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FRON AND OLD BRAICH QUARRY

LAND RECLAMATION SCHEME

SURVEY AND RECORDING (G1298)

REPORT NO. 166

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APPENDICES

MAPS

1 INTRODUCTION

1.1 Gwynedd County Council is proposing a land reclamation and stabilization scheme on part of the tips belonging to Fron and Old Braich slate quarries, on the edge of the village of Y Fron, some six miles south of Caernarfon (SH 514547) at 290m OD. This scheme will involve (i) rebuilding the retaining wall which runs alongside the slate tip east of Y Fron and grading the waste tip to a safer angle of repose; (ii) reducing the height of the existing retaining walls either side of the former tramway; (iii) regrading the tips above the road between the top of the tip and the existing hollow; and (iv) filling the hollow which exists between the tips with any surplus waste from the regrading.

1.2 Gwynedd Archaeological Trust carried out an archaeological assessment ahead of the proposed scheme in November 1994. This study comprised a desk-top survey and field search of the area proposed for reclamation in order to assess the impact of the proposals on features of archaeological and historical importance within that area.

1.3 The results of this study were incorporated in the Trust's report number 137, which also included an evaluation of the relative importance of the features as well as a series of recommendations for further work necessary to minimise damage to those features.

2 PROJECT BRIEF

2.1 The recommendations of the archaeological assessment were as follows:

> *Fron and Old Braich quarries contain an interesting sequence of remains, dating from the 18th century to the 1960s. The area to be affected by the proposed reclamation contains the line of the 1881 tramway with high retaining walls, some buildings from the late 19th-century quarry working, and substantial remains from the re-working of the tips up to 1960.*
>
> *It is now generally recognised that the Industrial period in Britain is of great historical importance, and the archaeological study of remains of the period is a vital element in the understanding of that period. Slate quarrying constituted the most important industry in Gwynedd in the 19th century, whilst Gwynedd formed the most important area of slate quarrying in Britain. Therefore the slate quarrying remains in Gwynedd are of national importance, and whereas the remains at Fron quarry are not of specific importance in themselves, they do form a representative sample of what is a declining archaeological resource.*
>
> *It is therefore recommended that the remains of the quarry are surveyed, and each feature identified, photographed and described. This will enable a complete record to be made of the quarry remains, and will ensure that there is a sufficient body of evidence to unravel the working phases of the quarry. Some documentary work will be necessary to allow the archaeological findings to be put into a historical context.*
>
> *It is also recommended that the line of the tramway is retained as a landscape feature, and that the retaining walls either side of the tramway are carefully dismantled so that features such as the bridge abutments visible within the wall are preserved.*

2.2 In summary, it was recommended that a full measured survey be carried out, with a photographic survey of all features.

2.3 These recommendations were accepted by Gwynedd County Council and the Welsh Development Agency, and a project design was submitted and, after modifications, accepted by the WDA. This project design was set out out in a letter dated 22nd April, 1994 (see appendix 1), and the amended proposal discussed in late May/early June 1995.

3 FIELDWORK METHODOLOGY

3.1 General

3.1.1 It was determined at the beginning of the project that the best way of tackling the recording would be to split it into two parts, using a two-man team for each. First, a survey using EDM would be carried out, and subsequently a plot of this would form the basis for numbering, describing and photographing the features.

3.1.2 The first major problem was to define the limits of the survey. Each of the two previous pieces of work on the site (Malcom Hughes's survey, and GAT's assessment) appeared to have established different limits, and the brief supplied by Gwynedd County Council was very vague as to the extent of the reclamation scheme.

3.1.3 In the end it was decided to err on the side of caution and survey and record all the features on the tops of the tips, and down the sourthern ends. Unfortunately, the survey was limited by the warning in the brief:

> *3. FIELDWORK METHODOLOGY i) EDM SURVEY NB. The SW face of the tip above the road is potentially very dangerous to access when wet. Therefore only those features which can easily be reached will be surveyed in, other features will be located approximately and this identified on the drawing* (GAT Brief, April 22nd, 1994, page 3).

3.1.4 The weather was very wet and windy when the survey was carried out and this, plus the potential danger of starting a rockslide prevented access to the slope above the road. However, the site was photographed from the air on the afternoon of 10th May (GAT sortie 95-FL3), and this should allow features here to be sketch-plotted on to the survey drawing and described and added to the gazetteer. (The results of the flight were only just becoming available as this report was written - 20th June 1995.)

3.1.5 Footnote - A final site visit was carried out on the evening of 29th June, 1995, when ground preparation for the reclamation was under way. It was noted that of the two principal features already removed, wall 71 and cableway anchorage 52, the latter lay outside the area of Malcolm Hughes's survey, thus vindicating the cautious approach recording everything on the tip top.

3.2 EDM Survey

3.2.1 The Trust uses a Geodimeter 400 total station, downloading into an HP100LX field computer installed with Autograd (Autograd Integrated Data Acquisition System). The data is processed using SCC386 (Survey Control Centre v 2.16) digital mapping and surface modelling software, with output to FastCAD.

3.2.2 The survey was carried out by a two-man team between 25th and 31st May, 1995, in very wet and windy weather conditions which made the task at times almost impossible. The only surviving station (from the Malcolm Hughes contour survey of the tips carried out previously), station 4, was located and this was used for the first station of the GAT survey: all subsequent stations were set up with reference to this. (This station was subsequently 'removed' over the Bank Holiday, but its position could still be located.)

3.2.3 A total of eight stations were used in all, including Malcolm Hughes's stations 4 and 1, and this allowed access to all the features on the tops of the tips. These stations were tied in to a number of fixed points including the top edge of the quarry, the adjacent field boundary and a number of telegraph poles near the mill building and down on the road.

3.2.4 It was decided to separate the area of survey into managable blocks to be carried out from each station, beginning with station 4. The edges of these blocks (which do not appear anywhere in the report as distinct entities) were based on a combination of things such as the roadway, the tops/bottoms of certain tip runs and lines of sight. Within each block the ground was covered systematically by the staff man moving out from the station to the edge of the block and back in on a slightly different line.

3.2.5 Every deliberate, man-made structure was recorded: this included everything from substantial *gwaliau* over 1.5m high, to insubstantial, ephemeral sections of wall only a few courses high. To ensure that features were not recorded more than once, and that every feature was recorded, the ends and/or middle of each feature were marked with yellow highway paint as they were surveyed. Only the bases of walls were recorded, and sufficient points were taken to allow the shape and size of each feature to be reproduced (*i.e.* for a simple length of wall, only each end was surveyed, but for the complex *gwaliau* a number of points were needed at corners, junctions of walling *etc.*).

3.3 Recording

3.3.1 This was carried out by a two-man team between 1st and 3rd June, 1995. The basis for the recording was a series of print-outs at A3 size of the EDM survey. An overall plan of the site was marked as the 'master plan', and for the purposes of the recording the area was divided into six 'insets', whose limits were marked on the master. These have not been retained for the purposes of the report, but explain the way the features were numbered.

3.3.2 The recording began at the mill and the roadway, and this area of the site was covered by inset one. Each feature, or occasionally group of features, was given a consecutive number which was marked on the inset plan. It was then described as briefly as possible on paper. It was decided from the outset not to use standard GAT recording forms, as none of these were considered appropriate for the task in hand: also, it did not seem practical to design another, so the descriptions were just written on to ordinary paper underneath the feature number. These notes were later typed up in the office to form the basis of the gazetteer (see appendix 2).

3.3.3 At the same time, the second team member was responsible for taking photographs. Only those features which were considered to be either particularly good examples or very typical of their type were photographed. The basic photography was carried out using 35mm black and white film (Kodak TMX 400), supplemented by a number of colour slides (Kodachrome 200) for illustrative purposes. A detailed record was kept of which features were photographed, and these have been catalogued.

3.4 Project archive

3.4.1 All paper records, plans, photographs, EDM data and CAD drawings have been stored in the GAT site archive under the project number G1298.

4 HISTORICAL SUMMARY OF QUARRY AND TIP WORKING

4.1 The Quarry

4.1.1 The present Fron & Old Braich Quarry is a late 19th-century creation. Previously, both the Fron and the Old Braich (or Braich-rhydd) workings were separate entities, having been variously worked from the eighteenth century by a variety of companies and sub-tenants under a series of mineral leases granted by the Crown Estates.

4.1.2 Prior to the amalgamation of the Fron and Old Braich mineral setts in the late 1860s, both quarries had hitherto been worked on a small scale. Their main impediment was an unsatisfactory transport system to the shipping wharf at Caernarfon, involving an eight-mile journey by horse-drawn carts. The massive increase in demand for slates during the 1860s resulted in a spate of speculative investment in the Welsh quarries, and even the more remote sites such as the Fron and Old Braich Quarries benefited from the rush to cash in on the bonanza by companies raising their capital in England.

4.1.3 The Fron Quarry lease was taken by the British Slate Company Ltd in around 1864, whereupon a large scale development of the workings was instigated, involving a new steam winder and slab mill. In 1868 the concern took over the adjoining Old Braich mineral sett, re-equipped its winding plant and constructed an exit railway (3ft 6inch gauge) to connect with the Nantlle Railway at Tal-y-sarn. However, this phase proved to be a flash in the pan, and the subsequent financial problems of the concern and of its short-lived allied successor resulted in the reduction of the scale of workings to a more modest level.

4.1.4 After 1880, with the exception of a brief interregnum in the late 1890s, and another in the late 1920s, the Fron and Old Braich Quarry was successively operated by Welsh Companies based in Caernarfon and by local quarrymen under tenancy agreements. With the exception of the 1890s sawmill (extant) and a new exit connection to the North Wales Narrow Gauge Railway (in 1881), there was very little new investment on the site thereafter. With the gradual working out of the accessible reserves in the pits, operations on the site diminished progressively during the first half of the present century.

4.1.5 A brief flurry of activity in 1946-51, when a Manchester firm of merchants worked the Old Braich pit to circumvent Government restrictions on the supply of essential building materials, was the last concerted attempt to quarry slates here. After 1951, a local tenant scavenged rock from a corner of the Fron pit for several years, but by c.1960 even this last phase of minimal working had petered out.

4.2 The Tips

4.2.1 Slate quarrying was (and is) an industry which produced a very large proportion of waste in relation to the amount of finished product. The very best quarries during the nineteenth century operated on a yield of only 10 per cent and a more common average was around half that figure. The rapid growth of the slate industry during the 1860s and 70s consequently produced huge volumes of waste, leading to the development of the core of the present complexes of tips which dominate the Nantlle district.

4.2.2 The content of the quarry waste tips varied according to the source of the excavated material and the methods of working. The surface soil, broken top rock and so-called "granite" (actually a variety of gritstones and volcanic rock interbedded with the slate) was useless, as were the fine trimmings from the slatemaking process.

4.2.3 However, many tips also contained workable blocks of slate which had been spoilt or dumped in error by inexpert quarrymen, or deliberately passed as waste to circumvent inequities in the complicated pay system (termed 'bargaining'), or the material was unmarketable because

of its colour or size during a particular period of time. These potentially useful slate blocks were to provide a source of income to generations of men after c.1890.

4.2.4 The fundamental market change which created a value for the workable tip material was the introduction of damp-proof courses in the brick walls of better quality housing towards the end of the last century. Thick slates, in breadths of 4 1/2" or 9" to match the brickwork, laid in a multiple layer just above the foundation courses provided a good barrier to rising damp. Previously, the minimum size of roofing slate had been either 14 x 7" or 10 x 6", such that the quarry waste tips were full of the narrow offcuts ideal for damp-course slates.

4.2.5 As a result of the growth in demand for damp-course slates during the present century, the reworking of the spoil-heaps became a viable commercial proposition. However, because of historical and social reasons, this activity came to be primarily associated with the Nantlle area, although it later spread further afield. Existing quarry companies at Nantlle were very willing to sub-let their tips to contractors on a discounted first refusal agreement for their 'make'. These contractors then set men (mostly unemployed quarrymen) to work on individual plots in a similar system to the ubiquitous quarry 'bargain' pay system. This seems to have been the arrangement at the Fron & Old Braich Quarry. Elsewhere in the district, gangs of men or a single agent leased defunct quarries so as to open independent 'tip-works'.

4.2.6 The golden age of tipworking at Nantlle was the 1920s-30s, with the operations diminishing in the 1940s-50s, ceasing altogether by the early 1970s. The introduction of new damp-course materials and damp-proofing techniques spelled the end of the slower and more expensive slates. The work on the Fron tips appear to be predominantly from the inter-war years, with the final phase during the 1950s being small in scale, ending c.1960.

5 RESULTS AND CONCLUSIONS

5.1 General

5.1.1 The Fron & Old Braich tip workings are typical of their type within Nantlle, albeit exhibiting the individual idiosyncrasies which resulted from the working of plots by separate gangs of men under minimal supervision.

5.2 Tip workings

5.2.1 The distribution of the tip workings on this site exemplifies the methodology that developed in this specialised aspect of the slate industry. The workings consist of three main types of excavations - (a) cuttings along the upper edge of the tip where the heavy slate blocks of the tipping platforms have been quarried; (b) peripheral scratchings along the base of the tip and (c) craters in its surface, suggesting almost a 'prospecting' approach by the workers.

5.3 *Gwaliau*

5.3.1 Associated with the excavations are crude shelters (*gwaliau*) which housed the sedentary process of splitting and dressing under cover in the predominantly inclement weather. These *gwaliau* have a distinct typography and development pattern. The majority are lean-to structures originally with one open long side sheltered typically from the prevailing south-westerly wind (see features 85, 106 and 120 which are good examples of this early stage of development).

5.3.2 Simple cantilevered slabs overhanging a single wall have also been identified in the district, as has a variety of roughly pitched roofs, although neither of these two were positively identified at Fron.

5.3.3 The roofs were usually slab and a fine waste covering, supported by old rails or timbers, but later versions used corrugated iron. An example of a still-roofed *gwal* exists at the bottom of the waste tip which forms the northerly boundary of the survey area: this has utilised sleepers, fence posts and an estate agent's 'for sale' sign.) Some had coal stoves for heating and tea, but such luxuries were removed when operations moved on to fresh ground and evidence of fine detail is sparse.

5.3.4 The *gwaliau* structures were usually modified over time as they developed organically, either extended to allow extra men in the gang, or closed off into a system of passages due to the need for holding back the waste from the activity, lest it overwhelm the sitting slatemaker. Consequently, there is a pattern of free-standing *gwaliau* becoming engulfed in their own waste and resembling sunken versions that had been constructed into the flank of a surface crater (features 26, 38, 42 109, 115 and 132 are particularly good examples of this). There was also an intermediate 'half sunken' version found on the sides of tips (for example, features 81, 85 and 93).

5.3.5 In some quarries near the highly populated village of the valley floor (but probably not at Y Fron) the *gwaliau* show a distinct pattern of being totally sunken on easily accessible sites, but free-standing in more remote sites. The former were allegedly hidden to enable the tip workers, who were predominantly unemployed and drawing the 'dole', to escape from view if the officials of the Employment Exchange chanced to call!

5.4 Other features

5.4.1 Surrounding the *gwaliau* are low walls for temporary stock-yards, small tips from the slate making and reject blocks from the excavations (carefully held back, by crude retaining walls, from overflowing onto workable ground), and paths linking the workings and providing barrow-ways to the central large stock yard from which the produce was loaded and dispatched. In many sites, the existing tramway connection was retained to allow an exit route either to the main railway depot or road transshipment site. At other sites, including Fron, the old railway access was, after the closure of the outlet railway in 1937, converted into a long road because of its easy gradient and wide formation.

5.5 Use of site types

5.5.1 With very few excaeptions, all the features recorded on the site could be categorised within one of the site types described above, namely *gwal*, retaining wall, building (usually function unknown), tip, shelter, or trial excavation.

6 ACKNOWLEDGEMENTS

6.1 The Trust would like to acknowledge the generous support of the Welsh Development Agency, and especially Mr S Smith, which funded this work.

6.2 It would also like to acknowledge the help and support of staff at Gwynedd County Council especially Mr G J Williams and Mr A Griffith, who were instrumental in ensuring the project was carried out.

6.3 The staff at Malcolm Hughes Land Surveyors of Manchester were also very helpful in supplying the Trust with a copy of their original contour of the site.

APPENDIX 1

PROJECT DESIGN FOR SURVEY AND RECORDING

APPENDIX 2

GAZETTEER

Gazetteer

01 Mill
Standing building in good condition.

02 Wall
Comprising mill-sawn blocks: much disturbed by later tip landscaping and standing less than 0.5m high. Connected with tip working.

03a Wall
One of two walls (see also 3b) built to protect tramway from tip material. This northern wall is the better preserved, only partially collapsed, and the impressive dry-stone masonry structure stands to over 3m high. The wall was built in horizontal stages beginning at the eastern end where it abuts bridge 4a, and material was tipped behind it. When the western end was reached there was no room left for tipping, and bridge 4b was built to carry waste over the tramway to begin tipping on its southern side. Wall 3b was built to retain this tipped waste and keep it from spilling over the railway (5).

03b Wall
One of two walls (see also 3a) built to protect tramway from tip material. This southern wall is less well preserved, but nevertheless is an impressive dry-stone masonry structure standing over 3m high.

04a Bridge abutment (east).
This bridge pre-dates the whole of the northern supporting wall (3a). It was built to carry spoil from the mill area over the tramway to the tip forming the southern boundary of the site above the road.

04b Bridge abutment (west).
This bridge post-dates the whole of the northern supporting wall 3a (see above). It was built to carry spoil directly from the quarry over the tramway to the tip forming the southern boundary of the site above the road. There is no abutment on the north side, only the south.

05 Roadway.
The roadway went through a number of stages, beginning as a steeply-graded tramway, and was in use as an access way right into the period in which the tip contractors were working. The railway closed in 1937, and this track was probably converted to a lorry roadway soon afterwards. The southern abutment of bridge 4a shows where the trackway was widened to accommodate lorries.

The probable phasing of this series of features is 5, 4a, 3a, 4b, 3b.

06 *Gwal.*
Tip contractors' sunken hut.

07 *Gwal.*
Hut: more roughly built than 6.

08 Walls.
Sections of wall from probably last period of sub-contracting: they are very much rougher in construction than many of the *gwaliau*. This area of the tips has been very much turned over, obscuring the original tip contours.

09 *Gwal.*
Good example of hut built on the side of a tip: interestingly its entrance is to the south-east.

10 Walls.
A series of roughly-built walls supporting a pile of rejected slates.

11 *Gwal.*
Hut built into the side of the tip: it was not a good position for workable material.

12 Wall.
A roughly-built wall built from rejected slates which had been dug from an are immediately to the north-east. None have been worked, showing that this area was not productive for working (see 11).

13 *Gwal.*
Tip contractors' hut, with external wall still partially visible. A substantial retaining wall has been built to the south to hold back debris.

14 *Gwal.*
Hut built on the side of the tip: a trench has been dug straight through into the tip, with retaining walls built to prop up the tip on either side.

15 Wall.
A very rough, temporary "back rest" for open air working.

16 Trial.
The remains of early excavations infilled by more recent waste.

17 Trial.
The remains of early excavations infilled by more recent waste. Interestingly this one contains green slate waste.

18 Wall.
Remains of a now-infilled rough shelter, probably formerly for outside working.

19 Wall.
Retaining wall holding up a dump of rejected slates from an excavation, which lies to the south-west.

20 Wall.
Possibly representing a stockyard from open-air working to the north-west.

21 *Gwal.*
Good example of a hut, with its four walls possibly built first down from the top of the tip. There is a lot of waste thrown back on the roof and sides.

22 *Gwal.*
Remains of an older hut of rougher construction, now largely tipped over, built down the slope of the tip.

23 *Gwal.*
A good example of a hut, now c.1.5m deep, with much roof collapse on the floor. It is well-built, with even an apparent string course around the top of the wall. It still retains evidence for its corrugated iron roof, as well as for three phases of building, and has an empty tin of linseed oil stuffed in the wall.

24 *Gwal.*
Hut built just off the edge of the top of the tip. Much of the existing construction is actually a retaining wall: it is possible that only a small area of the structure was originally roofed.

25 Wall.
Contractors' wall for reataining discarded slate waste, which is contained to the north.

26 *Gwal.*
Good example of a (later) hut: the construction is of good quality, with most of the external wall length still standing proud of the surrounding slate tip (although the rear has been obscured by debris). At least three phases can be discerned (the original *gwal*, plus two lengths of retaining wall across the open side, with other retaining walls on the eastern side).

27 *Gwal* and excavation.
Collapsed remains of a hut with roof remains form the west side of this feature, with its associated excavation immediately outside: the latter is protected by two stretches of retaining wall holding back the rest of the tip and discarded material.

28 Trial.
A deep working excavated into the tip by a contractor is surrounded by a series of retaining walls: two phases of these walls can be seen in the north side. There are also the remains of a possible *gwal* in the centre. Other corners of retaining walls are visible up to the north and out to the west.

29 Wall.
Short stretch of wall, possibly relating to a trial excavation to the south.

30 Wall.
A short stretch of wall holding up a squarish pile of rejected slates alongside the edge of an earlier tip run.

31 Wall.
A short stretch of wall holding up a squarish pile of rejected slates alongside the edge of an earlier tip run.

32 Wall.
A small 'corner' shelter for outside working, formed by infilling with slates between two large boulders, with a wall projecting out to the north. On old tip run. X marks enclosed area.

33 Walls.
Two short stretches of walling formed by piling reject blocks loosely on top of each other, with the possible remains of a contractor's excavation in between. Other trial excavations are visible in this area, most of them in a collapsed condition. There also many other similarly-built walls, indicating an area of considerable past activity.

34 *Gwal.*
Remains of a slight, roughly-built shelter, probably connected with outside working. The 'interior' marks a working area, while to the east there is a deeper hole, presumably from an excavation, with a retaining wall above. Another, similar, hole lies to the north, with discarded material built up above it. There is a number of slight walls in the area to the north, which unfortunately do not make a definite pattern.

35 Excavation and wall.
A cleared area dug into the tip, with a low, roughly-built, wall, presumably constructed from slate excavated from it, above it. It does not appear to be a *gwal* as such. There is evidence for working in the centre. The area has collapsed in on its north-west side.

36 *Gwal.*
A roughly-built hut excavated out of the tip, with its wall made from excavated material. A linear excavation continues to the south west, with the excavated material thrown up to form rough wall: this has collapsed back in in places.

37 *Gwal.*
Moderately well-constructed hut built up from the tip level, with its original square shape still showing (as does most of its exterior walling) despite some collapse. Interestingly, the entrance is a gap in the corner of the structure, rather than an open side. There is considerable waste dumped outside on the east and south sides.

38 *Gwal.*
Very well constructed, well-preserved and hut and passageway complex, probably originally set into the end of an earlier tip run, showing at least three phases of construction/use. The original *gwal* is at the east end of the 'passage' which is now the mainfeature: this was subsequently partially blocked in on its western side, and then a further retaining wall was built outside this. A long outer 'passage' now leads out from this, defined by a series of short, successive retaining walls with much waste material dumped on the top and sides, giving it a 'buried' appearance now. The development feature does not appear to have been planned, but rather it expanded 'organically'.

39 *Gwal.*
A short section of wall marks the remains of a now-ruined former *gwal*, dug into the side of an earlier tip run. The (unusual) amounts of masonry here imply that it may have been placed to quarry out a weighbridge. A considerable number of dumped large blocks, not slate, from the quarrying period help define the north edge of the hut.

40 Wall.
A short section of wall, within which two phases are visible, made from building up rejected slate from nearby excavations to form a waste pile c.0.75m high.

41 Wall.
The corner of a wall built up on the tip to form a sheltered outside work area. It is of very rough construction, less than 0.5m high. The external face of the wall is also visible (although only the internal was planned).

42 *Gwal* and passageway.
This is one of the most complex features on the site: it is a series of what appear to be massive retaining walls built up from the level of the original tip top to retain discarded waste material (on its southern side). Much waste material is visible all along the top and behind. At the east end is a substantial, high (1.5m) section of wall, built up again from tip level, possibly to form an original hut (on its western side) with another retaining wall opposite the open side. This section of wall is also capped by a huge amount of waste material. Opposite the other (western) end of the retaining wall is another, similarly massive, retaining wall: the small area between these gives the impression of being a very deep hole, although much-collapsed to the south. However, it is more likely that the bottom here is the level of the original tip, and that the walls have been built up from it forming a narrow 'passage' feature. As a whole, this feature comprises many phases, and cannot be properly interpreted without detailed examination.

43 Wall.
Short sections of retaining wall built around either a trial excavation or possibly the remains of a hut now collapsed and infilled. There is a possible entrance on the east side.

44 *Gwal.*
The collapsed remains of a solidly-built, large hut, built in a number of phases. It is now completely surrounded by chipped waste remains, and the south-east corner is completely buried by collapsed material.

45 Walls.
Two short stretches of retaining wall to hold up discarded working waste (possibly from the rear of 44). Built on top of (earlier) working waste material, they are now much collapsed.

46 Wall.
Built from discarded slate blocks, it partially encloses an area to the south, although it is not obviously a former hut as such. Two or three phases of construction are visible, and an iron rail juts out from near the base of the northern wall, although its original function is not clear. The feature is now badly collapsed, with large amounts of waste filling the 'interior'.

47 Wall.
A very short section of wall buried below collapsed waste (see also 49).

48 Wall.
A very short section of wall built of rejected slates from a minor trial excavation to the north (see also 49).

49 Wall.
This feature is a right-angled section of wall, now much collapsed and buried below working waste. A 'hole' between this feature and 47 may mark the site of a former hut now completely buried by later activity.

50 Wall.
A short section of badly-collapsed wall, possibly the remains of a corner of a collapsed hut, now almost completely infilled by later debris.

51 Building - base for inclined cableway mast.
The remains of a massively-built and now completely collapsed building on the edge of the quarry hole, which was formerly the base for the cableway mast which was used to haul material out of the quarry below. The remains appear to be of two pillars, or similar, up to 1.5m high at each end, with a narrow slot across the centre. The eastern side is likely to be the site of the winch room, probably housing a simple petrol-driven winch. It had been built on level ground which itself comprises earlier quarry waste, still visible in the quarry edge, and was in operation in the 1950s. The system was of the fixed wire type (anchored on the top to feature 52 - see below - and to a point in the bottom of the pit) with a pulley, and would have brought up finished slates only from the floor of the adjacent pit.

52 Anchorage structure.
Directly related to feature 51, and thus similar in massive construction, this feature was the anchorage for the winch described above. It comprises two massively-built long side 'pillars', up to 1.5m high but in ruinous condition (the western one is in better condition), with a narrow slot between slightly off-set towards the west. It too was built on a level of earlier quarry waste. There is a wall apparently leading off it to the south towards the roadway.

53 Trial.
This feature appears to be a deep, curving trench excavated down into tip material, with retaining walls built to keep discarded material out. It was apparently partially blocked later by a cross-wall (with a maximum height of c.1.5m), and possibly served as a small, rudimentary hut.

54 Wall.
A retaining wall, this feature is probably a continuation of the retaining wall of feature 53 (semi-circular in plan), preventing material from falling into the adjacent trench excavation (which, in this area at least, is probably dug into the end of an earlier tip run), now collapsed and infilled. There is also a later phase of walling abutting the northern end of this wall. Again, a perpendicular section of later wall appears to block, or divide, the trench. Waste and other material has collapsed from the edge of the roadway (5) to fill the middle part of the feature.

55 Wall (roadway).
A stretch of wall, surviving c. 0.5m high, appears to form the edge of the roadway (5) at this point. It is c.20m in length, almost straight except for a slight kink near the centre, and its top is slightly higher than the surface of the roadway. It appears to be of single-phase construction.

The area adjacent to feature 55 formerly held a series of buildings, including a smithy and boilerhouse. Features 56, 57, 58, 59, 60 and 61 are the remains of robber trenches and subsequent *gwaliau* established to extract the good slates from the foundations and floors of these buildings. There is still a considerable amount of mortar *etc.* around this area, but plans of the earlier buildings are impossible to determine.

56 Wall.
A very slight section of retaining wall connected with the removal of existing buildings (see above).

57 *Gwal.*
Roughly-built, open-sided hut with low walls set within the area of former buildings (see above). Waste from working covers the top of its east side (rear).

58 Wall.
This appears to be a revetting wall for a robber trench excavated into the remains of former buildings (see above).

59 Walls.
A feature comprising a square of four retaining walls for robber trenches excavated into the remains of former buildings (see above). The walls contain a lot of stone to which are attached lumps of mortar *etc.*

60 Wall.
A very slight section of collapsed wall possibly marking a robber trench excavated into the remains of former buildings (see above).

61 Wall.
A very slight section of collapsed wall possibly marking a robber trench excavated into the remains of former buildings (see above).

Features 62 and 63 (including 63a) almost certainly mark the site of the earlier winding-house and are a result of robbing activity. The building held a steam-winder and boiler, of which only a single holding-down bolt (feature 63a) now remains, which would have been used to haul material out of the nearby quarry pit by way of a winding platform built at the edge of the pit (see features 67 and 68).

This would have been particularly lucrative for contractors due to the huge amount of dressed stone that formed the masonry bases for the machinery, as well as the stone in the foundations of the buildings. For this reason, this building has been totally plundered and nothing really remains of it.

62 *Gwal.*
A reasonably well-defined, square open-sided hut built in the remains of the winding house. It comprises a back wall which is the edge of the roadway (feature 5) with walls built out from this at right angles, at least partially into earlier tip material. The interior is now partially infilled by collapsed waste, of which there is much more on the side to the south-east.

63 Walls
These appear to be revetting walls for a robber trench excavated deep below the foundations of the winding-house (see above).

64 *Gwal.*
Quite a good, well-preserved example of a relatively late hut, standing c. 1m, high in the valley between the grassed-over area in the centre of the site and an earlier tip, with evidence of slate working in the interior, and waste on the top. Interestingly its open side faces south, unlike most of the other huts.

65 Tip edge.
Two short sections of laid slate blocks which probably once formed the western edge of rail bedding for this tip run: this edge has since been much dug into and is very ragged, and only these sections look to be still-intact built edge.

66 Wall.
A short section of wall, less than 0.5m high, apparently built into the edge of the tip. It may have been directly connected with the tip, although there is evidence of contractors' working waste immediately below it.

Features 67 and 68 are built into the remains of a former platform which was built out at the end of the tip over the edge of the quarry pit as a platform for the original steam-powered winding gear which was used to haul material up out of the pit (see also features 62 and 63). The platform would have been similar to the 'pyramids' at Dorothea, comprising a huge amount of large slates, and for this reason it would have been one of the first things to be removed by contractors. The platform would perhaps have measured some 30m by 40m, so a good deal of material has been removed from this area.

67 Walls.
A small outdoor working area formed by two retaining walls less than 1m high built into the bottom of the end of an earlier tip right above the quarry edge. There is evidence for a working floor within the walls, with waste debris outside to the north. It is reasonably well preserved, and was probably not roofed. A soft edge (*i.e.* not man-made) is visible opposite, to the south west, as is a path around the base of the end of the tip.

68 Wall.
A large sheltering wall built proud of the grassed slope above the quarry edge the opposite end of the earlier tip run. It stands up to 1.5m high, and is quite well preserved. Slate waste from working covers the interior. Its southern edge is defined by a path which leads down to feature 67 and then around the bottom of the end of the tip.

69 Wall.
A section of solid revetment wall built across the base of the former tip run, presumably from material excavated out of a hole to the north: this area is now infilled by large tumbled blocks, although there is some evidence of waste working on top and to the north. The area immediately to the north was possibly once a hut, now destroyed. This wall was obviously previously very high (and still exists to a considerable height beneath the present surface), but has since been largely buried by tumble.

70 Wall.
A massive, well-built retaining wall similar to feature 69, again built across the base of a tip, with evidence of working waste on top of it. It too has been largely buried by large, tumbled blocks. There may be the remains of a former hut in the large excavation immediately adjacent to it, but this is now filled in.

(Features 69 & 70 very probably formed opposite sides of a major *gwal*/passage (see feature 78 *etc.*) which has since been infilled).

71 Wall.
A massive wall, arguably the most prominent feature on the site after the mill and the tramway walls, which formed part of the central stock yard for storing slates made by the tip contractors. It is c. 15m long, up to 1m high and c.0.5m wide, straight and square, and stands on the edge of a flat area beside the roadway (feature 5), marking the line between the level, 'greened-over' area to the north and disturbed tip material to the south.

72 Excavation.
A 'soft edge' (*i.e.* there is no actual construction) marking the top edge of a hole from where material has been excavated out by contractors. There is a slight depression on the other side.

73 Wall.
A very short, slightly-built section of probable retaining wall, now largely buried by working debris and collapse. The remains of a possible former hut, now buried, lie to the south-west.

74 Wall.
Similar to feature 73, though of rougher construction. A hole here is probably not a former hut, but a deep excavation hole now infilled by collapse. There is an apparent edge opposite, above which is former tip run, so this area has obviously been excavated into the side of a tip.

75 Walls.
Very insubstantial sections of walling, less than 0.3m high, made roughly of piled rejected slats excavated out from the area around.

76 Walls.
A slight but definite outside working area/floor right on top of an earlier tip run (see also 77), defined by very roughly-built retaining walls, standing less than 0.3m high and probably not roofed.

77 Work area.
A similar (to feature 76) outside working area, defined by a concentration of loose chips, formed by banking up rejected slate material in a rough arc. There is no actual height to it inside, and it is more prominent when viewed externally on the side of the tip. It is situated a few metres from the end of the tip, and there are further work areas, less well-defined, nearer the end.

78 *Gwal.*
A very good example of partially sunken hut built in the top of a gully between two tips. Its high sides were probably built to retain rejected slates. Quite long passage down to actual *gwal* which still has considerable corbelled overhang, c. 0.5m, and sheet of corrugated iron, former roof, now collapsed in bottom. Some collapse infilling it. Several phases of building display the usual development.

79 *Gwal.*
Remains of square hut built part-way down the outer steep slope of the tip. It is in quite ruinous condition: its lower edge has completely gone and most of the outer edge of the walling is obscured by waste. The interior shows some signs of working.

80 Wall.
Slight right-angle of walling c. 1m high maximum, built right into the top of the tip slope, open to the prevailing weather: possibly the remains of a former hut.

81 *Gwal.*
Square, well-built hut built up from tip level just below the top. Typically it was originally square, with one open side, and later additions comprise rejects built into retaining walls holding back discarded waste, especially to the north-west. The outer (downhill) side is partially collapsed, but the remainder of the structure is quite well preserved. The external sides of the walls on all but the downhill side are obscured by dumped waste. The interior comprises a crushed slate working floor. An entrance path comes down from the north from the path which runs along the length of the tip top.

82 *Gwal.*
Very well-preserved, substantial hut built on the edge of the slope of the tip. Downhill, the external sides of the walls are still visible, although discarded waste obscures the uphill ones. The walls are up to 1.5m high internally: the floor is crushed slate waste which tumbles out of the door downhill. The contractor has quarried a massive excavation deep into the tip behind.

83 Wall.
Slight angle of retaining wall built from rejected slates from a trial excavation alongside.

84 Feature.
A soft edge is visible just below the top of the tip, possibly defining a temporary work area above it, as there is waste debris on and below it.

85 *Gwal.*
Very well-built, substantial hut on the weather side of the tip right at its end and just below the top. The external down hill walls are visible and still over 1m high. Waste material has been dumped on the up hill side, obscuring the walls' exterior. To the south, opposite the entrance, a later retaining wall has been built to retain discarded waste material. (There is a possible external working floor between this feature and 84, defined by large amounts of chipped stone debris.) There is an *in-situ* iron rail across the west corner of the feature, presumably for the roof. The hut was typically square originally, with a later narrowing of its entrance brought about by building an oblique wall, probably to retain waste.

86 Wall.
Very slight retaining wall, less than 0.25m high, holding up discarded slates above an external working floor, which comprises much chipped stone debris, and which in turn is supported by feature 87.

87 Wall.
Quite substantial retaining wall, roughly built, on the steep tip side. Another possible working area lies downslope of it.

88 Wall.
Similar (to 87) roughly-built retaining wall holding up external working floor. Built across a narrow gully between two tips.

89 Walls.
A number of walls which in effect create a cairn of rejected slates, from adjacent trial excavations, in the gully between the two tips. Up to 1m high, it contains evidence for two or three phases of building.

90 *Gwal.*
Collapsed and buried remains of a hut, perhaps formed by the excavation of a trench into the side of the tip, which was shored up by retaining walls, only the ends of which are now visible, the rest having tumbled in. There is working waste in front of the opening and downslope from it.

91 Walls.
Similar feature to 89, tho' smaller (less than 1m high), this is a cairn made up of rejected slates, revetted on one side but against the slope on the other. Again built in the gully between tips, with external work floors around it.

92 Walls.
Two short lengths of retaining wall, possibly indicating a former trench excavation in between them which is now collapsed and obscured.

93 *Gwal.*
Good example of a hut built into the base of a tip. Typically it was built in several phases: it was originally open to the west (unusually), and its entrance was blocked in successive builds. Its uphill external walls are obscured by slate waste, and it is partially collapsed. Its south-east interior corner retains some evidence of corbelling.

94 *Gwal.*
Hut built proud of the tip, about half way down the slope. Its downhill wall has collapsed, but the others still stand up to 1m high: it is open to the north, and most of the external sides are still visible.

95 Wall.
Very slight, roughly-built stretch of wall built at the base of the tip, probably to retain discarded material from an excavation below.

96 and 97 Wall.
Probably two parts of one original linear feature which was probably a retaining wall protecting a linear excavation across the bottom of the tip. Up to 1m high in places, it is much collapsed. It may be connected with *gwal* 98.

98 *Gwal.*
Simple hut, still in its early (square, open-sided) phase, now incorporated into the field wall. Built right at the base of the tip it is c. 1m high, and quite well preserved, with its external walls just discernible.

99 Wall.
A simple shelter at the very base of the tip formed by angled walls: only the internal face is still discernible.

100 Wall.
A very small section of retaining wall at the base of the tip.

101 and 102 Features (possible).
'Soft edges', not really constructions, made from rejected slates piled up from adjacent trial workings.

103 *Gwal.*
Simple, well-preserved, square hut, c. 1m high, built on the edge of a high gully between two tips. Two phases of building are discernible, with a later blocking of the open side.

104 Wall.
Cairn of rejected slate from nearby workings contained by a retaining wall over 1m high. Formerly much more extensive, it is now partially hidden by tumbled stone.

105 Tip run.
Possible edge of the tip run, now largely obscured.

106 *Gwal.*
Very prominent, well-preserved hut of typical plan, open-sided with a later cairn built against its north side. Some debris is piled around it, but its external walls are still visible: its internal walls are over 1.5m high. Its situation, on the top and at the end of the tip, meant that there was no problem with getting rid of waste, thus there is subsequent blocking of the entrance *etc.* It is also probably late in date. This is a good example of what a *gwal* would have looked like in its first phase of construction. It probably partially overlies feature 107.

107 *Gwal.*
Badly eroded and collapsed hut built right on the end of the tip: it is probably earlier than feature 106.

108 Wall.
Very short piece of wall, possibly the edge of a collapsed hut.

109 *Gwal.*
Very complete, multi-phased working, with the original hut at one end, with a lengthy passage formed by consecutive pieces of wall added to retain discarded waste. The fact that patches of vegetation are visible in the floor of the passage implies that the walls were built up from existing tip level, even though now the vast amounts of discarded debris give it a buried appearance. It was originally built in a gully (now largely obscured) between tips.

110 Wall.
A rudimentary, late, shelter defining an external work area. Poorly constructed and less than 0.25m high, it is in a gully between tips.

111 Wall.
Section of retaining wall holding up a cairn of rejected slate from a nearby excavation.

112 Wall.
Very slight retaining wall holding up rejected slate from a nearby excavation.

113 Trial.
Formerly large, though now much collapsed and infilled excavation, defined by a soft edge from where the collapsed slate has derived. Two phases of retaining walls contain much discarded material above the hole.

114 Wall.
Slight, insignificant retaining wall for a trial excavation to south.

115 *Gwal* and passageway.
A very complex and impressive passage working, one of the best examples of the fully-fledged *gwal*/passageway complexes on the site. The original square *gwâl* is clearly visible, with the typical later retaining wall additions forming a curvilinear passageway which is on average 1.5m high (now deep). The remains of a further *gwal*, presumably originally also part of the complex, are visible to the south of the 'passageway'. A further, less robust *gwal*, itself of several phases of construction, is clearly visible at the end of the 'passage' and post-dates it.

116 Wall.
Section of wall possibly marking the edge of a former *gwâl*/passage working. See also feature 117.

117 Wall.
Possibly the other side of feature 116, a retaining wall for rejected slates. Both features are now much collapsed and their original pattern has been lost.

118 *Gwal.*
Similar feature to 109, but not as well preserved, this is a *gwal* with a passage extension, again built in a gully between tips. Most of the passageway around to the east is now collapsed.

119 Wall.
A well-preserved stretch of retaining wall related to a now-collapsed excavation to the north.

120 *Gwal.*
A very good, well-preserved square, open-sided *gwal* built right on the edge of the tip, with an oblique blocking wall on the north-west side. Two phases are visible in the high external walls. Again, this is probably a late feature, not fully developed, borne out by the fact that debris can be seen only just to have started to accumulate.

121 Wall.
A feature which undoubtedly pre-dates 120, whose associated working waste lies over its south end. This was a retaining wall, probably from an adjacent linear excavation which is now largely infilled.

122 Feature.
A soft edge, possibly with elements of a ruined retaining wall, holding up rejected slates from a nearby working.

123 Wall.
Only the end of this retaining wall is now visible in collapsed material.

124 Wall.
Possible slight section of retaining wall.

125 Feature.
"Accidental" *gwâl*/shelter formed by the removal of part of a tip leaving behind a large hole with an overhanging 'wall'/roof which is almost 2m deep.

126 Wall.
Short section of buried retaining wall, with its now infilled associated excavation to the north. It probably predates feature 127.

127 *Gwal.*
Slighter in build than most *gwaliau*, it nevertheless shows a number of phases of construction and is built close to the edge of the tip. Debris and rejected material obscure its external walls.

128 Wall.
Short retaining wall, now largely obscured by debris and collapsed material: an associated excavation is nearby.

129 *Gwal.*
Very good example and typical of its type (square *gwal* with passageway leading off in two directions), and one of only a handful to contain evidence of a form of corbelling for its roof. Now partially collapsed, it was built on a level area on the tip top.

130 Wall.
Section of retaining wall c.1m high.

131 Walls.
Series of retaining walls, now largely collapsed, marking a former (extensive) *gwal*/passage complex.

132 *Gwal.*
Almost circular hut with typical passage extension, with a corrugated iron sheet (presumably from the roof) in the collapsed interior. A very good, well-preserved example of this system of working.

133 Wall.
Corner of square walling, possibly a former hut though facing into the prevailing wind. Its detail is now obscured by collapsed material.

134 *Gwal.*
Hut, now collapsed, with intact sections of passageway.

135 Wall.
A corner of retaining wall visible where the tip has been partly quarried away.

136 Walls.
Two sections of retaining wall, possibly representing a former *gwâl*/passageway.

137 Walls.
Three sections of retaining wall, possibly representing a former *gwâl*/passageway.

138 *Gwal.*
Well-preserved, typical example of a hut and passageway built on the edge of the tip.

139 Feature.
A 'soft edge' left by a collapsed retaining wall, with a former excavation between this and feature 140.

140 Walls.
A series of retaing walls connected with adjacent linear excavations.

141 *Gwal.*
Hut, now largely obscured by collapsed material, with the remains of a passage formerly connecting it with features 139, 140 *etc*..

142 Walls.
A number of retaining walls above a now-infilled passageway/ excavation.

143 *Gwal.*
Square *gwal*, with later retaining walls, now much collapsed. Its external walls are obscured, but it is still 1.5m high internally.

144 *Gwal.*
Badly collapsed ruins of a former hut, with rare evidence of corbelling in its roof structure.

145 Walls.
Three very roughly-made retaining walls, probably associated with temporary outside work areas, now badly damaged so precise detail is indiscernible.

146 *Gwal.*
Good example of a hut of standard plan, square and open-sided. Its wall is of two phases of construction in width, and it is built right on the very edge of tip: its external walls are still largely visible. There is a later retaining wall to up-slope to the north east. There is a possible open, narrow passage between this and the hut. It is probably quite a late feature.

147 Wall.
Short section of retaining wall holding up rejected slates from a nearby trial excavation.

148 Wall
Short section of retaining wall holding up rejected slates from a nearby trial excavation.

149 Wall
Short section of retaining wall holding up rejected slates from a nearby trial excavation.

150 Wall
Short section of retaining wall holding up rejected slates from a nearby trial excavation.

151 Wall
Short section of retaining wall holding up rejected slates from a nearby trial excavation.

152 Wall
Short section of retaining wall holding up rejected slates from a nearby trial excavation.

153 Wall
Longer section of retaining wall, possibly once forming part of a large complex outside a *gwal*.

154 Wall
Short section of retaining wall holding up rejected slates from a nearby trial excavation.

155 Wall
Short section of retaining wall holding up rejected slates from a nearby trial excavation.

156 Building.
Completely ruined building of at least two rooms, possibly early *gwaliau* connected with the original quarry working (see also feature 182), near the quarry edge. Most of it has been buried by slate debris, and less than 0.3m of the height of parts of the walls can be seen.

157 Walls.
Two or three phases of retaining walls, roughly built, are visible on the side of feature 156: they are probably related to adjacent excaavtions which may continue to the west and re-emerge as feature 158.

158 Walls.
A complex series of retaining walls, probably connected with adjacent excavations (see also feature 157). This area of the site has been much disturbed, and probably represents activity connected with removing good slate waste from early quarry tips.

159 wall.
A very short stretch of retaining wall.

160 Wall.
A well-built retaining wall, c. 1m high, to keep material off the roadway (5): now largely collapsed.

161 Wall.
A retaining wall, holding up the south side of roadway 5: c. 0.5m high, only a short section of the feature is now visible.

162 Wall.
Retaining 'buttress' to prop up the end of wall 3a.

163 Wall.
Ruined section of poorly-built buttressing to prop up the end of wall 3b.

164 Wall.
The remains of an apparently partially-robbed wall holding up the western end of the spoil tip above the road.

165 Wall.
The western end of the huge retaining wall built to keep slate from the present road. This wall was obviously built in phases, from the west to the east, and some sections are better-preserved than others. Interestingly, the best-built (and currently highest) sections are at the west end: this is quite typical, the quality of workmanship deteriorating over time as either interest, care or supervision waned.

166 Wall.
Retaining wall opposite the return of wall 165 to protect the path which leads up from the current road to roadway 5.

167 Wall.
Additional section of buttressing, very roughly-built, on the end of feature 165.

168 Pipe.
A cast iron pipe, probably a sewage outlet.

169 Building.
Substantial remains of a probable hut standing proud of the surrounding tip: it is not of typical hut construction (and its open side faces the wrong way), so it may have been adapted from an existing building.

170 Walls.
Two very short sections of tip retaining wall, now almost wholly obscured by waste material.

171 Walls.
Probably the remains of a collapsed passageway, now represented by a few sections, including two corners, of retaining wall covered by waste which largely obscures them.

172 Wall.
A short section of retaining wall, possibly within a truncated earlier tip.

173 Wall.
A very short section of retaining wall, possibly part of the ruined complex 171.

174 Rail edge.
Long stretch of the foundation of the rail which ran along a former tip is visible at this point. A wall leading off it at right angles defines a hut built to quarry into the tip side and possibly into a building which stood on the site (there is evidence of mortar here).

175 wall.
A very short retaining wall, now all collapsed, associated with a nearby excavation.

176 Wall.
Very late, very crude, temporary wall made from rejected slates.

177 Wall.
Short stretch of largely-buried retaining wall, possibly connected with feature 178.

178 Wall.
Very short section of possible passagway entrance connected with now destroyed hut.

179 Wall.
A very short stretch of very rough walling, near the tip top among waste debris.

180 Wall.
A longer but equally rough (late) stretch of walling holding up rejects and debris. This whole area has been completely flattened by re-working, and now contains lots of holes, craters and piles but no recognisable features, structures *etc.*

181 Feature.
This feature is defined by a linear spread of mortar on a slight
bank, with apparently-collapsed material to the north. It may represent the only wall of the 1880s mill to have been built: the mill was never finished but its location is unknown, and this position makes sense.

182 Wall.
Similar to feature 156, two short sections of buried wall, well-built and probably belonging to a building, possibly original *gwaliau* from the quarry.