FELIN FAWR, COED Y PARC, BETHESDA
LOCAL AGENDUM 21
WORKSHOP PROJECT

ARCHAEOLOGICAL ASSESSMENT

Report No. 245

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

FELIN FAWR, COED Y PARC, BETHESDA
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prepared for Building Design Partnership

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1. INTRODUCTION

Building Design Partnership of Manchester have been asked by Gwynedd County Council to submit proposals for the development of a strategy for Felin Fawr at SH614664 in the community of Llandygái (formerly Llandegai) near Bethesda, Gwynedd.

2. ASSESSMENT BRIEF

An initial report was requested from Gwynedd Archaeological Trust, assessing the archaeological significance of the site and its individual components and suggesting mitigatory measures.

The basic requirement was for a desk-top survey and field visit to the proposed area to assess the impact of any future development on the archaeological and heritage features within the area concerned. The importance and condition of known archaeological remains were to be assessed and areas of archaeological potential identified.

Gwynedd Archaeological Trust's proposals for fulfilling these requirements were, briefly, as follows:

a) to identify and record the cultural heritage of the area to be affected by the proposals

b) to evaluate the importance of what was identified

c) to recommend ways in which damage to the cultural heritage can be avoided or minimised.

The present report does not, therefore, offer to advise on the location of machinery such as was once used on the site, as outlined in the initial project brief to Building Design Partnership.

3. METHODS AND TECHNIQUES

3.1 Desk-top study

Analysis of archival documentation relating to the site was undertaken in the Sites and Monuments Record, Gwynedd Archaeological Trust, the archives of the University of Wales, Bangor (henceforth UWB), and the Gwynedd County Record Office, Caernarfon (henceforth CRO). These included Penrhyn Quarries' own archive, the Penrhyn estate's archive, and early ordnance survey maps and tithe maps. The quarry's engineering archive is reputed to have been burnt in the 1960s. The two standard works of reference, by Susan Turner and James Boyd, were consulted and their data checked against archival material. Eric Foulkes, who has been researching the history of Penrhyn Quarries for many years, and who supplied Mr Boyd with much of his information, was consulted, and alerted Trust staff to a number of archival sources, though this has led Trust staff to draw different conclusions from Mr Foulkes in many respects. In addition, Theodore Roberts and Iorwerth Jones, both former employees of Penrhyn Quarry who worked at the site, were consulted and gave a number of useful pointers.

The photographic archive held at the CRO was trawled for photographs of the site; within the time available, only one photograph was identified, showing the mills at work in perhaps the 1890s, to judge by the men's clothes.

3.2 Field search

The site was visited on 9 January and 5 and 12 February 1997 by a member of Trust staff; features were identified on a current 1/10,000 map and an archive map at 25"/1 mile, and each was described and assessed. Detailed notes, sketch plans and photographs were made of the more important features.

3.3 Report

All available information was collated and the sites were then assessed and allocated to the categories listed below. These are intended to give an idea of the importance of the site and the level of response likely to be required; descriptions of the sites and specific recommendations for further assessment or mitigatory measures, as appropriate, are given in the relevant sections of the report. The criteria used for allocating sites to categories are those used by the Secretary of State when considering ancient monuments for scheduling; these are set out in Welsh Office Circular 60/96 Planning and Historic Environment: Archaeology.

3.4 Categories

The following categories were used to define the importance of the archaeological resource.

Category A - Sites of national importance.
Scheduled Ancient Monuments, Listed Buildings and sites of schedulable or listable quality, *i.e.* those which would meet the requirements for scheduling (ancient monuments) or listing (buildings) or both.

Sites which are scheduled or listed have legal protection, and it is recommended that all Category A sites remain preserved and protected *in situ*.

Category B - Sites of regional or county importance.
Sites which would not fulfil the criteria for scheduling or listing, but which are nevertheless of particular importance within the region.

Preservation *in situ* is the preferred option for Category B sites, but if damage or destruction cannot be avoided, appropriate detailed recording might be an acceptable alternative.

Category C - Sites of district or local importance.
Sites which are not of sufficient importance to justify a recommendation for preservation if threatened.

Category C sites nevertheless merit adequate recording in advance of damage or destruction.

Category D - Minor and damaged sites.
Sites which are of minor importance or so badly damaged that too little remains to justify their inclusion in a higher category.

For Category D sites, rapid recording, either in advance or during destruction, should be sufficient.

Category E - Sites needing further investigation.
Sites whose importance is as yet undetermined and which will require further work before they can be allocated to categories A - D are temporarily placed in this category, with specific recommendations for further evaluation. By the end of the assessment there should be no sites remaining in this category.

3.5 Definition of Mitigatory Recommendations

For the purposes of this report, the mitigation and rescue archaeology proposals as suggested by Gwynedd Archaeological Trust have been summarised as:

None:
No impact, so no requirement for mitigation measures.

Detailed recording:
Detailed recording requires a photographic record, surveying and the production of a measured drawing prior to the commencement of the works on site.

Archaeological excavation works may also be required depending upon the particular feature and the extent and effect of the impact. Some of the sites would require dismantling by hand, to provide a detailed record of the method of construction and in the case of a listed structure, the salvage of materials for re-use and re-building.

Recording by photograph and description:
Recording by photograph and description requires a photographic record and survey work prior to the commencement of works on site. A measured drawing may be required in certain cases.

Watching brief:
At the commencement of the improvement works on site, all sites affected by the works would need to be observed up to the end of the contract period.

3.6 Existing statutory protection

The western mill and the waterwheel between it and the eastern mill are listed Grade II*; six other features on the site are listed Grade II. The Ogwen Valley as a whole has been designated an Historic Landscape in the recent *Consultation Document Part 2:1 - Landscapes of Exceptional and Great Historic Interest* published jointly by Cadw: Welsh Historic Monuments, the Countryside Council for Wales and the International Council on Monuments and Sites (ICOMOS), which allots it a grade 1 ("landscapes which by virtue of the historic interest, integrity and coherence of their contents considered together make them of exceptional interest"). It is described as "containing contrasting evidence of prehistoric and later land use, superimposed by the extensive and visually dramatic remains of the recent and continuing industrial exploitation of slate", which include Penrhyn Castle and Park, Telford's road, the town of Bethesda, described as a "classic example of both an irregular and planned development", as well as the quarry itself.

4. ARCHAEOLOGICAL FINDINGS

4.1 Historical background

Y Felin Fawr ("the big mill") is the name given to a structure in the former Coed y Parc yard of the Penrhyn Slate Quarries, and by extension is an alternative name for the whole yard. The yard is an industrial complex, part disused, part in re-use, which occupies a site approximately 400m long north to south on the western slopes of the Afon Ogwen in the community of Llandygái, immediately to the north of the present limits of the quarry permission.

The land on which it stands formed part of the Penrhyn estate; in 1765 Richard Pennant of Liverpool and Hanover Square, London (ennobled as Lord Penrhyn in 1793), married Anna Susannah Warburton, heiress of part of the estate, whereupon her husband began negotiations for the purchase of the remainder. From the 1780s he began to work the estate in a vigorous fashion, re-investing the profits from his Jamaican sugar plantations in agriculture, communications and, above all, in slate quarrying on the slopes of Cae Braich y Cafn. As the Penrhyn Slate Quarries, these grew to be of enormous size, amongst the largest man-made excavations in the world, in which the slate was won from both from hillside galleries and from a deep pit. These came to be covered in the nineteenth century by an extensive tramway network, with counterbalance inclines lowering the raw blocks from the quarry face, and water-balance shafts raising them to the processing levels, where they were split into roofing slates by hand. Turbines and water-pressure engines pumped the quarry out.

The quarry's first new transport link under the Pennant regime was a cart road, constructed in stages from the 1780s onwards to give the quarry direct access to the sea near the demesne at Penrhyn, but it quickly proved inadequate to the quarry's growing output. A plan for a canal drawn up in the 1790s was abandoned in favour of a horse-worked railway to the port, which was constructed from 1800 and 1801, one of the earliest iron edge railways in the world. At the first point out of the quarry premises where the railway crossed a stream, a mill was constructed to produce slate slabs.

Unlike roofing slates, hand-processed in the quarry itself, slate slabs for architectural purposes or for gravestones or cisterns require mechanical sawing; since the Caledffrwd contained a fall of water sufficient to turn a water-wheel, it was here that a mill was erected, one of the earliest sites in the world where stone was mechanically processed. Though there are hints that it was at the planning stage as early as 1798 (NLW Walter Davies notebooks), and some reports speak of it as a fact by 1801 or 1802 (Lewis 1834, Williams 1802), it was in June 1803 that the first blocks were delivered from the quarry to Broad Malkin, the foreman, for sawing (CRO: PQ22/1). This first monthly delivery was for 258.75 tons, but within fifteen years the amount processed had almost doubled. The most detailed description is by Faraday in 1819 (Tomos nd, 92), which describes the operations of the reciprocating frame saws with which it was equipped:

"A number of large frames are connected each with a crank and united by one common axle. This is put in motion by a water wheel and the revolutions of the cranks backwards and forwards. Saws are attached at each end of the frames by a hinge joint and consequently move with it and cut anything placed beneath them. When the saws are not in use they are raised up and held by a string and then on the slab beneath the men arrange blocks of slate with the part which is to be cut in line with the saws' motion. One, two, three or more pieces are put down at once according to their size and the extent of the saw and then it is let down and commences cutting. Water is made to drip by small pipes on the saws as they work and the part by which they are attached to the large frame is furnished with a long screw which being made gradually to turn round preserves the saw as it sinks in cutting the slate always in a horizontal direction. Here slabs for tombstones, mantle pieces, tables etc, are cut and in another mill furnished in a similar way, their surfaces are ground smooth and polished if required."

Hugh Derfel Hughes, who was at work at Penrhyn Quarry by 1844 when he was twenty-eight, devotes a paragraph to the mills in his *Hynafiaethau Llandegai a Llanllechid*, published at Bangor in 1866. Presumably drawing on the memories of older fellow-workers, he dates the first mill to 1813, clearly wrong but possibly an error for 1803, and describes the sixteen saws, "that were moved forwards and backwards by cranks, which were connected together, and which derived their movement from the waterwheel." A paste of water and sea-sand was fed into the cuts - common frame-saw practice, since the sand itself acts as the cutting agent, rather than the soft wrought-iron blade.

The early nineteenth century travellers Richard Fenton and Edmund Hyde Hall, by contrast, offer only cursory descriptions (Fenton 1917, Hyde Hall 1952). Hyde Hall gives the number of the frame saws as fourteen.

The earliest extant plan of the site is the Penrhyn Rail Road survey of 1829 (UWB: Penrhyn Further Additional 1829). This shows the Galedffrwd unculverted; to its north and alongside and to the east of the railway line is a building, and a further building immediately to the east again which is marked as "Mill". Between the mill and the river, alongside and to the east of the railway, is an L-shaped building, but no obvious waterwheel-pit or launder.

Coed y Parc was also the point where ochre, quarried on the hillside above the railway, was delivered by cart to the railway wagons, to be taken to Llandygái, where it was ground with flint and chert to supply the Herculaneum pottery at Toxteth, Liverpool.

The growing transport needs of the quarry prompted the development of the site as a small but well-equipped industrial complex. Stables for the horses that pulled the slate wagons to Port Penrhyn were in existence by 1801; these were later converted to housing, the present Tai'r Stablau in 1875 (CRO: XPQ 997 p. 20). In 1835 an oil house is recorded (CRO: PQ22/2) and in 1838 a foundry was in existence (CRO: XPQ 486).

The increased output of the quarry may also have been reflected in an improvement in slate-processing facilities at Felin Fawr; Lewis' *Topographical Dictionary*, published in 1834 speaks of "a large mill where mantle pieces & tombstones are sawn, also for production of laminae for roofing" (Lewis 1834) but from April 1834 to March 1835 the production records refer to a new mill, supplied by a new weir, without specifying where it was or what purpose it served. It may have been a corn or other mill elsewhere on the Penrhyn estate, but more probably it was a new slate mill at the Coed y Parc site (CRO: PQ22/2); the Coed y Parc foundry records make a distinction between the slate mill and Felin Isaf, "the lower mill". To confuse matters, Felin Isaf does not appear on the foundry records (CRO: XPQ486) until 1843, but there are references from their commencement in January 1837 to a "New Ingein", which either means a machine of some description or equally possibly a slate mill, commonly *injan* in Welsh. The foundryman was also kept busy producing parts for his own machinery; in December 1840, wrestling with an unfamiliar language, he notes he had made a "slite for Poreing Mach(ine)."

From December 1843 there is another flurry of activity at the foundry when it was set to work producing parts for a waterwheel for Felin Isaf, as well as flywheels and cogwheels, all of which further suggest an industrial building rather than an agricultural mill. Two mill reservoirs on the Galedffrwd were constructed upstream from Coed y Parc in 1846 and 1848 (CRO XPQ 997 p. 20). The foundry also produced "8 collars for circle saws" in January 1846 and "2 Frames for Sawing Engine" and "2 Rack wheels for the Sawing Engine" in January and August 1847 (CRO: XPQ486), suggesting that the new facilities included circular saws, such as were rapidly becoming standard in the industry. Some idea of the extent of the site can be gleaned from the 1845 tithe map (see Appendix 2).

Hughes gives some further details about this new mill; he states that in 1846 the then manager, "Mr Francis built a new mill, which made use of circular saws *(gwnaeth Mr Francis Felin newydd yn yr hon yr arferid y Llif gron)* which almost completely supplanted *(disodlu)* the old one; and in it also were sawn the rock known to the quarrymen as the mottled black *(crych ddu)*, which before this was good for nothing but flinging off the end of a tip, but these machines sawed it, and there came to be a great demand for them" (Hughes 1866).

Archival references to the use of circular saws therefore only appear to begin c. 1846. However, it has been suggested that there is archaeological evidence for their use at Felin Fawr before this, in the shape of gravestones in local churchyards dating from perhaps 1834, and that they were installed in the mill thought to have been constructed that year (ex info., Eric Foulkes).

It was not long before even these new buildings were inadequate; Hughes goes on to observe: "In the year 1855 Mr Francis and his son built a bigger and better building again, which also was also more convenient; and as I write in the year 1865, another excellent and more convenient building is being constructed for the same purpose" (Hughes 1866).

The quarry's own records state that the buildings which existed on site in the 1920s were constructed between 1863 and 1868 (CRO: XPQ 997 p. 20), and roofing slates were supplied to the mills in 1866 (ex info., Eric Foulkes), so a date 1865-66 for their construction seems probable. The present foundry building probably dates from this period, replacing the original foundry of 1837; a pattern shop was built in 1864, and a brass foundry added later. All are marked on a map of 1873 (UWB: Penrhyn Further Additional 1873) together with the present foundry and a large building on the south-eastern perimeter of the site which has now largely vanished. An account of the same year speaks of "the mill where slates are sawn and planed into slabs" (*Slate Quarries of North Wales in 1873*). The northern extension on the western mill was started on 3 September 1867, to house a Hunter saw (ex info., Eric Foulkes), an experimental early use of renewable tip tooling, developed in the freestone quarries of Aberdeen, and which found a short-lived favour in a number of north Wales slate quarries. To the north of the mills are marked a row of gwaliau, open-fronted booths where blocks were hand-split into roofing slates. These might have been used for splitting the sawn ends from the mills, trimming slates broken in transit from the quarry or for demonstration purposes.

The experimental use of steam power on the railway to the port in 1875 (Clayton, 1987-8), and its subsequent reconstruction and realignment as a purpose-built steam railway led to the decision to construct locomotive facilities at the site. These existed by 1877, though the locomotive sheds in their present form appear to be of more recent construction - possibly of the 1930s (ex info., Theodore Roberts).

Until the end of the nineteenth century the eastern perimeter of the site was the original road of the 1780s from the port to the quarry, turnpiked in 1803. Around 1898 the Ogwen slate works was constructed to the east on the banks of the Galedffrwd, and apparently powered by a mill-race from it. Here bricks and tiles were made from slate dust, though the work appears not to have been of long duration (*Slate: The Penrhyn Quarry*). The building has been in industrial re-use for many years. In the 1950s it was used as a dye-works (ex info., Iorwerth Jones). Rail connection was by a bridge over the road and an incline down to the mill level.

The site was enlarged to the east again a few years later, requiring a diversion of the original road from the quarry to the port. A waterwheel is said to have been constructed on this site in 1906 to power the foundry blower, though a building on the same site or fractionally to the west is marked on the plan of 1873 and on the 25" OS of 1889.

A 1922 inventory lists twelve saw tables, six planing machines, one saw sharpener and an emery wheel in the two slab mills, and both a water wheel and a turbine to provide power. The foundry contained a cupola hearth, a fan, a crane and moulding boxes (CRO: XPQ 997 p. 30).

The mills continued to process slabs until the 1960s, though from 1952, following a fire, the joiners' shop was demolished and its equipment moved into the northern parts of the two mills. Thereafter only three of the old saw tables and a more modern diamond saw remained at work in the western mill, and an uncertain number of planers in the eastern (ex info., Iorwerth Jones). An inventory taken in 1954 lists a variety of old and new equipment which included lathes, drills, planers, milling, screwing and slotting machines, hammers and bending rolls as well as woodworking machinery. The mill workshops (presumably the foundry building) contained a forge blower (two years old) a foundry blower of uncertain age, a gantry crane capable of lifting five tons, and a hydraulic ram capable of lifting 80 tons that dated from 1844 (CRO: XPQ 581).

It remained the engineering centre for the quarry and its railway until the decision to go over to road transport was implemented in 1962. In 1965 the rails and the remaining disused locomotives were sold for re-use or preservation elsewhere.

4.2 Archaeological description

The site stands on made-up ground north of the Penrhyn Quarry, at a point where the course of the former railway crossed the Afon Galedffrwd, and forming part of a cluster of industrial buildings connected with the quarry, which includes a foundry and locomotive repair facilities.

(The numbers refer to the map published as Appendix 1)

1. Slab mill
SH61476635
Category A (listed grade II)*
This structure is thought to have been built in 1865-6; it is orientated north to south, and constructed out of a mixture of igneous rock, schist and granite, except for a northern extension built of slate slab sawn with a circular saw. It is of the transverse pattern (that is to say, formerly served by transverse railways, and with a transverse process flow), with four pairs of doorways in the older part of the building, one in the newer. The doorways are of the segmental arch type. The roofs remain intact, supported on queen-post trusses.

No machinery survives, but a concrete base for a diamond saw was noted in the southern part of the building, together with traces of a three-phase electrical supply in the gable wall. At roof level immediately above are traces of timber joists which may have supported an electric motor.

Truss-height longitudinal line-shafting brackets fitted into the eastern longitudinal wall were noted; these are evident on the outside walls as cast-iron circular plates embellished with a scalloped pattern. A more substantial cast-iron bracket contains the axle box not only for line-shafting but for a vertical power-drive from below floor level; this is integral to a substantial backing plate set in the wall. A central truss-height line-shaft was also noted in the northern extension; the central part of the mill is boarded off and is inaccessible.

This structure was listed Grade II* in the belief that it was the original mill of 1803. Documentary evidence suggests that it was built in 1865-6, and it is certainly an excellent example of a typical transverse mill of its period, which fully deserves its listed status. Others survive at Rhosydd (the earliest known example, built in 1856), Prince of Wales (1864), Cwt y Bugail (by 1867), Arthog (1868) as well as later examples elsewhere.

2. Locomotive shed
SH61496633
Category A (listed grade II)*
A slate slab-built locomotive shed has been added against the southern gable wall of (1), accessed by an arched doorway in its own southern gable and also by a doorway and length of rail in the eastern longitudinal wall. It is probable that this dates from shortly after the introduction of steam on the main line in December 1875, and that the access in the longitudinal wall is a later addition for an internal combustion locomotive.

3. Slab mill
SH61496635
Category A (listed grade II)
This structure thought to be coeval with (1); it is parallel to it and of similar construction, with four pairs of doorways in the longitudinal walls. It is locked and inaccessible, but the pattern of axle-boxes in the southern gable wall suggests that there were at least three longitudinal truss-level line shafts in this structure.

4. Waterwheel, wheel-pit and housing
SH61486635
Category A (listed grade II)*
Between (1) and (3) is an iron waterwheel situated in a pit constructed partly of igenous rock and partly of sawn slab, formerly covered by a garden-bond brick structure, which has now partly collapsed. The roof timbers have collapsed in places, and fallen into the wheelpit; from the remains which survive it is clear that there was a ventilation clerestory in the roof. It is thought that it dates from c. 1846.

The wheel is a high backshot suspension type, a design evolved by Thomas Hewes in the first decades of the nineteenth century and advocated by William Fairbairn. It measures 9.1m diameter (30') by 1.6m breast (5' 3"); there are eight spokes on each rim, alternately either bolted direct to the shroud or crossed in an X-pattern. Two of the spokes are missing. The soleing is partly intact but the wrought-iron buckets have rotted. Water supply is evident as two iron pipes which run slightly below ground level along the western rim of the pit and rise into the header tank. An external rim gear operates a spur wheel at the northern end of the pit, underneath the iron header-tank, which survives in situ, as does its control mechanism. The tank has a downward projection shaped to the contour of the wheel. The tailrace discharges to the north into a channel in which water still flows.

The spur wheel is mounted on transverse line-shafting below ground level which appears formerly to have been connected to the longitudinal line shafting within the mill buildings, and lines up with the backing plates in the mill walls.

5. Structure
SH61516635
Category A (listed grade II)
A rectangular two-bay structure built out of sawn slate slabs, in re-use for the manufacture of steel components and as a carpenter's workshop. This probably formed part of the original fitting shop believed to date from 1877, but has been rebuilt.

6. Waterwheel, wheel-pit and housing
SH61556635
Category A (listed grade II)
A slab-walled and slate-roofed waterwheel pit, orientated north to south, enclosing a waterwheel which formerly powered the foundry blower, and possibly also tools in the now-vanished fitters' shop. The doors and windows have been blocked up with breeze blocks. Integral with the pit building and to the north side is a pyramidal roofed structure, thought to be a lavatory, and against the eastern longitudinal wall is a lean-to extension. Both these structures are unstable, and are coming away from the main building; the main wheel housing, however, appears to be sound.

The waterwheel is intact. It is a backshot suspension type, 9.1m (30') diameter, 2.6m (4'3") breast, with alternate direct and crossed wrought-iron spokes. The words HENRY SUGDEN AND SON MAKER BRAMLEY NEAR LEEDS are cast in the shrouds. Water supply is from a header tank at the northern end of the building, fed from two iron pipes slightly below ground level which rise into the tank. Unusually, the spur wheel operates on the upward motion of the rim gear, and is therefore situated at the southern end of the building. A layshaft leads off it in a vaulted underground chamber in the direction of the foundry for a distance of approximately 6m, until a wider chamber is reached, at which point the lay shaft ends and a wall has been constructed across its site.

The date of this structure is uncertain; some sources ascribe it to 1906-7, but it appears to be shown on a map of 1873.

7. Gwaliau
SH61486642
Category A
A row of six slate-splitters' booths, in Welsh *gwaliau*, for hand-splitting of blocks into laminae for roofing slate, orientated north to south, open to the east. Four of them have a most unusual timber canopy awning. The most northerly is roofless and severely delapidated.

8. Gantry crane
SH61486643
Category B
A hand-operated timber gantry crane, running on rails, in poor condition. The longitudinal members are broken, and the crab mechanism damaged. A photograph exists (private possession) showing it or a similar device in the quarry around the turn of the century. Such devices were a common feature of engineering shops from the 1840s onwards. This example was used to lift sawn slate pillars off the railway trucks used within the yard itself on to specially-built flat wagons which carried them down to the port.

9. Foundry
SH61516633
Category A (listed grade II)
A substantial foundry building, built out of sawn slate slabs with quoins of igneous rock. The main access is on the north side. Against the south gable wall is an open-sided coke-store whose roof is supported on cast-iron columns, and the remains of a brick-built chimney dividing on either side of an arched doorway. This represents the site of an external cupola hearth, in which two vertical pipes for the draft are evident at ground level. There is some slag on the ground here. The doorway is believed to be a siding entrance for bringing truck-loads of scrap into the building.

Against the north-eastern corner is an external chimney for a brass-founding area. Within the building is a gantry crane running immediately below truss level. Along the east wall is a later extension, accessed from within the foundry, containing a store and an arched kiln, possibly for enamelling slate blocks.

10. Locomotive repair shops
SH61526632
Category B
A two-bay locomotive repair shops, orientated north-east to south-west, built in two stages. Both are built out of sawn slate blocks; the roof of the northern bay is supported on king-post trusses, that of the southern bay with steel struts. Locomotive access was by two surviving wooden sliding doors in the south west gable end. The more northerly range housed a range of machine tools; in the other an inspection pit and an overhead gantry crane survive. The facilities here made it possible to fabricate new smoke-boxes for the locomotives and carry out some boiler repair work.

11. Oil shed
SH 6148 6632
Category B
A monopitch structure orientated east to west, accessed by a door in the eastern gable end. Roofed, and externally rendered. This may be the original oil-shed of 1834.

12. Afon Galedffrwd - culvert
SH 6152 6633
Category B
The Afon Galedffrwd is culverted where it runs through the site. At the point where it enters the site four iron pipes were noted, probably corresponding to the iron pipes observed feeding (4) and (6). In February 1995 Arfon Borough Council employees exposed the slate cover of a culvert immediately south of (3), approximately 7.5m deep and approximately 2m wide, which may be the course of the river.

The river emerges through a corbelled arch on the eastern perimeter of the site. The tailrace from (6) is apparent immediately upstream of the arch, together with what may be the remains of an eighteenth century bridge carrying the original slate road. A further culvert emerges from the perimeter retaining wall through a flattened arch approximately 2m to the north of the corbelled, which may represent the tailrace from (4). 2m to its north is a cast-iron pipe which may have served the Ogwen tile works.

13. Bridge
SH 615 662
Category A (listed grade II)
This feature dates to 1900, when the yard began to be enclosed, and replaced an earlier level crossing with St Anne's Road. It consists of a single segmental arch with red brick arching and a stone keyblock; coursed slab piers flank slab spandrels supporting ornamental cast-iron parapets.

5. CONCLUSION

The Coed y Parc/Felin Fawr yard is an excellent example of a largely self-sufficient industrial complex of the nineteenth century. Its growth was evidently *ad-hoc* - there was no attempt to match the fort-like construction which Lord Penrhyn's neighbour Assheton-Smith erected for his own Dinorwic quarry at Gilfach Ddu - but the quality of the engineering and architecture is superb. It survives almost entirely intact, and in good condition.

Its importance is further emphasised in that it forms an integral part of an outstanding historic landscape, and has been recognised as such by the International Council on Monuments and Sites.

It is also remarkable as a site which depended almost entirely on hydraulic power, from 1803 if not earlier, until the 1960s. Even though the Penrhyn Quarries made abundant use of steam locomotives, their stationary power sources were mainly water-driven, reflected in the two superb suspension wheels which remain on site. Whilst they are not on the scale of the similar wheel which remains in working order at the Welsh Slate Museum, they are remarkable survivors, and confirm the site's historical and archaeological importance.

6. RECOMMENDATIONS

In that the site contains not only surface features of national importance, most of which have already been afforded statutory protection, but also buried features which are likely to be of considerable significance in themselves, it requires both comprehensive archaeological evaluation and detailed recording. Nine of the thirteen features identified are considered to be of national importance and the remaining four of regional importance; of the nine, six are listed grade II, two are listed grade II*. Known buried features include the tailraces of the two waterwheels and the line-shaft to the foundry blower; possible buried features include the tailrace from the original waterwheel on site, the original wheelpit and the foundations of earlier mills, as well as the eighteenth-century bridge which formerly carried the quarry's ouptput before the construction of the railway.

6.1 Evaluation

A full evaluation of the site will therefore involve further analysis of the features and remains below ground level. In order to accomplish this, an archaeologist should monitor the progress of any trial pits that may be excavated for any purpose; should they yield insufficient information, an archaeological excavation will be required, with the express purpose of establishing the depth and nature of the stratigraphical deposit on different parts of the site.

Depending on the results of such an evaluation, either further archaeological excavation or a watching brief during excavation will be required.

6.2 Detailed recording

A full archaeological record as outlined in **3.5** above should be made of all structures and features on the site before work begins, to include a photographic record, surveying and the production of a measured drawing prior to the commencement of work on site. Should restoration of the waterwheels be contemplated, they should be recorded in their present condition before work begins.

7. BIBLIOGRAPHY

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Tithe map for parish of Llandegai 1845 (photocopy in Caernarfon Record Office)

1"/1 mile survey of 1839-41 (David and Charles reprint)

25"/1 mile XII 6 (1900 and 1914)

25"/1 mile XII 10 (1889 and 1914)

1/10,000 66NW

Manuscript sources

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Walter Davies (Gwallter Mechain) notebooks

University of Wales, Bangor

Penrhyn Further Additional 1829, 1844, 1873

Caernarfon Record Office

PQ 1 1-3 (Quarry bank books, 1834-1854)
PQ 22 1-11 (Quarry production books 1800-1868)
XPQ 419-421 (Quarry account books 1835-1852)
XPQ 486 (Foundry account, 1837-1848)
XPQ 581 (Inventory of machine tools, 1954)
XPQ 997 (Abstract of old ledgers and engineering records)

Photographs

Caernarfon Record Office

XCHS 1328 2: photograph of the slab mills from the north east, ?1890s.
Photographs reproduced in Boyd and Turner, op. cit.

8. NON-TECHNICAL SUMMARY

This project has assessed the archaeological and archival evidence for the features identified at Y Felin Fawr/Coed y Parc, the former slab mill and engineering workshops of the Penrhyn Slate Quarries, in use from at least 1803 until the 1960s. Thirteen features were identified, of which nine were described as of national importance, and four as of regional importance.

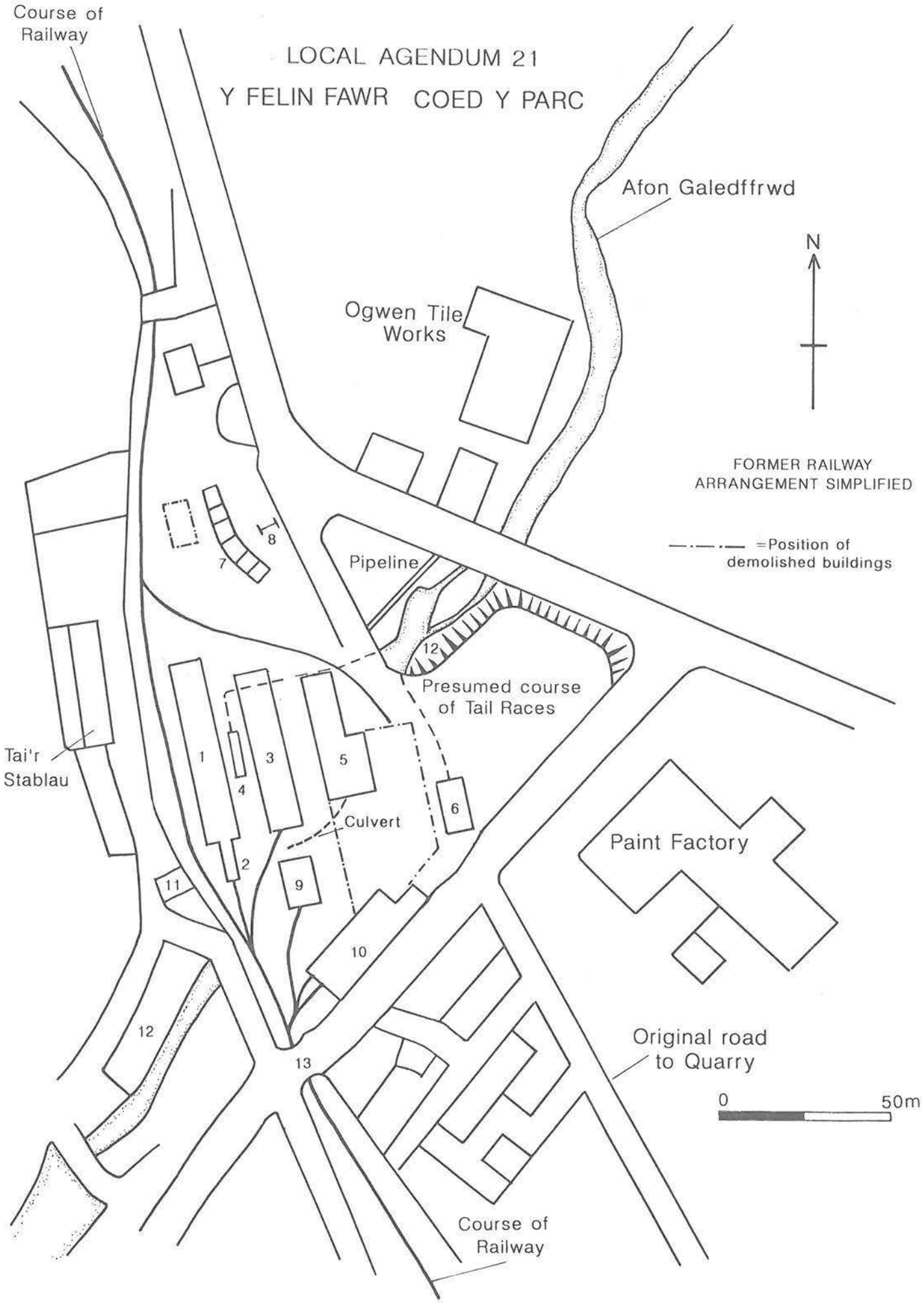
It has established that the dates given in the standard published histories need to be treated with some caution; that the foundry and slab mills are in all probability structures of the mid-1860s rather than of the early years of the nineteenth century.

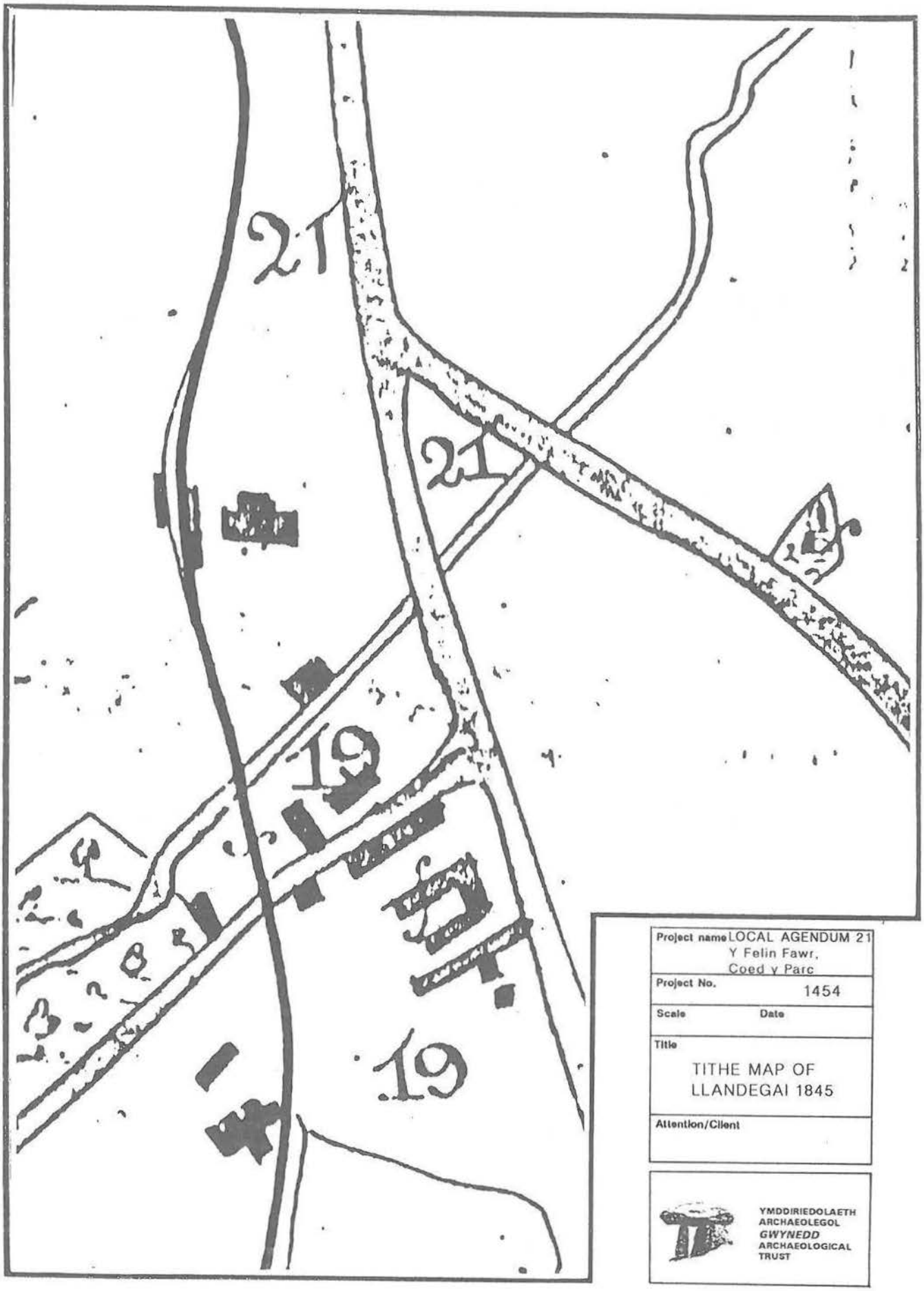
It has also established that the site made remarkable and consistent use of hydraulic technology, archaeological evidence for which survives in the form of the two iron suspension waterwheels which remain *in situ*.

The Gwynedd Archaeological Trust has not sought to advise on the whereabouts and availability of historic machinery in the present document, as outlined in the initial project brief, but is prepared to do so when requested by Building Design Partnership.

9. ACKNOWLEDGEMENTS

Thanks are due to Eric Foulkes of Bromborough, who gave the Trust some useful leads. Theodore Roberts of Coed Isaf, Llanllechid, who served his apprenticeship at Felin Fawr, made a number of suggestions about dating of structures. Iorwerth Jones, Maesgeirchen, who worked as a fitter and fireman on the Penrhyn Railway from 1959, gave the Trust useful advice on the latter days of the site.


Course of Railway
LOCAL AGENDUM 21
Y FELIN FAWR COED Y PARC
Afon Galedffrwd
N
Ogwen Tile Works
FORMER RAILWAY ARRANGEMENT SIMPLIFIED
=Position of demolished buildings
Pipeline
Presumed course of Tail Races
Tai'r Stablau
Culvert
Paint Factory
Original road to Quarry
0
50m
Course of Railway



Project name	LOCAL AGENDUM 21 Y Felin Fawr, Coed y Parc
Project No.	1454
Scale	Date
Title	TITHE MAP OF LLANDEGAI 1845
Attention/Client	

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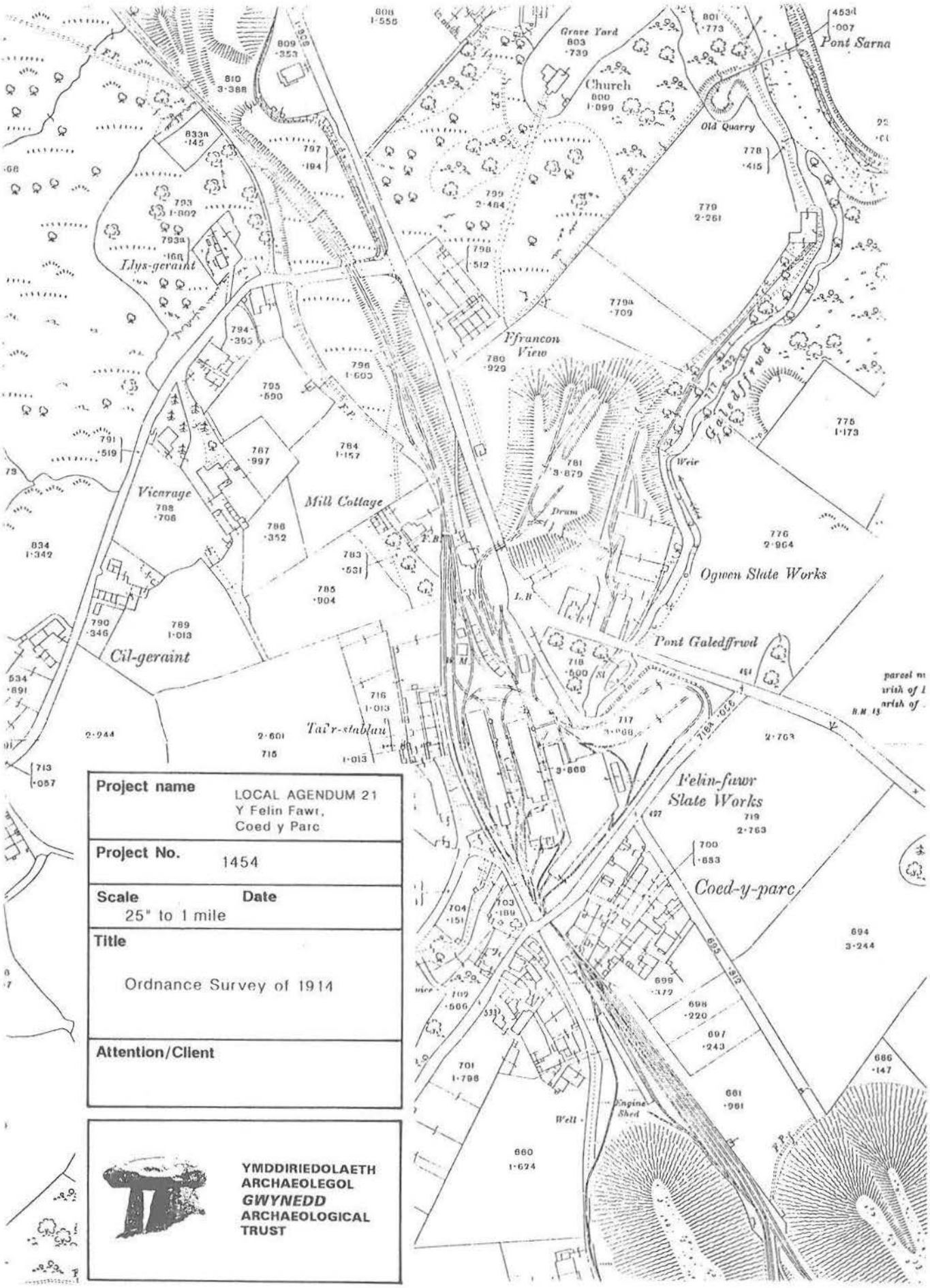

Project name	LOCAL AGENDUM 21 Y Felin Fawr, Coed y Parc
Project No.	1454
Scale	25" to 1 mile
Date	
Title	Ordnance Survey of 1914
Attention/Client	

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