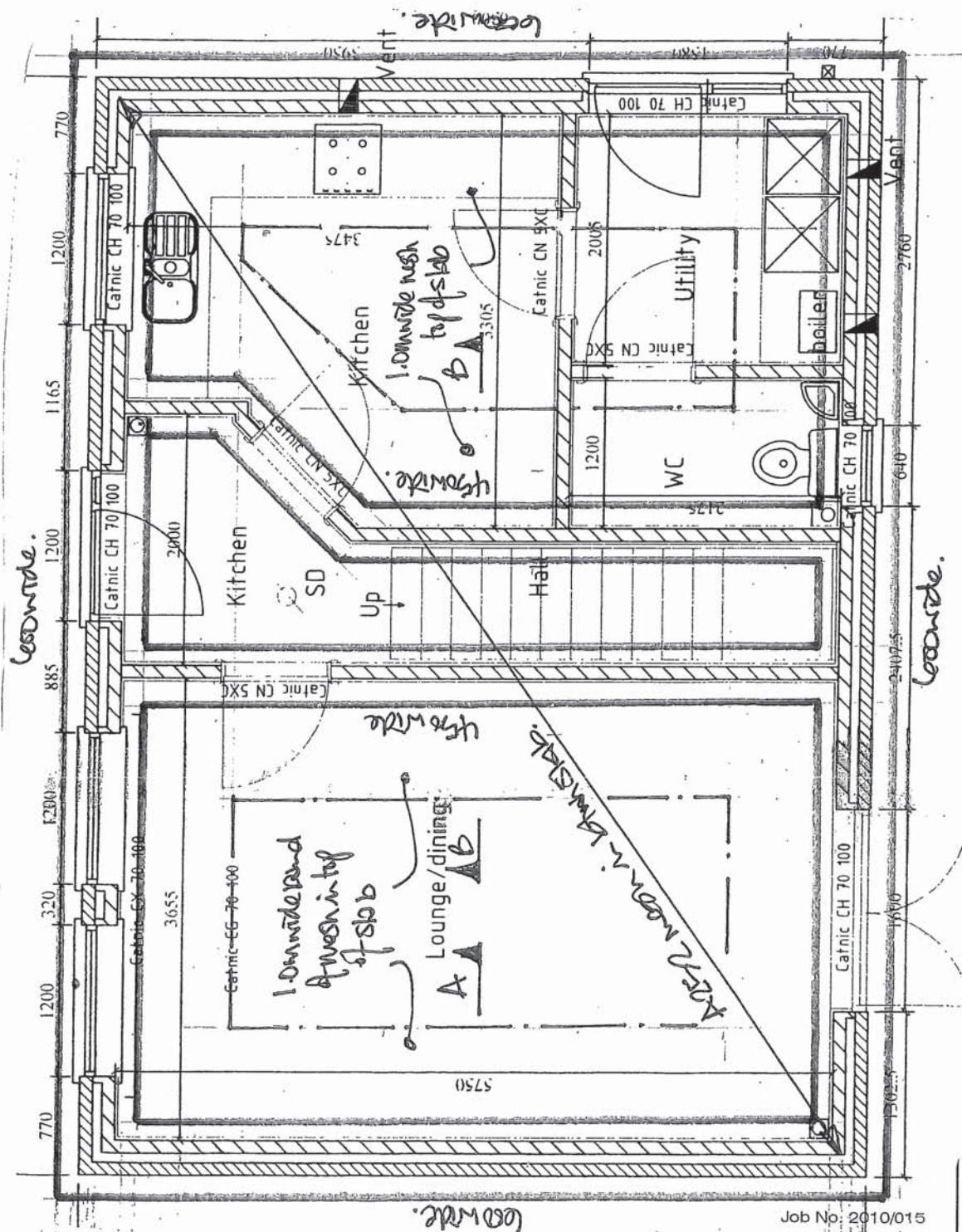
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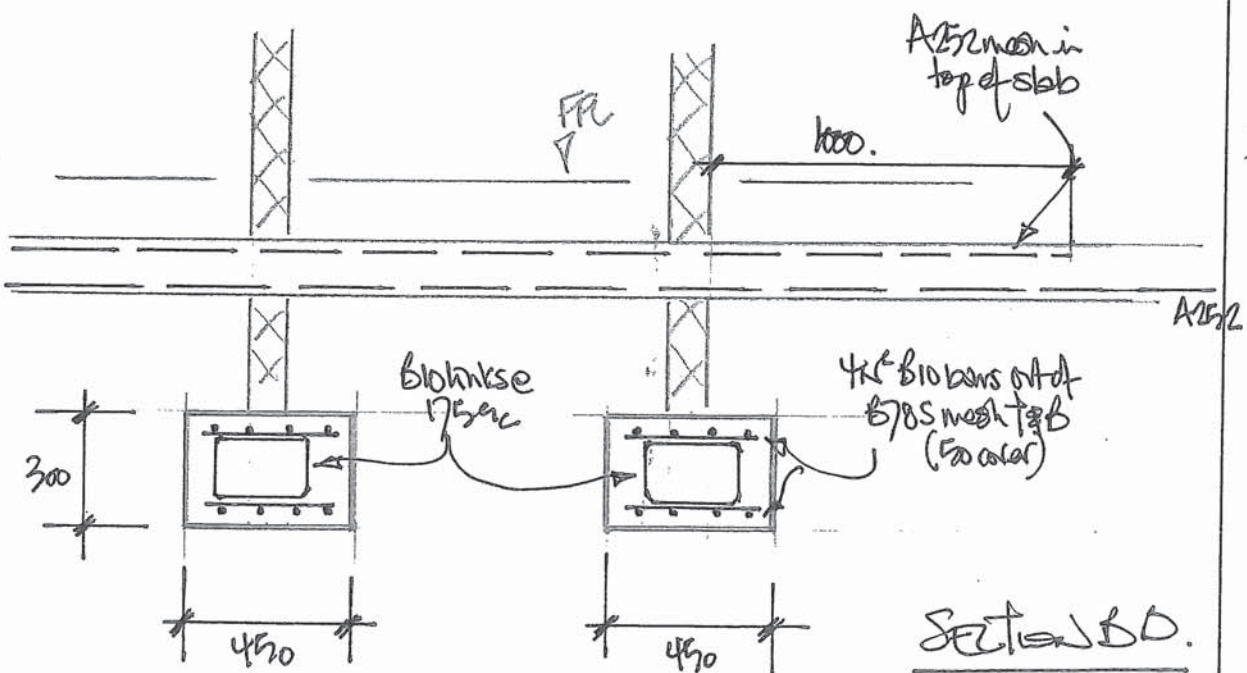
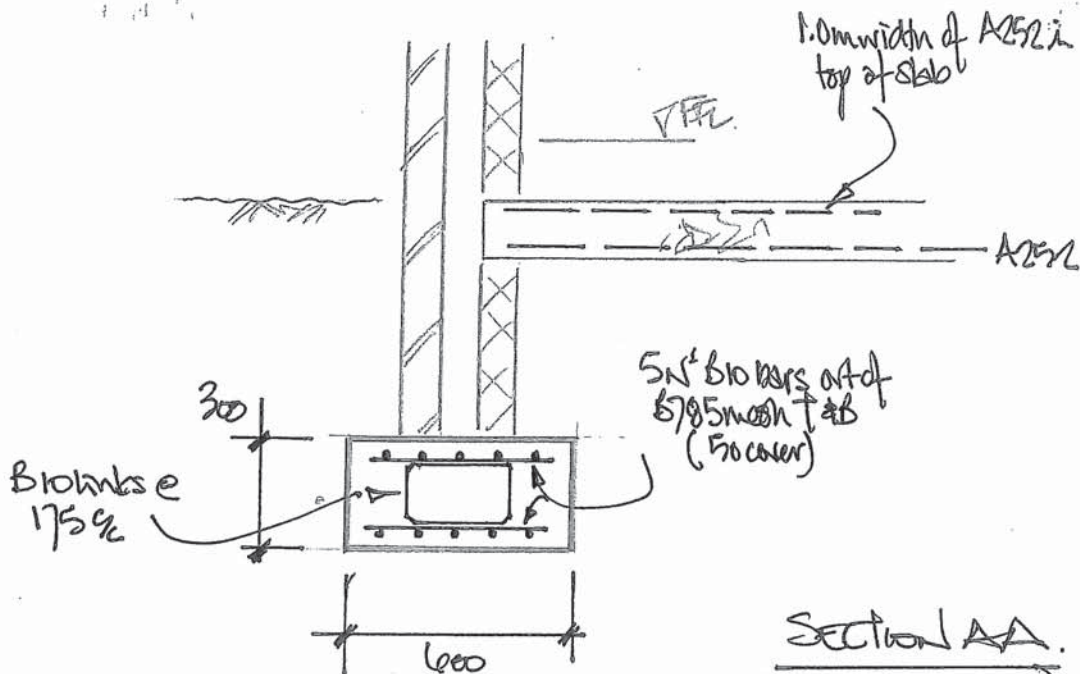
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NOTES/SPECIFICATION

General

1. All dimensions in millimetres unless noted otherwise.
2. All dimensions shall be checked by the Contractor prior to commencement and any discrepancies brought to the attention of the Project Architect.
3. The Contractor shall be responsible for the provision of adequate propping of the existing walls and floors. All propping shall be tight and locked off prior to removal of existing supports, walls or floor construction.

Reinforced Concrete

4. Concrete for reinforced strip footings to be Designed Mix RC28/35. Concrete for blinding shall be Designated Mix GEN1. All concrete to comply with BS8500.
5. Reinforcing bar shall be Grade B500B or B500C bar to BS4449:2005 cut and bent in accordance with reinforcement schedules to BS8666. Minimum laps shall be as shown on the drawings. Minimum cover to outermost bars to be 50mm.
6. Mesh reinforcement to retaining wall to be Grade B500B or B500C in accordance with BS4483:2005. Minimum cover shall be 50mm to exposed faces. Mesh reinforcement shall be placed prior to concreting and shall be adequately supported off spacers or mesh coils, "treading in" will not be allowed. Minimum laps to mesh shall be 400mm.
7. All concrete shall be mechanically vibrated after placing to remove all air from the mix.
8. The system for bar marking used on the drawings is as follows:

Total No.	Type	Diameter	Bar Mark	Centres	Position
12	B	16	- 02	- 150	NF
9. Finishes to concrete surfaces to be as follows:
Formed Surfaces wrought board finish free of ridges (F2)
Unformed Surfaces smooth floated finish (U2)

Andrew Hannett Ltd

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Rev
letter
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Site ref : land adj Sara, Acrefair

22-Jan-10

Job no : 2010/015

AH

AH Checked by :

[illegible]

This schedule conforms to BS 8666:2005

* Specified in multiples of 5mm.

† Specified in multiples of 25mm.

Bar Schedule 8666 v5.02

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APPENDIX 18

Investigation Techniques and General Notes



INTRODUCTION

The following brief review of Ground Investigation techniques, generally used as part of most Site Investigations in the UK, summarises their methodology, advantages and limitations. Detailed descriptions of the techniques are available and can be provided on request. This review should be read in conjunction with the accompanying General Notes.

TRIAL PITS

The trial pit is amongst the simplest yet most effective means of identifying shallow ground conditions on a site. Its advantages include simplicity, speed, potential accuracy and cost-effectiveness. The trial pit is most commonly formed using a back-acting excavator which can typically determine ground conditions to some 4 metres below ground level. Hand excavation is often used to locate, expose and detail existing foundations, features or services. In general, it is difficult to extend pits significantly below the water table in predominantly granular soils, where flows can cause instability. Unless otherwise stated, the trial pits will not have been provided with temporary side support during their construction. Under such circumstances, entrance into the pit is not permitted and hence observations will have been made from the ground surface and samples taken from the excavator bucket.

Where access for personnel is required to allow close observation of the exposed strata, the taking of samples and the carrying out of in situ tests, the sides of the trial pits (Observation Pits in BS 5930:2015) will be made safe using temporary supports or the sides battered back to a stable angle. Some limited access to such Trial Pits (Observation Pits) at depths less than 1m may be allowed in stable conditions or where the sides are benched or battered back to a safe angle.

Trends in strata type, level and thickness can be determined, shear surfaces identified and the behaviour of plant, excavation sides and excavated materials can be related to the construction process. They are particularly valuable in land slip investigations. Some types of in situ test can be undertaken in such pits and large disturbed or block samples obtained.

CABLE PERCUSSION BORING

The light Cable Percussion technique of soft ground boring, typically at a diameter of 150mm, is a well-established simple and flexible method of boring vertical holes and generally allows data to be obtained in respect of strata conditions other than rock. A tubular cutter (for cohesive soils) or shell with a flap valve (for granular soils) is repeatedly lifted and dropped using a winch and rope operating from an "A" frame. Soil which enters these tools is regularly removed and either sampled for subsequent examination or test, or laid to one side for later removal off site and licensed disposal or, if permitted by the Client, use as backfill. Steel casing will have been used to prevent collapse of the borehole sides where necessary. A degree of disturbance of soil and mixing of layers is inevitable and the presence of very thin layers of different soils within a particular stratum may not be identified. Changes in strata type can only be detected on recognition of a change in soil samples at the surface, after the interface has been passed. For the foregoing reasons, depth measurements should not be considered to be more accurate than 0.10 metre. The technique can determine ground conditions to depths in excess of 30 metres under suitable circumstances and usually causes less surface disturbance than trial pitting.

In cohesive soils cylindrical samples are retrieved by driving or pushing in 100mm nominal diameter tubes. In soft soils, piston sampling or vane testing may be undertaken. In granular soils and often in cohesive materials, in situ Standard Penetration Tests (SPTs) are performed. The SPT records the number of standard blows required to drive a 50mm diameter open or cone ended probe for 300mm after an initial 150mm penetration. A modified method of recording is used in denser strata. Small disturbed samples are obtained throughout.

ROTARY DRILLING

Rotary Drilling to produce cores by rotating an annular diamond-impregnated tube or barrel into the ground is the technique most appropriate to the forming of site investigation boreholes through rock or other hard strata. It has the advantage of being able to be used vertically or at an angle. Core diameters of less than 100mm are most common for site investigation purposes. Core is normally retrieved in plastic lining tubes. A flushing fluid such as air, water or foam is used to cool the bit and carry cuttings to the surface. Depths in excess of 60 metres can be achieved under suitable circumstances using rotary techniques, with minimal surface disturbance.

Examination of cores allows detailed rock description and generally enables angled discontinuity surfaces to be observed. However, vertical holes do not necessarily reveal the presence of vertical or near-vertical fissures or joint discontinuities. The core type and/or techniques used will depend on the ground conditions. Where open hole rotary drilling is employed, descriptions of strata result from examination at the surface of small particles ejected from the borehole in the flushing medium. In consequence, no indication of fissuring, bedding, consistency or degree of weathering can be obtained.

DYNAMIC SAMPLING

This technique involves the driving of an open-ended tube into the ground and retrieval of the soil which enters the tube. It was previously called window or windowless sampling. The term "window sample" arose from the original device which had a "window" or slot cut into the side of the tube through which samples were taken. This was superseded by the use of a thin-walled plastic liner to retrieve the soil sample from within a sampler (windowless sampling) which has a solid wall. Line diameters range from 36 to 86mm. Such samples can be used for qualitative logging, selection of samples for classification and chemical analysis and for obtaining a rudimentary assessment of strength.

Driving devices can be hand-held or machine mounted and the drive tubes are typically in 1m lengths. Depending on the type of rig used, the hole formed can be cased to prevent collapse of the borehole sides. Where the type of rig does not allow the insertion of casing, the success of this technique can be limited when soils and groundwater conditions are such that the sides of the hole collapse on withdrawal of the sampler. Obstructions within the ground, the density of the material or its strength can also limit the depth and rate of penetration of this light-weight investigation technique. Nevertheless, it is a valuable tool where access is constrained such as within buildings or on embankments. Depths of up to 10m can be achieved in suitable circumstances depending on the rig type but depths of 5m to 6m are more common.

EXPLORATORY HOLE RECORDS

The data obtained by these techniques are generally presented on Trial Pit, Borehole, Drillhole or Dynamic Sample Records. The descriptions of strata result from information gathered from a number of sources which may include published geological data, preliminary field observations and descriptions, in situ test results, laboratory test results and specimen descriptions. A key to the symbols and abbreviations used accompanies the records. The descriptions on the exploratory hole records accommodate but may not necessarily be identical to those on any preliminary records or the laboratory summaries.

The records show ground conditions at the exploratory hole locations. The degree to which they can be used to represent conditions between or beyond such holes, however, is a matter for geological interpretation rather than factual reporting and the associated uncertainties must be recognised.

DYNAMIC PROBING

This technique typically measures the number of blows of a standard weight falling over a standard height to advance a cone-ended rod over sequential standard distances (typically 100mm). Some devices measure the penetration of the probe per standard blow. It is essentially a profiling tool and is best used in conjunction with other investigation techniques where site-specific correlation can be used to delineate the distribution of soft or loose soils or the upper horizon of a dense or strong layer such as rock.

Both machine-driven and hand-driven equipment is available, the selection depending upon access restrictions and the depth of penetration required. It is particularly useful where access for larger equipment is not available, disturbance is to be minimised or where there are cost constraints. No samples are recovered and some techniques leave a sacrificial cone head in the ground. As with other lightweight techniques, progress is limited in strong or dense soils. The results are presented both numerically and graphically. Depths of up to 10m are commonly achieved in suitable circumstances.

The hand-driven DCP probing device has been calibrated by the Highways Agency to provide a profile of CBR values over a range of depths.

INSTRUMENTATION

The most common form of instrument used in site investigation is either the standpipe or else the standpipe piezometer which can be installed in investigation holes. They are used to facilitate monitoring of groundwater levels and water sampling over a period of time following site work. Normally a standpipe would be formed using rigid plastic tubing which has been perforated or slotted over much of its length whilst a standpipe piezometer would have a filter tip which would be placed at a selected level and the hole sealed above and sometimes below to isolate the zone of interest. Groundwater levels are determined using an electronic "dip meter" to measure the depth to the water surface from ground level. Piezometers can also be used to measure permeability. They are simple and inexpensive instruments for long term monitoring but response times can limit their use in tidal areas and access to the ground surface at each instrument is necessary. Remote reading requires more sophisticated hydraulic, electronic or pneumatic equipment.

Settlement can be monitored using surface or buried target plates whilst lateral movement over a range of depths is monitored using slip indicator or inclinometer equipment.



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4. The assessment of the significance of the factual data, where called for, is provided to assist the Client and their Engineer and/or Advisers in the preparation of their designs.
5. The report is based on the ground conditions encountered in the exploratory holes together with the results of field and laboratory testing in the context of the proposed development. The data from any commissioned desk study and site reconnaissance are also drawn upon. There may be special conditions appertaining to the site, however, which are not revealed by the investigation and which may not be taken into account in the report.
6. Methods of construction and/or design other than those proposed by the designers or referred to in the report may require consideration during the evolution of the proposals and further assessment of the geotechnical and any geoenvironmental data would be required to provide discussion and evaluations appropriate to these methods.
7. The accuracy of results reported depends upon the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristics of the strata as a whole (see accompanying notes on Investigation Techniques). Where such measurements are critical, the technique of investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the Company where necessary.
8. The samples selected for laboratory test are prepared and tested in accordance with the relevant Clauses and Parts of BS EN ISO 17892 and BS 1377 Parts 1 to 8, where appropriate, in Geotechnics Limited's UKAS accredited Laboratory, where possible. A list of tests is given.
9. Tests requiring the use of another laboratory having UKAS accreditation where possible are identified.
10. Any unavoidable variations from specified procedures are identified in the report.
11. Specimens are cut vertically, where this is relevant and can be identified, unless otherwise stated
12. All the data required by the test procedures are recorded on individual test sheets but the results in the report are presented in summary form to aid understanding and assimilation for design purposes. Where all details are required, these can be made available.
13. Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes, or on the possible presence of features based on either visual, verbal, written, cartographical, photographic or published evidence, this is for guidance only and no liability can be accepted for its accuracy.
14. The Code of Practice for Ground Investigations – BS 5930:2015 calls for man-made soils to be described as Anthropogenic Ground with soils placed in an un-controlled manner classified as Made Ground and soils placed in a controlled manner as Fill. In view of the difficulty in always accurately determining the origin of man-made soils in exploratory holes, Geotechnics Limited classify such materials as Made Ground. Where soils can be clearly identified as being placed in a controlled manner then further classification of the soils as Fill has been added to the Exploratory Hole Records.
15. Classification of man-made soils is based on the inspection of retrieved samples or exposed excavations. Where it is obvious that foreign matter such as paper, plastic or metal is present, classification is clear. Frequently, however, for man-made soils that arise from the adjacent ground or from the backfilling of excavations, their visual characteristics can closely resemble those of undisturbed ground. Other evidence such as site history, exploratory hole location or other tests may need to be drawn upon to provide clarification. For these reasons, classification of soils on the exploratory hole records as either Made Ground or naturally occurring strata, the boundary between them and any interpretation that this gives rise to should be regarded as provisional and subject to re-evaluation in the light of further data.
16. The classification of materials as Topsoil is generally based on visual description and should not be interpreted to mean that the material so described complies with the criteria for Topsoil used in BS 3882:2015. Specific testing would be necessary where such a definition is a requirement.
17. Ground conditions should be monitored during the construction of the works and the report should be re-evaluated in the light of these data by the supervising geotechnical engineers.
18. Any comments on groundwater conditions are based on observations made at the time of the investigation, unless specifically stated otherwise. It should be noted, however, that the observations are subject to the method and speed of boring, drilling or excavation and that groundwater levels will vary due to seasonal or other effects.
19. Any bearing capacities for conventional spread foundations which are given in the report and interpreted from the investigation are for bases at a minimum depth of 1m below finished ground level in naturally occurring strata and at broadly similar levels throughout individual structures, unless otherwise stated. Typically they are based on serviceability criteria taking account of an assessment of the shear strength and/or density data obtained by the investigation. The foundations should be designed in accordance with the good practice embodied in BS 8004:2015 - Foundations, supplemented for housing by NHBC Standards. Foundation design is an iterative process and bearing pressures may need adjustment or other measures may need to be taken in the context of final layouts and levels prior to finalisation of proposals.
20. Unless specifically stated, the investigation does not take account of the possible effects of mineral extraction or of gases from fill or natural sources within, below or outside the site.
21. The costs or economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to geotechnical or geoenvironmental considerations and hence their evaluation is outside the scope of the report.