Watching Brief Commissioned by The National Trust Wales

Fieldwork

by

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Hafod y Llan Hydro Scheme Watching Brief October 2013 EAS Client Report 2013/10

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Introduction

NGR

Centred on:

Location and Topography (Figure 1)

The hydroelectric scheme within the land associated with Hafod y Llan runs from SH 62125 52016 to SH 62894 51400 a distance of approximately 1120 m. A dam and outfall system was constructed near to the Hafod y Llan copper mill, at a height of approximately 260 m OD, which was linked to a turbine house near to Hafod y Llan farm, at approximately 201 m OD, by a pipe 560 mm in diameter. For approximately 800 m this was a welded plastic pipe, however the lower section used slot-together, ductile iron, pipes. The pipeline runs to the east of the Afon Cwm Llan whose course it roughly follows.

Archaeological Background

An initial assessment of the potential archaeological impact of the hydroelectric scheme was carried out by K. Laws for the National Trust in August 2010. Amongst other recommendations this report recommended a more detailed survey be carried out once the final route of the pipeline had been determined. This was carried out by the Gwynedd Archaeological Trust in September 2011 (Cooke and Evans 2011), locating twelve sites of potential archaeological interest within a corridor 30 m wide centred on the pipe route. The majority of these "sites" were stone walls or tracks associated with the agricultural regime within the valley, however at the north western end of the pipeline is the Hafod y Llan copper mill and its associated tramways which were thought to be of regional interest.

Further fieldwork in May 2012 by K. Laws described one of the track ways in more detail and located a bridge abutment which was not recognised in the previous surveys. No archaeological conditions were placed on the planning permission for the development by the Snowdonia National Park Authority and thus the limited watching brief was commissioned by the National Trust under its own auspices. Construction started in November 2012 with the cutting of a haulage road up the mountain to provide access to the dam site. Engineering Archaeological Services Ltd were appointed to carry out a limited watching brief on the project in April 2013. By this time, the haul road had already been construction and the works on preparing the dam site was well advanced. Eight visits were made to the project in order to monitor the progress and record any archaeological features disturbed by the works. These visits took place on 16/4/13, 23/4/13, 29/4/13, 13/6/13, 20/6/13, 1/7/13, 16/8/13 and 1/10/13.

SUMMARY

The watching brief recorded a series of features along the pipeline, some of which were not located in the previous surveys. However, the limited nature of the work meant that some features or deposits of archaeological interest may have been missed.

Of particular interest were the features and deposits associated with the Hafod y Llan Copper Mill and an area of peat cutting.

Methodology

The appointment of an archaeological consultant to monitor the works associated with the construction was timed to coincide with the insertion of the pipe. This meant that the haul road to the inlet site had already been constructed. It was, therefore, only possible to inspect the uphill side of the track and the drainage features dug as part of this phase of the works. The digging of the trench, to bury the pipe, was largely through the already disturbed area of the haul road, therefore only specific areas of the pipeline were inspected in order to monitor know possible archaeological conflicts and where the pipeline deviated from the haul road.

The hydroelectric scheme at Hafod y Llan was visited on 16/4/13, 23/4/13, 29/4/13, 13/6/13, 20/6/13, 1/7/13, 16/8/13 and 1/10/13 in order to monitor the progress of the works and to record any archaeological features disturbed. Prior to this the route was walked with K. Laws of the National Trust and a few features not previously recognised were noted. The recording of these features was incorporated into the visits made to monitor the works.

Survey Results

At the north western end of the development the Watkin Path was temporarily breached in order to construct the inlet pond and dam. This revealed a peat deposit, approximately 800mm thick (Plate 1). This was sampled in two sections (Plate 2) using overlapping column samples, at SH 62115 52018. At the time of sampling there was no budget for the analysis of these samples, however it was an opportunity to take samples from a peat deposit with the ultimate aim of investigating the palaeoenvironmental development of this part of Snowdonia. The peat deposit would have been sealed by the construction of the Watkin Path in 1892 and therefore predate this point in history. A similar peat column studied near Blaenau Ffestiniog, for example, had deposits dated to 5805 ± 35 BP (Grant 2013, 22) at its base showing the potential for the sampled deposits. It is also possible that this core may give an indication for the earliest period of metal extraction, in the area, in the form of metal dust caught within the peat which could be indicated using X-ray fluorescence analysis.

This north western end of the pipeline had the most potential for disturbing archaeological deposits. It was threaded through the remains of Hafod y Llan copper mill (NT PRN 44858), avoiding the major buildings, but running along the line of the tramway which fed the crusher. Before Engineering Archaeological Services Ltd were appointed K. Laws recorded the presence of dumps of crushed waste alongside the Afon Cwm Llan at the point where the dam was to be constructed (Plate 3). Adjacent to this point one of the rocks within the river bed of the Afon Cwm Llan has the remains of a series of iron fittings (Plate 4 - 6). It is not entirely clear as to the original function of these fittings. One interpretation is that they supported a bridge carrying a tramway from Braich-yr-oen Copper mine (Plate 7), however it is also possible that they were part of the support system for a leat providing the water supply to the Hafod y Llan copper mill.

Slightly to the east of the dam site is the office for the Hafod y Llan copper mill (NT PRN 44829, Plate 8). This is an essentially two celled building which was extended to the north and which faced to the west overlooking the point where the tramway from Braich-yroen would have crossed the Afon Cwm Llan. Outside this building, at SH 62140 52049, is a stone, partly buried, which has four holes drilled into its upper surface (Plate 9). Whilst it is possible that these holes held the posts for a fence line, the relatively close spacing between the holes suggest this may have been a simple rock cannon.

Whilst the Office building (NT PRN 44829) and an open shaft (NT PRN 44857) at SH 62130 52023 were protected during the course of the construction works, the space between the office and an adit (NT PRN 44857) at SH 62146 52023 was used as a temporary construction compound for storing materials and the turning vehicles causing disruption to this area. The main copper mill (NT PRN 44858, Plate 10) was also avoided with both the haul road and the pipeline skirting the eastern side of the buildings and associated platforms. However this required both of these to run along the line of the tramway (NT PRN 44856, Plate 11) which originally ran from the river crossing to the hoppers which fed the crusher within the copper mill. The tramway would appear to have been a two phase construction with a lower tramway being replace by a higher level route, presumably to allow ore to be tipped into the top of the ore bin. Both of these routes had dry stone revetting along their south western sides and were terraced into the hillside to the north and east. During construction, the surface of the upper tramway was buried with debris from pecking the rock so that the tramway could be widened to allow access by mechanical excavators to the dam site. The pipe trench was then dug through this debris (Plate 12). This trench was very shallow, such that the majority of the pipe was above the level of the trench. On reinstatement little attempt was made to follow the original contours of the tramway, however this resulted in the tramway being protected with the layer of spoil which also covered the pipe (Plate 13).

Between SH 62220 51982 and SH 62146 52023 the pipeline and the haul road cut through the tail of a large spoil heap (Plate 14). The digging of the haul road exposed a section approximately 32 m long and up to 2.2 m high of angular stone block in a matrix of dark brown clayey silt. Originally this spoil heap had a smooth profile with its tail resting against the rear wall of the building in the south eastern corner of the working platform associated with the copper mill. This building contained the presumed terminus for a cableway marked by a drum house on the skyline (Plate 15). It would seem likely that the build-up of spoil may be related to this method of transporting ore from the mountainside and Hafod v Llan mine itself to the works. Other possible interpretations are that the spoil heap may be the result of the dumping of the excess spoil from the creation of the working platform or the remains of a denuded incline feeding the copper mill from the mine high on the hillside.

The construction of the haul road required the inclusion of drains in order to keep the road dry. Unfortunately these drains had their outfalls on the downhill side onto the working platform and waste tips associated with the copper mill. Some attempts were made to disperse the water by the use of straw bale filters, however some damage was done to the site by erosion. This was particularly noticeable within the waste tips to the south east of the working platform (Plate 16) where the fine deposits probably derived from the buddle (Plate 17) were remobilised. Also at the bottom of this slope the deposits were disturbed by turning a vehicle around leaving tracks across the deposits.

The natural instability of the slopes to the south and east of the copper mill are demonstrated by the rotational slumping at SH 62223 51918 (Plate 18). Here the rotation is such that the underlying natural clay has been brought to the surface and the iron pan rich soils have been at least partly buried. This demonstrates both the relatively high slopes and the generally wet condition of these slopes.

The haul road cut through and ran alongside a series of stone walls (Figure 2). Walls 1 and 2 (Plates 19 and 20) were of a similar character, approximately 1.5 m high with pitched stone capping, however Walls 3 and 4 (Plates 21 and 22) are of different characters. It is likely that Walls 1 and 2 are contemporary and were recorded as NT PRN 45869 by the Gwynedd Archaeological Trust (Cooke and Evans 2011,

9). The size and preservation of these walls may suggest a possible nineteenth century date, they appear on the First Edition Ordnance Survey map published in 1889, however they are well built and are maintained suggesting they may be relatively late in the development of the landscape. Wall 3 (Plate 21) was recorded as NT PRN 45864 (Cooke and Evans 2011, 8). Surviving only up to 1 m high in places this wall differs from Walls 1 and 2 in that it is constructed of rounded stone boulders and is much less well preserved. It is somewhat intermittent, but tends to be better preserved to the south of the haul road where it is also pierced by one of the ditches from the peat cutting area to the west (see below). Wall 4 (Plate 22), (NT PRN 45863, Cooke and Evans 2011, 7) revetted the high side of the track way (NT PRN 45862) running from the river crossing of the Afon Cwm Llan. Only 0.7 m high, the wall has a break in its length at SH 62789 51442 which was probably a gateway. On the eastern side of this gap one of the stone block has a drilled hole in its surface. Whilst this may be a result of the quarrying process it is more likely that this hole was part of a "gate" or other means of blocking this gap.

Slightly to the west of Wall 4 is an area of peat cutting (Plate 23) that was not recognised in the initial surveys of the pipeline. Extending over an area of 45 x 65 m there are a network of drainage ditches (Figure 4) cutting across an area of soft sediments (Plate 23). Each of the ditches (Plates 24-26) was up to 1.2 m wide and 0.4 m deep. They were cut through a layer of degraded peat up to 0.4 m thick (Context 1) which formed slight hummocks between each of the ditches (Plate 27). This layer sealed a layer of angular stones in a grey, slightly sandy, clay matrix up to 0.2 m thick (Context 2) which appear to be water lain, possibly an out wash layer. This in turn sealed a layer of amorphous peat up to 0.5 m thick (Context 3). These layers would suggest there has been at least two phases of peat cutting on the site. The top of Context 3 appears to have been truncated, however there was then a period of run off depositing Context 2 over the area. This period must have included considerable water flow with an area of exposed gravels above the area of the peat cutting. Peat, or at least organic rich soils, then regenerated on the site and it was these deposits which were

drained with the network of ditches, probably to dry the peat deposits for cutting.

The location of the excavations for the turbine house were of some archaeological interest given their proximity to the bridge abutment located by K. Laws in her site visit of May 2012 (Plate 28). No signs of a formal track way leading from the bridge abutment was located, however, the pipe trench leading into the north western side of the turbine house was dug and backfilled without archaeological monitoring. The excavation for the Turbine House, however did give an opportunity to inspect the Pleistocene deposits in this part of the valley. There would appear to be a mixture of till and outwash gravels within the sections (Appendix 1, Plate 29). Given the large size of the water worn boulders within these deposits (up to $1.5 \ge 1.5 \ge 1.5 = 1.5$ relatively high energy regime occurred to move the stones whilst the clays associated with the till would suggest a much quieter period of deposition.

Conclusions

The National Trust are to be congratulated in commissioning this watching brief without having it forced upon them by means of a planning condition. As a result, a number of new archaeological features and significant deposits were located and a series of potential archaeological studies revealed.

With hindsight, the more detailed recording of the Hafod y Llan Copper Mill before construction, may have given a much better information base for the construction of the pipeline and thereby avoiding some of the damage to the site which has inevitably occurred. In particular the drains associated with the haul road could have been designed to avoid the damage to the working platform. It would also have given a much better database for the re-instatement of this part of the pipeline, particularly along the tramways feeding the crusher house. It should be recorded that the cross drains were removed on archaeological advice during the reinstatement of the pipeline.

The works, however, did give the opportunity to sample the peat deposits sealed by the Watkin Path. These deposits have great potential for the understanding of the palaeoenvironmental history of this part of Snowdonia and the National Trust is urged to commission the palynological study of the sample columns and at least two radiocarbon dates on the deposits in order to place the data into its historical framework. A possible extension to this work would be to sample the peat deposits associated with the peat cutting area which could then be compared to the column from beneath the Watkin Path. This would require the sampling of the lower peat, probably with an auger.

The works did locate a number of previously unknown features including the possible Rock Cannon associated with the office for the Hafod y Llan Copper Mill. Rock Cannons are not uncommon in Gwynedd, Jones, in his study of Rock Cannons in Gwynedd, had recorded 235 examples by 2001 (Jones 2002, 1), however they are more commonly associated with the slate. They consist of a series of holes drilled in a rock slab filled with black powder which were linked with slow burning fuses. The length of the fuses were timed so that when ignited the "cannon" produced a rhythmic pattern of explosions. The earliest record of rock cannons within North Wales occurs in a survey of the Vaenol Estate in 1777 (Jones 2002, 6), although most would appear to be nineteenth century in date (Jones 2002, 7). Dating of these feature is difficult, although Jones (2002, 3) suggest that rock cannons without fuse channels tend to be earlier. The rock cannon recorded, however, is relatively small and appears to be related to local events, it is probably relevant, in this context, that in the Nantlle Valley that Rock Cannons are also known as "wedding or marriage" stones (Jones 2002, 1). One possible event which this feature may be related to is the Gladstone's visit in 1892, however, this is extremely speculative. The more detailed recording of this possible rock cannon would be a suitable project for National Trust Volunteers, however a suitable environmental specialist should be consulted before the rock was further exposed.

The earliest record of the Hafod y Llan Copper Mill occurs in 1825/6 when ore was sold from the site at Swansea (Bick 2003, 85), however care should be taken as Braich-yr-oen and Hafod-y-Llan often worked in conjunction. It is likely, however that work was being undertaken on the site before this date. Within the standing remains there is some evidence that the site developed overtime. There would appear to be at least two phases of tramway leading to the site from the north with the higher level tramway replacing an earlier route. There is also some evidence within the rest of the remains with the possible buddle having a pulley wheel pit built over its remains for the possible cableway linking the Hafod y Llan mine to the site. The link between Braich-vr-oen mine and the site would have required the crossing of the Afon Cwm Llan on a bridge. It is not certain whether the iron fittings embedded into a rock in the stream bed are the remains of this bridge or the supports for a launder leading to the main waterwheel driving the crusher house, however the relatively small size of the iron work may suggest that a launder support may be the most probable interpretation.

Given its prominent position, adjacent to the very popular Watkin Path, the commissioning

of a more detailed study of the Copper Mill would give the opportunity for the interpretation of the Copper Industry on Snowdon. Ideally this should include the detailed examination of any documentary records and a survey of the remains. This survey should not only be restricted to the mill buildings but should record the integration of the mill to the extractions sites and the methods of removing the ore from the site.

Further down slope the presence of deliberate peat cutting has been demonstrated. It is assumed that this peat cutting is associated with the domestic economy of Hafod y Llan farm, providing a possible source of fuel. It is curious that there would appear to be more than one phase of activity in this area, an interpretation which could only be confirmed by more detailed work on the deposits.

Acknowledgements

The watching brief was commissioned by K. Laws for the National Trust. Thank are due to D. Smith and J. Millen of the National Trust who were the on-site contacts. The works were carried out by GH Jones Contractors and special thanks are due to Alan Jones and his team for their tolerance.

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| Context | Location | Relationships | Description |
|---------|------------------|----------------------------|---|
| 1 | Peat Cutting | Above 2, Cut by 4,5,6,7 | Layer of organic rich soil with many grass root. Slightly degraded peat forming slight hummocks between the drainage ditches. Up to 0.4 m deep |
| 2 | Peat Cutting | Below 1 Above 3 | Layer of angular stones in a grey slightly sandy clay matrix. Stones up to 0.2 m in size. [out wash layer]. |
| 3 | Peat Cutting | Below 2 | Layer of amorphous peat up to 0.5 m thick. Organic rich amorphous layer |
| 4 | Peat Cutting | Cuts 1 | Ditch 1.2 m wide and approximately 0.4 m deep |
| 5 | Peat Cutting | Cuts 1 | Ditch 1.2 m wide and approximately 0.4 m deep |
| 6 | Peat Cutting | Cuts 1 | Ditch 1.2 m wide and approximately 0.4 m deep |
| 7 | Peat Cutting | Cuts 1 | Ditch 1.2 m wide and approximately 0.4 m deep |
| 8 | Turbine House | Above 9 | Mid brown silty soil with rots from the grass above. Up to 180 m thick. Pockets of water worn gravel from when the river bursts it bank, particularly at the southern end of the trench. [topsoil] |
| 9 | Turbine House | Below 8 Above 10 | Orange/brown clayey silt with many cobbles and large stone boulders which are largely rounded or sub-rounded in character. The bounds and cobbles are pitched at random angles suggesting a tumbling within the deposits. The layer is up to 1m thick although it becomes thinner towards the south. Some of the pockets of boulders has less matrix and contain pockets of iron panning and manganese [partial hill slope deposits, but largely glacial till.] |
| 10 | Turbine House | Below 9 | Cobbles and large rounded and sub-rounded stones up to 1.5 x 1.5 x 1.5 m in size in a mottled grey and yellow sandy silt. [possible out wash gravel] |

Appendix 1: Context Summary

| Appendix 2 | : Summary | of the P | hotographs | in the | Archive |
|-------------------|-----------|----------|-------------------|--------|---------|
| 11 | | | I | | |

| Frame | Date taken | Direction | Subject | |
|-------|------------|-----------|---|--|
| | | (looking) | | |
| 001 | 21/03/2013 | S | Test pit for the turbine house | |
| 002 | 21/03/2013 | S | Test pit for the turbine house | |
| 003 | 21/03/2013 | NW | Test pit for the turbine house | |
| 004 | 21/03/2013 | NW | Point at which the pipeline crossed Wall 4 before | |
| | | | excavation | |
| 005 | 21/03/2013 | NW | General view of Hafod y Llan Copper mill with | |
| | | | machine pecking rock in the background | |
| 006 | 21/03/2013 | W | Stack of rails alongside the bridge over the Afon | |
| | | | Cwm Llan | |
| 007 | 21/03/2013 | SW | Location of the peat deposit disturbed at the inlet | |
| | | | site | |
| 008 | 21/03/2013 | SW | Iron fitting in a boulder in the stream bed of the | |
| | | | Afon Cwm Llan possibly part of the structure | |
| | | | supporting either a bridge or a leat | |
| 009 | 21/03/2013 | E | Iron fitting in a boulder in the stream bed of the | |
| | | | Afon Cwm Llan possibly part of the structure | |
| | | | supporting either a bridge or a leat | |
| 010 | 21/03/2013 | E | Iron fitting in a boulder in the stream bed of the | |
| | | | Afon Cwm Llan possibly part of the structure | |
| | | | supporting either a bridge or a leat | |
| 011 | 21/03/2013 | SE | View of the Copper Mill and associated tramway | |
| 012 | 21/03/2013 | Down | The possible buddle | |
| 013 | 14/04/2013 | SW | The peat section | |
| 014 | 14/04/2013 | SW | The peat section | |
| 015 | 14/04/2013 | SW | The peat section | |
| 016 | 14/04/2013 | SW | The peat section | |
| 017 | 14/04/2013 | SW | The peat section | |
| 018 | 14/04/2013 | SW | Sample tubes in the peat section | |
| 019 | 14/04/2013 | SW | Sample tubes in the peat section | |
| 020 | 14/04/2013 | SW | Sample tubes in the peat section | |
| 021 | 14/04/2013 | SE | Machines working on the inlet site | |
| 022 | 14/04/2013 | S | General location of the peat sample site | |
| 023 | 14/04/2013 | SSE | General location of the peat sample site | |
| 024 | 14/04/2013 | SSE | General location of the peat sample site | |
| 025 | 14/04/2013 | S | Possible Rock Cannon | |
| 026 | 14/04/2013 | S | Possible Rock Cannon | |
| 027 | 14/04/2013 | N | Possible Rock Cannon | |
| 028 | 14/04/2013 | E | Office building | |
| 029 | 14/04/2013 | E | Office building | |
| 030 | 14/04/2013 | ENE | Tramways leading to the Hafod y Llan Copper | |
| 031 | 14/04/2013 | ENE | Tramways leading to the Hafod y Llan Copper Mill | |
| 032 | 14/04/2013 | ENE | Tramways leading to the Hafod y Llan Copper Mill | |
| 033 | 14/04/2013 | E | Tramways leading to the Hafod y Llan Copper Mill | |
| 034 | 14/04/2013 | SSW | One of the ditches within the peat cutting area | |
| 035 | 14/04/2013 | Ν | One of the ditches within the peat cutting area | |

| Frame | Date taken | Direction | Subject | |
|-------|----------------|-----------|---|--|
| | | (looking) | | |
| 036 | 14/04/2013 | NE | One of the ditches within the peat cutting area | |
| 037 | 14/04/2013 | NE | Ditches within the peat cutting area | |
| 038 | 14/04/2013 | SE | General view of the peat cutting area before | |
| | | | digging the trench | |
| 039 | 14/04/2013 | SE | General view of the peat cutting area before | |
| | | | digging the trench | |
| 040 | 23/04/2013 | WNW | Machinery working within the Afon Cwm Llan, | |
| | | | pecking rock for the inlet site | |
| 041 | 23/04/2013 | WNW | Machinery working within the Afon Cwm Llan, | |
| | | | pecking rock for the inlet site | |
| 042 | 29/04/2013 | N | Wall 4 | |
| 043 | 29/04/2013 | N | Detail of Wall 4 showing drilled hole | |
| 044 | 29/04/2013 | SW | Wall 3 | |
| 045 | 29/04/2013 | SSW | Wall 3 | |
| 046 | 29/04/2013 | NE | Wall 2 | |
| 047 | 29/04/2013 | E | Wall 1 | |
| 048 | 29/04/2013 | E | Temporary hole opened where the pipeline meets | |
| | | | the inlet structure | |
| 049 | 29/04/2013 | WNW | During excavation of the dam structure | |
| 050 | 29/04/2013 | SE | Welding the pipe near to the Hafod y Llan | |
| | | | Copper Mill | |
| 051 | 29/04/2013 | SE | Welding the pipe near to the Hafod y Llan | |
| | | | Copper Mill | |
| 052 | 29/04/2013 | SE | Spoil tip above the copper mill | |
| 053 | 29/04/2013 | SE | Spoil tip above the copper mill | |
| 054 | 29/04/2013 | SE | Rotational sump | |
| 055 | 29/04/2013 | SE | Rotational sump | |
| 056 | 29/04/2013 | SE | Rotational sump | |
| 057 | 29/04/2013 | SE | Rotational sump | |
| 058 | 13/06/2013 | NW | Excavation for the Turbine House | |
| 059 | 13/06/2013 | NW | Excavation for the Turbine House | |
| 060 | 13/06/2013 | NW | Excavation for the Turbine House | |
| 061 | 13/06/2013 | S | Excavation for the Turbine House | |
| 062 | 13/06/2013 | NW | Excavation for the Turbine House | |
| 063 | 13/06/2013 | SW | Excavation for the Turbine House | |
| 064 | 13/06/2013 | SW | Excavation for the Turbine House | |
| 065 | 13/06/2013 | Ν | Men working on the excavation for the Turbine | |
| | | | House | |
| 066 | 13/06/2013 | ENE | Excavation for the Turbine House | |
| 067 | 13/06/2013 | SE | Excavation for the Turbine House | |
| 068 | 20/06/2013 | SE | Relationship of the pipeline to the haul road | |
| 069 | 20/06/2013 | W | Damage to the deposits below the Hafod y Llan | |
| | | | Copper mill as a result of the cut off drains | |
| 070 | 20/06/2013 | W | Damage to the deposits below the Hafod y Llan | |
| 0.51 | 0.10.6.10.0.10 | | Copper mill as a result of the cut off drains | |
| 071 | 20/06/2013 | W | Damage to the deposits below the Hafod y Llan | |
| 0.55 | 0.000000 | | Copper mill as a result of the cut off drains | |
| 072 | 20/06/2013 | NW | Damage to the deposits below the Hafod y Llan | |
| 0.72 | 20/06/2012 | | Copper mill as a result of the cut off drains | |
| 073 | 20/06/2013 | NW | Damage to the deposits below the Hafod y Llan | |
| | | | Copper mill as a result of the cut off drains | |

| Frame | Date taken | Direction | Subject |
|-------|------------|-----------|--|
| | | (looking) | |
| 074 | 20/06/2013 | SW | Damage to the deposits below the Hafod y Llan |
| | | | Copper mill as a result of the cut off drains and |
| 075 | 20/06/2012 | CW | the movement of machinery |
| 0/5 | 20/06/2013 | SW | Damage to the deposits below the Hatod y Llan |
| | | | the movement of machinery |
| 076 | 20/06/2012 | SE. | Work on the inlet atmeture |
| 070 | 20/06/2013 | | Work on the inlet structure |
| 077 | 20/06/2013 | SE | Machinery in the area of the inlet structure |
| 078 | 20/06/2013 | | Inlet structure during construction |
| 079 | 20/06/2013 | NW | Inlet structure during construction |
| 080 | 01/07/2013 | ESE | General view of the Hafod y Llan Copper Mill |
| 082 | 01/07/2013 | ESE | General view of the Hafod y Llan Copper Mill |
| 082 | 01/07/2013 | ESE | General view of the working platform of the |
| 085 | 01/07/2013 | LOL | Hafod y Llan Copper Mill |
| 084 | 01/07/2013 | SE | Power barrow stored in the Office Building and |
| 004 | 01/07/2015 | 5L | scar of the stone moved to make this possible |
| 085 | 01/07/2013 | SSE | General view of the Hafod v Llan Copper Mill |
| 086 | 01/07/2013 | SE | Work on the Inlet structure with the copper mil in |
| 000 | 01/07/2015 | 5E | the background |
| 087 | 01/07/2013 | E | General view of the Hafod v Llan Copper Mill |
| 088 | 01/07/2013 | E | The location of the Hafod y Llan Mine above the |
| 000 | 01/07/2015 | | Office building |
| 089 | 01/07/2013 | E | The location of the Hafod v Llan Mine above the |
| | | | Office building. Also showing the proximity of |
| | | | the works to the Office |
| 090 | 01/07/2013 | NE | Structure above the line of the haul road near to |
| | | | the Hafod y Llan Copper Mill |
| 091 | 01/07/2013 | SW | The working platform of the Hafod y Llan |
| | | | Copper Mill with the Watkin Path in the |
| | | | background |
| 092 | 01/07/2013 | NW | General view of the Hafod y Llan Copper Mill |
| 093 | 01/07/2013 | WNW | Pipe trench above the tramway leading to the |
| | | | copper mill |
| 094 | 01/07/2013 | WNW | Pipe trench above the tramway leading to the |
| | | | copper mill |
| 095 | 01/07/2013 | WNW | Pipe trench above the tramway leading to the |
| 000 | 01/07/2012 | | copper mill |
| 096 | 01/07/2013 | N | Pipe trench above the tramway leading to the |
| 007 | 16/00/2012 | QWI | copper mill |
| 097 | 16/08/2013 | SW | water damage and tracks on tips below the |
| 008 | 16/09/2012 | CW | Working platform |
| 098 | 10/08/2013 | SW | water damage and tracks on tips below the |
| 000 | 16/09/2012 | NIW | Working platform |
| 099 | 10/08/2013 | IN W | copper mill |
| 100 | 16/08/2012 | N | Reinstatement of the area between the inlet and |
| 100 | 10/00/2015 | 1 N | the Office building |
| 101 | 16/08/2013 | W | The completed inlet structure |
| 101 | 16/08/2013 | W | The completed inlet structure |
| 104 | 10/00/2013 | ** | The completed mile surveure |

| Frame | Date taken | Direction (looking) | Subject |
|-------|------------|------------------------|---|
| 103 | 16/08/2013 | W | Re-instatement of the Watkin Path at the peat |
| | | | sampling site |
| 104 | 16/08/2013 | NW | Re-instatement of the Watkin Path |
| 105 | 16/08/2013 | SE | Re-instatement above the Hafod y Llan Copper Mill |
| 106 | 16/08/2013 | WNW | Crusher house, wheel pit and ore bin of the Hafod y Llan Copper Mill |
| 107 | 16/08/2013 | WNW | Crusher house, wheel pit and ore bin of the Hafod y Llan Copper Mill |
| 108 | 16/08/2013 | NW | Re-instatement above the Hafod y Llan Copper Mill |
| 109 | 16/08/2013 | NW | Re-instatement above the Hafod y Llan Copper Mill |
| 110 | 16/08/2013 | SE | Relationship of the re-instatement to the buildings at the SE end of the working platform |
| 111 | 16/08/2013 | ESE | Relationship of the re-instatement to the buildings at the SE end of the working platform |
| 112 | 16/08/2013 | NW | Re-instatement above the working platform of the Hafod y Llan Copper Mill |
| 113 | 16/08/2013 | SE | Water seeping out of cut off drain below the haul road above the working platform |
| 114 | 16/08/2013 | SE | Water seeping out of cut off drain below the haul road above the working platform |
| 115 | 16/08/2013 | SE | Removing spoil from around the buildings at the SE end of the working platform |
| 116 | 16/08/2013 | SE | Removing spoil from around the buildings at the SE end of the working platform |
| 117 | 16/08/2013 | NE | Re-instatement above the working platform with the possible drum house on the sky line above |
| 118 | 16/08/2013 | NE | Re-instatement above the working platform with the possible drum house on the sky line above |
| 119 | 16/08/2013 | N | Re-instatement above the working platform |
| 120 | 16/08/2013 | NE | Detail of the terminal of the possible cable way at the SE end of the working platform |
| 121 | 16/08/2013 | NE | Re-instatement above the working platform with the possible drum house on the sky line above |
| 122 | 01/10/2013 | ESE | Re-instatement above the Turbine House |
| 123 | 01/10/2013 | WNW | Trench across the peat cutting area |
| 124 | 01/10/2013 | Ν | Section of the trench through the peat cutting area |
| 125 | 01/10/2013 | WNW | Re-instatement above the peat cutting area |
| 126 | 01/10/2013 | W | Line of one of the ditches across the peat cutting area not re-instated after the pipe trench had been filled |
| 127 | 01/10/2013 | SW | Line of one of the ditches across the peat cutting area not re-instated after the pipe trench had been |
| | | | filled |
| 128 | 01/10/2013 | NW | Pipe trench across the peat cutting area |
| 129 | 01/10/2013 | W | Pipe trench across the peat cutting area |
| 130 | 01/10/2013 | N | Section of deposits cut by the trench through the peat cutting area |

| Frame | Date taken | Direction | Subject |
|-------|------------|-----------|---|
| | | (looking) | |
| 131 | 01/10/2013 | Ν | Section of deposits cut by the trench through the peat cutting area |
| 132 | 01/10/2013 | Ν | Machine working in the peat cutting area |
| 133 | 01/10/2013 | SW | Section of deposits cut by the trench through the peat cutting area |
| 134 | 01/10/2013 | SW | Section of deposits cut by the trench through the peat cutting area |
| 135 | 01/10/2013 | SW | Section of deposits cut by the trench through the peat cutting area |
| 136 | 01/10/2013 | W | Pipe trench through the peat cutting area |



Figure 1: Location Scale 1:25,000

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Figure 3: Sketch plan of Hafod y Llan Copper Mill Based on sketch plan by S. Garfi Scale 1:600 (approx.)





Plate 1: Location of the peat deposits



Plate 2: Sampling the peat



Plate 3: Copper waste alongside the Afon Cwm Llan (source K. Laws, taken October 2012)



Plate 4: Rock with iron fittings in the river bed of the Afon Cwm Llan



Plate 5: Detail of the iron fittings



Plate 6: Detail of iron fittings



Plate 7: The tramway from Braich-yr-oen



Plate 8: Hafod y Llan office



Plate 9: Block with drill holes in front of the Hafod y Llan office



Plate 10: Hafod y Llan copper mill looking SE



Plate 11: The tramway feeding the Hafod y Llan copper mill



Plate 12: The pipe trench over the tramway



Plate 13: The tramway after reinstatement



Plate 14: The spoil heap, looking SE



Plate 15: Relationship of the spoil heap to the copper works and drum house in the landscape (after reinstatement)



Plate 16: Damage caused to the spoil heaps by the drainage to the haul road



Plate 17: The possible buddle.



Plate 18: Rotational slump



Plate 19: Wall crossing 1



Plate 20: Wall crossing 2



Plate 21: Wall crossing 3



Plate 22: Wall 4



Plate 23: Area of peat cutting



Plate 24: Drainage ditch within the area of peat cutting



Plate 25: Drainage ditch within the area of peat cutting



Plate 26: Drainage ditches within the area of peat cutting



Plate 27: Pipe trench through the peat cutting area



Plate 28: Bridge abutment (Source K. Laws, taken May 2012)



Plate 29: The excavation for the turbine house