

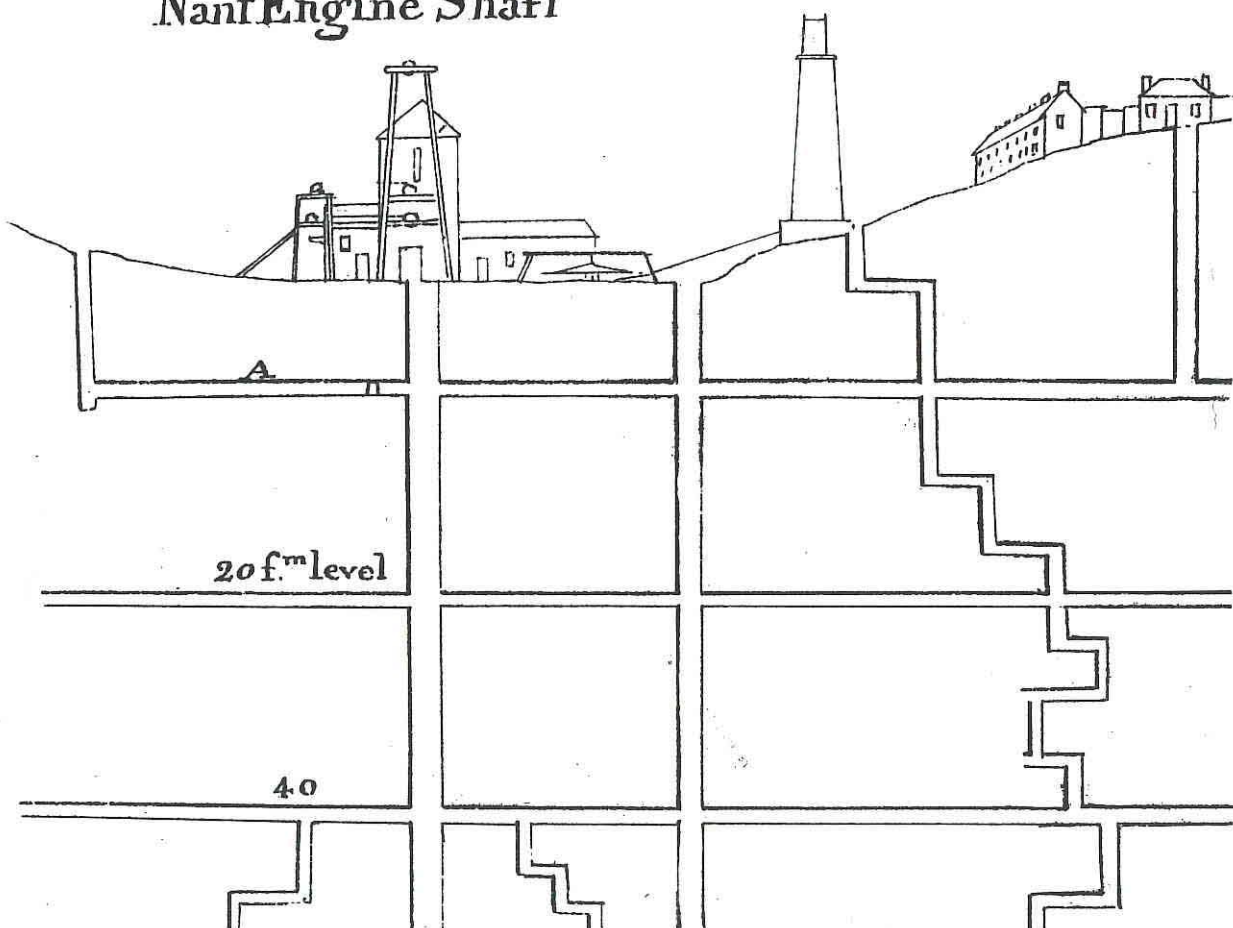
CONSULTATION DRAFT

Clwyd Metal Mines Survey 1993

Part 1

Ellis's Shaft

Nant Engine Shaft



Nant Engine Shaft abandonment plan (Clwyd County Record Office, Hawarden)

CPAT Report No 88

CONSULTATION DRAFT
Clwyd Metal Mines Survey 1993

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Survey undertaken with financial assistance from
Cadw: Welsh Historic Monuments

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PART 1 INTRODUCTION

1 BACKGROUND

- 1.1 The history of metal mining in Clwyd (the old counties of Denbighshire and Flintshire and parts of Merioneth) can be traced back to Roman times and earlier. Previous studies have mainly either focused on the geology of the area, most notably *Lead and Zinc Ores in the Carboniferous Rocks of North Wales* by Bernard Smith (1921) or the historical details of particular areas, notably *The Lead Mines of the Alyn Valley* by Chris Williams (1979-80) and *Minera: Township of Mines* by Derrick Pratt (1976). The series of publications by Foster-Smith on *The Non-Ferrous Mines of Wales* mainly records the locations of sites in Denbighshire and Flintshire (1972 and 1974). In general, however, published information on the metal mines in Clwyd is very scarce and few detailed studies have been undertaken of the surviving physical remains of the industry. The limited scale of the work that has been undertaken is more a reflection of the infancy of mining studies in the area and of the small number of specialists in this field than of the inherent archaeological and historical importance of the remains themselves.
- 1.2 The present study, based on rapid fieldwork and recording, is intended to provide a summary of the surviving physical evidence of non-ferrous metal mines in Clwyd rather than a definitive history or interpretation of the industry that these remains represent.
- 1.3 Following the publication of the *Planning and Policy Guidance Note: Archaeology and Planning* (PPG 16) by the Welsh Office in November 1991, greater emphasis has been placed on the role of the local planning authorities in the conservation of archaeological remains through the planning process and a framework has been provided for the construction of appropriate mitigation measures depending on the size and nature of the planning threat to the archaeology.
- 1.4 The archaeological potential of mining sites in Clwyd has previously had little study, and little appreciation has been possible of the extent or nature of the surviving archaeological resource relating to these sites. As a consequence, poor consultation and liaison between planners and archaeologists concerning early mining sites has in some cases led to total destruction of mine sites with little or no archaeological recording.
- 1.5 The Clwyd-Powys Archaeological Trust (CPAT) has therefore taken a lead in carrying out this rapid field survey of non-ferrous metal mines and trials in Clwyd. It is intended that coal mining remains in the North-East Wales Coalfield will be covered by a future thematic report in the same format. Financial support has been provided by Cadw: Welsh Historic Monuments.
- 1.6 Until recently, advice on the implications of the proposed developments affecting mining sites has often only been sought from reclamation consultants and industrial archaeology historians. Specialist advice of this kind continues to be

of importance, but following the publication of PPG 16 it is recommended that the advice of CPAT, the principal advisory body on archaeological matters in the counties of Clwyd and Powys, should be sought as a matter of course, as in the case of other development proposals with archaeological implications.

Acknowledgements

- 1.7 I would like to thank the following for their help and support during the survey and production of this report: Cadw: Welsh Historic Monuments for funding the survey and report production costs; Chris Musson of the Royal Commission on Ancient and Historical Monuments in Wales for his aerial photographic work; Bill Slater, Industrial Archaeologist on the Minera Land Reclamation Scheme and Stephen Greuter, Clwyd County Council, for their advice and interest; colleagues within the Clwyd-Powys Archaeological Trust, particularly Bill Britnell and Chris Martin, for their general support of the project and their assistance in providing advice on the content and layout and Mark Walters for his supervision and advice throughout the project and assistance with some of the fieldwork; staff at the National Library of Wales, Ruthin and Hawarden County Record Offices, particularly Chris Williams, for the supply of maps and documents.

2 OBJECTIVES OF THE STUDY

- 2.1 The main objectives of the study are as follows:

- To produce an overall survey of the surviving archaeological resource at every identifiable non-ferrous metal mine site in Clwyd.
- To identify archaeologically sensitive areas in and around each mining site in order to assist in the day-to-day planning process and future planning strategies at district and county level.
- To recommend where archaeological work should be carried out at the pre-determination stage of the planning process.
- To propose instances where mining landscapes, sites or structures are sufficiently important to warrant continued preservation, conservation and management.

- 2.2 It is hoped that this document will be used in conjunction with other planning policy documents and development control procedures as a day-to-day reference and for use in strategic planning.

3 METHODS OF STUDY

- 3.1 The greatest proportion of the time taken on this survey was devoted to field assessment of identifiable mines and most of the more significant trial workings. Rapid identifications were carried out on site of all the surviving features, backed up by a 35mm black and white and colour slide photographic record of all the main features of each mine, and of the general mining landscape.

- 3.2 In the field notes were taken of the character and state of preservation of mining features together with identification of potential threats to the mine site. Where available, copies of OS maps were annotated in the field while sketch plans were drawn up where maps were not available.
- 3.3 The fieldwork survey undertaken by CPAT has been carried out in conjunction with aerial reconnaissance undertaken by Chris Musson of the Royal Commission on Ancient and Historical Monuments in Wales (RCAHMW), Aberystwyth.
- 3.4 The project archive which has been retained by CPAT consists of field notes, annotated maps, ground-level photographs and prints from RCAHMW's aerial surveys. The original aerial photographic material has been retained by RCAHMW.
- 3.5 Documentary research has been limited to the main secondary sources of information, including the Regional Sites and Monument Record maintained by CPAT. Primary sources of information have been largely restricted to published Ordnance Survey maps and a number of other documents including the following; maps held by the National Library of Wales; maps, mine plans, leases and prospectuses held by the County Record Offices at Hawarden and Ruthin and various articles published in the transactions of the Denbighshire and Flintshire Historical Societies.
- 3.6 Research and fieldwork data have been collated by means of a relational database compatible with the Regional Sites and Monument Record maintained by CPAT.

4 THREATS TO MINING SITES IN CLWYD

- 4.1 Widespread damage results from natural deterioration of earthworks and structures combined with local robbing of stone from structures for other usage. The other principal threats identified during the survey are listed below.

Agricultural

- 4.2 Improvement of pasture has already caused damage to mining remains in Clwyd. The area of Pen-y-Ball (SJ17507580), for example, intensely mined from at least early 18th century, now largely only survives as fields of improved pasture. Small-scale agricultural development for trackways, agricultural buildings or dwellings potentially also present a significant threat to mining sites, particularly in remote areas.

Forestry

- 4.3 Forestry Commission planting schemes, preparatory ploughing of new plantations or thinning could damage the mining landscape. It is anticipated that these problems can be avoided by liaison between archaeological bodies and the Forestry Enterprise and Forestry Authority to promote a growing awareness of the importance of industrial archaeology and the tourist potential of mine sites. Sites worthy of preservation in areas of woodland include Pen-y-Fron (103159) on the eastern slopes of the River Alyn.

Shaft Capping

- 4.4 Although the need for safety measures is high, shaft backfilling, capping, and gating of levels represent a potentially major threat to archaeological evidence. Shaft capping and related works often necessitate the use of heavy plant machinery to excavate around the shaft collar in order to locate solid ground on which to lay the cap base. This can result in extensive damage to vulnerable surrounding features such as bob pits, whim circles, wheelpits and engine house remains. Shafts are frequently backfilled with demolished surface buildings and machinery (e.g. headgear, shear legs, pumping rods and piping, and engine house remains) at the time of closure or demolition of the mine. Generally, the maintenance of access to mine workings by means of restricted access gateways more preferable than total backfilling and capping. Besides destroying important archaeological information the latter can also seriously damage rare and frequently protected wildlife habitats.

Quarrying and Mining

- 4.5 Large-scale quarrying on previous mining sites has frequently resulted in the total loss of archaeological evidence. The old engine house at Pen-yr-Hemblas (18165), for example, was lost to the chert quarry and the large-scale workings of the Prince Patrick Mine, including the engine house on the main site (18182, SJ18907190) were lost to the Pant-y-Pwll Quarry on Halkyn Mountain.
- 4.6 Although the metal mining industry in Clwyd is now fairly inactive and is currently not economically viable, there is undoubtedly still potential for the extraction of lead and zinc ore in the county. The most promising areas for future mining are likely to be the Llanarmon District and along the line of the Milwr Tunnel. The most recent exploitation, by Halkyn District United Mines Ltd in the 1950s, combined the mining of limestone for agricultural and industrial purposes with the mining of lead ore. Production was centred around the Pen-y-bryn Shaft (SJ20307070), in an area which now lies in the Wimpey Quarry.
- 4.7 Any attempt to re-work the mines would undoubtedly pose a serious threat to surviving archaeological remains. Applications for renewed extraction should therefore be subject to the consultation procedures outlined in PPG 16.

Reclamation Schemes

- 4.8 Large-scale reclamation schemes undertaken by local authorities with grant aid from the Welsh Development Agency (WDA) currently pose the single greatest threat to mining sites in Clwyd, particularly where derelict buildings and landscapes and the threat of chemical contamination are concerned.
- 4.9 There is considerable scope for preservation and display of industrial remains as part of a reclamation scheme, and it is to be welcomed that the WDA have a stated preference for schemes that make provision for the retention of surviving features of the industrial landscape.
- 4.10 For this to be achieved, however, it is vital that archaeological consultation is undertaken at a very early stage, adopting the procedures outlined in PPG 16. (See also draft guidelines prepared by the Welsh Industrial Archaeology Panel 1992).

- 4.11 The current reclamation scheme at Minera shows the scope of a long-term project incorporating funding for industrial archaeology. The scheme, being undertaken by Richards Moorehead and Laing Ltd on behalf of Wrexham Maelor Borough Council, is being carried out with due regard to the needs of industrial archaeology in the process of reclaiming large areas of contaminated soil, and capping and making safe shafts with the minimal disturbance to surrounding features. The recreational use of the area and the development of the main site as an open-air museum has been supported by the Countryside Council for Wales and The Nature Conservancy Council have been consulted about areas within the SSSI. The success of the Minera scheme has undoubtedly been due to prior research and an awareness of the potential for hidden archaeological remains. It will be appropriate for an evaluation of surviving archaeological remains to be undertaken elsewhere at an early stage in the formulation of reclamation schemes.

5 RECOMMENDED ARCHAEOLOGICAL CONSULTATION PROCEDURES

- 5.1 Since few of the mining sites in Clwyd have been excavated or surveyed in detail, existing records are seldom complete and there is often a degree of uncertainty, as in the case of other archaeological remains, about what evidence might survive at any particular site and about the quality of preserved evidence. The archaeological implications of any scheme can only be judged if adequate information about the archaeology is available, and even though many reclamation schemes that effect mining sites are not subject to planning permission, it is strongly recommended that in order to maximise that available information the archaeological consultation procedures outlined in PPG16 are used as a model when preparing such schemes, as they would be in all cases where planning permission is required. These procedures highlight the need for assessing and evaluating the archaeological resource at a pre-determination, or equivalent early, stage of a development proposal, thus enabling suitable mitigatory measures (including preservation of extant features, survey and recording and if necessary excavation) to form an integral part of the proposal. Early consultation, after the manner of PPG16, will allow appropriate design briefs to be prepared, for reclamation schemes or other development proposals effecting mine sites, and properly integrate any necessary archaeological components with the scheme. The identification of potential additional costs, arising from archaeological conservation is particularly important at this early stage. The staged approach outlined in PPG 16 may be summarised as follows.

Consultation

- 5.2 Prospective developers of mining sites, and those promoting reclamation scheme, should seek consultation to identify the archaeological implications of their proposals. Preferably this should be done at as early a stage as possible in the design of reclamation works, and certainly before a planning permission is sought. It is often too late to take proper account of the industrial heritage if consultation only comes in response to a planning application, or after a detailed development brief has been prepared.

Consultees

- 5.3 The Curatorial Section of CPAT is the principal body in Clwyd and Powys providing advice on a broad range of archaeological matters to planning authorities and developers, and can be consulted directly about schemes effecting mining sites. On receipt of such consultation, specialist advice is sought by staff of the Curatorial Section from bodies such as Cadw, RCAHMW, the Welsh Mines Society and the Welsh Mines Preservation Trust as appropriate. CPAT's Curatorial staff will normally provide an appraisal existing information and will indicate the desirability of any further work, in accordance with the guidelines in The Welsh Archaeological Trusts' Curators' Code of Practice. Copies of this document are available from CPAT.

Initial responses

- 5.4 The initial response by CPAT to consultation will usually take the form of a written appraisal of existing information (from the SMR and other readily available sources). As the existing record is often inadequate, it is possible that initial responses will also include recommendations that more detailed archaeological assessment and evaluation should be carried out, as recommended in PPG16, designed to locate and record visible surviving features and to assess their state of preservation, function and overall importance. This might usually be achieved by a combination of documentary research, selective small-scale trial excavation and field survey, which will be outlined in a written brief.

Archaeological contractors

- 5.5 It will normally be appropriate for a public or private developer to engage the services of a professional archaeological contractor to undertake any archaeological work prescribed by CPAT.

Mitigation strategies

- 5.6 The primary aim of consultation, and the appraisal, assessment and evaluation of archaeological information that it entails, should be the production of a positive strategy to mitigate the effects of the reclamation scheme, or development, on the archaeological resource. Mitigation strategies should be designed (normally the archaeological contractor within a framework supplied by the developer) to ensure the continued preservation in-situ of significant remains, or to ensure that remains are adequately recorded in advance of destruction where this continued preservation is not feasible, and should be presented as part of any overall project design. A typical strategy might suggest, the exclusion of certain areas or structures from the development proposals (preservation in-situ), more extensive archaeological recording and excavation (preservation by record), and will almost invariably recommend a watching brief over a broader area of a site during earthmoving operations. In some instances it will also be appropriate to include recommendations for the conservation and display of preserved archaeological remains as part of a scheme.

6 SUMMARY OF THE HISTORY OF MINING IN CLWYD

Prehistoric mining

- 6.1 Although there is no certain evidence, it is possible that metal mining was first undertaken in Clwyd during the prehistoric period. The close proximity of mineral veins to some of the hillforts such as Moel Hiraddug (SJ06307870) and Castell Cawr (SH93807660) may suggest the discovery of ore some time before the Roman period. The deep linear cut at Ffos-y-Bleiddiad (18070) to the north of Castell Cawr is typical of early workings along a vein which may have appeared on the surface. Evidence from elsewhere in Wales shows that stone and bone tools were used to follow the vein down.

Roman mining

- 6.2 It has been claimed that a large number of mines were worked for lead and silver by the Romans from AD 58, although there is little evidence to establish their precise location. A Roman pig of lead was found at Carmel, near Holywell, and three similar lead pigs have been found near the Roman legionary fortress at Chester. Two of these pigs are inscribed with the letters DECEANGL, the name of the tribe which inhabited north-east Wales at the time of the Roman conquest. The lead pigs provide evidence of an active lead extraction and exporting industry in the region from the late 1st century AD.
- 6.3 Archaeological excavations in the Pentre Oakenholt area of Flint (Atkinson and Taylor 1924) have provided evidence of lead smelting, presumably from ores brought down from Halkyn Mountain. The remains of Roman domestic buildings and a bath-house at Pentre Farm (O'Leary et al 1989) are thought to be the dwelling of a Roman official responsible for supervising this industry, which probably exported lead along the Dee estuary to Chester and beyond.
- 6.4 Little evidence has yet been found of mining during the Roman period. It has been thought that mining was carried out in the western part of Minera which is now exhausted: the deep open-cut known as the 'Hush Vein' (18067) suggests early mining technology, although there is no surviving evidence of the storage reservoirs or other sources of water that would have been necessary for flushing out the veins. The suggestion that the cut at Ffos-y-Bleiddiad (18070), near Abergele, was worked during the Roman period seems to be based on the 19th century discovery of hammers and tools and the hilt of a Roman sword (Davis 1856).

Medieval mining

- 6.5 Evidence of mining in the medieval period in Clwyd is mainly derived from documentary sources. The survey of the lordships of Bromfield and Yale in 1391, for example, describes the workings of mines in the area (Pratt 1962, 28-36). The Minera and Eryrys districts appear to have been continually mined for some time, prior to 1391. Each miner was given a plot of land sufficient for his house and curtilage (op cit, 32), and enough wood to repair his house or fences and to make props for his pits. The miners were freemen, they could pasture their stock on common land, sell their ore on the free market, providing they paid their dues to the lord, who owned the mineral rights. Field evidence for mining during this and earlier periods has probably been destroyed or obscured during the large-scale 19th century mining operations. It has generally been assumed

most early mining extraction involved surface trenching along a vein, but it is possible that some of the earlier underground workings described as 'old workings' on 19th century mine plans may belong to the medieval period. The methods described by Agricola in the 16th century may already have been in use for hundreds of years and certainly still continued into the 19th century.

- 6.6 Thorough survey of documentary resources and intensive field survey are urgently needed to remedy the current lack of information of medieval mining in Clwyd.

Post-medieval mining

- 6.7 Until the invention of the steam engine at the end of the 17th century by de Savery, and the improvement by Newcomen by 1712, the raising of ore had been by rope and bucket, windlasses and later by horse whims. Similar rag and chain methods and horses whim were also used for pumping. Consequently, at this period shafts remained as bell-pits, generally not exceeding 10m in depth to avoid flooding.
- 6.8 These and other technological changes gave rise to large-scale mining in north-east Wales at the end of the 17th century. The early 18th century in particular brought large profits and a great expansion in the industry in Flintshire. The ability to use coal as a replacement for charcoal in smelting lead ore by The Governor and Company of Lead Miners in England and Wales led to their expansion and establishment of operations in Flintshire. Generally known as the Quaker Company, they worked the richest mines on Halkyn Mountain and northwards to Dyserth and Trelogan. In 1703, the company began to build their own smelt works at Gadlys, near Bagillt (SJ21407430).
- 6.9 The Quaker Company were pioneers of the lead mining industry in Clwyd until 1792, the surviving records of the company providing considerable documentary evidence of technological changes which took place in the 18th century (Bevan-Evans 1960; 1961; 1962). The Quaker Company installed their first of many Newcomen engines at Trelogan (SJ12308060) in 1732 in an attempt to pump the deeper shafts free of water. The mine at Garreg (102779), known as Windmill Field), for example, is documented as only being workable in dry summer months. The company cut horizontal drifts into the mines, which served as drainage and access levels and invested in wind-power for pumping and winding. Previously, a majority of mines would have been under water and unworkable in the winter months, but improvements in technology and drainage meant that deeper, richer veins could be exploited. The rich Maeslygan mine (18117) on Halkyn Mountain, for example, was already 100yds deep by 1730. The industry had already opened up most of the richest veins by the end of the 18th century and expansion continued in the form of deeper workings along these lodes.
- 6.10 The adjoining Coal Measures provided ample fuel for driving the mine engines and the proximity of the River Dee facilitated the shipment of ore to manufacturing industries and large smelteries.

Nineteenth century mining

- 6.11 The expansion of the industry led to the disappearance of small mining ventures

and the formation of large-scale mining companies during the 19th century. Flintshire became the most productive mining area in Wales and in Britain second only to the Pennines during the late 19th century.

- 6.12 Maps produced by the Ordnance Survey from the 1870s provide location details for most of the 19th century mining sites, although the extent of the setts is often difficult to determine. Returns for the production of lead and copper were recorded by the Mining Record Office from 1845 (Burt et al 1992). These records contain various inconsistencies and inaccuracies, however, and unfortunately some of the sites recorded in the returns (Burt 1992) still remain unlocated (see Appendix 2).
- 6.13 The large capital investments that were being made are evident in the reports given in contemporary mining journals. The employment of the more efficient Boulton and Watt engines patented in 1775 and the large Cornish Engines of Richard Trevithick has been recorded by Bayles (1969) and Bick (1989). Although the industry suffered the general fluctuation of the market during the 19th century, companies continually invested in new plant. The invention of the rock drill, the use of compressed air underground and the use of dynamite during the 19th century also improved the mining of ore. Co-operative schemes were undertaken to overcome drainage problems. The Halkyn Deep Level Tunnel was started in 1818 from Nant-y-flint (SJ23007110) and extended from 1875 by the Halkyn District Mines Drainage Company. In 1896, the Holywell-Halkyn Mining and Tunnel Company began the Sea Level or Milwr Tunnel from Bagillt (SJ21307600). These tunnels drained the Halkyn Mountain and Holywell mines and eventually the Mold and Llanarmon mines.

Twentieth century mining

- 6.14 The end of the 19th century saw a decline in the mining industry due to foreign imports. During the 1914-18 war, the Ministry of Munitions loaned money to stimulate the industry. In 1913, the Holywell-Halkyn Mining and Tunnel Company began to extend the Sea Level Tunnel. Drainage and Mining interests were amalgamated in 1928, when the Halkyn District United Mines extended the Sea Level Tunnel southwards and opened up new veins. The tunnel served an underground railway system using battery locomotives for the carriage of ore and personnel. The 20th century surface operations were powered by electricity.
- 6.15 Work was suspended during the Second World War, but subsequently recommenced combining the mining of lead ore with the mining of limestone for agricultural purposes. The large-scale operations of the Halkyn District United Mines (the amalgamation of nine former mining companies) were centred around the Pen-y-bryn Shaft (103462) on Halkyn Mountain, which continued to be worked intermittently until the 1960s.

7 SITES RECOMMENDED FOR PRESERVATION

- 7.1 Following the rapid field survey the mines and features of mine sites listed in Table 1 are recommended for preservation. The recommendations fall into three broad categories, as follows: firstly, reasonably well-preserved individual structures which form a component of a mining site; secondly, entire mining sites which are well-preserved; thirdly, more extensive areas of mining landscape combining a number of different mining sites (see *Historic Mining Landscapes* defined below). Less specific recommendations about individual sites are included in the Gazetteer in Part 2.
- 7.2 Attention is drawn to the discussion by Dr. Stephen Briggs (1992) on the subject of the conservation of non-ferrous mines which contains specific references to the Halkyn Mountain and Minera areas. The importance of preserving industrial monuments has recently been considered by the Welsh Affairs Committee (1993, xxvi, paragraph 62) in their inquiry into the preservation of historic buildings and ancient monuments in Wales.
- 7.3 Advice on the preservation of mining remains is available from a number of different bodies as well as CPAT, including Cadw's Ancient Monuments Inspectorate, the Welsh Industrial Archaeology Panel, Welsh Mines Preservation Trust, the Welsh Mines Society, the Royal Commission on Ancient and Historical Monuments in Wales, and Clwyd Archaeology Service.
- 7.4 Some of the structures and sites listed in Table 1 are already subject to other conservation measures. The Gazetteer of sites identifies Scheduled Ancient Monuments, Listed Buildings and areas designated as SSSIs, but due to the limited time available for undertaking this study these listings are not necessarily complete. Some of the structures and mining areas in the Minera area listed in Table 1 form part of the current reclamation scheme being undertaken by Wrexham Maelor Borough Council.

Individual structures

- 7.5 The list of buildings and other structures identified in Table 1a, including whims, coes, leat systems, wheelpits, engine houses and limekilns, are considered to be worthy of protection. It is important, however, that protection is seen as one element of a management scheme to allow for continued conservation and reconsolidation to prevent further deterioration. The fabric of the Cornish Engine House at Aberduna (18000), for example, has continued to deteriorate since it was first Listed.

Individual mine sites

- 7.6 The individual mine sites identified in Table 1b are well preserved and relatively intact as earthworks. These sites generally comprise building foundations appearing as grassed-over mounds and other earthwork features. Some of the sites contain structural remains such as engine houses, chimneys and ore bins which are considered to be worthy of protection as part of an entire mine site. Where possible, the preservation of entire mine sites is highly desirable in order to maintain the archaeological integrity of individual sites.

Historic Mining Landscapes

- 7.7 Extensive areas of well-preserved mining activity, working areas with the richest mineral veins, survive in the six areas distinguished as *Historic Mining Landscapes* in Table 1c. Each of these areas (see Maps 24-29) include dense concentrations of mine sites identifiable in returns from 1845 onwards as well as numerous other workings including trial pits for which there appears to be no surviving documentary evidence. These landscapes are of considerable historical and archaeological importance and it is recommended that consideration should be given to their protection. The protection of individual mine sites which form components of a number of these landscapes is recommended above. The general character of these areas is given in the aerial photographs in Figures 1-5.

8 RECOMMENDATIONS FOR FURTHER WORK

Measured surveys

- 8.1 Recommendations for further more detailed archaeological survey are given in Table 2. This provides a provisional list of priorities relating to the more important mine structures and mine sites and is largely designed to provide information to aid the drawing up of management schemes, scheduling priorities, the enhancement of development control procedures and to supplement information currently held in CPAT's Regional Sites and Monuments Record.

Aerial survey

- 8.2 Further aerial photographic reconnaissance is recommended to cover sites which have not yet been photographed for archaeological purposes and also to provide more detailed coverage of the workings of a number of the more important sites that have only been partly recorded from the air.

Sub-surface survey

- 8.3 Sub-surface survey is recommended in cases where underground workings and machinery is likely to survive, which should be recorded in advance of permanent blocking of access.

Historic Mining Landscape survey

- 8.4 Recording of the *Historic Mining Landscapes* is highly desirable but given the extensive areas covered by these landscapes it will probably be appropriate to develop techniques which combine aerial and ground survey.

Workers' housing

- 8.5 There has been little opportunity as part of this study to identify workers' housing, or related buildings, associated with the mining industry in Clwyd. This is an important facet of the industry which it is desirable should be covered in future studies.

Table 1: Recommendations for preservation

1a INDIVIDUAL STRUCTURES		
18008	Blaen-y-Nant	Whim and coe
18050	Coed-y-Fedw	Wheelpit
18064	Dyserth Castle	Leat system for Tarlargocho Mines
18078	Glanalyn	Wheelpits
18122	Minera Central	Maesyfynnon engine house ¹
18125	Minera Quarry	Limekilns ¹
18135	Mwynbwll	Engine house
18227	Westminster, Bog Mary Ann	Engine house
18250	Minera	Mineral railway track ¹
102802	Fronissa	Chimney and ore bins
102915	Maeshafn	Wheelpits
102917	Holway Consols	Boat Level Portal
103159	Pen-y-Fron	Dressing floors and leat system
103276	Trelogan, West	Engine house
104367	Minera, Boundary Shaft	Whim site and Atcherley limekilns ¹
104261	Minera, Lloyd's Shaft	Engine house ¹
1b INDIVIDUAL MINE SITES		
18005	Belgrave	Entire mine site including engine house
18035	Cefn-y-Gist	Entire mine site ²
18067	Eisteddfod Hush	Early open-cut ³
18070	Ffos-y-Bleiddiad	Early workings
18084	Graig Fawr	Early workings
18115	Maes Maelor	Entire mine site
18123	Minera, Halvans*	Entire mine site
18145	Minera, Burton's Shaft	Entire mine site ¹
18144	Pool Park, Boundary	Entire mine site ²
18149	Pant du East	Entire mine site
18179	Pool Park, Mary Ann	Entire mine site ²
18199	South Minera, Walker's	Entire mine site ²
18210	Twelve Apostles	Entire mine site ³
18226	Westminster, Bog East	Entire mine site
18229	Westminster, Nant	Entire mine site
18231	Cefn Cilcen	Entire mine site including engine house
100042	Minera, Taylor's Shaft*	Entire mine site ¹
102766	Pennant	Entire mine site
102803	Maeshafn, Grosvenor Shaft	Entire mine site
103308	Axton	Entire mine site
104270	Eisteddfod*	Entire mine site ³
104274	Top Eisteddfod	Entire mine site ³
104275	Minera, Meadow's Shaft*	Entire mine site ¹
104352	Pool Park	Entire mine site ²
104355	Park Mine, New Shaft	Entire mine site
104365	South Minera, Dixon's	Entire mine site ²
1c HISTORIC MINING LANDSCAPES		
	Pen-y-Ball Top	Mining landscape
	Holywell Common	Mining landscape
	Halkyn Mountain	Mining landscape
	Eisteddfod Mountain	Mining landscape
	Minera	Mining landscape
	Esclusham Mountain	Mining landscape

Notes

*Part of current Minera reclamation scheme

¹Part of Minera Historic Mining Landscape

²Part of Esclusham Mountain Historic Mining Landscape

³Part of Eisteddfod Mountain Historic Mining Landscape

Table 2: Recommendations for further work

18000	Aberduna	Measured survey of engine house
18001	Alltgymbyd	Aerial photographic survey of whole site
18005	Belgrave	Measured surface survey of whole mine site
18008	Blaen-y-Nant	Measured survey of Lot's farm site, whim and coe
18012	Bron Eyarth	Aerial photographic survey of whole site
18013	Bron Eyarth/Coed Marchon	Aerial photographic survey of whole site
18014	Bron Heulog	Aerial photographic survey of whole site
18018	Brynalyn/Gt.New Westminster	Sub-surface survey
18019	Bryncoch	Measured surface and aerial photographic survey of whole mine site
18016	Brynnantllech	Aerial photographic survey of whole site
18031	Cambrian	Aerial photographic survey of whole mine site
18035	Cefn-y-Gist	Measured surface survey of whole mine site
18036	Cefn-y-Groes Fawr	Aerial photographic survey
18037	Cefn-yr-Ogof	Aerial photographic survey
18038	Cefn-yr-Ogof/Gwyrch Castle	Aerial photographic survey
18039	Cheney Rake	Measured surface survey of whole mine site
18042	Chwarel Wen	Aerial photographic survey
18043	Cilcen Hall	Aerial photographic survey
18048	Coed-yr-Esgob/Fish Mine	Sub-surface survey
18050	Coed-y-Fedw	Measured surface survey of whole sett; survey of wheelpit structure
18051	Coetia Ball	Aerial photographic survey
18053	Coetia Mawr	Aerial photographic survey
18056	Creigiog	Aerial photographic survey
18057	Cefn Mawr/Deborah	Aerial photographic survey
18067	Eisteddfod Hush	Measured surface survey
18069	Fford-las Bach	Aerial photographic survey
18070	Ffos-y-Bleiddiad	Measured surface survey
18077	Gladstone	Aerial photographic survey
18078	Glanalyn	Measured survey of wheelpits
18079	GloI	Aerial photographic survey
18080	Glyndwr, East	Measured surface survey of structural remains
18084	Graig Fawr	Aerial photographic survey and measured surface survey
18089	Hafod	Aerial photographic survey
18092	Halkyn, Deep Level	Measured survey of whole mine site
18096	Hendre	Survey of engine houses, chimneys and other structural remains
18108	Lixwm	Aerial photographic survey
18111	Llanfairtalhaiarn	Aerial photographic survey
18112	Lloc	Measured survey of engine house
18115	Maes Maelor	Measured surface survey of whole mine site and aerial photographic survey
18116	Maesypwll	Aerial photographic survey
18117	Maeslygan	Aerial photographic survey
18123	Minera, Halvans	Aerial photographic survey
18131	Mold Mines, Cadole	Aerial photographic survey
18132	Mold, Pantymwyn New Shaft	Measured survey of whole site
18135	Mwynbwll	Measured survey of engine house
18136	Mynydd Bodran	Aerial photographic survey
18137	Mynydd Du	Aerial photographic survey
18144	Pool Park, Boundary	Measured survey of whole mine site
18145	Minera, New/Burton's Shaft	Measured survey of whole mine site
18148	Pant du	Measured survey of chimney

continued

Table 2 continued

18149	Pant du East	Measured surface survey of whole mine site
18154	Pantygwlanod	Measured survey of engine house remains
18156	Pantyne/North/South	Aerial photographic survey
18157	Pantypwldwr	Aerial photographic survey
18161	Park Mine, Hill Shaft	Measured survey of engine house remains
18163	Pen-y-Mynydd	Measured surface survey of whole site and aerial photographic survey
18164	Pen-y-Pylle	Aerial photographic survey
18166	Pen-yr-Orsedd	Aerial photographic survey
18167	Pen-yr-hwylfa	Aerial photographic survey
18169	Penmachno	Measured survey of building remains
18171	Pentre Halkyn	Aerial photographic survey
18173	Maeshafn, Moel-findeg	Aerial photographic survey
18174	Picton	Aerial photographic survey
18177	Plas Captain	Aerial photographic survey
18178	Plas Newydd	Aerial photographic survey
18179	Pool Park, Mary Ann	Measured survey of whole mine site
18185	Prysau	Aerial photographic survey
18187	Pwllgwenllan	Aerial photographic survey
18189	Pwllwheal	Aerial photographic survey
18193	Rhyd-yr-Eirin	Aerial photographic survey
18197	Silver Rake	Aerial photographic survey
18199	South Minera, Walker's	Measured survey of whole mine site
18203	Talargoch, Walker's	Measured survey of whole mine site
18204	Tan-y-Foel	Aerial photographic survey
18205	Tan-y-Graig	Aerial photographic survey
18207	Trellynia	Aerial photographic survey
18210	Twelve Apostles	Measured surface survey of whole mine site
18213	Tyddyn Morgan	Aerial photographic survey
18214	Ty maen	Aerial photographic survey
18215	Tyn-y-caeau	Aerial photographic survey
18227	Westminster, Bog Mary Ann	Measured survey of engine house
18229	Westminster, Nant	Measured survey of whole mine site
18230	Wynnstay	Sub-surface survey
18231	Cefn Cilcen	Measured surface survey of whole mine site and survey of engine house; aerial photographic survey
18237	Gwernymynydd	Aerial photographic survey
18244	Wern-y-Gaer	Aerial photographic survey
18249	Garneddwen	Aerial photographic survey
18266	Westminster, Bog East	Measured surface and sub-surface survey of whole mine site
100042	Minera, Taylor's Shaft	Measured survey of whole site
102786	Trelogan	Measured survey of structural remains and aerial photographic survey
102802	Fronissa	Measured surface survey of whole mine site; survey of chimney
102898	Cefn Spar Mine	Sub surface and measured surface survey of whole mine site
102915	Maeshafn, River Alyn Site	Measured survey of wheelpits and leat, and aerial photographic survey
102917	Holway Consols	Measured surface survey of whole mine site and survey of engine house remains
103158	Llynypandy	Aerial photographic survey
103159	Pen-y-Fron	Measured survey of dressing floor areas
103203	Pantybuarth	Aerial photographic survey

continued

Table 2 continued

103219	Fronfawnog	Aerial photographic survey of whole site
103276	Trelogan, West	Measured survey of engine house remains
103308	Axton	Measured surface survey of whole mine site
103388	Halkyn, New North	Measured survey of whole mine site
103407	Maenbras	Aerial photographic survey
103419	Halkyn, Mount	Measured survey of whole mine site
103424	Pen Bronwiski	Measured surface survey of whole mine site
103425	Plas Winter	Aerial photographic survey
103442	Coed-y-Fron	Aerial photographic survey
103651	Thorntree	Aerial photographic survey
104129	Herward	Aerial photographic survey
104261	Minera, Lloyd's Shaft	Measured survey of engine house
104270	Eisteddfod	Measured surface survey of whole mine site and engine house remains
104274	Top Eisteddfod	Aerial photographic survey
104352	Pool Park	Measured survey of whole mine site
104355	Park Mine, New Shaft	Measured surface survey of whole mine site
104365	South Minera, Dixon's	Measured survey of whole mine site
104367	Minera, Boundary Shaft	Measured surface and sub-surface survey
104373	Park Mine, Western Shaft	Measured surface survey of whole mine site
104438	Coed Mawr	Aerial photographic survey



Fig. 1 Halkyn Mountain Veins, including Union (18218) and Wagstaff (18223). Photo: C R Musson, RCAHMMW (935136-47)



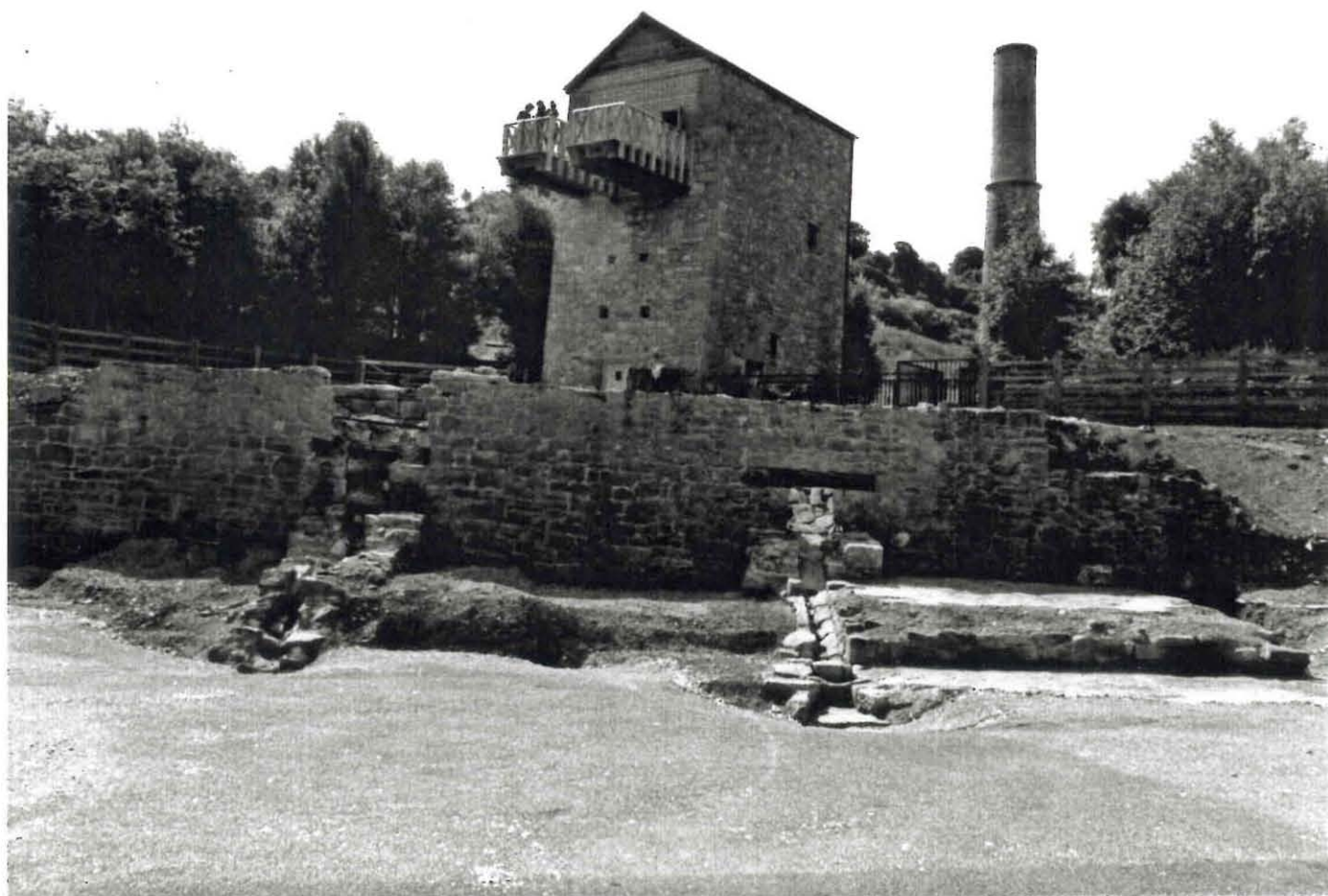
above Fig. 2 Halkyn Mountain, workings along the veins. Photo: C R Musson, RCAHMMW (935136-49)

below Fig. 3 Holywell Common veins, including Pwllclai (18186) and Pantypydew (104142). Photo: C R Musson, RCAHMMW (935134-54)



above Fig. 4 Pen-y-Ball Top, True Blue Vein (18208). Photo: C R Musson, RCAHMW (935134-46)

below Fig. 5 Esclusham Mountain: Pool Park, Boundary Shaft (18144), Mary Ann Shaft (18179), and South Minera, Walker's Shaft (18199). Photo: C R Musson, RCAHMW (935144-44)



above Fig. 6 Minera, Meadow's Shaft (104275), excavated buddle. Photo: P Frost, CPAT (241-1A)

below Fig. 7 Minera, Meadow's Shaft (104275), engine house, chimney and ore bins on open-air museum site. Photo: P Frost, CPAT (241-5A)



above Fig. 8 Eisteddfod Engine House remains (104270). Photo: P Frost, CPAT (237-1)

below Fig. 9 Glanalyn Wheelpit (18078), Loggerheads Country Park. Photo: P Frost, CPAT (218A-2)



Fig. 10 Westminster Vein, Llanarmon, Nant Chimney (18229). Photo: P Frost, CPAT (237-21)



Fig. 11 Westminster Vein, Llanarmon, Nant Engine House (18229). Photo: P Frost, CPAT (237-17)

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MAPS ACCOMPANYING PART 1

General location maps (1-24)

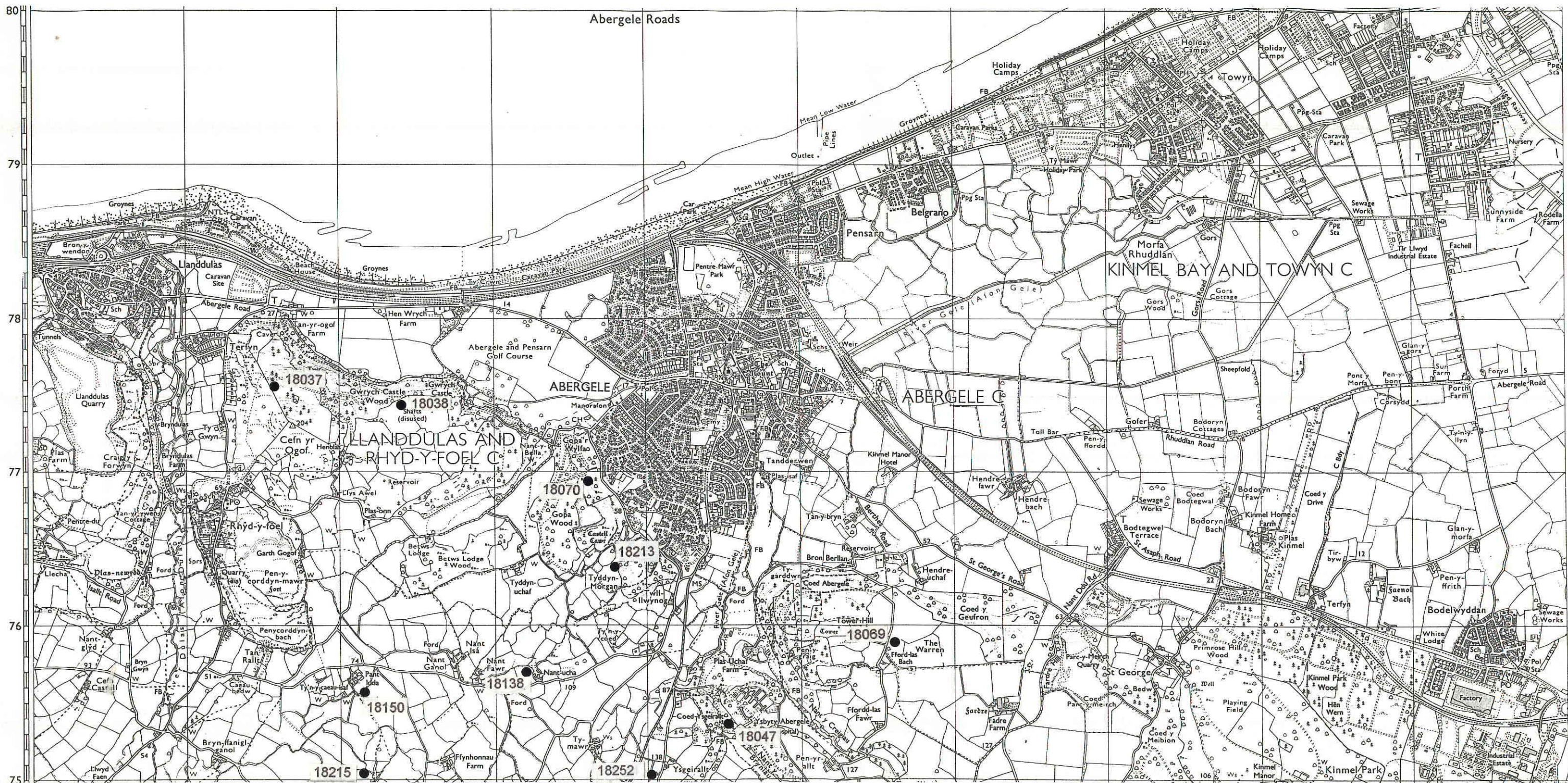
The location of sites included in Gazetteer are shown on Maps 1-23 (1:25,000) at end of report. Map 30 provides a key to the location of Maps 1-23.

Historic Mining Landscape maps (24-29)

The extent of more extensive *Historic Mining Landscapes* are shown on Maps 24-29 (1:25,000). These maps outline the approximate extent of areas of archaeological sensitivity (subject to further appraisal)

Location map (30)

Key to location of maps 1-24

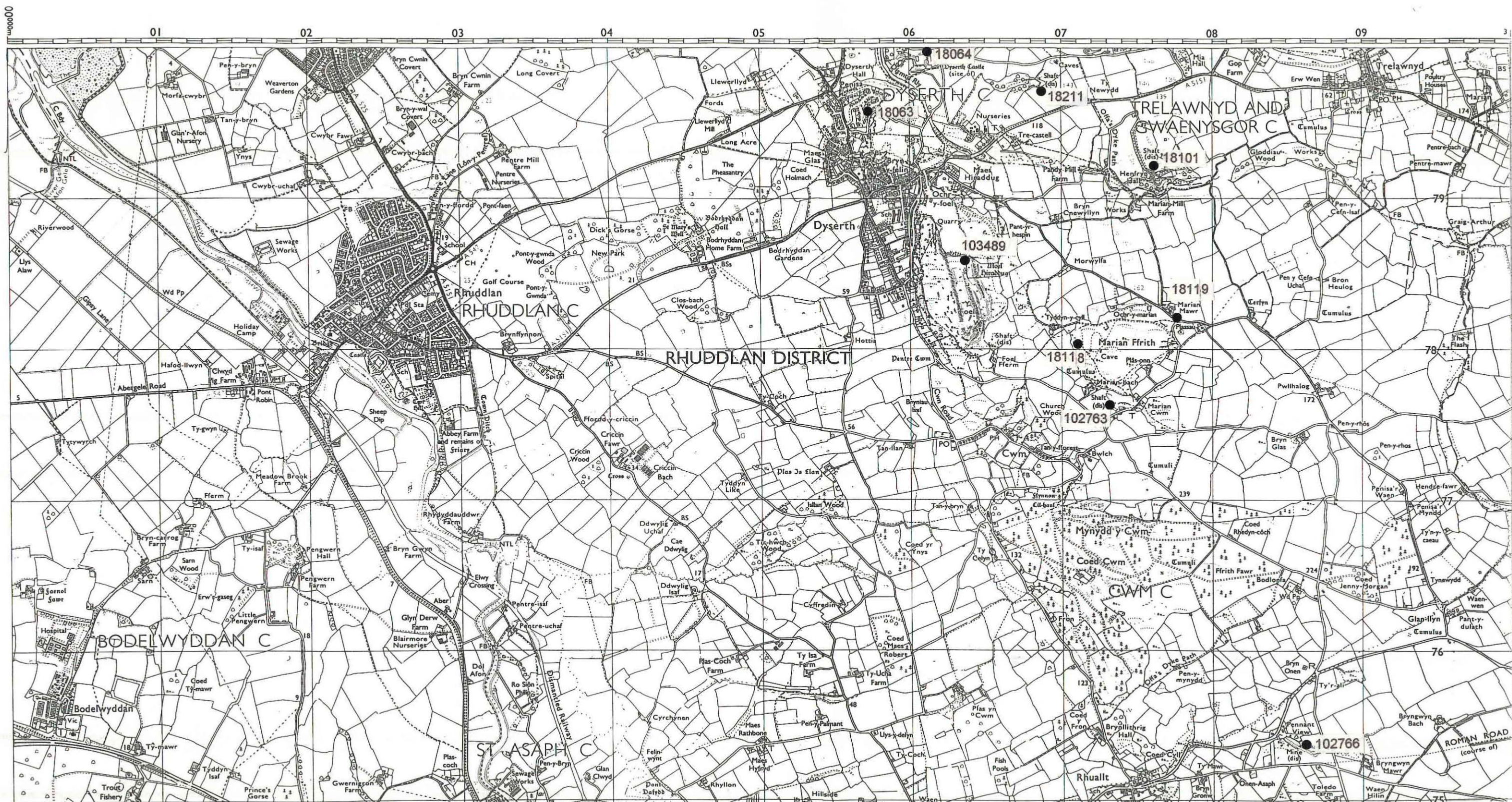


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Clwyd Metal Mines Survey 1993
Map 2

Pathfinder SH97 (N)



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Map 3

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Clwyd Metal Mines Survey 199

Map 4

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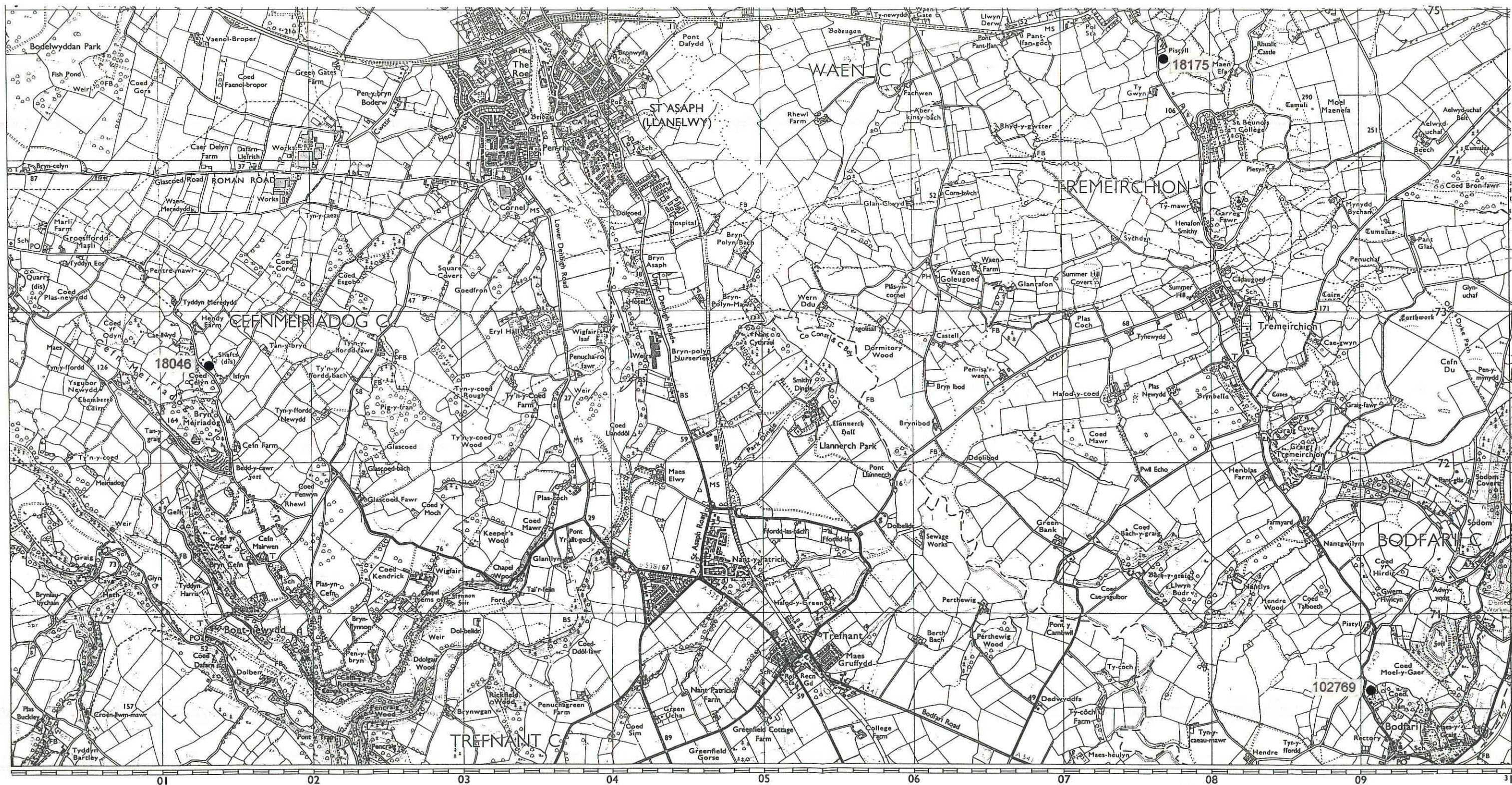


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Map 5

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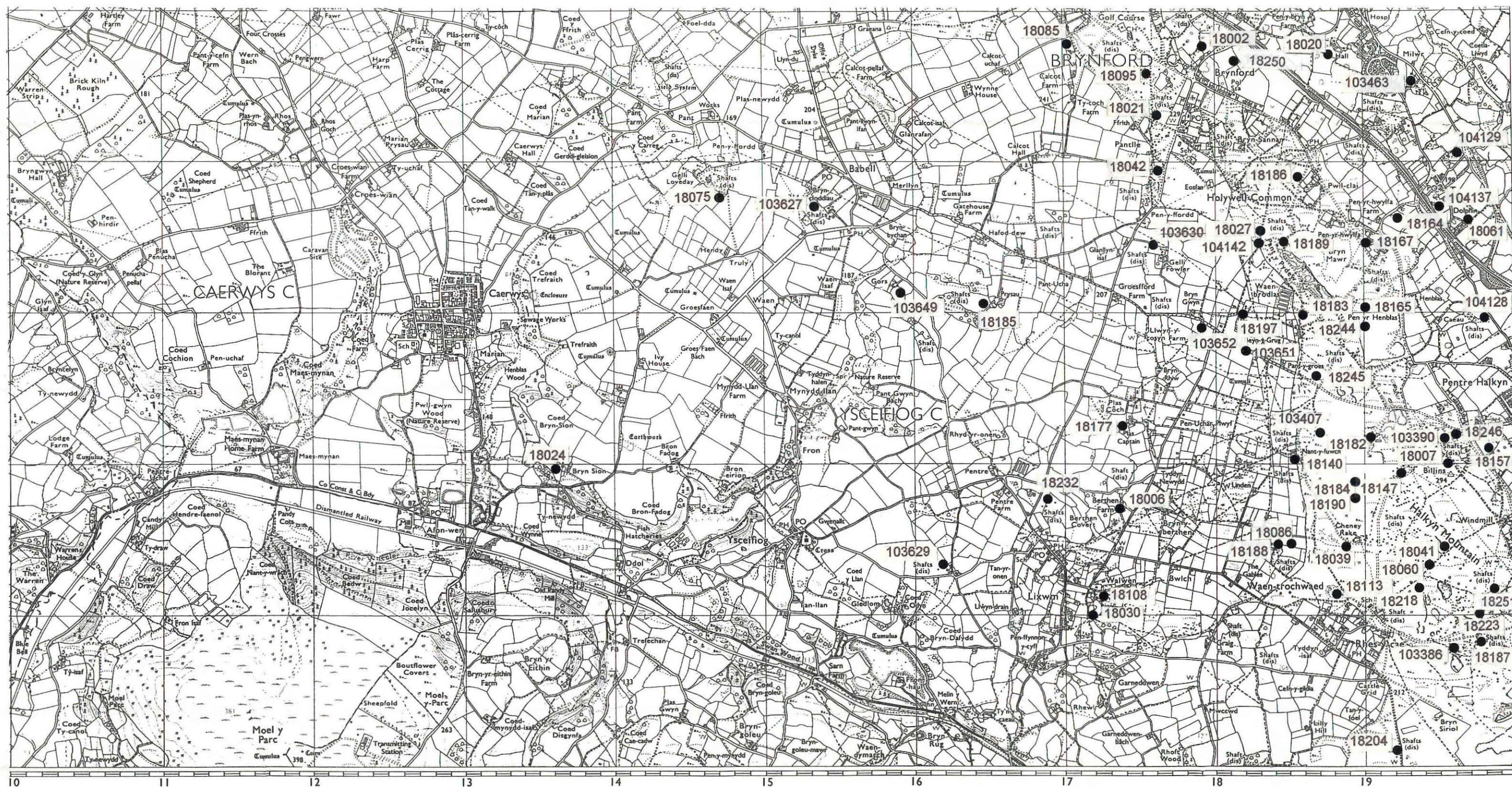


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Map 6

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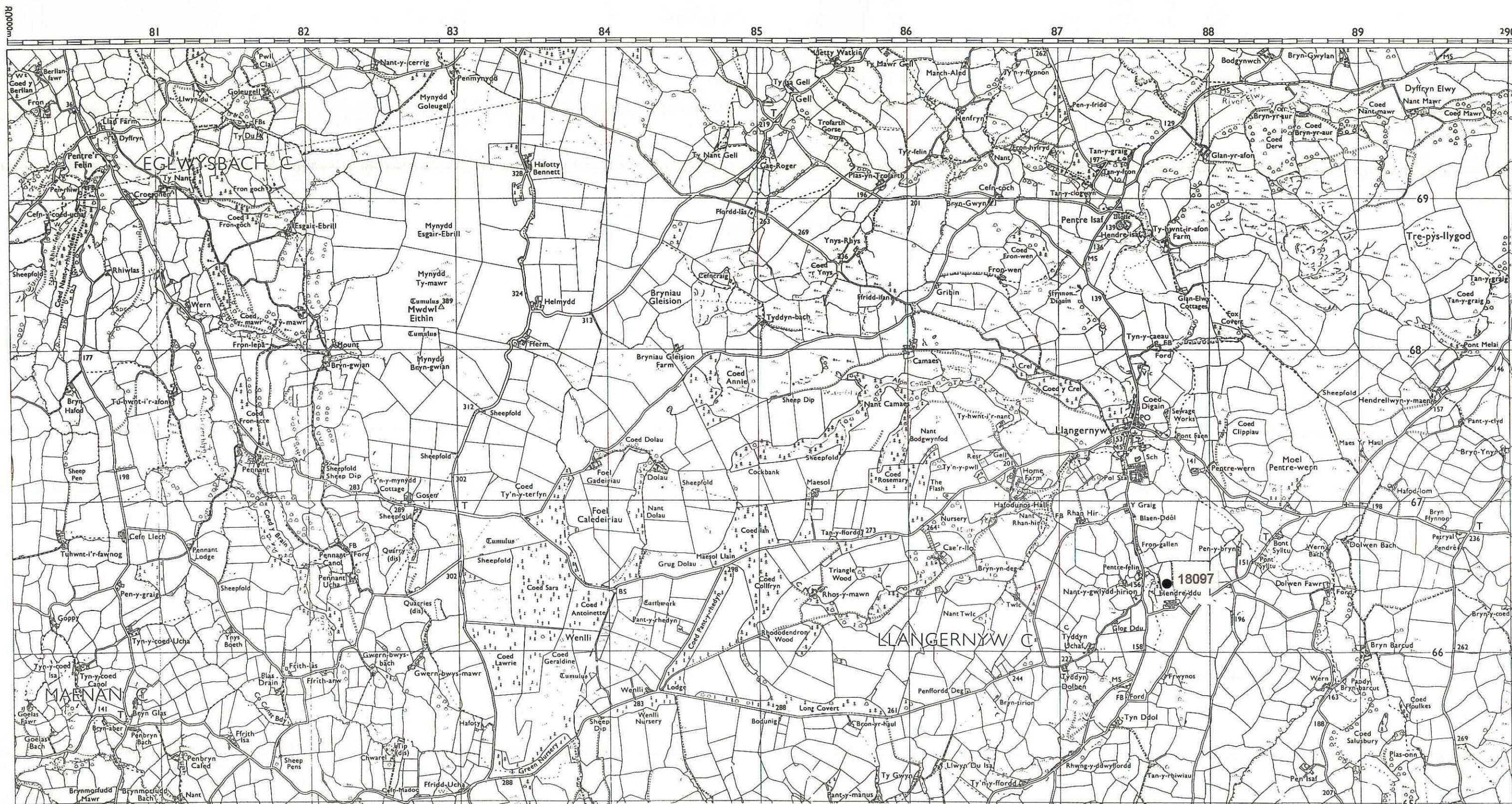
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Map 7

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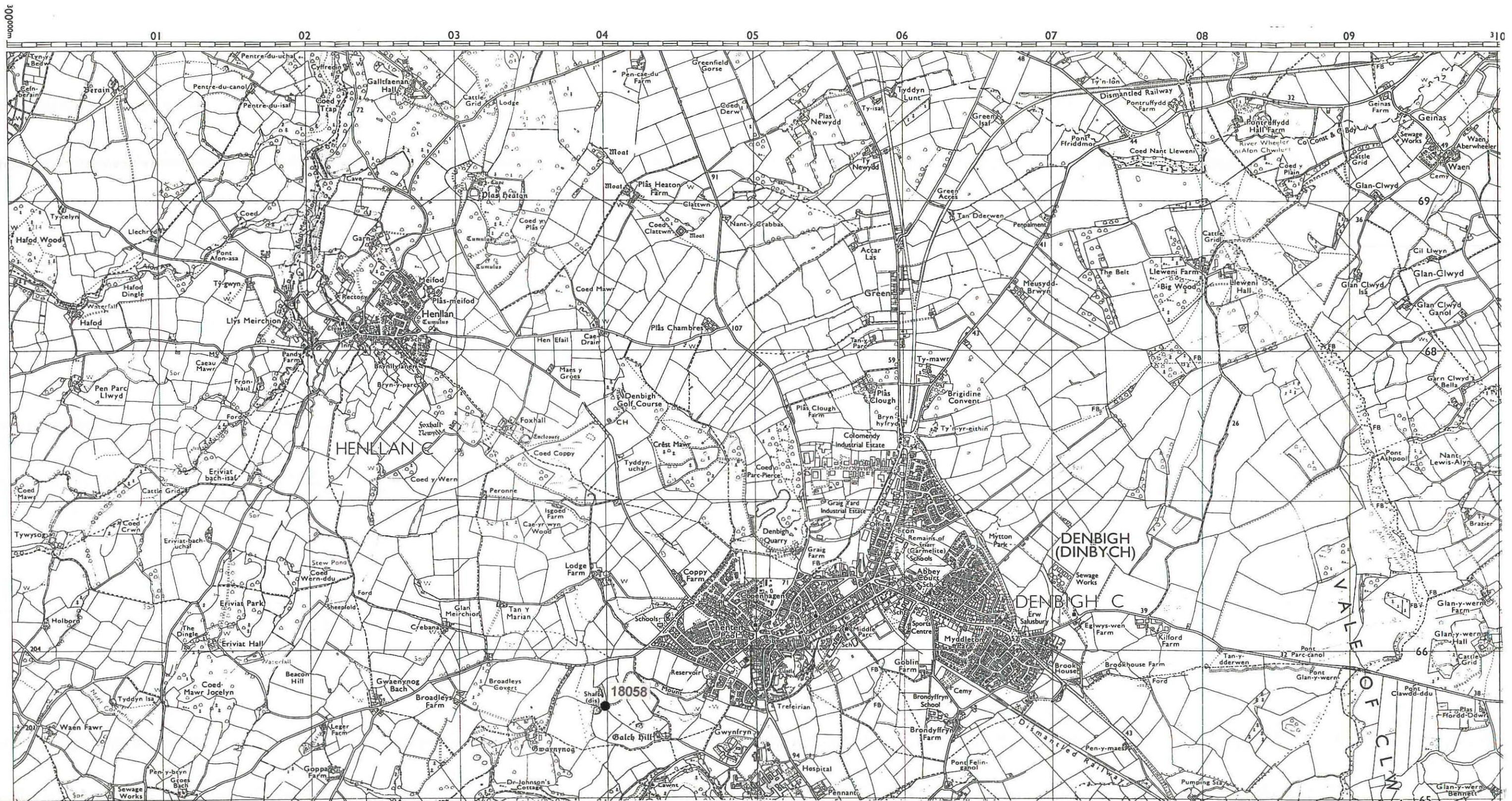


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Map 9

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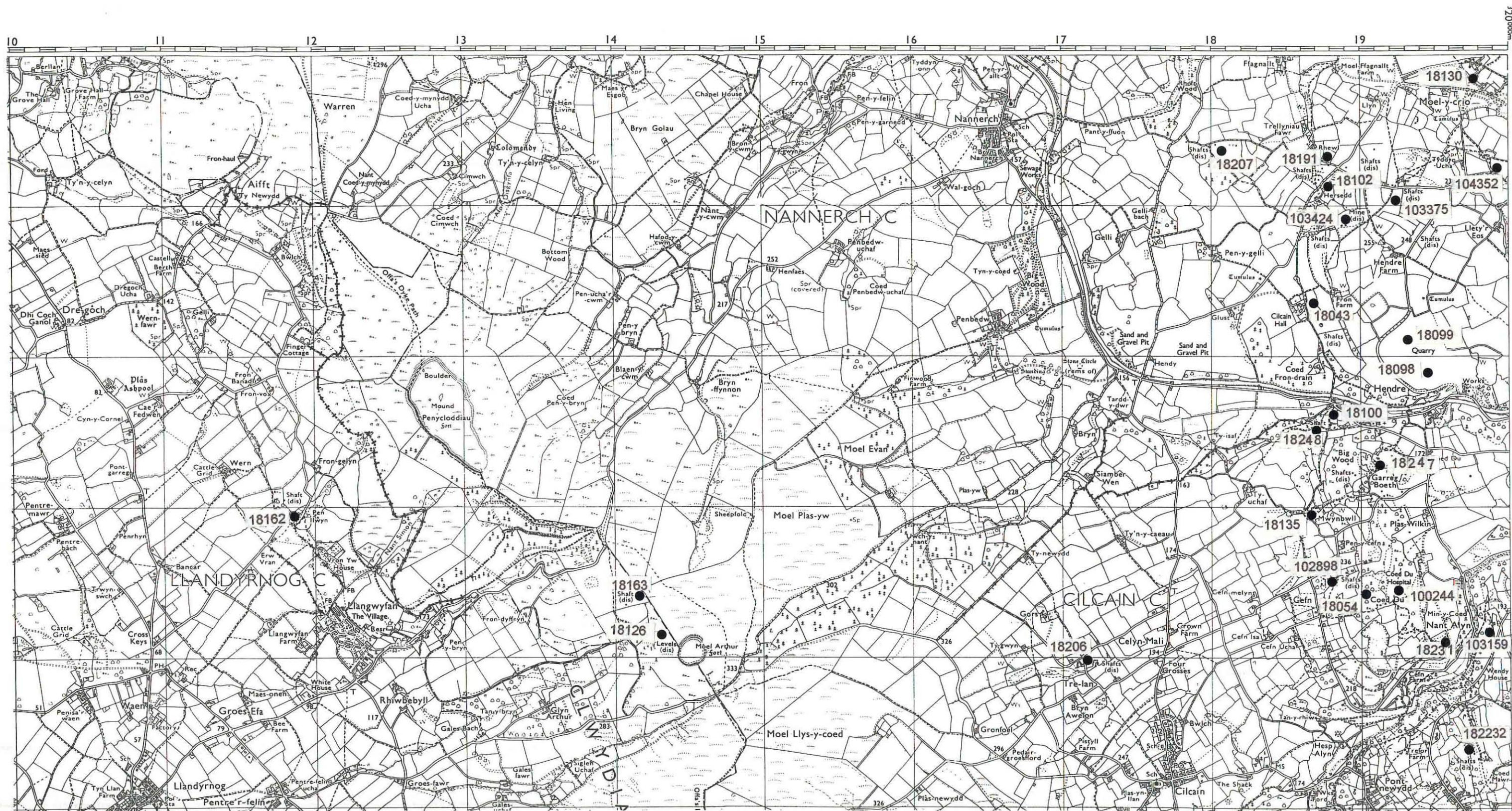


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Map 11

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Map 12

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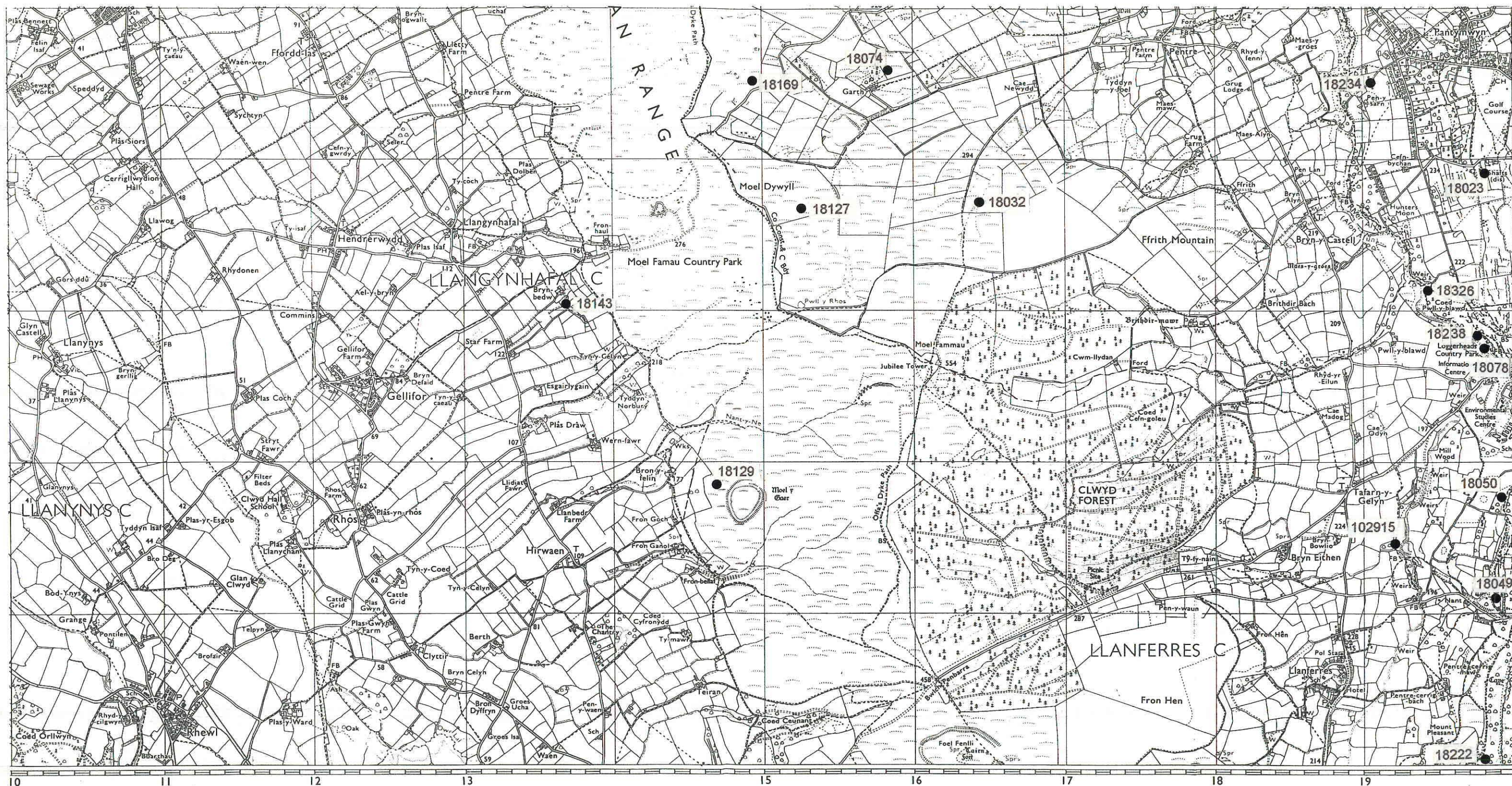


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Map 13



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Map 17

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Clwyd Metal Mines Survey 1993
Map 18

Pathfinder SJ25/35 (NW)

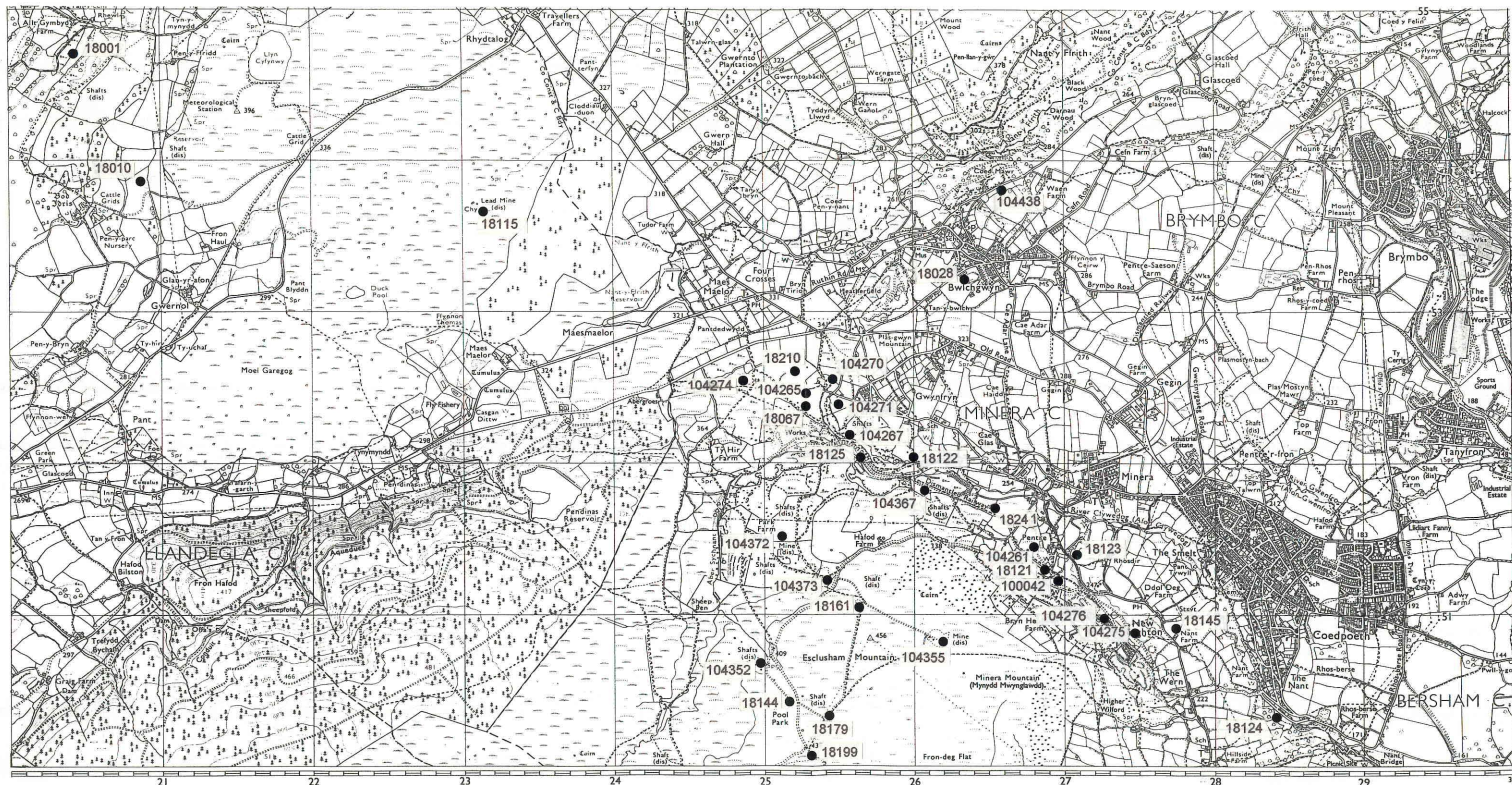


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Map 19

Pathfinder SJO5/15 (SE)



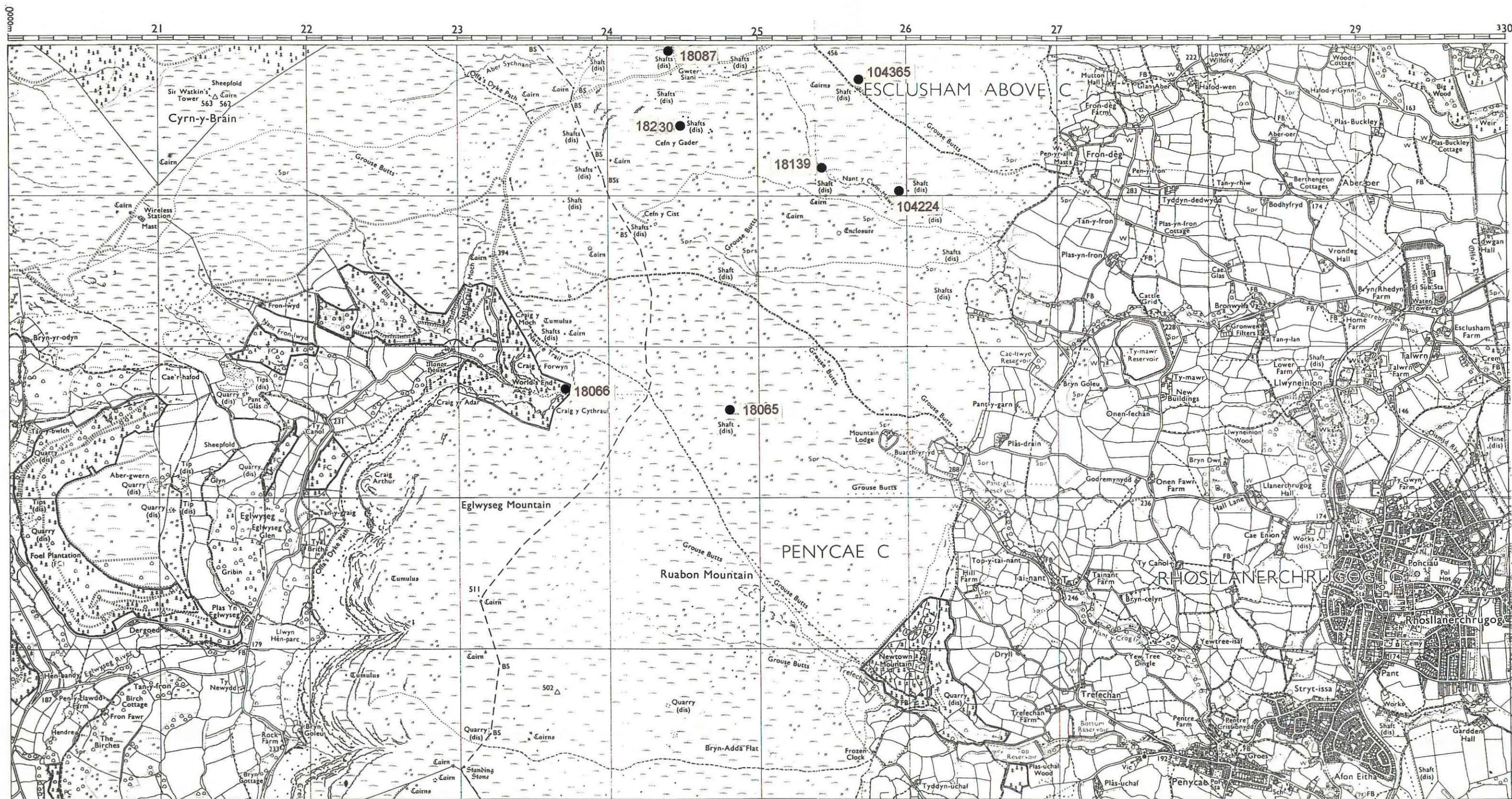
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Map 20

Pathfinder SJ25/35 (SW)

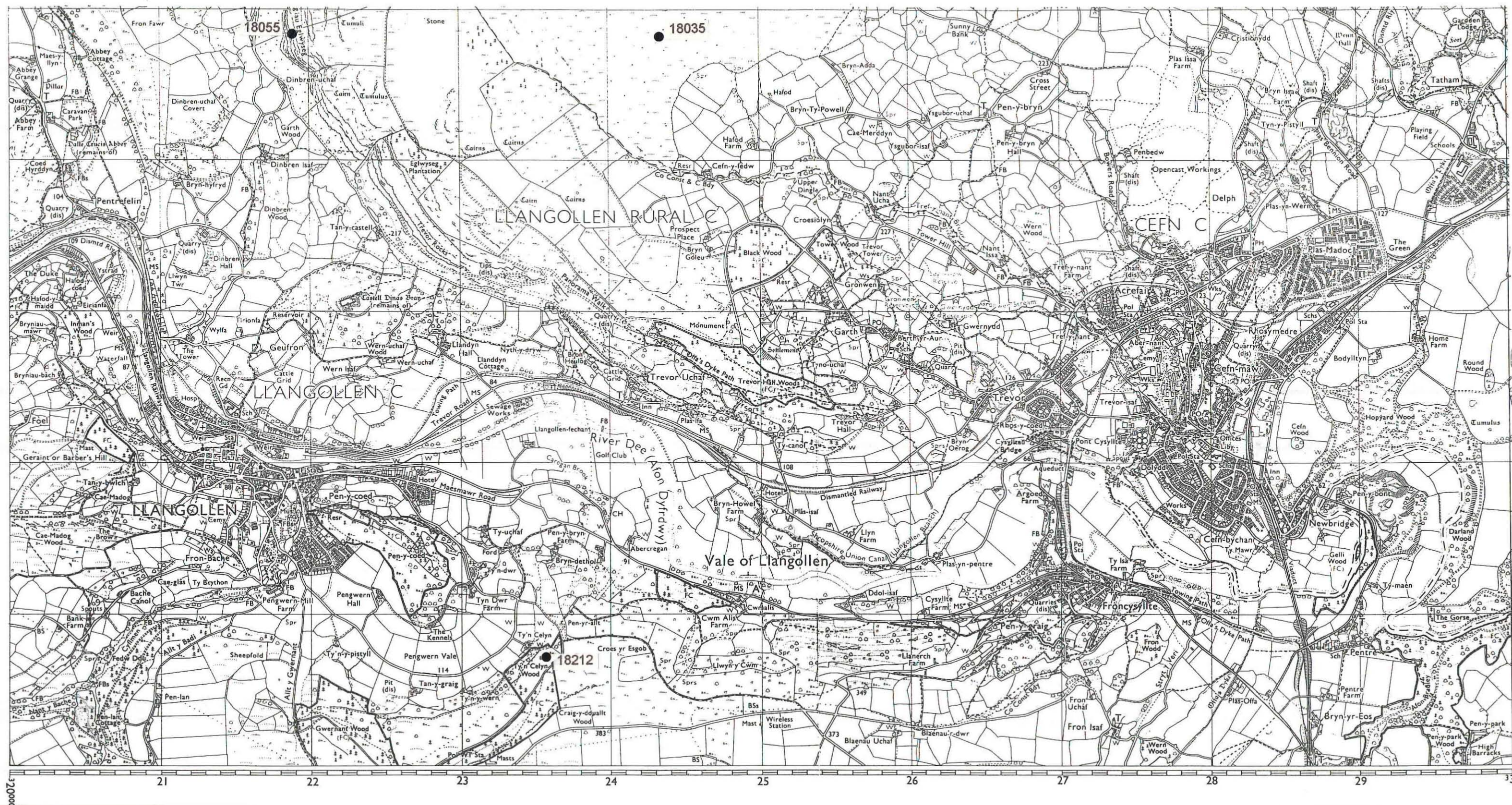


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Map 21

Pathfinder SJ24/34 (NW)

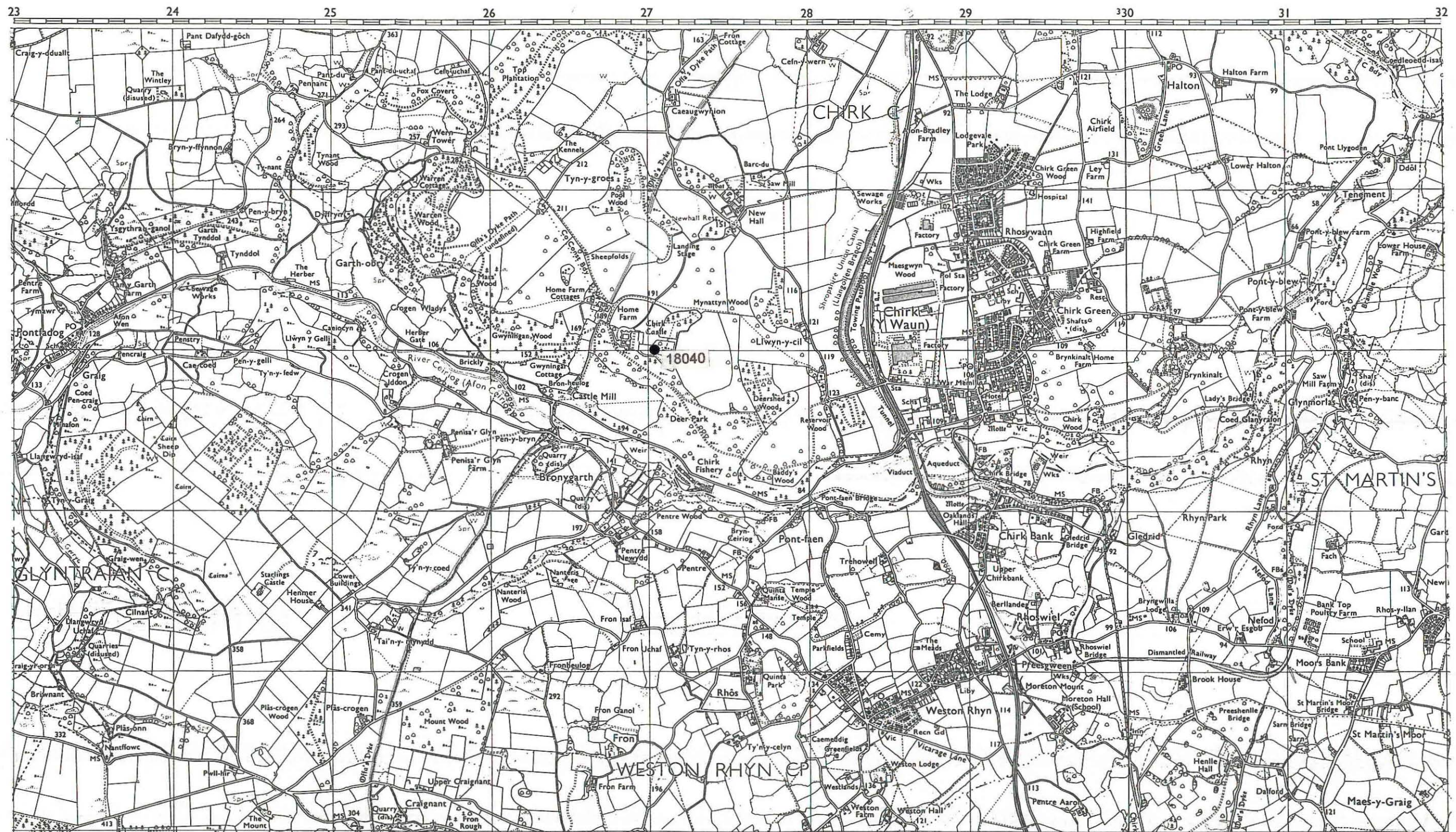


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Map 22

Pathfinder SJ24/34 (SW)



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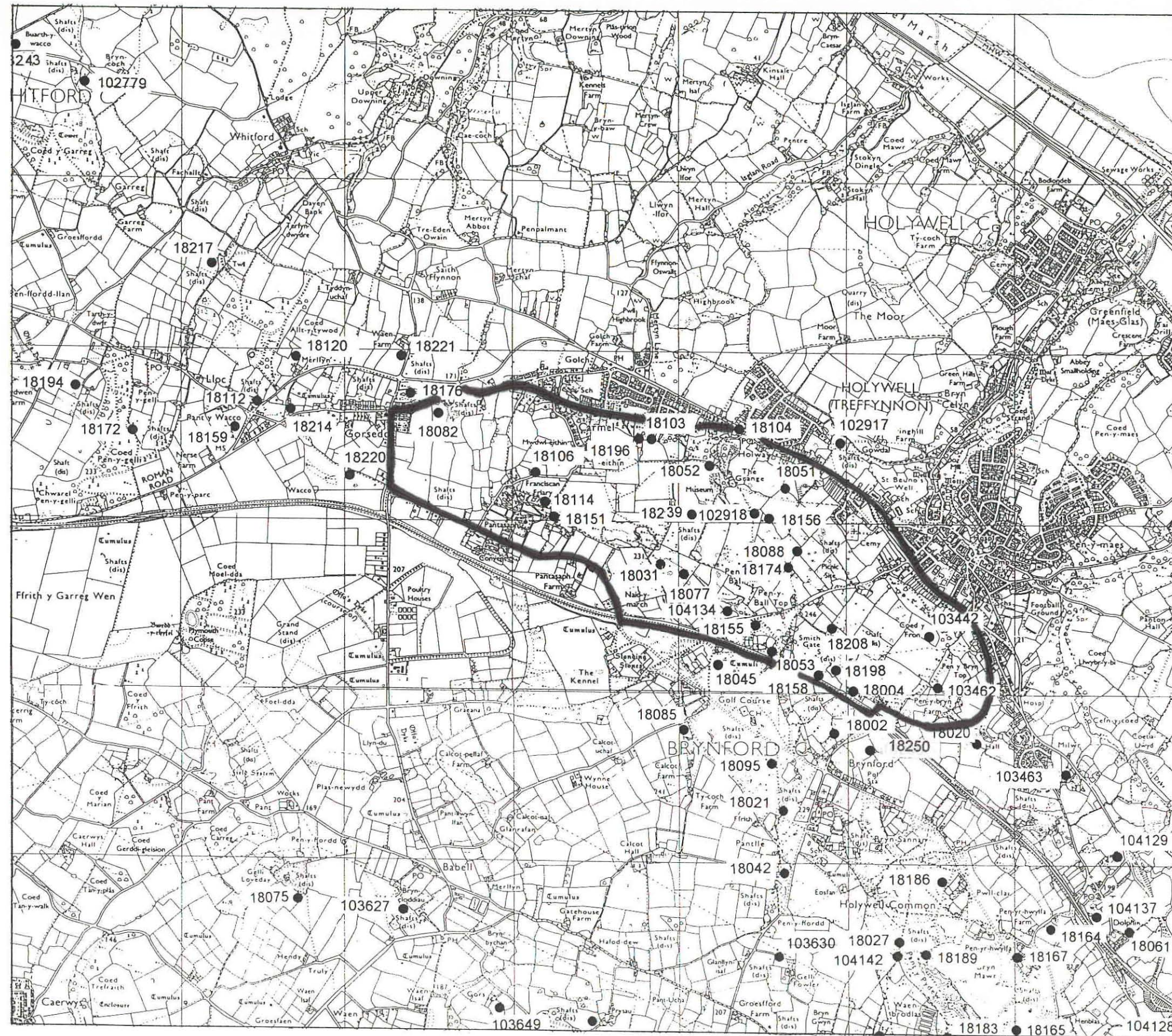
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Map 23

Pathfinder SJ23/33 (NW)

SJ1379



SJ1373

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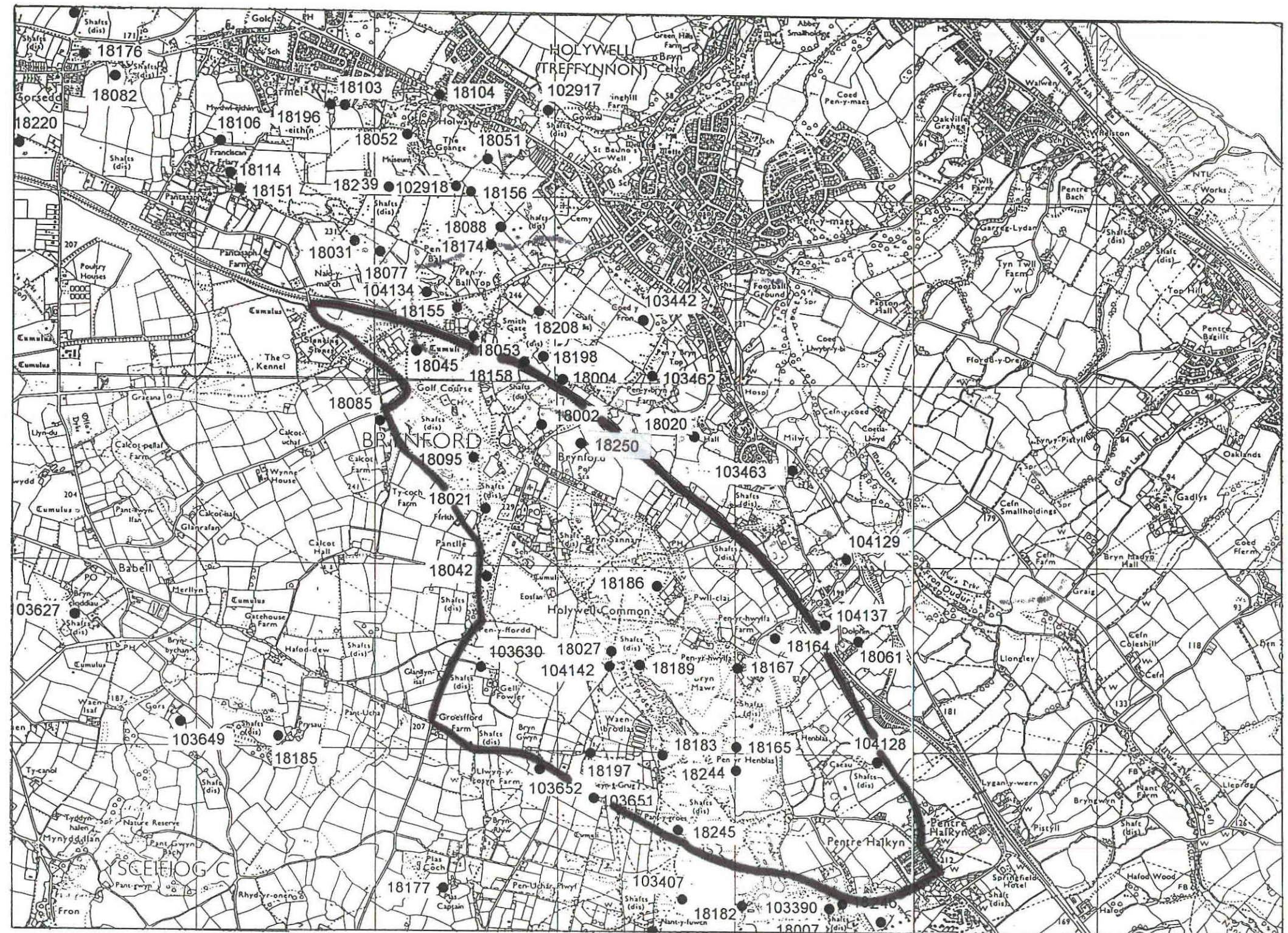
Map 24

Pen-y-Ball Top

Historic Mining Landscape

SJ1577

SJ1572



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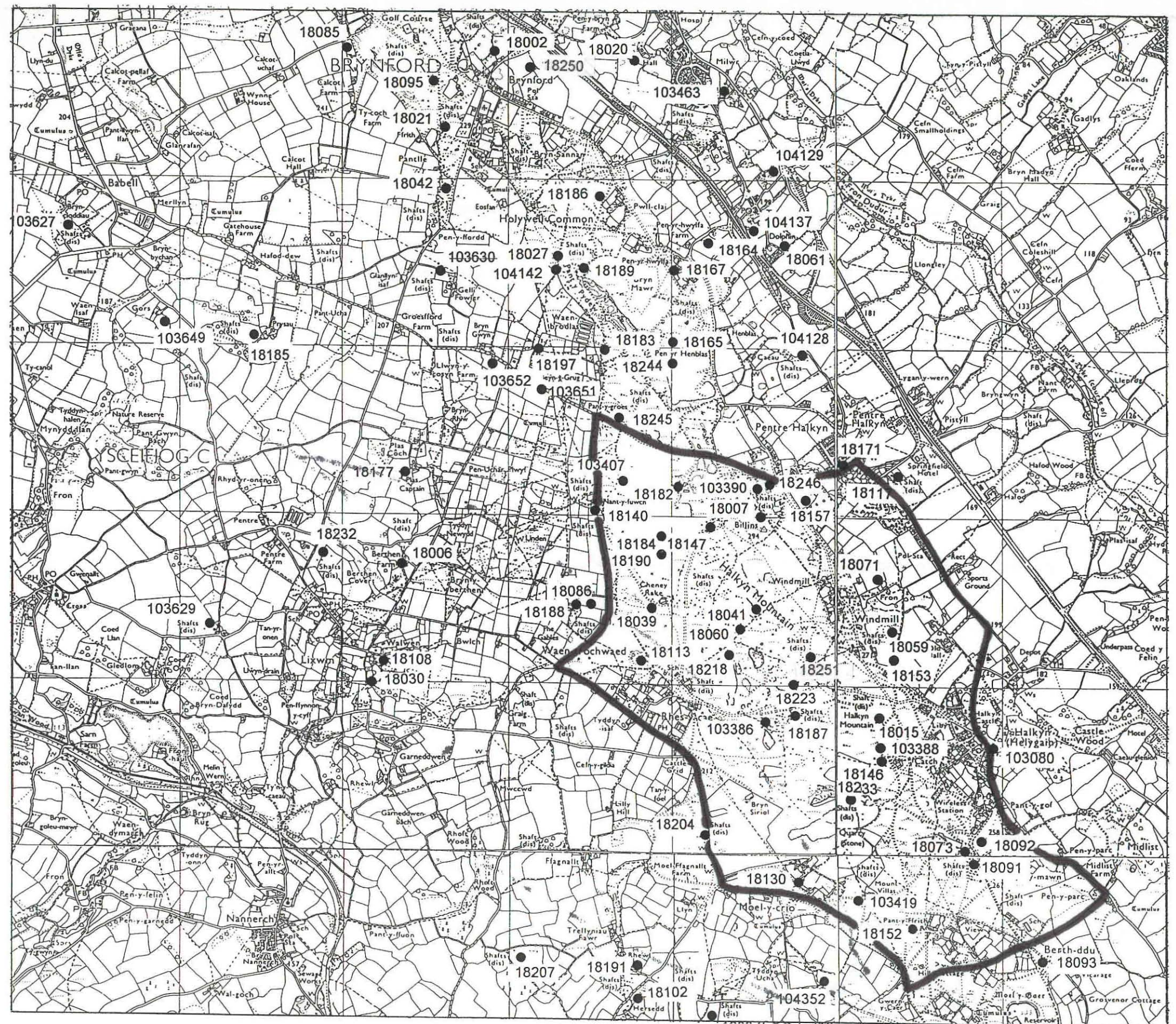
Clwyd Metal Mines Survey 1993

Map 25

Holywell Common

Historic Mining Landscape

SJ1569



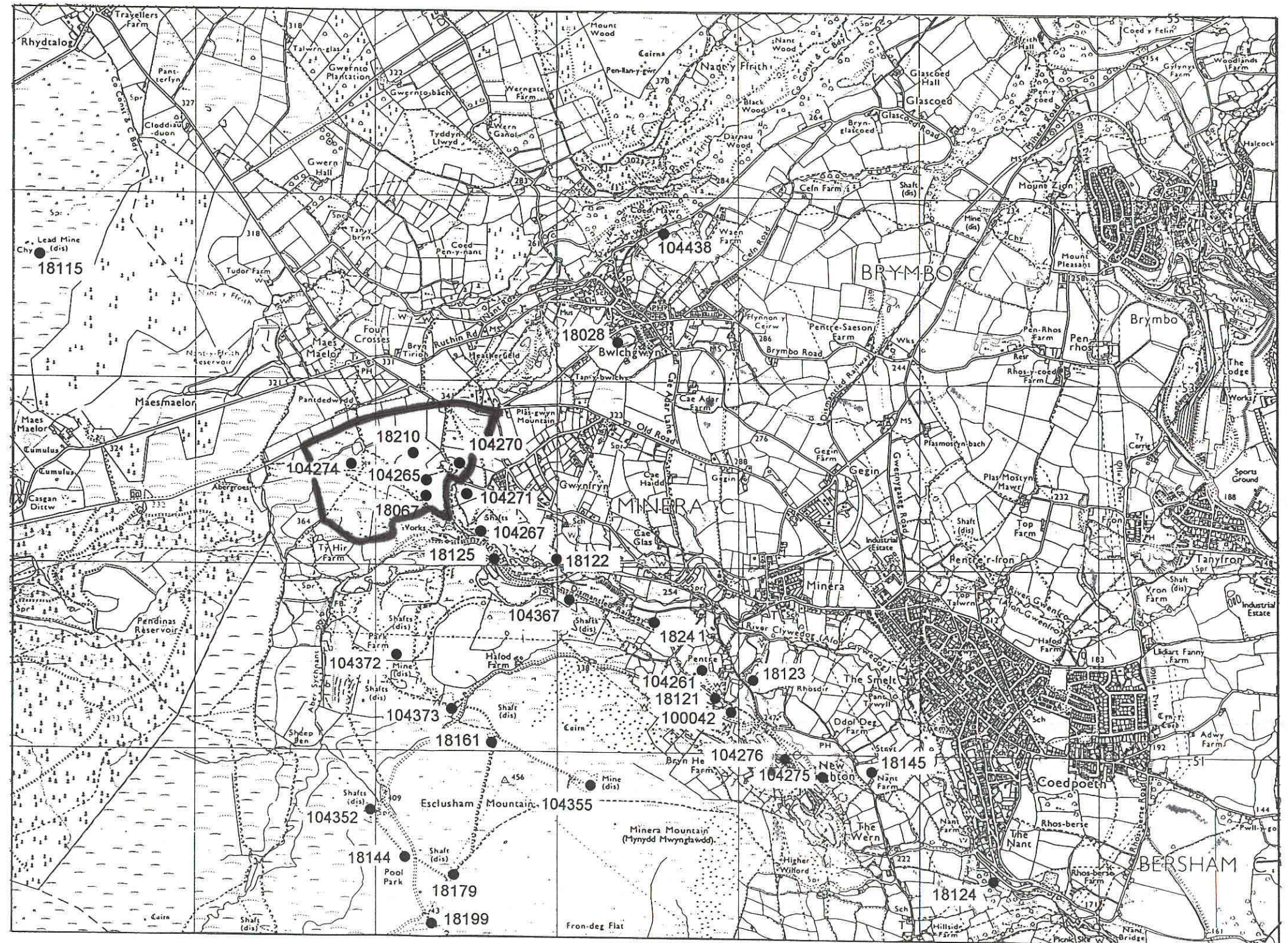
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Map 26

Historic Mining Landscape

SJ2355

SJ2350



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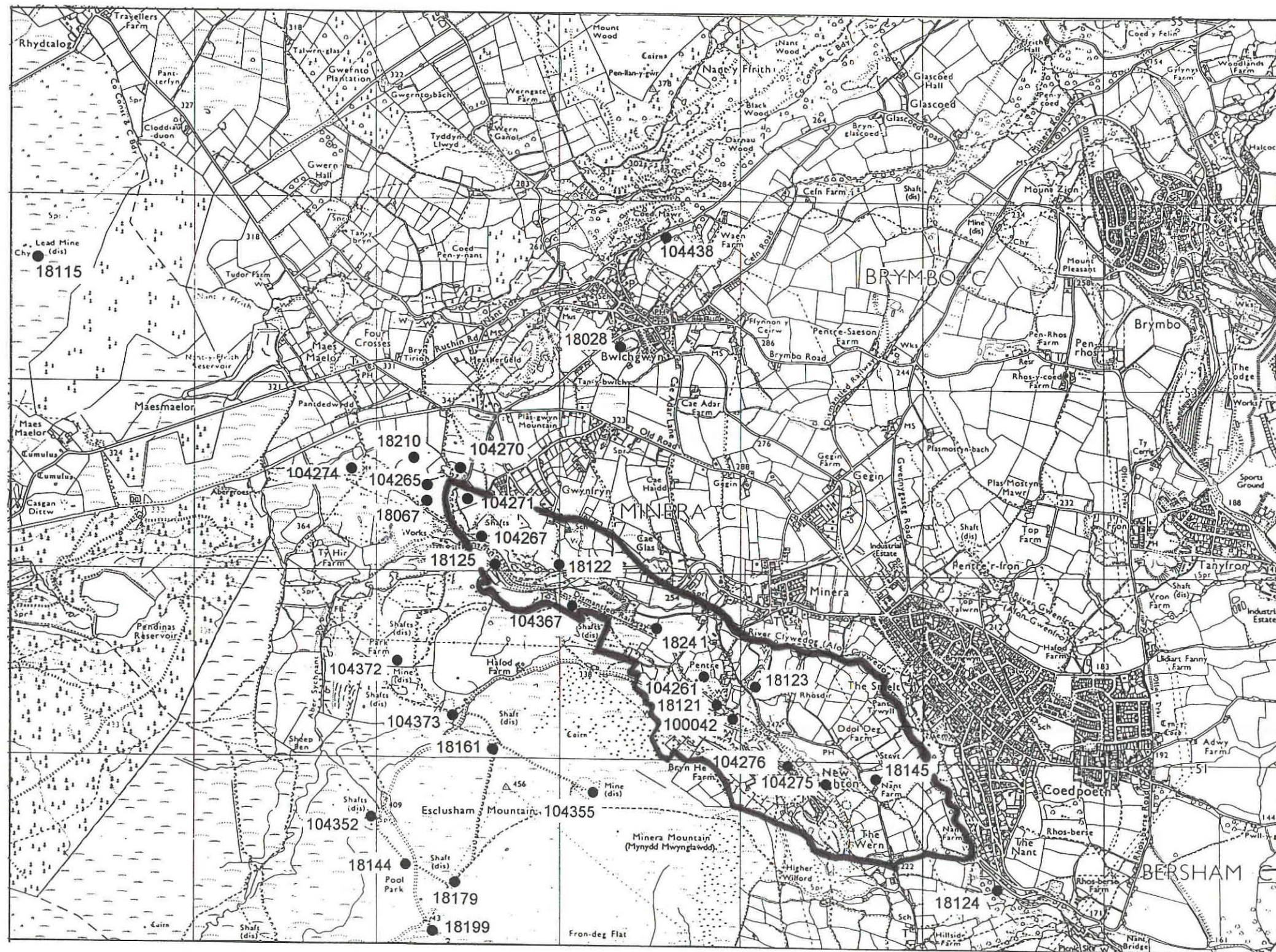
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Map 27

Eisteddfod Mountain
Historic Mining Landscape

SJ2355

SJ2350



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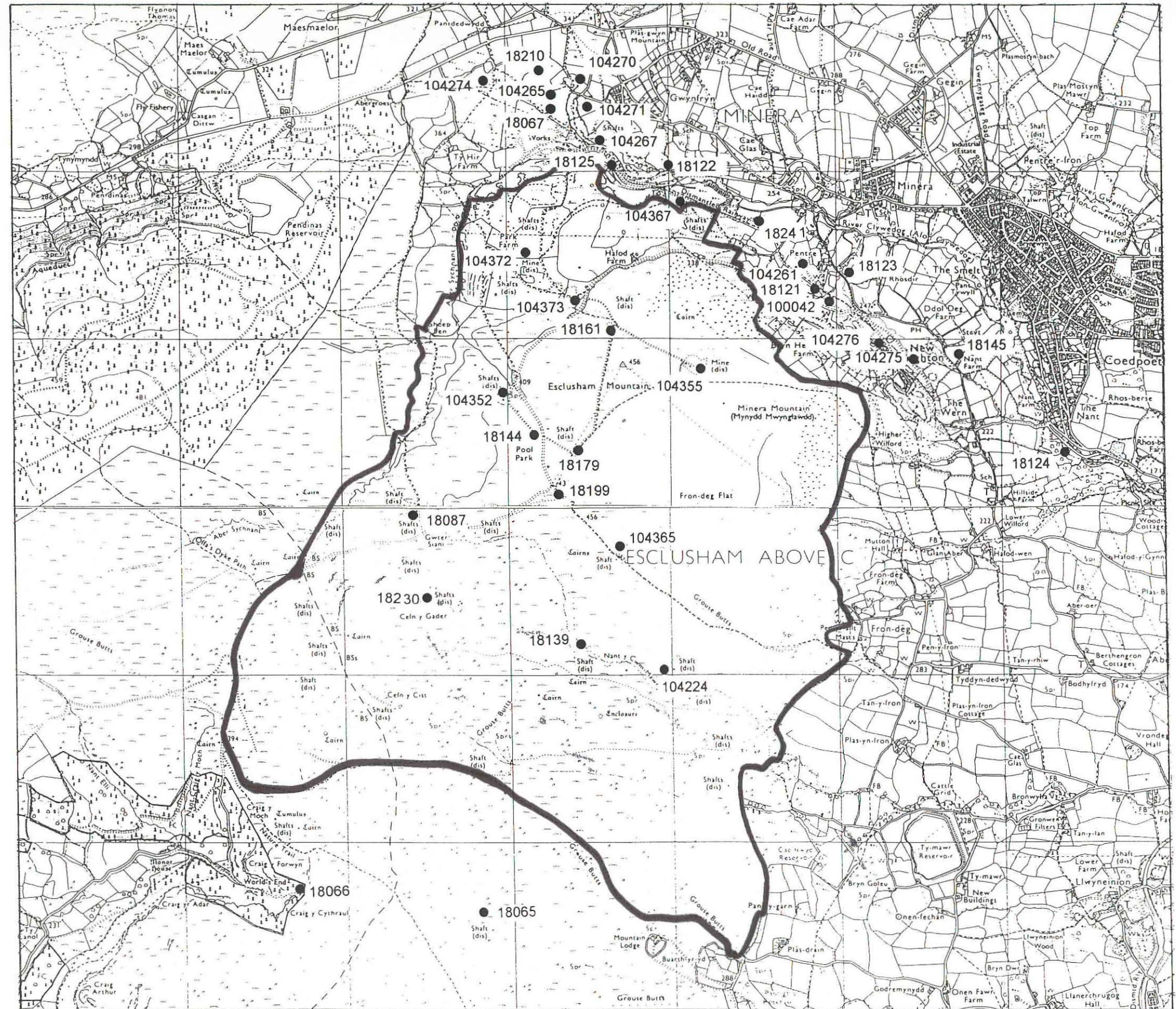
Clwyd Metal Mines Survey 1993

Map 28

Minera Mines

Historic Mining Landscape

SJ2253



SJ2247

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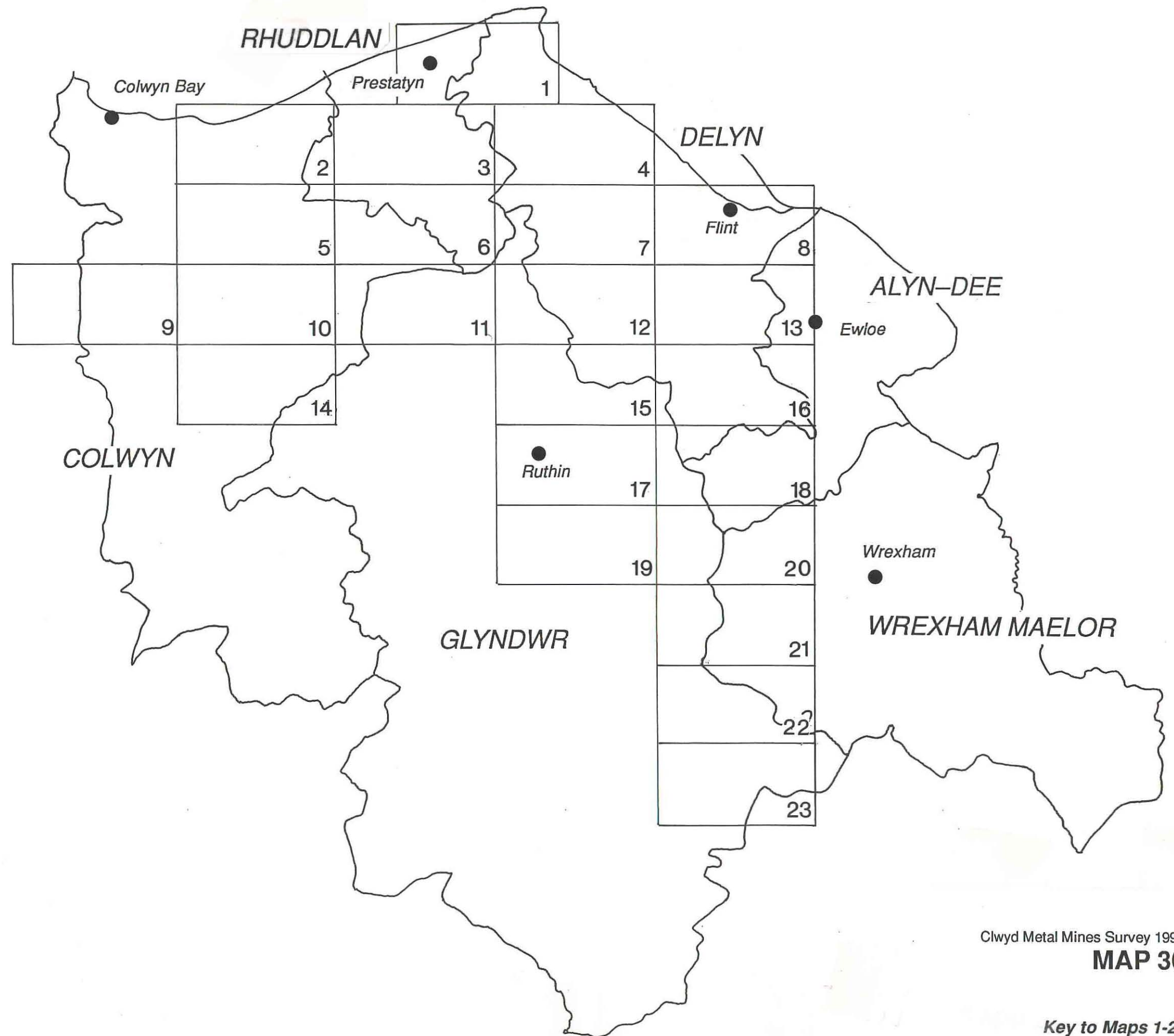
The Clwyd-Powys Archaeological Trust
7a Church Street, Welshpool, Powys, SY21 7DL
Licence No AL 50529A

Clwyd Metal Mines Survey 1993

Map 29

Esclusham Mountain

Historic Mining Landscape



Clwyd Metal Mines Survey 1993

MAP 30

Key to Maps 1-23