EVENT ALMOST

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Ty Mawr West Desktop Study and Survey

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EAS Client Report 2002/2

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## Ty Mawr West Slate Quarry - Introduction:

#### NGR

#### Centred on SH 4956152365

It is proposed to recycle part of one of the waste tips within the Ty Mawr West slate quarry. The tip is to the south west of surviving quarry buildings and to the west of the quarry itself. The approximate extent of the proposal is shown in Figure 1. It is also intended that the products from this recycling will be taken out of the working area across another spoil heap into the Ty Mawr East Quarry Complex. The southern end of the tip to be removed is marked by a footpath crossing the tip. The northern end is marked by the upper spoil heap adjacent to an incline and working area. Of interest are the coloured slates within the spoil heap, particularly the green slate which is dominant on parts of the heap.

It is intended to place a crusher to process the slate on a flat area in the centre of the quarry stacking yard. (Plate 21)

It is not intended to affect the standing buildings (Plate 1) at the head of the main ramp linking the processing area to the Rhyd Ddu - Penygroes road. (B 4418)

The site is within the Ty Mawr West quarry which is in the south eastern sector of the Nantlle complex of slate quarries.

#### Archaeological Background

The Nantlle Valley has been recognised as a landscape of special historic interest by CADW (1998), at least in part because of the number and quality of the industrial remains within the valley.

Slate quarrying in the Nantlle Valley has been claimed to have a long history with Cilgwyn Quarry claiming to be the oldest quarry in Wales. It is said to have be operating when Edward I visited the Drwys-y-coed copper mines (North 1927, 62).

Slate quarries in the Nantlle area exploited the Cambrian series of slates outcropping in the

## Ty Mawr West Slate Quarry - Sources:

valley floor around the village of Talysarn (Richards 1991, 43). With the exception of the Dorothea Slate Quarry, workings tended to be small with complex histories of working and re-working on any one site.

Ty-mawr West Quarry was active in the 1860's with up to 40 men employed. It had closed in the 1930's (Richards 1991, 58). The product from the quarry were reduced in a small mill and taken to the road by a long shallow ramp.

Within the quarry area there are a series of buildings and structures associated with the exploitation of the quarry. In general a flat processing area with a range of buildings is surrounded by spoil heaps and is linked to the main pit by an open cut. A possible shaft also survives in front of the main buildings.

#### Aims of Survey

To locate any structures within the proposed development area, comment on their forms and condition and the effect of the proposed development.

#### SUMMARY OF RESULTS

The spoil heap would appear to have at least three phases of development followed by a period of reuse and <u>ad hoc</u> extraction from the spoil heap. A number of structures were located on the spoil heap, the majority of which were related to the reuse of the spoil heap as a source of slate. Some structures could be associated with the main phases of dumping on the site.

### Sources Consulted :

#### Maps

- 1889 Ordnance Survey Map XX.9 1:2500
- 1900 Ordnance Survey Map XX.9 1:2500
- 1916 Ordnance Survey Map XX.9 1:2500
- 1977 Ordnance Survey Map SH 4951, 1:2500
- 1813 A survey of the Estates belonging to Richard Carnons Esq<sup>re</sup> In the counties of Carnarfon and Anglesey.
- 1849 Tithe Map for Llanllyfni

#### Aerial Photographs

- 1948 RAF sortie 541/178, frames 3056, 4143-4144
- 1985 RAF sortie 0740, frames 287-288
- 1990 RAF Sortie 453, frames 10-11
- 1990 RAF Sortie 452, frames 234-235

#### Documents

- XM/7489 Table of Tonnages of slates forwarded from Nantlle Station in 1912 and 1913.
- 1895 1950 List of quarries working under the Quarries Act in North Wales and Inspection District

#### References

CADW, Welsh Historic Monuments 1998 Landscapes of Historic Interest in Wales. Part 2 of the Register of Landscapes. Parks and gardens of special historical interest in Wales. Part 2.1: Landscapes of outstanding historical interest. CADW, Cardiff.

## Ty Mawr West Slate Quarry - Desk Top Study:

- Lindsay, J. 1974 <u>A history of the North Wales</u> <u>Slate Industry</u>. David and Charles, Newton Abbot
- Morris, T.O. And Fearnsides, W.G. 1926 The stratigraphy and structure of the Cambrian Slate Belt of Nantlle (Carnarvonshire). <u>Quarterly Journal of</u> <u>the Geological Society</u> 82, part 2. 250-303.
- North, F.J. 1927 <u>The Slates of Wales.</u> National Museum of Wales, Cardiff.
- Richards, A.J. 1991 <u>A gazetteer of the Welsh</u> <u>Slate Industry.</u> Gwasg Carreg Gwalch, Llanrwst
- Richards, A. J. 1995 <u>Slate Quarrying in Wales</u>. Gwasg Carreg Gwalch, Llanrwst

### Desk Top Study

The Ty Mawr Quarries are placed to extract the Cambrian Slate deposits of the Nantlle Valley. Morris and Fearnsides (1926, Plate XVIII) show the Ty Mawr quarries to be at the junction between the Mottle Blue Slate and the Green Slate giving access to both slate resources. Indeed the Green and Mottled Blue slate deposits are slightly interleaved in the Ty Mawr area leading to multiple option in slate extraction in the area.

Prior to the establishment of the slate quarries on the site the area was part of Ty Mawr farm. In AD 1813 this was part of the estate owned by Richard Carnons Esqre and tenanted by Robert Williams. The estate map of AD 1813 (Figure 2, Appendix 2) shows no slate quarries and the field in which the spoil heap is now have agricultural related names. These are fields 11 and 12 on the map called 'r Allt goediog (the wooded slope) and Cae'r Lloiau Ucha (upper field of calves). Two fields (2 and 3, Cae Lleiki bach and Cae Lleiki mawr) do include slate in the field names, however these are near to the road and the original farm site and well away from the site of the spoil heap and its associated quarries. Similarly the AD 1839 Tithe Map for Llanllyfni (Figure 3, Appendix 2) records no quarrying within Ty Mawr, however a small quarry is marked close to the farm boundary with Tyn-y wergiod. At the time of the Tithe map the land was recorded as being owned by Richard Garnons and occupied by Robert Williams. It is likely that Richard Carnons and Richard Garnons are the same person with a mistake being made on the tithe records.

The date of the starting of slate quarrying on the site is uncertain, Jones (1991, 58) claims that the quarry was active in 1860's and the AD 1873 Mining Journal records seven veins being worked including Ty Mawr (Richards 1995 120).

The register of quarries working under the Quarries act from AD 1895 onwards (Appendix 3), records Ty Mawr West being worked in AD 1895 and AD 1896 by J. Robinson from Talysarn with five workers. The quarry is then no longer recorded, although Ty Mawr quarry is recorded, working initially from AD 1897 to AD 1906 by the United Quarries Company. Of particular interest is the starting of the Ty Mawr Green Pit in 1905 by Frederick Davies. This would appear to have been a small operation with only three quarry workers and two other workers. Work was obviously sporadic as in AD 1906 the quarry is recorded as working occasionally and in AD 1907 it had a total of four workers. The quarry is no longer recorded after AD 1908.

The First Edition Ordnance Survey Map of AD 1889 (Figure 4) shows the spoil heap under consideration to have been already constructed. Indeed the incline at the northern end of the heap is already abandoned suggesting that the slate source which formed the heap was not being exploited at the time. It is evident, however, that the heap which forms the subject of this study was covering earlier spoil heaps which extend to the north. It is assumed that these earlier spoil heap are associated with the early exploitation of the site. The general trend of the early spoil heaps may suggest that at least part of the waste was coming from Vale Slate Quarry, on the land associated with Tyn-y wergliodd. As this,

## Ty Mawr West Slate Quarry- Field Survey:

however, would involved crossing a property boundary it seems unlikely.

Both phases of waste appear to follow the western boundary of Ty Mawr Farm which might suggest that there was an early phase where the farm and quarrying took place in concert.

The Second Edition Ordnance Survey Map of AD 1900 shows little change with the status of the spoil heap. Indeed the old incline is no longer marked. This is probably a cartographic error as the incline is marked on the later AD 1916 map.

The AD 1916 Ordnance Survey Map shows the spoil heap to have been slightly extended. This is particularly evident with the addition of material to the eastern side of the heap and the provision of a tunnel to a quarry to the south of the heap. It is likely that this work was associated by Frederick Davies exploitation of the Ty Mawr Green Pit with the waste material being brought through the tunnel and dumped on the pre-existing heap. There is also some suggestion that the total length of the spoil heap was extended. There is no evidence as to how the products of the extraction were removed from the site as the incline would still appear to have been abandoned. It is possible that the usable slate was brought through the tunnel and then down an aerial ropeway into the main quarry as there no other exit from the Green Pit.

### Survey Results:

### Methods

A site visit was made on 12/7/01, by I. P. Brooks to assess and record any structures within the proposed development area, a second visit was made on 29/1/01 by I.P. Brooks and G.P. Jones to refine the earlier record and to relate the structures recorded to the results of the desk top study and to place the structures in the context of the quarry as a whole. Structures were located with a Garmin Etrex Summit hand held GPS system. This has an accuracy of up to 5 m.

The structures were then photographed using a 35 mm camera and colour slide film. Annotated sketch plans were also made.

The extent of the development area was defined by R.W. Jones on site.

### **RESULTS:**

Three areas are to be disturbed by the proposed development. The first is the spoil heap to be recycled, the second is the area of the crusher and the third the proposed route from the crusher to an exit in Ty Mawr East (Figure 1). The location of the structures recorded is shown on Figure 7 and detailed in Figure 8 and on the Plates.

The spoil heap (PRN 16000) is a single finger leading from an upper level to the processing area. The area to be disturbed is approximately 140 m long and 45 m wide. The northern end of the spoil heap sat on a series of earlier spoil heaps (Plate 2) each with its remnants of the tip top tramway systems. The eastern extent of the spoil heap was confined by the main quarry area and the open cut leading from the processing area to the quarry. There is some evidence of the development of the spoil heap with a widening of the heap in the mid, eastern section, associated with a high quantity of green slate waste. This is assumed to be part of the dumping from Ty Mawr Green Pit exploited by Frederick Davies.

# Ty Mawr West Slate Quarry - Field Survey:

The heap acted not only as an area for the dumping of spoil, but also as a route from an upper level to the processing area. To facilitate this an incline (PRN 16021) was constructed (Plate 3). This structure is in a very eroded state, the position is marked by a broad sweep of grass mounting the end of the spoil heap. A small area of the original revetment for the side of the incline survives (Plate 4), however most of this and much of the incline structure has been robbed out at a later date, probably from the gwâl (a temporary working shelter or shed) PRN 16009. The incline is further disturbed by fallen rubble and a tree growing approximately half way up.

Two tramway were noted on the top of the spoil heap PRN 16019 and 16020. These were clear strips approximately 1.20 m wide often marked by strips of grass and vegetation growing on the smoother strips. Both of these ended in tip end platforms (PRN 16015, 16016 and 16017). At least two phases of platforms were noted associated with PRN 16020, these are assumed to be demonstrating the development of the one of the tipping area associated with Frederick Davies.

The western side of the spoil heap was revetted (PRN 16002 and 16018) (Plates 5 and 6), presumably to confine the tip from spilling onto the adjacent property. At the southern end, just outside the development area, this revetment would appear to be in two phases, with an initial well built dry stone wall being heightened with a less well built wall (Plate 5). It is assumed that the lower wall is a marker wall built to define the extent of the dumping area. The upper portion was then built as the spoil heap developed to confine the dumping. PRN 16002 also contained a section of well built section above the lower wall. This is directly below a building (PRN 16001) on the present ground surface and may represent an earlier building buried within the structure of the heap. It would seem likely that both of these structures were associated with the management of the spoil heap, or control of products coming from the quarry.

Only two other major structures may have been associated with the development of the spoil heap, rather than the reuse of the spoil heap. PRN 16004 (Plate 7) sat immediately above the quarry area on a slight platform at the base of the spoil heap. The low level of this structure and its construction on a rock platform may suggest this was related to an early phase of the development of the spoil heap. It is possible that an assumed aerial ropeway associated with Frederick Davies' exploitation of the site was based in this area. The spread of split slate around the structure suggest that it was probably reused as a gwal in the reuse of the spoil heap as a source of slate. The structure is three sided with the open side facing NW.

PRN 16013 was a well built building, 2.10 m square and standing to 2.40 m (Plates 8 and 9). The door was in the south east corner overlooking the rock cut entranceway to quarry. No windows were within the structure, although a long, iron handle found on top of the western wall may suggest that it originally had a sky light. The outer surface of the wall was partly rendered and three of the roof slates survive along the western wall. The function of this building is uncertain, it is not sufficiently robust to be an explosive store and its position close to the quarry would also tend to preclude this. Other options would include a "caban" or tea-hut or an office monitoring the products leaving the quarry.

A series of stone piles were recorded on the spoil heap and at the eastern foot of the spoil heap. The stone piles on the spoil heap formed two general groupings with the first group being at the south end of the survey area and the second forming a line of blocks in the middle of the survey area.

The first group comprises three stone piles (PRN 16013). All of these were adjacent to the main tramway. One (Plate 10) was distinctive being much larger than the other blocks. It was approximately 1.00 m square and stood to a maximum of 0.90 m high. It was located on the side of spoil heap and is possibly the start of a tip end buttress. The others were smaller

# Ty Mawr West Slate Quarry - Field Survey:

(approximately 0.50 m square) and stood 0.30 m high. It is possible that these supported either an air hose for pneumatic machinery in the quarry, or water leet carrying water from a spring somewhere to the south of the quarry area to the mill.

This group is similar to the well built stone piles noted at the eastern foot of the spoil heap. Two blocks were noted (PRN 16029 and 16030) (Plates 11 and 12) within the development area, although more were noted, particularly within the quarry area. These form a clear line and are assumed to be the supports for an air line linking a compressor in the mill buildings to the air powered tools in the quarry. PRN 16030 is built into the revetting wall on the eastern side of the spoil heap. This confined the spoil heap and provided a clear passage to the quarry.

The second group on the spoil heap (Plates 13) consisted of nine square piles of blocks (PRN 16022) extending the line of an inner wall of a tip end buttress (PRN 16016). Each of the piles were approximately 0.50 m square and stood to a maximum height of 0.60 m. They were marked in being less well built than PRN 16013, 16030 and 16031 and it is assumed that they may represent a temporary field boundary along the top of the spoil heap.

Eight small rectilinear structures were located and recorded on the spoil heap (Plates 14 - 20). They were between 1.50 and 3.00 m square and are generally assumed to have been gwâliau or temporary shelters associated with the reuse of the spoil heap as a source of slate. (Figure 8, Plates 1 - 6). All of the gwâliau were in a ruinous state standing to a maximum of 1.20 m and all were of dry stone, slab construction. The form of these structure range from low, roughly built, dry stone walls to well built building and probably reflect the expediency, period of exploitation and number of people involved in the reworking of the spoil heap.

PRN 16003 (Plate 14) consisted of three low walls with the open side to the south. The area above

this gwâl was disturbed and a spread of split slate waste around the structure suggest that blocks of slate were being extracted from the side of the spoil heap and being reduced on site.

PRN 16005 (Plate 15) consisted of a short "L" shaped wall with a smoothed area in front. It was close to the transway on the top of the spoil heap and was probably extracting slate blocks from the side of the transway. Split slate waste was also around this structure.

PRN 16006 (Plate 16) A short length of very eroded dry stone walling along the western break of slope of the soil heap. In front of this wall was a rectilinear hollow with a possible entrance way in the south east corner. The base of the hollow was worn and contained sherds of split slate suggesting increased use of this area.

PRN 16008 (Plate 17) was adjacent to the main tip top tramway and is assumed to be part of its management system Two walls stood to a maximum height of 1.20 m, although a third wall was buried in the spoil heap and stood to less than 0.30 m. The open face of this structure faced north. Within the structure the floor was smoothed and worn and contained sherds of split slate.

PRN 16009 (Plate 18) was the most complete structure, with internal dimensions of 1.20 x 1.40 m. It had a "doorway" 0.50 m wide in its NW corner and stood to a maximum height of 1.20 m. The spoil heap above this gwâl was highly disturbed and contained the remains of the incline (PRN 16021) This structure would appear to be associated with the exploitation of the larger blocks of slate used in the construction of the incline. The form of the gwâl may suggest that it was intended to exploit this source of slate throughout the year.

PRN 16031 was a short length of dry stone walling, with two stub walls facing west. The spread of split slate and the disturbance of the spoil heap above this structure would suggest that is was a .gwâl

### Ty Mawr West Slate Quarry- Field Survey:

PRN 16029 (Figure 19) A polygonal structure with an entrance passage built into the base of the spoil heap. The structure was 2.90 m x 4.30 m in size and stands to a height of 1.20 m in places. It was constructed of dry stone walling, although the western side is partly formed by a natural rock exposure.

Two short lengths of dry stone walls (PRN 16011 and 16012) (Plate 20) set into the eastern side of spoil heap and surrounded with split slate waste would appear to mark the position of gwâliau.

Not within the development area, but immediately below the spoil heap on the western side was a another gwâl (PRN 16007) (Plate 21). The form of these structures is difficult to determine because of the scrub and tips partly obscuring these structure. At the north east end of these structure, however, remnants of a slate slab roof survive. The gwâl was surrounded with split slate, particularly green slate, it is was therefore constructed after the exploitation of the Green Pit by Frederick Davies between AD 1905 and AD 1908

The proposed area of the crusher is on a flat area near to the base of the incline. The eroded remains of a stacking yard (PRN 16023) (Plate 22) 11 x 30 m was recorded (Plate 10). Two walls survive and to a maximum height of 0.30 m. The eastern face of this structure is marked by a tramway, up to 1.70 m wide on a slight mound (PRN 16024). The area to the east of this stacking yard contains the upstanding remains of two ranges of quarry building (Plate 12). It is assumed that these building will not be effected by the proposed development and are not, therefore part of this report.

The proposed route for the products of the recycling is over the spoil heap to the east of quarry buildings to join in with a track which has already been carved into the eastern side of the spoil heap and leads towards the Ty-mawr East quarry complex. The construction of this track has already disturbed the top and eastern side of the spoil heaps and the dumping of the resultant rubble further obscured any details. To the north of the proposed track a series of tip to tramways (PRN 16025 - PRN 16028) were noted (Plate 14).

Whilst fragments of iron rails are to be found on the site no in situ rails were recorded.

## Ty Mawr West Slate Quarry- Discussion:

#### Discussion

Prior to the development of the slate quarries on the site the area of the proposed development was part of Ty Mawr Farm. This was a tenanted farm owned by Richard Carnons and occupied by Robert Williams. Field name evidence would suggest that that at least part of the economy was based on cattle, although sheep were presumably also kept.

Slate quarrying in the immediate area probably started in the adjacent farm, Ty'n-y-weirgiodd before AD 1839, although the presence of slate is also recorded from field name evidence as early as AD 1813.

The date of the first exploitation of slate on the farm is uncertain, although it is allegedly in the early 19<sup>th</sup> Century AD, with the land being split into 'East' and 'West' setts in the 1840's. It seems likely that the earliest working in the 'West' was along the western side of the farm with the spoil being dumped along the farm boundary with Ty'n-y-weirgiodd. The position of the initial quarry is uncertain, however a rock cut platform above the entrance to the main quarry area (Plate 24) may suggest a shallow quarry now largely destroyed. The spoil from this was primarily plum or grey in colour and forms the spoil heaps which are sealed by the spoil heap which is the subject of this application.

The spoil heap which forms the bulk of this report has two phases of dumping. Initially, largely, of plum coloured and grey slates extracted from a quarry site, slightly to the south of the initial quarry. The products and waste would appear to have been winched up the side of the quarry and the waste dumped along the farm boundary. The usable slate was then moved down the incline probably to be worked elsewhere on the site. This phase of activity had finished by AD 1889 as the First Edition Ordnance Survey map marks the incline as abandoned.

Major activity on the spoil heap probably started again in AD 1905 with the opening of Ty Mawr

Green Pit by Frederick Davies. The quarry would appear to be to the south of the spoil heap to which it was linked by a tunnel (Plate 25). It is clear from the waste on the tip that Davies only worked the green slate of the area. The small size of this tunnel and low numbers of workers employed suggest that this was a somewhat speculative, or under resourced attempt to work the green slate. Tipping took place on the previous spoil heap extending both the width and length of the heap. The system used to remove usable slate from Ty Mawr Green Pit is not clear. The incline does not appear to have been renovated, it is therefore possible that an aerial ropeway was used joining the spoil heap to the floor of the adjacent quarry. A large block of dry stone walling in the base of the quarry may suggest the position of the base of any aerial ropeway (Plate 26).

After Davies left Ty Mawr Green Pit in AD 1908 the whole of the Ty Mawr West was taken over by the Welsh Green Slate Company Ltd and it is assumed that the remains at the base of the eastern side of the spoil heap and within the main quarry are largely associated with this phase of exploitation. The Welsh Green Slate Company Ltd survived into the AD 1930's.

The dumping of spoil was confined both on the east and west. To the west was the farm boundary which would lead to disputes with the adjacent land owner. To the east access was required to a quarry through a partly rock cut passageway. The well built structure (PRN 16013) and the supposed supports for an air line (PRN 16030 and 16029) are assumed to be associated with this quarry.

After major extraction from the associated quarries had stopped, or the waste was being dumped elsewhere the spoil heap was used as a source of slate in its own right. A series of gwâliau were constructed as temporary shelters and the larger blocks of slate within the tip was reworked. Of particular interest were the larger slate blocks associated with such structures as the incline and the tip end buttresses. The date of the exploitation is uncertain, but it was probably of

## Ty Mawr West Slate Quarry- Conclusions:

low level, <u>ad hoc</u> nature, possibly lasting into the AD 1950's.

The development of the spoil heap is summarised in Figure 9.

#### Conclusions

The structures recorded form part of the industrial archaeological remains of the early phases of the exploitation of the Ty Mawr West Slate quarry. Whilst individually structures recorded are only of local interest and are universally in a poor state, their importance is as part of a much larger group of structures recording the use of the Ty-mawr West quarry and of the exploitation of slate in the Nantlle area.

The spoil heap concerned forms only a small part of the quarry complex and the structures recorded area poorly preserved. Similar examples of these structure exist both within the Ty-mawr West Quarry and elsewhere.

The spoil heap would appear to have a fairly complex history, with at least three phases of dumping followed by a phase of reworking. Most of the structures recorded are associated with the reworking, although some details of the earlier phases survive. A limited number of structures associated with an adjoining quarry will also be affected.

## Ty Mawr West Slate Quarry- Recommendations:

### Recommendations

The following recommendations are made in the assumption that the planning permission is granted.

- 1. The proposed position of the crusher be moved to avoid the possible stacking yard.
- 2. The gwâl, to the west of spoil heap to be removed, be protected during the course of the work.
- 3. The standing buildings at the heart of the quarry complex be protected from accidental damage

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Phase 1: Possibly AD 1860's



Phase 2: Pre AD 1889







Phase 3: AD 1905 - AD 1908, Frederick Davies

Phase 4: Post AD 1908 exploitation of the spoil heap.

Figure 9: Summary of the phases of deposition on the spoil heap



Plate 1: General view of mill buildings



Plate 2: Early Soil heaps



Plate 3: PRN 16021



Plate 4: Revetting on PRN 16021



Plate 5: PRN 16002



Plate 6: PRN 16018



rlate 7: 16004



Plate 8: PRN 16013



Plate 9: Detail of doorway to PRN 16013



Figure 10: PRN 16021



Figure 11: PRN 16029



Figure 12: 16030



Plate 13: PRN 16022



PRN 14: PRN 16003



Plate 15: PRN 16005



Plate 16: PRN 16006



Plate 17: PRN 16008



Plate 18: PRN 16009



Plate 19: PRN 16029



Plate 20: PRN 16011 and 16012



Plate 21: PRN 16007



Plate 22: PRN 16023 and 16024.



Plate 23: PRN 16025 - 16026



Plate 24: Rock cut platform, possible old quarry



Plate 25: Tunnel from Ty Mawr Green Pit



Plate 26: Possible base of aerial ropeway

Appendix 1:	Summary of Features

PRN	Туре	Grid Reference	Description	Condition	Illustrations
16,000	Spoil heap	SH 49575238	Single finger of spoil running approximately north-south. At least 150 m long and up to 50 m wide. Some evidence for at least two phases of deposition on this spoil heap. The structure sits on top of earlier spoil heaps, at least at the northern end.	Complete	
16,001	Building	SH 4959052314	Rectangular structure, probably outside the development area. Dry stone wall construction, approximately 2.50 m square. The quality of construction used for this structure would suggest it may not be a gwâl, but possibly served as an office or Caban. Possibly a replacement for PRN 16002 as the tips grew.	Ruinous standing to 1.20 m in places.	
16,002	Possible building in revetment wall	SH 4958452304	Section of well built dry stone walling set into the rougher dry stone walling which forms the retaining revetment for the spoil heap at this point. Possibly the wall of a buried building. Possibly earlier structure replaced by PRN 16001.	Uncertain	Plate 6
16,003	Gwâl	SH 4958852314	Three low, dry stone, block walls with the open face pointing south. The structure was approximately 1.70 m x 2.50 m in size with walls up to 0.50 m thick. Surrounded by slate splitting waste.	Ruinous standing to a maximum height of 0.90 m. The southern wall is missing	Plate 14 Figure 3
16,004	Gwâl	SH 4959252320	Three low, dry stone, block walls with the open face pointing north-east. The structure was approximately 3.00 m x 2.05 m in size. The wall was 0.50 m thick The SW wall was slightly bowed.	Ruinous standing to 0.60 m. The NW wall was missing	Plate 7 Figure 3

PRN	Туре	Grid Reference	Description	Condition	Illustration
16,005	Gwâl	SH 4957252330	"L" shaped dry stone, block, wall, approximately 2.00 m x 0.65 m and was 0.50 m thick. The area in front of the structure was smoothed suggesting it was part of a gwâl or hut. The structure was aligned north - south. Surrounded by slate splitting waste.	Ruinous standing to 0.70 m with a slightly smoothed area in front of the structure.	Plate 15 Figure 3
16,006	Gwâl	SH 4956452333	Dry stone, block, wall 1.30 m long and 0.50 m thick aligned north - south. To the west of this wall was a roughly rectilinear hollow with a slightly smoothed surface. A possible entranceway was noted in the SW corner. Surrounded by slate splitting waste.	Ruinous with the wall standing to a maximum of 0.55 m	Plate 16 Figure 3
16,007	Gwâl	SH 4954752367	A complex of structures outside the survey area including at least two linked sub-rectangular structure and a separate rectilinear structure slightly to the south. The northern most of the linked structure was approximately 2.5 m square and cut into the ground surface by approximately 0.70 m. Three diagonal slab on this structure formed part of the roof of this structure. Surrounded by slate splitting waste.	Variable. Parts of the structures are to roof level, although also disturbed by trees and covered by spoil from the surrounded heaps	Plate 21
16,008	Gwâl	SH 4955752385	"L" shaped, dry stone, block wall with a smooth area within the walls suggesting a possible gwâl or hut. The structure was approximately 1.50 m x 1.60 m in size. A third wall was buried in the spoil tips. The surviving walls were 0.75 m thick. Surrounded by slate splitting waste.	Ruinous with the wall standing to a maximum height of 1.20 m	Plate 17 Figure 3

PRN	Туре	Grid Reference	Description	Condition	Illustrations
16,009	Gwâl	SH 4957652409	Rectilinear structure 1.40 m x 1.20 m in size with a simple entranceway in the north west corner. The doorway was 0.50 m wide. The wall were 0.50 m thick. Surrounded by slate splitting waste,	Ruinous with the wall standing to a maximum height of 1.20 m.	Plate 18 Figure 3
16,010	Gwâl	SH 4958952383	Polygonal structure with an entrance tunnel. The main structure is approximately 2.90 m x 3.0 m with the entrance "tunnel" being 1.30 m long and 1.0 m wide. Constructed of dry stone walling, although using a natural rock exposures on the north and east sides of the structure. Partly buried by spill from the spoil heap.	Ruinous, but standing to 1.20 m in places	Plate 19 Figure 3
16,011	Gwâl	SH 4958852363	Short length of rough dry stone walling in the edge of the spoil heap. Wall approximately 2.0 m long. Associated with a spread of split slates. Partly buried by spill from the spoil heap.		Plate 20
16,012	Gwâl	SH 4959252368	Short length of rough dry stone walling in the edge of the spoil heap. Wall approximately 2.0 m long. Associated with a spread of split slates. Partly buried by spill from the spoil heap.		Plate 20
16,013	Building	SH 4959952369	Rectilinear building 1.90 m x 2.45 m standing to 2.40 m height. There is a doorway in the south east corner 0.90 m wide, however there is no evidence for windows in this structure. The walls are 0.55 m thick and are constructed of mortared stone. A three of the roof slates survive along the western wall. An iron handle found in the structure may suggest this building had a studiebt	Standing to roof level. Partly buried in spill from the spoil heap.	Plates 8 and 9 Figure 3

PRN	Туре	Grid Reference	Description	Condition	Illustrations
16,014	Stone Supports	SH 4958352311 SH 4958152311 SH 4957852321	Three well made stacks of slate blocks up to 1.00 m x 1.00 m in size and surviving to a height of 0.90 m. One of the blocks was sitting slightly on the side of the spoil heap. Possibly the support for either an air pipe or water leat.	Probably complete	Plate 6
16,015	Tip end platform	SH 4957252351	Revetted area on the side of spoil heap. Approximately 1.50 m square. No sign of the tramway feeding this structure was noted.	Compete and slightly buried	
16,016	Wall	SH 4956752349 - SH 4956652359	A length of dry stone walling approximately 10 m long, 0.50 m thick and up to 0.80 m high. Probably part of a tip end buttress.	Slightly collapsed	
16,017	Tip end platform	SH 4955752414	Revetted area at the north end of PRN 16019. Up to 1.50 m wide.	Compete and slightly buried	
16,018	Revetting Wall	SH 4955752367	Length of revetment wall above the PRN 16007 Wall approximately 5 m long and up to 1.5m high.	Largely complete	Plate 5
16,019	Tip top tramway	SH 4958552308 - SH 4955752414	Smooth, grassy strip up to 1.20 m wide running along the spine of spoil heap.	Preserved as a smooth grassy strip	
16,020	Tip top tramway	SH 4957152358 - SH 4956952342	Spur from PRN 16019 consisting of a grassy strip 1.20 m wide.	Preserved as a smooth grassy strip	
16,021	Incline	SH 4958852451 - SH 4956052401	Very eroded grass strip running slightly diagonally up the front of the spoil heap. The grassy strip was up to 3.00 m wide towards it base, although it became narrower towards it top. One small section of revetment survives. Much of the incline has been disturbed by later reworking of the tip, probably from PRN	Preserved only as a grassy area. Disturbed by a tree, half way up the incline and fallen rubble.	Plates 3 and 4

PRN	Туре	Grid Reference	Description	Condition	Illustration
16,022	Possible temporary boundary	SH 4956352363 SH 4956152381	Line of nine, roughly made, dry stone, stacks of slate blocks Each was 0.50 m x 0.50 m in size surviving to a height of approximately 0.50 m.	Slightly collapsed	Plates 7
16,023	Stacking Yard	SH 4956952482 - SH 4957252452	Large flat area, approximately 11 x 30 m bounded on the south and west by the remnants of a low dry stone wall up to 0.50 m wide and standing to a height of up to 0.30 m. The eastern edge of this structure was marked by PRN 16024.	Ruinous standing to only 0.30 m. The central area is covered by grass.	Plate 22
16,024	Possible Tramway	SH 4958152490 - SH 4958452457	Smooth grassy strip up to 1.50 m wide along the eastern side of the working area. The tramway is on a slightly raised mound, revetted by slate blocks.	Very eroded, but the line of this structure is clear.	Plate 22
16,025	Tip top tramway	SH 4962352487 - SH 4965252458	Smooth, grassy strip up to 1.20 m wide running along the spine of spoil heap.	Preserved as a smooth grassy strip	Plate 23
16,026	Tip top tramway	SH 4963352485 - SH 4963852474	Spur from PRN 16025 consisting of a grassy strip 1.20 m wide.	Preserved as a smooth grassy strip	Plate 23
16,027	Tip top tramway	SH 4964352515 - SH 4966452482	Smooth, grassy strip up to 1.20 m wide running along the spine of spoil heap.	Preserved as a smooth grassy strip	
16,028	Tip top tramway	SH 4965652504 - SH 4964852515	Spur from PRN 16027 consisting of a grassy strip 1.20 m wide.	Preserved as a smooth grassy strip	
16,029	Stone heap	SH 4959052386	Stack of slabs approximately 1.0 x 1.0 m and standing to 0.50m. Possible support for an air hose in to the quarry.	Complete	Plate 11
16,030	Gwâl	SH 4958952390	Short length of dry stone walling, approximately 2.0 m long with two stub walls at the north and south ends running into the spoil heap. Standing to 0.50 m. Surrounded by slate splitting waste.	Ruinous, partly buried by spill from the spoil heap.	Plate 12

# Appendix 2: Summary of Field Names on AD 1813 Estate Map and AD 1839 Tithe Map

Field	Welsh Name	English
	AD 1813 Esta	te Map
1		House, yards and Gardens
2	Cae Lleiki Bach	Small slate field
3	Cae Lleiki Mawr	Big slate field
4	Cae Mawr Ucha	Upper big field
5	Cae'r Llyn	Field of the lake
6	Caer Sarn	Causeway field
7	Cae Mawr Issa	Lower big field
8	Cae Derw Issa	Lower field of the oaks
9	Cae Rhwng y Ddaudy	Field between the two houses
10	'R Alltwrth Ben y Ty	The slope at the end of the house
-11	'R Allt Goediog	The wooded slope
12	Caer Lloiau Ucha	Upper field of the calves
13	Cynffyrch Bach	Little ???
14	Wereglawdd y Fotty	Hollow of the summer farmstead
15	Cae'r Fotty	Summer farmstead field
16	Caer Pant	Valley field
17	Caer Mynydd	Mountain Field
	AD 1839 Tith	e Map
1895	Cae Llech Mawr	Big slate field
1896	Cae Llech Bach	Little slate field
1897	Yrallt wrth ben ty	The slope at the end of the house
1898		
1899	Cae mawr isaf	Lower big field
1900	Cae mawr uchaf	Upper big field
1901	Cae derw lwyn	Oak thicket field
1902	Cae mawr isaf	Lower big field
1906	Wergledd y Llwyn	Hollow of the thicket
1907	Yr allt wrth y goedwig	The slope next to the wood
1908	Cae Llriau uchaf	Upper field of the calves
1909	Cynfrych bach	
1912	Gors y bryn	Hill bog
1913		Slate Quarry
1914	Rhos bach	Little moor

Appendix 3:	Summary of Ownership at Ty Mawr based on List of Quarries
	working under the Quarries Act.

Year AD	Ty Mawr West	Ty Mawr	Ty Mawr Green Pit	Ty Mawr East
1895	J. Robinson			
1896	J. Robinson			/
1897		United Quarries		
1898		United Quarries		
1899		United Quarries		1
1900		United Quarries		
1901		United Quarries		
1902		United Quarries		
1903		United Quarries		
1904		United Quarries		
1905		United Quarries	Frederick Davies	
1906		United Quarries	Frederick Davies	
1907		Frank Turner	Frederick Davies	
1908			Frederick Davies	
1909		Ty Mawr Slate Quarry Company		
1910		Ty Mawr Slate Quarry Company	÷	
1911		W.J Evans and Company		
1912		Ty Mawr Slate Quarry Company		
1913		Ty Mawr Slate Quarry Company		And the second second
1914				Ty Mawr Slate Quarry Company
1916				Ty Mawr East Slate Company
1918				Ty Mawr East Slate Company
1920		1		W. Evans and Company
1922				W. Evans and Company
1925				W. Evans and Company
1928				Robert and Evans
1931				Vron Log Green Slate Quarries Ltd
1934				Vron Log Green Slate Quarries Ltd