

Archaeological Assessment

GAT Project No. 1918 Report No. 644 July 2006

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Archaeological Assessment

Report No. 644

Prepared for Capita Symonds

July 2006

By

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ARCHAEOLOGICAL ASSESSMENT

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DINORWIG POWER STATION (G1918):

MARCHLYN MAWR MODIFICATION WORKS

ARCHAEOLOGICAL ASSESSMENT

SUMMARY

An archaeological assessment has been carried out prior to modification works at the Marchlyn Mawr Reservoir, east of Deiniolen, Gwynedd. The reservoir is part of the Dinorwig Hydro-Electric Power Station operated by the First Hydro Company and is used to power a series of underground turbines. The reservoir was created from a mountain lake located c.600m above sea level and the proposed works aims to increase the storage capacity of the reservoir by raising the crest and bunds of the current reservoir. The rockfill used for this will be sourced from slate tips associated with the former Marchlyn Slate Quarry and the proposed scheme aims to use the quarry itself as a general compound during the works.

Marchlyn Quarry was a late addition to the Dinorwig Quarry complex, with initial (unsuccessful) quarrying attempted in the 1930's and continued from the 1950's until the close of the Dinorwig Quarry in 1969. The slate was transported from the site using lorries that utilised a local road network and the waste was dumped in large slate tips to the west and south of the quarry. The quarry site at Marchlyn can be viewed as one of the last attempts to exploit Dinorwig Quarry prior to its closure.

Marchlyn Mawr was never part of the Dinorwig Quarry, and formerly belonged to the Penrhyn Estate. The lake and its surrounding area was never exploited and remained unaltered until its transformation into the main reservoir for the Dinorwig Power Station between 1975 and 1979. The proposals will impact upon the existing dam and related structures.

In addition to the dam, the proposed works will principally affect slate waste material deposited between 1954 and 1969 whilst the proposed site access will utilise existing road networks. It was not possible to differentiate between the two selected sources of slate waste in terms of more specific dating. What is clear is that neither slate waste area was visible on the 1953 6"Ordnace Survey Map of the area (Fourth edition OS 6" SH17NW) but were extant on the 1978 1:10000 Ordnance Survey Map (OS 1:10000 County Series, Caernarfonshire. Sheet SH56SE. 1978).

In response to the intended reduction in the lowest operational water level in Llyn Peris it is proposed to construct two bunds in Llyn Peris. The bunds are intended to reduce the potential for temporary discoloration of the water as water levels rise and disturb existing sediments. The two bunds will only be exposed at the lowest operating level at Llyn Peris (usually early in the morning). The bunds will be formed using existing slate waste in Llyn Peris and will not affect any slate waste tips. The height of the bunds will approximately be 0.5m.

1. INTRODUCTION

Gwynedd Archaeological Trust has been asked by Capita Symonds on behalf of First Hydro to carry out an archaeological assessment in advance of an increase of the storage capacity of the Marchlyn Mawr Reservoir (SH61626200). The project involves the raising of the crest of the dam using rockfill material sourced from the former slate tips of the Marchlyn Quarry, *c*.1.5km to the west of the reservoir, with the former quarry being used as the proposed main site offices, car park and storage area during the course of the works (Figure 1), coupled with a proposed construction of two low-lying bunds in Llyn Peris to reduce the potential for discoloration of the water as water levels rise (Figure 8). The basis for the site location and access is taken from Drawing Number 410/003926/01/301/1001, provided by First Hydro Company.

The majority of the rockfill will be sourced from two slate waste tips located to the west and south of Marchlyn Quarry (Figure 1), with a smaller amount sourced from the west shore of the reservoir (Plate 10). The slate waste is material deposited during the operation of the quarry, between 1954 and 1969 (at which point the quarry was closed down), whilst the material from the west shore of the reservoir includes scree material deposited during the construction of the reservoir between 1975 and 1979. The

transportation of the slate waste from the quarry to the reservoir will be achieved using a local access road built in 1975 as part of the construction of the reservoir and power station (Figure 1).

There will also be a number of adjustments made to the crest of the reservoir to accommodate the increase in storage capacity. This will include the raising of the crest of the reservoir (the "wavewall"), as well the current access chamber and spillweir, with adjustments also made to the existing access ramp and storage house pump generator (Figure 1).

The material used to construct the proposed bunds will be sourced from existing slate waste within Llyn Peris

The quarry landscape (of which Marchlyn Quarry is part) is regarded to be of special significance and appears in the Landscape Register of Outstanding Historic Interest in Wales (ICOMOS, CADW and CCW, 1998: Dinorwig, 24). An archaeological survey of Dinorwig Quarry was undertaken by Gwynedd Archaeological Trust (GAT) between 1994 and 1995, which identified a large number of extant archaeological sites within the quarry area (GAT Report 154). Gwynedd Archaeological Trust conducted an assessment of proposed works affecting Afon-Y-Bala Dam and Llyn Peris (GAT Report No. 637), also part of Dinorwig Quarry and located to the *c*.3.0km to the southwest of the study area. A project design was completed for this assessment and is included in the appendix.

The study area incorporating Marchlyn Mawr Reservoir and Marchlyn Quarry is designated as part of a Site of Specific Scientific Interest (SSSI): Eryri ID No. 430 Code 31 WAD. The area incorporating the proposed bunds is outside a SSSI.

2. SPECIFICATION AND PROJECT DESIGN

A brief has not been prepared for the work, but the project will be monitored by Gwynedd Archaeological Planning Service (GAPS). The project has been undertaken according to guidelines specified in *Standard and Guidance for Archaeological Desk-based Assessment* (Institute of Field Archaeologists, 1994, rev.1999). The basic requirement was for a desktop survey and field search of the proposed area, in order to assess the impact of the proposals on the archaeological features within the area concerned. The importance and condition of known archaeological remains were to be assessed, and areas of archaeological potential and new sites to be identified. Measures to mitigate the effects of the improvement work on the archaeological resource were to be suggested.

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

- *a) to identify and record the cultural heritage of the area to be affected;*
- *b) to evaluate the importance of what was identified (both as a cultural landscape and as the individual items which make up that landscape); and*
- *c) to recommend ways in which damage to the cultural heritage can be avoided or minimised.*

A full archaeological assessment usually comprises 6 phases:

- 1) Desk-top study
- 2) Field Search
- 3) Interim Draft Report
- 4) Detailed Field Evaluation
- 5) Final Draft Report
- 6) Final Report

This assessment has covered the work required under 1, 2 and 3. It is sometimes necessary to undertake a programme of field evaluation following the desktop assessment. This is because some sites cannot be assessed by desktop or field visit alone, and additional fieldwork is required. This typically takes the form of geophysical survey or trial excavation, although a measured survey is also an option. The present report makes recommendations for any field evaluation required.

3 METHODS AND TECHNIQUES

3.1 Desk-top Study

This involved consultation of maps, computer records, written records and reference works, which make up the Historic Environment Record (HER), located at Gwynedd Archaeological Trust (GAT), Bangor. The archives held by the Gwynedd Record Office, Caernarfon, were also consulted. Secondary sources were consulted to provide background information.

The sites listed in the HER within 2.0km around the study area were collected to give an indication of the type of sites recorded in the general locality and are included in Appendix 1.

3.2 Field Visit

The field visit was carried out on 7th June 2006. The aim of the field survey was to inspect the study area and to assess the impact of the development on the historic landscape, specifically, the former quarry workings. The present condition of all sites were identified and recorded and the results are given below (para. 5).

3.3 Report

The available information was synthesised to give a summary of the archaeological and historic background and of the assessment and recommendations, as set out below. The separate features, their evaluation and recommendations are listed separately, and a summary of the overall assessment of the area is given at the end.

The criteria used for assessing the value of features was based upon those used by the Secretary of State for Wales when considering sites for protection as scheduled ancient monuments, as set out in the Welsh Office circular 60/96. The definitions of categories used for impact, field evaluation and mitigation are set out below.

3.3.1 Categories of importance

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

Category A - Sites of National Importance.

Scheduled Ancient Monuments, Listed Buildings of grade II* and above, as well as those that would meet the requirements for scheduling (ancient monuments) or listing (buildings) or both.

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

Category B - Sites of regional or county importance.

Grade II listed buildings and sites which would not fulfil the criteria for scheduling or listing, but which are nevertheless of particular importance within the region.

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

Category C - Sites of district or local importance.

Sites which are not of sufficient importance to justify a recommendation for preservation if threatened.

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

Category D - Minor and damaged sites.

Sites that are of minor importance or are so badly damaged that too little remains to justify their inclusion in a higher category.

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

Category E - Sites needing further investigation.

Sites, the importance of which is as yet undetermined and which will require further work before they can be allocated to categories A - D are temporarily placed in this category, with specific recommendations for further evaluation. By the end of the assessment there should usually be no sites remaining in this category. In this case several areas of unknown potential have been allocated to this category. These require environmental sampling which should be carried out during the pipeline works.

3.3.2 Definition of Impact

The impact of the development on each site was estimated. The impact is defined as *none, slight, unlikely, likely, significant, considerable or unknown* as follows:

None:

There is no construction impact on this particular site.

Slight:

This has generally been used where the impact is marginal and would not by the nature of the site cause irreversible damage to the remainder of the feature, *e.g.* part of a trackway or field bank.

Unlikely:

This category indicates sites that fall within the band of interest but are unlikely to be directly affected. This includes sites such as standing and occupied buildings at the margins of the band of interest.

Likely:

Sites towards the edges of the study area, which may not be directly affected, but are likely to be damaged in some way by the construction activity.

Significant:

The partial removal of a site affecting its overall integrity. Sites falling into this category may be linear features such as roads or tramways where the removal of part of the feature could make overall interpretation problematic.

Considerable:

The total removal of a feature or its partial removal which would effectively destroy the remainder of the site.

Unknown:

This is used when the location of the site is unknown, but thought to be in the vicinity of the proposed road.

3.4 Definition of Mitigatory Recommendations

None:

No impact so no requirement for mitigatory measures.

Detailed recording:

Requiring a photographic record, surveying and the production of a measure drawing prior to commencement of works.

Archaeological excavation may also be required depending on the particular feature and the extent and effect of the impact.

Basic recording:

Requiring a photographic record and full description prior to commencement of works.

Watching brief:

Requiring observation of particular identified features or areas during works in their vicinity. This may be supplemented by detailed or basic recording of exposed layers or structures.

Avoidance:

Features, which may be affected directly by the scheme, or during the construction, should be avoided. Occasionally a minor change to the proposed plan is recommended, but more usually it refers to the need for care to be taken during construction to avoid accidental damage to a feature. This is often best achieved by clearly marking features prior to the start of work.

Reinstatement:

The feature should be re-instated with archaeological advice and supervision.

4 ARCHAEOLOGICAL BACKGROUND

4.1 Topographic Description

The study area incorporates the north side of Elidir Mountain, east of the village of Deiniolen and includes the Marchlyn Mawr Reservoir (part of Dinorwig Hydro-Electric Power Station), a site access road linking the reservoir to the main road network and Marchlyn Quarry, 1.0km west of the reservoir (with associated slate tips) (see Figure 1). The reservoir was formerly a natural lake, but was transformed into a curved reservoir 600m long and 40m high as part of the construction of the Dinorwig Power Station. The reservoir has a storage capacity of 7 million cubic metres with the Natural Bottom Water Level at 600m above sea level. During full operation of the pumped storage scheme (which powers the turbines within Elidir Mountain), the water level of the lake will rise and fall 34m daily.

To the south of this area is the glaciated valley of Nant Peris, which is the location of the former Dinorwig Quarry (in operation between 1788 and 1969) and the current Dinorwig Power Station (opened in 1983). The valley comprises Cambrian rock and includes two large lakes, Llyn Padarn and Llyn Peris and opens onto the Arfonian plateau at *c*.100m above sea level. The proposed bunds are located towards the northeast shore of Llyn Peris (Figure 8).

4.2 Archaeological and Historical Background

Consultation of the Historic Environment Record has revealed that the study area has retained evidence for post-medieval land holdings that have been superseded by mid-20th century slate quarrying and a late 20th century Hydroelectric Power Station reservoir with its associated transport infrastructure.

4.2.1 Prehistory

A prehistoric roundhouse site is located at Cwm Gafr 1.7km south of the study area (PRN 5273; SH62206040; see Appendix I) but it will not be affected by the proposed scheme.

4.2.2 Roman

A coin findspot has been recorded 1.7km to the north of the study area (NPRN 233; SH63006300; Appendix I)

4.2.3. Early Medieval

There appear to be no listed Early Medieval features within a 2.0km radius of the study area.

4.2.4 Medieval

The study area was located within the Cantref of Arfon and the Commote of Is Gwyrfai and was divided between the parishes of Llandeiniolen and Llandegai. The area incorporating Marchlyn Quarry and the slate waste tips was located in the parish of Llandeiniolen (Figure 3) whilst Marchlyn Mawr Reservoir (a lake until 1975) was at the southern end of the parish of Llandegai (Figure 2). A Medieval Platform House is located 1.4km to the north of the study area (PRN 763; SH62956231; see Appendix I), but it will not be affected by the proposed scheme.

The area incorporating the proposed bunds near the east shore of Llyn Peris lies in the parish of Llanberis. The main features within the area are Dolbadarn Castle, a 13th Century castle built on the isthmus between Llyn Padarn and Llyn Peris, *c*.500m west of the proposed bunds (NGR 15830; SH58505950) and two wooden boats recovered from Llyn Peris during the construction phase of Dinorwig Hydro Power Station when Llyn Peris was drained and lined with slate waste. The oldest of the two vessels was a log boat was dated via dendrochronolgy to between AD 1187 and 1205 (PRN 9366; SH58105980). It had a remaining length of 4.03m and an estimated length of 5.5m, with a maximum beam of 0.67m (McElovougue, D. M, 1999, 6). The second vessel was a clinker-built boat dated via dendrochronolgy to between AD 1547 and 1549 (PRN 9367; SH58105970). It measured 6.30m between ends and 2.20m in the beam (*ibid.*, 7). The boats were found *c*. 200m to the west of the proposed bunds.

4.2.5 Post-Medieval

There are at least eight post-medieval sites within a 2.0km radius of the study area. The sites encompassing Dinorwig Quarry and listed in GAT Report 637 are outside this area and are located *c*3.0km to the south. The list of post-medieval sites is reproduced in the Appendix I and are: a leat associated with Marchlyn Mawr Reservoir and located 1.2km to the north (PRN 12446; SH60836294); a copper trial at Cwm Graianog, 1.3km to the north (PRN 20808; SH62606280); another copper trial at Cwm Bual, 1.8km north of the study area (PRN 20809; SH63406170); a rock cannon at Carreg Cannan, Gwaen Gyfni, 1.4km north of the study area (PRN 12626; SH61086326); two sheepfolds at Gwaen Gyfni, 1.5km north of the study area (PRN 12409 & 12640; SH60636345 & SH61336349); a stone-built agricultural shelter also at Gwaen Gyfni (PRN 12445: SH60786340); a copper mine within Nant Ffrancon, 1.9km north of the study area (PRN 20803; SH63106320). None of these features will be affected by the scheme.

Within the study area is a single-storey brick-built structure, southwest of Marchlyn Quarry (Plate 19). It does not appear on any of the 6" Ordnance Survey Maps of the area and from its construction appears to be mid to late twentieth century in date. It is not an agricultural building and is most likely part of the Marchlyn Quarry operations. It will not be affected by the scheme.

The history of the study area can be divided into two parts: its use as a mid-20th century slate quarry and its use as part of the Dinorwig Hydroelectric Power Station.

Marchlyn Quarry was part of the Dinorwig Quarry complex, which was owned originally by the Assheton Smith Family of the Vaynol Estate. Slate quarrying on their land was originally carried out on an ad hoc basis by local farmers/quarriers, who worked above Llyn Padarn and Llyn Peris, extending towards Allt Ddu, who paid an annual or "take-note" fee of one guniea to Assheton Smith, with the quarried slate taken by pack horse to Moel-y-Don, later Port Dinorwig. Slate was also carried down to Llyn Padarn and Llyn Peris, to Y Cei Newydd and Y Cei respectively and then shipped along the lake to Penllyn or along Afon Rhythallt to Cwm y Glo, with the journey to Moel-y-Don completed by horse and cart (Carrington 1994, 13). In 1787 Assheton Smith, with a view to a profitable expansion, evicted the ad hoc operators and let the rights to a partnership of three: William Bridge, Hugh Ellis and Thomas Wright, who were already operating a copper mine on the Great Orme. They had plans for an operation on a much bigger scale than previously and during 1788, work started on the "Great New Quarry" on the slopes to the east of Llyn Peris. One of the earliest available maps is the 1836 sketch map of "Dinorwic (sic) Quarries" by R. Lloyed Ellis of Carvnarvon (sic) (reproduced in Carrington, 1994,7), which details several of the quarry workings and their associated incline planes. Most of the major quarry sites are listed, including Victoria, Wellington and Matilda, all located on the eastern shore of Llyn Peris. The 1840 Tithe Map recorded the area on a much larger scale, incorporating the entire parish, but did not include specific detail of the quarry workings (Figure 2). The map did reveal the system of enclosed fields that still existed and the names of the occupiers (listed on the associated Tithe Schedule), with all land belonging to Thomas Assheton Smith Esq.

During the course of the 19th Century, Dinorwig Quarry evolved to become the second largest slate quarry in the world, overtaken only by the neighbouring Penrhyn quarry, which extracted the same Cambrian slate veins, with both quarries employing over three thousand men. Dinorwig Quarry covered 324 hectares and was divided into galleries that were between 20 to 40 metres deep and were connected by a railway and tramway network that carried the slates through the quarry and northwards

to the coast at Y Felinheli (Port Dinorwic), where a port and standard gauge rail interchange was provided to take Dinorwig slate to its markets in the United Kingdom, Europe and worldwide. Slate was extracted from a system of stepped quarries on the open hillside and on the sides of pits, with inclines linking the terraces and workshops. Rail transport links were introduced in 1825 and 1843 and steam locomotives and steam-powered mills were introduced in 1848, enabling the dramatic growth of operations. A programme of further investment from the late 1860s onwards successfully united the different workings, improved internal rail transport and saw the construction of massive quadrangular workshops at Gilfach Ddu, replacing earlier facilities on Ffeiar Injan gallery, and enabled the quarry to become largely self-sufficient in terms of its ability to repair and maintain equipment. The quarry was responsible for creating a network of communities that grew from depopulated agricultural areas, including Llanberis, Deiniolen, Llanrug, Bethel and Cwm-y-Glo. The quarries also affected the geographical layout of the area, not only through quarrying but also from the tipping of slate waste, which comprised as much as nine times that of the saleable product (Carrington, 1994: 6). Production reached its peak in 1898, after which point output fell, but in the 1930's the payroll was still over 2000.

4.2.5.1 The Study Area

By the 1930's, Dinorwig, "due to dispersion and indiscriminate dumping, had become too expensive to work" (Richards, 1994: 45) so an abortive attempt was made to open Marchlyn Quarry as a "Green field" site (*ibid.*), utilising a road network and lorries instead of a rail network to transport the slate from the site. The idea was revived in the 1950's with major investment including an electric mill. The quarry was never a great success but continued working until Dinorwig's 1969 closure. An examination of the available map evidence shows the development of the quarry from the mid-1950's onwards. Prior to this, the area was devoted to enclosed pasture farming. This is clearly evident from the 6-inch Ordnance Survey Maps of the area. The first to third editions of this map (SH12SW and SH17NW, 1891, 1909 and 1919 respectively) show the location as a large rectangular field with no evidence of quarry workings or slate waste tipping (the first and third editions are reproduced as Figures 4 and 5 with the quarry location superimposed for comparison). There is no evidence of any local road networks leading to this area nor to the location of the reservoir. The only dominant landscape features are Marchlyn Mawr and Marchlyn Bach lakes. The main workings at Dinorwig Quarry can be seen c.3.0km to the south (Figures 4 and 5). The 1953/1954 Fourth Edition of the 6-inch map (SH12SW and SH17NW) shows small-scale quarry workings at the site of the Marchlyn Quarry, but nothing on the scale of the eventual workings (see Figure 6 for a reproduction of the map with the full quarry workings superimposed). A series of small slate tips are visible fanning northwards from the quarry. Neither of the slate waste tips selected for the proposed works are visible, suggesting they had not been deposited at this time. The quarry was accessed by a road from Deiniolen, but no roads are visible accessing Marchlyn Mawr (Figure 6). The 1978 1:10000 Ordnance Survey County Series Map of the area (SH56SE and SH66NW), was published after the closure of the Marchlyn Quarry and during the construction of the Dinorwig Power Station. The full outline of the quarry is visible, as are the slate tips (see Figure 7). The access road to the reservoir at Marchlyn Mawr, is clearly visible as it was built in 1975, whilst the outline of the reservoir, built between 1975 and 1979 is also visible. On this evidence, it is clear that the quarry was fully opened from 1954 onwards, with the slate waste deposited at some point between 1954 and 1969 (when the quarry was closed).

Construction of the Dinorwig Power Station began in 1975 and was completed in 1983, utilising the former site of Dinorwig Quarry and the lakes of Marchlyn Mawr and Llyn Peris as the two links in the chain that would power the turbines buried deep within Elidir Mountain. The transformation of Marchlyn Mawr from a lake into a reservoir was the first major construction project begun on the power station and a special access road was built up to Marchlyn Mawr in 1975. The reservoir took four years to complete and the construction was undertaken by Gleeson Civil Engineering (Dinorwig the Electric Mountain: 31). The transformation of the lake is quite apparent when comparing the available map evidence. Figures 4 to 6 show Marchlyn Mawr as a natural lake, whilst Figure 7 shows the reservoir during its construction (the current outline of the lake is superimposed on each figure to highlight the difference). On Figure 7, the difference in width is quite evident, as is the noticeable bund constructed on the northwestern side of the reservoir, built to support the curved wavewall of the reservoir (visible on Plates 1 to 11). It would appear that material for the bund was sourced from the quarry workings, particularly the slate waste, as the site visit revealed that there was much less slate waste evident west and south of Marchlyn Quarry than was recorded on the 1978 1:10000 Ordnance Survey Map of the area (reproduced as Figure 7). Similar waste material may have been used to construct the access road to the reservoir.

5 SITE GAZETTEER

Feature 1Marchlyn Mawr Reservoir (SH61696194)

Category: B

Impact: Significant

A reservoir built between 1975 and 1979 on the site of a natural lake. The reservoir is much larger and deeper than the original lake and has a storage capacity of 7 million litres. The reservoir is an integral part in the operation of the Hydro-Electric Power Station as it provides the water used to power a series of turbines deep within Elidir Fawr Mountain. The water is discharged into Llyn Peris, 3.0km south of the reservoir and pumped back into the reservoir overnight. As such, the water level within the lake can rise and fall as much as 34 metres on a daily basis. When it was built, the Hydro-Electric Power Station was the most expensive civil engineering project on Britain and the complex housed the largest pumped storage system in Europe. The reservoir is categorized as regional in importance because of the size and complexity of the Hydro Electric Power Station and unusual Pumped Storage system, which can be classed as a civil engineering scheme of national importance. **Recommendations for further assessment: None**

Recommendations for mitigatory measures: Basic Recording

Feature 2 Existing Access Road (SH60176287 to SH61496242)

Category: C

Impact: None

The access road leading to Marchlyn Mawr Reservoir was one of the first construction phases undertaken for the Power Station. The road was constructed in 1975 to enable access to Marchlyn Mawr. Prior to this the local road terminated at Marchlyn Quarry. The road is closed to the public and is now used by First Hydro Company for accessing the reservoir complex. For the proposed scheme, the access road will be used for transporting the rockfill from the slate waste tips to the reservoir. *Recommendations for further assessment: None*

Recommendations for mitigatory measures: None

Feature 3 Marchlyn Quarry (SH60186267)

Category: C

Impact: None Marchlyn Slate Quarry was opened as part of the larger Dinorwig Quarry complex. Dinorwig Quarry was in operation from 1788 to 1969 under the aegis of the Vaynol Estate and was at one time the second largest slate quarry in the world. Dinorwig Quarry began a gradual decline in output during the early 20th century as the main quarry areas became harder to work. Marchlyn Quarry was opened as a "green field" site, 3.0km north of the main workings in an attempt to open new ground for exploitation. An abortive attempt was begun in the 1930's but a more concerted attempt was made in the 1950's and the quarry was worked from this period until its closure in 1969 when the whole Dinorwig Quarry complex was shut down. Marchlyn Quarry has been chosen as the location for the main site offices and welfare facilities associated with the proposed reservoir alterations. The site is of local importance

as it represents one of the final attempts to exploit Dinorwig Quarry. It appears, however, that it will not be altered or affected by its use as a main site compound. *Recommendations for further assessment: None*

Recommendations for mitigatory measures: None

Feature 4 Slate waste tip west of Marchlyn Quarry (SH59936303)

Category: D

Impact: Considerable

A slate tip associated with the quarry workings at Marchlyn Quarry to the immediate west (Feature 4). The slate material was deposited between 1954 and 1969. There is modern building waste deposited with the slate and the tip may have been disturbed during the construction of the reservoir as it may have been a source of rockfill for the access road or the reservoir bund.

Recommendations for further assessment:None

Recommendations for mitigatory measures: Basic Recording

Feature 5 Slate waste tip south of Marchlyn Quarry (SH59826261)

Category: C A slate tip associated with the quarry workings at Marchlyn Quarry to the immediate north (Feature 4). The slate material was deposited between 1954 and 1969. The tip may have been disturbed during the construction of the reservoir as it may have been a source of rockfill for the access road and/or the reservoir bund.

Impact: Considerable Recommendations for further assessment:None Recommendations for mitigatory measures: Basic Recording

6 IMPACT AND MITIGATION

6.1 Impact

6.1.1 Designated Sites and Areas within close proximity of proposed development:

Scheduled Ancient Monuments (SAM)

- CN066: Dolbadarn Castle (SH586598)
- CN163: Dinorwig Quarry: Hafod Owen Winding Engine, Locomotive Shed, Main Waterwheel and Housing (SH585602)
- CN177: Dinorwig Quarry: Barracks "A" Incline (SH586601)
- CN198: Dinorwig Quarry: Vivian Slate Quarry, Incline, Walia and associated structures (SH586606)
- CN337: Dinorwig Quarry (SH595603): Including the Northeastern end of the Victoria Incline.

There are four SAM's associated with Dinorwig Quarry (see GAT Report 637) and they are located 3.0km to the south of Marchlyn Mawr Reservoir, whilst Dolbadarn Castle is to the southwest across Llyn Peris. They will not be affected by the proposed scheme.

Listed Buildings

Grade I

• There are no Listed Buildings (Grade I) within 2.0km of the study area

Grade II

• There are no Listed Buildings (Grade II) within 2.0km of the study area

Landscape Register of Outstanding Historic Interest in Wales

The study area is located within the Dinorwig section of the Landscape Register of Outstanding Historic Interest in Wales (ICOMOS, CADW and CCW, 1998: Dinorwig, 24). The Countryside Council for Wales was contacted regarding the proposed scheme and it was decided that the proposals will not significantly impact on the historic landscape and A Staged Process for the Assessment of the Significance of the Impact of the Development on Historic Landscape areas (ASIDOHL) will not be required.

6.1.2 The Scheme:

The proposed scheme involves the enlargement of the existing Marchlyn Mawr reservoir to increase its storage capacity, with the aim of creating a New Top Water Level (NTWL)of 637.30m above sea level (the current NTWL is *c*.634.00m above sea level). The embankment crest of the reservoir is to be raised using pre-cast concrete units, with the bund supporting it raised using material sourced from the slate waste tips from Marchlyn Quarry. Alterations to the existing operating equipment will be made to accommodate this, including, at the southwestern end of the reservoir, the raising of the existing access chamber and the tapering of the wavewall into the natural slope (Figure 1; Plate11); the modification of the apron leading to the switchgear generator house (Figure 1; Plate 12) and the existing headgate tunnel to be to meet the new levels, with the surrounding area landscaped using material sourced from

the west shore of the reservoir (Plate 10). This will also be the proposed location of the upper site offices and welfare facilities (Figure 1). The shore of the reservoir includes natural rockhead landscaped during the construction of the reservoir and material dumped during previous landscaping. The current access ramp leading to the shore will be modified and re-graded to tie-in with the new crest level (Figure 1; Plates 2 and 10). At the northeastern end of the reservoir the existing spillweir will be modified to accommodate the rise in the NTWL. The spillweir will be raised from 633.50m above sea level to a new height of 637.30m. The spillweir will be encased by a rectangular block of foam concrete 18.0m long and 9.0m wide, set against the original bedrock profile (see Plate 6 for an outline of the raised level and the location of the spillweir (Figure 1; Plates 7 and 8) and the access road surrounding the reservoir crest will also be raised from 636.0m to 637.0m (Figure 1; Plates 5 and 9).

The proposed source for the majority of the rockfill for raising the crest and bund of the reservoir will be from the slate waste tips to the west and south of the Marchlyn Mawr quarry (closed in 1969). The slate waste to the south of the quarry comprises and extensive spread of large blocks of slate deposited in the bottom of a small quarry joined to the larger Quarry face (Plates 17 and 18). The slate waste to the west of Marchlyn Quarry is much larger than that to the south, forming a curved deposit (Plate 19). To the south of the waste dump is a single storey rectangular building built from brick (Plate 19) that is derelict. The construction materials used for the building are 20th century and whilst it is not visible on any of the available map evidence, it is presumably part of the quarry operation (an electric sawmill was operated at Marchlyn Quarry). Either way, the building will not be affected by the scheme. An inspection of the waste slate reveals it to be comprised of large irregular chunks of slate with inclusions of modern waste material, including concrete piping (Plate 24). It appears in both instances that slate waste from this area was sourced for use on the construction of the reservoir and access road (built in 1975) as the map evidence locating the expanse of slate waste does not match that visible on the ground (Figure 7 compared to Plate 19, for example).

The other proposed works within the study area are the damming of the stream running from Marchlyn Mawr and feeding Marchlyn Bach (Figure 1; Plate13) and the proposed access point associated with this (Figure 1; Plate 14). Access to the stream by vehicle is to be achieved using "bog mats": non-intrusive mats laid on top of the vegetation that will not impact on the landscape. The proposed main site offices will be located on the floor of Marchlyn Quarry.

The preferred source of general rockfill material is the slate waste tip to the south of Marchlyn Quarry (Feature 5).

In response to the proposed reduction in the lowest operational water level in Llyn Peris it is proposed to construct two bunds in Llyn Peris. The bunds are intended to reduce the potential for temporary discoloration of the water as water levels rise and disturb existing sediments. The two bunds will only be exposed at the lowest operating level at Llyn Peris (usually early in the morning). The bunds will be formed using existing slate waste in Llyn Peris and will not affect any slate waste tips. The bunds will be c.2.0m wide and 0.5m high and Bund A will be 300m long and Bund B, 400m long (Figure 8).

6.1.3 Impact on non-designated sites

- It appears from an examination of the available evidence that the proposed scheme will impact upon slate waste tips deposited between 1954 and 1969. It also appears that some of the slate waste had already been removed during the construction of the reservoir as the area encompassed by the slate waste tips visible on the 1978 Ordnance Survey Map of the area (SH56SE and SH66SW; reproduced in Figure 7) appears more extensive than that which is currently visible. First Hydro have identified the South tip (feature 5) as their preferred source of general rockfill material, rather than the alternative source to the west of the quarry (Feature 4). Both features are classified as 'Local' or less in importance, and the impact upon the archaeological resource would be similar whichever were used, though the south tip is slightly better preserved.
- There will be direct impact upon the 1979 dam and related features (Feature 1), but no direct impact on any other built structures or upon any listed buildings or Scheduled Ancient Monuments.
- There is a small brick-built structure, possibly associated with Marchlyn Quarry, located to the southwest of the slate tips, but it is located outside of the proposed rockfill extraction area and is not threatened by these works (see Plate 19).

- Access to and from the waste tips will be achieved using roads created for lorries and slate loaders during the operation of the quarry, whilst access to the reservoir from the slate tips will be achieved using a local road built for the reservoir in 1975.
- The rock-fill to be sourced from the west shore of the reservoir is material associated with the construction of the reservoir between 1975 and 1979 and natural scree, some of which has been terraced.
- The material for the proposed bunds in Llyn Peris will be sourced from existing slate waste.

6.2 Mitigation

Basic recording is recommended for the slate tips and dam prior to the start of works. However, a photographic record of the slate tips has been taken as part of this assessment, and it is considered that no further record is necessary. Similarly a photographic record has of the dam has been taken, and First Hydro hold engineering drawings of its present and proposed states. These include details of its construction and changes in height. It is therefore proposed that no further recording is necessary, though it may be advantageous to compile a report of the relevant information which can be lodged with the Historic Environment Record.

The material for constructing the bunds in Llyn Peris will be sourced from material scraped together from existing slate waste material. This activity will not affect the underlying peat deposits at the lake bottom.

7 SOURCES

Ordnance Survey Maps

First edition OS 6" SH12SW 1891 First edition OS 6" SH17NW 1891 Second edition OS 6" SH12SW 1901 Second edition OS 6" SH12SW 1901 Third edition OS 6" SH12SW 1919 Third edition OS 6" SH12SW 1919 Fourth edition OS 6" SH12SW 1954 Fourth edition OS 6" SH17NW 1953 OS 1:10000 County Series, Caernarfonshire. Sheet SH56SE. 1978. OS 1:10000 County Series, Caernarfonshire. Sheet SH56SE. 1978.

GAT Report No. 154 GAT Report No. 637

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Tithe map and schedule for Llandegai parish, 1840. Tithe map and schedule for Llandeiolen parish, 1840.

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Gwynedd', Industrial Gwynedd. Volume 4. 1999. pp.5-15.

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Richards, A. J., 1999, The Slate Regions of the North and Mid Wales and their Railways. Llanrwst.

APPENDIX I

Archaeological Sites within a 2.0km radius of Marchlyn Mawr Reservoir: (Source HER and CARN Database www.rcahmw.org.uk/data/carn.shtml)

Prehistoric

| SINGLE HUT, CWM GAFR Reference: 5273 National grid reference: SH62206040 Broadclass:Domestic Type:HUT CIRCLE Pre 74 County:Caernarfonshire County:Gwynedd Record Originator:Gwynedd Archaeological Trust | Period: Prehistoric Community:Llanberis | Distance: 1.7 |
|---|--|---------------|
| Roman-British | | |
| COINS - FINDSPOT, TYN-Y-MAES FARM Reference: 2339 National grid reference: SH6363 Period: H Broadclass:Object Type:FINDSPOT Pre 74 County:Caernarfonshire County:Gwynedd Record Originator:Gwynedd Archaeological Trust | Roman Distance: 1.7 Community:Llandygai | |
| Medieval | | |
| PLATFORM HOUSE, CWM PERFEDD Reference: 763 National grid reference: SH62956231 Broadclass:Domestic Type:PLATFORM HOUSE Pre 74 County:Caernarfonshire County:Gwynedd Record Originator:Gwynedd Archaeological Trust | Period: Medieval Distance Community:Llandygai | : 1.4 |
| Post-Medieval | | |
| LEAT, MARCHLYN MAWR DAM Reference: 12446 National grid reference: SH6083629 Distance: 1.2 Broadclass:Water Supply and Drainage Type:LEAT Pre 74 County:Caernarfonshire County:Gwynedd Record Originator:Gwynedd Archaeological Trust | 94 Period: Post-Medi Community:Llanddeinioler | eval n |
| COPPER TRIAL, CWM GRAIANOG Reference: 20808 National grid reference: SH6260623 Distance: 1.3 Broadclass:Industrial Type:TRIAL Pre 74 County:Caernarfonshire County:Gwynedd Record Originator:Gwynedd Archaeological Trust | 80 Period: Post-Medi Community:Llandygai | eval |
| CARREG CANNAN, GWAEN GYNFI Reference: 12626 National grid reference: SH6108632 Distance: 1.4 Broadclass:Commemorative Type:ROCK CANNON Pre 74 County:Caernarfonshire County:Gwynedd Record Originator:Gwynedd Archaeological Trust | 26 Period: Post-Medi Community:Llandygai | eval |
| SHEEPFOLD, GWAEN GYNFI Reference: 12640 National grid reference: SH6133634 Distance: 1.5 Broadclass:Agriculture and Subsistence Type:SHEEPFOI | 49 Period: Post-Medi | eval |

| Pre 74 County:Caernarfonshire Record Originator:Gwynedd Arc | County:Gwynedd chaeological Trust | Community:Llandygai |
|--|--------------------------------------|--|
| SHELTER, GWAEN GYNFI | | |
| Reference: 12445 Nation Distance: 1.6 | nal grid reference: SH60786 | 340Period: Post-Medieval |
| Broadclass: Agriculture and Subs | istence Type:SHELTER | R |
| Pre 74 County:Caernarfonshire | County:Gwynedd | Community:Llandygai |
| Record Originator: Gwynedd Arc | chaeological Trust | |
| COPPER TRIAL, CWM BUAL | | |
| Reference: 20809 Nation | nal grid reference: SH63406 | 170 Period: Post-Medieval |
| Distance: 1.8 | - | |
| Broadclass:Industrial Type: | TRIAL | |
| Pre 74 County:Caernarfonshire | County:Gwynedd | Community:Llandygai |
| Record Originator:Gwynedd Arc | chaeological Trust | |
| SHEEPFOLD, GWAEN GYNFI | [| |
| Reference: 12409 Natio | nal grid reference: SH60636 | 345 Period: Post-Medieval |
| Distance: 1.8 | C | |
| Broadclass: Agriculture and Subs | istence Type:SHEEPFO | DLD |
| Pre 74 County:Caernarfonshire | County:Gwynedd | Community:Llandygai |
| Record Originator:Gwynedd Arc | chaeological Trust | , ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, |
| COPPER MINE. NANT FFRAN | JCON | |
| Reference: 20803 Natio | nal grid reference: SH63106 | 320 Period: Post-Medieval |
| Distance: 1.9 | 8 | |
| Broadclass:Industrial Type: | COPPER MINE | |
| Pre 74 County:Caernarfonshire | County:Gwynedd | Community:Llandygai |
| Record Originator:Gwynedd Arc | chaeological Trust | |









Figure 4: 6" Ordnance Survey Maps SH12SW & SH17NW 1891



Figure 5:6" Ordnance Survey Map SH12SW & SH17NW 1919



Figure 6: 6" 6" Ordnance Survey Maps SH12SW & SH17NW 1954



Figure 7: Ordnance Survey County Series Map SH56SE & SH66SW 1978





Plate 1: View Southwest of Marchlyn Mawr Reservoir Locating the Proposed Development Areas (Source: www.fhc.co.uk)



Plate 2: View North of Marchlyn Mawr Reservoir Locating the Proposed Development Areas (Source: www.fhc.co.uk)



Plate 3: View North of Proposed Development



Plate 4: View South of Proposed Development



Plate 5: Detail of Road Level along Dam Crest



Plate 6: Location of Spillweir and Proposed Changes



Plate 7: View Northwest of Existing Vehicle Turning Area



Plate 8: View Northeast of Existing Vehicle Turning Area



Plate 9: Detail of Proposed Crest Raising and Abutment Modification Works



Plate 10: Location of Access Ramp Alterations and Source of Rockfill



Plate 11: Location of Proposed Raised Access Chamber and Wavewall



Plate 12: Location of Wingwall and Generator House Modifications



Plate 13: Location of Proposed Damming of Stream



Plate 14: Proposed Temporary Access Point for Damming of Stream



Plate 15: View Northeast of Marchlyn Quarry and Location of Proposed Site Access Road



Plate 16: View South of Marchlyn Quarry and Proposed Location of Main Site Offices, Car Park and Storage Area



Plate 17: Proposed Source of General Rockfill Material For Marchlyn Mawr Landscaping Bund Southwest of Marchlyn Quarry



Plate 18: Proposed Source of General Rockfill Material For Marchlyn Mawr Landscaping Bund (Detail)



Plate 19: Proposed Source of General Rockfill Material for Marchlyn Mawr Landscaping Bund Northwest of Marchlyn Quarry and Site Access Road



Plate 20: Proposed Source of General Rockfill Material for Marchlyn Mawr Landscaping Bund Northwest of Marchlyn Quarry and Site Access Road



Plate 21: Proposed Source of General Rockfill Material for Marchlyn Mawr Landscaping Bund Northwest of Marchlyn Quarry and Site Access Road



Plate 22: Detail of Proposed Source of General Rockfill Material for Marchlyn Mawr Landscaping Bund Northwest of Marchlyn Quarry (View East)



Proposed Source of General Rockfill Material for Marchlyn Mawr Landscaping Bund Northwest of Marchlyn Quarry

Modern Rubbish Mixed With Slate Waste

Plate 24: Detail of Proposed Source of General Rockfill Material for Marchlyn Mawr Landscaping Bund Northwest of Marchlyn Quarry (View North)



Plate 25: Proposed Sources of General Rockfill Material for Marchlyn Mawr Landscaping Bund (View Southeast)



Plate 26: Photograph of a lorry and slate loader at a Dorothea Quarry. January 1965, contemporary with the workings at Marchlyn Quarry (Source: www.llechicymru.info)



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