CPAT Report No 1061

Llyn Isaf Hydro-electric Scheme, Cwmystwyth, Ceredigion

CULTURAL HERITAGE ASSESSMENT

THE CLWYD-POWYS ARCHAEOLOGICAL TRUST

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Report for Cambrian Hydro Power Ltd

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CPAT Report Record

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Introduction

This report describes the results of an assessment of direct and indirect impacts on cultural heritage features over the routes for a new access track and pipeline associated with a proposed hydro-electric scheme which utilises Llyn Isaf, near Cwmystwyth, in Ceredigion. It was conducted by the Field Services division of the Clwyd-Powys Archaeological Trust (hereafter CPAT). The assessment was commissioned by Cambrian Hydro Power Ltd and was conducted as one element of an Environmental Impact Assessment (EIA) of the proposed development which has resulted in the compilation of an Environmental Statement (ES). This report forms a part of that Statement. A curatorial brief for the assessment was prepared by the Heritage Management section of the Dyfed Archaeological Trust and this formed the basis for determining the scope of the study.

The proposed hydro-electric scheme is situated on the north side of the Ystwyth valley, around 1km east of the village of Cwmystwyth. The proposals include an access track running for 2.5km from SN 78807460 to Llyn Isaf (SN 30307572) and a new 1.7km-long pipeline from there to Cwmystwyth (SN 79997432).

Scoping and Consultations

Scope of the Assessment and Report

Cultural heritage is deemed to include the complete range of man-made features that have been introduced into the landscape from the Palaeolithic, more than two hundred and fifty thousand years ago, to the 20th century. Some of these features will be visible as upstanding remains on the ground; others will be buried and only become apparent during ground disturbance, whilst others may be objects that have been discarded, lost or deliberately deposited. Some will have an archaeological interest and importance; others will be more historical in their origin. In addition, some natural features will be relevant because of the information they contain; peat bogs, for instance, hold pollen that can throw light on past human activity in the area. Individually all these features are known as cultural heritage assets - as for instance defined in the Highways Agency's Design Manual for Roads and Bridges (DMRB 2007).

Scoping Request

It is understood that although this has been prepared as part of an Environmental Statement the decision to undertake an Environmental Impact Assessment, leading to the Environmental Statement, was made by Cambrian Hydro Power Ltd themselves and not at the request of the Local Planning Authority. Consequently, no formal Scoping Report has been submitted in connection with the proposals and therefore the views of the following bodies who have responsibilities for the cultural heritage are not currently known: Cadw; the Royal Commission on the Ancient and Historical Monuments of Wales; and CCW.

Sources of Information & Guidance

The Design Manual for Roads and Bridges (DMRB), Volume 11 Section 3 Part 2, HA 208/07 (August 2007) provides a suitable framework for environmental statement reports and considers in detail the cultural heritage as a whole. The approach to the cultural heritage which it promotes, although designed for road developments, is relevant as a methodology for the proposed pipeline and has been adopted here.

The baseline survey of the assessment was undertaken with reference to the principles and methods for assessing archaeological and cultural heritage assets laid out in a) the Standard and Guidance for Archaeological Desk-based Assessments and b) the Standard and Guidance for Archaeological Field Evaluation (2001), both produced by the Institute for Archaeologists, the regulatory body for the profession.

Legislative & Planning Policy Considerations

National Policies

The principal legislation relating to the cultural heritage is the Ancient Monuments and Archaeological Areas Act (1979) which provides statutory protection to monuments of national importance, otherwise known as Scheduled Ancient Monuments. Buildings of cultural heritage interest are protected under the Planning (Listed Building and Conservation Areas) Act (1990), as amended.

A survey of historic parks and gardens in Wales was initiated by Cadw in 1992 and completed ten years later. Those considered to be of exceptional (Grade I), great (Grade II*) and special interest (Grade II) were published in six volumes, that for Ceredigion appearing in 2002, and together they form Part 1 of the Register of Landscapes, Parks and Gardens of Special Historic Interest in Wales. The Register is advisory and the inclusion of a particular park or garden does not signify a statutory designation. Nevertheless, it is anticipated that statutory consultation on planning applications concerning gardens and parks on the Register will be introduced in Wales, at some stage in the future.

Some historic landscapes in Wales are considered to be particularly significant and/or well preserved. These have been recorded in a Register of Landscapes of Historic Interest in Wales. Classed as either outstanding or special interest these have been published in two volumes which form Part 2 of the Register of Landscapes, Parks and Gardens of Special Historic Interest in Wales published in 1998 and 2001. Again this part of the Register is advisory but non-statutory.

The cultural heritage and archaeological resource is a material consideration in the determination of planning applications. It is explicitly stated in Planning Policy Wales that:

‘It is important that the historic environment - encompassing archaeology and ancient monuments, listed buildings, conservation areas and historic parks, gardens and landscapes - is protected’ (para 6.1.1).

More specifically it states that ‘the desirability of preserving an ancient monument and its setting is a material consideration in determining a planning application, whether that monument is scheduled or unscheduled. Where nationally important archaeological remains, whether scheduled or not, and their settings are likely to be affected by proposed development, there should be a presumption in favour of their physical preservation in situ. In cases involving lesser archaeological remains, local planning authorities will need to weigh the relative importance of archaeology against other factors, including the need for the proposed development’ (para. 6.5.1). Detailed guidance is given in Welsh Office circulars 60/96 and 61/96.

Local Policies

Cultural heritage assets without statutory protection are curated by the archaeological advisors to the local planning authorities and afforded protection through local Development Plan policies. Those planning policies specific to the protection of cultural heritage assets include those in the Dyfed Structure Plan (revised 1990), from which the following policies can be cited:

EN1A 'It is the policy of the County Council that there shall be a presumption against development which would reduce the amenity or historic value of listed buildings of grades I, II* and II or scheduled ancient monuments.'

EN1A 'It is the policy of the county council to protect and conserve wherever possible unscheduled archaeological, historical and architectural features or areas of importance. Where permission is granted for development, conditions will be included, if necessary, to provide adequate opportunities for the recording and where desirable, the excavation of such sites. The protection of areas in close proximity to these sites will always be an important consideration.'

EN2 'It is the policy of the county council to protect and enhance designated conservation areas in Dyfed. Within and adjoining any such area new development shall be of a type and standard of design which has full regard to the character of the conservation area.'

EN3 'it is the policy of the county council that characteristic and individual landscape types throughout the county will be protected and conserved as special landscape areas in the localities listed below or additionally identified:

i) The Pembrokeshire Coast National Park
ii) The Brecon Beacons National Park
iii) The Eastern Upland
iv) The Ceredigion Coast
v) The Towy, Teifi, Rheidol, Aeron and Ystwyth Valleys
vi) The Carmarthen Bay Coastline
vii) Heritage Coast Areas

There shall be a presumption against development proposals likely to adversely affect the character and amenity of these areas.'

The Ceredigion Unitary Development Plan has yet to be formally adopted and the Ceredigion Local Plan is currently in preparation.

LANDMAP

Wales, through its National Assembly, has a statutory responsibility to manage its landscape in a sustainable manner, and the assessment of landscape character is based on the LANDMAP programme, co-ordinated by the Countryside Council for Wales, but based upon County Council boundaries and undertaken by individual local authorities. LANDMAP is a system that allows information about the landscape to be gathered, organised and evaluated into a nationally consistent dataset that is both holistic and as objective as possible. It was developed to provide a resource that considers all facets of the landscape for use in sustainable landscape decision-making.

The core information provides data for five evaluated layers or 'aspects' into which LANDMAP divides the landscape, the most relevant for this section of the ES being the Historic Landscape aspect.

Historic Hedgerows

Under the criteria for determining "Important Hedgerows" for the purposes of section 97 of the Environment Act 1995 and the Hedgerow Regulations, a hedgerow is important if it, or the hedgerow of which it is a stretch,

a) has existed for 30 years or more; and
b) satisfies at least one of the criteria listed in Part II of Schedule 1 within the Hedgerow Regulations

These criteria are defined for Archaeology and history (Part II of Schedule 1, Subsections 1 – 5) as:

1. The hedgerow marks the boundary, or part of the boundary, of at least one historic parish or township; and for this purpose 'historic' means existing before 1850.
2. The hedgerow incorporates an archaeological feature which is –
(a) included in the schedule of monuments compiled by the Secretary of State under section 1 (schedule of monuments) of the Ancient Monuments and Archaeological Areas Act 1979; or
(b) recorded at the relevant date in a Sites and Monuments Record [Historic Environment Record].
3. The hedgerow -
(a) is situated wholly or partly within an archaeological site included or recorded as mentioned in paragraph 2 or on land adjacent to and associated with such a site; and
(b) is associated with any monument or feature on that site.
4. The hedgerow -
(a) marks the boundary of a pre-1600 AD estate or manor recorded at the relevant date in a Sites and Monuments Record or in a document held at that date at a Record Office; or
(b) is visibly related to any building or other feature of such an estate or manor.
5. The hedgerow -
(a) is recorded in a document held at the relevant date at a Record Office as an integral part of a field system pre-dating the Inclosure Acts; or
(b) is part of, or visibly related to, any building or other feature associated with such a system, and that system -
(i) is substantially complete; or
(ii) is of a pattern which is recorded in a document prepared before the relevant date by a local planning authority, within the meaning of the 1990 Act, for the purposes of development control within the authority's area, as a key landscape characteristic.

Assessment Methodology

General

The primary aim of the assessment is to identify the cultural heritage assets within the Development Area in as far as constraints such as varying land-use allow, and to provide a report on them which should enable the reader to understand their historical context, offer guidance on their level of importance, whether national, regional or local, identify the significance of impact that the development might have upon them, and recommend mitigation to limit the impact of the development on them.

Impacts and Effects

A development can have one of four types of impact on a cultural heritage asset. These are:

i) **Direct Impacts:** A direct impact upon a cultural heritage asset involves its physical alteration or destruction as a result of the construction, operation or decommissioning of the pipeline. Direct impacts could include the construction of pipeline, turbine house, new or upgraded access tracks and the like.

ii) **Indirect Impacts:** An indirect impact involves an impact on a cultural heritage asset or area, or its setting, regardless of whether it is designated or not.

iii) **Cumulative –** where incremental effects arise due to the presence of other proposed schemes or from the interaction of different effects over time.

iv) **Uncertain –** where there is a risk that the works may affect a cultural heritage asset, for example, when it is unclear where the location or boundaries of a site lie, or where the baseline condition of a site cannot be established satisfactorily.

The report does not consider assets beyond the route corridors which extend to 50m on either side of the proposed access track and pipeline. The visual impact of the development will be apparent beyond this zone, and this is considered below in relation to statutorily designated and non-statutorily registered sites and landscapes.

It is considered that the possibility of physical impacts on the cultural heritage resource of the area will be at its greatest during the construction phase of the development, and appropriate mitigation is recommended in table 11. It appears unlikely that there will be any significant direct impact during the operational phase of the development.

Assessment Methodology

It is a general tenet in conservation strategies that cultural heritage assets represent a non-renewable resource, and should be avoided wherever this is feasible in order to avoid damage or destruction. All sites can be classified according to a system based on that provided for the assessment of cultural heritage assets in the DMRB (2007).

The classification of each asset (with the exception of nationally important scheduled sites and listed buildings) is based on the collective professional judgement and expertise of the field staff of CPAT using information both from existing records and the field visits to selected assets.

The relative value (importance) of a cultural heritage asset, as given in DMRB (2007) is laid out in Table 1.

Table 1 Factors for Assessing the Value of Cultural Heritage Assets

Factors for Assessing the Value of Cultural Heritage Assets	
Very High	World Heritage Sites (including those nominated). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives.
High	Scheduled Monuments (including those proposed). Undesignated monuments of which could potentially be worthy of scheduling. Grade I and Grade II* Listed Buildings. Assets that can contribute significantly to acknowledged national research objectives.
Medium	Grade II Listed Buildings. Conservation Areas. Designated or undesignated assets that contribute to regional research objectives.
Low	Designated and undesignated assets of local importance. Assets compromised by poor preservation and/or poor survival of contextual associations. Assets of limited value, but with the potential to contribute to local research objectives.
Negligible	Assets with very little or no surviving cultural heritage interest.
Unknown	The importance of the resource has not been ascertained.

Factors that need to be considered in assessing the magnitude of the impact are given in Table 2, based on the DMRB (2007) but in modified form, for each cultural heritage sub-topic has its own set of factors, which are set out in great detail in the Design Manual.

Table 2 Factors in the Assessment of the Magnitude of Impacts

Factors in the Assessment of Magnitude of Direct Impacts	
Major	Change to most or all key cultural heritage elements, such that the resource is totally altered.
Moderate	Changes to many key cultural heritage elements, such that the resource is clearly modified.
Minor	Changes to key cultural heritage elements, such that the asset is slightly altered or different.
Negligible	Very minor changes to cultural heritage elements.
No Change	No change.

The significance of the impact of a development on a particular cultural heritage asset is then established from the matrix (Table 3) also taken from the DMRB (2007).

Table 3 Matrix for Assessing the 'Significance' of Direct Impacts of the Proposed Development upon Cultural Heritage Assets

Magnitude of Impact	**Value/Sensitivity of Cultural Heritage Asset**				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Major	Very Large	Large/ Very Large	Moderate/ Large	Slight/ Moderate	Slight
Moderate	Large/Very Large	Moderate/ Large	Moderate	Slight	Neutral/ Slight
Minor	Moderate/ Large	Moderate/ Slight	Slight	Neutral/ Slight	Neutral/ Slight
Negligible	Slight	Slight	Neutral/ Slight	Neutral/ Slight	Neutral
No change	Neutral	Neutral	Neutral	Neutral	Neutral

No detailed guidelines specific to an assessment methodology of the indirect effects on the setting of a designated feature have been produced by Cadw or other national agencies in Wales, as far as can be established. The methodology adopted here, therefore, utilises the Guide to Good Practice for Assessing Landscapes of Historic Interest (ASIDOHLs) produced by Cadw and CCW in conjunction with ICOMOS UK (Cadw 2003). These guidelines were developed to promote good practice in the use of the two volumes of the Register of Landscapes of Historic Interest in Wales (Cadw 1998 and Cadw 2001). The guidelines are concerned primarily with historic landscapes rather than specific historic features, which represent elements of those landscapes. Nevertheless, some aspects of the ASIDOHL process can be usefully adopted. Specifically, the section on the assessment of indirect visual effects (Cadw 2003, 21) offers useful guidance in the assessment of impacts on historic features that are on, or at some distance from, the Development Area.

In assessing the significance of indirect effect, the previous matrix set out in Table 3 is useful, although guidance on its effective use provided by the DMRB (2007) is less expansive for indirect visual impacts than for direct impacts. It should be noted that because the cultural heritage assets considered here are all designated as being of national importance, their value/sensitivity is automatically classed as high.

The Cultural Heritage Baseline

Desk-top and Field Methodology

The routes for the access track and pipeline have been determined by Cambrian Hydro Power Ltd and a corridor of 50m on either side of these routes defines the search area for all cultural heritage assets for the assessment of direct impacts. The defined routes are depicted on Figure 1.

The desk-based study, which forms the basis for this assessment of the area, involved the examination of readily available written, cartographic, and aerial photographic sources held in the following repositories:

1. The National Library of Wales (NLW) in Aberystwyth.
2. The National Monument Record (NMR), a department of the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW), also in Aberystwyth.

3. A search was made for the study area using *Archwilio*, the online access system to the Historic Environment Records (HERs) of Wales. A subsequent enquiry to regional Historic Environment Record, curated by the Dyfed Archaeological Trust, confirmed that no further data was available for the study area.

The desk-based study was followed by a field visit which examined the route corridors for the access track and pipeline in order to identify any previously unrecorded cultural heritage features and to assess known features. Sites found during the field visits were located to the Ordnance Survey's national grid using hand-held global positioning system equipment (GPS) and were described and photographed as appropriate.

Data on scheduled ancient monuments and listed buildings derived from digital data circulated by Cadw, the Welsh Assembly Government's historic environment service, was also examined, and informed both the assessment of potential direct impacts, and the separate assessment of indirect impacts.

Information and advice was also sought from the following regarding the history, significance and potential impact of the development on the cultural heritage: Polly Groom of Cadw; and Robert Protheroe-Jones of National Museum Wales.

The Cultural Heritage History of the Cwmystwyth

Cwmystwyth is perhaps the most important non-ferrous metal mining site in and contains evidence for mining activity over an extremely long time period from the Bronze Age onwards, with the first documentary reference in 1535. It was last worked in 1939-40. A detailed history of the mine is provided by Simon Hughes (1981). This is an extremely complex mining landscape and evidence for successive workings have been elucidated by a series of studies, including those by Robert Protheroe Jones for the Dyfed Archaeological Trust and by the Royal Commission on the Ancient and Historical Monuments in Wales (RCAHMW), who also funded surveys in the surrounding area as part of their Uplands Initiative. Investigations by the Early Mines Research Group on Copa Hill, at the eastern end of the workings, identified opencast workings on the Comet Lode which have been dated to the Bronze Age (Timberlake and Mighall 1992).

Aerial reconnaissance by RCAHMW has been particularly useful in identifying a series of leats and water channels associated with a process known as hushing, whereby water is used to wash away overlying deposits to reveal the mineral veins. This can be used as a means of extraction, although at Cwmystwyth the evidence suggests that it was also used for prospecting and there is even a reference to this process in 1788. Although the most obvious evidence for hushing is on Copa Hill there is now clear evidence for a system of channels at the western end of the workings in an area known as the Kingside Mine and Pugh's Mine (Hughes 1994), through which the pipeline route will pass.

Both Llyn Isaf and Llyn Uchaf were deepened in the mid 19th century and used to supply water to the mine workings. It has been proposed that a section of the pipeline should be laid within the bed of an existing leat, a feature which is depicted by the Ordnance Survey in 1905, but not before. The leat appears to have been constructed between 1890 and 1900 and was used by the Cwmystwyth Mining Co Ltd to provide water to a turbine and compressor powering their new dressing mill which was primarily hydraulically powered. There is a sluice at the end of the leat (SN8012574991) from where the water was piped to a second sluice (SN8002574850) before descending steeply in a pipe to the compressor house (Hughes 1981, 33).

Apart from mining activity there is also evidence for peat cutting on the upland plateau and at least some of the many trackways which cross the area could be associated with peat extraction, although others may be associated with mining. The proposals include a new access track which would largely follow the course of some of these tracks, most of which are depicted by the Ordnance Survey in 1888.

The Baseline Assessment

Cultural Heritage Assets within 100m of the proposed access track and pipeline

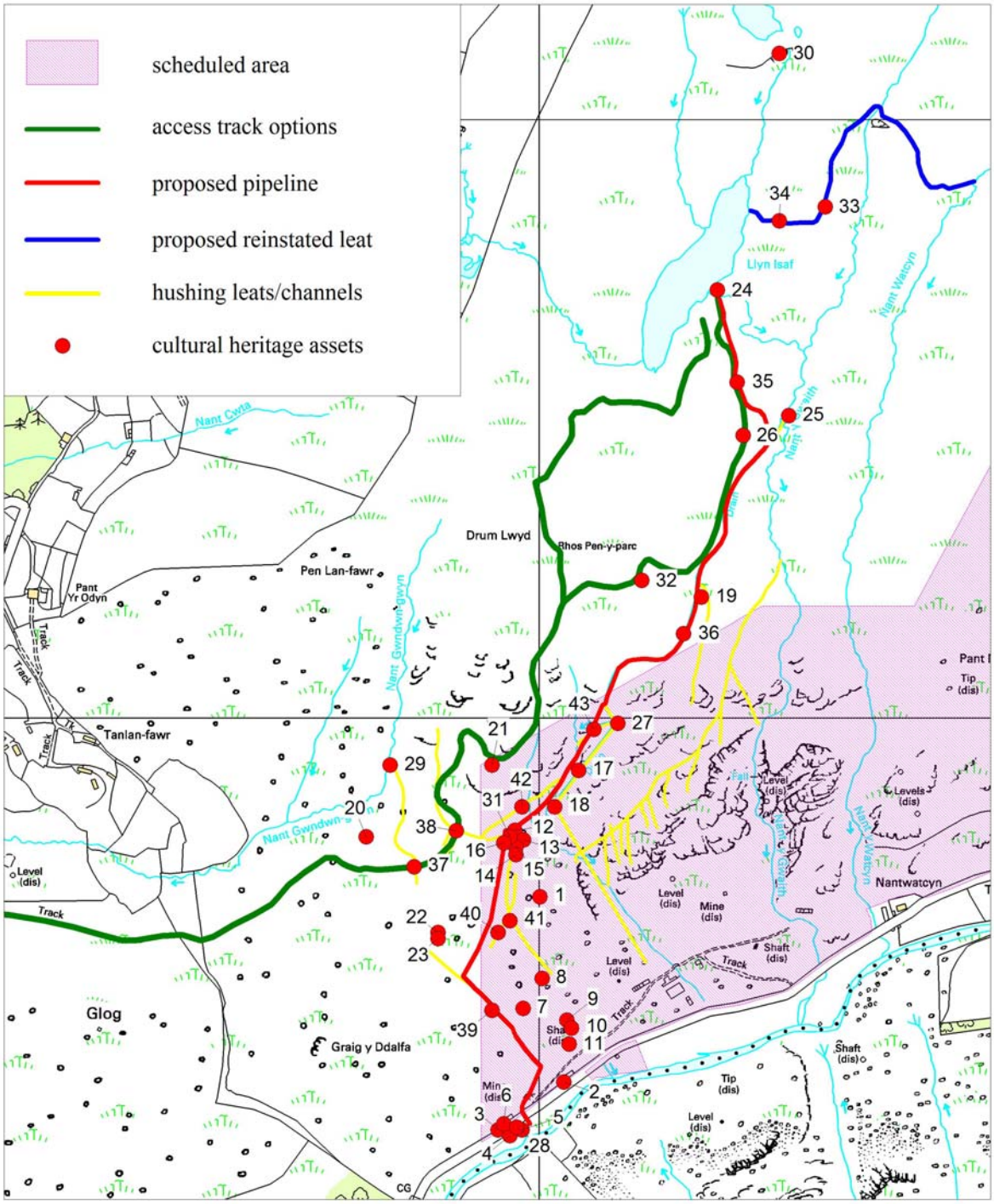
There is one scheduled monument within 100m of the proposed routes, Copa Hill/Cwmystwyth Lead, Copper and Zinc Mines (SAM CD145), but no listed buildings, Registered Parks and Gardens or Conservation Areas. In total, 43 assets have to date been identified within 100m of the pipeline and access track.

The assets are tabulated below, where they are listed and identified by Site Numbers which have been assigned for ease of reference, followed by further descriptive information on each. Here, brief information regarding each asset includes its perceived value within the classification system described above in Table 1 and mapped on Figs 1 and 2. The area in question is an important mining landscape and for this reason many of the assets have been assessed as being of high or medium value as a result of their importance to the landscape as a whole. All assets within the scheduled area automatically merit high value because of their designated status.

Table 4 Known Cultural Heritage Assets within 100m of the Development Area

Site No.	Name	NGR	Site Type	Period	Value
1	Pen Trefach	SN8000074700	Hushing	Post Medieval	High
2	Old Place	SN8004074390	Mine barracks	Post Medieval	High
3	Neville Place Garden I	SN7993074310	Garden	Post Medieval	High
4	Neville Place Garden II	SN7995074300	Garden	Post Medieval	Low
5	Neville Place Garden III	SN7997074310	Garden	Post Medieval	Low
6	Neville Place	SN7994074320	Mine barracks	Post Medieval	High
7	Craig y Ddalfa adit	SN7997274513	Level	Post Medieval	High
8	Raw's adit	SN8000474563	Level	Post Medieval	High
9	Pugh's shaft	SN8004574493	Shaft	Post Medieval	High
10	Pugh’s Shaft structure	SN8005374480	Structure	Post Medieval	High
11	Pugh's shaft tip	SN8004974453	Spoil tip	Post Medieval	High
12	Cwmystwyth Mine	SN7995874811	Hushing	Post Medieval	High

			channel		
13	Pentrefach mine	SN7997374795	Level	Post Medieval	High
14	Graig y Ddalfa trial working I	SN7996074770	Trial working	Post Medieval	High
15	Cwmystwyth Mine	SN7996074783	Shaft	Post Medieval	High
16	Graig y Ddalfa trial working II	SN7994074790	Trial working	Post Medieval	High
17	Graig y Ddalfa pipeline	SN8006574911	Pipeline	Post Medieval	High
18	Rhos Pen-y-parc sluice I	SN8002574850	Sluice	Post Medieval	High
19	Cwmystwyth Mine	SN80277520	Waste tips	Post Medieval	Low
20	Nant Gwndwn-Gwyn hut	SN79717480	Deserted rural settlement	Medieval	Medium
21	Drum Lwyd Peat Stand	SN79927492	Peat stand	Post Medieval	Low
22	Graig y Ddalfa leat I	SN79837464	Leat	Post Medieval	Medium
23	Graig y Ddalfa Reservoir	SN79837463	Reservoir	Post Medieval	Medium
24	Llyn Isaf dam	SN8029775714	Dam	Post Medieval	Medium
25	Rhos Pen-y-parc sluice I	SN8041675504	Sluice	19th century	Medium
26	Rhos pen-y-parc building	SN8034075471	Building	19th century	Medium
27	Rhos Pen-y-parc sluice II	SN8013074990	Sluice	19th century	High
28	Neville Place building	SN7996174314	Building	Post Medieval	Medium
29	Nant Gwndwn-Gwyn reservoir	SN79777485	Reservoir	Post Medieval	Medium
30	Llyn Uchaf Dam	SN80407611	Dam	19th century	Medium
31	Trefach Reservoir	SN7995074800	Reservoir	Post Medieval	Medium
32	Rhos Pen-y-parc trial working	SN8017075228	Trial working	Post Medieval	Low
33	Nant y Gwaith Platform	SN8047775853	Platform	Post Medieval	Medium
34	Nant y Gwaith leat I	SN80407583	Leat	Post Medieval	Medium
35	Llyn Isaf Leat	SN80337556	Leat	Post Medieval	Medium
36	Nant y Gwaith leat II	SN80247514	Leat	Post Medieval	Medium
37	Graig y Ddalfa Hushing leat I	SN79797475	Leat	Post Medieval	Medium
38	Graig y Ddalfa Hushing leat II	SN79867481	Leat	Post Medieval	Medium
39	Graig y Ddalfa Hushing Channel I	SN79927451	Hushing channel	Post Medieval	High
40	Graig y Ddalfa Hushing leat III	SN79937464	Leat	Post Medieval	High
41	Graig y Ddalfa Hushing leat IV	SN79957466	Hushing channel	Post Medieval	High
42	Graig y Ddalfa Hushing leat V	SN79977485	Leat	Post Medieval	High
43	Graig y Ddalfa Hushing Channel II	SN90097498	Hushing channel	Post Medieval	High



Based on Ordnance Survey 1:10,000 mapping provided by Cambrian Hydro Power Ltd and scheduled ancient monument data provided by Cadw.

Fig. 1 The proposed pipeline and access track options and known cultural heritage assets, 1:10,000

1 Pen Trefach SN8000074700
This system of hushings lies on the hillside above Pugh's mine. The principal elements of the area are: a series of interconnecting leats; a water collection tank; and two prospecting trenches; two mine shafts with their associated spoil mounds.

Fig. 2 View eastwards towards the area of Pen Trefach mine showing some of the leats and the line of the high pressure pipeline (Site 17)

2 Old Place SN8004074390
Former mine barracks known as 'Old Place'. Now demolished to sub-basement level and infilled with rubble. The large block of houses, which post-date 1886, was originally four-storeys high with walls of local rubble stone.

3 Neville Place Garden I SN7993074310
Two former garden areas which abut the south-west end of Neville Place and slope south-east towards the road. Both are rectangular and were originally bounded by stone walls.

4 Neville Place Garden II SN7995074300
A small field directly opposite Neville Place, originally bounded by a low wall.

5 Neville Place Garden III SN7997074310
Garden area to the east of Neville Place, surrounded by the remains of stone walls. The proposed turbine house would be constructed within this enclosure with the pipeline, outfall and access breaching the enclosure banks.

6 Neville Place SN7994074320
Former mine barracks comprising four terraced houses.

7 Craig y Ddalfa adit SN7997274513
A run-in adit and tip cascade termed 'Graig y Ddalfa adit' by Hughes 1981.

8 Raw's adit SN8000474563
A stone arched, small, open adit with a large cascade of spoil down the hillside below (Protheroe Jones 1993, Mine no.182, Site no.9).

9 Pugh's shaft SN8004574493
A run-in working with the remains of a masonry angle bob pit on the east side but no sign of other structures (Protheroe Jones 1993, Mine no.182, Site no.27).

10 Pugh's Shaft Structure SN8005374480
A small building depicted on the Ordance Survey 1st edition 25" map of 1888 immediately below Pugh's Shaft.

11 Pugh's shaft tip SN8004974453
An area of waste tips depicted on the Ordance Survey 1st edition 25" map of 1888 below Pugh's Shaft.

12 Cwmystwyth Mine SN7995874811
A small hush channel (Protheroe Jones 1993, Mine no.182, Site no.87).

13 Pentrefach mine SN7997374795
A grassy run-in level. Termed 'Pentrefach Mine' by S.J.S. Hughes (Protheroe Jones 1993, Mine no.182, Site no.12) recorded within Cwmystwyth lead mine. Thought to date to *c*.1700 by SJS Hughes.

14 Graig y Ddalfa trial working I SN7996074770
A grassy trial trench recorded within Cwmystwyth lead mine (Protheroe Jones 1993, Mine no.182, Site no.10).

15 Cwmystwyth Mine SN7996074783
Two grassy, collapsed trial pits recorded within Cwmystwyth lead mine (Protheroe Jones 1993, Mine no.182, Site no.11).

16 Graig y Ddalfa trial working II SN7994074790
Grassy trial trench recorded within Cwmystwyth lead mine (Protheroe Jones 1993, Mine no.182, Site no.10).

17 Graig y Ddalfa pipeline SN8006574911
Route of a high pressure pipeline taking water from Nant y Gwaith and Llyn Isaf to drive a turbine and compressor which provided power for the lead processing mill constructed by the Cwmystwyth Mining Co Ltd around 1900. The route is well marked by minor earthworks, rock cuttings and fragments of steel pipes.

18 Rhos Pen-y-parc sluice II SN8002574850
Masonry sluice box at the head of the high pressure section of pipeline (Hughes 1994, 50; fig. 3).

19 Cwmystwyth Mine SN80277520
A large development tip from Herbert's Adit (Protheroe-Jones 1993, Mine no.182 centre, Site no.125; Hughes 1994, 50; fig. 3).

20 Nant Gwndwn-Gwyn hut SN79717480
Terraced platform measuring 8m by 5m with the earthwork outline of a building measuring 7m by 4m visible on it. Wall bases of the building are *c*. 1m wide and less than 0.2m high (Sambrook and Hankinson 2001).

21 Drum Lwyd Peat Stand SN79927492
A group of four stone-revetted peat drying platforms (Sambrook and Hankinson 2001).

22 Graig y Ddalfa leat I SN79837464
A leat which runs from a stream source north of Craig y Ddalfa and appears to feed a hushing pond (Site 23) (Sambrook and Hankinson 2001).

23 Graig y Ddalfa reservoir SN79837463
A small reservoir surviving as a depression measuring 15m by 11m and defined by a curving earth dam on its southern side. The dam is *c*.12m long and up to 1m high. Appears to have been fed by a leat approaching from the north (Site 22) (Sambrook and Hankinson 2001).

24 Llyn Isaf dam SN8029775714
The dam at Llyn Isaf, measuring approximately 45m by 10m, and with an overflow sluice at its south-west end.

25 Gwndwn-gwyn level SN7911574131
Mine level depicted on the 1st edition Ordnance Survey 25" mapping of 1888.

26 Rhos Pen-y-parc sluice I SN8041675504 Sluice
Sluice at the start of a major leat/pipeline taking water from the Nant y Gwaith stream. Depicted on the 2nd edition Ordnance Survey 25" mapping of 1905, but not on the 1st edition mapping of 1888.

27 Rhos Pen-y-parc sluice II SN8013074990
A sluice at the end of a major leat/pipeline taking water from the Nant y Gwaith stream. Depicted on the 2nd edition Ordnance Survey 25" mapping of 1905, but not on the 1st edition mapping of 1888 (Hughes 1994, 50; fig. 3).

28 Neville Place building SN7996174314
A building on the opposite side of the road to Neville Place, depicted on the 2nd edition Ordnance Survey 25" map of 1905.

29 Nant Gwndwn-Gwyn reservoir SN79757492
A small reservoir feeding hushing leat Site 37 (Hughes 1994, 50; fig. 3).

30 Llyn Uchaf Dam SN80407611
Earth and stone dam, now breached.

31 Trefach Reservoir SN7995074800
A small reservoir with an earth and stone bank initially identified by S. Hughes in 1993 and fed by a series of leats. Associated with the hushing system in the area of Pentrefach Mine (Hughes 1994, 50; fig. 3).

Fig. 3 Trefach Reservoir (Site 31) from the north-east also showing some of the leats and trial workings (Sites 15, 16 and 38)

Fig. 4 Rhos Pen-y-parc trial working (Site 32)

32 Rhos Pen-y-parc trial working SN8017075228
An area of spoil, including numerous quartz boulders, surrounding a circular trial working.

33 Nant y Gwaith Platform SN8047775853
A rectangular levelled platform along the eastern side of a leat (Site 34), measuring around 5m by 2.5m.

Fig. 5 Nant y Gwaith platform Site 33 with the leat (Site 34) immediately to the left

34 Nant y Gwaith leat SN80407583
Earthwork leat contouring the slopes between Nant Watcyn, Nant y Gwaith and Llyn Isaf.

35 Llyn Isaf Leat SN80337556 Leat
The upper section of a substantial leat constructed to supply water from Llyn Isaf to the compressor and dressing plant in the valley floor. See also Site 36.

Fig. 6 Nant y Gwaith leat II

36 Nant y Gwaith leat II SN80247514
A substantial leat constructed to supply water from Nant y Gwaith to the compressor and dressing plant in the valley floor, and also fed by water from Llyn Isaf via another leat (Site 35). It has been proposed to reuse the leat as the route for the pipeline, burying the pipe in the base of the leat.

37 Graig y Ddalfa Hushing leat I SN79797475
Earthwork leat supplying the hushing system in the area of Pentrefach Mine. The leat has been cut by a 19th-century track, the route of which will be followed by the new access track (Hughes 1994, 50; fig. 3).

Fig. 7 Hushing leat Site 37 at the point where it is cut by the 19th-century track

38 Graig y Ddalfa Hushing leat II SN79867481
Earthwork leat supplying the hushing system in the area of Pentrefach Mine. The leat has been cut by a 19th-century track, the route of which will be followed by the new access track (Hughes 1994, 50; fig. 3).

39 Graig y Ddalfa Hushing Channel I SN79927451
Linear hushing channel, possibly associated with Sites 22 and 23. The proposals include the resuse of this channel for the route of the pipeline as it descends to the valley floor.

Fig. 8 Graig y Ddalfa Hushing Channel I

40 Graig y Ddalfa Hushing leat III SN79937464
Earthwork leat supplying the hushing system in the area of Pentrefach Mine.

41 Graig y Ddalfa Hushing leat IV SN79957466
Earthwork leat supplying the hushing system in the area of Pentrefach Mine (Hughes 1994, 50; fig. 3).

42 Graig y Ddalfa Hushing leat V SN79977485
Earthwork leat supplying the hushing system in the area of Pentrefach Mine.

43 Graig y Ddalfa Hushing Channel II SN80097498
An obvious linear channel descending from the end of a leat, Site 36, to a small stream.

Designated Cultural Heritage Assets within 2 Kilometres of the Development Area

The identification of designated assets within 2km of the Development Area is based on information provided by Cadw and also utilises the several parts of the published Register of Landscapes, Parks and Gardens. All nationally designated assets are automatically considered to be of **high** value (see Table 1).

Each of these designated assets was assessed to establish whether there is likely to be any indirect, visual impact as a result of the proposed pipeline and access track.

Table 5: Scheduled Ancient Monuments within 2km of the Development Area

Number	Name	Type	Period	NGR
CD145	Copa Hill/Cwmystwyth Lead, Copper and Zinc Mines	Mine	Multiperiod	SN806749

There are no grade I or grade II* listed buildings within 2km.

One registered garden, Hafod lies at a distance of 1.6km from the western end of the access track. The developments lies within the Upland Ceredigion historic landscape area.

Historic Hedgerows

The proposed development lies within an unenclosed upland landscape which contains no hedgerows.

LANDMAP

The proposed development falls within two character areas, both of which are considered to have outstanding value.

Table 6: LANDMAP areas

LANDMAP Historic Landscape Aspect Area	Name	Value
CRDGNCL036	Lead Mining Landscapes	Outstanding
CRDNGCL028	Upland	Outstanding

Summary description of CRDGNCL036 Lead Mining Landscapes:

> 'Lead mines which were worked in Prehistory and which were active again from the 18th century. By the Victorian period the Cardiganshire lead field was one of the most productive in the UK but few mines remained active into the 20th century. Organisations such as Ysbryd y Mwynwyr, the Welsh Mines Preservation Trust and the Welsh Mines Society are dedicated to restoring individual mine features and a sense of community pride, with the assistance of the County Council.'

Summary description of CRDNGCL028 Upland:

> Part of the Northern Ceredigion Historic Landscape, the western slope of Plynlimon/Pumlumon Fawr, affording views to the south and south-west over Cardigan Bay. Historic character has

been partly effaced by the Mynydd Gorddu wind-farm. The area includes the settlement of Bont Goch/Elerch, where houses were noted as being (appropriately) rebuilt.

Palaeoenvironmental Potential

It is evident that the plateau which is crossed by both the pipeline and access track contains extensive areas of peat bog and although the depth of deposits is currently unknown there is likely to be considerable palaeoenvironmental potential.

Assessment of Impacts

Project Description

The project is described in detail elsewhere within of the Environmental Statement. It is sufficient to say here that the scheme involves the construction of a pipeline extending for 1.7km from Llyn Isaf to the floor of the Ystwyth valley. For the most part the pipe would be buried within an existing leat, although part of the lower section would be visible, laid largely within the bed of a former hushing channel. The scheme also includes the construction of a 2m-wide access track which in general follows the line of a 19th-century trackway, although there are currently two options under consideration for the upper section of the track, one of which would diverge from the earlier route. In addition, there are also limited works to an existing leat linking Nant y Gwaith and Nant Watcyn with Llyn Isaf, together with works on the dam at Llyn Uchaf.

Assessment of Impacts

Impacts on the cultural heritage resource may arise from a variety of sources at any or all stages in the life-cycle of the development. For the purposes of this assessment, the terminology follows that laid out in the DMRB, Volume 11 Section 3 Part 2, HA 208/07), page 4/2. Short-term temporary impacts are those associated with the construction and decommissioning periods and are reversible. Long-term temporary impacts are those lasting more than 15 years but are still reversible, and are thus associated with the operational life of the development. Permanent impacts are irreversible.

Where an impact is identified, an assessment is made of its significance. In the context of this development, all impacts on cultural heritage assets are considered adverse, in other words no beneficial effects on the cultural heritage resource arising from the development have been identified.

Sources of Impact

Pre-construction Site Investigation Work

At the time of writing the extent of any pre-construction site investigation works is uncertain, although there may be some limited investigation of the foundations for the dam at Llyn Isaf.

Construction Impacts

The potential impacts of ground disturbance associated with intrusive elements of the proposed development – the access road, pipeline and turbine house – will be taken into account in the site design process.

Operational Impacts

No obvious direct impacts relating to the operation of the proposed hydro-electric scheme have been identified during the preparation of this study and the direct operational impact is considered to be Neutral.

Decommissioning Impacts

No obvious decommissioning impacts can be recognised at this time, but in view of the timespan involved, coupled with the potential for changes in working practices and technology, this issue must be re-assessed before the decommissioning phase commences.

Identified Impacts

The identified potential physical impacts on cultural heritage assets lying within 100m of the proposed access track and pipeline are listed in Table 7. For ease of reference each asset has been assigned a Site Number as already described above. This is shown in the table together with the type of the asset, its value and the predicted magnitude of the impact before mitigation, and the nature of the impact. At the time of writing a single borrow pit was proposed at SN 7999874982, which lies outside the scheduled area and would not impact on any known assets. There was, however, no information available regarding the potential for any associated infrastructure works and ground investigation works.

In the table, the magnitude of impact before mitigation is an assessment of the impact that could occur if a site were damaged during the construction process, either through the construction process itself or through gaining access.

Table 7: Identified Physical Impacts

Site No.	Asset Type	Value of Asset	Magnitude of impact before mitigation	Impact Type
1	Hushing	High	No change	Pipeline
2	Mine barracks	High	No change	Pipeline
3	Garden	High	No change	Pipeline
4	Garden	Low	No change	Pipeline
5	Garden	Low	Major	Pipeline
6	Mine barracks	High	No change	Pipeline
7	Level	High	No change	Pipeline
8	Level	High	No change	Pipeline
9	Shaft	High	No change	Pipeline
10	Structure	High	No change	Pipeline
11	Spoil tip	High	No change	Pipeline
12	Hushing channel	High	Minor	Pipeline
13	Level	High	No change	Pipeline
14	Trial working	High	No change	Pipeline
15	Shaft	High	No change	Pipeline
16	Trial working	High	Moderate	Pipeline
17	Pipeline	High	No change	Pipeline
18	Sluice	High	No change	Pipeline
19	Waste tips	Low	No change	Pipeline
20	Deserted rural settlement	Medium	No change	Access track
21	Peat stand	Low	Moderate	Access track
22	Leat	Medium	No change	Pipeline
23	Reservoir	Medium	No change	Pipeline
24	Dam	Medium	Moderate	Pipeline
25	Sluice	Medium	No change	Pipeline
26	Building	Medium	Major	Access track
27	Sluice	High	No change	Pipeline

28	Building	Medium	No change	Pipeline
29	Reservoir	Medium	No change	Access track
30	Dam	Medium	Moderate	Pipeline
31	Reservoir	Medium	Major	Pipeline
32	Trial working	Low	Moderate	Access track
33	Platform	Medium	Moderate	Pipeline
34	Leat	Medium	Major	Pipeline
35	Leat	Medium	Major	Pipeline
36	Leat	Medium	Major	Pipeline
37	Leat	Medium	Minor	Access track
38	Leat	Medium	Minor	Access track
39	Hushing channel	High	Moderate	Pipeline
40	Leat	High	Major	Pipeline
41	Hushing channel	High	Major	Pipeline
42	Leat	High	No change	Pipeline
43	Hushing channel	High	Minor	Pipeline

The main direct impacts which are likely to result from the scheme affect a number of leats which it is proposed to reuse for the pipeline route. A narrow trench would be mechanically excavated below the base of each leat and following the insertion of the pipe the spoil would be reinstated and, where possible, turf would be relaid. Apart from excavating the base of the leats it is also likely that there would be some minor disturbance to the structure of the leats and the surrounding area.

The site of the turbine house lies within one of the garden enclosures (Site 5) opposite Neville Place and construction works would inevitably impact on this feature.

Assessment of Indirect Effects

The following section summarises the predicted indirect effects on the setting of statutorily designated and registered cultural heritage assets within 2km of the proposed hydro-electric scheme.

Useful guidance on the assessment of setting is provided by the consultation draft of *the Setting of Heritage Assets: English Heritage guidance* (English Heritage 2010). Although this is only applicable to England there is no Welsh equivalent so that the document provides the only guidance currently available. In defining setting and its relationship to character, context and curtilage the document makes reference to *Planning Policy Statement 5: Planning for the Historic Environment (PPS5),* which defines setting as:

> The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral.
>
> The *Historic Environment Planning Practice Guide* supporting PPS 5 provides further guidance as follows (with the relevant paragraph numbers cited).
>
> (113): Setting is the surroundings in which an asset is experienced. All heritage assets have a setting, irrespective of the form in which they survive and whether they are designated or not. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance, or may be neutral.

(114) The extent and importance of setting is often expressed by reference to visual considerations. Although views of or from an asset will play an important part, the way in which we experience an asset in its setting is also influenced by other environmental factors such as noise, dust and vibration; by spatial associations; and by our understanding of the historic relationship between places. For example, buildings that are in close proximity but not visible from each other may have a historic or aesthetic connection that amplifies the experience of the significance of each. They would be considered to be within one another's setting.

(115) Setting will, therefore, generally be more extensive than curtilage, and its perceived extent may change as an asset and its surroundings evolve or as understanding of the asset improves.

(116) The setting of a heritage asset can enhance its significance whether or not it was designed to do so. The formal parkland around a country house and the fortuitously developed multi-period townscape around a medieval church may both contribute to the significance.

(117) The contribution that setting makes to the significance does not depend on there being public rights or an ability to access or experience that setting. This will vary over time and according to circumstance. Nevertheless, proper evaluation of the effect of change within the setting of a heritage asset will usually need to consider the implications, if any, for public appreciation of its significance.

Scheduled Ancient Monuments (Fig. 9)

CD145 Copa Hill/Cwmystwyth Lead, Copper and Zinc Mines SN806749

The proposed pipeline route lies within the scheduled area for around half of its length (0.8km), although for all but 0.16km of this it will be buried, largely within existing 18th- and 19th-century leats so that following reinstatement the visual impact should be **neutral**. Only 0.16km of the pipeline will be visible in the section which descends towards the floor of the Ystwyth valley. Here, the pipe will be laid on the bed of a former hushing channel and although its sides will be masked by earth and stone, the top of the pipe will be visible. This would be an obvious linear feature which would be relatively prominent, at least within the immediate area. However, the visual impact would be lessened to a degree by its positioning within an existing linear channel in an area which already contains prominent man-made features associated with mining activity and the visual impact is therefore considered to be at most **moderate**, decreasing to **minor** with distance.

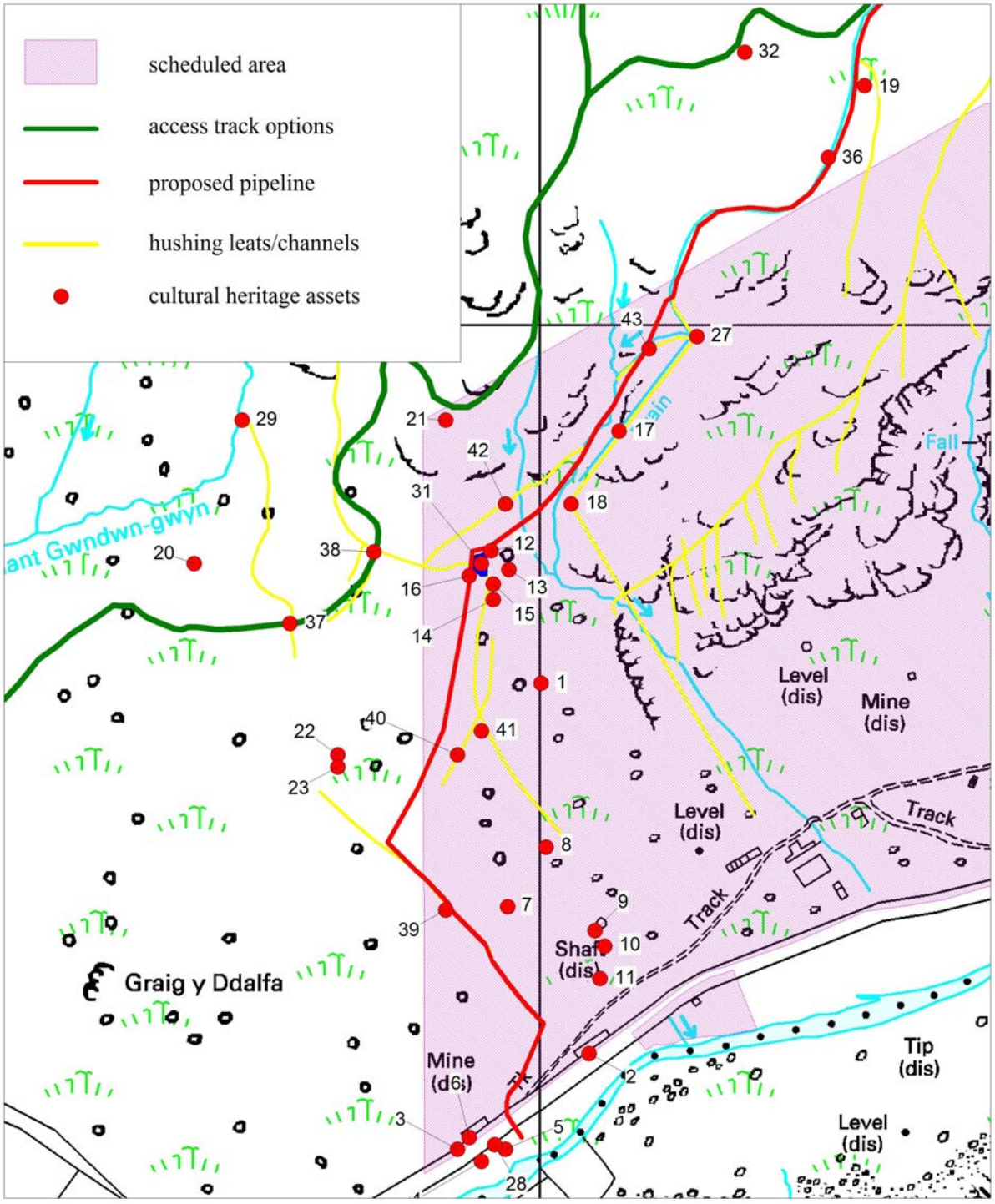
Only a very short section of the access track (50m) lies within the scheduled area, although around 1.5km of the 2.5km route is likely to be visible from the scheduled area at distances of up to 0.5km. The visual impact is therefore considered to be **moderate**, decreasing to **minor** with distance.

With regard to the setting of the monument it is clear that the principal landscape and archaeological features relating to this important mining landscape are situated on the south- and south-east-facing slopes of the Ystwyth valley and its is from within the valley that the main views of the site are gained, as well as from the opposite side of the valley. The pipeline itself will have only a slight impact on the setting, while that of the access track would be at most **moderate**, decreasing to **minor** with distance.

In summary, the predicted indirect impact of the scheme on the scheduled ancient monument and its setting is considered to be at most **moderate**, decreasing to **minor** with distance and the significance **moderate** to **slight**.

Listed Buildings

There are no higher grade listed buildings within 2km.



Based on Ordnance Survey 1:10,000 mapping provided by Cambrian Hydro Power Ltd and scheduled ancient monument data provided by Cadw.

Fig. 9 Cultural heritage assets within the scheduled area, 1:5,000

Registered Parks and Gardens

PGW (Dy) 50 (CER) Hafod
The former Hafod estate occupies a 5km-long stretch of the Ystwyth valley and is included in *The Register* (1995) as Grade I. Hafod is one of the most important and influential picturesque landscapes of the late 18th century in Britain. The estate was landscaped by Thomas Johnes in a style which has been dubbed the 'wilderness picturesque'. Although the mansion was demolished in 1958 and the character of the landscape altered by conifer plantations the natural landscape and the focal points within it remain largely unaltered.

The eastern extent of the park lies some 1.6km from the western end of the access track, although at its closest point the pipeline is over 2km away and the focus of the estate is also more than 2km from any part of the proposed scheme. The pipeline itself will be screened from the estate by local topography, while only a short section of the access track would be visible. None of the significant views are towards the development, which is at least partly screened from view by the topography and the potential effect registered area and its setting is considered to be **Minor** and the significance **Slight**.

Registered Landscapes

The proposed development lies within the Register Landscape of Upland Ceredigion (HLW (D) 2), a series of plateaux between 200m and 400m above OD, which are deeply dissected by the valleys of the Rivers Rheidol and Ystwyth and their tributaries. The whole area is rich in diverse and often visually dramatic evidence of land use and the exploitation of natural resources, from the prehistoric period to the present.

The pipeline extends for 1.6km through the historic landscape and for the majority of this (1.45km) it will be buried, largely within existing 18th- and 19th-century leats. Only 0.16km of the pipeline will be visible in the section which descends towards the floor of the Ystwyth valley. Here, the pipe will be laid on the bed of a former hushing channel and, although its sides will be masked by earth and stone, the top of the pipe will be visible.

The proposed access track extends for 2.5km, with a maximum width of only 2m. Although there are currently two options under consideration for the upper section, the indirect impact is likely to be the same for both routes. Whichever route option is chosen virtually the whole length will follow the line of 19th-century tracks which are currently turf-covered. The use of stone to resurface the tracks will inevitably mean that they are more prominent in the landscape than at present, particularly at a local level. However, the impact will decrease with distance, especially as the route follows the valley of Nant Gwndwn-gwyn and then leads into the hollow of Rhos Pen-y-parc so that from the Ystwyth valley in particular the route will not be visible. The potential effect on the landscape as a whole is considered to be **Minor** and the significance **Slight**.

Summary

In summary one designated asset has been identified where the magnitude of visual impact is judged to be **Moderate** to **Minor**, and two where it is **Minor**. The significance of that visual impact, based on Table 3 and with the requirement that all nationally designated assets are of high value, is thus assessed as **Moderate** or perhaps **Slight** in one instance and **Slight** in two instances.

Palaeoenvironmental Areas

There will inevitably be some disturbance to peat deposits during the construction the pipeline and access track, although the construction methods proposed for the latter have been designed to cause minimum impact.

Detailed Mitigation Measures & the Identification of Residual Impacts

Introduction

The proposed hydro-electric scheme extends over a relatively small tract of countryside and a number of sites of cultural heritage interest (assets) have been identified adjacent to the access road and pipeline routes.

In the light of the assessment above, this section provides a description of the measures adopted to mitigate the identified impacts on cultural heritage assets, together with a consideration of the residual effects of the development on cultural heritage assets.

Mitigation strategy

It is accepted that cultural heritage assets represent a non-renewable resource, and should be avoided wherever this is feasible in order to avoid damage or destruction. A preferred route for the pipeline and its infrastructure would be one that avoided every single asset that collectively form the cultural heritage resource of the Development Area.

The purpose of mitigation is to avoid or reduce any adverse impacts that might result from the proposed development on the cultural heritage resource. The main strategy for minimising impacts from the scheme is avoidance, through careful planning, design and routeing. Where an impact is unavoidable, the reduction of that impact on the cultural heritage asset necessitates detailed consideration of the site characteristics and the introduction of specific measures designed to limit the impact. These are addressed in the section that follows. Residual impacts are those which remain after mitigation has been put in place.

Mitigation options

The following standard archaeological terms are used as recommended mitigation measures, though not all of them will necessarily be relevant to the current proposal:

> *Preservation in situ*: where a site is considered to be of sufficient significance it may be considered appropriate to preserve the site in its present form, condition and location. This may be achieved during primary design and by layout finalisation, after detailed site survey. Where complete avoidance can be achieved, any impact can be totally avoided.
>
> *Preservation by record*: where proposals will inevitably lead to the loss of a site sufficient recording should be undertaken to provide a full, accurate and permanent record of its nature, form, significance and dating.
>
> Preservation by record can take a number of forms, depending on the nature of the site in question, and may be achieved with or without excavation and could include any or all of the following: a written record; drawn record; photographic record; artefactual record; survey; and environmental sampling. Unless guidance is requested jointly from the client and archaeological curator, the level of detail required for preservation by record in any specific instance is a decision for the local authority's archaeological advisor to make rather than the writers of this report.
>
> *Excavation*: where a feature of local or minor significance is to be wholly removed as part of the development, its complete excavation may be required in advance of any construction works.

Evaluation: where insufficient information exists regarding a site for a decision to be made regarding its future management a programme of investigative work may be proposed. Such investigation may include geophysical survey, topographical survey and trial excavation.

Watching brief: a watching brief may be recommended to include archaeological monitoring of all relevant groundworks, including topsoiling, in order to identify and record any previously unknown archaeological remains which may be revealed. Sufficient time must be allowed for adequate recording of any remains that are encountered, and in the case of assets considered to be of medium, high or very high value, their continuing preservation may need to be considered by the archaeological curator in conjunction with the developer.

Demarcation: features that are close to planned works or that could be affected by unplanned works should be fenced in advance of the work and monitored (during the watching brief) during the construction phase. Close here is defined as within 50m of the perimeter or boundary of the asset.

Protection: the use of a membrane may be appropriate to protect certain assets from damage during the construction or operational phases.

Mitigation Measures – Direct Impacts within the Development Area

Of the 43 assets identified within 100m of the proposed scheme, 24 are considered to be unaffected. For the remaining 19 assets a mitigation strategy is proposed below.

Table 11: Mitigation for Identified Impacts within the Development Area

Site no	Asset type	Value of Asset	Impact type	Mitigation	Magnitude of impact after mitigation	Significance
5	Garden	Low	Pipeline	Watching brief	Major	Slight
12	Hushing channel	High	Pipeline	Watching brief	Minor	Slight
16	Trial working	High	Pipeline	Avoidance/ demarcation	No change	Neutral
21	Peat stand	Low	Access track	Avoidance/ demarcation	No change	Neutral
24	Dam	Medium	Pipeline	Watching brief		
26	Building	Medium	Access track	Avoidance/ demarcation	No change	Neutral
30	Dam	Medium	Pipeline	Watching brief		
31	Reservoir	Medium	Pipeline	Avoidance/ demarcation	Minor	Slight
32	Trial working	Low	Access track	Avoidance/ demarcation	No change	Neutral
33	Platform	Medium	Pipeline	Avoidance/ demarcation	No change	Neutral
34	Leat	Medium	Pipeline	Evaluation/ Watching brief	Minor	Slight
35	Leat	Medium	Pipeline	Evaluation/ Watching brief	Moderate	Moderate
36	Leat	Medium	Pipeline	Evaluation/	Moderate	Moderate

				Watching brief		
37	Leat	Medium	Access track	Avoidance/ demarcation	No change	Neutral
38	Leat	Medium	Access track	Avoidance/ demarcation	No change	Neutral
39	Hushing channel	High	Pipeline	Protection/ Watching brief	Minor	Slight
40	Leat	High	Pipeline	Watching brief	Moderate	Moderate
41	Hushing channel	High	Pipeline	Watching brief	Moderate	Moderate
43	Hushing channel	High	Pipeline	Watching brief	Minor	Slight

Positive mitigation is proposed for each of the assets listed above, which in the first instance takes the form of avoidance assisted by the demarcation of the site by fencing. This fencing should remain in place, and be renewed as necessary during the course of construction works. It can be removed after completion of the works.

In certain cases trial excavation, or evaluation, has been recommended to record the form and construction of leats prior to their reuse by the pipeline. The position of the evaluated sections will need to be agreed with Cadw and the regional archaeological curator before work commences. It is possible that sections of the leats could be excavated concurrent with the construction programme, rather than in advance.

There is a general recommendation for a watching brief to be undertaken during any significant groundworks, as well as during work in the vicinity of specific sites, as detailed above.

In addition, it is also recommended that for the section of the pipeline through the scheduled area a number of photo monitoring points are established to allow record photographs to be taken before, during and after construction as a means of monitoring the overall impact and the success, or otherwise, of reinstatement.

Palaeoenvironmental Potential

In addition to the known cultural heritage assets, some zones of peat deposits have been identified, although their depth and significance is currently not known. However, mitigation for these deposits is dealt with under the Ecology section of the Environmental Statement.

Residual Impacts

Residual impacts are those which will remain even after mitigation and in this instance would include all of the indirect, visual impacts.

Conclusions

A full cultural heritage study has been prepared for the proposed Llyn Isaf Hydro-electric Scheme, based on an assessment of all the available desk-top sources and integrated with a field survey of the proposed route for the pipeline and access track and selective examination of statutorily designated and registered cultural heritage assets within 2km of the site. The proposed mitigation measures include an the fencing off of cultural heritage assets where these lie close to elements of the proposed development, the excavation of trial sections across the principal leats affected by the scheme and a general watching brief during topsoil stripping and initial groundworks, particularly within the scheduled area.

The study indicates that communities have been using the general area from at least the Bronze Age in the third millennium BC and activity has continued, if intermittently and in different forms, through to the present day. The Development Area includes part of the nationally important mining landscape of Cwmystwyth, which has been designated as a scheduled ancient monument. This area, together with the 22 individual assets within it are therefore considered to be of high value. A further 16 sites are considered to be of moderate value and 5 of low value.

Mitigation measures are based on the underlying assumption that no identified archaeological site, regardless of its category, should be significantly disturbed unless this proves to be wholly unavoidable. Within the Development Area, potential physical impacts have been identified for 19 of these assets, although with the exception of the leats which are to be reused by the pipeline it should be possible to avoid the assets at the development stage by careful micro-siting.

Provided that the mitigation measures detailed in this section of the Environmental Statement are fully implemented, the impacts from the proposed development, both on known and unknown features, are predicted to be 'slight', and the potential significance of that impact is the same.

The visual impact of the proposed scheme on statutorily designated and registered cultural heritage assets around the Development Area has also been considered. In one instance the visual impact is considered to be moderate to slight, owing to the pipeline crossing part of a scheduled area. The impact on the Upland Ceredigion registered historic landscape is also considered to be minor as although the scheme is entirely within the landscape area it is only a small-scale development. The impact on the registered park and garden at Hafod is also considered to be minor.

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Cartographic Sources

1881 First edition Ordnance Survey 1:10,560 map (Cardiganshire 12SW and 12NW)

1888 First edition Ordnance Survey 1:2,500 map (Cardiganshire 12.10)

1905 Second Edition Ordnance Survey 1:2,500 map (Cardiganshire 12.10)

1906 Second edition Ordnance Survey 1:10,560 map (Cardiganshire 12SW and 12NW)

Aerial Photographs

RAF: CPE/UK/1873/6132 to 6135, dated 4 December 1946

RAF: CPE/UK/2095/2269-2270, dated 28 May 1947

RAF: CPE/UK/2095/4226-4269, dated 28 May 1947