

Metal Mine Strategy for Wales



Llywodraeth Cynulliad Cymru
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CONTENTS

EXECUTIVE SUMMARY	2		
1.0 INTRODUCTION	5	5.0 FUTURE ACTIONS AND RECOMMENDATIONS	22
1.1 Objectives	5	5.1 Groups 1 and 2 Actions	22
1.2 Who are the Stakeholders?	5		
1.3 Who Should Use this Strategy?	5	5.2 Group 3A Actions	22
2.0 BACKGROUND AND DRIVERS	6	5.3 Group 3B Actions	22
2.1 History	6	5.4 Group 4 Actions	22
2.2 Impact	6	5.5 Overarching Actions	23
2.2.1 Aquatic Environment	7	5.6 Timetable of Actions	23
2.2.2 Human Health	7		
2.2.3 Cost of Remediation	8		
		6.0 REFERENCES	24
2.3 The Environment Agency's Role and Regulations	8		
2.3.1 Water Quality- The Water Resources Act 1991 and the Environment Act 1995	8	APPENDIX A: TABLE OF THE ENVIRONMENT AGENCY'S TOP 50 METAL MINE SITES IN WALES	26
2.3.2 Land- Part IIA of the Environment Protection Act 1990.	8		
2.4 Links with other Strategies and Initiatives	9	APPENDIX B: GLOSSARY	28
2.4.1 Water Framework Directive	9		
2.4.2 Diffuse Pollution Strategy	9	APPENDIX C: DETAILED MINE INFORMATION	31
2.4.3 Objective One	9		
2.4.4 Habitats Directive	9		
2.4.5 Salmon Action Plans	9		
2.4.6 Ceredigion Local Plan	10		
2.4.7 Local Initiatives	10		
2.5 Stakeholder Drivers and Values	10		
3.0 PROJECT SCOPE	13		
3.1 Task 1: Key Agency Sites	13		
3.2 Task 2: Engage the Stakeholders and Seek Comments	13		
3.3 Task 3: Compile the Comments and Interpret the Results	13		
4.0 KEY FINDINGS	15		
4.1 Summary of General Information	15		
4.1.1 Archaeological	15		
4.1.2 Mineralogical	15		
4.1.3 Biological	16		
4.1.4 Other	16		
4.2 Stakeholder Comments Regarding Remediation	16		
4.2.1 Archaeological	17		
4.2.2 Mineralogical	17		
4.2.3 Biological	17		
4.2.4 Other	18		
4.3 Data Interpretation	19		
4.3.1 Mine Groups	19		
4.3.2 WDA Ranking	20		
4.3.3 Stakeholder Matrix	21		
4.4 Summary of Mine Groups	20	JUNE 2002	

Executive Summary

INTRODUCTION

Non-ferrous metal mining has taken place across Wales over the last four thousand years. The economic, social and cultural benefits of this activity have been vast. Following the post-industrial revolution decline and the eventual closure of metal mines in Wales, attention has turned towards the legacy now left by such activities.

Metal mine sites present significant sources of land contamination, water and sometimes air pollution. Consequently habitats are effected, valuable fishing rivers are loaded with toxic metals and there have been instances of the metal rich dusts from old spoil heaps presenting a risk to human health through inhalation and ingestion by local populations. In terms of water quality approximately a fifth of all river quality objective failures in Wales can be attributed to the impacts of mine pollution, with three-quarters of these mine pollution failures due to diffuse pollution from land contaminated. This equates to 108 kilometres of rivers failing due to the impacts from mine sites.

One of the principal roles of the Environment Agency (the Agency) is to ensure the protection of the aquatic environment, therefore to better understand the scale of the impact from metal mines a database of sites was commissioned in 1996. This database consists of 1,311 known non-ferrous metal mine sites in Wales and describes the extent of environmental information currently available. It also ranked 204 of the most problematic sites by their level of aquatic and environmental impact.

The legacy of metal mining has also created valuable and in some instances internationally important archaeological, mineralogical and biological features. The Agency recognises the need to consider all the differing views and issues of the various stakeholders at these sites when proceeding with any remedial scheme required to deal with the pollution of rivers and streams.

OBJECTIVES

This strategy document for the first time brings together these sometimes differing views on the Agency's top 50 sites recognised as having the greatest environmental impact. A total of 50 sites were selected for this strategy in order to maintain a workable and manageable number of sites for the planned time-scales. The strategy is designed to explore common ground, identify potential site constraints, enable a clear assessment of all the issues at each site and to develop future site management options.

The specific objectives of this piece of work were to:

- Bring together the site specific views of various stakeholders in one document;
- Identify sites with differing stakeholder views or concerns;
- Revisit the Agency's priority list such that better informed decisions can be made regarding the prioritisation of sites.

APPROACH TAKEN

This strategy has been completed with the close co-operation and assistance of various stakeholders who hold an interest at these sites. Twenty organisations have provided both general and site specific details of their

respective issues and concerns regarding mine site management. The Agency wishes to thank these 20 organisations, and the individuals involved for their valuable and essential contributions towards the production of this strategy.

Stakeholders were asked what were their issues of interest at each site and what concerns they may have for a potential remediation scheme. In many cases the stakeholders also made recommendations on the best approach to safeguard the interests they represent from being damaged. The information they provided was characterised into four areas:

- Archaeological or historical
- Mineralogical
- Biological and
- Other issues (e.g. aesthetic landscape)

By drawing on the data held by numerous other organisations this strategy for the first time presents a realistic picture of the potential issues/concerns/views at the top 50 polluting metal mine sites in Wales that the Agency would wish to see addressed. A breakdown of the full responses received from stakeholders for each mine is contained within the main report.

SUMMARY OF CONCLUSIONS

The Agency recognises the need for a pragmatic approach when developing a solution to the problem of metal mine pollution. During the analysis of the collected data it became apparent that the top 50 list of mines could be sub-divided into five groups. As such the process of interpreting the collected information and sub-dividing the sites into the following five groups, allows that pragmatism to be followed and greatly assists in the continued prioritisation of resources and the development of solutions.

- **Group 1** (No diverging issues) - It appears that there are no diverging issues at this site, the Agency could therefore pursue the remediation relatively easily.
- **Group 2** (Converging issues) - It appears that the Agency and one or more stakeholders have a shared interest in the remediation of the site and therefore it may be possible to develop a collaborative project. For example, there could be a combined interest to install a water clean-up scheme at the same time as the development of the site as a tourist attraction or the water remediation scheme could be extended to address issues of public health and safety.
- **Group 3A** (Diverging issues) - It appears that the Agency and the views of one or more stakeholders diverge at this site, however, it is considered that the differences could be resolved subject to careful negotiations and sympathetic design.
- **Group 3B** (Diverging issues) - It appears that the Agency and the views of one or more stakeholders diverge at this site, it is considered that the differences are so great that it would be extremely difficult to progress any remediation scheme. For example sites extensively designated as SSSI.

- Group 4 (Further information)** - During the review of data it appears that these sites may not be presenting such an impact to the water environment as previously understood or data on sites outside the top 50 has come to light that indicates that they should be included within the top 50. Further monitoring and data review required.

A summary of the sites and their associated grouping is presented in the following table:

Site Name	Grouping
Abbey Consols	3A
Grogwynion	3B
Aberdaunant	4
Gwynfynydd	4
Alltycrib	3A
Hafan	3A
Bog	2
Henfwlch	3A
Bronfloyd	3A
Level Fawr	3A
Brynyrafr	4
Llanfair	1
Bwlchgwyn	3B
Llanfyrnach	3A
Caegynon	2
Llwyntefify	3B
Castell	3A
Llywernogq	2
Cwm Rheidol	3A
Logaulas	3A
Cwmsymlog	3A
Mynyddgorddu	4
Cwmystwyth	3B
Minera (Deep Day Level)	2
Cystanog	4
Nantycreiau	3B
Daren	3A
Nantymwyn	4
Dolaucothi (Ogofau)	4
Parc	4
Dyfngwm	4
Parys	2
Dylife	3B
Penrhiew	3A
Esgairffraith	3B
Penycefn	4
Esgairlle	2
Powell's	3A
Esgairmwyn Old	4
Rheidal United (Erwtomau)	3A
Frongoch	3A
Rheidal United (Gwaith Goch)	3A
Geirionydd Mine	4
Temple	3A
Glogfawr	3A
Ty'n-Y-Fron	3A
Goginan	2
Wemyss	3A
Graiggoch	3A
Ystumtuen	3A

In summary a total of 31 out of the 50 mine sites fall within Groups 1, 2 or 3A. Therefore, clearly evident from the findings is the potential to achieve a consensus of opinion, on the best environmental course of action, for the majority of the fifty sites.

The group to which a site has been assigned in this strategy is by no means definitive and it is anticipated that as further detailed investigations ensue some sites may move between groups. It is also important to note that for all sites there will be the requirement to undertake site specific work including desk studies, site investigation and appropriate surveys to assist in the design of the most suitable remedial scheme.

RECOMMENDATIONS

It is recommended that the following actions be undertaken at each of the Agency's top 50 sites based on the group to which they are assigned.

Group 1 and Group 2 sites where there are no diverging issues (Group 1) and converging issues (Group 2) the actions are:

- Further prioritisation of these sites based on their environmental impact;
- For Group 2 sites begin dialogue with all stakeholders regarding converging interests;
- Identify possible collaborative projects and potential sources of funding to secure remediation.

Group 3A sites where diverging issues have been identified but could be resolved, actions for this group are:

- Further prioritisation of these sites based on their environmental impact;
- Begin dialogue with stakeholders to identify solutions, and use a cost benefit analysis approach;
- Identify possible potential sources of funding to secure remediation.

Group 3B sites are considered to have diverging issues such that remedial works would be very difficult to progress, actions for this group are:

- Further prioritisation of these groups based on their environmental impact;
- Reconsider the sites based on the prioritisation to justify further dialogue with stakeholders to identify possible solutions at 'worst' case sites using a cost benefit analysis approach.

Group 4 sites are where during this study it appears they are not presenting such an impact to the water environment as previously understood. Actions for sites in this group are:

- Confirm impact these sites may be having on the water environment;
- Undertake additional monitoring and analysis if required;
- Assess whether sites should still be considered within the top 50 sites.

IMPLEMENTATION AND TIMESCALES

In addition to the actions required for each group of sites a set of overarching actions need to be put in place to ensure that the implementation of this strategy continues and metal mine sites are taken through to remediation. As such the following actions are also recommended.

- The Agency sets up an internal group with the specific task of implementing the group actions listed above;
- This strategy is disseminated to all interested stakeholders to ensure that they are better informed regarding the views of others and to assist in the management of metal mine sites;
- Where sites can be progressed to remediation, and from the work of the Agency's internal group, establish site specific or sub-area working groups of all the interested stakeholders to ensure remediation is progressed in a constructive manner;
- The Agency sets up an external group consisting of stakeholders with regulatory or statutory powers to participate in a steering group enabling the implications of emerging legislation to be fully incorporated into the strategy, identifying appropriate resources, and maintaining multi-agency support for the strategy. This group should adopt a cost benefit analysis approach when considering issues at sites.
- Commence the process of addressing impacts of the remaining sites outside the top 50 list which may include cost benefit analysis to take account of diminishing environmental returns.

The Agency intends to appoint a part time Project Officer for an initial 2 year period to develop the findings in this document. During this two year period the Agency aims to take forward:

- Eight sites in Groups 1 and 2;
- Four sites from Group 3A having the greatest environmental impact;
- Four sites from Group 3B having the greatest environmental impact for the external steering group to initiate a solution;
- Confirm the impact of Group 4 sites.

The Agency therefore intends to:

- Scope remedial options in conjunction with all relevant stakeholders;
- Develop and secure collaborative projects;
- Bid for funds for remedial works (including long-term site management) as collaborative projects;
- Continue the development of the strategy and start to address the issues at other sites not on the initial top 50 list.

1.0 INTRODUCTION

Metal rich rocks have been extracted in Wales on a near continuous basis from pre-Roman times to the present day (the last recorded metalliferous extraction in Wales took place at Gwynfynydd Gold Mine, which only ceased production in 1998). This long period of activity has left an indelible and continuing mark on the landscape, environment and social history of Wales.

For Environment Agency Wales (the Agency), metal mine sites present significant point sources of water pollution, loading the valuable fishing rivers of Wales with toxic metals. In addition, there have been known cases of the metal rich dusts from old spoil heaps presenting a risk to human health through inhalation and ingestion by local populations. However, at the same time these sites can provide valuable habitats that allow the development of unique ecosystems. A number of metal mine sites have been designated Sites of Special Scientific Interest (SSSI) to reflect this.

Metal mine sites also provide a historic and archaeological interest with the preservation of old workings and surface buildings an important consideration as a tourist attraction and for the intrinsic historic value they hold. This again is often balanced by the obvious safety hazard old structures and workings can present to the general public.

The Agency therefore recognises the need to address and consider these often diverging views when proceeding with any remedial scheme required to deal with the pollution of rivers and streams. This strategy document for the first time brings together these sometimes differing views on the Agency's top 50 sites to explore common ground, identify potential site constraints and inform both the Agency and other stakeholders of how to take these sites forward in the development of future site management options.

1.1 Objectives

This strategy focuses on the top 50 sites (as presented in Appendix A) for which the Agency recognises are having the greatest environmental impact on surface waters and should be prioritised for remedial work. Comments and opinion on each of the sites has been sought from various stakeholders. The specific objectives of this piece of work were to:

- Bring together the site specific views of various stakeholders in one document;
- Identify sites with differing stakeholder views or concerns;
- Revisit the Agency's priority list such that better informed decisions can be made regarding the prioritisation of sites and development of site management options.

Longer-term objectives of this strategy are:

- Scope remedial options in conjunction with all relevant stakeholders;
- Identify possible collaborative projects;
- Develop and secure funding for collaborative projects;

Continue the development of the strategy and start to address the issues at other sites not on the initial top 50 list.

1.2 Who are the Stakeholders?

This strategy has been completed with the close co-operation and assistance of various stakeholders who hold an interest at these sites. Strategy responsibilities and stakeholder interest are detailed in Section 2.

The Agency wishes to thank the following organisations for their valuable and essential input:

- Anglesey Mining Plc
- Anglesey Council
- Amlwch Industrial Heritage Trust
- Archaeological Trusts
- Cadw
- Carmarthenshire County Council
- Ceredigion Council
- Conwy Council
- Countryside Council for Wales (CCW)
- Forest Enterprise
- Gwynedd Council
- Pembrokeshire County Council
- Powys Council
- National Trust
- North Wales Caving Club
- Pentir Pumlumon Tourism
- Royal Commission on Ancient and Historical Monuments in Wales (RCAHMW)
- Snowdonia National Park Authority
- The Mid-Wales Mining Museum Ltd
- Wardell Armstrong (Mineral Agents for the Crown Estate)
- Welsh Assembly Government
- Welsh Development Agency (WDA)
- Welsh Gold Plc
- Welsh Mines Preservation Trust (WMPT)
- Welsh Mines Society (WMS)
- Wrexham County Borough Council
- Wildlife Trusts

1.3 Who Should Use this Strategy?

In addition to informing the Agency of any stakeholder issues at metal mine sites the information contained within this strategy will be of use to all stakeholders at these sites.

It is envisaged that via this strategy stakeholders will be better informed and will be able to:

- Influence funding bodies;
- Increase confidence in the prioritisation of resources;
- Identify areas of common ground to develop partnership or collaborative projects.

2.0 BACKGROUND AND DRIVERS

2.1 History

Mining in Wales has taken place from the Bronze Age right up to the present day. Metals played an important role in attracting the Romans to Britain and it has been recorded that they worked lead in north-east Wales, gold at Dolaucothi, and possibly copper at Llanyrnach and on Anglesey. It is probable that other sites were worked during their occupation but the evidence has either not been recognised or is lost beneath later workings.

The strength of the mining industry in Wales during the medieval period is unclear. Lead was worked extensively in the north-east during the 13th and early 14th century but declined dramatically in the aftermath of the Black Death and during the 15th century. A small number of lead mines are known to have been active in mid and south Wales during this period but there is scant documentary and archaeological evidence on which to establish their impact or the techniques employed.

In 1568 the Society of Mines Royal was established and was to have a great impact on Welsh mining for over a century. Silver has been worked since the 1590's and large amounts were sent to London at the end of the 16th century largely from the great vein at Cwmsymlog Mine. The Mines Royal continued to hold a monopoly on mines containing gold and silver (this included most of the working Welsh mines) until an Act of Parliament was passed in 1693 which removed the Crown ownership of base metal mines containing gold or silver. This Act allowed local landowners to develop or lease mines on their own initiative.

While early methods of ore extraction involved the digging of open trenches and shallow shafts, the demand on resources initiated by the search for silver required deeper working below the water table. The development of pumps and effective use of free draining deep adits from the mid 17th century onwards aided development, as did the introduction of explosives and, much later, mechanised drilling.

Mining activities have always been labour intensive and within the majority of Welsh ore fields the use of steam power came relatively late due to the costs and difficulties of transporting coal from South Wales to the Mid Wales mines. This resulted in the long reliance on waterpower to drive pumps and processing machinery, and the location of mines associated with the supply of water. Various processes including sieving and water separation techniques were applied to separate the host rock and concentrate the ore. Smelting of the ore took place at a limited number of mine sites.

The second half of the 19th century saw the peak in lead and zinc mining activity in Wales due to improved mining techniques and the unquenchable demand of the industrial revolution. As a measure of the importance of the Welsh ore fields between 1845 and 1938 lead production accounted for 25% of the total United Kingdom output and for zinc Wales contributed 43% to total UK production (Lewis, 1967). The largest producers of these ores were the counties of Flintshire, Denbighshire and Ceredigion. Many other minerals were mined, including silver, copper, manganese and gold. However, towards the end of the century large deposits of lead and copper were discovered in Spain, South America and Australia and it became

cheaper to import these than buy the home produced product.

From the beginning of the 20th century metal mining underwent decline exacerbated by the discovery of new metal reserves abroad and the sudden downturn in the market price for zinc in 1921. Consequently most mines in Wales had closed by the early 1920's, with limited mining activity continuing at only select locations. Lead mining was re-started in 1952 at the Parc mine near Llanrwst but ceased production in 1954. Some specialist mining, particularly for gold, has continued intermittently and exploration for gold endures to this day with five leases and two licenses currently in existence. Such activity is especially aided by the fact that verified Welsh gold commands a significant premium from the jewellery trade, which allows what would otherwise be sub grade material to be worked economically.

This long period of industrial activity has resulted in an indelible mark left on the landscape of Mid and North Wales. The current landscape associated with these former metal mining areas now consists of numerous spoil heaps of excavated host rock, spoil heaps of waste process material (high in metals), adits and shafts and various derelict structures including processing areas, power houses and drainage channels. The number of actual mines is extensive with the Agency's database holding records for over 1,300 mine sites.

2.2 Impact

A table highlighting the names and locations of the 50 mine sites, along with the receiving river water quality compliance downstream of each mine is presented in Appendix A.

Compliance is measured against an objective to meet a certain target water quality depending on the uses for which that river stretch should be suitable. In reality, rivers are used for many purposes, so as a surrogate, if the quality is suitable for a certain type of 'river ecosystem' then it is likely that the other uses will also be met.

There are five river ecosystem (RE) classes, from RE1 (excellent water quality) to RE5 (poor water quality). The objective for each river stretch must be met at all times and compliance is reported on an annual basis. Where river quality does not meet the objective set, then a clear improvement plan must be made. To meet this improvement it may be necessary to make improvements to discharges to the river. Hence, river water quality compliance is an important part of the prioritisation process, which the Agency uses to focus its remediation efforts.

Appendix A lists twelve mine sites out of the 50, which discharge to river stretches that last year complied with their river quality objective. In such circumstance further investigations are necessary so as to ascertain whether the site has been incorrectly prioritised or if there is a reason why the true impact of the mine site is not being accurately portrayed by compliance results. For example, it is known that in a few instances the routine monitoring point used to represent the water quality of a river stretch are many kilometres downstream of where a mine discharges to the river. In these circumstances it is not uncommon for inputs from other tributaries between the mine and the monitoring point to dilute the metal

contamination to such a degree that it is suddenly able to comply with the river quality objective. However such compliance is not a true reflection of the water quality immediately downstream of the mine. Therefore sites in the top 50 list which were previously believed to be having an adverse impact but that are currently compliant, will require further investigation to ensure these levels are truly representative of the water quality immediately downstream of the mine discharges. Examples of the impacts of non-compliance are presented in Section 2.2.1 below.

2.2.1 Aquatic Environment

This strategy deals with the top 50 water polluting sites considered by the Agency as conducted by the 1996 R&D Project (Kitts & Smith, 1996). Even allowing for instances involving considerable river dilution, discharges from these sites can significantly impact water quality, which in turn results in failures in water quality objectives and impacts fish and wildlife populations.

Run off and leachate from old spoil tips and discharges from underground workings can contain very high concentrations of heavy metals including zinc, copper, aluminium, cadmium, nickel and lead. It is not unusual for the metal concentrations in these discharges to be hundreds of times greater than those required in rivers to comply with European Quality Standards (EQSs) and River Quality Objectives. Of the 5042 kilometres of monitored river stretches in Wales, in 1999, 505.8 kilometres of river failed to comply with its river quality objectives and of those 108 kilometres of those failures were directly attributable to mine pollution.

As a result of the dumping of wastes from the milling process in or near rivers there is often the occurrence of finely divided sulphides in riverbed sediments. These sulphide grains suffer constant abrasive attrition, with continuously fresh surfaces available for dissolution of metals by the regionally slightly acidic river waters.

Aquatic organisms acquire metal ions or salts by transporting them, either actively or passively, across cell membranes into intra or inter cellular media, from where they are either incorporated in molecules within the organism or excreted actively into the external medium again. In the case of freshwater fish, the main inward route for heavy metals is via the respiratory surface of the gill structure, whilst the route out may be by secretion into the gut, transport in a reverse direction across gill membranes or excretion via the kidney. If there is no easy route out, then the metal may be stored in the body of the fish. Whereas fish have a metabolic requirement for zinc, copper and iron, metals such as lead, cadmium, mercury, chromium and nickel have no known metabolic function and consequently metabolic pathways are ill-equipped to deal with them, and if necessary, dispose of them. This is reflected in the fact that, unlike zinc, both lead and cadmium can be cumulative poisons at very low environmental concentrations (Alabaster & Lloyd, 1980; Milne et al, 1981).

Zinc, copper and cadmium all cause damage to gill tissue, and one effect of chronic exposure to a mixture of these metals may be an increased sensitivity to low dissolved oxygen levels. Lead, zinc, copper and cadmium were also found to accumulate to a significant extent in trout, during studies on the river Clarach in 1982. The significance of the

concentrations found in fish tissues is not fully known, and with a mixture of poisons, it is difficult to attribute specific actions to one particular pollutant (Howell, 1982). However, blackening of the posterior third of the body, usually from between the dorsal and adipose fin to the caudal peduncle, has been noted in salmonids exposed to sublethal concentrations of lead over long periods. Dorsal and lateral spinal curvatures (lordoscoliosis) and erosion of the caudal and anal fins were also associated with the later stages of chronic exposure of fish to lead (Davies et al, 1976, in Milne et al, 1981).

Long stretches of river can be impacted by a metal mine site, examples of impacted rivers include:

- The discharge from the Dylife mine near Llanidloes affects the water quality for over 20 km of the River Twymyn.
- Parys Mountain metal mine workings on Anglesey severely affects the water quality along 10 km of the Afon Goch Dulas and Afon Goch Amlwch. Studies have shown that the fluvial input of copper and zinc to the Irish Sea is over twice as much as the combined totals emanating from the Mersey, Dee, Conwy, Ribble, Wyre and Duddon rivers (Hemsworth, 1995).
- For catchments such as the Rheidol, which have a legacy of metal mining, the impacts of run off and leachate from old spoil heaps, and discharges from underground workings on salmon populations is well documented. Here the discharge from the Cwm Rheidol mine alone results in the water quality to fall below its objective for 16 km of the Afon Rheidol.
- The Salmon Action Plan (SAP) for the Rheidol, which reviews the status of the stock and fisheries of the river, and seeks to identify the main issues limiting performance, outlines that much of Rheidol is affected by acidification and abandoned metal mines, causing low pH values and elevated metal levels. The acidic and poorly drained organic soils covering most of the upper catchment naturally produce poorly buffered acidic drainage and surface water run-off. Coniferous forestation can further exacerbate this problem in sensitive areas.

2.2.2 Human Health

Old workings, including shafts and surface buildings, present a safety hazard due to their structural integrity, possible subsidence and the uncontrolled public access to many of these sites. In addition, spoil tips can provide a source of metal rich dust that can be blown in the wind and ingested and inhaled by nearby communities.

An example of this latter impact is the Cwmsymlog mine site where elevated lead concentrations were found in the blood of inhabitants (including children) in the village in the mid 1970's. The village is situated adjacent to a complex of metal mine spoil tips. These tips consisting of heavily contaminated 'fines' were a particular problem as they contained up to 1.4 percent lead.

The capping by the District Council in 1981 funded by a WDA land reclamation grant, was successful in controlling the dust but the disturbance of the spoil during re-profiling exposed previously covered material to oxidation and resulted in the release of acid drainage waters containing

high levels of dissolved zinc. The work reduced particulate lead and zinc from washing into the nearby stream. However, the enhanced levels of dissolved zinc continued for over 10 years, gradually declining. Experience at this site led to the encapsulation in lined pits of heavily contaminated 'fines' at other sites remediated in the area (e.g. Cwm Erfin Mine in the adjacent valley). However, where possible the introduction of lead tolerant flora should be considered as a means to effectively controlling air-borne pollution, which avoids the adverse impact of disturbance to spoil heaps.

There have been occasions where private water supplies have been drawn from metal mine workings. Where these have been identified during the examination of mine sites they have been notified to the Local Authority Environmental Health Department who have the responsibility for private water supplies. Unfortunately it is not possible to get any accurate information regarding private water supplies due to the fact that these are not licensed. It is likely that private water supplies are used extensively throughout rural Wales. It has, however, been found that none of the top 50 metal mines exist within any designated groundwater source protection zones. Although this does not preclude the possibility that metal mines are affecting drinking water supplies from private wells.

2.2.3 Costs of Remediation

The costs associated with remediation of metal mine sites will vary greatly depending on the type of remediation and the scale of the site involved. Based on past experiences, the costs at Cwmbrwyno mine for reprofiling, and capping contaminated spoil was in the region of £300,000. However, at the other extreme the installation of an active lime dosing and sludge disposal treatment plant at Wheal Jane tin mine in Cornwall cost £3.5 million to build and costs around £1 million per year to run and maintain. Taking into account the need for maintenance costs will be an important issue that needs to be addressed at all remediated mine sites.

2.3 The Environment Agency's Role and Regulations

2.3.1 Water Quality - The Water Resources Act 1991 and The Environment Act 1995

Under the 1991 Act, water discharges from mines are controlled by consents from the Agency. If there is no consent, or consents are exceeded, the owner or operator of the mine is liable to prosecution under Section 85 if a person:

"causes or knowingly permits any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters"

However, the 1991 Act provided only limited control over water discharges from abandoned mines because under Section 89:

"person shall not be guilty under Section 85 by reason only of his permitting water from an abandoned mine to enter into controlled waters"

The Environment Act 1995 amended the Water Resources Act 1991 by inserting two new sections, relating to water pollution from abandoned mines. These were:

- Section 58 of the 1995 Act requires mine operators to give the Agency six months' notice of their intention to abandon a mine or part of a mine after 31 December 1998.
- Section 60 of the 1995 Act removes statutory protections from the owners and former operators of mines abandoned after 31 December 1999, where a polluting discharge is permitted to flow from an abandoned mine.

What these changes in regulation have done is to make it a legal obligation on mine operators to provide specific information on the proposed abandonment with enough advance notice to enable the Agency to avoid unexpected mine water breakout. This information not only allows the Agency to prevent pollution, but also makes it much easier to prove causation if the operator does undertake measures to prevent pollution.

2.3.2 Contaminated Land-Part IIA of the Environment Protection Act 1990.

The Part IIA Contaminated Land regime came into force in Wales during 2001 and provides a statutory definition of what constitutes Contaminated Land and places new roles and responsibilities on both the Agency and Local Authorities who are joint regulators under the regime. Local Authorities are the principal regulators with the responsibility to inspect their areas to identify land that may meet the definition of Contaminated Land following a methodology set out in a published inspection strategy, only a Local Authority can determine land as Contaminated Land under the regime.

Once land is determined as Contaminated the regime requires the enforcing authority to follow a series of steps to determine who is responsible for clean up, what actions should be taken and how liabilities should be apportioned.

The Agency provides advice with respect to the pollution of controlled waters and becomes the enforcing authority for a separate category of Contaminated Land sites known as Special Sites. The Special Site categories are based on land use or certain types of water pollution.

With regard to metal mine sites, the Part IIA regime may be applicable to areas of spoil tips that could be presenting an unacceptable impact to human health and the environment, direct discharges from adits are exempt from the regime. In addition, metal mine sites may also be designated as Special Sites if they fit one of the Special Site definitions, of particular relevance is regulation 3b, which defines a Special Site as:

Controlled waters are being affected by the land and, as a result those waters do not meet or are not likely to meet the criterion for classification applying to the relevant description of waters specified in regulations made under section 82 of the Water Resources Act 1991.

Therefore to designate a special site, it is necessary to demonstrate that the water quality objective specified in the Regulations are breached or are at risk of being breached as a result of pollution arising from contaminated

land. The demonstration can take the form of water quality data obtained by the Agency or another party, by modelling studies, or a combination of both.

The Part IIA regime also presents a number of exemptions for those that may be liable for the cost of clean up of Contaminated Land sites. If no liable person or group can be identified or the exemptions from liability apply the site is considered 'orphan' and the cost of remediation falls to the enforcing authority. That is the Local Authority in the case of 'ordinary' Contaminated Land sites and the Agency for Contaminated Land Special Sites.

2.4 Links with Other Strategies and Initiatives

It is important to recognise that this Metal Mine Strategy has not been developed in isolation. The development and implementation of this strategy is linked to numerous other strategies, initiatives and actions at local, regional and national level. Key links are outlined below.

2.4.1 Water Framework Directive

The Water Framework Directive (WFD) reforms European Union (EU) water legislation by introducing a new model for water management. It was officially adopted by the EU decision-making bodies in September 2000, but it did not enter into force until 22 December 2000.

From an environmental point of view, the WFD's ultimate aim is preventing further deterioration and achieving 'good status' in all waters. The WFD's managerial approach - integrated water management at the river basin level - aims at ensuring overall co-ordination of water policy in the EU.

Being a 'framework', the Directive focuses on establishing the right conditions to encourage efficient and effective water protection at the local level, by providing for a common approach and common objectives, principles, definitions and basic measures. However, the mechanisms and specific measures required to achieve 'good status' will take place at the local level and are the responsibility of competent (national, regional, local, or river basin) authorities.

The implementation of the WFD should lead to a more rational water protection and use, to reduced water treatment costs, to increased amenity value of surface waters and to a much more co-ordinated administration of waters. The ultimate benefit is that the sustainability of water use should be ensured.

The WFD is, therefore, much needed as the different pieces of EU water legislation - as developed over the past 25 years - have been fairly unrelated, often lacking consistency with one another, and not designed for sustainability but mainly for pollution control in certain waters or by certain pollutants.

2.4.2 Diffuse Pollution Strategy

The Agency is currently developing a Diffuse Pollution Strategy. Within it, metal mines are recognised as a key diffuse pollution source. The production of this strategy is driven by the recognition of the increasing importance diffuse pollution has in relation to surface water quality.

In terms of just diffuse pollution within Wales, over 60 percent of the River Quality Objective (RQO) failures are believed to be due to diffuse pollution sources, with a

quarter of these failures due to metal mine pollution. Statistically this means that 75 percent of the RQO failures due to mine pollution can be attributed to diffuse sources, such as run-off and leachate from land contamination. Diffuse pollution sources are difficult to identify and regulate, compared to point source emissions such as sewage treatment works or industrial discharge points. As such the Diffuse Pollution Strategy needs to influence land use policy and practice and adopt a partnership approach to progress solutions, of which this Metal Mine Strategy will form a part.

2.4.3 Objective One

With regard to regional development in Wales the Objective One programme is seen as one of the most significant sources of funding in recent years and is a key enabling initiative if socio-economic benefits can be shown. Within the Single Programming Document the remediation of metal mine sites are considered as an aim and objective under Priority 6 Measure 4, Environmental Infrastructure, with the need to address the industrial legacy of Wales and facilitate economic development including tourism.

In addition, the Programme Compliment Document sets a target of funding 25 mine water treatment schemes during the period of Objective One. The Infrastructure Strategy document, which sets out how projects should be prioritised, and sets other criteria including the requirement that the site should be consistent with the Agency's top 50 list presented in this strategy and that no person or group can be considered statutorily liable for clean up costs.

2.4.4 Habitats Directive

Within a legislative framework the Habitats Directive, that is currently being implemented in Wales by NAW, the Agency and CCW, will require site issue briefing notes to be prepared by CCW for designated candidate Special Area of Conservation sites (SACs). These notes require an assessment of impacts at SACs and outline possible solutions. Undoubtedly these notes will need to consider the impacts metal mines may have and once published CCW is required to start working on implementing any actions.

2.4.5 Salmon Action Plans

The National Salmon Strategy, launched by the National Rivers Authority in February 1996 and inherited by the Environment Agency sets out four objectives for the management of salmon fisheries in England and Wales:

- Optimise the number of salmon returning to home water fisheries;
- Maintain and improve fitness and diversity of salmon stocks;
- Optimise the total economic value of surplus stocks;
- Ensure beneficiaries meet necessary costs.

The basic principle of the strategy is that its implementation is intimately tied to management of individual rivers and the active participation of user groups (such as the anglers and others interested in the salmon's well-being). This will be achieved through the preparation and implementation of local Salmon Action Plans (SAPs) in which the aspirations for the catchment, the issues limiting their achievement (including metal mine discharges) and the means to resolve problems are set out clearly and unambiguously. The importance of metal mine discharges on water quality

fishery issues resulting from acidified surface waters and metal mine contamination will be an important issue for many SAPs.

2.4.6 Ceredigion Local Plan

The Ceredigion Council has 38 of the 50 priority mine sites within its area. The local authority's planning policies clearly reflect the need to acknowledge the general landscape value of metal mine sites in the county as well as the particular archaeological and nature conservation interests. There are several sustainable development policies and environment conservation policies in the Ceredigion Local Plan, which will relate to the mine strategy. These include policies ESD04, ESD05, ENV01 and ENV22. Policy ENV22 relate specifically to metal mines and states:

Land reclamation, capping or works associated with the restoration or the development of derelict metal mines will only be permitted where:

- *There is no significant adverse effect on the nature conservation, scientific or archaeological interest of the site;*
- *The works will not result in pollution of either groundwater or surface waters;*
- *There is no loss of visual amenity;*
- *There is a significant danger to the public from the land in its existing state and urgent works are required to alleviate the danger;*
- *Adequate and acceptable arrangements have been made for the survey of the site, and the recording and preservation of any features, and or items of interest.*

A similar policy (ENVP3.3) has been included in the Ceredigion Unitary Development Plan, soon to be adopted at deposit stage.

2.4.7 Local Initiatives

During the undertaking of this strategy the Agency identified numerous local initiatives and working groups that have been set up to either address specific issues at particular sites or provide a forum for interested persons to discuss their own personal interest presented by historic metal mine sites. The information provided by such groups has been invaluable in the preparation of this strategy and in some cases has identified sites where collaborative projects could be progressed for mutual benefit.

Two examples of these initiatives include the:

- Welsh Mines Preservation Trust which was set up to effect the conservation of surviving physical evidence for mining in Wales, it has been instrumental in channelling local funds and grant aid to the restoration and protection of important structures on a number of mines.
- Amlwch Industrial Heritage Trust that has been set up to address the specific issues presented by the Parys Mountain site on Anglesey and is seeking to preserve and promote the site as a tourist attraction and research location.

2.5 Stakeholder Drivers and Values

The input from various stakeholders has been an essential aspect of the development of this Metal Mine Strategy.

The Agency would like to thank all those involved and the contributions made. Stakeholder interests at metal mine sites varies considerably. The Agency's own objectives at these sites is to seek the reduction in contaminant loading of streams and rivers. However, on a site by site basis other stakeholders interests can vary from CCW's aims to conserve wildlife and protect habitats, Local Councils objectives to protect and enhance community environments, through to local groups who value metal mine sites for their unique historic and archaeological features.

This section summarises the aims and objectives of each of the stakeholders involved in this strategy.

Amlwch Industrial Heritage Trust

The aims of the trust are to:

- Conserve the natural and industrial landscape of Parys Mountain and Amlwch Port;
- Promote scientific and historical research and a fuller understanding of the two sites;
- Present sites for the appreciation of the public.

The Trust co-operates closely with the Parys Underground Group whose aims are to explore, research and conserve the underground workings.

www.angleseymining.co.uk/ParysMountain/AHT.htm

Anglesey Mining plc

Has mining interests at two properties:

Parys Mountain on the island of Anglesey in north Wales. Possibly the only undeveloped polymetallic mineral deposit in the United Kingdom. Contains an important identified geological resource of 6.5 million tonnes with a combined average grade of over 10% zinc, copper and lead with gold and silver. Positive independent feasibility study completed full planning permission for a 1,000 tonne per day mine. Exploration is planned with the objective of developing a significantly larger deposit, which should support a higher production rate.

Dolaucothi Gold located near Lampeter in South Wales. Anglesey Mining plc leases the mineral rights for gold and silver for part of the site. While there is potential for a small gold mining operation that would attract the premium for Welsh gold, such plans are currently on hold pending new exploration with the objective of discovering new gold zones. At present Anglesey Mining has no surface rights and does not own any plant or buildings on the site.

www.angleseymining.co.uk

Archaeological Trusts

The four Welsh Archaeological Trusts, were established in the mid 1970s to respond to the rapidly increasing demands of *rescue archaeology* and to provide a uniform local archaeology service across the whole of Wales.

Archaeological Trust stakeholders for this project are:

- Cambria Archaeology (Dyfed Archaeological Trust);
www.acadat.com

- Clwyd-Powys Archaeological Trust;

www.cpat.org.uk

- Gwynedd Archaeological Trust.

www.heneb.co.uk

Trusts provide a broad range of archaeological and heritage services in their respective areas from the maintenance of Sites and Monument Records and the provision of archaeological management advice and educational services to field survey, excavation and heritage interpretation. The Trusts are independent limited companies with charitable status, employing professional archaeological staff with a wide range of expertise, and receiving financial support from both national and local government, commercial contract work and even private donation.

Cadw

Cadw's mission is to protect, conserve, and to promote an appreciation of the built heritage of Wales.

The full title of the organisation is Cadw: Welsh Historic Monuments Executive Agency, and it is a part of the National Assembly for Wales. Created in 1984, Cadw carries out the complete range of responsibilities for the conservation, presentation, and promotion of the built heritage of Wales on behalf of the National Assembly for Wales.

These duties include:

- Securing the preservation of ancient monuments and historic buildings;
- Grant aiding the repair of ancient monuments and historic buildings;
- Managing 129 ancient monuments in Wales, which are in direct State care.

www.cadw.wales.gov.uk

Countryside Council for Wales (CCW)

The Countryside Council for Wales advises the Government, the National Assembly for Wales, local authorities and others on sustaining the natural beauty, wildlife and the opportunity for outdoor enjoyment. CCW is the national wildlife conservation authority.

www.ccw.gov.uk

Environment Agency Wales

The Agency enforces environmental legislation; including the regulation of the disposal of wastes, industrial discharges, maintenance of water quality and is a joint regulator of Contaminated Land. In addition, the Agency assesses water quantity and demand and manages a programme of flood defence works and provides monitoring and warnings of flood events.

www.environment-agency.gov.uk

Forest Enterprises

Manage the following forest estates in Wales:

- Canolbarth Forest

- Dolgellau Forest

- Llanrwst Forest

- Llanyddyfri Forest

www.forestry.gov.uk

Local Authorities

Stakeholder objectives in relation to metal mines include public health and safety, long term risks to human health, lead regulator under Part IIA Contaminated Land regime, local economic development and planning authority.

Local Authority have a number of different interests in metal mines: as a landowner, as charged with protection of the cultural and natural environment, as promoter of tourism etc. Authorities also have the overarching obligation to improve economic and social conditions within its area.

Local authority stakeholders for this project are:

- Anglesey Council
- Carmarthenshire County Council
- Ceredigion Council
- Conwy Council
- Gwynedd Council
- Pembrokeshire County Council
- Powys Council
- Wrexham County Borough Council

www.oultwood.com/localgov/wales.htm

Llywernog Mine Museum

Privately owned and operated since 1973, the mine site has been utilised as a museum of lead and silver mining with public underground access. It is the only properly registered and managed mine within the Cardiganshire district.

www.silverminetours.co.uk

Mineral Agents for the Crown Estate - Wardell Armstrong Ltd

Wardell Armstrong is currently acting as the Mineral Agents for the Crown Estate

www.wardell-armstrong.com

Welsh Assembly Government

The Welsh Assembly Government develops and implements policies, which reflect the particular needs of the people of Wales. Decisions about local issues are made by politicians who are accountable to voters in Wales. The Assembly decides on its priorities and allocates the funds made available to Wales from the Treasury. Its key role is as secondary legislative function, with responsibility for a sustainable development scheme, and overall policy responsibility for economic development, social policy, planning and environmental protection for Wales. All of this is achieved by sponsorship of a range of agencies within Wales.

www.assembly.wales.gov.uk

National Trust

The National Trust works to preserve and protect the coastline, countryside and buildings of England, Wales and Northern Ireland. The Trust does this in a range of ways, through practical caring and conservation, through educating and informing, and through encouraging millions of people to enjoy their national heritage.

www.nationaltrust.org.uk

North Wales Caving Club

Underground exploration for historical and leisure purposes.

www.lake22.demon.co.uk

Pentir Pumlumon Tourism

Pentir Pumlumon is a tourism association whose aim is to develop and market the Plynlimon Upland area sustainably for the benefit of the local community and of visitors.

www.pumlumon.org.uk

Royal Commission on Ancient and Historical Monuments in Wales (RCAHMW)

The Royal Commission on the Ancient & Historical Monuments of Wales was established in 1908 to make an inventory of the ancient and historical monuments of Wales. RCAHMW carries out surveys, maintains an archive, library and national database (NMRW), supplies archaeological information to the Ordnance Survey for mapping purposes, and publishes information about ancient, historical and maritime sites, structures and landscapes.

www.rcahmw.org.uk

Snowdonia National Park Authority

The purposes of national park designation are set out in the Environment Act 1995. The purposes are to:

- Conserve and enhance the natural beauty, wildlife and cultural heritage of the Park;
- Promote opportunities for the understanding and enjoyment of the special qualities of the Park by the public;
- Seek to foster the social and economic well being of the local communities within the Park area.

The Authority does this by providing a range of services, including information and education, agriculture, forestry, archaeology and ecology. The Authority is the local planning authority for the area, with responsibilities for producing development plans and development control.

www.eryri-npa.gov.uk

Welsh Development Agency (WDA)

The Welsh Development Agency is committed to helping existing businesses expand and thrive and to encouraging inward investment, the relocation of industry and the creation of jobs. The WDA is also charged with improving the Welsh Environment. Reclamation of derelict land has been one of the main methods of achieving this

improvement. The order of priorities has been safety, development then environmental improvement. Much of the work to date on metalliferous mines has been to remove hazards and environmental threats, but has also assisted with tourism and heritage developments.

www.wda.co.uk

Welsh Gold Plc

Owners of Gwynfynydd Mines Royal, Dolgellau, Gwynedd, North Wales. The underground part of the mine recently closed but a small supply is still available for a short while from the reworking of old surface tips.

www.welshgoldplc.co.uk

Welsh Mines Society

Since 1979 the Welsh Mines Society has brought together those interested in past mining activity in Wales. Under the general heading of 'mining history' the society encompasses members from many disciplines - archaeology, history, and geography - professional and amateur, along with some commercial interests. As a member of the National Association of Mining History Organisations (NAMHO) the society works with other organisations to address the problems associated with our mining heritage; access, conservation and interpretation.

NAMHO was formed in 1979 to promote mining history interests and represent the diverse groups seeking to conserve and interpret past mining activity. It has provided a point of contact with the statutory bodies responsible for mines and currently represents over 90 organisations in Britain and Ireland, 12 of which are based in Wales. Members of NAMHO include the Welsh Mine Society, Welsh Mine Preservation Trust, Royal Commission on Ancient and Historical Monuments in Wales, National Trust (Dolaucothi), North Wales Caving and the Llywernog Mining Museum.

www.mike.munro.cwc.net/mining/wms/wmsoc_hp.htm

Welsh Mines Preservation Trust

The Welsh Mines Preservation Trust was formed in 1992 with the support of members of the Welsh Mines Society. It has preserved a number of sites and buildings associated with mining, either with grant aid from Cadw and other bodies, or from its own resources. Its most notable achievement to date has been the restoration of the Pearl Shaft engine-house on Parys Mountain, Anglesey. The trust is also able to support work on mine sites by providing research, expertise and advice.

www.xs4all.nl/~jorbons/wmpt_uke.html

Wildlife Trusts

The Wildlife Trusts protect a multitude of habitats and species. The Wildlife Trusts campaign for better protection of our precious wildlife and habitats. Raising awareness of threats to wildlife is central to the Wildlife Trusts' role. Through monitoring and collecting data they demonstrate an accurate picture of the health of the UK's wildlife, and those habitats and species that need protection.

www.wildlifetrusts.org

3.0 PROJECT SCOPE

The project objective was to produce a strategic document that brings together all the stakeholders to assist with the remediation and/or preservation of former metal mine sites in Wales. This was achieved through undertaking the following tasks.

3.1 Task 1: Key Agency Sites

The Agency holds a database that contains the records of 1,337 metal mine sites in Wales. This information was an amalgamation of the Department of the Environment (DoE) Database, Contaminated Land Database (compiled by Liverpool University), Mine Information Consultants (Robert Protheroe-Jones) and the Agency's own archives. Of these 1,337 sites, additional data is held on 204 sites that are known to be causing an impact on a receiving watercourse. Within the database system it is possible to perform a screening exercise to prioritise sites on various criteria including the degree of impact on fish, other biota, groundwater, potable and industrial abstractions, chemical levels of pH, lead, zinc, copper, aluminium, cadmium and the presence of slimes and other aesthetic impacts on the receiving watercourses.

For this strategy the top 50 ranked sites in relation to their environmental impact according to the database were selected as this was considered to be a workable and manageable number for the timescales involved.

The 50 selected sites were then subjected to a further quality assurance exercise by Agency officers to double check the status of the sites and undertake a 'reality check' for their inclusion on a final list. This exercise removed a number of sites where remedial works have already been completed and added sites where recent monitoring data indicated that they should be included on the list over and above others.

This produced a list of 50 sites that are considered by the Agency to be having a significant enough impact on surface waters to warrant prioritisation for remediation. The list of 50 sites and their grid reference location is included in Appendix A of the report. The environmental impacts have been recorded, however, it is important to note that at this stage the sites on the list are not presented in order of priority, rather the batch of sites as a whole should be considered a priority to progress to remediation. This approach has been adopted due to the inherent difficulties of using ranking systems and the objective of the project to move sites forward by engaging stakeholders and trying to develop areas of consensus.

The location of the Agency's top 50 non-ferrous metal mine sites across Wales are shown in Figure 1. These sites are distributed throughout the metalliferous ore fields of Mid and North Wales, but illustrate an intense concentration of 38 sites (76 percent of top 50 sites) occurring within Ceredigion.

The complete distribution of the top 50 sites by Local Authority is shown on Table 1 above.

Table 1 Distribution of Metal Mine Sites by Local Authority

Local Authority	Number of Metal Mine Sites on the Top 50 List
Anglesey	1
Carmarthenshire	3
Ceredigion	38
Conwy	2
Gwynedd	1
Pembrokeshire	1
Powys	3
Wrexham	1

Figure 1
Distribution of the top 50 non-ferrous metal mine sites across Wales. (See page 14)

3.2 Task 2: Engage the Stakeholders and Seek Comments

Following production of the Agency's list of 50 sites the next stage in the process was to engage the various stakeholders identified in earlier sections of this report. This activity was undertaken during August and September 2001 and involved the use of standard questionnaires and map extracts for each site, coupled with follow-up telephone calls and face to face meetings.

For each mine stakeholders were asked to provide information based on three main topics:

- Archaeological or historical features requiring protection;
- Species/habitats or geological features requiring protection;
- Any other special uses for the site requiring protection.

Where appropriate respondents were then asked supplementary questions to:

- Briefly describe these features, including any scheduling or designations;
- Identify if there was any planned intention to promote or protect these features;
- Indicate if potential remediation was likely to have an impact and how;
- Specify any exclusion zones for remediation.

The number of questionnaires sent to each stakeholder ranged from 1 to 50 depending on the number of sites they were considered to have a stakeholder interest in. In total 587 individual mine questionnaires were sent out, to 46 individuals, representing 20 distinct stakeholder organisations. A total of 582 responses were received (representing a 99 percent response rate) with 414 of these questionnaires containing issues raised by stakeholders. Those questionnaires with no issues raised, represented instances where the recipient stated they did not actually have a stakeholder interest for that site.

3.3 Task 3: Compile the Comments and Interpret the Results

Following the collection of stakeholder views and comments the data has been compiled in to summary sheets for each mine, including a location map, and are presented in Appendix C. In addition the comments received depending on stakeholder type is presented in a matrix form in Table 5. This shows the various issues that need to be considered for each mine.

LOCATION OF TOP 50 PRIORITY METAL MINES

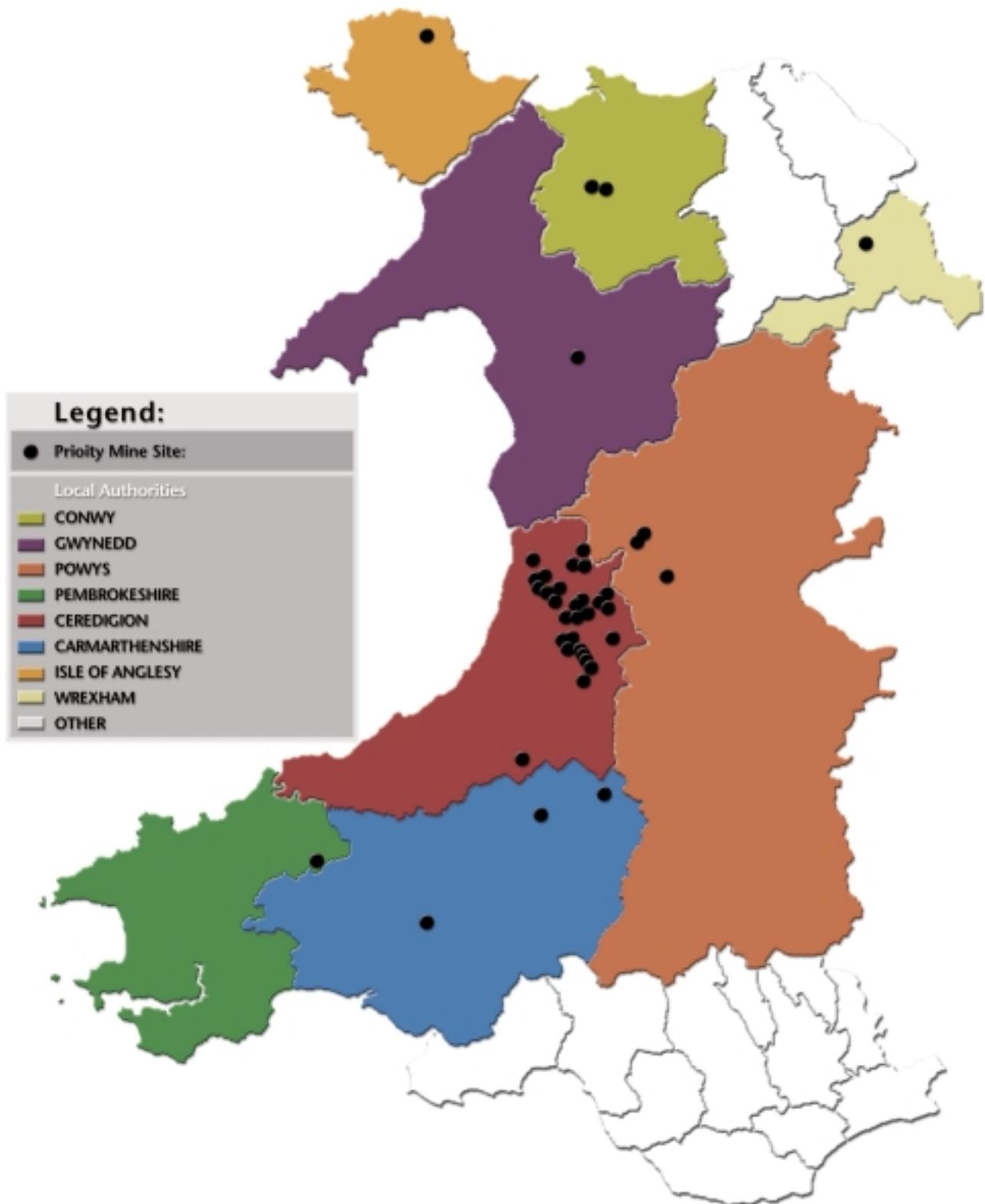


Figure 1

4.0 KEY FINDINGS

A detailed report of all the responses from every stakeholder can be found in Appendix C. It consists of the site specific information received from the questionnaires and is a summary of immediately available data. It is not a complete account of the known information, which will be thoroughly assessed in subsequent phases of the strategy, as explained in Section 5.0 Future Actions and Recommendations.

4.1 Summary of General Information.

The information provided here in Section 4 describes the general issues raised by the stakeholders in respect to each of the four topics. These topics were:

- Archaeological or historical
- Mineralogical
- Biological
- Other issues (aesthetic landscape)

4.1.1 Archaeological

All of the metal mines contain features and structures of archaeological and historical significance, and where known these are recorded on the Regional Sites and Monuments Record that continues to expand as more features are detected. These sites form a significant element of the historic landscape character. There is more to mining archaeology than standing structures. On every one of the sites listed consideration has to be given to surviving earthworks, access to underground features and the potential for subsurface archaeological evidence. Material that acts as the source of contamination, the tailing heaps, is also a part of the archaeological record.

In recognising the importance of individual structures, the assessment of any site is based on its integrity as an industrial landscape, in which the parts contribute to the whole. Of the thirty-six historic landscapes included in the first edition of the Register of Outstanding Landscapes of Historic Interest in Wales (Cadw: Welsh Historic Monuments, Cardiff, 1998) eleven have a strong mining element. Mining is a central feature of the Upland Ceredigion Landscape, with mines like Cwmystwyth being cited as essential elements in the landscape. For this reason it is not always possible to indicate the exact importance of a site simply through a list of individual structures.

In districts such as Gwynedd, some years ago the archaeological trust had assigned a ranking system of importance to both the sites and the features, based on the knowledge amassed during a condensed landscape survey of the district. However subsequent further information, or archaeological discovery, particularly of Prehistoric, Roman or Medieval working, would alter a site's value considerably.

The National Monuments Record for Wales, which is the Royal Commission's public archive, holds a considerable amount of information on metal mines in Wales, derived from Cadw's own studies including fieldwork, and from various other sources. Cadw has funded three of the four Welsh archaeological trusts to undertake assessment projects of metal mines within their areas, completed in recent years.

These have been carried out by Clwyd Powys Archaeological Trust, Dyfed Archaeological Trust and Gwynedd Archaeological Trust, and each final report has provided information identifying the most significant remains of metal mining sites in their area. The Sites and Monuments Records (SMR) held by each of these trusts contains detailed information, and they also hold summary reports on the subject.

This archaeological importance in some cases is statutorily protected as Scheduled Ancient Monuments, and others contain individual Listed Buildings. Such scheduling is the province of Cadw. There is also more that Cadw may soon be considering for scheduling as a result of recent studies undertaken by the regional archaeological trusts of Wales. It is being recognised increasingly that Wales contains some of the most important early mining remains in the UK, and some sites are only gradually becoming better understood.

The Welsh Heritage Assets Survey carried out by Forest Enterprise (FE) also has identified many important mining sites and their archaeological sensitivity on land owned and managed by the FE. There are a number of structures and shafts that require special management. FE have an agreement with the Welsh Archaeological Trusts and any works require their input and recommendations for management. An annual exchange of the SMR data is part of this agreement and each District holds GIS and database information and management plans for each feature.

4.1.2 Mineralogical

There lies significant geological interest at many of the top 50 sites within the spoil tips, exposed open cut rock faces and in the underground workings.

The great majority of sites in the Ceredigion district are located in the Central Wales Ore Field which is often associated with intensive mining activity dating from the Bronze Age times up to the first quarter of the 20th Century.

In such areas, important phases of mineralisation are often clearly visible. Typical mineralisation can include various quartz-sphalerite-galena-chalcopyrite-dolomite breccias together with mineralisation, which often provides most of the ores mined, represented by sphalerite-galena-quartz-calcite-pyrite assemblages.

In 1998 CCW commissioned the National Museums and Galleries of Wales to provide a Welsh database of mine sites (MINESCAN), and produce a full comparative justification of GCR (Geological Conservation Review) and pSSSI's (proposed Sites of Special Scientific Interest), and RIGS (Regionally Important Geological Sites) throughout Wales. This work is presented in four volumes covering the whole of Wales, in addition to a mineralogical database of mines in Wales.

The target list of 50 mines contains 7 Geological Conservation Review (GCR) sites, including both SSSI and proposed SSSI, and 17 proposed Regionally Important Geological/Geomorphological sites (RIGS).

4.1.3 Biological

The spoil tips and rock cuttings often support rare lichen, as well as bryophyte and fern species, which in many cases are unique to these mining habitats. Most of this information for West Wales is available through the West Wales (formerly Dyfed) Wildlife Trust survey (1993).

Many of these top 50 mines, in view of their location may support species of amphibian, reptile, and mammal protected under the provisions of the Wildlife and Countryside Act 1981 (as amended); the EC Habitats and Species Directive (as implemented in Great Britain by Statutory Instrument 2716: The Conservation (Natural Habitats & c) Regulations 1994; and the Badgers Act 1992.

Historical records of bats at sites will relate almost solely to occasional hibernation records. However recent studies have discovered a far more widespread activity known as 'swarming', which occurs from early August into late autumn. At these times many hundreds of bats may visit an underground site at night and leave by morning. Mines can be ideal swarming sites because they often consist of complex network of passages and microclimates that seems to be a feature of good swarming locations. It will therefore be necessary to conduct further bat surveys at the proposed remedial sites at strategic times of the year to fully assess the sites importance for bat communities.

Some areas have been recommended as a candidate Special Area of Conservation (SAC) because they contain habitat types and/or species that are rare or threatened within a European context. Amendments to candidate SACs can also be considered based upon further habitat or species considerations. Examples of habitats and/or species for which mine areas have previously been recommended as a candidate SAC include Blanket Bogs, Calamarian Grasslands, European Dry Heaths and Luronium natans (floating water plantain).

A SSSI citation describes the special interests for which the site was notified in the British context. The interests for which the site was selected as SSSI may differ from the interests selected in a European context.

4.1.4 Other

The significance of individual sites is recognised by the protection of Scheduled Ancient Monument and Listed Building designations at individual sites. However, the mines are also important as significant features in the cultural or historic landscape. Much of the upland area of Ceredigion in which many are located has been designated as Historic Landscape on the basis of features such as the mining landscape features including the wide-spread remains of water power systems, transport routes, and settlements, as well as mine workings, buildings and extraction waste. Many of these mines are also located in the Cambrian Mountains Environmentally Sensitive Area.

Many of the mines are of great scenic and industrial-archaeological interest and in these changing times, with greater interest in tourism and themed interests in the countryside, are likely to become increasingly appreciated and used.

Several stakeholders have commented on the use of sites for a wide variety of educational and tourism activities on a more or less informal basis. The sites, however, have a potential for use by more general interest tourist beyond their use by the more obvious mining interest and activity

users. As described above, the sites have great potential, not just for their individual features, but also for their group value, as a significant part of the historic landscape of Ceredigion.

A number of sub-groups of mines can be recognised as having significant landscape value taken together as a group e.g. Level Fawr, Pontrhydygros; Darren-Cwmsymlog-Cwmerfyn; west Pumlumon Massif; etc. These have great potential as a focus for educational and tourist opportunities in the county.

Most of the sites are located in areas of great landscape interest, with footpaths, cycle tracks and other features of a developing rural tourism infrastructure. A number of promoted ways cross the main mining areas, and the mine sites have obviously been noted in promotional literature for their historical and landscape value.

4.2 Stakeholder Comments Regarding Remediation

Respondents to the questionnaire were provided with the following list of commonly used environmental remediation techniques:

- Redistribution of waste spoil;
- Capping of waste spoil to prevent exposure to the atmosphere;
- Installation of perimeter cut-off drains to prevent water infiltration;
- Culvert or divert surface water away from contaminated land;
- Line stream bed with clay to prevent contact with contaminate material;
- Increase the size of natural marsh land areas providing natural water treatment;
- Create new anaerobic wetland treatment areas to reduce metal levels;
- Construction of a semi-passive operational treatment plant on site.

Stakeholders were then asked if and how these proposed techniques could have an impact. In many cases the stakeholder also made recommendations on the best approach to safeguard the interests they represent from being damaged. Below describes the general issues raised by the stakeholders in respect to each of the four topics. These topics were:

- Archaeological or historical
- Mineralogical
- Biological
- Other issues (aesthetic landscape)

4.2.1 Archaeological

Any remedial work could have an impact on the archaeological remains at a site, not only on features and structures visible on the surface but also sub-surface remains covered by later surface layers and underground features. Also in many instances the preservation of underground access is also considered desirable.

It is important to retain all those contributory features, from tailing heaps to chapels, in a landscape which has an important role in the economic regeneration of an area increasingly reliant on the tourist industry as a source of income.

Therefore, it is recommended that no such work should be undertaken without a prior archaeological assessment being carried out for all sites.

At sites of particular archaeological importance or significance RCAHMW would recommend that an archaeological watching brief be carried out during any remedial work.

In general the remediation works indicated may have significant effects on archaeological interests where these exist. For example, the re-distribution of spoil or capping of tips may hide evidence for the phasing of mining over many centuries or may lead to the loss of individual features. Installation of drains may cut through archaeological stratigraphy, or otherwise disturb features of importance. Set against this is the fact that the conservation of metal mine sites, which have usually been abandoned for several generations, is of concern to Cadw. Several important sites are suffering from natural decay, which in some cases is accelerating.

Where sites are Scheduled, Scheduled Ancient Monument Consent from the National Assembly for Wales will be required for any works within the identified areas. Outside these Scheduled Areas there may be other features of importance which should also be taken into consideration in any proposed works and protected where possible - many of the metal mines sites have exceptionally extensive physical remains, including open cast workings from early exploration, areas of tips, and linear watercourses which may run for several miles. In some cases, there may be grounds for sites not yet Scheduled to be considered for Scheduling.

It may be advisable to commission an archaeological assessment to determine the sensitivity of sites where there are known remains. Welsh Office Circular 60/96 Planning and the Historic Environment: Archaeology gives advice on the National Assembly's policy in considering Scheduled Monument Consent applications (paras 5-12) and on the assessment and preservation of archaeological remains, whether scheduled or not (paras 8-24).

In a few cases there may be other ancient monuments in the vicinity of mine sites which are not connected with mining. If works are proposed outside the mine sites themselves, then the Agency may need to consult Cadw separately on each of these.

The Welsh Mines Society and Preservation Trust will require very detailed and specific information about the Agency's interests in each site and the way in which the Agency intend to mitigate any impact upon the cultural heritage. Archaeological assessments or evaluation work will be required where the integrity of the surviving surface or sub-surface archaeology is endangered by the proposed works with great preference given to the preservation of all archaeological deposits in-situ.

There should also be visits to each potential scheme area in the company of a development control archaeologist from each of the four Welsh Archaeological Trusts and an Agency representative so that issues can be discussed on-site well in advance of proposals being formalised.

Detailed consultation and planning is essential to reduce potential damage to both archaeology and landscape

whilst addressing concerns over waterborne pollution. The final designs should seek to ensure the protection of significant archaeological remains and their settings.

However, there will be instances where resolving environmental hazards can be beneficial to a site's development. One example is Parys Mountain to which many of its development objectives concern conservation and research issues. Thus the local Amlwch Industrial Heritage Trust are naturally anxious that any necessary remediation of drainage takes this into account. The Trust notes that the drainage system is a prime asset in terms of national (and even international) research, but also in a way that could be compatible with cleaning up the Afon Goch.

4.2.2 Mineralogical

For sites designated or proposed as SSSI or RIGS, any removal, redistribution or recapping of these designated areas would severely compromise the geological interest.

Also prior consent will be required at any site for activities that can significantly alter the geological character of a site. Such activities include:

- Modification to the structure of water courses including rivers, streams, springs, ditches, drains, including their banks and beds, as by re-alignment, regrading, damming or dredging;
- In-filling or digging of ditches, drains, ponds, pools, marshes, quarries or pits;
- Destruction, construction, removal, re-routing, or regrading of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, including soil and rock exposures;
- Modification of natural or man-made features and clearance of boulders, large stones, loose rock or scree and the battering, buttressing or grading of geological exposures and cuttings (rock and soil).

4.2.3 Biological

In regard to each of the eight suggested remediation techniques the biological impacts are set out in Table 2.

Therefore, it is recommended that protected species and sites with any significant biological interests are subject to a survey using recommended techniques at an appropriate time of year using specialist consultants. It is only when this information is available that the likely impacts of the proposed scheme on protected species and biological interests can be fully assessed.

On completion of the surveys identified above, and subject to the legal status of individual species present, the final remedial design should include appropriate conservation and reasonable avoidance measures.

If the proposed mines are considered likely to support populations of European Protected Species, such as the Great Crested Newt, operations may only proceed after an appropriate licence has been issued by the Welsh Assembly Government. This licence can only be issued for the purposes of preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature, and beneficial consequences of primary importance for the environment. Furthermore, the licence can only be issued by NAW on condition that there is no satisfactory

alternative, and the development will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

In order for CCW to assess whether the works would have a negative impact on the favourable conservation status of bats, it will be necessary for background information to be provided in the form of survey information and any monitoring data. If there is no recent survey information, CCW would expect that to be undertaken before a licence application could be considered. CCW would also expect to see a method statement outlining:

- The work to be undertaken;
- The possible effects of this on the bats/bat roost and;
- How the work will be undertaken to minimise effects on the bats/bat roost and;
- Any other mitigation works for the benefit of the bat interest at the site.

4.2.4 Other

In instances where the spoil and shafts lie within Forest Enterprise land, any works would involve clearance of trees, even if just for access. From a landscape and woodland point of view there would need to be in depth consultation with Forest Enterprise. Of course any alteration to current forest management plans will require a Forest Design Plan amendment submitted via Forest Enterprise for approval by the Forestry Commission.

Should any remediation works be required and planned, full consultation with Forest Enterprise will be required at an early stage. This will also allow for early consultation with the local population.

With 38 of the Agency's 50 priority sites within Ceredigion the Local Authority sees the Metal Mine Strategy as an opportunity to improve on the previous approach to site identification, and the design and implementation of schemes. The authority are aware that early remediation

schemes, whilst successful in their primary objectives, did not take proper regard for the historical, archaeological and nature conservation aspects of the sites.

A major criticism of early reclamation schemes is that they were designed almost exclusively as civil engineering projects, with a monolithic approach to the site using large-scale material movement and hard engineering solutions. In many cases the design of the project has been extended from limited areas of acute concern (e.g. eroding tailings tips) to areas of the site of relatively little pollution potential (e.g. stable waste rock tips, workings, standing structures). The projects have used a limited hard landscaping palette, replacing diverse habitats and landscape features with areas of uniform improved pasture grasses and concrete features. This style of reclamation of spoil tips often produces a curiously ugly and sterile-looking landscape (as at the Goginan mine, the west part of Cwmsymlog), which can look much less well integrated with the local landscape than the original workings.

The authority would support the use of a more subtle approach to the management of the sites. Since the early schemes the value of the individual features and the sites as a whole has gained greater recognition, and this should be reflected in the design of schemes. A general starting point would be to aim for minimum intervention in the sites necessary for the remediation of the acute problems of contamination. At the same time options could be considered for appropriate work on consolidation of features, and interpretation and safety works where required. In general, Ceredigion Council would support the use of more varied solutions to the problems posed by mine sites.

An important aspect of the management of the sites should be close attention to the implementation of the schemes. Archaeological and other features on mines sites are relatively fragile and are easily damaged by operations during remediation. This emphasises the need for intelligent design with regard to the site features and for close control of operation of the works.

Table 2 Biological Impacts from Potential Remediation Techniques

Technique	Potential Impact
Redistribution waste spoil.	Waste spoil is known to support scarce metallophyte liverworts and mosses, lichens and other rare lower plants may be present that could be destroyed if waste is moved, as well as result in loss of habitat.
Capping of waste spoil to prevent exposure to the atmosphere.	As above.
Installation of perimeter cut-off drains to prevent water infiltration.	Data is incomplete regarding wetland species - not known.
Culvert or divert surface water away from aging areas of spoil.	May impact on bryophytes, otters and flight paths of bats. Could also reduce the for-habitat for these animals.
Line stream bed with clay to prevent contact with contaminate material.	May destroy invertebrate and bryophyte habitat.
Increase the size of natural marsh land areas providing natural water treatment.	Could enhance/increase wetland areas - potentially positive impact.
Create new anaerobic wetland treatment areas to reduce metal levels.	Could increase bat foraging areas and create new habitat for invertebrates.
Construction of a semi-passive operational treatment plant on site.	Depending on its siting location may destroy important semi-natural habitat e.g. Woodland. But could also have a positive impact for insectivorous species.

4.3 Data Interpretation

The interpretation of the information provided by various stakeholders was facilitated by defining mine groups, examining previous WDA ranking study and producing a stakeholder matrix summarising their involvement in each of the 50 priority mine sites.

4.3.1 Mine Groups

During the analysis of the collected data it became apparent that the top 50 list of mines could be sub-divided into five groups. These are presented in presented in Table 3. An alphabetical list of the mines and their associated group is presented in Table 4.

Table 3 Metal Mine Site Groups

Group	Interpretation
1	No diverging issues - It appears that there are no diverging issues at this site, the Agency could therefore pursue the remediation relatively easily, but still taking into account intrinsic historic interests and still requiring a complete desk study and scope of works and possible impacts.
2	Converging issues - It appears that the Agency and one or more stakeholders have a shared interest in the remediation of the site and therefore it may be possible to develop a collaborative project. For example, there could be a combined interest to install a water clean-up scheme at the same time as the development of the site as a tourist attraction or the water remediation scheme could be extended to address issues of public health and safety.
3A	Diverging issues - It appears that the Agency and the views of one or more stakeholders diverge at this site, however, it is considered that the differences could be resolved subject to careful negotiations and sympathetic design.
3B	Diverging issues - It appears that the Agency and the views of one or more stakeholders diverge at this site, it is considered that the differences are so great that it would be extremely difficult to progress any remediation scheme. For example sites extensively designated as SSSI.
4	Further information - During the review of data it appears that these sites may not be presenting such an impact to the water environment as previously understood or data on sites outside the top 50 has come to light that indicates that they should be included within the top 50. Further monitoring and data review required.

Table 4 Mines and Groupings

MINE NAME	GROUPING	MINE NAME	GROUPING
ABBEY CONSOLS	3A	GROGWYNION	3B
ABERDAUNANT	4	GWYNFONYDD	4
ALLTYCRIB	3A	HAFAN	3A
BOG	2	HENFWLCH	3A
BRONFLOYD	3A	LEVEL FAWR	3A
BRYNYRAFR	4	LLANFAIR	1
BWLCHGWYN	3B	LLANFYRNACH	3A
CAEGYNON	2	LLWYNTEIFY	3B
CASTELL	3A	LLYWERNOG	2
CWM RHEIDOL	3A	LOGAULAS	3A
CWMSYMLOG	3A	MYNYDDGORDDU	4
CWMYSTWYTH	3B	MINERA	2
CYSTANOG	4	NANTYCRAEIAU	3B
DAREN	3A	NANTYMWYN	4
DOLAUCOTHI (OGOFAU)	4	PARC	4
DYFNGWM	4	PARYS	2
DYLIFE	3B	PENRHIW	3A
ESGAIRFFRAITH	3B	PENYCEFN	4
ESGAIRLLE	2	POWELL'S	3A
ESGAIRMWYN OLD	4	RHEIDOL UNITED (ERWTOMAU)	3A
FRONGOCH	3A	RHEIDOL UNITED (GWAITH GOCH)	3A
GEIRIONYDD MINE	4	TEMPLE	3A
GLOGFAWR	3A	TY'N-Y-FRON	3A
GOGINAN	2	WEMYSS	3A
GRAIGGOCH	3A	YSTUMTUEN	3A

4.3.2 WDA Ranking

During the consultation process it became evident that the Welsh Development Agency had previously conducted its own ranking study of metal mines in Wales. To appreciate this ranking study in the context of this strategy it is important to consider the following related issues:

- (i) The study was carried out in 1978 and embodies the views of that time.
- (ii) The study gives a broad combined score of 5 environmental impacts namely:
 - Physical features
 - Amenity/Landscape
 - Environmental Pollution of Land
 - Environmental Pollution of Water
 - Spoil

If mine sites that have undergone treatment since this 1978 survey were re-ranked by the WDA today then obviously the rankings presented here would change. This is particularly so because the WDA has funded work at seven of the top ten sites as ranked in the WDA survey.

One further point to be noted is that within the WDA survey, sites which appeared environmentally benign but which posed physical hazards, by way of open and unprotected shafts or dangerous structures, were separately logged.

The study commissioned by the WDA produced large amounts of valuable site specific data. The Agency would like to thank the WDA for making this data available where it is envisaged that it will be used in the consideration of site specific issues as the strategy is implemented.

4.3.3 Stakeholder Matrix

Table 5, Stakeholder Site Matrix, provides a summary of which stakeholder responded at each site. A further two columns to the far right of the table also list the Agency mine group and WDA rank.

It is important to note that certain stakeholders indicated an interest in all the mine sites. The interpretation of the data in this strategy will be used to identify sites that can be taken forward to remediation in a constructive and collaborative manner. The data collected in no way removes the need for detailed desk study, site investigation and survey work before remedial schemes are progressed.

4.4 Summary of Mine Groups

By classifying the top 50 sites into these five groups it is possible to determine which sites may be progressed through to remediation more expediently than others by identifying site constraints and possible joint interests at sites at an early stage.

In summary a total of 31 out of the 50 mine sites fall within Groups 1, 2 or 3A, that is those sites where it is considered that there are: no diverging issues (Group 1); converging issues (Group 2); and sites with diverging issues, but resolution possible (Group 3A). This means that further remediation can now be considered at the majority of top 50 sites.

However, of those that are not currently suitable, seven are considered to have diverging issues so complex (Group 3B) that at present it is not considered viable to progress any

plans for a remediation scheme. While the remaining twelve sites will first require further environmental impact assessment (Group 4) before a complete understanding of the degree of impact these sites are having on the environment.

The distribution of the sites into the sub-groups is illustrated in Table 6. The largest proportion consists of sites in group 3A. These being sites which, although including some diverging issues, still have potential for site remediation subject to site specific issues being resolved. While of the remaining eight sites without diverging issues, seven have converging issues and one is considered relatively easy to remediate (but taking account of intrinsic historic interests and still requiring a complete desk study and scope of works and possible impacts).

Table 5 Stakeholder Site Matrix
see page 21

Table 6 Distribution of Sites by Group

Group	No. of Sites	% of Total	Colour Code used in Table 5
1	1	2	■
2	7	14	■■■
3A	23	46	■■■■■
3B	7	14	■■■■■■■
4	12	24	■■■■■■■■■■■■

Table 5
Stakeholder Site Matrix

MINE	STAKEHOLDER ORGANISATION								Archaeological Issues			Mineralogical		Biological Issues		Other Information Provided by the Stakeholder													
	Amlwch Industrial Heritage Trust	Archaeological Trust	Cadw	CCW	Forest Enterprise	National Trust	North Wales Caving Club	Royal Commission on Ancient and Historical Monuments in Wales	Amlwch Industrial Heritage Trust	CCW	National Trust	Amgueddfa National Park	The Mid-Wales Mining Museum	Welsh Mines Preservation Trust	Welsh Mines Society	Wrexham Museum	Amgueddfa National Park	Angelsey Mining plc	Archeological Trust	Local Authority/Council	NAW	North Wales Caving Club	Pentir Pummon Tourism	Snowdonia National Park	The Mid-Wales Mining Museum	Wardell Armstrong	Welsh Gold plc	Welsh Mines Society	Environment Agency Wales Group
LLANFAIR	●●								●																●	1	-		
BOG	●●●		●																						●	2	-		
CAEGYNON	●●●																								●	2	-		
ESGAIRLLE																									●	2	-		
GOGINAN	●●●																								●	2	10		
LLYWERNOG	●●●								●															●	2	-			
MINERA					●																			●	2	7			
PARYS	●●●								●●●															●	2	2			
ABBEY CONSOLS	●●●																								●	3A	34		
ALLTYCRIB	●●●		●																					●	3A	-			
BRONFLOYC	●●●																							●	3A	49			
CASTELL	●●●																							●	3A	37			
CWM RHEIDOL	●●●																							●	3A	16			
CWMSYMLOG	●●●																							●	3A	1			
DAREN	●●●																							●	3A	-			
FRONGOCH	●●●																							●	3A	10			
GLOGFAWR	●●●																							●	3A	32			
GRAIGGOCH	●●●																							●	3A	21			
HAFAN	●●●																							●	3A	-			
HENFWLCH	●●●																							●	3A	-			
LEVEL FAWR	●●●		●																					●	3A	12			
LLANFRYRNACH	●●●																							●	3A	31			
LAGAULAS	●●●																							●	3A	20			
PENRHIW	●●●																							●	3A	-			
POWELL'S	●●●																							●	3A	47			
RHEIDOL UNITED (Erwtomau)	●●●																							●	3A	-			
RHEIDOL UNITED (Gwaith Goch)	●●●																							●	3A	-			
TEMPLE	●●●																							●	3A	-			
TY'N-Y-FRON	●●●																							●	3A	-			
WEMYSS	●●●																							●	3A	8			
YSTUMTUEN	●●●																							●	3B	15			
BWLCHGWYN	●●●																							●	3B	41			
CWMYSTWYTH	●●●																							●	3B	3			
DYLIFE	●●●																							●	3B	26			
ESGAIRFFRAITH	●●●		●																					●	3B	57			
GROGWYNION	●●●																							●	3B	26			
LLWYNTEIFY	●●●																							●	3B	-			
NANTYCREIAU	●●●																							●	3B	5			
ABERDAUNANT	●●●																							●	4	38			
BRYNYRAFR	●●●																							●	4	-			
CYSTANOC	●●●																							●	4	-			
DOLAUCOTHI	●●●																							●	4	-			
DYFNGWM	●●●																							●	4	53			
ESGAIRMWYN OLD	●●●																							●	4	-			
GEIRIONYDD	●●●																							●	4	-			
GWYNFYNYDD	●●●																							●	4	-			
MYNYDDORGORDDU	●●●																							●	4	-			
NANTYMWYN	●●●																							●	4	13			
PARC	●●●																							●	4	4			
PENYCEFNF	●●●																							●	4	-			

5.0 FUTURE ACTIONS AND RECOMENDATIONS

By drawing on the data held by numerous other organisations this strategy for the first time presents a realistic picture of the potential issues/concerns/views at the top 50 polluting metal mine sites in Wales that the Agency would wish to see addressed. A breakdown of the full responses received from stakeholders for each mine is contained within Appendix C.

However, the Agency also recognises the need for a pragmatic approach when developing a solution to the problem of metal mine pollution. As such the process of interpreting the collected information and sub-dividing the sites into the five groups allows that pragmatism to be followed and greatly assists in the continued prioritisation of resources and the development of solutions.

As previously stated it is important to note that for all sites there will be the requirement to undertake site specific work including desk studies, site investigation and appropriate surveys to assist in the design of the most suitable remedial scheme.

Specific actions for each of the groups of site are presented below.

5.1 Groups 1 and 2 Actions

Sites where there are no diverging issues (Group 1) and converging issues (Group 2) actions are:

- Further prioritisation of these groups based on their environmental impact (Kitts H & Smith G [Acer Environmental] (1996);
- For Group 2 sites begin dialogue with all stakeholders regarding converging interests;
- Identify possible collaborative projects and potential sources of funding to secure remediation.

Sites falling in these two groups are:

Mine Name	Environment Impact Ranking within groups 1 & 2
Goginan	1
Esgairlle	2
Llanfair (Group 1)	3
Parys	4
Bog	5
Caegynon	6
Nant Minera	7
Llywernog	8

5.2 Group 3A Actions

Sites where diverging issues have been identified but could be resolved, actions for this group are:

- Further prioritisation of these groups based on their environmental impact (Kitts H & Smith G [Acer Environmental] (1996);
- Begin dialogue with stakeholders to identify solutions, and use a cost benefit analysis approach;
- Identify possible potential sources of funding to secure remediation.

Sites in this group are:

Mine Name	Environment Impact Ranking within group 3A
Cwm Rheidol	1
Castell	2
Frongoch	3
Temple	4
Ty'n-Y-Fron	5
Ystumtuen	6
Wemyss	7
Graiggoch	8
Henfwlch	9
Llanfyrnach	10
Daren	11
Rheidal United (Gwaith Goch)	12
Logaulas	13
Hafan	14
Abbey Consols	15
Alltycrib	16
Powell's	17
Cwmsymlog	18
Glogfawr	19
Rheidal United (Erwtomau)	20
Bronfloyd	21
Penrhiew	22
Level Fawr	23

5.3 Group 3B Actions

These sites are considered to have diverging issues such that remedial works would be very difficult to progress, actions for this group are:

- Further prioritisation of these groups based on their environmental impact (Kitts H & Smith G [Acer Environmental] (1996);
- Reconsider the sites based on the prioritisation to justify further dialogue with stakeholders to identify possible solutions at 'worst' case sites using a cost benefit analysis approach.

Sites in this group are:

Mine Name	Environment Impact Ranking within group 3B
Bwlchgwyn	1
Esgairffraith	2
Dylife	3
Cwmystwyth	4
Grogwynion	5
Nantycreiau	6
Llwynteify	7

5.4 Group 4 Actions

These are sites where during this study it appears they are not presenting such an impact to the water environment as previously understood. Actions for sites in this group are:

- Confirm impact these sites may be having on the water environment;
- Undertake additional monitoring and analysis if required;
- Assess whether sites should still be considered within the top 50 sites.

Sites in this group are:

Aberdaunant	Geirionydd
Brynyrafr	Gwynfynydd
Cystanog	Mynyddgorddu
Dolaucothi	Nantymwyn
Dyfngwm	Parc
Esgairmwyn Old	Penycefn

5.5 Overarching Actions

In addition to the actions required for each group of sites a set of overarching actions need to be put in place to ensure that the implementation of this strategy continues and metal mine sites are taken through to remediation. As such the following actions are also recommended:

- The Agency sets up an internal group with the specific task of implementing the group actions listed above;
- This strategy is disseminated to all interested stakeholders to ensure that they are better informed regarding the views of others and to assist in the management of metal mine sites;
- Where sites can be progressed to remediation, and from the work of the Agency's internal group, establish site specific or sub-area working groups of all the interested stakeholders to ensure remediation is progressed in a constructive manner;
- Commence process of addressing impacts of the remaining sites outside the top 50 list which may include cost benefit analysis to take account of diminishing environmental returns.

5.6 Timetable of Actions

The Agency intends to appoint a part time Project Officer for an initial 2 year period to develop the findings in this document in the next phase. Based on previous environmental impact rankings (Kitts H & Smith G [Acer Environmental], 1996) the Agency aims to take forward into the next phase:

- All eight sites in Groups 1 and 2;
- Four sites from Group 3A having the greatest environmental impact;
- Four sites from Group 3B having the most environmental impact for the external steering group (see below) to initiate a solution by further dialogue with stakeholders;
- Confirm the impact of Group 4 sites.

In addition the Agency intends to:

- Scope remedial options in conjunction with all relevant stakeholders;
- Develop and secure collaborative projects;
- Bid for funds for remedial works (including long-term site management) as collaborative projects;
- Continue the development of the strategy and start to address the issues at other sites not on the initial top 50 list;
- Invite stakeholders with regulatory or statutory powers to participate in an external steering group to take the strategy forward in the next phase. Thus enabling the implications of emerging legislation to be fully incorporated into the strategy, identifying appropriate resources, and maintaining multi-agency support for the strategy. This group should adopt a cost benefit analysis approach when considering issues at sites.

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Appendix A

Table of the Environment Agency's Top 50 Metal Mine Sites in Wales



MINE NAME	MINE GRID REFERENCE	MINE REFERENCE NUMBER	DISTRICT	RIVER NAME	RIVER QUALITY COMPLIANCE
ABBEY CONSOLS	SN7440066300	M0423	Ceredigion	Teifi	Marginal
ABERDAUNANT	SN9060086500	M1275	Powys	Nant Gwestyn	Compliant
ALLTYCRIB	SN6480089400	M0350	Ceredigion	Leri	Marginal
BOG	SN7390081400	M0536	Ceredigion	Nant y Bog	Significant Failure
BRONFLOYD	SN6590083500	M0387	Ceredigion	Silo	Significant Failure
BRYNYRAFR	SN7450087900	M0508	Ceredigion	Nanty Moch Dam	Compliant
BWLCHGWYN	SN7380078700	M0452	Ceredigion	Trib. Babi	Significant Failure
CAEGYNON	SM7180078400	M0454	Ceredigion	Rheidol	Significant Failure
CASTELL	SM7780081500	M0515	Ceredigion	Castell	Significant Failure
CWM RHEIDOL	SM7300078300	M0457	Ceredigion	Rheidol	Significant Failure
CWMSYMLOG	SN6980083700	M0364	Ceredigion	Symlog	Significant Failure
CWMYSTWYTH	SN8020074600	M0570	Ceredigion	Ystwyth	Significant Failure
CYSTANOG	SN4400020000	M0745	Carmarthenshire	Twyi	Compliant
DAREN	SN6750082800	M0363	Ceredigion	Erfyn	Significant Failure
DOLAUCOTHI (OGOFAU)	SN6630040300	M0689	Carmarthenshire	Cothi	Compliant
DYFNGWM	SN8500093100	M1274	Powys	Clywedog	Compliant
DYLIFE	SN8590094000	M1220	Powys	Twynmyn	Significant Failure
ESGAIRFFRAITH	SN7420091200	M0561	Ceredigion	Lluestgota	Significant Failure
ESGAIRLLE	SN7910082700	M0521	Ceredigion	Castell	Significant Failure
ESGAIRMWYN OLD	SN7550069200	M0432	Ceredigion	Garw	Compliant
FRONGOCH	SN7220074400	M0463	Ceredigion	Nant Cwm	Significant Failure
GEIRIONYDD MINE	SH7620061100	M1341	Conwy	Trib. Llyn	Compliant
GLOGFAWR	SN7470070600	M0468	Ceredigion	Level Fawr	Significant Failure
GOGINAN	SN6900081700	M0368	Ceredigion	Melindwr	Significant Failure
GRAIGGOCH	SN7050074100	M0469	Ceredigion	Nant Cwm	Significant Failure
GROGWYNION	SN7150072200	M0470	Ceredigion	Ystwyth	Significant Failure
GWYNFYNYDD	SH7360028200	M1088	Gwynedd	Mawddach	Compliant
HAFAN	SN7300088000	M0524	Ceredigion	Cyneioniog	Marginal
HENFWLCH	SN7370088300	M0525	Ceredigion	Nant y Chwareli	Significant Failure
LEVEL FAWR	SN7390072200	M0608	Ceredigion	Level Fawr	Significant Failure
LLANFAIR	SN6270051200	M0663	Ceredigion	Clywedog	Significant Failure
LLANFYRNACH	SN2250031700	M0708	Pembrokeshire	Taf	Marginal
LLWYNTEIFY	SN7410078900	M0472	Ceredigion	Rheidol	Significant Failure
LLYWERNOG	SN7330081000	M0606	Ceredigion	Llywernog	Significant Failure
LOGAULAS	SN7430071700	M0473	Ceredigion	Level Fawr	Significant Failure
MYNYDDORGORDDU	SN6680086100	M0377	Ceredigion	Bow Street Brook	Compliant
NANT MINERA	SJ2840050200	M0323	Wrexham	Stryt y Scweiar	Significant Failure
NANTYCREIAU	SN7900080200	M0530	Ceredigion	Nant y Creiau	Significant Failure
NANTYMWYN	SN7840044600	M0673	Carmarthenshire	Nant y Bai	Compliant
PARC	SH7870060200	M0869	Conwy	Nant Gwydy	Compliant
PARYS	SH4400090200	M0808	Anglesey	Afon Goch	Significant Failure
PENRHIW	SN7370078600	M0488	Ceredigion	Rheidol	Significant Failure
PENYCEFN	SN6550085600	M0380	Ceredigion	Bow Street Brook	Compliant
POWELL'S	SN7290080800	M0535	Ceredigion	Llywernog	Significant Failure
RHEIDOL UNITED	SN7120078200	M0597	Ceredigion	Rheidol	Significant Failure
RHEIDOL UNITED(Gwaith)	SN7110078400	M0494	Ceredigion	Rheidol	Significant Failure
TEMPLE	SN7490079300	M0497	Ceredigion	Rheidol	Significant Failure
TY'N-Y-FRON	SN7240078500	M0499	Ceredigion	Nant Harvest Hall	Significant Failure
WEMYSS	SN7160074200	M0501	Ceredigion	Nant Cwm	Significant Failure
YSTUMTUEN	SN7320078800	M0505	Ceredigion	Rheidol	Significant Failure

Appendix B

Glossary



Appendix B - Glossary

- Adipose fin - Small vestigial fin on a fish between the tail (caudal fin) and dorsal fin
- Adit - a tunnel communicating with the surface for drainage and access.
- Aerial ropeway - a cable-car used to transport materials over rocky terrain
- Anaerobic - biological process devoid of oxygen
- Assaying - the analysis of a sample to establish the concentration of a particular element such as silver, lead or gold
- Assemblages - A mineralogical term used to describe the composition of vein material
- Blende - the common ore of zinc, usually with a semi-metallic blue/brown lustre. Contains up to 56% zinc, 33% sulphur, plus iron as an impurity
- Bob pit - a pit, often adjacent to a shaft, used to carry the weight employed in counter-balancing the weight of the pumping rod
- Breccias - angular fragments of rock cemented with a gangue mineral such as quartz or calcite
- Bryophyte - mosses
- BSBI - Botanical Society of the British Isles
- Buddle - a machine for separating finely crushed ore from gangue
- Capstan circle - a stone lined pit which housed the lower part of the hand capstan used to maintain the heavy mine pumps
- CCW - Countryside Council for Wales
- Corbelled roof - a stone roof, so constructed as to be self supporting, viz- in an arch or by catenary slabs
- Crusher house - a building constructed to accommodate the rock crushing and sizing plant
- Day levels - the same as an adit but specifically for access
- Dorsal fin - large fin on the back of a fish
- Drawing machine - an archaic term for a winding engine used to haul cages or kibbles up a shaft
- Dressing - the process of removing waste material and gangue from the crude or undressed ore
- Dressing floor - a flat area upon which the washing processes (dressing) would take place. A more casual affair than a dressing mill
- Drumhouse - a term usually applied to slate mining. At the head of self acting inclines it was necessary to build a large diameter wooden drum around which the cable could be wrapped. The drum was also fitted with a brake by which the operator could govern the cable speed
- DWT 1993 report - Dyfed Wildlife Trust survey and report on mine sites
- EQSs - European Quality Standards
- EU - European Union
- FE - Forest Enterprise
- Fines - is applied to all material under a given mesh size. Files also describe 'slimes' which are < 50 microns. Fines are < 1 mm but > 50 microns. A diffuse term which includes 'Tailings'
- Fire setting - the softening and shaking of rock by the application of fire
- Flat rod dolly wheels - rollers
- Flat-rods - pump rods were frequently square or round and usually of pitch pine with iron strapping but sometimes of iron. They only work under tension and can take no compressive loads
- Fly tipping - dumping of rubbish, usually by the public
- Galena - the common ore of lead, distinguished by its great density and silvery metallic lustre when freshly broken.
- Gangue - The ore matrix, often comprising fragments of rock cemented with quartz, calcite, etc
- GCR - Geological Conservation Review
- GIS - Geographical Information System
- Groups 1, 2, 3A, 3B and 4 - Environment Agency's priority groupings as described in the strategy document
- Hammerstones - stones used as hammers
- Hand cobbed debris - small angular fragments of vein which have been broken up using hand held cobbing hammers. Pre-dates rock crushers
- Hand-tipped shaft mounds - dumps formed without tramways
- Horse-whim circle - the track left by horses walking in a circle to turn the horse whim
- Hushing - the washing away of topsoil so as to expose any mineral veins which might be buried beneath the soil. Usually of some antiquity
- Hushing channels - these are usually called 'Hush Gutters'. See above
- Kibble - a barrel-shaped vessel of iron or wood in which ore was raised
- Leat - a man-made watercourse to enable water to be brought to where it was needed. Not mining specific

Appendix B - Glossary

- Line-of-lode workings - outcrop workings or workings on the back of the lode or the course of the lode
- Lode (or vein) - mineralized ground containing ore usually in company with worthless material eg. rock, quartz, etc
- Meer stones - stones erected to delineate a boundary (from 1750, and probably before, until the late 19th century)
- Metalliferous - containing metal
- Metallophyte liverworts - members of a group of green lower plants that are metal-loving (or maybe metal tolerant)
- MINESCAN - Welsh metallophyte and metallogenic evaluation project by The National Museums and Galleries of Wales (commissioned by CCW)
- NAW - National Assembly for Wales
- NMGW - National Museum and Galleries of Wales
- NMRW - National Monuments Record for Wales (RCAHMW's national database)
- Non-ferrous - a metal other than iron or steel
- Opencast pit - usually open stopes where a great width of vein has been followed down from the surface
- Paragenesis - mineralogical. Many geneses or phases of mineralogical activity
- PAWS - Plantations on Ancient Woodland Site
- PDO - Potentially Damaging Operations
- Penstock - a tank constructed at the head of a pipeline to power a turbine
- Powder magazine - the gunpowder store. Required by law after the 1872 act. They are of a particular construction.
- pRIGS - proposed Regionally Important Geological Site
- pSAC - proposed Special Area of Conservation
- pSSSI - proposed Site of Special Scientific Interest
- RCAHMW - Royal Commission on Ancient and Historical Monuments in Wales
- RDB/UKBAP - Red Data Book/UK Biodiversity Action Plan
- RE classes - river ecosystem classes ranging from RE1 (excellent water quality) to RE5 (poor water quality)
- RIGS - Regionally Important Geological Site
- RQOs - River Quality Objectives
- SAC - Special Area of Conservation
- Salmonids - Fish from the family salmonidae; salmon and trout
- SAM - Scheduled Ancient Monument
- SAP - Salmon Action Plan
- Sett - an area of land taken for mining purposes
- Smelting site - where metal was extracted from ore by melting
- SMR - Sites and Monuments Record (held by the archaeological trusts)
- SN 0000 0000 - national grid references
- SSSI - Site of Special Scientific Interest
- Stakeholder - party with interest or concern in this mine strategy
- Stopes - the working chambers or cavities in a mine created by removal of ore.
- WDA - Welsh Development Agency
- WDA rankings - Welsh Development Agency rankings as explained in the strategy document
- Wet bryophyte turfs - a wet piece of earth that has mosses and liverworts (two groups of green lower plants) growing on it
- WFD - Water Framework Directive
- WMPT - Welsh Mines Preservation Trust
- WMS - Welsh Mines Society

Appendix C

Detailed Mine Information



Appendix C - Detailed Mine Information

MINE NAME: ABBEY CONSOLS

Archaeological

Welsh Mines Society

Recent reclamation work has destroyed many of the features on this mine. However, it is probable that further remedial work will uncover new features and result in the rediscovery of features lost in the earlier work. A full archaeological assessment is essential before remedial work is commenced.

Cambria Archaeology (Dyfed Archaeological Trust)

Remains of dressing floors and waterwheel pit, but most of the site is levelled. No structures scheduled on mine site but there is a scheduled site CD109 (Pen y Bannau, Iron Age Hill Fort) immediately north of the mine site, which also overlooks CD001 Strata Florida Abbey to the south on the opposite side of the Afon Teifi.

Although upstanding buildings have been demolished there is potential for extensive surviving buried archaeological remains at this site. Further archaeological assessment required prior to designing any scheme.

Mineralogical

No comments.

Biological (Habitat / Species)

Welsh Mines Society

Virtually all the species/habitats will have been destroyed by earlier reclamation work. If any were identified before the earlier work, their survival should be assessed before further work is carried out.

Countryside Council for Wales

Two nationally rare lichens exist on spoil heaps in Area 6

Other

Welsh Mines Society

This site drains into the headwaters of the Teifi and impairs its quality; as water is drawn from the Teifi for public consumption, its quality is of paramount importance. It's believed the County Council once proposed a land reclamation scheme. The surface and minerals are in multiple ownership.

It is understood that this mine is already part of a circuit of local walking routes promoted for visitors to the Strata Florida Abbey area.

Ceredigion Council

A feasibility study was undertaken by Excal Ltd. Under the management of Ceredigion County Council, funded by the Agency. The study highlights that remediation would have a high environmental benefit to the Afon Teifi.

This study was not connected with reclamation that has been carried out on the site. It should be made clear that this work was nothing to do with CCC and that the Excal feasibility study was a separate project.

The site is in an area that has potential for promoted tourism routes and is in the Upper Teifi Valley community project area promoted by a team based at Lampeter University.

Cambria Archaeology (Dyfed Archaeological Trust)
Site overlooks CD001 Strata Florida Abbey.

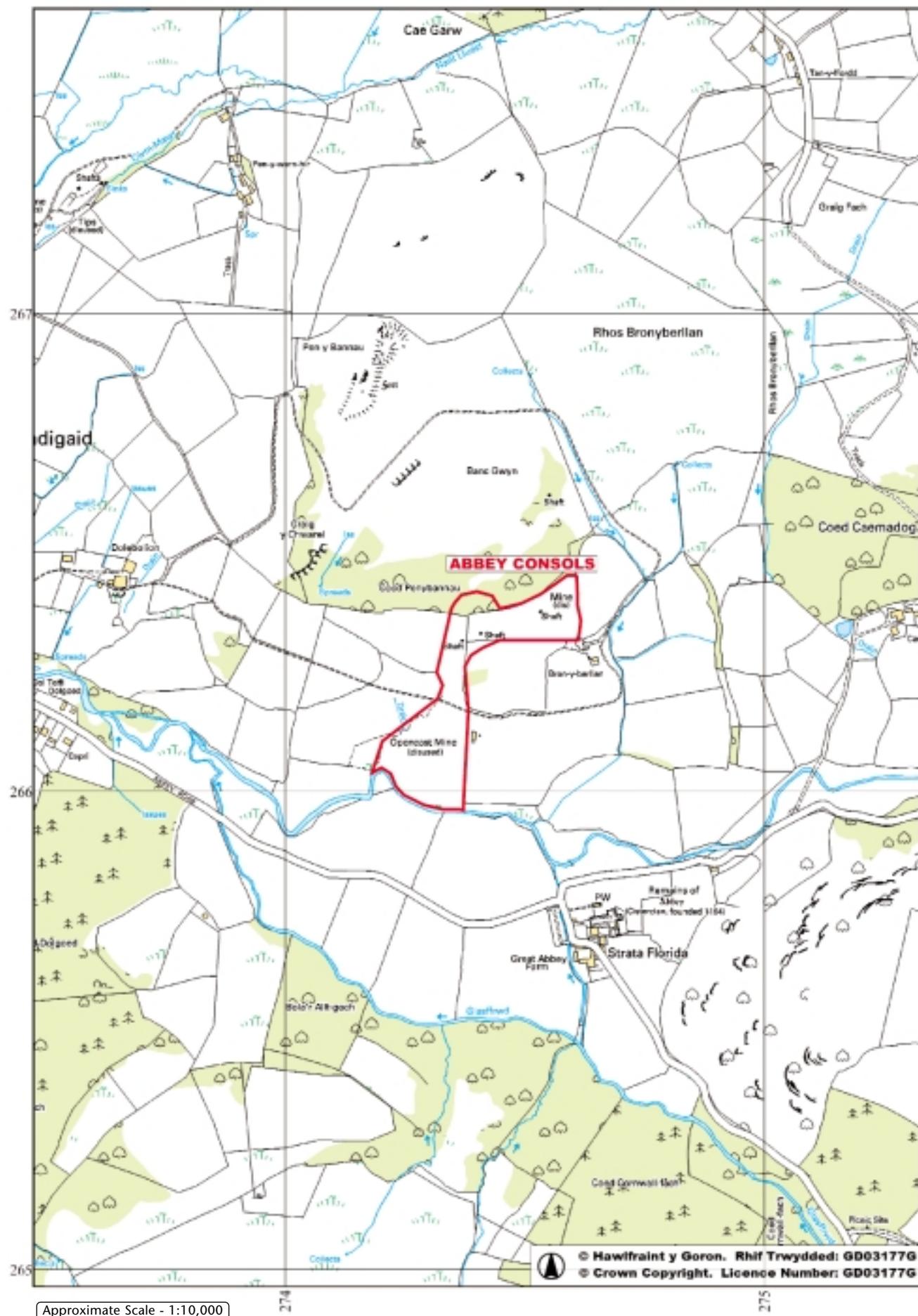
Pentir Pumlumon Tourism

The southernmost site on the proposed Miner's Way through N.E. Ceredigion. Classic landscape location overlooking River Teifi & Strata Florida Abbey. Interesting heritage storyline dating from the WW1 reopening. The ruined Mine Office has potential for renovation as a Bunkhouse on the Trail. Controlled sub-surface access possible via the Deep Adit for archaeological surveys & educational use.

Welsh Development Agency

In 1978 the WDA ranked this site 34th, in addition it was also noted that the site was impacting the environment.

ABBEY CONSOLS



MINE NAME: ABERDAUNANT

Archaeological

Welsh Mines Society

Site of a very ancient mine, possibly pre-historic in origin with much potential for archaeological investigation. Structures include old buildings, waterwheel pit in valley bottom and old engine house on hillside.

Clwyd-Powys Archaeological Trust

Basal foundation remains of an 1871 30ft waterwheel pit. 1876 engine house partially survives but is in urgent need of repair and restoration if walls are to survive imminent collapse. A possible mine office building foundation is visible on the poorly preserved dressing floors at the foot of the slope. Where development is proposed pre-planning archaeological evaluation will be necessary to frame an appropriate response.

Mineralogical

Welsh Mines Society

The waste dumps on the hillside and the exposed rock faces of the quarry are of mineralogical importance.

Countryside Council for Wales

The in situ exposures and spoil tips at this mine are of regional importance (proposed RIGS). This provides the only good exposure of mineralisation associated with the famous Van Lode. The galena is extensively altered to the secondary lead minerals, pyromorphite, cerussite and wulfenite occurs, unusually, in situ. Additionally, galena crystals are thickly coated with the hydrous iron oxide, goethite. Many of the secondary minerals have formed specifically as part of the alteration of the extracted minerals. The process of weathering the metalliferous ores is active in the tips and lodes and enables such processes to be studied in place.

Biological (Habitat / Species)

Countryside Council for Wales

Site visit by CCW staff essential before remediation works finalised as there is likely to be lichen interest on the rock exposures. Also shafts and adits are probably used by bats, with all species protected.

Other

Welsh Development Agency

In 1978 the WDA ranked this site 38th, in addition it was also noted that the site was impacting the environment.

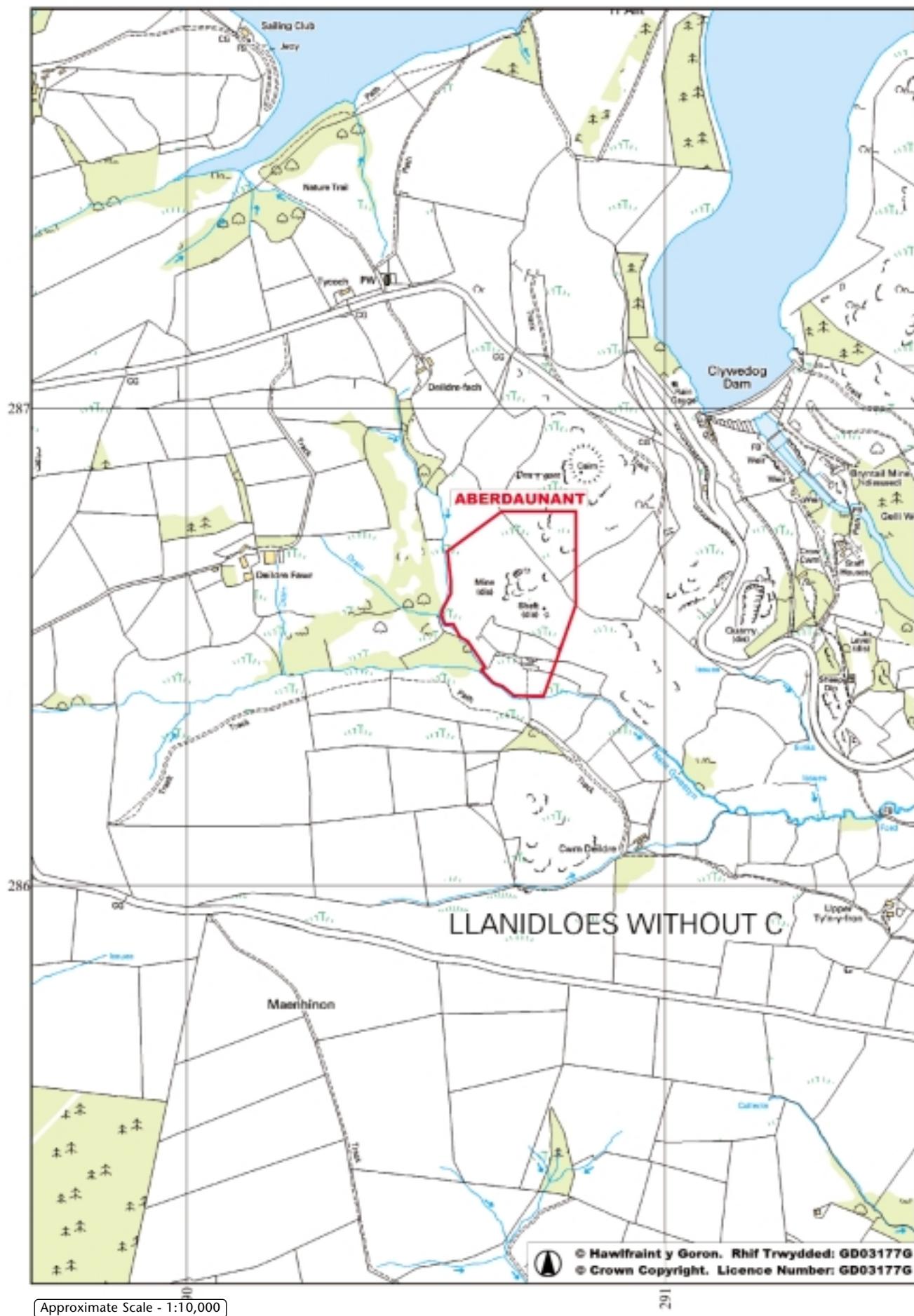
Welsh Mines Society

Possible works involve the prevention of the river encroaching upon the dumps and an iron grid placed over the Engine Shaft. Toy's engine house needs to be conserved before it topples over.

Countryside Council for Wales

The workings are on private farmland (rough grazing) and approached by poorly maintained footpaths from a nearby minor road. The exposures are small and the steepness of the ground ensures the dumps are inaccessible by vehicle and unsuitable for large parties.

ABERDAUNANT



MINE NAME: ALLTYCRIB

Archaeological

Welsh Mines Society

This is one of the key early mining sites in mid Wales (archaeology of 17th century or even earlier). There are numerous features within the boundary of the mine which are of great significance to the history and archaeology of silver and lead working. There are about 100 pits, shafts and trenches associated with this mine, aligned along two east - west lodes and one north - south lode. Some early fire setting and hydraulic mining has taken place along the crest and on the north side of the hill that is now endangered by agricultural improvement. These improvements could also be a threat to an ancient gallery colloquially called 'the Roman Level'. No buildings survive on Allt y Crib hill except for the ruins of a powder magazine and the concrete foundations of an early 20th century mill. There is also on the Afon Leri at the southern end of the mine, a lead/silver smelting site dating from at least the 18th century.

Cambria Archaeology (Dyfed Archaeological Trust)

There are no Scheduled Ancient Monuments (SAM), but there are a large number of features recorded on the Sites and Monuments Record (SMR). Alltycrib mineral workings documented from 1641. Overgrown workings and extensive spoil tips dating from 17th to 18th century. Site holds possibility of extensive sub-surface archaeology relating to 17th/18th century mineral workings. Remains include: shafts, pits, levels, spoil tip and tramway.

Forest Enterprise

There are a number of structures and shafts which require special management. FE have an agreement with the Welsh Archaeological Trusts and any works require their input and recommendations for management. An annual exchange of the SMR data is part of this agreement and each District holds GIS and database information and management plans for each feature.

Mineralogical

Countryside Council for Wales

No comments

Biological (Habitat / Species)

Countryside Council for Wales

Three rare lichen species that require protection exist on spoil in Area 3.

Forest Enterprise

Standard works management plans need to be consulted before any remediation is proposed. The spoil tips and rock cuttings also support good numbers of common invertebrates such as the green tiger beetle.

Other

Welsh Mines Society

The site is accessible via public rights of way, and although there are no plans to promote, there is certainly potential for low key interpretation of the site.

The greater part of the surface is owned by Forest Enterprise. The minerals are reserved to the Gogerddan Estate.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

Countryside Council for Wales

Current public rights of way will need to be preserved.

Ceredigion County Council

Located close to Talybont village with potential for informal use of public rights of way through Allt y Crib woods.

Pentir Pumlumon Tourism

Location is on the route of the proposed Miner's Way through N.E. Ceredigion.. Important part of the 17th century storyline, with well documented history. Interesting juxtaposition with Talybont as a mining settlement, with deep adit dressing floors located within the curtilage of the village. Low-key Interpretation potential within Forest setting. Scope for inclusion in a local village Heritage Trail, embracing mining, woollen mills and the Plynlimon & Hafan Tramway (former mineral railway).

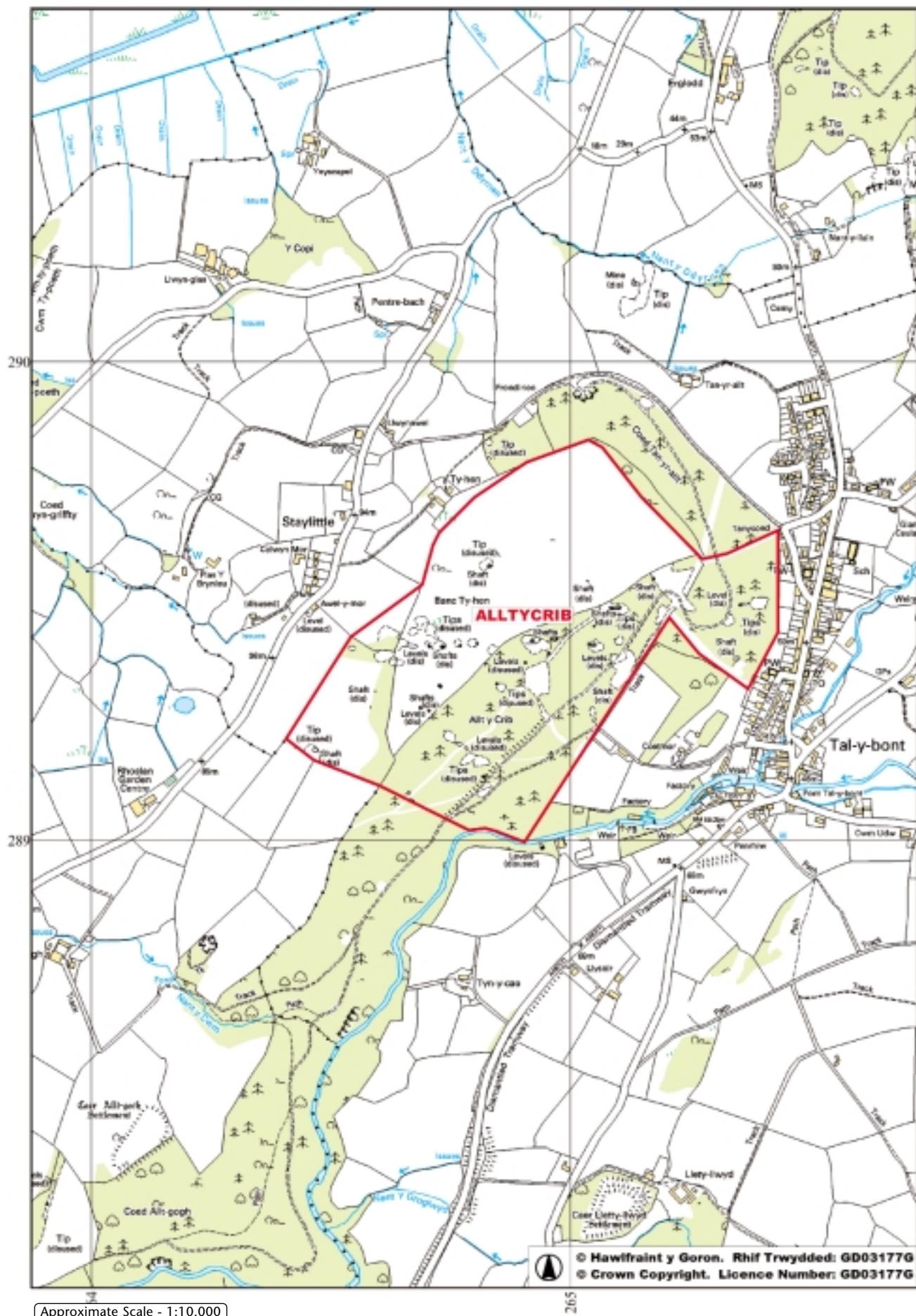
Forest Enterprise

This site has several public footpaths and is well used in general by the public, especially by the local villagers. Many of the spoil heaps are used (against our wishes) as racing grounds for quad bikes.

Much of the spoil and shafts lie within forested land and any works would involve clearance of trees, even if just for access. From a landscape and woodland point of view there would need to be in depth consultation with FE. This whole wood is a PAWS site (plantations on ancient woodland site) with restoration to upland oakwood. Of course any alteration to current forest management plans will require a Forest Design Plan amendment to be submitted via FE for approval by the Forestry Commission.

Should any remediation works be required and planned, full consultation with FE will be required at an early stage. This will also allow for early consultation with the local population.

ALLTYCRIB



MINE NAME: BOG

Archaeological

Welsh Mines Society

A 19th century lead mine occupying afforested upland with good surviving archaeological features. These include (from north to south) pumping waterwheel pit, with adjoining mountings for a drawing machine, the earthworks marking the course of the flat-rods with the associated support mountings. A further drawing machine approximately 400 metres south of the pumping-wheel, and the structures associated with the working shaft on the lodes at the southern end of the mine, along with the surrounding dressing floors.

Cambria Archaeology (Dyfed Archaeological Trust)

Bog Site forms part of a larger complex incorporating Graignant, Graignant Bach and Llywernog Mines. The Bog site is largely forested, operating from 1830 to 1882, large numbers of archaeological features including winding engine house, wheel-pits, shaft lodes, quarries and many sections of leat.

Forest Enterprise

There are a number of structures, which require special management. FE have an agreement with the Welsh Archaeological Trusts and any works require their input and recommendations for management. An annual exchange of the SMR (Sites & Monuments Record) data is part of this agreement and each Forestry District holds GIS and database information and management plans for each feature.

Cadw

The features on this site were noted in the Forest Enterprise Welsh Heritage Assets Survey. There are good remains of shafts, dressing floors, water powered features, site building and waste tips. The site was proposed for scheduling but rejected. However its interest would be taken into consideration in controlling and limiting work on the site.

Mineralogical

Countryside Council for Wales

No comments

Biological (Habitat / Species)

Forestry Enterprise (Canolborth Forest District)

Standard works management plans need to be consulted before any remediation is proposed.

Other

Forestry Enterprise (Canolborth Forest District)

Many people from the general public access and enjoy the site in its current state. Much of the spoil and shafts lie within forested land and any works would involve clearance of trees, even if just for access. From a landscape and woodland point of view there would need to be full consultation, with any potential Forest Design Plan amendments via FE requiring approval from the Forestry Commission. There should also be consultation with the local population.

Ceredigion Council

No public rights of way, see Cambria Report.

Pentir Pumlumon Tourism

Remote workings largely intact through location. Strong sense of period mining landscape with remains of high-level water-power system showing innovative use of remote pumping/winding technology. Worthy of low-key interpretation as a 'wilderness' site, with potential for footpath link to the Forest Centre at Bwlch Nantyrarian and to the Llywernog Mine Museum.

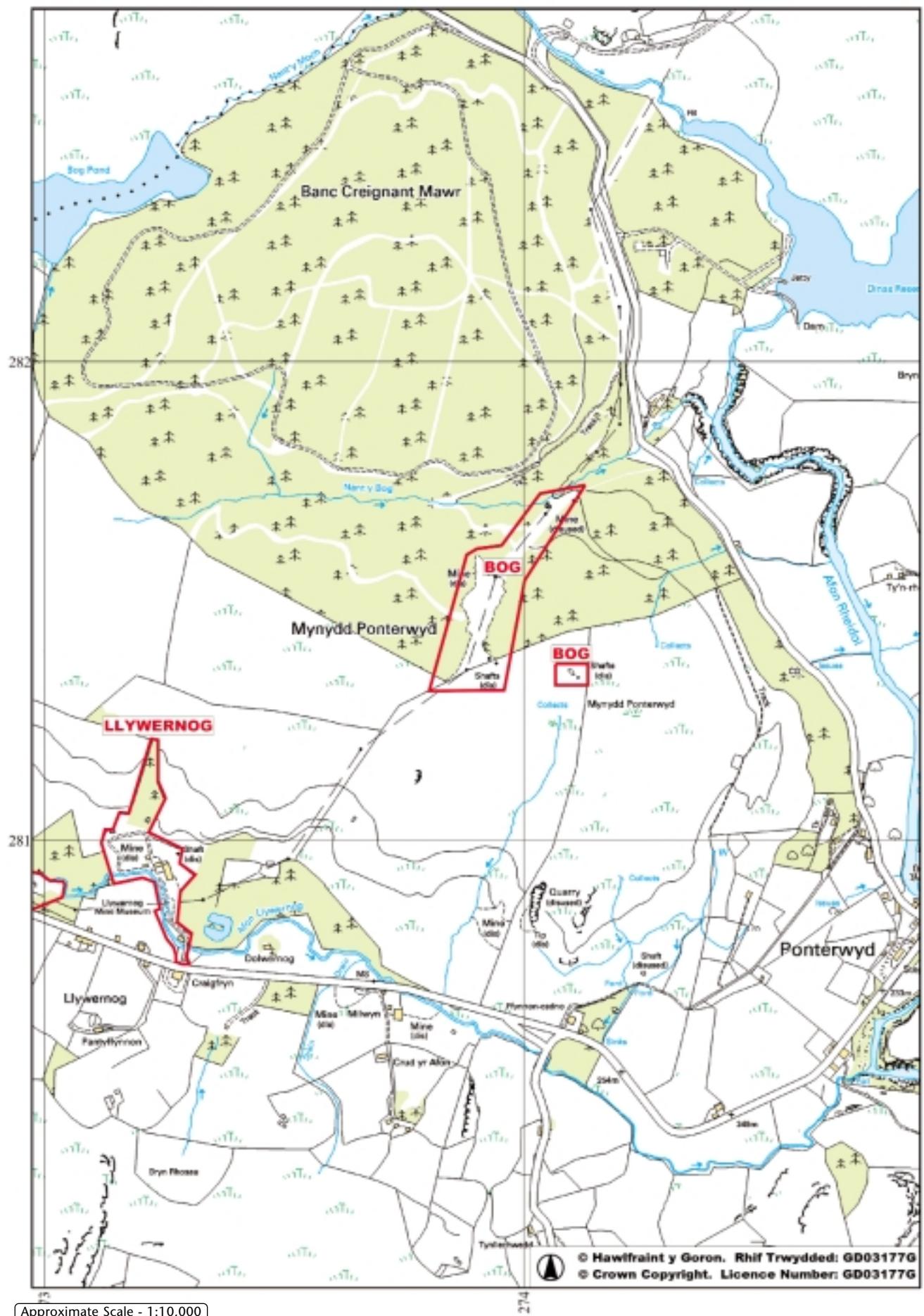
Welsh Mines Society

The surface is owned by the Forest Enterprise and the minerals are reserved to the Gogerddan Estate.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

BOG



Approximate Scale - 1:10,000

MINE NAME: BRONFLOYD

Archaeological

Welsh Mines Society

Dates back to the first half of the 17th century, but the majority of features surviving on site are from the second half of the 19th century. The vast majority of the site is a Scheduled Ancient Monument - Cd 152. Surviving features include late 19th century dressing floors, pumping water wheel pit (at north end near the river). Any remedial work would have a severe impact on the dressing floor and underlying features from the early modern period (see 18th century plan produced in Bick and Davies, Lewis Morris and the Cardiganshire Mines, p.34). It is essential that a detailed topographical survey followed by a full archaeological assessment is carried out on this site before remedial work is considered.

Cambria Archaeology (Dyfed Archaeological Trust)

Majority of site is Scheduled Ancient Monument Cd 152, as remains survive for most processes. Mining first recorded in the 17th century, grew significantly in 1850's and ceased in 1892. Remains include: opencast pit, level shafts, adit, building complex, two water wheels, dressing floors, leats, winding drum and pump-rod tracks.

Cadw

This site is of very high archaeological importance and hence is a Scheduled Ancient Monument (Cd152). Since scheduling the site has been periodically surveyed in 1988, 89, 91, 93 and 2000. On each occasion descriptive text and photographs are taken to record any changes. The most recent survey dated 19/07/2000 indicates that with the exception of dumping in some of the shafts the buildings and structures remain as previously recorded. Because this site is Scheduled, Scheduled Ancient Monument Consent from the National Assembly for Wales will be required for any works within the identified area.

Mineralogical

Countryside Council for Wales

No noteworthy mineralogy identified.

Biological (Habitat / Species)

Countryside Council for Wales

No noteworthy species identified.

Other

Welsh Mines Society

There are no plans to promote this structure, but it presents an excellent opportunity for low key interpretation, being accessible from public rights of way.

This site is relatively undamaged except for some minor stone robbing. Access is down a narrow lane that passes through a farmyard, and this has no doubt prevented fly tipping. The minerals are reserved to the Gogerddan Estate.

Cadw

There are no plans to promote this site.

Ceredigion Council

While public footpaths exist across site, people are probably not being encouraged to trek through an ancient monument. The complexity of the site would suggest that the preferred remedial option would be to stop water from reaching the receptor, rather than on site remediation.

Countryside Council for Wales

Whole site is sheep grazed. The large spoil heap beside the stream, has been partially removed, probably for use as hardcore.

Pentir Pumlumon Tourism

Located on the route of the proposed Miner's Way through N.E. Ceredigion. Low level site exhibiting many classic features of a water-powered metalliferous mine. Scheduled Ancient Monument with important links to the 17th/18th centuries. Considerable scope for detailed surface and sub-surface archaeological investigation, and controlled use of the site as an educational resource.

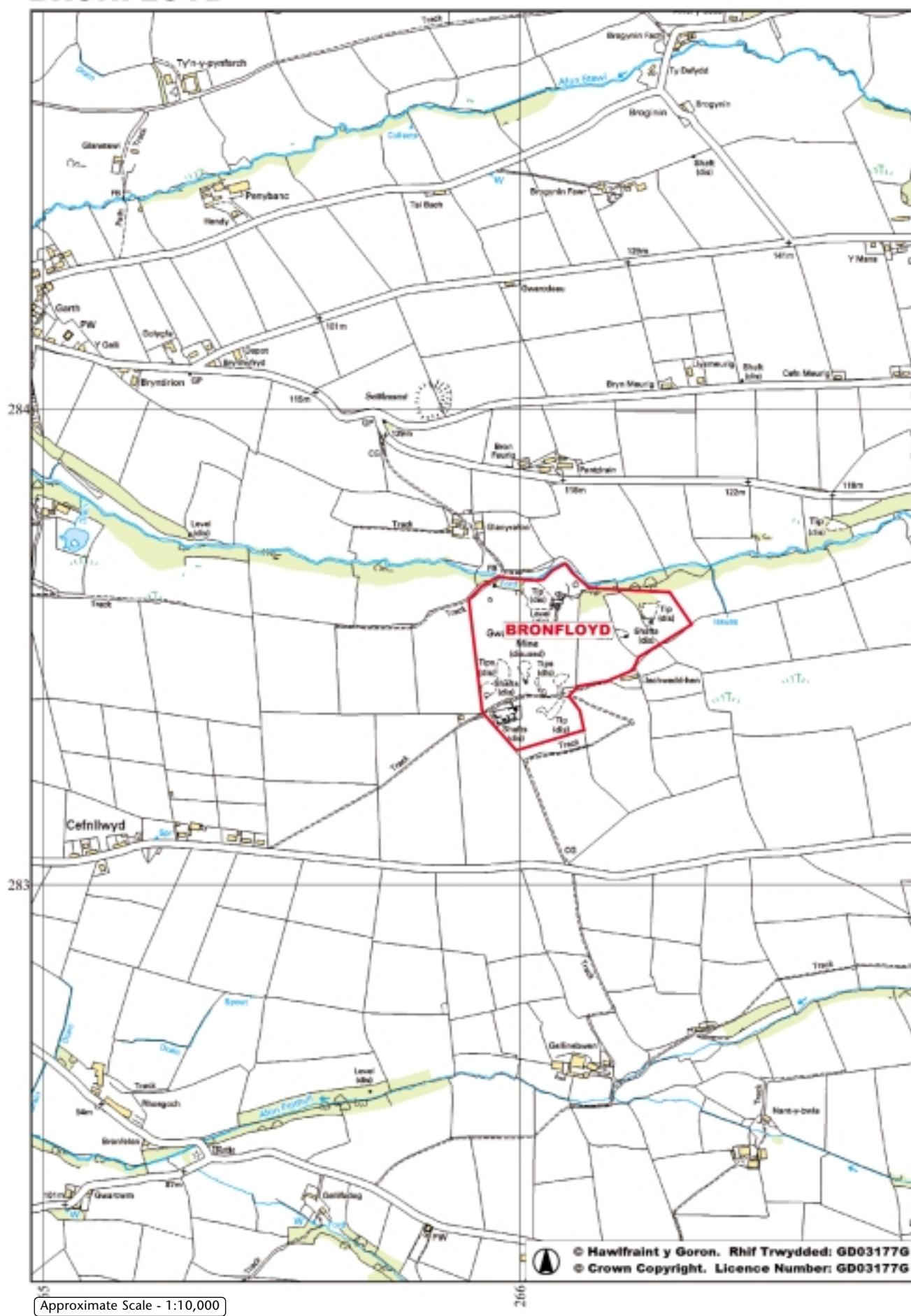
Welsh Development Agency

In 1978 the WDA ranked this site 49th, in addition it was also noted that the site was impacting the environment.

Bibliography

Bick, David and Davies, Phillip Wyn. Lewis Morris and the Cardiganshire Mines, (Aberystwyth, 1994).

BRONFLOYD



Approximate Scale - 1:10,000

MINE NAME: BRYNYRAFR

Archaeological

Welsh Mines Society

Little survives of the mine since the construction of the Nantymoch reservoir. However the working shaft and the dressing floor remains above the water level. There is potential for the survival of evidence for complex dressing processes as a result of the increasing output of blende concentrates when confronted by steadily falling lead prices. A topographic survey and full archaeological assessment is essential prior to the commencement of remedial work, which should be accompanied by archaeological monitoring. Any remedial work of these dressing floors could reveal more evidence for complex ore separation processes, any features revealed should be recorded.

Cambria Archaeology (Dyfed Archaeological Trust)

Part of mine now underwater in Nant-y-Moch Reservoir including pumping wheel and winding drum. Surviving remains include buildings, shafts and leat.

Mineralogical

Countryside Council for Wales

Site is programmed for SSSI designation in January 2002. The mineral bearing spoil tips (covering 1.35 ha) are of special scientific interest because they provide one of the best sites for the study of textures associated with vein mineralisation in the Central Wales orefield. The site is of unparalleled quality for demonstrating the repeated sequence of re-brecciation and cross cutting which characterises the primary paragenesis of the orefield. In addition, fine specimens of the rare nickel sulphide mineral millerite are abundant on the tips. Hence any re-distribution, capping or removal would severely compromise the interest.

Biological (Habitat / Species)

Countryside Council for Wales

No noteworthy species identified.

Other

Countryside Council for Wales

The land is privately owned.

Ceredigion County Council

Part of a group of mines important for their landscape value on the western side of the Pumlumon Massif.

Pentir Pumlumon Tourism

An important 'wilderness' mine site in the Plynlimon Uplands, clearly visible from the Nantymoch Reservoir perimeter road, and the route of the proposed Miner's Way at Carn Owen. Site closely linked to the mining revival of the 1900's. Long leat systems are evident, once supplying the traditional water-powered plant. A mineralogically important site which also typifies the difficulties encountered in operating mining ventures in remote mountainous country.

Welsh Mines Society

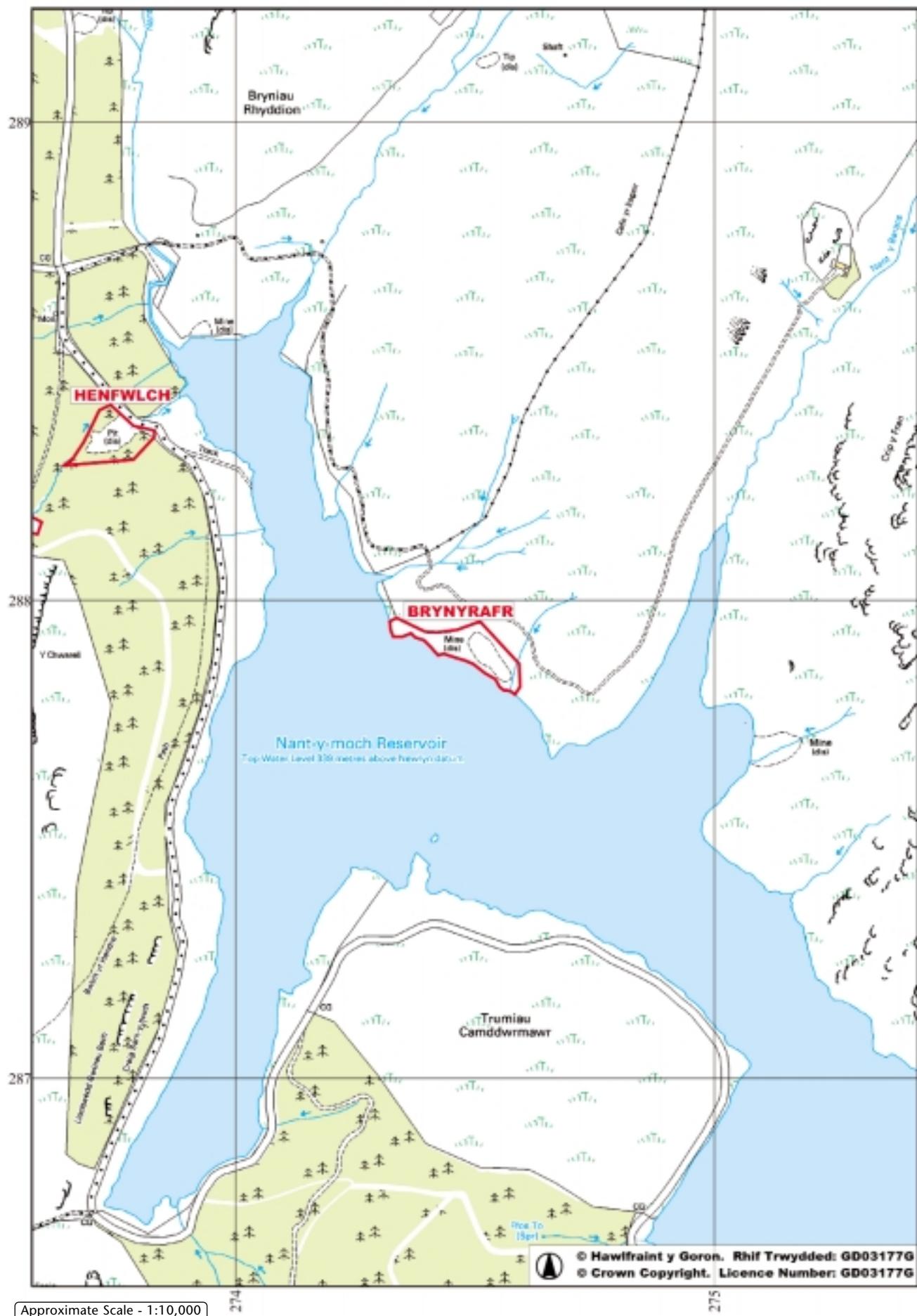
Much of this site was demolished by contractors during the construction of the Nant y Moch reservoir during the

late 1950s and there is little left to see. Careful excavation of the remains may reveal some further details about the site and the leats which supplied this, and neighbouring mines have largely survived and form an integral part of the historical landscape. The minerals are reserved to the Gogerddan Estate and the surface is a sheepwalk, part of Penypontpren Uchaf Farm, Talybont.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

BRYNYRAFR



MINE NAME: BWLCHGWYN

Archaeological

Welsh Mines Society

Bwlchgwyn is one of a group of ancient mines, worked through to the late 19th century, on the high ground north of the Rheidol - see also Penrhiew and Llwynteifi. They were, at times, worked as one concern and the features evident on one sett cannot be viewed in isolation from those on adjoining setts.

Many features still survive which can be readily identified with Lewis Morris's sketches dating from the 1740s and illustrated in Dick and Davies, Lewis Morris and the Cardiganshire Mines, (Aberystwyth, 1994). Features on the Bwlchgwyn sett date from at least the early 18th century through to the late 19th century. These include earthworks related to watercourses, whim rounds, tramways and hand-tipped shaft mounds, along with the residues from ore dressing processes. The latter will include hand cobbed debris from 18th century operations plus the tailings from later 19th century ore processing. Sub-surface archaeological features are to be expected across the whole site and it is thought to be the only site in mid Wales known to have an underground boundary marker stone, dating from 1742. Along with neighbouring Llwynteifi, there is the potential to identify prehistoric workings.

Cambria Archaeology (Dyfed Archaeological Trust)

Part of the Cwm Rheidol sett, so worked in conjunction with Ystumtuen, Penrhiew and Llwynteifi, with Bwlchgwyn Mine closing in 1917. The remains of a crusher house and wheel-pit should not be disturbed.

Mineralogical

Countryside Council for Wales

Forming a linked sett with Llwynteifi, this site is of regional importance because it provides one of the most informative combinations of the mining geology and primary mineralisation, located in one of the finest early mining landscapes in the Central Wales Orefield. Good examples of typical late (A2) mineralisation are common on the spoil tips, particularly those associated with the large Eastern Shaft. Removal of the spoil, infilling of the shafts and restoring the landscape will compromise the geological interest. The site is a proposed RIGS (Regionally Important Geological Site) designation, lying wholly within common land, and overlapping, in part, with the existing Bryn Bras biological SSSI.

Biological (Habitat / Species)

Countryside Council for Wales

This is a lichenologically important site with eight rare species of lichen existing across defined Areas 4,5 and 6. Also note-worthy are water spiders recorded in the reservoir (Area 8)

Other

Welsh Mines Society

This site is prominent amongst those landscape features which led to 'upland Ceredigion' being designated as a 'Landscape of Outstanding Historic Interest'. The designation opens up real possibilities of promoting the

area to visitors, providing much-needed boost to the local economy. Remedial work will inevitably lead to the disturbance of archaeological features. A detailed topographical survey followed by a full archaeological assessment is essential before work is started. The site must also be considered in its landscape setting.

Much water gets into the mine from the reservoir and stream, a temporary culvert had to be installed in 1992 when the whole of the stream disappeared into a stope and flowed out of Cwm Rheidol No. 6. Unless a permanent solution can be found, this problem will occur again. There is potential for diverting the stream into the old leat to bypass the workings in the valley, as was done when the mine worked. The minerals are reserved to the Nanteos Estate with the surface being part of Penrhiew farm, Ystumtuen.

Ceredigion Council

A feasibility study into the capping of shafts and remediation of contaminated land has been carried out for Bwlchgwyn mine as part of a wider study into the Ystumtuen and Cwm Rheidol system. It is essential that all the system is addressed as one scheme as they are hydraulically linked with Cwm Rheidol, Ystumtuen and Penrhiew mines.

Part of a group of upland metal mines in mining settlement of Ystumtuen with potential interest as features near footpath system.

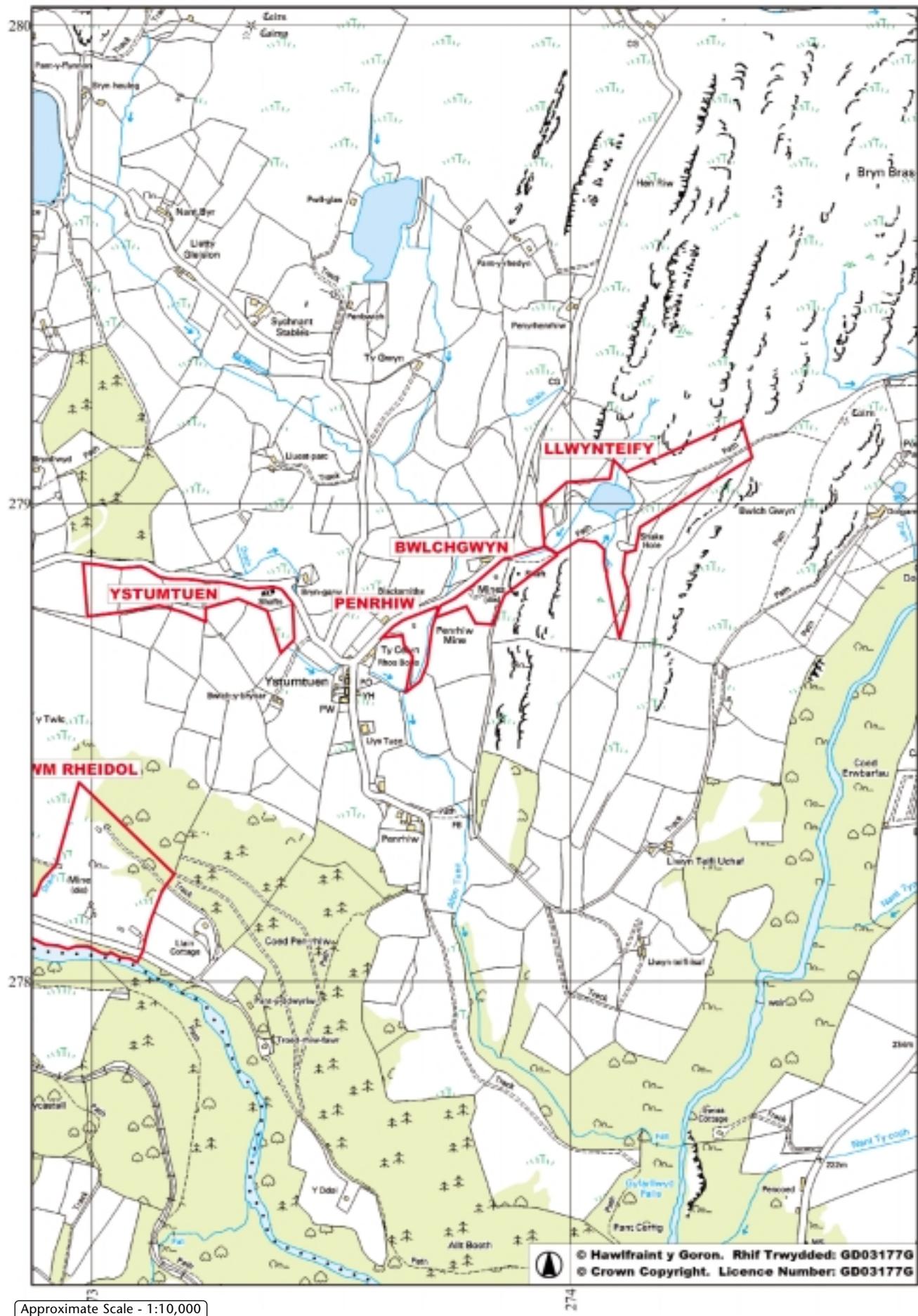
Pentir Pumlumon Tourism

One of the most evocative of the mining landscape features of old Cardiganshire, closely allied to the other Castell line-of-lode workings. Strong sense of an 18th century presence with many primitive outcrop excavations and good geological exposures. Located on the route of the proposed Miner's Way through N.E. Ceredigion. Important heritage resource with the potential to justify the revival of the Ystumtuen Youth Hostel as a Study Centre.

Welsh Development Agency

In 1978 the WDA ranked this site 41st, in addition it was also noted that the site was impacting the environment.

BWLCHGWYN



Approximate Scale - 1:10,000

MINE NAME: CAEGYNON

Archaeological

Welsh Mines Society

This mine was active from at least the early part of the 18th century into the early years of the 20th century. At the foot of the hillside are the dumps and structures associated with 19th century ore preparation processes surrounding the engine shaft and deep adit. Some robbing of material from the spoil heaps has occurred and the tailings have been levelled and grassed over. Nevertheless a significant proportion of the structures survive. Adjoining them are the offices and housing from that period. Above these are the spoil dumps and other earthworks associated with shallow works, some of which will date to the 18th century and possibly earlier.

Cambria Archaeology (Dyfed Archaeological Trust)

Caegynon Mine (PRN 25,897) no remains information provided.

Cadw

Site is not known to Cadw, potentially archaeologically sensitive and therefore requires assessment. This is especially the case in Dyfed where the archaeological trust mine study has not so far been followed up with recommendations to Cadw for scheduling.

Mineralogical

No comments.

Biological (Habitat / Species)

Ceredigion Council

The wooded area above the spoil tips is known to be a bat habitat, Nature Reserve and SSSI.

Countrywide Council for Wales

The area immediately above the spoil tips, within the woodland is designated SSSI/SAC. This designated area also has several shafts with the lowest one having a very local lichen species as well as being a possible roost for Natterer's Bats.

Cambria Archaeology (Dyfed Archaeological Trust)

Caegynon Mine lies on the edge of the SSSI (Rheidol Woods and Gorge), NNR and candidate SAC (block of ancient woodland).

Other

Welsh Mines Society

The smithy has recently been converted to a dwelling but retains much of its former character. Associated with this mine is the powder magazine, located in the field to the south, which is still in a remarkable condition. The mineral rights appear to be divided and the present owners have not been identified, the surface is also in multiple ownership.

In promoting the mining landscape, which features large in the historic landscape of upland Ceredigion, the view from the Vale of Rheidol Railway on the opposite side of the valley is perhaps crucial. To replace the dramatic sequence of spoil and tailings dumps with a uniform grass-covered graded heap is to damage the visual aspects of the mining landscape.

Countrywide Council for Wales

The bottom of the site near to the road is at times, used as a campsite. Any remedial work would need to preserve this use. Some of the mine buildings have been converted to a house at the bottom of the site. One of the adits within the SSSI/SAC is water-filled and a pipe carries water from it to this house.

Ceredigion Council

Valued as part of a group of mine workings, transport systems and mining settlements in Cwm Rheidol. There are plans to promote a cycle route through Cwm Rheidol from Pontarfynach, and Ystumtuen, and the valley is a destination for walkers and cyclists.

Pentir Pumlumon Tourism

Surviving group of Mine Buildings dating from the 18th & 19th centuries, with some early 20th century mill additions. The complex is an important visual feature from the Vale of Rheidol Railway, and the mine lies on the route of the proposed Miner's Way through N.E. Ceredigion. Reopening efforts were made here as late as the 1930's, in the very final phase of the industry. Scope for low-key interpretation and controlled sub-surface access for archaeological surveys and educational use.

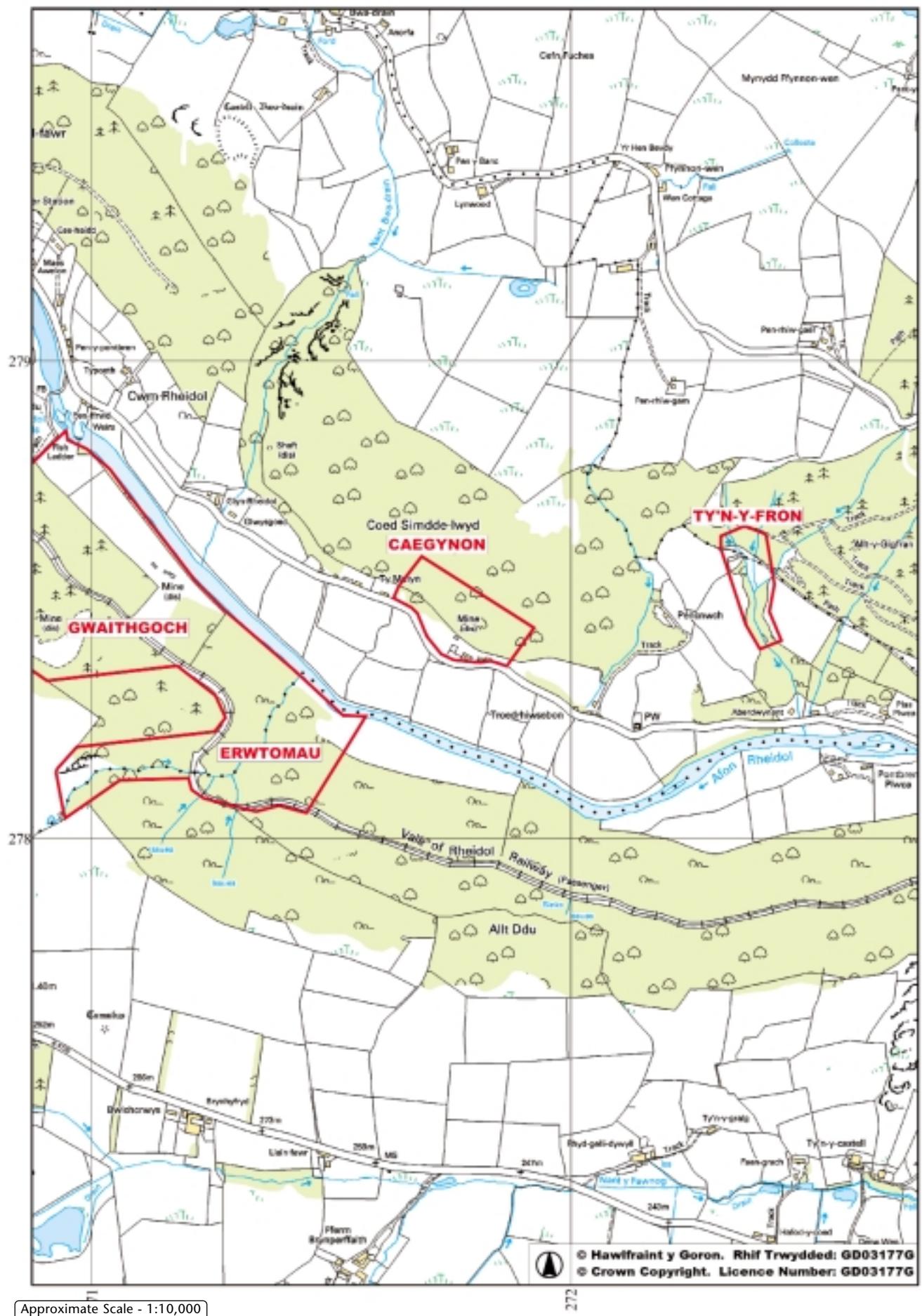
Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

Bibliography

Register of landscapes of outstanding historic interest in Wales', Cadw: Welsh Historic Monuments, (Cardiff, 1998)

CAEGYNON



Approximate Scale - 1:10,000

MINE NAME: CASTELL

Archaeological

Welsh Mines Society

The site of this late 18th / 19th century mine has largely been destroyed in recent years by the removal of spoil for hardcore. Only the crusher house of 1898 survives in recognisable form and that is close to total collapse. A portion of the site, including the crusher, is a scheduled ancient monument - Cd 153. All the other structures have been robbed for stone. The site of the engine shaft and other workings has been used as a dumping ground for rubbish. Nevertheless there is much that can be identified by the surviving earthworks and there is the potential for sub-surface archaeological features across the entire site. There will be a significant impact on the archaeological and landscape value of this site. Any remedial work should take that into consideration a detailed topographical survey and full archaeological assessment are required before work commences.

Cadw

Part of the site is a Scheduled Ancient Monument (Cd 153). They may also be other archaeological interests in surrounding area. Archaeological features and strata are liable to be disturbed by any excavation or spoil redistribution. Hence a site meeting would be required to determine sensitivity in surrounding area, with advice from County Sites and Monuments Record.

Cambria Archaeology (Dyfed Archaeological Trust)

Scheduled Ancient Monument Cd 153, and area is also a SSSI. Mine opened 1785 - 1803 and 1856 - 1908. Remains include 1898 crusher house and water wheel pit, both imposing landmarks. Also some post medieval enclosures in immediate surroundings.

Mineralogical

Countryside Council for Wales

This site designated as a SSSI (4.1 ha) has the best in-situ exposure of mineralised vein in the Central Wales Orefield and is of key importance for understanding the mode of emplacement. The outcrop reveals several episodes of brecciation and mineralisation and provides a classic demonstration of a process known as hydraulic fractioning. Removal, redistribution or capping of spoil will not effect geological feature but may severely compromise lichenological interest. Main threat to geological interest is posed by infilling of eastern opencast which contains the critical rock outcrops.

Biological (Habitat / Species)

Countryside Council for Wales

The site is very rich in rare terricolous and saxicolous metallophyte lichens (16 in total) which occur widely across the mine denoted by Areas 1, 4 and 5. There is also a rare bog Orchid in Area 1.

Other

Countryside Council for Wales

Health and safety remediation measures have taken place in 1993. This produced significant habitat changes to area 1. Also areas 2 and 3 where newly fenced with danger signs erected. Major civil engineering works also took place

during 1992-93 and included the opening up of new adits. This is a complex site, and key geological educational/research locality. The only remediation potential appears to be enhancing marshland in Area 5 at the bottom of the site.

Crown Estate

The Crown Estate (with Wardell Armstrong appointed as mineral agents) has ownership of minerals only. No mineral licence or lease exists.

Welsh Mines Society

Castell is the first metal mine site, with surviving structures, that any visitor will see when entering Ceredigion from the east and warrants interpretation as a gateway to the mining heritage of the area. If developed as a gateway to Ceredigion attraction this could compromise the Llywernog Museum. Alternatively the lower part of the site would make a good research or test plot to study what species will grow where and under what conditions, and the effects of applying lime. The minerals and surface are both owned by the Crown.

Ceredigion Council

Easily accessible from the A44, popular tourism area with hotel immediately opposite, also known to have been one of the main sites used by the Aberystwyth University for education. Council contracted feasibility study (by Excal) with remediation issue complex. The receiving watercourse is known to feed a reservoir, so there is potential for important potable water abstraction issues.

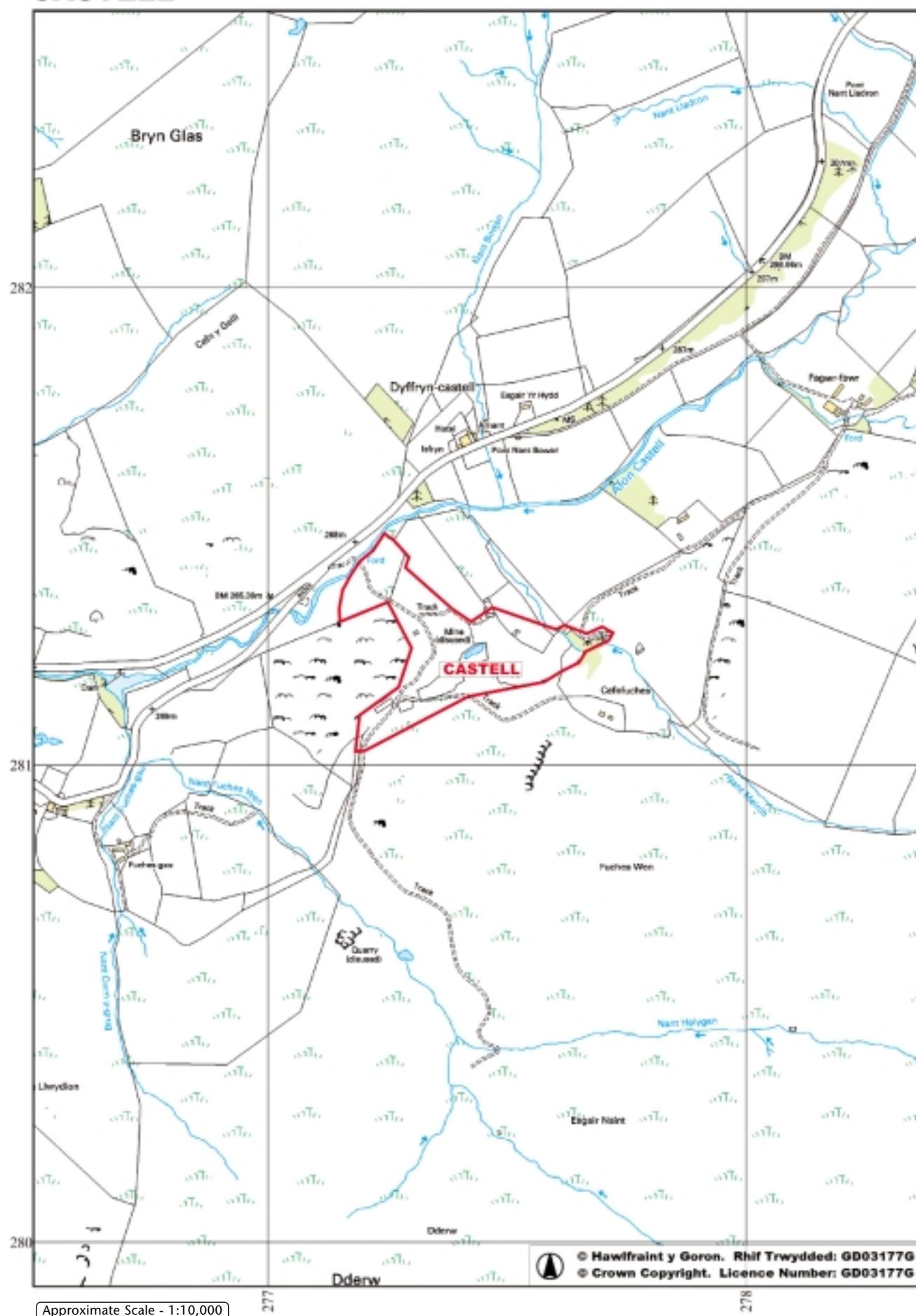
Pentir Pumlumon Tourism

Geographically important site being clearly visible from both the A44 and B4343 tourist route to Devil's Bridge. Suggested site for a replica working waterwheel in the restored crusher-house whelpit, as a mining landscape heritage feature and electrical generator. Some interesting & dramatic exposures of the Castell Lode and sub-surface mining & geological features. Ample scope for interpretation, with safe viewing areas & car parking. The site is an important element in the storyline of the 1900's mining revival. Scope for local trail linking this site with Nantycraigau, the Myherin Forest and Devil's Bridge, using existing public footpaths. Controlled access should be maintained to the Adit Level for educational resource use.

Welsh Development Agency

In 1978 the WDA ranked this site 37th, in addition it was also noted that the site was impacting the environment.

CASTELL



Approximate Scale - 1:10,000

Ddwriw

274

MINE NAME: CWM RHEIDOL

Archaeological

Welsh Mines Society

Earthworks and structures, including a substantial crusher house, associated with an early 20th century ore preparation site are to be found at Cwm Rheidol. The site was worked in connection with Ty'nyfron to the west and the two were connected by tramway. There is evidence on site for the watercourse and structures connected with the turbine used as a source of power. Evidence will also be found for an aerial ropeway linking with the Vale of Rheidol Railway. High above the spoil heaps is the entrance to Aldersons Level, driven north to access the ore deposits under Ystumtuen in the mid 19th century, adjoining which is the mine office. Any remedial work on the lower dumps will result in the disturbance of much, if not all, the archaeological evidence for ore preparation on this site. As with all the sites on the Environment Agency's priority list, the absolute minimum requirement is a detailed topographical survey followed by a full archaeological assessment with constant monitoring and recording of any features uncovered.

Cambria Archaeology (Dyfed Archaeological Trust)

The Cwm Rheidol Mine is associated with the nearby Caegynon and Level Fawr Mines. The mine was developed in the early 20th century, with an aerial ropeway linking the mine to the Valley of Rheidol Railway. Part of the site seems to be in a SSSI. Remains include mine buildings, reservoir, precipitation ponds, steam engine and power station.

Ceredigion Council

The Cwm Rheidol mine site and its structures are connected to the other sites of Bwlchgwyn, Penrhiew, Ystumteun and Llwyntifi. The Aldersons level has a hydrological link with these are sites.

Mineralogical

Countryside Council for Wales

This site has been selected as a proposed RIGS (Regionally Important Geological Site) by the National Museum and Galleries of Wales (NMGW). The site is viewed as being of regional importance for studies in the interaction between mineralogy, environmental geochemistry and ecology.

Biological (Habitat / Species)

Countryside Council for Wales

It is expected this will prove to be an important ecological site, possibly a SSSI status. It has seven note-worthy lichens, five of which are nationally rare. Also of note is the limestone grassland vegetation (not typical of this part of the country). Rare Five-spot Ladybird within the now defunct limestone chippings filtration system, and silver birch re-vegetating on spoil area between limestone chippings and river .

Other

Welsh Mines Society

At one time also known as Level Fawr, a lengthy adit drains the Ystumtuen, Penrhiew, Bwlchgwyn and Llwyntifi Mines, who's ores were brought to the surface here, for crushing and processing; Also, ore from the neighbouring Tynyfron Mine was conveyed here by tramway, the course of which survives. The prominent position of this site when viewed from the railway and its part in the wider landscape, mean that it must not be reduced to a meaningless graded heap.

The water being discharged from both the adits is so corrosive, and the valley so steep, that it will not be easy

to lay a pipeline to carry the effluent to a treatment works. It is far too acid to be treated with a limestone filter or reed beds and due care must be paid to the health and safety of employees. Work to remedy the problems associated with the flow of water from Aldersons Level will entail engineering work on unstable ground above the dumps. Consideration should be given to using lightweight plant and manual labour to avoid an unnecessarily heavy impact on the site. After the remedial work has been completed the site should be returned to a form resembling that before work was commenced.

Temporary works were undertaken ten years ago to reduce the pollution being discharged from the No. 9 adit and further work was then undertaken within No. 6 or Alderson's adit. There is a danger that rock falls within the workings will divert the discharge to the east, through Llwyntifi and into Temple. Therefore there is a need for further, permanent preventative measures, including a detailed assessment of the risk of the Afon Tuen being captured by the old workings and emerging as a potentially catastrophic flood in Cwm Rheidol. Attempts to contain and divert the water from Alderson's Level have largely failed resulting in the erosion of the spoil below the level. The present owners were aware that the dumps were being badly disturbed by grazing sheep, this problem has now been addressed and significant natural regrowth has occurred annually thereafter. The mineral rights, and liberty of access, were retained by Mineral Holdings, who sold the surface to two local farms.

Countryside Council for Wales

The public uses the river for swimming and sunbathing. Although remedial works may damage the scientific interest, the NMGW consultants accept the need for such works to prevent/reduce pollution of the Afon Rheidol.

Ceredigion Council

Valued as part of a group of mine workings, transport systems and mining settlements in Cwm Rheidol. There are plans to promote a cycle route through Cwm Rheidol from Pontarfynach, and Ystumtuen, and the valley is a destination for walkers as cyclists.

The site, particularly the adit discharge, is a major source of pollution, which has resulted in fish kills.

A feasibility study into prevention of contamination has been carried out for Cwm Rheidol as part of a wider study into the Ystumtuen and Cwm Rheidol system. It is essential that all the system is addressed as one scheme as they are hydraulically linked with Bwlchgwyn, Ystumtuen and Penrhiew mines.

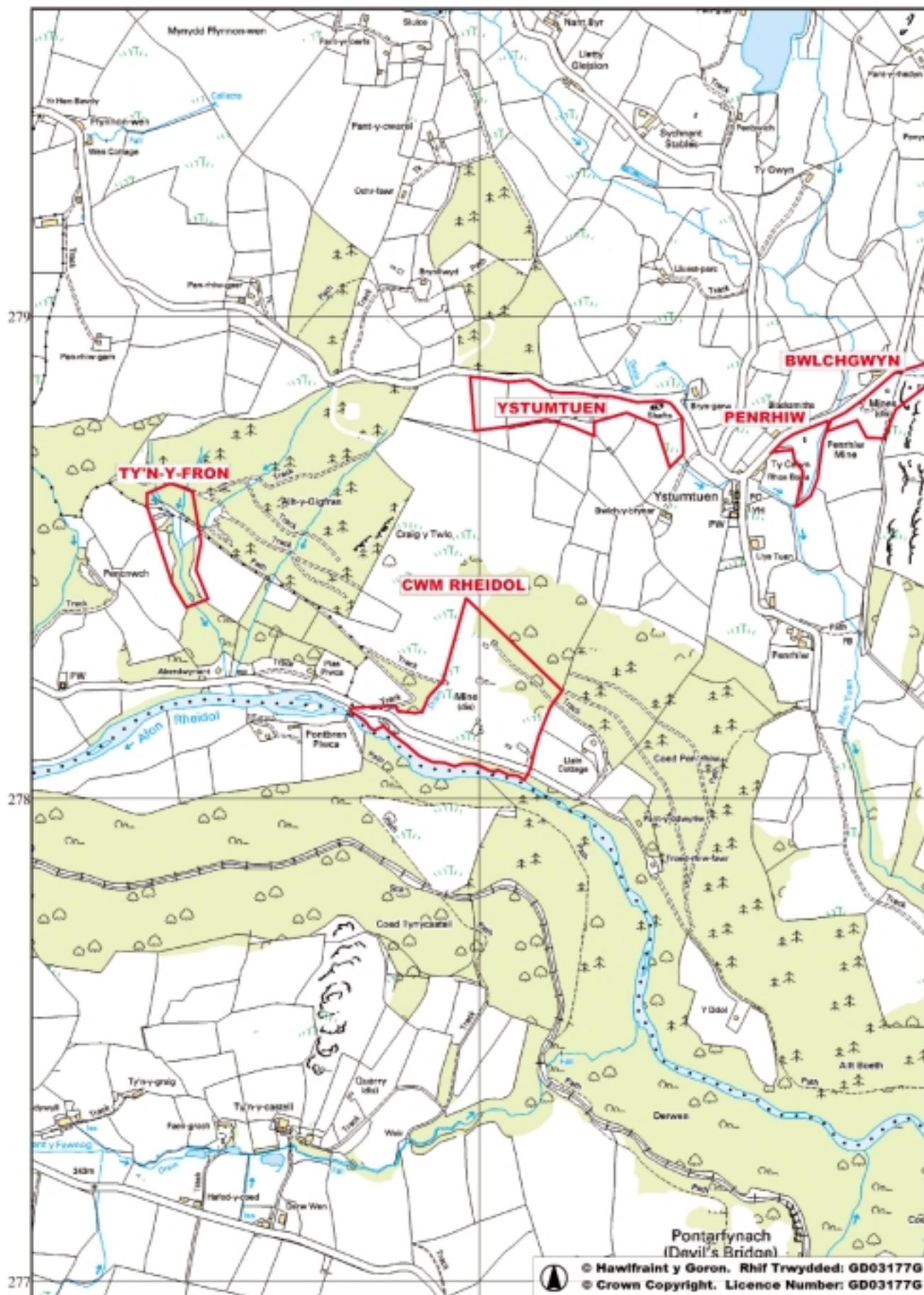
Pentir Pumlumon Tourism

Part of the important Castell line-of-lode workings, with evidence of features spanning several centuries. Clearly visible as an important mining landscape feature from the Vale of Rheidol Railway, and once linked by aerial ropeway. Large-scale reworking in the 1900's mining revival with efforts continuing to the late 1940's. Scope for interpretation and job creation by the establishment of a small-scale plant for commercially processing ochre for the specialist pigment market. The site lies on the route of the proposed Miner's Way through N.E. Ceredigion.

Welsh Development Agency

In 1978 the WDA ranked this site 16th, in addition it was also noted that the site was impacting the environment.

CWM RHEIDOL



Approximate Scale - 1:10,000

50

Metal Mine Strategy for Wales

MINE NAME: CWMSYMLOG

Archaeological

Welsh Mines Society

Cwmsymlog is one of the most important mining sites in mid Wales, with significant features dating from the late medieval period through the 16th to the late 19th century. Many features still survive which can be readily identified with Lewis Morris's sketches dating from the 1740s and illustrated in Dick and Davies, Lewis Morris and the Cardiganshire Mines, (Aberystwyth, 1994). The western part of the site, south of the stream, was severely damaged during earlier reclamation work. Some features around Taylors Shaft have survived on the western part of the site and north of the stream, at the western extremity of the site, is a prominent water-wheel pit and evidence for Bushell's adit of the early 17th century. The eastern section, from immediately south of the Cwmsymlog settlement eastwards to Llyn Pendam, contains a whole range of features. These remains include open works from the 16th century, one or more adits probably dating to the late medieval period, watercourse earthworks, a chimney and footings for a 19th century steam engine, and a number of water-wheel pits. Any remedial work, even on the western section where reclamation work has already been carried out, could damage surviving features and the sub-surface archaeology.

Cambria Archaeology (Dyfed Archaeological Trust)

Part of Cwmsymlog lead mine has been scheduled (Cd 159). This mine is one of the most important lead and silver mines in Wales, for its well preserved remains, complex history and good overall documentation. There are many well-preserved features, and a high potential for archaeological remains, including: store chimney from an engine house, Pryse's Shaft, Skinner's Shaft, capstan circle, Myddleton's Trench, tramway, leats, wheel pits and reservoir.

Cadw

This is an outstanding early mining site with a long history of activity. The lower part is a Scheduled Ancient Monument (Cd 159), and the upper part, Blaen Cwmsymlog, is in the process of being scheduled (Cd 201). Archaeological deposits, shaft features, tips and leats, as well as obvious structures, with sensitive areas extending beyond scheduled areas, including watercourses and reservoirs.

Forest Enterprise

There are a number of structures and shafts that require special management. FE has an agreement with the Welsh Archaeological Trusts and any works require their input and recommendations for management. An annual exchange of the SMR data is part of this agreement and each District holds GIS and database information and management plans for each feature.

Mineralogical

Countryside Council for Wales

No comments

Biological (Habitat / Species)

Countryside Council for Wales

Most of the site is designated as a SSSI, particularly as

much of the site is of considerable importance for rare species of lichen and fern. The areas recorded as containing these rare species and includes the following:

Area 3:

Ten lichens

Six on and around the crumbling mould that once was the old engine foundation.

Four lichens to the west of this mound.

Area 4:

Five lichens, One fern and One Bryophyte

One lichen on the south side of the chimney.

One very important fern to the north west of the chimney (Forked Spleenwort)

One bryophyte on barer spoil in this area

Four lichens (including one new to Wales) north of the chimney on a cut with vertical north facing rock faces.

Area 5:

One fern (Forked Spleenwort) grows along a much of the wall on the north side of the river, running east to west along the length of site, although it is broken by the presence of the quarry. The wall is a vital habitat for this fern and should not be damaged by any remediation works.

Area 6:

Five lichens on the vertical east facing rock just outside the west side cave entrance. Also of note is a variety of fern species in all life cycle stages, three of which are note-worthy.

Area 7:

Note-worthy species include:

Sea Campion over much of this area.

Two rare ferns one in the western part, north of the road, the other south west of the wheel pit

Two lichens on the north side of the pit

Six lichens on a strip of spoil on the south facing slope at the east end of this area.

Area 8:

Two bryophytes in the north of this area.

Area 9:

Seven lichens to the north near the road.

Six lichens near the gridded shaft at the western end of this area

Six lichens to the south west of the building remains including one that is nationally rare.

There is a second mine survey by Dyfed Wildlife Trust / CCW further to the east leading up to Llyn Pendarn referred to as 'North Cwmsymlog' Ref No. SN78-29. Much of this land is owned by the Forestry. There are three rare ferns all recorded in Area 3 of this mine survey. Of particular note is that remedial works around the Brittle Bladder Fern found on the walls of the old buildings within the conifer plantation should be avoided.

Forest Enterprise

Standard works management plans need to be consulted before any remediation is proposed.

Other

Forest Enterprise

Public access is enjoyed at this site. We are hoping to put

CWMSYMLOG cont

together our own bid for funds to have this metal mine as part of a wider heritage trail with interpretation in partnership with Llywernog Mine Museum. Much of the spoil and shafts to the east end of the site lie within forested land and any works would involve clearance of trees, even if just for access. From a landscape and woodland point of view there would need to be in depth consultation with FE. Any alteration to current forest management plans will require a Forest Design Plan amendment, submitted via FE, for approval by the Forestry Commission. Llyn Pendam and the retaining wall is owned and managed by Aberystwyth Angling Club. Should any remediation works be required and planned, full consultation with FE will be required at an early stage. This will also allow for early consultation with the local population.

Welsh Mines Society

There are no current plans to promote this site, but there is considerable potential to do so. The site is on a public right of way. The surface of the western part of the site is owned by Ceredigion County Council, the central part is owned by the Gogerddan Estate and the eastern part is owned by Forest Enterprise. The base minerals are reserved in favour of the Gogerddan Estate.

Ceredigion Council

One of the most important mines of a group of mines in the Darren-Cwmsymlog area of the western fringe of the Pumlumon Massif. Important for archaeological features as well as historical associations with early mining. Potential for promotion of walking and cycling routes through this area from Aberystwyth to Pumlumon.

Western part of site, south of stream, which has already undergone remediation by Ceredigion District Council to control air-borne pollution, is in council ownership. Council owned land has recently been fenced off to stop trail bikers from using the site.

A feasibility study has been carried out on health and safety issues in the SSSI area of the site because of an opencut. This area of the site is privately owned.

Pentir Pumlumon Tourism

Evocative mining landscape, with related elements of a village community & surviving engine-house chimney stack. Large, untouched areas of original activity, including the major geological exposure of the lode in the great open-cut. Many important periods of mining represented on one site, from Medieval to early 20th century. Linkage to the early workings in Forestry Commission land at Blaen Cwmsymlog now a possibility, with considerable scope for on-site interpretation. Located on the route of the proposed Miner's Way through N.E. Ceredigion.

Sympathetic remedial work should be undertaken on buildings and other masonry structures to ensure their long-term survival. Reclamation of the 'fines' dumps, to produce a featureless area of no heritage or utility value, was undertaken some years ago as a County Council led project, funded by the WDA. It should remain as an object lesson for future, grant-driven, schemes. The site is worthy of proactive management and protection, as an outstanding mining heritage resource which has the potential for new enterprise & job creation within the village community.

Cadw

The area surrounding Reid's and Taylor's shafts was reclaimed in 1979, but much of the interest remains in the central part of the mining complex. Many of the features between Skinner's shaft and the forestry were lost to reclamation in 1981.

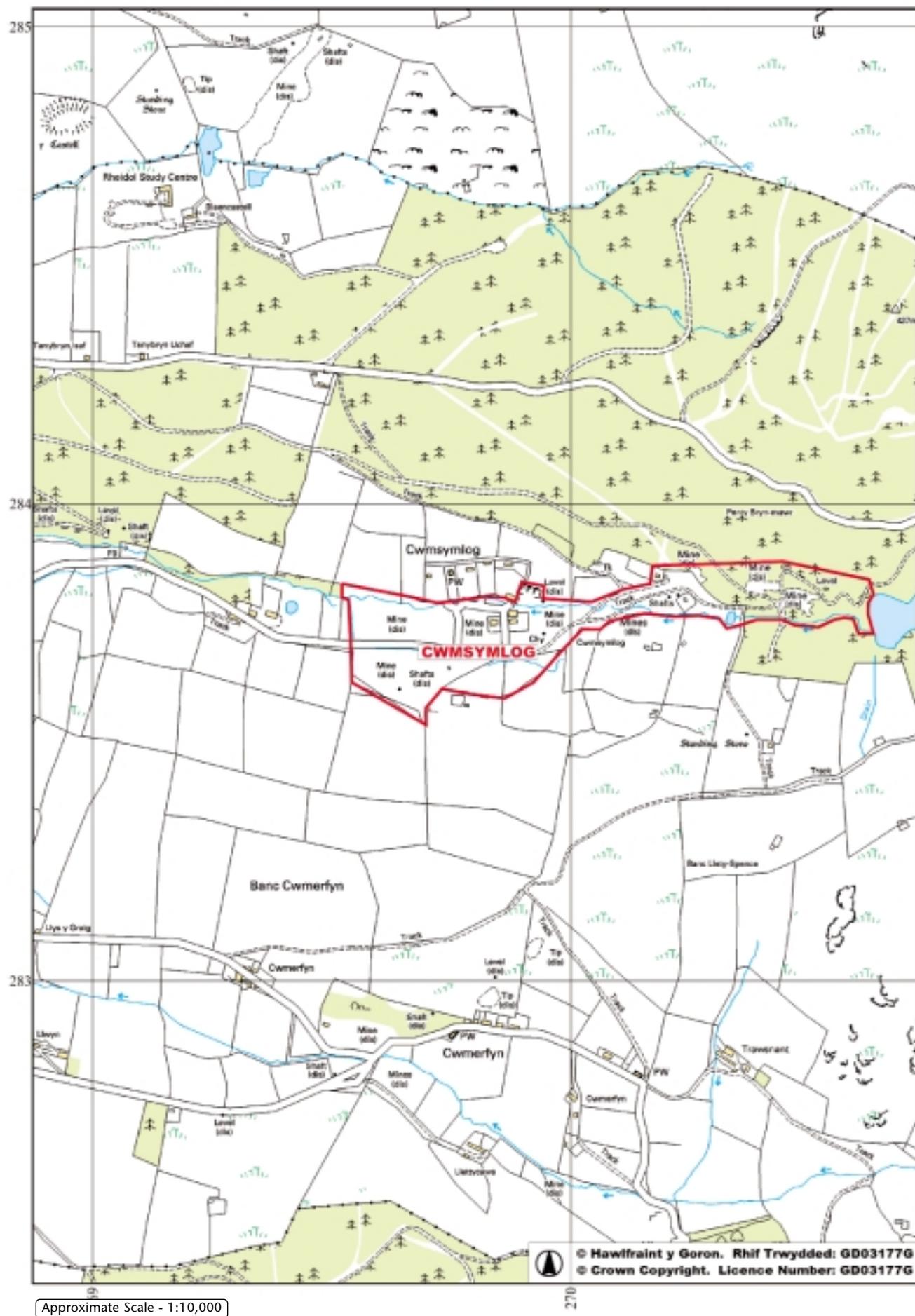
Countryside Council for Wales

The western end of the site, which consisted of fine tailings and was highly contaminated, was reclaimed in 1981. The whole of the site is sheep grazed but is an integral part of the village of Cwmsymlog. A track runs through the site to the forestry and Llyn Pendarn at the eastern end.

Welsh Development Agency

In 1978 the WDA ranked this site 1st, in addition it was also noted that the site was impacting the environment. This site has since been subject to treatment with WDA grant aid.

CWMSYMLOG



MINE NAME: CWMYSTWYTH

Archaeological

Welsh Mines Society

The vast majority of the site is a Scheduled Ancient Monument (Cd 145). This copper, lead and zinc mine is a central feature of the Upland Ceredigion Landscape of Outstanding Historic Interest. Workings on the site are dated to the Bronze Age, pre-medieval (possibly Roman) and late medieval periods, and from the 17th to 20th centuries. A full range of features from ancient opencast working, drainage levels, shafts, water-wheel pits and associated earthworks for watercourses, through to ore preparation areas and associated plant mountings, dating from the Bronze Age to the 20th century, are to be found on site. On the alluvial fan of the Nant yr onnen, north of the road, is the site of medieval (circa 12th century) lead smelting activity. The spread of tailings in the river valley, south of the road down stream of the Nant y gwaith, will hid a significant number of features related to 18th (possibly earlier) to 20th century ore preparation techniques.

Any remedial work will have a real and significant impact on the surviving features across the site. Sub-surface archaeological features are threatened. Remedial work should be confined to the area south of the road and downstream from the Nant y gwaith. It should be preceded by a detailed topographical survey and full archaeological assessment. Any work should be carried out under the supervision of a competent mining archaeologist with authority to suspend work whilst features are recorded and, where necessary, preserved.

Cadw

The vast majority of the site is a Scheduled Ancient Monument (Cd 145). Extensive landscape of very early mining up to 20th century, with excellent underground archaeological survival, with all remains (including some features outside the designation) highly sensitive and easily destroyed.

Cambria Archaeology (Dyfed Archaeological Trust)

Scheduled Ancient Monument (Cd 145). Also known to be a SSSI.

Mineralogical

Countryside Council for Wales

This site is designated as a mineralogical SSSI. It is a classic site for the study of mineralisation in the Central Wales Orefield. Although no element of the primary or secondary paragenesis is unique, many paragenetic stages belonging to the early (A1) and late (A2) phases of metallogenesis are well represented. Alongside the road and on the lower slopes of Graig Fawr and Copper Hill, the large spoil tips provide much study material. Further interest is provided by in-situ lode exposures in the Great Opencast, adjacent to Nant y Gwaith. Removal, redistribution or capping of spoil tips would severely compromise the geological interest at this site. The installation of an on site treatment plant would be the preferred option at this mine.

Biological (Habitat / Species)

Countryside Council for Wales

Site covers 32.5 hectares and much of it is designated as a SSSI. Part of the site has been recommended as candidate Special Area of Conservation (SAC) because it contains habitat types and/or species that are rare or threatened within a European context. The interests for why the site was selected as a SSSI may differ from the interests selected in a European context. The European priority interests present at this site are Blanket Bogs, Calamarian Grasslands, European Dry Heaths and Luronium natas (floating water plantain).

This is a lichenologically important site with areas requiring preservation. Also important for the RDB/UKBAP metallophyte moss *D.plumbicola*.

Eleven rare lichen areas identified. Eight adits used as bat roosts identified with grid references. Three areas with rare ferns identified with grid references.

Lichens (30 identified as rare)

Area 1: Six lichens on the undisturbed parts of the spoil around the old tramway.

Area 2: More than ten lichens on the south facing sides of the tip and within the hatched area on a wide band of intense mineralised spoil 10m x 5m.

Area 3: Nine lichens on the east of the Nant-yr-Onnen on a series of chocolate brown (ankerite) flat tips.

Area 4: Three lichens (2 nationally rare and new to Wales) on west side of Nant-yr-Onnen around a sequence of adit entrances.

Area 5: Two lichens on outcrops above Pant Morcell, although not directly linked to the mining activities on the site.

Area 6: Four lichens on a large area of very bare spoil beneath the tower crags of Craig Fawr.

Area 7: One lichen on a flat acidic area next to the foundations for a crusher house.

Area 8: Five lichens on prominent wide splay of spoil, isolated on the hillside.

Area 9: Eight lichens on flat area around buildings.

Area 10: Two lichens around the remains of a small building south of the road here.

Area 11: Two lichens common on this side of the valley.

Bats (Schedule 1 species)

Six species using the mine adits at: Level Fawr (805747), Kings Adit (808750), Felin y Graeg (702812), Level Newydd (707819), Caegynon (718784), Crossroads Adit (808750), Queen's (808750), Alderson's Trail (808750) and 'unnamed' (806747).

Species are Daubenton's, Whiskered, Brandt's, Natterer's, Brown long-eared and Lesser horseshoe bat.

CWMYSTWYTH cont

Birds

Choughs (Schedule 1 species) use this site.

Bryophytes

One rare metallophyte moss in small amounts on a small flat, wet area of fine spoil. The rare (Red Data Book) moss *Ditrichum plumbicola* is also a UK BAP (Biodiversity Action Plan - for threatened species) Priority species. The original population may have been lost (due to dumping by the local authority) but two additional populations were reported in 1998, at SN 8030 7460 and SN 8020 7450.

Ferns

Three ferns of note worthy species:

One at rock outcrops next to stream immediately west of Graig Fawr (SN 8020 7470)

One in the centre of spoil spree on the south side of the valley (Graig goch) across from the main mine area (SN 8030 7430)

One found on the curved masonry backwall of a substantial ore bin structure (SN 8080 7510) and again on rocks where 100 separate plants were found on rocks near to the stream immediately west of Graig Fawr and also east of a knocked down crushing mill (802/3/4 745/6/7)

Welsh Mines Society

Peregrine Falcons have recently been seen to inhabit the area, and it is understood they have nesting on a ledge on Graigfawr for many years.

Other

Welsh Mines Society

There are no plans to promote, but it has been suggested that the site would be suitable for visitor access. The ownership of the Pugh's & Kingside mine is complicated as the Crown is believed to have granted assignable mining rights to Collins & Fenn, their heirs and successors, for a 999 year term from 1631. These mining rights are currently owned by The Cwmystwyth Mining Co. Ltd. as the heirs to that part of the Nanteos Estate, and the grazing is let by the Crown. At the adjoining Copper Hill mine, the surface and minerals are both held by the Crown.

Countryside Council for Wales

There is a main road dissecting the site that will obviously form constraints on redesigning of the site. This road provides access for use by sightseers (views), birdwatchers, bat groups and industrial archaeologists whose rights will need to be maintained.

Crown Estates

The Crown Estate (with Wardell Armstrong appointed as mineral agents) has surface and mineral ownership (excluding lead). No mineral licence or lease exists. The land is subject to an annual tenancy. Section 193 of Law of property Act (1925) applies allowing public right of air and exercise.

Ceredigion Council

Cwmystwyth is one of the most important British sites for the

history of mining. The mine site is used by universities and other academic groups as well as caving clubs. Much of the site is scheduled and World Heritage status is being sought.

Many parts of the site are over 600m and therefore open to right to roam access. Llywernog Mining Museum have the sections of the dismantled early 20th century mill building that was a prominent feature on site.

Geologically complex with possible hydrodynamic link between the river and mine workings.

Most of the site is open. A proposed safety works scheme is deferred due to problems with potential damage to fragile parts of the scheduled area. There may be some safety issues due to closeness of some adits and shafts to county road.

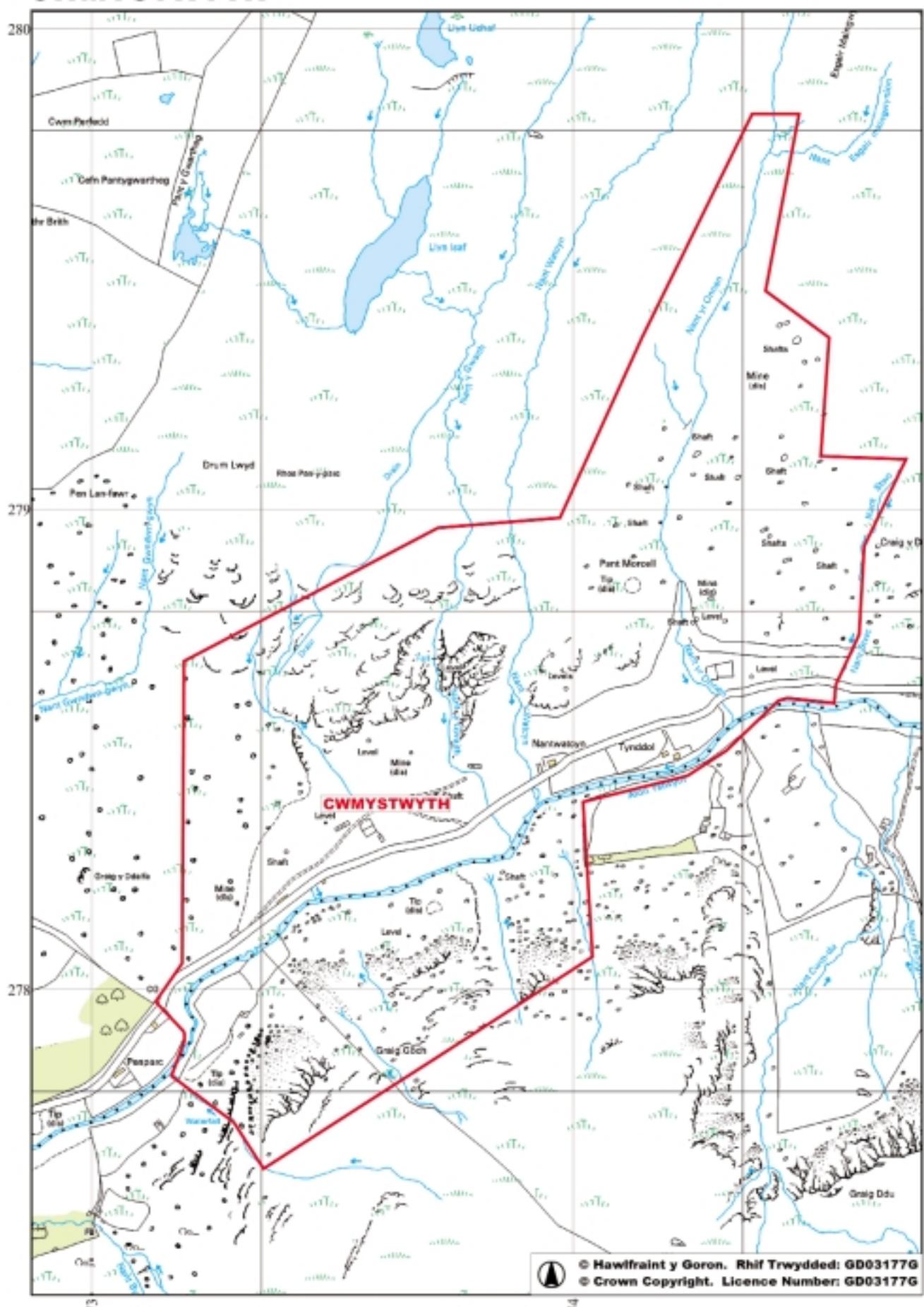
Pentir Pumlumon Tourism

An outstanding mining landscape of international importance. Virtually every period of mining technology, from the late Bronze Age to the 20th century, is represented on this one site. Massive geological features, both surface and sub-surface, associated with the major Ystwyth Fault. Considerable potential for use as a co-ordinated Interpretation and educational resource. The site is currently used extensively for informal recreational exploration. An overall conservation & management plan is essential, given that the site has direct access to a major tourist highway route, running from the Elan Valley into Ceredigion. This route is also being designated as the Sustrans National Cycle Network Route No.81 linking through to the West Midlands via Powys. The renovation of certain buildings should be considered, particularly the Smithy & Workshop to the east of the main dressing mill site. A warded Information Centre & Bunkhouse could operate here on a not-for-profit basis, and act as a focal point for management of the resource at a local level. A replica overshot waterwheel would provide the centre with power on a sustainable basis and help to recreate part of the heritage landscape. A feasibility study should look at the potential for returning and reconstructing the timber-frame mill building which was dismantled and removed from the site in 1989. The treatment of the mine drainage waters from the Cwmystwyth workings could feature as a strong 'environmental' component in the on-site interpretation structure. Located on the route of the proposed Miner's Way through N.E. Ceredigion, the site is also linked to a new permissive footpath following the route of the 1900's turbine leat to the east of the mine. Some organisation has to take overall responsibility for the control and project management of the Cwmystwyth Mining Heritage Site, which has the potential to become of major benefit to both the local community and the County through cultural tourism. Pentir Pumlumon & The Plynlimon Heritage Trust are both currently working on pilot schemes to increase economic activity within the Ystwyth Valley, and it may be appropriate to view the future of the Cwmystwyth Mine site within the framework of this present initiative.

Welsh Development Agency

In 1978 the WDA ranked this site 3rd, in addition it was also noted that the site was impacting the environment.

CWMYSTWYTH



Approximate Scale - 1:10,000

MINE NAME: CYSTANOG

Archaeological

Welsh Mines Society

There are no surviving structures on the mine, although the group of buildings at Riverside (formerly Penlan Villa), between the B4300 road and the river, are based on the original mine offices. A number of related earthworks survive on Allt Cystanog where there is also potential for sub-surface archaeological features. Working of the mine is documented from the mid 19th century but there are references to 'ancient' workings in the upper part of Allt Cystanog. The adjoining mine, Vale of Towy, was worked from at least the mid 18th century and there is a strong possibility that Cystanog was worked at that period or earlier.

From the 1850s onwards the mine was drained by an adit driven south from Riverside and later from a shaft sunk near the adit entrance, between the road and the river. The principal dressing floors of the mine were also situated between the road and the river to the east and west of Riverside. Workings extend to 0.5 kilometre south of the road on the central part of Allt Cystanog and to 200 metres south of the road at the western end.

Early, pre 19th century, ore preparation (dressing) sites are to be expected along the line of shallow shaft workings south of Riverside. Any remedial work on the 19th century dressing floors at Riverside will inevitably uncover the evidence for the processes used. A detailed topographical survey and a full archaeological assessment should precede any work, which should be accompanied by monitoring to identify and record the features uncovered.

Mineralogical

Countryside Council for Wales

This site is a proposed Regionally Important Geological Site (RIGS) and is the only near-intact mine of interest left in the Carmarthen area. Cystanog mine is of research interest because the spoil heaps provide examples of both primary and secondary mineralisation. The primary mineralisation comprises quartz-cemented breccias (Central Wales-style) with chalpyrite, galena and minor sphalerite followed baryte veining. Secondary mineralisation is characterised by cerussite with abundant pyromorphite, a material that was, unusually, worked here. The site interest relies on the integrity of the spoil tips, hence removal, redistribution or capping of the spoil would compromise this interest.

Biological (Habitat / Species)

Countryside Council for Wales

No biological survey information available for this site.

Other

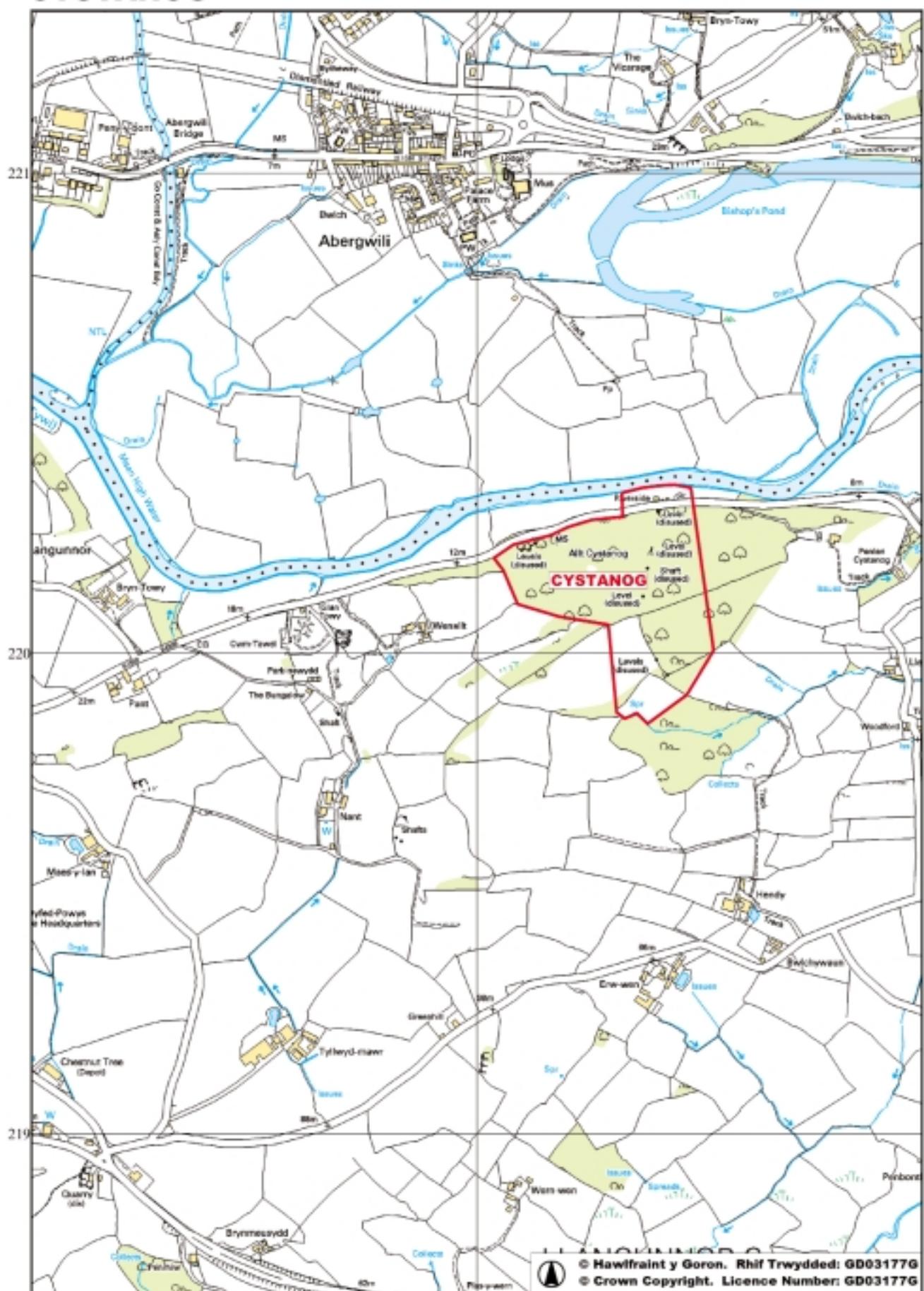
Carmarthenshire Council

Restoration works at Cystanog have already been carried out.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

CYSTANOOG



Approximate Scale - 1:10,000

MINE NAME: DAREN

Archaeological

Welsh Mines Society

The entire area of mining activity from west of Darren Farm to the north-eastern extremity of the open-work is a Scheduled Ancient Monument (Cd 144). It should also be noted that the hill fort immediately to the east of the open-work is also a Scheduled Ancient Monument (Cd 28).

Many features still survive which can be readily identified with Lewis Morris's sketches dating from the 1740s and illustrated in Dick and Davies, Lewis Morris and the Cardiganshire Mines, (Aberystwyth, 1994). The Daren Mine is one of the earliest workings in Ceredigion, with strong evidence for prehistoric activity. Mining activity from the 17th century, and earlier, through to the 20th century has left a range of significant features in an area stretching from west of Darren Farm north-east over the ridge and down to the stream opposite Cwmdarren. The mine is dominated by the large open works immediately north of the settlement of Daren. The dumps of spoil below, and to the north-east of, the open-works are associated with a number of adits driven south-west to drain the mine, with the deepest (Olivers) just above stream level. 17th century activity was centred on the area of Darren Farm to the south-west of the open-works, where there are the earthworks for various shafts associated with a shallow drainage adit along with those for later deeper working shafts. Earthworks and sub-surface features associated with pre mid 19th century ore preparation activity will be found around Darren Farm. Later 19th ore preparation was carried out at a mill site some distance down the Nant Silo.

Any remedial work will have a significant impact on the features associated with this mine. The dumps at the north-eastern extremity of the mine, between the openwork and the stream are a significant feature in the landscape and should be protected as such. These dumps are largely 19th century development waste, ore preparation being carried out at the Llechwedden mill some distance downstream. Any containment ponds required to deal with mine discharge water should be situated downstream within the afforested area to minimise damage to possible archaeological features and reduced the landscape impact. All remedial action will require a detailed topographical survey and full archaeological assessment prior to starting work.

Cadw

The site is a Scheduled Ancient Monument (Cd 144), and is an early and significant mine with important remains including features listed on the Site Monument Records.

Cambria Archaeology (Dyfed Archaeological Trust)

Same archaeological issues as already listed above.

Mineralogical

Countryside Council for Wales

The site has been proposed as a priority SSSI, which will prevent any further degradation of the site including removal of hardcore from the lower tips and partial landscaping of the upper tips. Spoil tips to the north of the hill fort (SN680832) are of special interest for the study of early (A1) assemblages in the Central Wales Orefield.

Galena of the A1-c assemblage contains silver-bearing inclusions of tetrahedrite, bournonite, ullmannite and gersdorffite.

Favourable conservation status depends wholly on maintaining the integrity of the spoil tips. Therefore, removal, redistribution or capping of the spoil would severely compromise the interest.

Biological (Habitat / Species)

Countryside Council for Wales

Five rare lichens exist across this site in areas denoted as:

- Area 1:** One lichen on spoil within the conifer plantation.
- Area 2:** Two lichens in damp seepage cracks on the west-facing sides of the open-cut rock walls.
- Area 3:** One lichen on the rock face
- Area 4:** Six lichens on rock faces of open-cut.

Other

Countryside Council for Wales

Footpaths cross the site.

Ceredigion Council

One of the most important mines of a group of mines in the Daren-Cwmsymlog area of the western fringe of Pumlumon Massif. Important landscape and archaeological features as well as historical associations with early mining. Potential for promotion of walking and cycling routes through this area from Aberystwyth to Pumlumon.

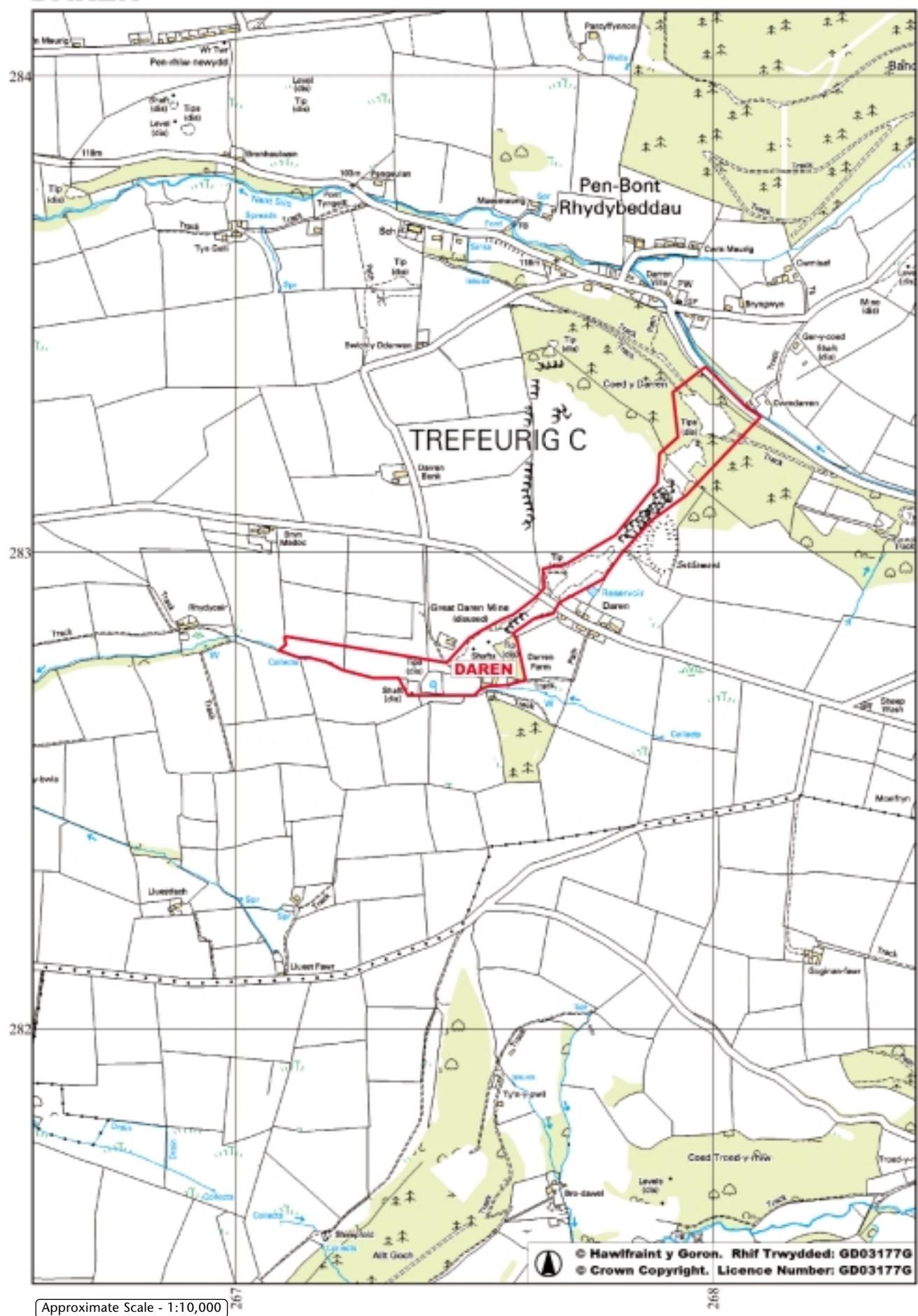
Pentir Pumlumon Tourism

A topographically unique site possibly associated with an Iron-Age Hillfort. Three centuries of proven mining activity based on a variety of workings from outcrop open-cuts, to shafts and deeper day levels driven in from the forested north face of the hill. The site contains many surviving surface and sub-surface features, including the deep adit (Olivers Level) which was reopened some ten years ago. Daren has an important heritage story-line relating to Crown incursions onto private mining lands in the context of the 18th century. Located on the route of the proposed Miner's Way through N.E. Ceredigion. Associated mining settlement. Low-key interpretation possible with good public footpath access to the wooded north-facing workings overlooking Cwmdarren.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

DAREN



MINE NAME: DOLAUCOTHI

Archaeological

National Trust

Dolaucothi gold mines comprise a series of pits, mine entrances, adits, channels, tanks, leats, spoil heaps, tracks, inclines, building platforms, shafts and settling ponds covering an area of some two square kilometres. Underground are a series of stopes, galleries and connecting tunnels. A network of leats, one example covering a distance of at least 11km, brought water to the site, possibly as much as 2.5m gallons per day. Archaeological investigation indicates that at least one phase of mining can be attributed to the Romans though recent survey has suggested that the mine may in part be pre-Roman. It would appear that after the Romans left mining ceased until the middle of the 19th century when the site was reopened and worked on an intermittent basis until 1938.

Dolaucothi is of international archaeological significance. Almost the entire site is scheduled (Cm 167, Cm 200, Cm 208) and it is included in the Register of Landscapes of Outstanding Historical Importance in Wales. Although apparently unique in Great Britain it is part of a network of Roman sites extending throughout Europe and sharing a common technology.

The archaeology at Dolaucothi is vulnerable and irreplaceable. The works suggested above could damage the mine to the extent that parts of the site might no longer be legible as archaeological monuments.

The chronology and technology employed at Dolaucothi is poorly understood. The Trust aims to ensure that the site is preserved in its entirety not only because of the significance of the site but also to provide the opportunity for researchers to address these issues.

The archaeological remains are complex and not easily understood. The introduction of modern engineering works could make it even more difficult to explain the significance of the site to our visitors and thereby reduce their enjoyment of the mine. As the entire site is of archaeological significance it is not possible to delineate exclusion zones.

Welsh Mines Society

A series of Scheduled Ancient Monument entries cover virtually the whole site (Cm 167, 200 and 208).

The Ogofau Mine at Dolaucothi is a complex site with features dating from the period of Roman occupation, with strong evidence for pre-Roman activity, through to the 1930s. Mountings and loadings for the ore processing mills used in the late 19th and early 20th centuries are to be found on the site, as are entrances to adits and shafts used at that period, but the principal features are the earthworks from Roman, and probable pre-Roman, activity. These include openworks, adits and shallow shafts, watercourses, probably water-powered stamps and associated ore preparation sites and spoil tips plus, on the lower ground, the working areas and spoil tips associated with alluvial mining. In addition there is the potential for sub-surface archaeological features, related to mining (including the extraction of alluvial deposits) and associated settlements,

across the site and in the area between the mine and the river.

A number of structures on site are not related to the working of the Ogofau Mine. A headframe and associated buildings, originally from the Olwyn Goch lead/zinc mine at Halkyn in northeast Wales, were relocated to Ogofau as part of the National Trust visitor centre. They were erected in the 1930s mine yard, around New Shaft, which is itself sited over the deep workings of the Roman period in the Ogofau Pit.

Any remedial work will have an impact on the features associated with this internationally important archaeological site. If it is intended to treat mine discharge waters from the site, careful consideration will have to be given to the siting of any treatment area. With the potential for sub-surface archaeological features in the area between the mine and the river, it is essential that any work in that area is preceded by a detailed archaeological assessment. Archaeological monitoring of all works will be necessary, with authority to suspend and, if necessary, curtail work to allow recording and/or preservation of any features uncovered.

Cambria Archaeology (Dyfed Archaeological Trust)

Same archaeological issues as already listed above.

Countryside Council for Wales

The site has a long history of mining and is the only known British example of gold mining by the Romans.

Mineralogical

National Trust

Dolaucothi represents a key European location for the study of turbidite sedimentology and complex, vein-hosted, gold mineralisation. Dolaucothi is a SSSI and was designated for both species assemblages and geology. The natural environment is a significant element of the visitor experience at Dolaucothi and it is not possible to interpret or present the archaeology at Dolaucothi without reference to the complex geology.

Countryside Council for Wales

The site is designated as a geological SSSI. Dolaucothi is unique in the scheme of Welsh metallogenesis. In an area otherwise mineralised by Central Wales-type Pb-Zn-Cu-Ag veins, there occurs a major stratabound gold-arsenopyrite deposit, hosted by black pyritic shales and a network of flat-lying and vertical quartz veins, the whole package deformed into series of tight inoclinal folds. Excellent exposures of mineralisation occur both on the surface in the pit walls and underground in the various adits. It is the first recorded locality for cookeite (a lithium-aluminium-hydroxy-silicate) which, together with the presence of gold in a variety of modes of occurrence and with a number of associated minerals, makes this site one of the most important examples of mineralisation in Great Britain.

DOLAUCOTHI cont

Biological (Habitat / Species)

National Trust

The Dolaucothi gold mines are covered with coniferous forestry plantation, American Oak plantation, broad-leaved woodland, bracken and improved pasture. Species of restricted distribution include Rhizocarpon furfurosom (a lichen known elsewhere only in Cumbria), and colonies of Bockler fern (*Dryopteris neinulus*). Both the adits and the surrounding woodland provide an excellent habitat for bats with Brands Leilans and Daubetans recorded during a recent survey.

Major engineering works would effect the habitat of the mine which could alter species assemblages.

Countryside Council for Wales

The site is a designated biological SSSI (consisting of 19.0 hectares). The predominantly oak woodland and willow carr which has developed around the old workings supports a wide range of moss, liverwort and lichen species. The most note-worthy species found at this site are:

- The rare lichen - Rhizocarpon furfurosom.
- The rare Hay-scented Buckler fern at entrance to several adits.
- Woods that provide a valuable habitat for birds such as pied flycatcher and redstart.

Other

National Trust

Dolaucothi is open to the public (between April and September) and will continue to be maintained as a visitor attraction. 17,000 people visited the site this year and we employ approximately 16 people.

The Trust has identified a need to review the management of the mine and is therefore currently drawing up a research strategy, which will be followed by an interpretation strategy. The natural environment and geology will be a significant part of this review.

The National Trust welcomes this initiative and fully supports the Environment Agency in their aim to ensure that the Cothi is no longer polluted with run-off from the gold mine. However any remedial works should take account of the archaeology and the natural environment of the site.

Welsh Mines Society

The site is already promoted as a visitor attraction owned and run by the National Trust.

Countryside Council for Wales

The site is owned by the National Trust and is accessible by all forms of road transport and a network of paths leads around the surface exposures. The underground exposures are accessible in the summer when guided tours are run by students from the Department of Earth Sciences, University of Wales Cardiff. At other times, a more detailed underground inspection may be arranged when the Department is active at the mine. The origin of this fascinating geological deposit will continue to be researched for many years to come. The public is admitted

to guided tours both above and below ground. Cardiff University also administers the site as a geological teaching facility.

This protected and well-managed site is a shining UK example of the realisable potential of old mines and if other sites (eg Bwlchglas) are to be considered as underground facilities the example of Dolaucothi should be studied for guidance.

Carmarthenshire Council

Owned by the National Trust and is a tourist attraction.

Crown Estate

The Crown Estate (with Wardell Armstrong appointed as mineral agents) has ownership of gold and silver. There are Mining Leases between the Crown Estate and the National Trust and between the Crown Estate and the Anglo Canadian Exploration (a subsidiary of Anglesey Mining plc).

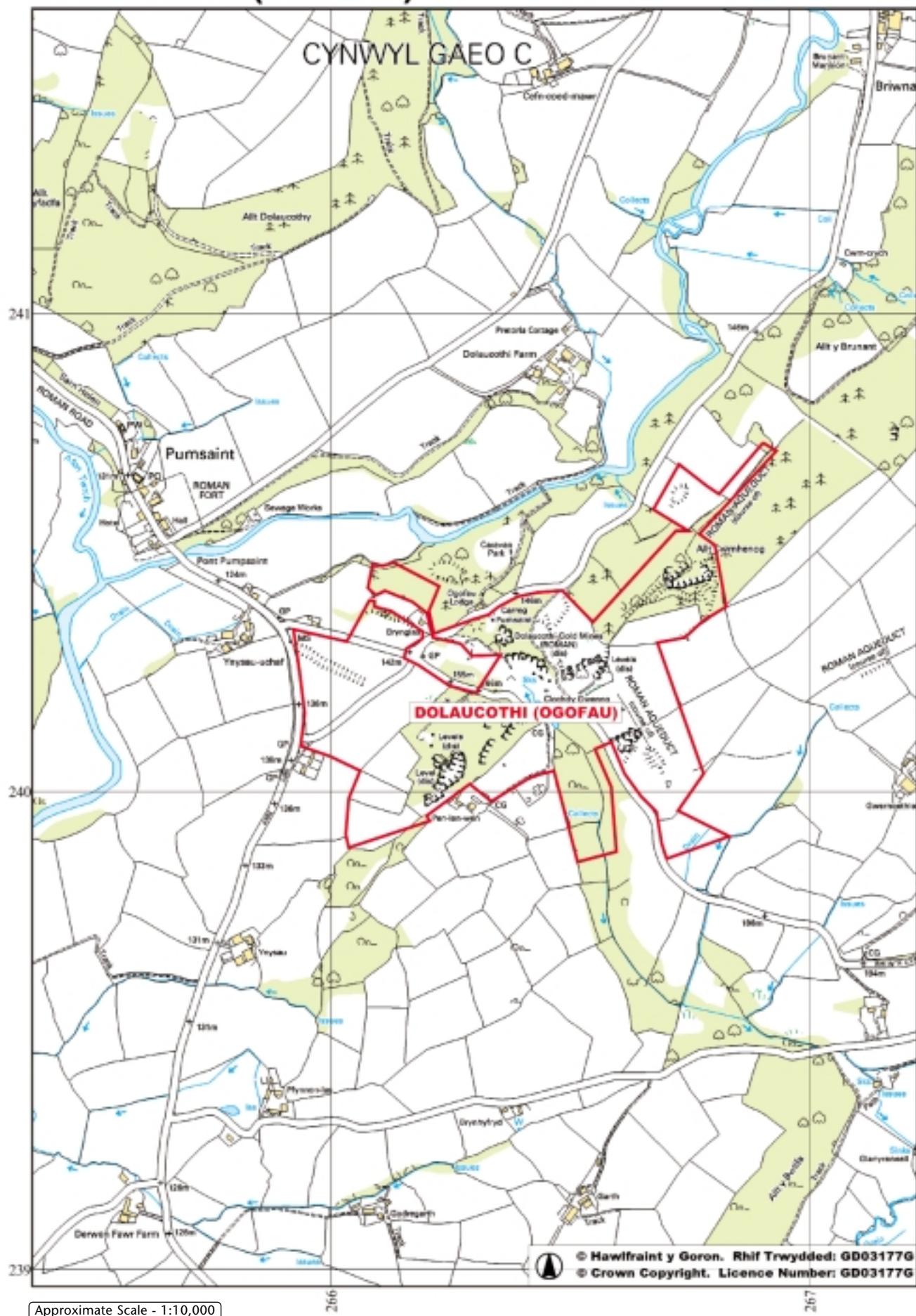
Anglesey Mining Plc

Have the gold and silver lease from the Crown Estates but does not own any plant or buildings and currently have no plans to mine. Neither do they have any surface rights, which are all held by the National Trust.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

DOLAUCOTHI (OGOFAU)



MINE NAME: DYFNGWM

Archaeological

Welsh Mines Society

These are amongst the most substantial remains in the most inaccessible place; the site has been very little damaged and is not subject to fly tipping. The exposure of the lode at Castle Rock is quite remarkable and must have attracted attention from the earliest times. Traces of hushing and high level leats are difficult to explain and do not tie in with the datable remains. There is a Roman Fortlet adjoining the site, and a palaeolithic flint working site a kilometre to the west. Man's early presence in the area is undisputed but some conventional archaeology is desperately needed to establish early dates both here and at Dylife which lies a short distance to the north. Dyfngwm mine is a Scheduled Ancient Monument. It is an important and historic lead mine with ancient open-cut workings, shafts, adits, a horse whim-circle and wheel-pits. Tailing dumps on the south side of the river Clywedog may also be of importance.

Cadw

The mine is a Scheduled Ancient Monument (Mg 247) with important remains of a long period of mineral exploitation. With the hushing remains one of only two groups in Powys. The proximity to the scheduled Roman fortlet may suggest that mining began in Roman or pre-Roman times. Other remains on the site represent a complex pattern of re-working in the 18th and 19th centuries. The scheduled area is bounded by fence lines on its north side, and by a modern farm track, a stream and the river Clywedog on its south.

Countrywide Council for Wales

The industrial archaeology is superb, even including rotted sacks of sulphide concentrate on the mill site below the deep adit.

Clwyd-Powys Archaeological Trust

The work remains provide evidence for mining activity over a considerable time period (possibly beginning with pre-Roman). The earliest is believed to be represented by hushing channels at several locations, connected to small leats and reservoirs. Just some of the visible remains recorded at this site are a quarry like open-cast near the 1935 processing mill (SN 8490 9315), tramways, dressing floors, two water-wheels and engine bases outside the adit entrance and a wire winding cable still visible for a short distance at SN 8578 9350. Further liaison is essential before any remedial works are to take place.

Mineralogical

Countrywide Council for Wales

This site has been recommended for scheduling as a SSSI in terms of mining geology and geomorphology with a variety of RIGS-grade features and possibly incorporation with the Dylife and Cyfartha proposed RIGS sites. The outstanding feature of the mine, which warrants the SSSI status, is the spectacular outcrop of the lode where it crosses the deep narrow valley of the Afon Clywedog. Dumps along the lode outcrop have been part removed for hardcore and heavily dug-over by collectors but the rest of the site is in pristine condition.

Biological (Habitat / Species)

Countrywide Council for Wales

There is likely to be lichen interest on rock exposures, and possibly bats hibernating in any shafts or adits. Hence a site visit by CCW staff will be essential before any works is finalised.

Other

Welsh Mines Society

The Welsh Mines Society is in the process of writing a detailed history of this mine (along with Dylife mine) which will attract attention to the visible remains.

Countrywide Council for Wales

A track (Public Right of Way) leaves the Dylife Mountain Road (unsuitable for coaches) at SN 8470 9430 for 1 km leading to the outcrop working before a further 1 km leads to Castle Rock.

Clwyd-Powys Archaeological Trust

Glyndwr's Way footpath (Public Right of Way).

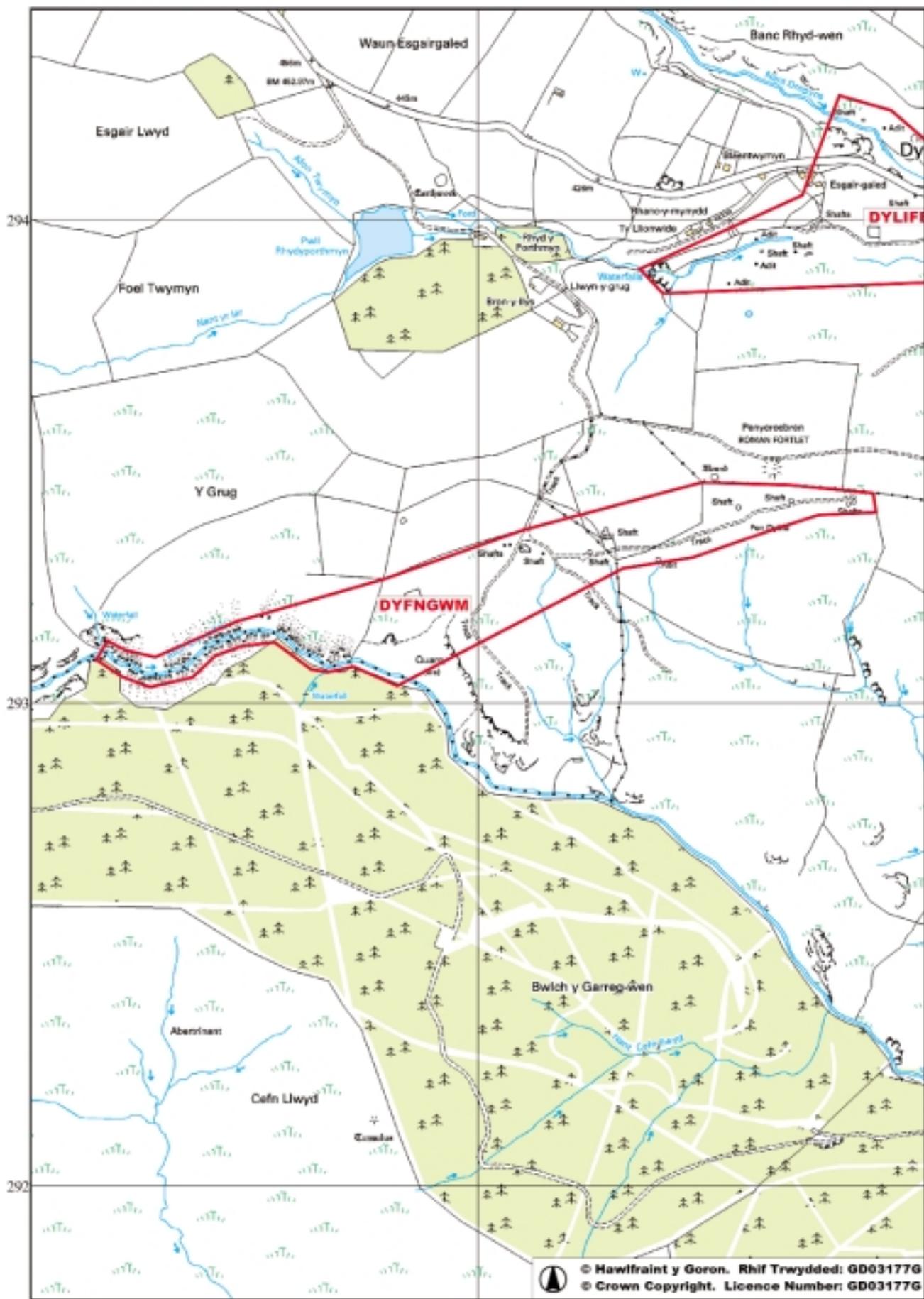
Forest Enterprise

This site lies adjacent to FE managed land known as Llywnyog. We would appreciate being involved in the consultation process should any specific works be planned for this site.

Welsh Development Agency

In 1978 the WDA ranked this site 53rd, in addition it was also noted that the site was impacting the environment.

DYFNGWM



Approximate Scale - 1:10,000

MINE NAME: DYLIFF

Archaeological

Welsh Mines Society

This site is very important archaeologically and was a famous and very productive mine with ancient origins. There is an impressive 18th century entrance to the great level and the nearby Llechwedd Ddu engine shaft. Other structures include shafts and adits in Nant Dropyns (scene of ancient and more recent mining) and a very large water wheel utilising the Nant Twymyn west of the currently located Star Inn. There is an area of workings between the two converging valleys (10-15 hectares) which requires scheduling assessment.

Features of historical and archaeological importance include the tramway, 63ft wheel pit and another 50ft wheel pit, leats, Afon Twymyn culvert, old weighbridge and loading ramps.

Clwyd-Powys Archaeological Trust

This site is a Scheduled Ancient Monument (Mg 247) (Note: this schedule reference has not been alluded to by the following Cadw response).

Cadw

Although not scheduled this is an archaeologically and historically important site with extensive sensitive remains that require further archaeological assessment.

Mineralogical

Countrywide Council for Wales

The site is currently designated as a geological SSSI (but is to be re-designated as a RIGS) with the spoil tips (3.8 ha) bounded to the south by the mountain road and the north by the Afon Twymyn. The spoil tips are of regional scientific interest because they provide a good demonstration of vein textures and common vein minerals. The tips are rich in quartz, calcite, ferroan dolomite, galena, chalcopyrite and sphalerite. A wide range of secondary minerals is also present, including attractive specimens of henninorphite in cavities within the sphalerite.

Much hardcore has been removed from the site in recent years so that only a fraction of the resource now remains. If these tips are removed or capped then the mineral interest will be lost. Further more the site has list of specific Potentially Damaging Operations (PDO) to protect the SSSI, with exemptions only being allowed with prior consent from CCW. Hence a site visit by CCW staff is essential before any works can take place.

Biological (Habitat / Species)

Montgomeryshire Wildlife Trust

The metal mine spoil provides an important and highly specialised habitat for a number of metal tolerant lower plants (principally lichens). At this site the lower plant interest is confined to the metal rich spoil, which if removed will cause the loss of the unique lichen assemblage.

Countrywide Council for Wales

The site is of considerable importance for lichens, with shafts and adits also probably used by bats. There are recent records of breeding Chough (protected bird species).

Other

Welsh Mines Society

There is great potential for limited tourism at this very historic lead mine about which books have been and are being written. Many structures of great interest are capable of being displayed. The mineral rights remain reserved in favour of the Wynnstay Estate.

Countrywide Council for Wales

While the site is currently notified as a SSSI, a reassessment of the interest by consultants at the National Museums and Galleries of Wales concludes that site status is as a RIGS.

Powys Council (Montgomeryshire)

In 1989 council carried out a Preliminary Design Stage Report (using Keltecs Ltd) which suggested the site had good potential as a tourist attraction. The study recommended further action on four issues: physical hazards; pollution control; historical interests and visitor facilities and also went on to estimate the associated costs of each action.

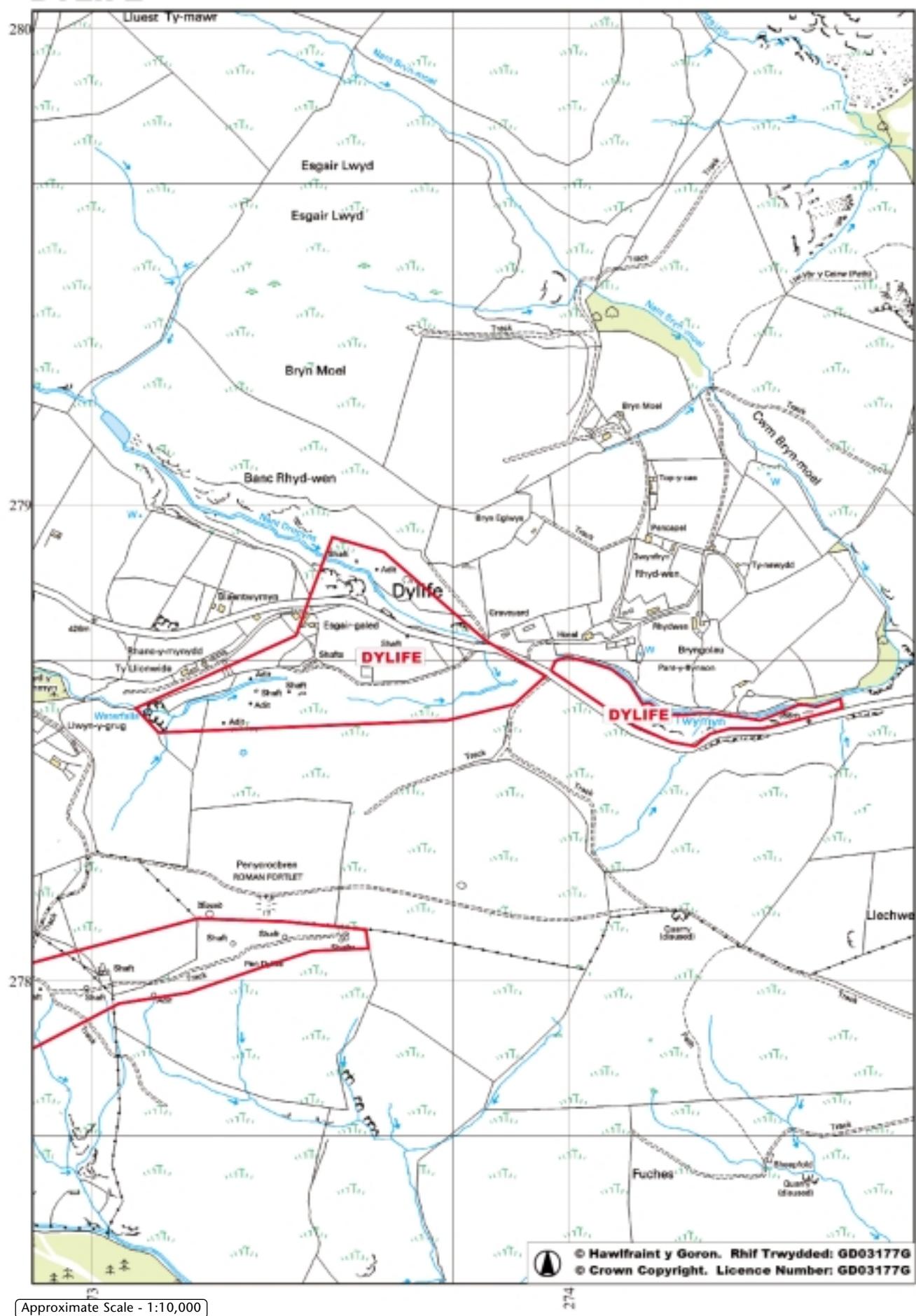
Clwyd-Powys Archaeological Trust

The trust has plans to promote this mine as an archaeological site.

Welsh Development Agency

In 1978 the WDA ranked this site 26th, in addition it was also noted that the site was impacting the environment.

DYLIFE



MINE NAME: ESGAIRFFRAITH

Archaeological

Welsh Mines Society

The Esgairfraith Mine, along with the adjoining Esgairhir, is one of the most important sites in the history of lead/silver mining in Wales. The latter was at the centre of the opposition to Crown control of silver-bearing ores when it was used by the Gogerddan Estate to challenge the sole prerogative of the Monarch established by the Mines Royal Society. Once this constraint had been lifted, the mine was vigorously exploited under the promotional guise of Welsh Potosi. Around 1705, copper ores were discovered to the east of Esgair Hir, this discovery turned into the Esgairfraith mine. The Esgairfraith site, east of the watershed, was opened up in the 18th century but the real development of the site came in the 19th century. Significant features will be found across the site, including various adit and shaft openings, earthworks for horse whims, tramways, watercourses and reservoirs, pumping and winding waterwheel pits with associated mountings for flat rods and balance boxes, the earthworks for dressing floors along with the structures related to a water-powered crusher. In addition to the waste rock and remains of buildings, floorings and shafts, there is a row of ruinous cottages, to the south of the mine, that appear to have been built around 1700 as barracks for the use of the miners. This is an integral part of the mine and must be included in any conservation scheme.

In the past this site has damaged by forestry operations, nevertheless a significant number of features survive on site. There is considerable potential for sub-surface features to be revealed during any remedial work. Remedial work needs to take account of the mining archaeology with a detailed topographical survey and full archaeological assessment carried out before any work commences.

Cadw

Acknowledged as historically important and archaeologically sensitive. No specific details known to Cadw, requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

Also acknowledges the historical significance because it was where the Crown monopoly on silver & gold deposits was broken. Remains: barrack block ruins, stone lined shafts, wheel-pits, dressing floors, engine house and office ruins and 7 shafts/levels. The site is not scheduled and is not seen as requiring scheduling.

Forest Enterprise

There are a number of structures and shafts which require special management. FE have an agreement with the Welsh Archaeological Trusts and any works require their input and recommendations for management. An annual exchange of the SMR data is part of this agreement and each District holds GIS and database information and management plans for each feature.

Mineralogical

Countryside Council for Wales

The site has been proposed as a Regionally Important Geological Site (RIGS).

The spoil tips at Esgairfraith Mine are of regional scientific importance because they display a particularly

fine example of the early (A1-c) polymetallic mineral assemblage, the subsequent (A1-e) ferroan dolomite influx, and the late (A2) calcite- and marcasite-rich assemblages. A wide range of secondary minerals is also present.

Any remediation works involving removal, redistribution or capping of the spoil tips would severely compromise the geological interest.

Biological (Habitat / Species)

Countryside Council for Wales

The site is not scheduled but will probably qualify for scheduling on biological grounds.

Esgairfraith was surveyed together with Esgairhir Mine (immediately upstream) and treated as one, since the workings are interconnected. Any potential remediation would therefore need to consider both mine areas.

- 22 rare lichens, 5 ferns and 3 mosses identified at Esgairfraith Site

- 5 rare lichens and 4 ferns identified at Esgairhir Site

Esgairhir:

Building 1 (Area 1): One lichen on the inner north wall of the gearing-pit, two lichens on spoil (with high quartz content and distinctive appearance) to the east near fence line.

Building 2 (Area 2): One lichen on a wall behind the barracks.

Area 3: Two rare ferns in the area referred to as 'The Barracks' in the vicinity of several walls still standing. There is also one lichen in the recesses of the inner north facing wall.

Area 4: Referred to as 'Wheel Pit 5' there are two rare ferns found in the wheel pit.

Esgairfraith:

Area 5: (Referred to in CCW report as 'Area D') One lichen alongside the track at the eastern end of this area, two lichens found on spoil near the fenced off open shaft, one of which is nationally rare.

Two club mosses exist south of the shaft in an old quarry. One fern at the base of the north-facing quarry wall.

One lichen grows on the soil faces around the top of the quarry.

Area 6: (Referred to in CCW report as 'Shaft C')

One rare lichen on heavily disturbed spoil west of this shaft.

ESGAIFFRATH cont

Area 7: (Referred to in CCW report as 'Shaft F')

Two lichens on associated spoil

One lichen found on flat areas at the top of the spoil

Three lichens found on the north side of the spoil, two of which are nationally rare.

One lichen in a smaller masonry shaft to the west of the main collapsed shaft.

Area 8: (Referred to in CCW report as 'Wheel pit 3')

One rare fern amongst many other common fern species has colonised the wall of this wheel pit.

One lichen only known to exist at three other mines has colonised algal mats on the west side of the pit.

Two lichens one nationally rare on the concrete floor of this building.

Area 9: (Referred to in CCW report as 'Shaft B')

Three lichens exist on an associated tip surrounded by conifers and very sheltered and shaded to form a glade 20-25m across.

Area 10: (Referred to in CCW report as 'Wheel pit 6')

Three ferns and one moss near the stream to the north of this area.

Two lichens on streamside shingle to the east of this area.

Area 11 (Referred to in CCW report as 'Building 4')

Three lichens immediately west of the old masonry wheel pit.

Forest Enterprise

Standard works management plans need to be consulted before any remediation is proposed.

Other

Welsh Mines Society

There are no plans to promote the site, but there is a real opportunity for interpretation of the site for visitors.

The eastern portion is owned by the Forest Enterprise, the minerals being reserved in favour of the Gogerddan Estate.

Countryside Council for Wales

Footpaths across site and evidence of small fires (possibly due to informal picnicking?). There is vehicular access via a forest road from Esgairhir. The site is wholly owned by Forest Enterprise.

Ceredigion Council

With Esgairlle part of a group of mines important for their landscape value on the western side of the Pumlumon Massif.

Important historically with standing structures and potential for excavated features on site.

Public right of way through site with bridleway link to Nantymoch.

Forest Enterprise

This site has several public footpaths and is well used in general by the public. Many of the spoil heaps have been used (against our wishes) as racing grounds for quad bikes, a 4x4 long distance route (RUPPs) and trails bikes. In consultation with the Agency, archaeological trusts, county council and wildlife trusts FE have spent a great

deal of time and money fencing the site to prevent this. Much of the spoil and shafts lie within forested land and any works would involve clearance of trees, even if just for access. From a landscape and woodland point of view there would need to be in depth consultation with FE. Of course any alteration to current forest management plans will require a Forest Design Plan amendment for submitted via FE for approval by the Forestry Commission.

Should any remediation works be required and planned, full consultation with FE will be required at an early stage. This will also allow for early consultation with the local population.

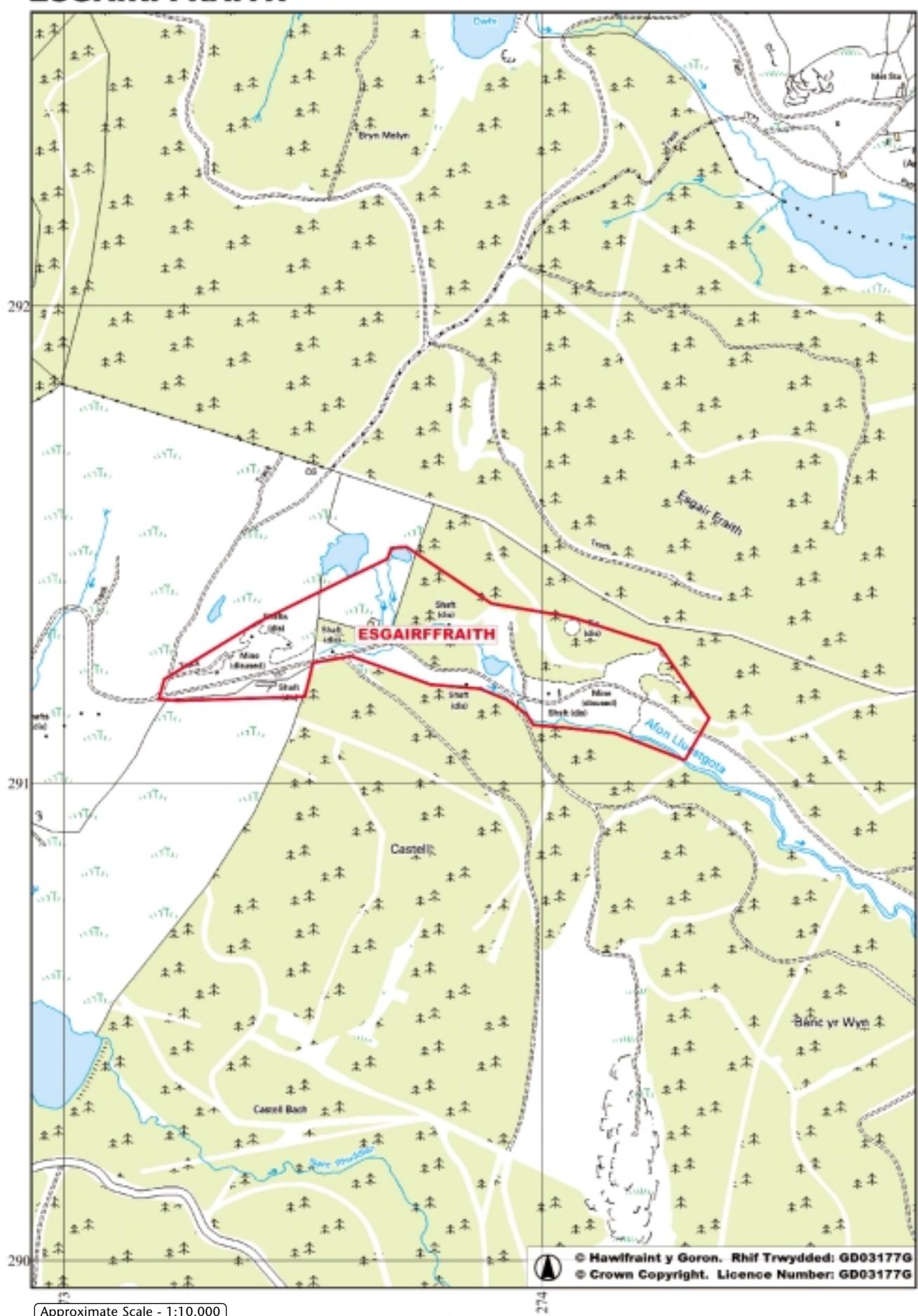
Pentir Pumlumon Tourism

Significant and remote mine site which captures the ethos of mining in the wild Plynlimon Uplands. 18th & 19th century mining remains, including wheel-pits, a steam engine-house (for a horizontal engine), ore-bins, tramway horizons, shafts and adits. Both Copper and Silver-lead mineralisation present on the extensive site. Consolidation of the masonry remains is highly desirable as is the re-excavation of the rubbish from the open-cut, close by the mine office ruin at Esgairhir, where a fine lode exposure was evident some years ago. The mine office featured prominently in George Borrow's book, 'Wild Wales' and has the potential for reconstruction as a Bunkhouse for walking trails in the Mountains. Stone-lined air and manway shafts along the lode outcrop are of particular importance. The Esgairhir Site is of national significance for the legal case which finally broke the Crown (Mines Royal) monopoly over argentiferous ores. Located on the route for the proposed Miner's Way through N.E. Ceredigion, and on the George Borrow Trail from Machynlleth, the site has considerable potential for low-key interpretation and further archaeological investigation.

Welsh Development Agency

In 1978 the WDA ranked this site 57th, in addition it was also noted that the site was impacting the environment.

ESGAIFFFRAITH



Approximate Scale - 1:10,000

MINE NAME: ESGAIRLLE

Archaeological

Welsh Mines Society

Recently stone tools have been found at the Esgairlle Mine indicating its early origin, however, the features on the site are largely from the late 19th century. Those features include the ore bins, crusher house and drawing machine, with associated water-wheel pit, and a pumping water-wheel pit, along with the earthworks for the watercourses, were identifiable until quite recently. Other earthworks include the spoil heaps, containing development waste, associated with the drainage adits and Eliza's Shaft (the principle working shaft), the tailings dumps, and associated tramways. It is expected that the tailings dumps will conceal a range of features related to the dressing processes.

The site has already been damaged by the removal of spoil for hardcore and dumping of domestic waste. Any remedial work will cause further damage to features related to the ore preparation processes used in the late 19th century. It may also destroy evidence for earlier working, including earlier ore preparation processes. A detailed topographical survey and full archaeological assessment is required before any work commences, and progress should be monitored by a competent mining archaeologist with authority to suspend operations whilst any features uncovered are recorded and if necessary preserved.

Cadw

Any archaeological interest is not known.

Cambria Archaeology (Dyfed Archaeological Trust)

Archaeological interest acknowledged, with remains as listed above. The site does not require scheduling.

Mineralogical

No comments.

Biological (Habitat / Species)

Countryside Council for Wales

No noteworthy biological interest.

Other

Ceredigion Council

With Esgairfraith part of a group of mines important for their landscape value on the western side of the Pumlumon Massif.

Important historically with standing structures and potential for excavated features on site. 17th century features prominent landscape feature at the west end of site.

Public right of way through site with bridleway link to Nantymoch.

Countryside Council for Wales

Public footpaths and tracks cross the site.

Crown Estate

The Crown (with Wardell Armstrong appointed as mineral

agents) has ownership of minerals only. No mineral licence or lease exists.

Forest Enterprise

This site lies adjacent to the FE managed land known as Cwm Ergyr. Early consultation should any specific remediation work be planned would be greatly appreciated. Some metal mine features do lie within the forested area such as shafts and spoil tips but also some built features so works may include FE managed land. This is clearly an important landscape as viewed from the A44 and early consultation would be critical should any forest works be required.

Pentir Pumlumon Tourism

An important landscape feature on the A44 route into Ceredigion from Powys. Located on the Castell line-of-lode workings, which eventually extend over to the Van Mine near Llanidloes. This highly visible site requires the removal of accumulated rubbish and some consolidation. The possibility exists for some low-key interpretation, perhaps in conjunction with the development of the main access to the Cefn Croes Windfarm site. Esgairlle was the site of an experimental water-turbine for winding ore which was described in 'Principles of Mining' by J.H.Collins published in 1875. The site is best viewed from a lay-by on the A44 from where a short waymarked trail could possibly access the main workings around Eliza's Shaft. The site contains all the features of a typical small water-powered lead mine and the layout of the components is straightforward and relatively easy to understand. Much scope for archaeological investigation both at surface and sub-surface horizons.

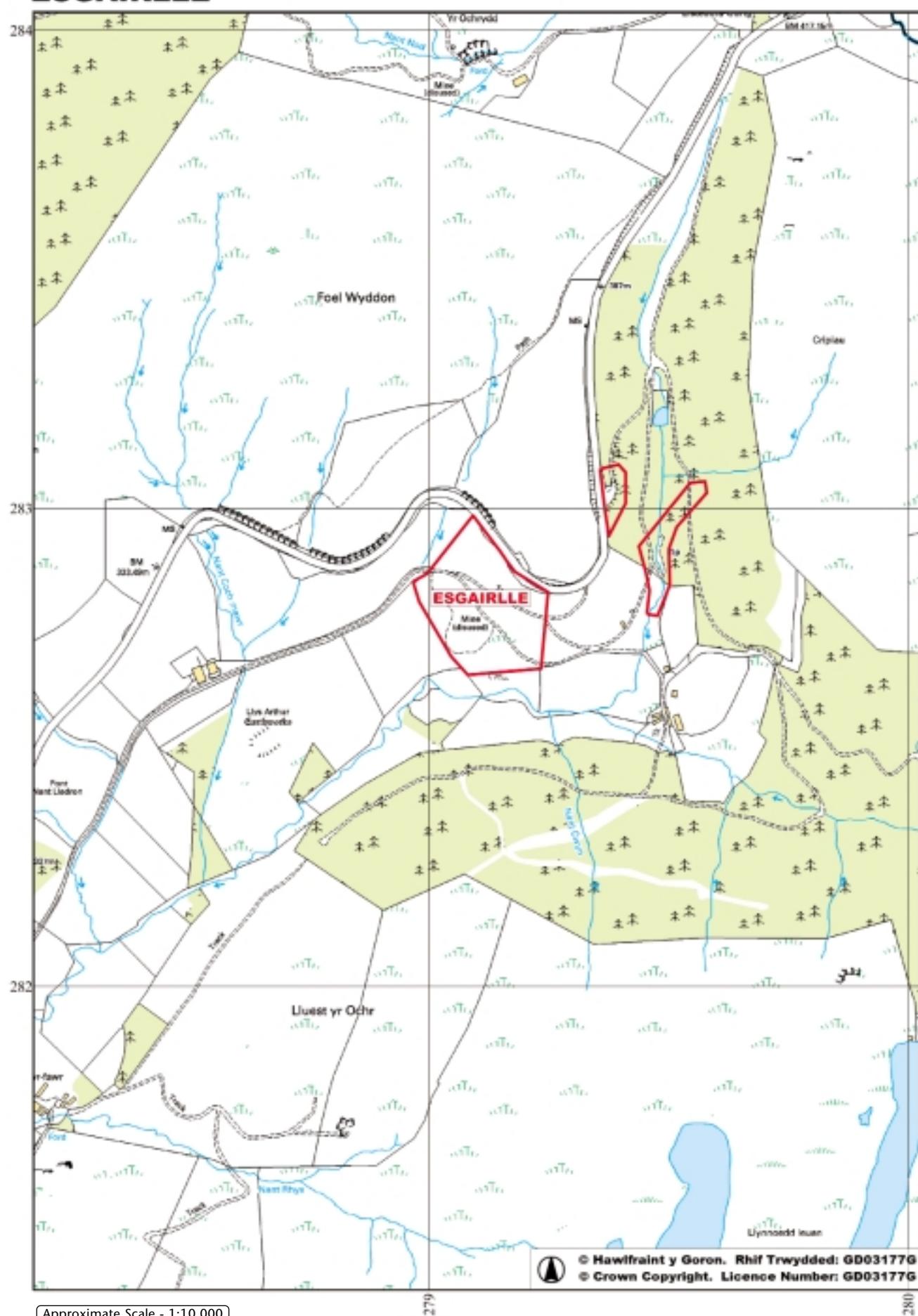
Welsh Mines Society

The fines dumps are sometimes used for four wheel drive rallies but the frequency of these events appears to be decreasing. Most of the features of a typical 19th mine can be found here and further remains would undoubtedly be unearthed if the site was thoroughly surveyed. The surface is part of Cwmergyr farm and the minerals are reserved to the Crown.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

ESGAIRLLE



MINE NAME: ESGAIRMWYN OLD

Archaeological

Welsh Mines Society
The site requires scheduling.

Many features still survive which can be readily identified with Lewis Morris's sketches dating from the 1740s and illustrated in Dick and Davies, Lewis Morris and the Cardiganshire Mines, (Aberystwyth, 1994). Zones A & B of this site form an important historic mining landscape with many interesting features, mostly earthworks. These include an open-cast working with two ancient reservoirs and associated channels of at least medieval age, possibly Roman. Zone A contains the ancient open-cast with two reservoirs with crescentic dams to the east. These are rare survivals in Wales. The open-cast was described by Lewis Morris in the 1750s as 'so ancient that a great thickness of black sod is grown over the rubbish and hillocks which they [the Ancient Britons (or as some think Romans)] left'. The open-cast was also at the heart of the 1750s mine. Many trial trenches can be studied in their original context. The bounds of Zone A just encompass these old features and the vast majority of later ones, but exclude the main tailings dumps to the north. Zone B comprises Esgair y Mwyn Cottage (the King's House) and associated large fish pond (1750s). Zone C, George Hall's Mill, and Zone D, turbine bases, should also be conserved.

Much of the layout of the 1750s mine has survived and this is supported by a wealth of contemporary documents in the National Library of Wales including plans, section and a written description. Altogether a unique study resource. Also, there are survivals from later mining episodes.

As a research resource it is highly unusual to have such a comprehensive record of a mid-18th century mine and the opportunity to see the structures, described in their original context makes the site even more valuable. There is also potential for archaeological investigations in the mine itself in connection with early mines research.

It would be extremely difficult to insert remedial works into this very sensitive landscape without harming these structures. Any remediation work within Zones A or B would be likely to seriously damage this historic mining landscape. If remedial work is proven to be necessary, it may be possible to carry it out within the fenced-off area to the north of Zone A, without impacting upon any of the identified sensitive zones. Full consultation would be required though.

Cadw
Important early mine site with archaeological sensitivity. Considered a priority to assess for scheduling.

Cambria Archaeology (Dyfed Archaeological Trust)
Ancient workings and remains acknowledged as above. In 1947, the site was re-opened and a waste treatment plant installed.

Mineralogical
No comments.

Biological (Habitat / Species)

Countryside Council for Wales

There are no plans to designate the site. Noteworthy species are as follows.

Area 3: Stag's Horn Club Moss (beside a wet streamlet near the foot of the E tip) + the rare moss *Gymnostomum recurvirostrum* (on the large iron hopper). This latter species has not been recorded in mid-Wales in the last 50 years.

Areas 1, 3 & 4: 10 rare lichens

Other

Welsh Mines Society

Hill farming, mining research & education and recreation via public footpaths. The site is considered a unique study resource. Esgairmwyn was unusual in that the silver content of the lead ore increased appreciably with depth, it was the deepest mine to be worked within Cardiganshire. The minerals and surface are reserved in favour of the Crown.

Ceredigion Council

One of major elements of Ceredigion upland historic landscape together with other settlement and field pattern features in Ceredigion Upland Historic Landscape area.

Countryside Council for Wales

Public footpaths across the site. Site is understood to be owned by Crown Estates.

Crown Estate

The Crown Estate (with Wardell Armstrong appointed as mineral agents) has surface and mineral ownership. No mineral licence or lease exists.

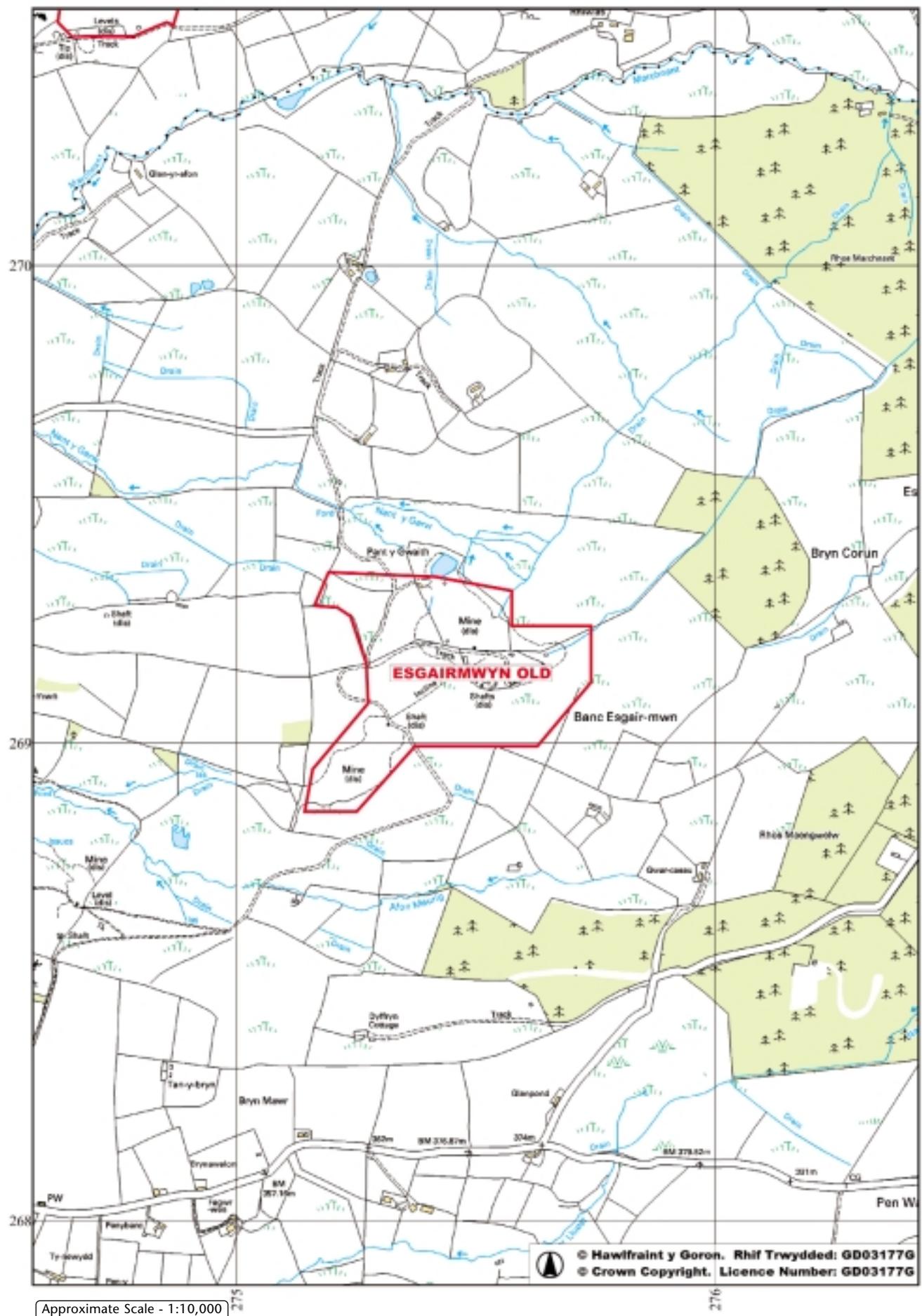
Pentir Pumlumon Tourism

An extremely ancient and important mining landscape, located on a prominent hill overlooking the Marchnant valley. The site is visible from the road from Devil's Bridge to Tregaron and is directly on the route for the proposed Miner's Way through N.E. Ceredigion. Considerable scope for archaeological work and low-key interpretation. Fascinating links to colourful periods of mining history, particularly in the 18th century, with a miners rebellion, truck shop and settled commons with numerous Tai-un-nos (One night houses built by squatters). Fine surface and sub-surface features, open-cuts, shafts and the remains of a dump re-milling venture dating from 1947. The mine was the last large-scale underground mining operation in Cardiganshire, closing in 1926. A colossal archive of documentation exists from early periods of operation.

Welsh Development Agency

Issues have been identified but the site is not currently ranked by WDA.

ESGAIRMWYN OLD



Approximate Scale - 1:10,000

MINE NAME: FRONGOCH

Archaeological

Welsh Mines Society

The north-western section of the mine site, adjoining the road and containing two of the engine houses along with the crusher house, is a Scheduled Ancient Monument (Cd 146).

Despite the ruinous state of this historic mine site a large number of features, dating from the mid-19th century through to the early part of the 20th century, can still be identified. These include the remains of three engine houses, a crusher house, a stamps mill, a winding house, the 'old' dressing mill, the structures and earthworks associated with at least 10 working shafts, a larger open-working, two powder magazines, the earthworks for a series of watercourses and a substantial reservoir, structures and earthworks associated with various ore preparation processes, sundry offices and stores, and the earthworks of a tramway linking the mine with a later dressing mill at Wemyss. The mine was at various times worked in conjunction with the adjoining Wemyss site.

The site was surveyed by the RCAHMW in 1984. The survey identified the range of features listed above. Since 1984 the site has suffered from inappropriate use as an off-road and motorcycle course, and the northern section is used as a sawmill with material being dumped in the northern open-working. If remedial work is to be carried out it should be part of an overall programme to protect the site from further deterioration. Remedial work on the spread of tailings across the southern part of the site will inevitably impact on the surviving features in that area. A full archaeological assessment is required before work commences and a detailed plan should be formulated to conserve not only those features identified but also those which might be uncovered during the work.

Cadw

This is an important mine site with good remains. There are extensive archaeologically significant remains outside the scheduled area, which should be protected.

Cambria Archaeology (Dyfed Archaeological Trust)

Acknowledged as important site as above. Site contains some of the first 19th century mining buildings in Wales.

Mineralogical

Countryside Council for Wales

The site is being recommended for SSSI status. This is viewed as a priority because of the nature of potentially damaging threats.

The spoil tips at this mine are of national importance for their suite of secondary minerals. This suite includes caledonite, susannite, mattheddleite and the first Welsh occurrence of lanarkite. Elyite, litharge, ramsbeckite and namuwite are also present, as well as the second reported world occurrence of bechererite.

The special interest lies solely in the spoil tips and would be severely compromised if any remediation work, such as tip removal or capping, takes place. The installation of an on-site treatment plant is the preferred option.

Biological (Habitat / Species)

Countryside Council for Wales

Noteworthy species are in Area 1: Sea Campion plants (frequent across this part of the site around the building remains) + two rare lichens (around the building wall bases). One of the rare lichens is possibly an undescribed lichen new to science.

Other

Ceredigion Council

Part of a group of mines important for their landscape value in Pontrhydygroes-Cwmnewydion area. Linked historically to early 20th century working in the Ystwyth valley.

Despite its scheduled status, the site has had a number of problems. It was used for local fly tipping for many years, and sawmill has continued to use the scheduled area as a waste dump with wood waste encroaching on structures.

Collection of stone buildings is still best in mid-Wales. The site is close to road access and would have potential for some level of tourism. Consolidation of existing features and tidying of site would be a substantial contribution to preservation of mining heritage.

A number of schemes have been proposed by private owners of the site including reinstatement of former reservoir in centre of site. However, there exist obvious problems of dealing with areas of fine spoil. The Council has conducted a study incorporating this scheme into a reclamation scheme. However, financial considerations have stopped the scheme from proceeding any further.

Countryside Council for Wales

According to CCW survey (1993), the site is being considered for siting of a spoil reprocessing plant.

Pentir Pumlumon Tourism

Site of a large mining operation with structural remains dating mainly from the 19th and early 20th centuries. The site, which is much degraded, still contains the most complete set of building remains, associated with Cornish steam plant, surviving in Mid Wales. The mine was associated with innovative design & practice in ore-dressing and featured regularly in the period mining press. Massive lode exposures are to be seen in the Zinc open-cuts to the north-east of the site. Problems of conservation and interpretation are very apparent owing to the current land-use of the site as an agricultural saw-mill and scrap dump. The building remains require urgent consolidation to arrest further decay. The pumping engine-house chimney, a unique and poignant feature of the site, collapsed during a storm in 1990. Public footpaths cross the site and the mine is located on the route for the proposed Miner's Way through N.E. Ceredigion and on the Lisburne Mines Trail, centred on Pontrhydygroes. A management plan for Frongoch, including Wemyss Mine, needs to be drawn up as a matter of some great urgency. Eventual interpretation should include New Row, New Row Stores, the Weslyan (Cornish) Miners Chapel, the 1900's Powerhouse and the Gwaithgoch Mill in the Ystwyth Valley.

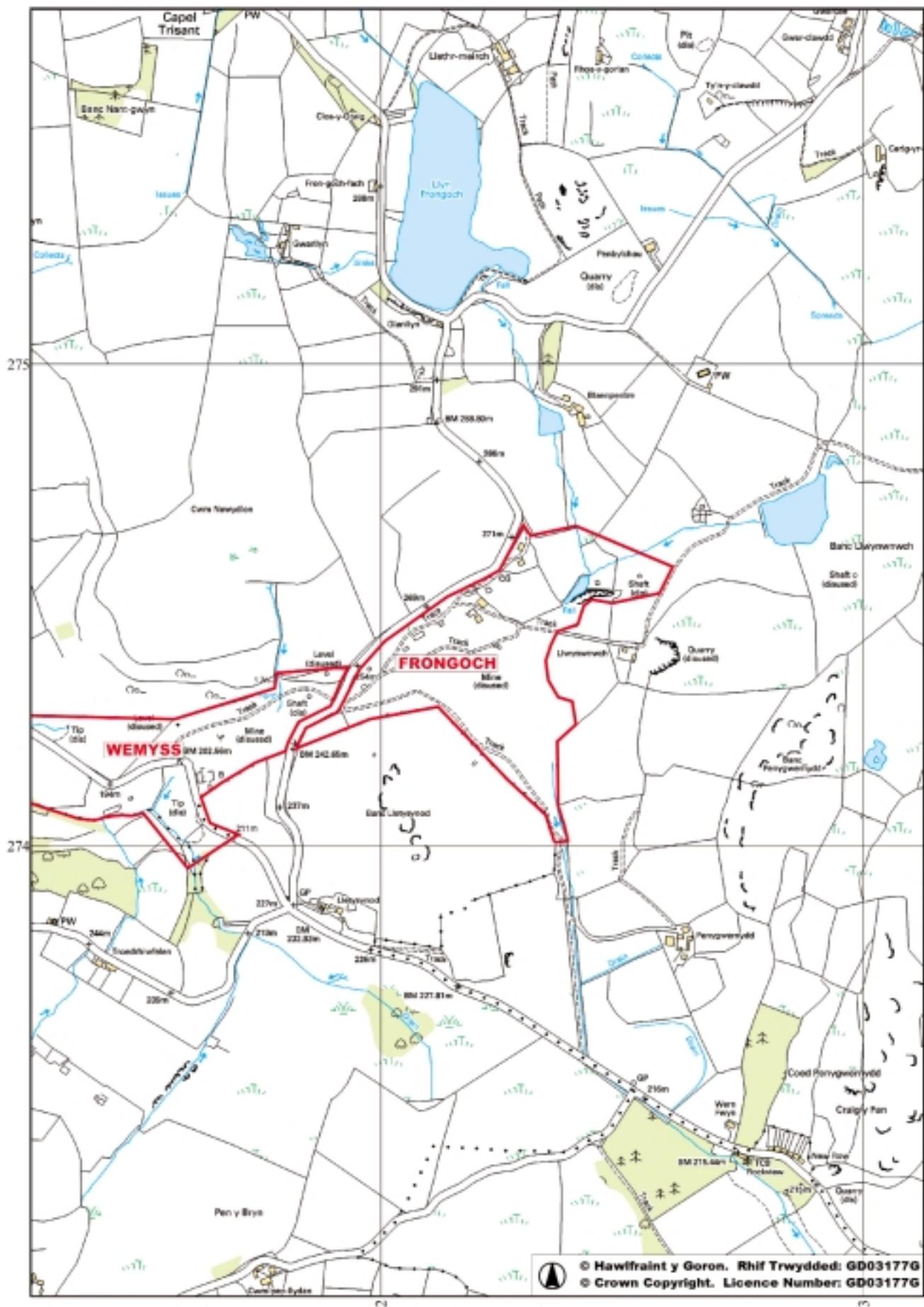
FRONGOCH cont

The fines and tailings dumps at Frongoch do require treatment and the hydrology of the site requires management. Currently a substantial stream of surface water falls into an open-cut and flows through the entire adit level system, to eventually emerge at the portal in Cwmnewyddion. Control of this surface water, perhaps to supply a recreated lagoon, would substantially ameliorate the volume pollution. The lagoon would discharge south-eastwards to enter the Ystwyth at Pontrhydygores via the New Row watercourse. Frongoch falls within the remit of the Ystwyth Valley Pilot Project area and both Pentir Pumlumon & The Plynlimon Heritage Trust are conscious of the cultural heritage potential of the site for local community benefit.

Welsh Development Agency

In 1978 the WDA ranked this site 10th, in addition it was also noted that the site was impacting the environment.

FRONGOCH



Approximate Scale - 1:10,000

66

27

MINE NAME: GEIRONYDD

Archaeological

Cadw

This site has no archaeological interest known to Cadw and therefore has not been identified for scheduling.

Gwynedd Archaeological Trust

A roofless and dilapidated three-bay structure survives at SH 7619 6115, the significance of which is uncertain. The site does not require scheduling and it is unlikely that remediation work would have any impact.

Welsh Mines Preservation Trust

The mine may represent some of the older workings in the Gwydyr Forest mining field. It is reputed that evidence could be seen in the workings for pre-gunpowder mining techniques suggesting the workings are possibly medieval or even earlier. If further archaeological evidence supports the age of the workings this could provide a future case for scheduling. The lower levels are no longer accessible. There are the remains of several walled structures adjacent to the level, which may require archaeological investigation.

Mineralogical

Countrywide Council for Wales

This mine was not ranked as significant during the Minescan survey.

Biological (Habitat / Species)

Countrywide Council for Wales

The site is a candidate for Special Area of Conservation, based on the Calaminarian grasslands and the Lesser horseshoe bat. The National Assembly and UK government are charged to maintain this site in 'Favourable Conservation Status'. The site is also a proposed SSSI.

Other

Snowdonia National Park

The National Park Authority is the Mineral Planning Authority for the area and may need to be notified of remediation proposals. Planning permission may be required.

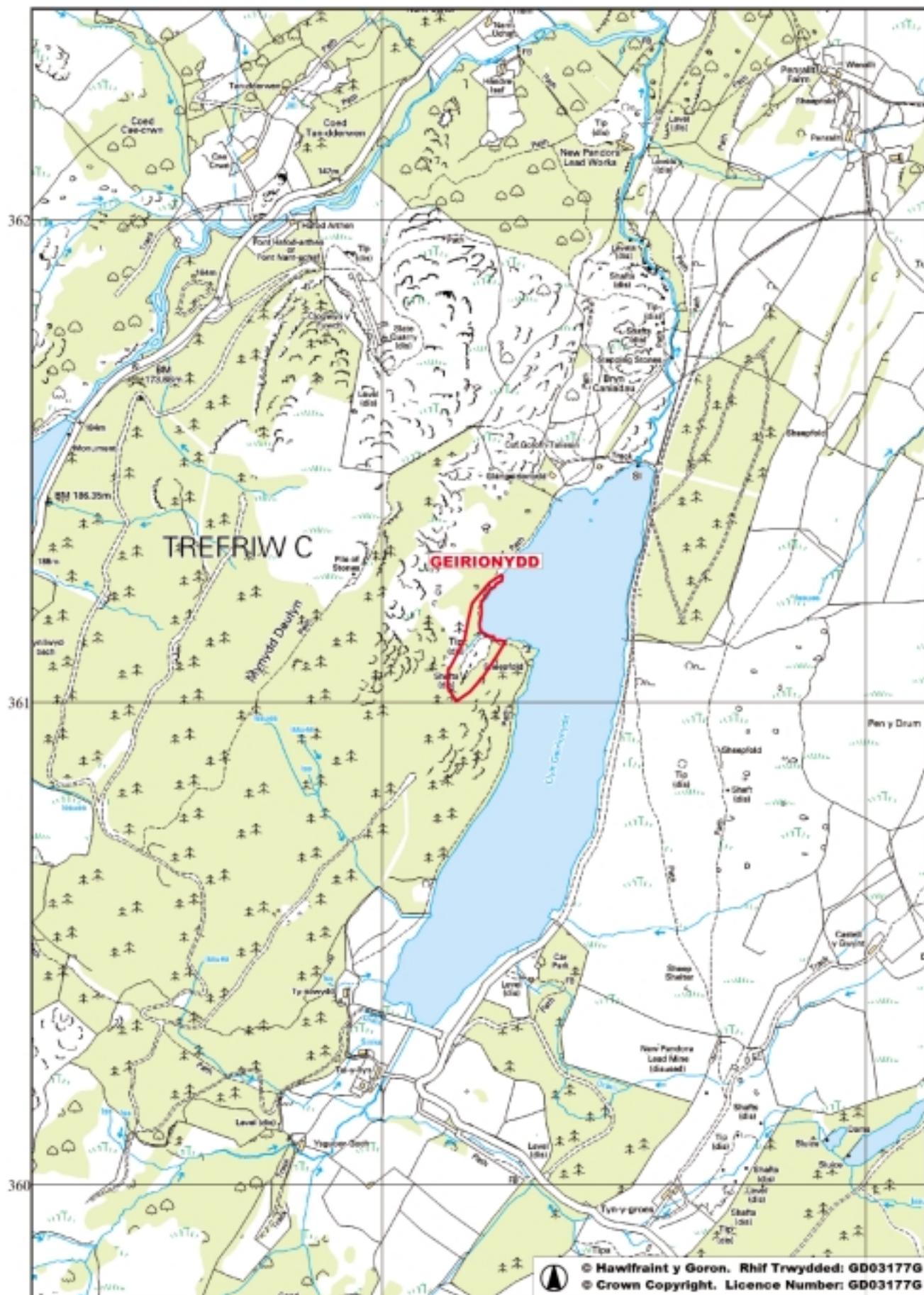
Welsh Mines Preservation Trust

Any major remedial work would impinge on the natural beauty of the area and would be visible from a popular tourist road.

Welsh Development Agency

In 1978 this site was not included in the WDA risk assessment.

GEIRIONYDD



Approximate Scale - 1:10,000

276

277

MINE NAME: GLOGFAWR

Archaeological

Welsh Mines Society

A number of features (structures and earthworks) related to the use of water power for winding, pumping and ore preparation survive on the Glogfawr and Glogfach sites. The two mines were largely worked together from the early 19th century and the features on each site are interrelated. Underlying the 19th century features is the evidence for much earlier working.

Remedial work will endanger many of the surviving features on this site. A detailed topographical survey and full archaeological survey is required before work commences. Work should be monitored by a competent mining archaeologist and a plan formulated to record and, if necessary, preserve any features uncovered. If, as the designation of the Lefel Fawr as 'receiving watercourse' implies, the aim is to reduce the pollution caused by water percolating from the site into that level, a detailed underground survey should be carried out. Work should also consider the protection of the underground features identified.

Cadw

No archaeological interest is known to Cadw. Assessment is required.

Cambria Archaeology (Dyfed Archaeological Trust)

Remains: crusher house, mine shafts, spoil heaps, level, reservoir, leat, wheel-pit, dressing floor, adit.

Mineralogical

Countryside Council for Wales

The site is recommended as a Regionally Important Geological Site (RIGS). Mineralization is dominated by a late (A2) assemblage of quartz, chalcopyrite and galena, which was emplaced along numerous sub-parallel stringers throughout the lode. The dumps have been worked for hardcore over the years, but the activity has exposed unweathered material and so enhances the value of the site. However, remedial works involving tip removal and capping would severely compromise the scientific interest at the site.

Biological (Habitat / Species)

Countryside Council for Wales

Noteworthy species: 17 species of lichens, plus 2 noteworthy fern species.

Area 1: West end, spoil near old processing buildings - rare fern.

Area 2: SW corner, large shell of crusher house - one fern and one lichen.

Area 3: Spoil covered in 7 lichens.

Area 4: Spoil covered in 13 lichens.

Area 5: Buddles - one lichen.

Area 6: Just outside area to west - one rare lichen on small concrete building.

Other

Countryside Council for Wales

Footpaths crossing much of the site.

Ceredigion Council

One of major elements of upland Ceredigion historic landscape together with other settlement and field pattern features in Ceredigion Upland Historic Landscape area. Together with group of mines on Level Fawr, Pontrhydygroes.

Site was used for local fly tipping for many years, but cars removed at the end of 2001, although access makes further dumping possible. Consolidation of existing features and tidying of site would be a substantial contribution to preservation of mining heritage.

Pentir Pumlumon Tourism

Important and highly visible mine workings forming a significant element in the mining landscape of Ceredigion. Site shows use of water-power at high altitudes with good examples of wheel-pits, leat systems and reservoirs. Substantial crusher house requires consolidation. The site has suffered from serious fly-tipping over recent years, particularly in the area of the spalling floors. Environment Agency has already culverted surface water around the Western Shaft sink, to relieve flow in the Level Fawr Adit system. Site is accessible by public footpath and is on the route of the proposed Miner's Way and the Lisburne Mines Trail. Sub-surface workings are drained to a depth of 216m by the Level Fawr and the Glogfawr Engine Shaft contains an entire lift of Cornish Pumps up to the shallow adit horizon. Early 20th century workings are present, including the collar of the Davy Shaft with its associated oil-engine hoist foundations. Considerable scope for archaeological investigation and interpretation.

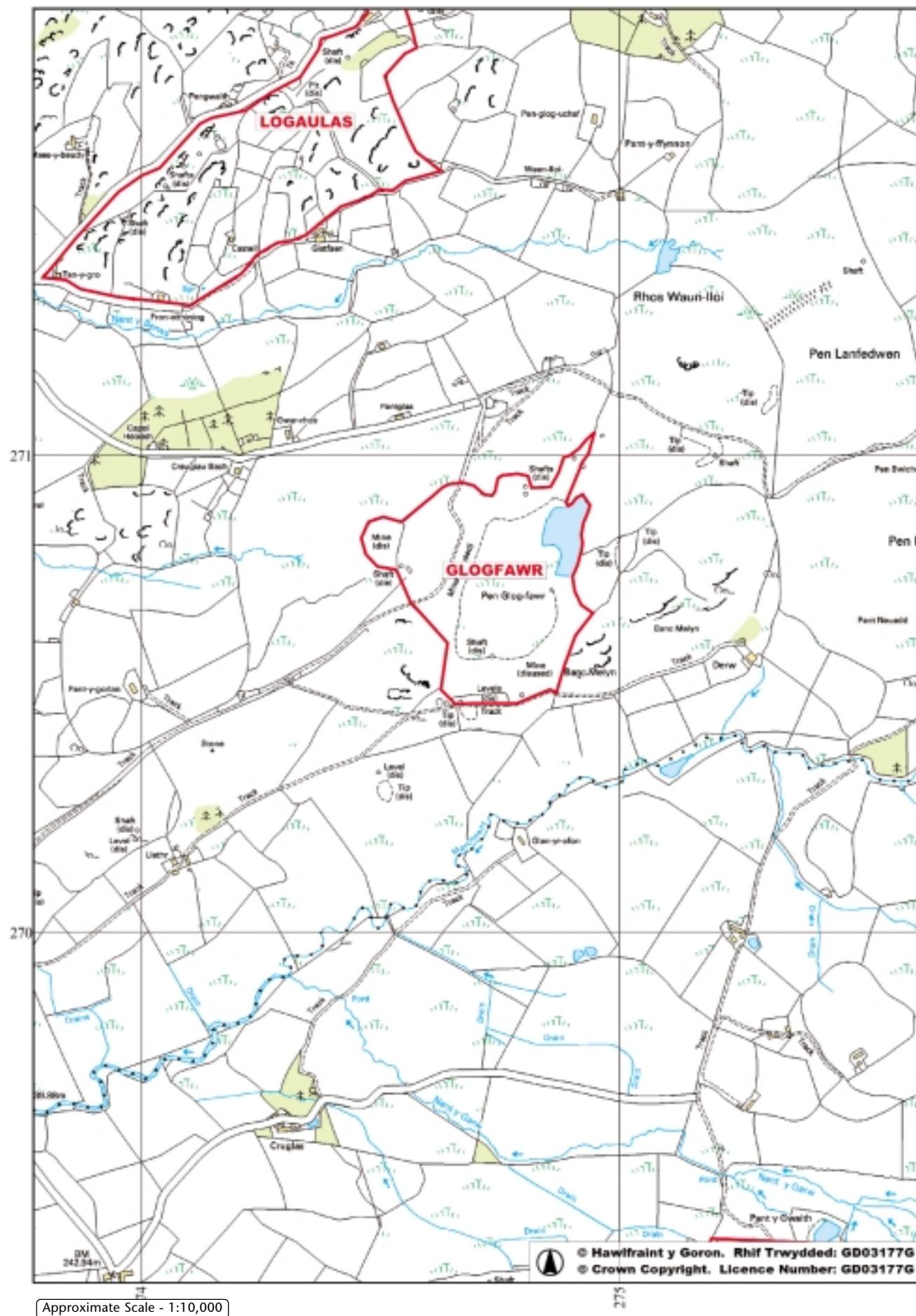
Welsh Mines Society

Until a few years ago, a stream ran across the dumps and into the Western Shaft at Glogfach carrying with it large quantities of fines into Level Fawr. The NRA diverted this flow and its effect in the adit was appreciable. There has been a great problem with fly tipping and the storage of scrap cars on and around the fines dumps.

Welsh Development Agency

In 1978 the WDA ranked this site 32nd, in addition it was also noted that the site was impacting the environment.

GLOGFAWR



Approximate Scale - 1:10,000

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MINE NAME: GOGINAN

Archaeological

Welsh Mines Society

Goginan was certainly worked in the 16th century and may be much older. The features surviving on the site largely date from the 19th century but evidence for earlier working should be expected. Unfortunately much of the evidence for 19th century ore preparation processes was lost during earlier reclamation work on the south-western section of the mine - that area now defined as a 'golf course'. An early drainage adit, with its entrance adjacent to Pont Ysgubor Newydd, runs under this area. To the north-east of 'golf course' much of the ground has been disturbed in attempts to divert water from the reclaimed area but there are significant features surviving, including the portal to Taylor's Incline Shaft.

Any remedial work could impact on surviving sub-surface features. A full archaeological assessment is required before work commences.

Cadw

No archaeological interest known to Cadw but may be significant and requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

Large number of individual features including water tank, Taylor's Shaft, open workings, spoil tips and levels. Scheduling is not proposed.

Mineralogical

No comments

Biological (Habitat / Species)

Countryside Council for Wales

Bats utilise Taylor's Inclined Shaft. The site would probably qualify for SSSI designation on biological grounds.

Other

Countryside Council for Wales

Visitor footpath along east side of site. Putting green on part of reclaimed land.

Ceredigion Council

Private remediation works in 1988 (Richards, Moorehead and Laing consultants).

Possible early mining site stone mortar found on upper part of site later destroyed by remedial work. Some of features of mine site have survived remediation and has potential for preservation of remains below capped material.

Pentir Pumlumon Tourism

An ancient mine site, visible from the A44 trunk road, at Goginan village. Workings have been subjected to various periods of grant driven reclamation schemes and preserved features include Taylor's Incline Portal and the 26fm Day Level. Nearly all trace of the once extensive buildings have been removed, but the site has interesting potential for sub-surface archaeological investigation. The mine is well documented and the water-powered plant is described in great detail in the 1848 Memoirs of the Geological Survey.

The site is on the route of the proposed Miner's Way through N.E. Ceredigion, and there is scope for low-key interpretation both here and in the neighbouring mining settlement of Goginan. To the east of the site, the main mine leat system has recently been exposed by tree felling operations by Forest Enterprise.

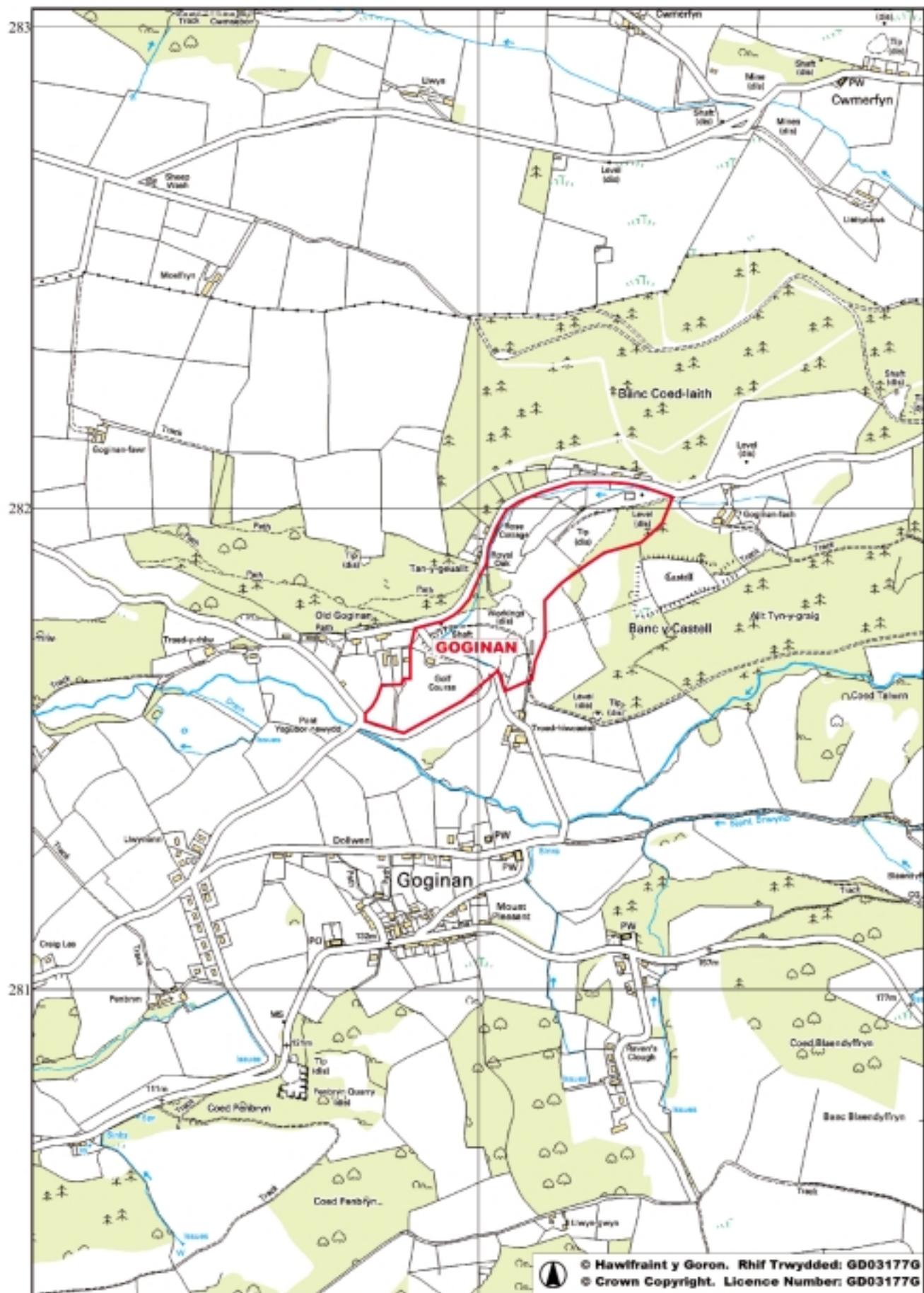
Welsh Mines Society

Has been subject to private land reclamation scheme mostly funded by the WDA in the 1970's. The river Melindwr runs along the southern edge of the site, a large quantity of sands and slimes have washed off the mine dumps into the river and spread some distance downstream.

Welsh Development Agency

In 1978 the WDA ranked this site 10th, in addition it was also noted that the site was impacting the environment. This site has since been subject to treatment with WDA grant aid.

GOGINAN



Approximate Scale - 1:10,000

MINE NAME: CRAIGGOCH

Archaeological

Welsh Mines Society

Significant features related to all elements of non-ferrous metal mining are found on this site, including a number of surviving structures and earthworks. Until recently even some parts of the wooden flat-rod system, used to transmit power from the waterwheel to the in-shaft pumps, survived on site.

The visual impact of this site is significant and important for the historic landscape. Any remedial work will have a significant impact on both the archaeology and the landscape value of this site. A detailed topographical survey and full archaeological assessment are required before work is considered.

Of special note is that on the opposite, north, bank of the Nant Cwmnewydion, and a short distance upstream from Graiggoch lies the cavernous remains of the Societe Anonyme 400 kilowatt powerhouse constructed in 1899 to electrify the Frongoch and Wemyss Mines. The primary source of power was a turbine with an auxiliary steam engine being used in times of drought. The course of the pipeline, the penstock, the reservoirs and leats can all be identified and are of considerable archaeological and historic importance and worthy of preservation.

Cadw

Site is not known to Cadw, potentially archaeologically sensitive and therefore requires assessment. This is especially the case in Dyfed where the archaeological trust mine study has not so far been followed up with recommendations to Cadw for scheduling.

Cambria Archaeology (Dyfed Archaeological Trust)

This site consists of the westerly working of the Frongoch lode, with water from the Weymess mine. Graiggoch mine active from 1840-1889. Remains include wheel pit, four walls of crushing house, mine shaft, slime pit, dressing floor, sluice and supports for flat rod dolly wheels.

Mineralogical

No comments

Biological (Habitat / Species)

Countryside Council for Wales

The site is lichenologically important and would possibly qualify as a SSSI with areas requiring preservation.

Area A: Two lichens occur on the fines at the NE corner of this area.

Area E: Seven lichens -

One lichen on the spoil heaps.

Four lichen around the crusher house remains (one new to Wales, one nationally rare and one potentially new to science).

One lichen on the inner walls of the crusher house remains.

One lichen (new to Wales) on the crumbling mortar of the crusher house remains.

Area F: Maidenhair Spleenwort on the back wall of the quarry.

Other

Ceredigion Council

Part of a group of mines important for their landscape value in Pontrhydygroes-Cwmnewydion area.

Feasibility study, linked with Frongoch and Wemyss conducted by Richards, Moorehead and Laing on behalf of council.

Disturbance of area of fine spoil by ford and vehicle track leading to some wind-borne contamination of adjacent land.

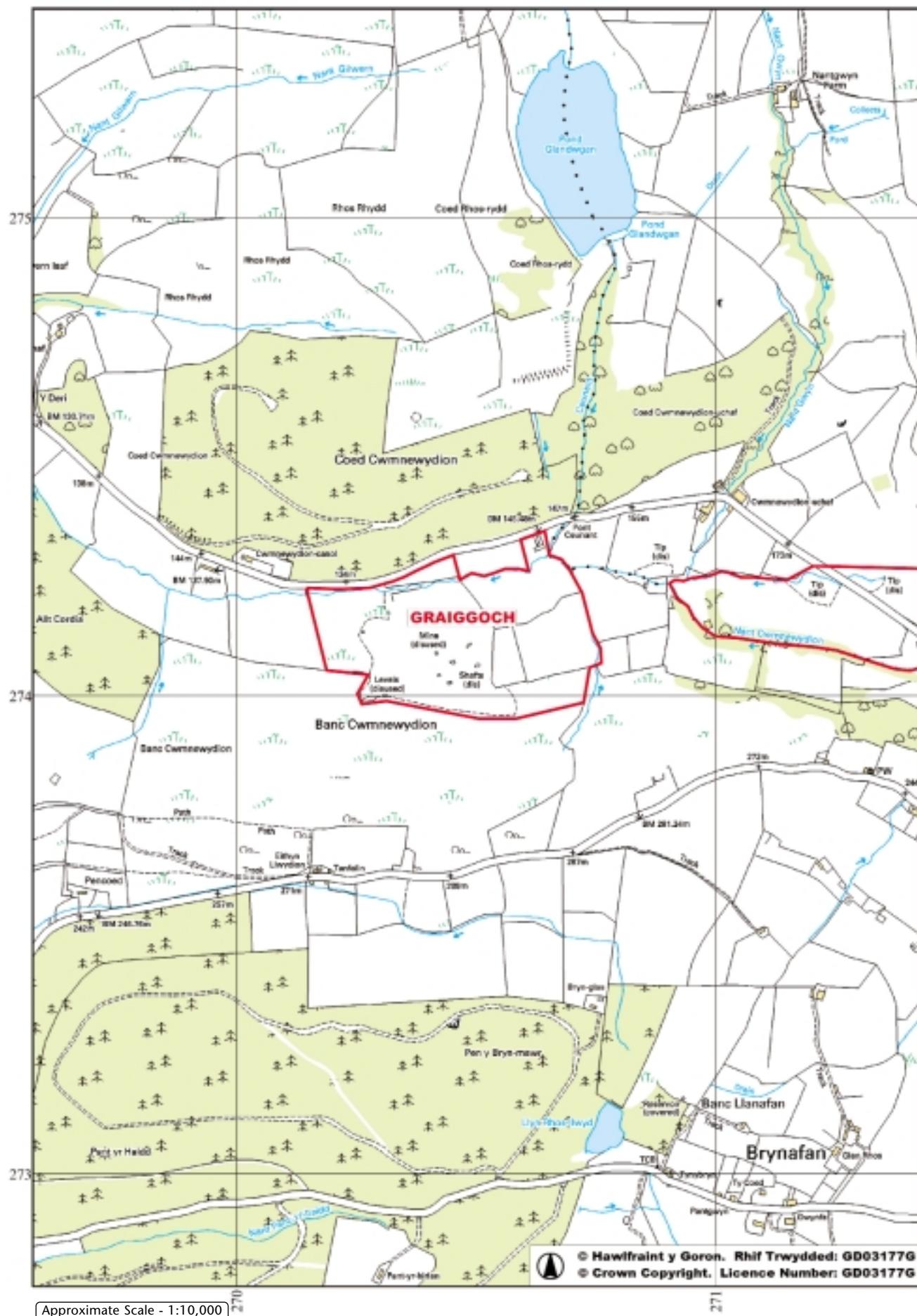
Pentir Pumlumon Tourism

Until comparatively recently, a totally undisturbed example of a 19th century Cardiganshire Lead Mine. Illegal earth-moving operations have destroyed some surface features and spread tailings across the site. Site structures should be consolidated and interpreted as a landscape feature in association with the other line-of-lode workings at Wemyss & Frongoch. The site is slightly off the route of the proposed Lisburne Mines Trail, but will be visible from it. Any landowners need to be made aware of the historical significance of the site as part of Ceredigion's mining landscape. The original Mine Captain's House, with walled garden, survives lower down the valley by the side of the road.

Welsh Development Agency

In 1978 the WDA ranked this site (otherwise known as Red Rock mine) 21st, in addition it was also noted that the site was impacting the environment.

GRAIGGOCH



MINE NAME: GROGWYNION

Archaeological

Welsh Mines Society

Significant features on the Grogwynion site include the structures and earthworks associated with the pumping waterwheel and the various features of the ore preparation site. The mine active by at least the 18th century and the features found underground include hand cut levels from that, or an earlier, period.

A short distance down stream from this site are the features connected with the working of the Gwaithgoch mine and the ore preparation plant installed there to treat material from Frongoch during the first half of the 20th century. Evidence there will include the remains of the aerial ropeway connecting it with Frongoch.

Any remedial work will have a significant impact on both the archaeological and landscape value of this site. Should remedial work be contemplated here, it is essential that it is preceded by a detailed topographical survey and a full archaeological assessment.

Cadw

Site is not known to Cadw, potentially archaeologically sensitive and therefore requires assessment. This is especially the case in Dyfed where the archaeological trust mine study has not so far been followed up with recommendations to Cadw for scheduling.

Cambria Archaeology (Dyfed Archaeological Trust)

Mine site could be ancient, however more recent mining activity took place from 1790 to 1880. Remains include spoil heaps and visible wheel pits and shafts.

Mineralogical

Countryside Council for Wales

No comments

Biological (Habitat / Species)

Welsh Mines Society

The site has already been noted for its scientific value and designated as a SSSI.

Countryside Council for Wales

The site has SSSI status which also includes areas of river shingles with a selection of notable lichens. The Grogwynion river shingles are heavily influenced by lead-wastes washed into the Ystwyth from the mine sites along the upper reaches of the river. A selection of notable lichens found on the shingle, are also present in the mine area. Further consultation with CCW is necessary to ascertain the affect of water quality remediation on the lichens present along river shingles. Corresponding with the boundary of the SSSI is a pSAC (possible Special Area of Conservation) because it contains habitat types and/or species that are rare or threatened within a European context. The interests for why the site was selected as a SSSI may differ from the interests selected in a European context. The European priority interests present at this site are Calamarian Grasslands and European Dry Heaths.

The site is lichenologically important with areas requiring preservation.

Area 1: Three lichens plus Sea Campion survive on the spoil or abundant flat shales, but the best lichen area is found at the boundary of areas 1 and 2, in the vicinity of a long, low wall, where a further four note-worthy lichens were recorded.

Area 4: Plentiful numbers of Carline Thistle plants.

Area 5: One note-worthy lichen collected from a boulder beside the track at the bottom of the scree.

Other

Countryside Council for Wales

A footpath across the site plus two houses are also close proximity.

Ceredigion Council

Part of a group of mines important for their landscape value in Pontrhydygroes-Cwmnewydion area together with structures in the Ystwyth Valley including Gwaithgoch to west. Early 20th century remains of scheme linking mines to Frongoch/Wemyss and hydro-electric dam on Afon Ystwyth.

Mining site and spoil scree form an important and prominent landscape feature in this section of the Ystwyth Valley.

The major source of pollution is considered to be actively eroding fine spoil tips by the Afon Ystwyth. A scheme using a range of possible remediation techniques was designed by Gibbs consultants, but not implemented.

Pentir Pumlumon Tourism

A highly visible and ancient mine working in the Ystwyth valley, about three miles east of the Roman Fort and Sarn Helen at Trawscoed. Opencuts have been worked on the lode exposures and later sub-surface workings were developed from adit cross-cuts driven northwards. Little survives of the plant apart from a wheel-pit and the overgrown dressing floors, although the Count House is now a private dwelling. Further archaeological work may well prove rewarding, particularly in the extensive (and largely drained) sub-surface workings. The entire site is close to a prominent Iron Age hill-fort at Grogwynion. Public footpaths lead through the site and on to the former Gwaithgoch Dressing Mill. The 20th century leat constructed to convey water to the mill turbine is clearly visible and passed over the portal of the old Grogwynion Mine Deep Adit in a launder. The site will form part of the route for the proposed Miner's Way through N.E. Ceredigion, and an important element in the more local Lisburne Mines Trail. Low-key interpretation is envisaged as part of this project.

Welsh Mines Society

Due to the sites inaccessibility by car the site is in a relatively undamaged and unspoiled condition. With steep hillsides the mine dumps blend in with natural scree to produce a dramatic landscape. At the foot of the hillside, alongside the River Ystwyth, are the scant remains of the 19th century crushing and dressing mill partly buried under tens of thousands of tonnes of mill tailings which are gradually being washed away into the river. The problem is sometimes compounded by motorcycles across the dumps and along erosion gullies. The deep adit, driven circa 1780, also known as Level Fawr is located just behind the mill; although of great historical interest, it is now inaccessible and totally flooded. The minerals are divided

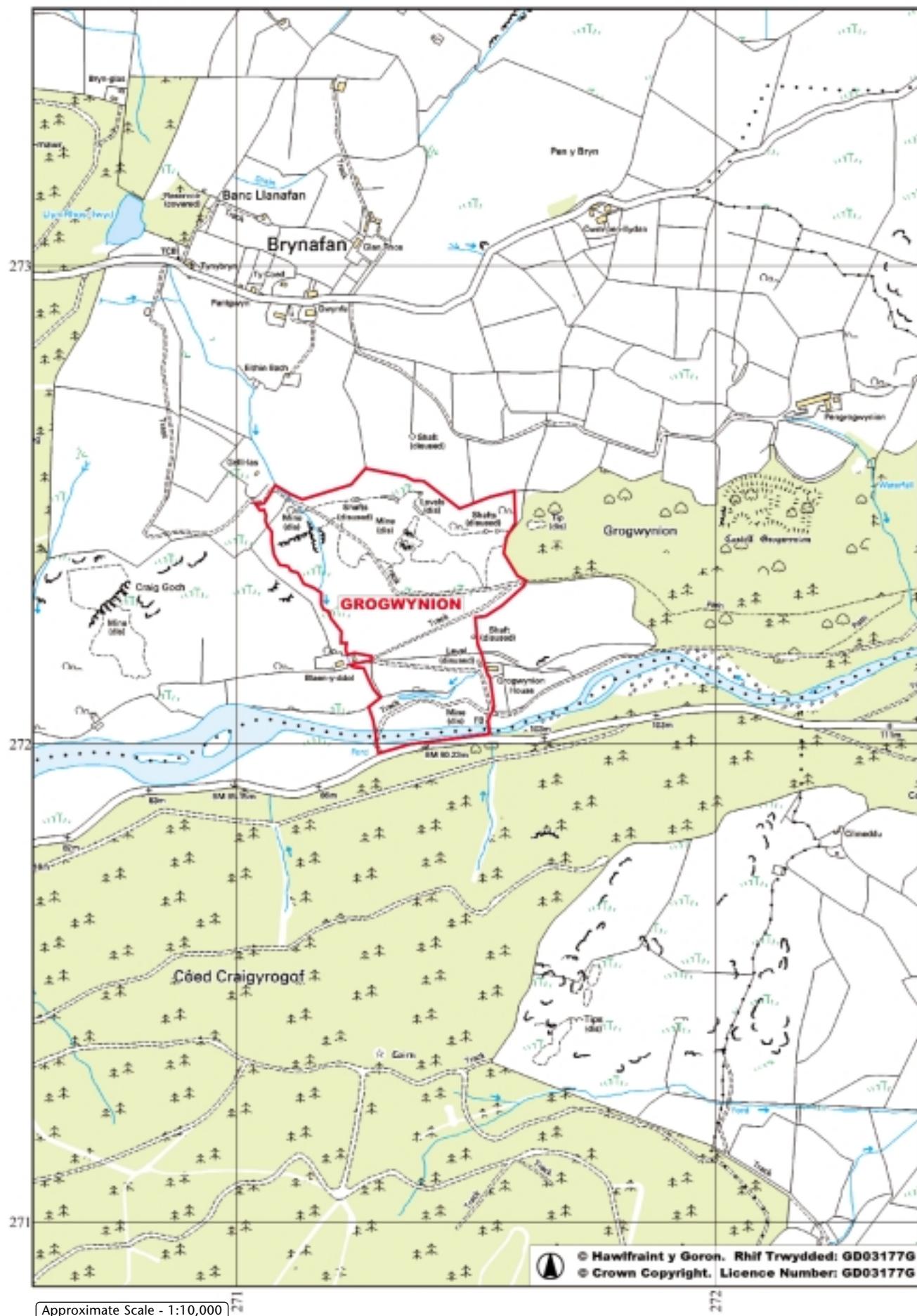
GROGWYNION cont

between the Gogerddan Estate who own the rights to the western part and Lord Lisburne, who own the rights under the eastern and lower parts. 'Meer Stones' were erected to delineate this boundary in the middle of the 18th century and a vigilant search may reveal surviving examples of these rare monuments. The ownership of the surface is complex.

Welsh Development Agency

In 1978 the WDA ranked this site 26th, in addition it was also noted that the site was impacting the environment.

GROGWYNION



Approximate Scale - 1:10,000

MINE NAME: GWYNFNYDD

Archaeological

Welsh Mines Society

Several significant features are known to exist on this site - structures and earthworks connected with tramways, inclines, ore preparation mills, sundry offices and the entrances to underground features. However, as the mine has only recently been abandoned, and it is understood that work on re-treating material in the dumps is continuing, it is impossible to give a full account.

Remedial work could have a significant impact on the archaeology and landscape value of the site. A detailed topographical survey and full archaeological assessment is required before work commences. Care should be taken in siting any treatment area intended to reduce the effect of mine discharge waters given the limited space available for this and earlier mine related features.

Cadw

There exists a Scheduled Ancient Monument (Cwm Heisan ME 204) on the south side of the Afon Mawddach. It consists of 19th century processing site, with remains including crusher house ruins, leat, wheel pit and a small smelter (a rare survivor from welsh metal mines) known to be in existence before 1845. There are also important remains at Gwynfnydd itself (on the north side of the river) that will require assessment for possible further scheduling.

Gwynedd Archaeological Trust

Although recently abandoned, the site survives intact as an example of late 20th century mine, complete with railway and mining machinery. The site requires further assessment for possible scheduling.

Mineralogical

Countryside Council for Wales

There are no designations in respect to this mine site.

Biological (Habitat / Species)

Countryside Council for Wales

Fauna

In respect to Otters and Badgers our records are not complete for this river and hence further assessment is required. The Gwynedd area is a strong hold for the Lesser Horseshoe Bats and therefore likely to exist at this site. The woodlands are significant in supporting various bat species. The destruction or obstruction of bat flight paths (which are sometimes less than one metre from the ground) should be considered with any planned remedial works.

Flora

Lower plants such as the scarce copper mosses, liverworts and lichens will require further assessment at this site, especially around spoil tips. The river gorge may contain significant bryophyte records but to date records for this are incomplete.

Downstream of the mine site is an area within a cSAC. Any remediation measures could potentially destroy sensitive biology. CCW would have to be consulted for any remediation work proposed at or around the mine site.

Other

Gwynedd Archaeological Trust

As the site is a surviving example of an intact Meirionnydd Gold Mine, it would lend itself to interpretation for visitors.

Gwynedd Council

A public footpath runs directly past the mine buildings. If remediation works were to encompass the land where the public footpath runs, the Agency would be advised to consult with the council's Highways Authority prior to instigating works. It may be necessary to apply for temporary prohibition or restriction.

Crown Estate

The Crown Estate (with Wardell Armstrong appointed as mineral agents) has ownership of gold and silver. No mineral licence or lease exists. Arrangements are in place between the Agency and Wardell Armstrong for monitoring and inspection of the mine water.

Snowdonia National Park

The National Park Authority is the Mineral Planning Authority for the area. There are existing planning permissions on the site.

Prospector

A private individual is renting the mine buildings from Welsh Gold Plc to rework the spoil tips. Tips No.2 and No.8 worked until 31st March 2002 whereupon ownership changes to the local landowner. At the end of 2002 the use of the buildings and lagoons will be returned to Welsh Gold Plc.

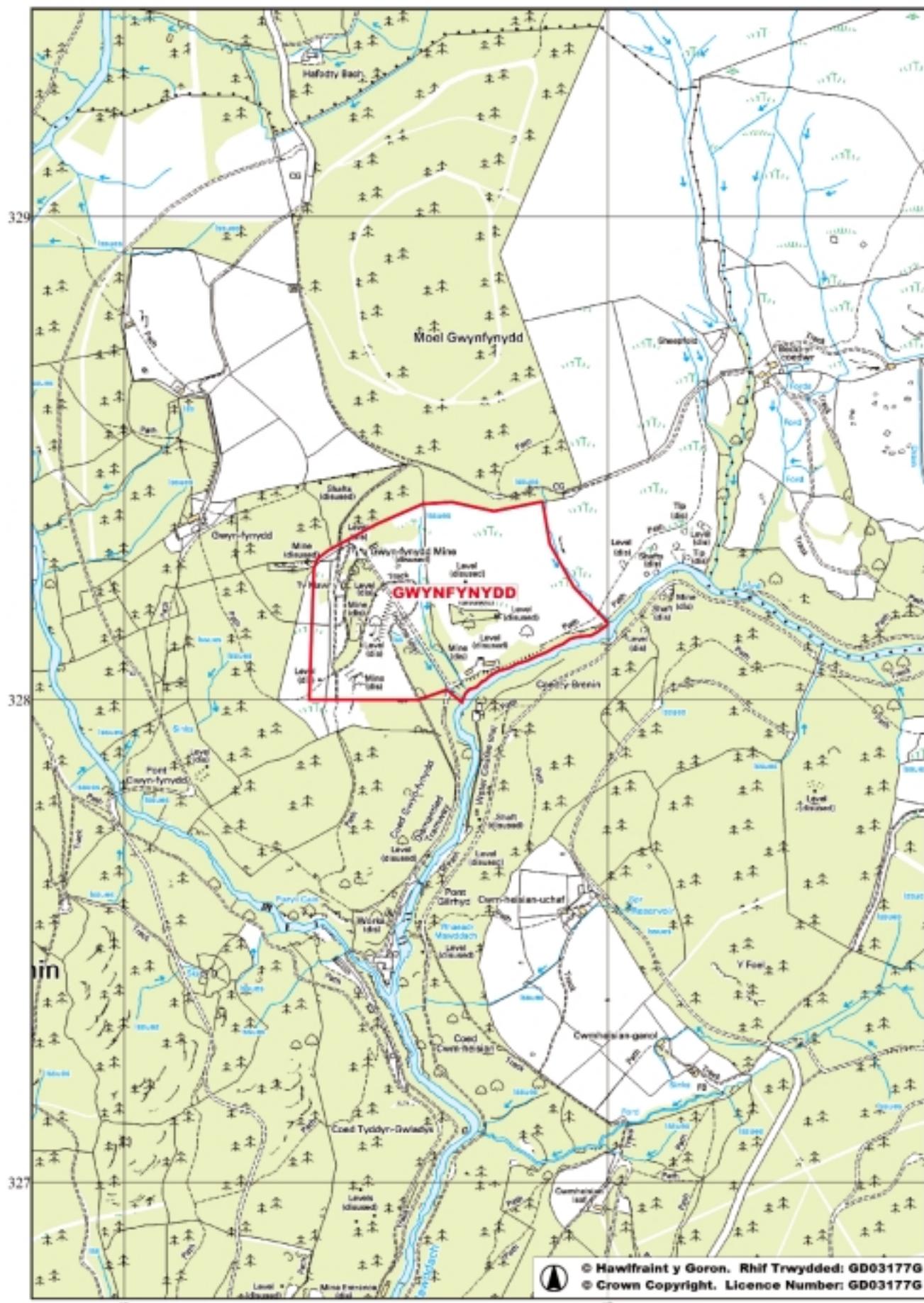
Forest Enterprise

While Gwynfnydd mine (north side of the river) is privately owned. Forest Enterprise owns much of the surrounding area including all the south side of the Afon Mawddach. This area is very popular with mountain biking, walking, horse riding, canoeing and fishing activities.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA, but does have physical health and safety hazards.

GWYNFYNYDD



Approximate Scale - 1:10,000

MINE NAME: HAFAN

Archaeological

Welsh Mines Society

A number of significant features, including the entrances to early underground features, will be encountered on this mine which was worked in the 18th century and earlier. Surviving structures include the portals to early 18th century adits and the pumping waterwheel pit with the earthworks for its associated watercourses.

The 'Macalpine's' quarry that operated in the 1950's destroyed the drumhouse and several of the shafts along the outcrop of the lode. Although not connected with the mine, the track bed of the Hafan tramway runs through the site.

Any remedial work will have a significant impact on the archaeology and landscape value of this site. Work should be considered in the light of the potential impact and, if carried out, preceded by a detailed topographical survey and full archaeological assessment.

Cadw

No archaeological interest known to Cadw, but requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

The surviving remains include a steep incline to the quarry, a masonry wheel-pit and two 1702 arched stone levels. To the north of the mine lies the Scheduled Ancient Monument Carn Owen.

Forest Enterprise

There are a number of structures and shafts which require special management. FE have an agreement with the Welsh Archaeological Trusts and any works require their input and recommendations for management. An annual exchange of the SMR data is part of this agreement and each District holds GIS and database information and management plans for each feature.

Mineralogical

Countryside Council for Wales

This site is recommended to be a Regionally Important Geological Site (RIGS). The site is of regional geological interest because it provides an excellent opportunity to examine in situ exposure showing early (A1) and late (A2) mineralised veins, together with large spoil tips that provide typical examples of the mineralisation.

The geological interest lies both in the open workings (i.e. in situ exposures) and in the spoil tips. Therefore, remedial works involving in-filling/closure of the open-cuts, and removal/capping of the spoil tips would severely compromise the interest.

Biological (Habitat / Species)

Countryside Council for Wales

The site is not proposed for SSSI designation, however the site is of considerable lichen interest. 24 note-worthy species of lichens identified across 4 distinctive areas of the site.

Area 1: 8 species in and around shaft + 11 species on rock faces above.

Area 2: 2 species in quarry area.

Area 3: 6 species on spoil near shaft.

Area 4: Same 6 species as Area 3 on spoil + 2 species on boulders + 6 species in wheel-pit.

Forest Enterprise

Standard works management plans need to be consulted before any remediation is proposed.

Other

Countryside Council for Wales

Footpath down site following inclined tramway to wheel-pit at the bottom.

Bwlchglas Mine, a few hundred metres down the valley, drains across a highly contaminated floodplain into the Afon Maesmawr.

Ceredigion Council

Hafan forms a significant landscape feature with Hafan Tramway and Carn Owen quarries at eastern end of Cyneiniog valley. Part of a group of mines important for their landscape value on the western side of the Pumlumon Massif.

Forest Enterprise

Much of the spoil and shafts lie within forested land and any works would involve clearance of trees, even if just for access. From a landscape and woodland point of view there would need to be in depth consultation with FE. Of course any alteration to current forest management plans will require a Forest Design Plan amendment for submitted via FE for approval by the Forestry Commission.

Should any remediation works be required and planned, full consultation with FE will be required at an early stage. This will also allow for early consultation with the local population.

Pentir Pumlumon Tourism

A significant element in the mining landscape of the remote Plynlimon region. Many 18th century features, including adits, shafts and a wheel-pit. Much weathered development rock and some lode exposures. The site is bisected by the massive masonry structure of the Hafan Tramway Incline, and by the line of the manually worked tramway to the setts quarry on Carn Owen. A spectacular viewpoint for the upper section of the Hafan Tramway route westwards towards Bwlchglas Mine, and eastwards to Brynrafr Mine on the shores of Nantymoch Reservoir. The site is worthy of low-key interpretation in conjunction with the route of the proposed Miner's Way which will pass through the site. A localised short route from Henfwlch Mine to Hafan Mine viewpoint could, perhaps, be developed in association with Forest Enterprise.

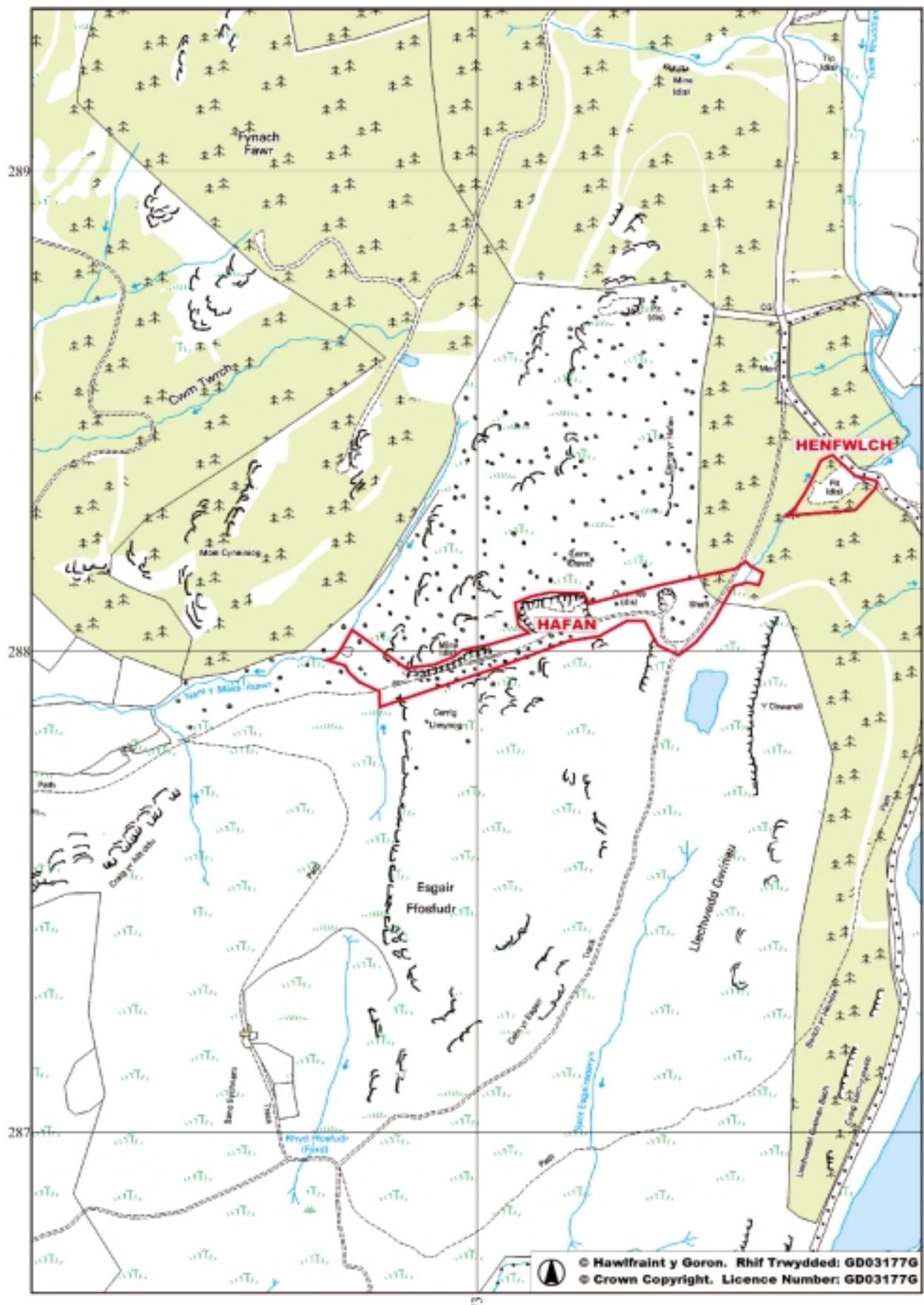
Welsh Mines Society

The small, newer, quarry to the west has intersected a vein of late stage foliated galena and is a popular site for mineral collectors. The minerals are reserved to the Gogerddan Estate and the surface is used as a sheepwalk forming part of the Glan yr Afon farm, Penrhyncoch.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA, but does have a dangerous level requiring fencing.

HAFAN



Approximate Scale - 1:10,000

三

MINE NAME: HENFWLCH

Archaeological

Welsh Mines Society

The main features of this mine are the depressions marking collapsed stopes. Many other features have been lost in the afforested area where significant earthworks are to be expected. Any remedial work will impact on the archaeology of this site. Detailed topographical surveying and a full archaeological assessment should be carried out prior to work commencing.

Cadw

No archaeological interest known to Cadw, but requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

The mine was worked with Hafan. The site contains 2 tiered dressing floors with potential buried archaeology, open level, 2 chimney breasts and concrete bases of a rectangular building and leat. Potential buried archaeology on dressing floor.

Forest Enterprise

There are a number of structures and shafts, which require special management. FE have an agreement with the Welsh Archaeological Trusts and any works require their input and recommendations for management. An annual exchange of the SMR data is part of this agreement and each District holds GIS and database information and management plans for each feature.

Mineralogical

Countryside Council for Wales

The site is recommended as a Regionally Important Geological Site (RIGS). The spoil tips at this mine are of regional geological interest both for early (A1) mineralisation, which carries a variety of rare sulphides including the Co-Ni minerals siegenite, millerite and tuckite, and for secondary mineralisation, in particular the quality of hemimorphite specimens.

The mineralogical interest at this site is wholly within the large spoil tips. Remedial works involving tip removal or capping would therefore severely compromise the interest.

Biological (Habitat / Species)

Countryside Council for Wales

12 rare lichens as follows:-

Area 1: Seven lichens -

Three lichens are present in small amounts on wet bryophyte turfs between the spoil on a consolidated lip above the forestry track.
Another four lichens occur on the spoil around the South edge of this area.

Area 2: Five lichens -

One lichen on flattened spoil.
One lichen on the end of the blockier spoil at the south side.
Three lichens on the ore-bin remains and smaller slopes of rusty spoil.

Area 3: Three lichens persist on a small patch of spoil.

Forest Enterprise

Standard works management plans need to be consulted before any remediation is proposed.

Other

Countryside Council for Wales

The site is close to the road. There is some evidence of mineral collecting.

The site is surrounded by coniferous plantation, part of the site has been planted up (presumably by the site owners, the Forestry Commission).

Ceredigion Council

Part of a group of mines important for their landscape value on the western side of the Pumlumon Massif.

Waste rock heaps have important suite of copper, lead and other minerals and has been used as a site by collectors for some time.

Relatively easy access from road.

Forest Enterprise

Enjoys general public access. Known to attract mineral hunters (against our wishes).

Much of the spoil and shafts lie within forested land and any works would involve clearance of trees, even if just for access. From a landscape and woodland point of view there would need to be in depth consultation with FE. Of course any alteration to current forest management plans will require a Forest Design Plan amendment for submitted via FE for approval by the Forestry Commission.

Should any remediation works be required and planned, full consultation with FE will be required at an early stage. This will also allow for early consultation with the local population.

Pentir Pumlumon Tourism

An interesting small mine working visible on the roadside of the scenic route around Nantymoch Reservoir. Much potential for investigation of surface and sub-surface features. Concrete building remains date from a last working attempt with Hafan, dating from the 1900's. Proximity to the road should be acknowledged with some low-key interpretation and the development of a new short permissive footpath to the Hafan Incline Viewpoint. The site should be consolidated and tree felling limited to exposing key features of this compact mine. Controlled access to the Adit Level should be maintained for archaeological work and educational purposes.

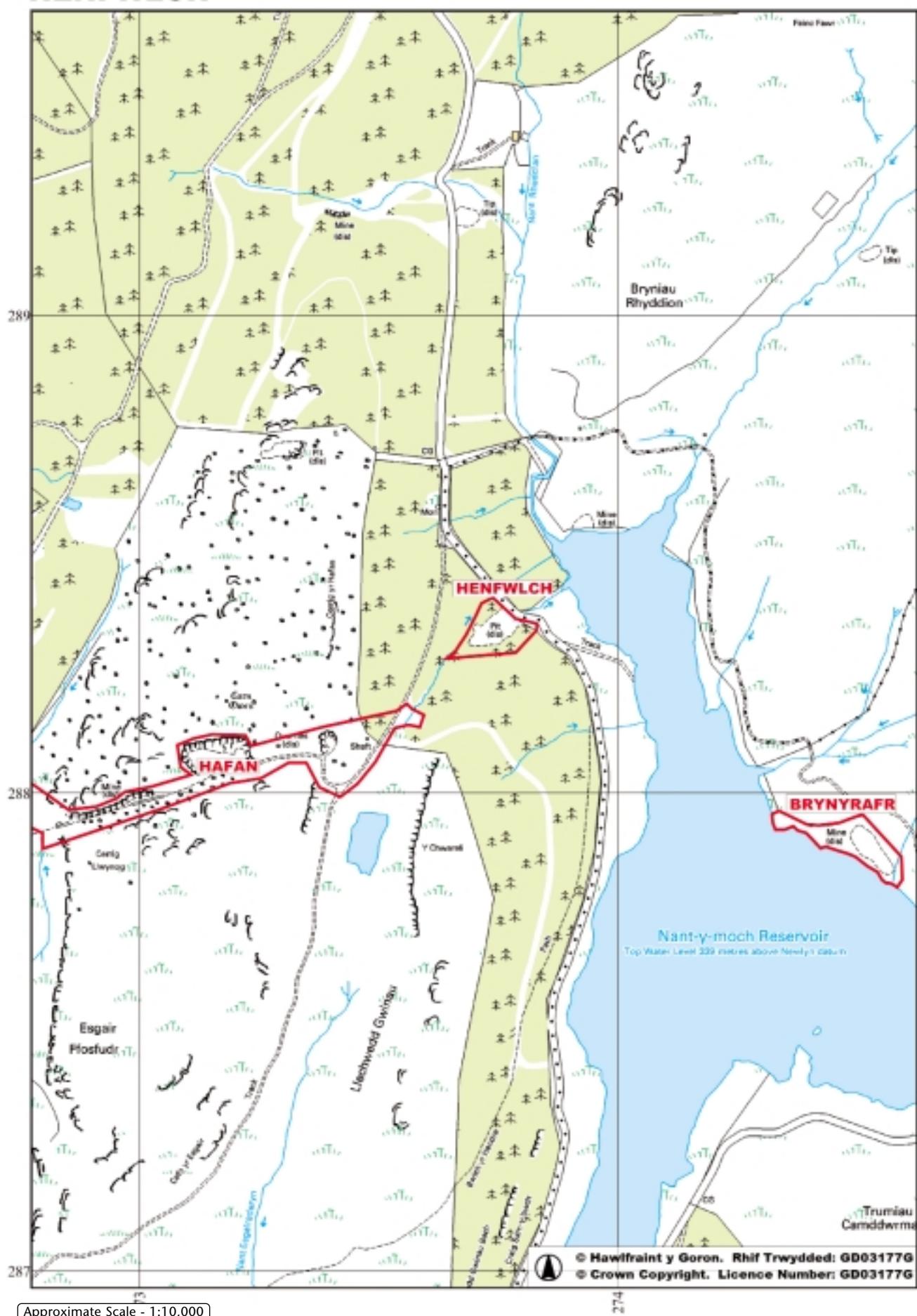
Welsh Mines Society

An accessible, compact site overlooking the Nant y Moch reservoir. This is the eastern end of the Hafan mine and the workings were connected at one time, quarry blasting has now badly shaken the ground between the two mines. There are very few remains on this mine and it is unusual in that the dumps have not been robbed to any great extent. The surface is owned by Forest Enterprise whilst the minerals are reserved to the Gogerddan Estate.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

HENFWLCH



MINE NAME: LEVEL FAWR

Archaeological

Welsh Mines Society

This is the drainage adit, commenced by John Probert in 1785, for the Logaulas mine, and then extended to Penygist, Glogfach and finally Glogfawr in later years. The Logaulas works closed prior to 1900 but the adit continued to discharge the pumpwater until the Glogfawr mines finally closed in 1923. Since the mines flooded, Level Fawr has served as a natural drain to the whole group of mines. The large crusher house which dominated the site, appears to have collapsed in the 1930s but is recorded in several contemporary photographs.

The Lefel Fawr provides access to a number of significant underground features in the mines to the east of Pontrhydygroes. At its entrance, and below the entrance, are a number of significant structures and earthworks comprising the offices, dressing floors and spoil dumps connected with the working of the level.

Any remedial work, including work to reduce the problems associated with mine discharge waters, could impact on the archaeology of the area around the Lefel Fawr entrance. A choice of site for any treatment area must be made with this possibility in mind. A detailed topographical survey and full archaeological assessment are required before work commences.

Cadw

Archaeological interest not known to Cadw, except for two listed buildings nearby which require assessment for possible scheduling.

- 1) Former Mining School - about 250m SSW of Old Post Office, below main village road, on lane opposite Lisburne garage. Listed as a rare industrial building associated with the lead mines at Pontrhydygroes.
- 2) Former Post Office - on W side of main village road, below and to S of prominent chapel on hillside. Consisting of former Post Office, house and cart house in three blocks. Listed as part of a well-preserved group of mid-19 century buildings in this lead-mining settlement.

Cambria Archaeology (Dyfed Archaeological Trust)

Level Fawr was the dressing floor for the surrounding mines of Logaulas, Penygist, Glogfawr and Glogbach. Level Fawr was the longest drainage tunnel in Central Wales and the buildings around it include a large dressing floor.

Mineralogical

No comments

Biological (Habitat / Species)

Countryside Council for Wales

The site is not proposed for SSSI designation. However it does have four noteworthy species as follows.
Sea Campion plants widespread across the site - particularly in Area 5, but also in Areas 7 & 9.
Two rare lichens on spoil heaps in Area 2, one of these is also on a retaining wall in Area 8.
Stag's Horn Club Moss in Area 8.

The Sea Campion plants, while worthy of preservation, are widespread across the site.

Other

Countryside Council for Wales

No formal visitor use, but easily accessible (being within the village) for informal use.
The site was not in fact a mine, but was a complex of offices, workshops and an ore dressing plant. Coarse crushing was performed above the road (east) and fine crushing below.

Ceredigion Council

Part of a group of mines important for their landscape value in Pontrhydygroes-Cwmnewydion area together with structures in the Ystwyth Valley.

Important group value of listed buildings around adit portal (adit portal listed?) and in mining village of Pontrhydygroes.

Most of gravity dressing mill site below adit portal removed, but fine spoil at base of slope near Afon Ystwyth.

Level Fawr drainage adit (1785) longest level in mid-Wales communicates through Logaulas to Glog Fawr. Important for hydrogeology of area.

Pentir Pumlumon Tourism

A major Adit Level Cross-cut draining Logaulas, Penygist, Glogfach & Glogfawr Mines. Became the site of a major Mill and Dressing Floor complex operated by the Lisburne Mines Company. The mine yard, Count House (c.1834/CADW Grade II Listed) and the adjoining 3-hearth smithy are privately owned. Scope for surface archaeological excavation to locate the main crusher house and wheel-pit (buried in tipped hardcore), together with other features of this innovative plant, fully documented by the French Engineer Moissenet in 1866. A full archaeological survey of the sub-surface system accessible via the Level Fawr should be carried out, with controlled access being maintained for the long-term. The site is to be interpreted as part of the route of the proposed Miner's Way and, more particularly, as part of the local Lisburne Mines Trail. Pontrhydygroes is an important surviving example of a lead mining settlement, and other key buildings associated with the former industry are to be incorporated in the heritage trail.

Welsh Mines Society

The mineral rights, and liberty of access, are reserved, whilst the surface is in multiple ownership and poorly defined in places.

Welsh Development Agency

In 1978 the WDA ranked this site 12th, in addition it was also noted that the site was impacting the environment.

LEVEL FAWR



Approximate Scale - 1:10,000

MINE NAME: LLANFAIR

Archaeological

Welsh Mines Society

Many of the structures which would be expected on this 18th/19th century water-powered mine have been lost. A number of related earthworks do survive although most of the spoil and tailings dumps, on the north side of the stream between the village and the main road have been robbed for hardcore. A number of significant features will be found in the central part of the mine, south of the stream. Sub-surface features are to be expected across the entire site.

There will inevitably be an impact on the archaeology of the mine as a result of any remedial work. A detailed topographical survey and full archaeological assessment is required prior to work commencing.

Cadw

No archaeological interest known to Cadw, but requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

No specific details but there are a few features listed on the site monument records.

Mineralogical

No comments.

Biological (Habitat / Species)

Countrywide Council for Wales

No information is available, but further survey should be carried out before remediation work.

Other

Ceredigion Council

Most mine structures removed, spoil used for hardcore, and mine buildings converted to dwellings/outbuildings.

Believed to have been Roman in origin due to high silver content of galena. Possibility of sub-surface archaeological interest.

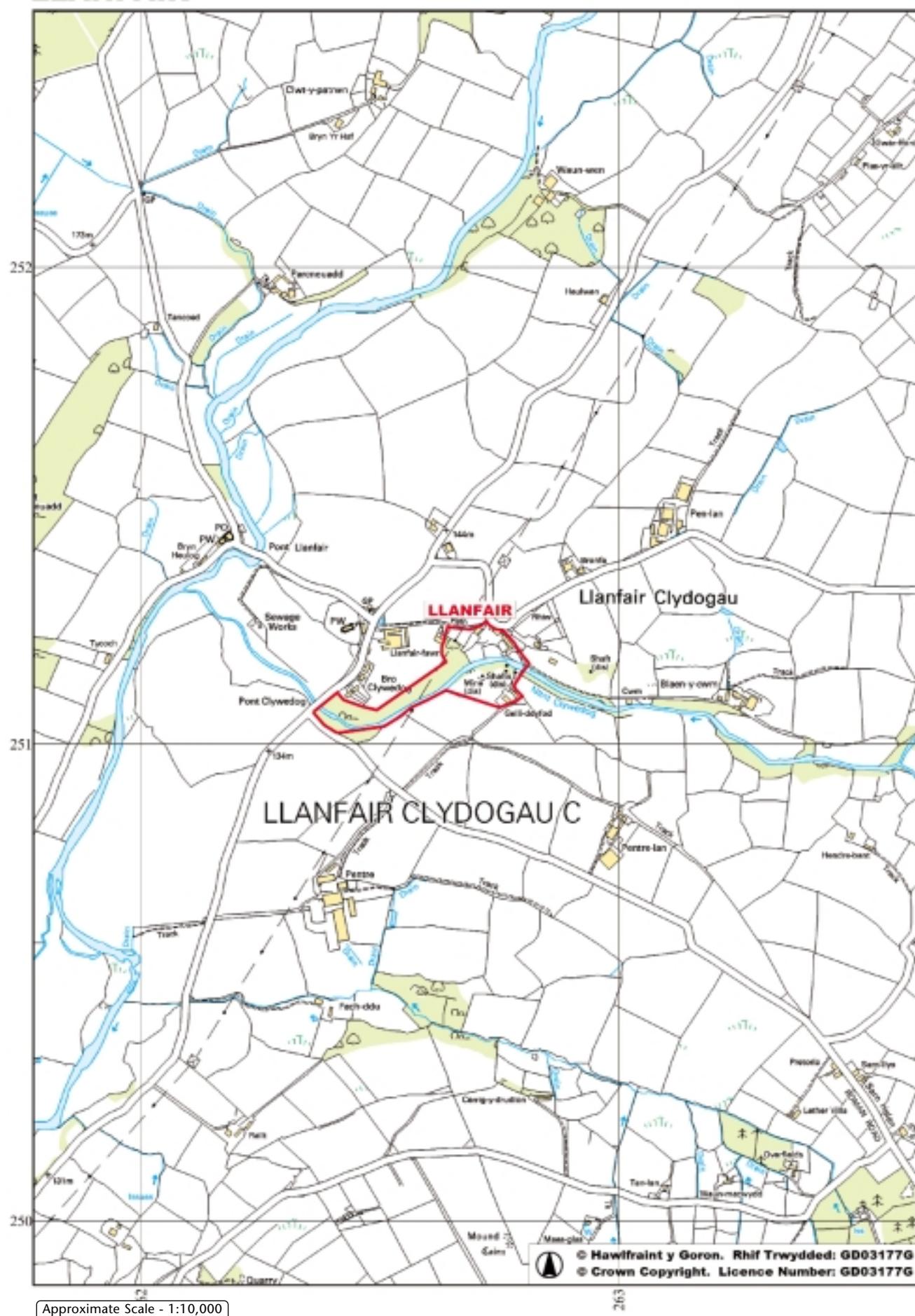
Welsh Mines Society

Specimens of ore are now uncommon and most of the mine has been reclaimed through gradual encroachment by neighbouring properties.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

LLANFAIR



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MINE NAME: LLANFYRNACH

Archaeological

Welsh Mines Society

There are a number of structures on the site. However, the potential impact of remedial work is not confined to structures alone, all the surviving earthworks, including the tailings dumps, along with the sub-surface archaeology should be considered.

The Llanfyrnach Mine site is relatively undisturbed - with no reworking of spoil or tailings - and is one of the better examples of a late 19th century silver-lead mine in South Wales. Although in a ruinous state it displays a wide range of 19th century mining and dressing technology underlying which will be evidence of 18th century working.

Cambria Archaeology (Dyfed Archaeological Trust)

Wide range of 19th century mining and dressing technology together with 18th century workings. Remains include: 3 shafts, cornish engine house, boiler house and dressing floors.

Mineralogical

No comments.

Biological (Habitat / Species)

Countryside Council for Wales

The local BSBI county recorder has higher plant and lichen species lists, collected in 1987, for the site. CCW recommend a further survey be carried out before any remediation works.

Other

Welsh Mines Society

Land is privately owned. Note that the mineral rights are still held by Bronwydd Estates.

Countryside Council for Wales

Llanfyrnach mine (SN 2250 3160) was one of those sites designated for reclamation by Dyfed County Council. The intention, therefore, was to examine it at the earliest opportunity during this study (Biological Survey of the Metal Mines of Mid-Wales 1992-1994).

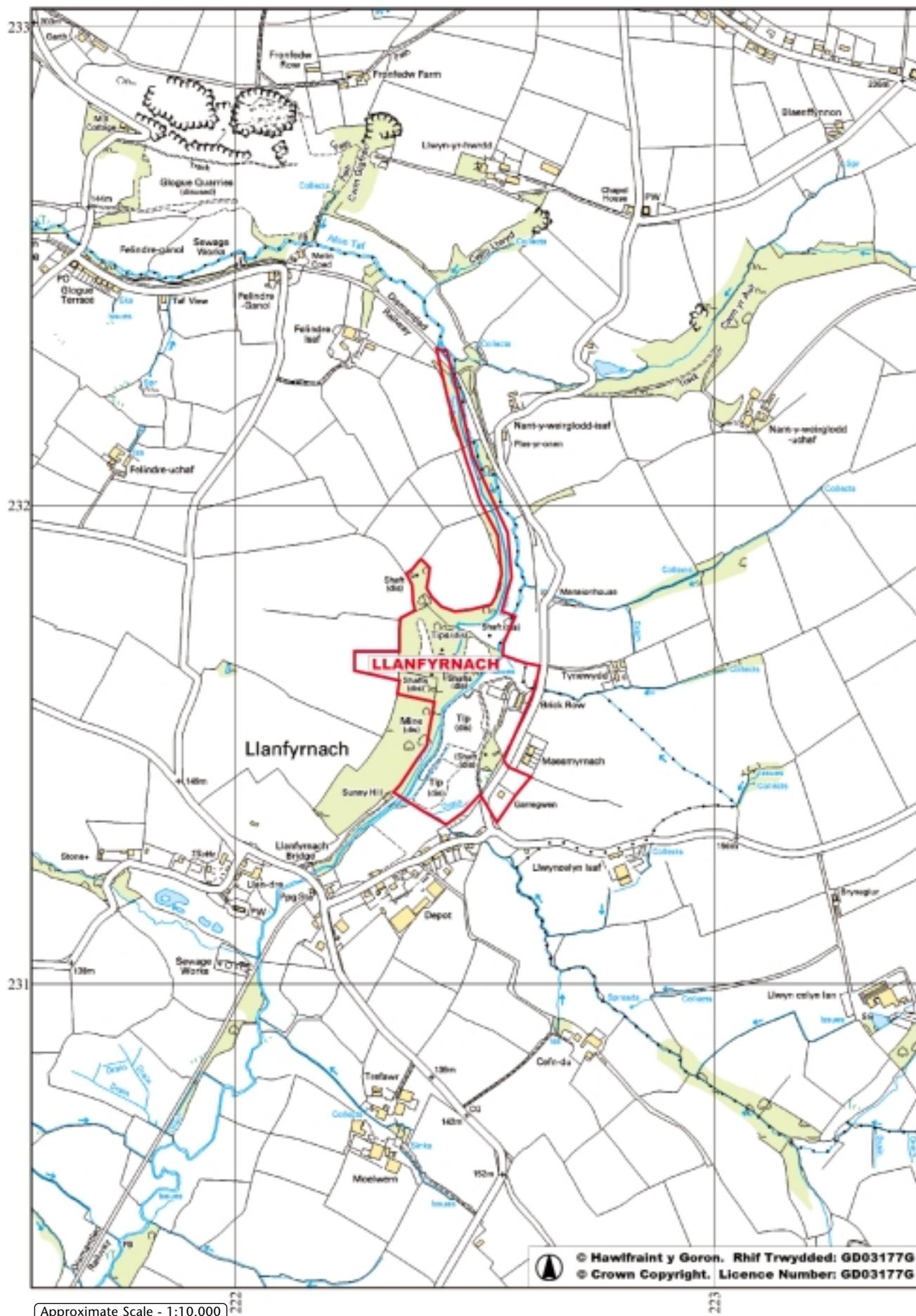
Pentir Pumlumon Tourism

The only true 'silver' mine in Ceredigion, with the silver content of the argentiferous galena assaying 86 ozs. per ton. Once a fairly extensive and deep mine, lost in the obscurity of woodland alongside the Clywedog stream. Collars of several stone-lined shafts were evident some years ago, and the former Count House/Smithy complex survives as the aptly named 'Silver Mines Cottage'. Water supplies were conveyed by leats from the stream, fed by a reservoir called ' LLyn-y-Gwaith', in the hills to the east. An intriguing site well worthy of detailed archaeological investigation both at surface and immediate sub-surface horizons. The proximity of this site to the B4343 road would make low-key interpretation beneficial and of relevance to the cultural tourism resource of the Lampeter area.

Welsh Development Agency

In 1978 the WDA ranked this site 31st, in addition it was also noted that the site was impacting the environment.

LLANFYRNACH



MINE NAME: LLWYNTEIFY

Archaeological

Welsh Mines Society

Llwyntefy and Bwlchgwyn should be viewed together, therefore this information is a duplicate of that for Bwlchgwyn.

The site is one of a group of ancient mines, worked through to the late 19th century, on the high ground north of the Rheidol - see also Penrhiew and Bwlchgwyn. They were, at times, worked as one concern and the features evident on one sett cannot be viewed in isolation from those on adjoining setts. The 18th century features are clearly evident on the north-eastern part of the sett.

Many features still survive which can be readily identified with Lewis Morris's sketches dating from the 1740s and illustrated in Dick and Davies, Lewis Morris and the Cardiganshire Mines, (Aberystwyth, 1994). Features found on the Llwyntefy sett date from at least the early 18th century through to the late 19th century. These will include the reservoir and earthworks related to watercourses, whim rounds, tramways and hand-tipped shaft mounds, along with the residues from ore dressing processes. The latter will include hand cobbed debris from 18th century operations plus the tailings from later 19th century ore processing. Sub-surface archaeological features are to be expected across the whole site.

All the features found on these setts are distinctive elements in the landscape of this remote part of upland Ceredigion. As such they were prominent in the designation of upland Ceredigion as a 'Landscape of Outstanding Historic Interest'.

Remedial work will inevitably lead to the disturbance of archaeological features. A detailed topographical survey followed by a full archaeological assessment is essential before work is started. The site must also be considered in its landscape setting. Ill-considered remedial work could effectively ruin a significant element in the historic landscape of upland Ceredigion.

Cadw

Archaeological interest not known to Cadw, but requires assessment.

Dyfed archaeological Trust

Archaeological interest as above. SSSI site 'Brynn Bras' includes the mine and land to the north.

Mineralogical

Countryside Council for Wales

The site is recommended to be a Regionally Important Geological Site (RIGS). Forming a linked sett, this site is of regional importance because it provides one of the most informative combinations of mining geology and primary mineralisation, located in one of the finest early mining landscapes in the Central Wales Orefield. Good examples of typical late (A2) mineralisation are common on the spoil tips, particularly those associated with the large Eastern Shaft. The interest lies both in the spoil tips and in in-situ exposures in the Eastern Shaft. Therefore, removal of the spoil, in-filling of the shafts and restoring the landscape will compromise the geological interest and also result in

the loss of key features of mining archaeological interest. In the context of this RIGS, the latter are viewed as complementary to the geological interest.

Biological (Habitat / Species)

Countryside Council for Wales

Llwyntefy and Bwlchgwyn should be viewed together as one site. The site is not proposed for SSSI, but is lichenologically important with areas requiring preservation.

8 species of lichens:

Area 4 (*Vezdaea acicularis*, *V. rheocarpa*)

Area 5 (*Lecanora epanora*, *Stereocaulon leucophaeopsis*, *S. pileatum* and *Vezdaea copbia*)

Area 6 (*Lecanactis dilleniana*, *Placosia lamblii*)

1 species of fauna: water spiders reported in the past in Area 8.

Areas particularly relevant to Llwyntefy are Areas 7,8 and 9 and part of Area 6.

Other

Welsh Mines Society

The site is prominent amongst those landscape features which led to 'upland Ceredigion' being designated as a 'Landscape of Outstanding Historic Interest'. The designation opens up real possibilities of promoting the area to visitors, providing a much needed boost to the local economy.

Ought to be considered as an eastern extension of Bwlchgwyn. The mine has been little disturbed, is surrounded by heathland and commands astonishing views; It seems totally unnecessary to consider a reclamation scheme as the solution to the few problems which exist on this mine; better site management ought to be considered as the only course of action. There is a good case for managing this site in conjunction with the Temple Mine, which lies 400 metres to the east, and promoting it as a mines trail. The mineral rights are divided between the successors of the Penglaise Estate and the Nanteos Estate to the west. The surface is used as a sheepwalk and forms part of Penrhiew Farm, Ystumtuen.

Countryside Council for Wales

The site lies wholly within common land. There are footpaths across the site.

The pRIGS overlaps, in part, with the existing Brynn Bras biological SSSI.

Ceredigion Council has carried out a feasibility study into the capping of shafts and remediation of contaminated land at Bwlchgwyn Mine.

Ceredigion Council

A feasibility study into the capping of shafts and remediation of contaminated land has been carried out as part of a wider study into the Ystumtuen and Cwm Rheidol system. It is essential that all the system is addressed as one scheme as they are hydraulically linked with Cwm Rheidol, Ystumtuen and Penrhiew mines. Part of a group of upland metal mines in mining settlement of Ystumtuen with potential interest as features near footpath system. SSSI Brynn Bras to north of mine site.

LLWYNTEIFY cont

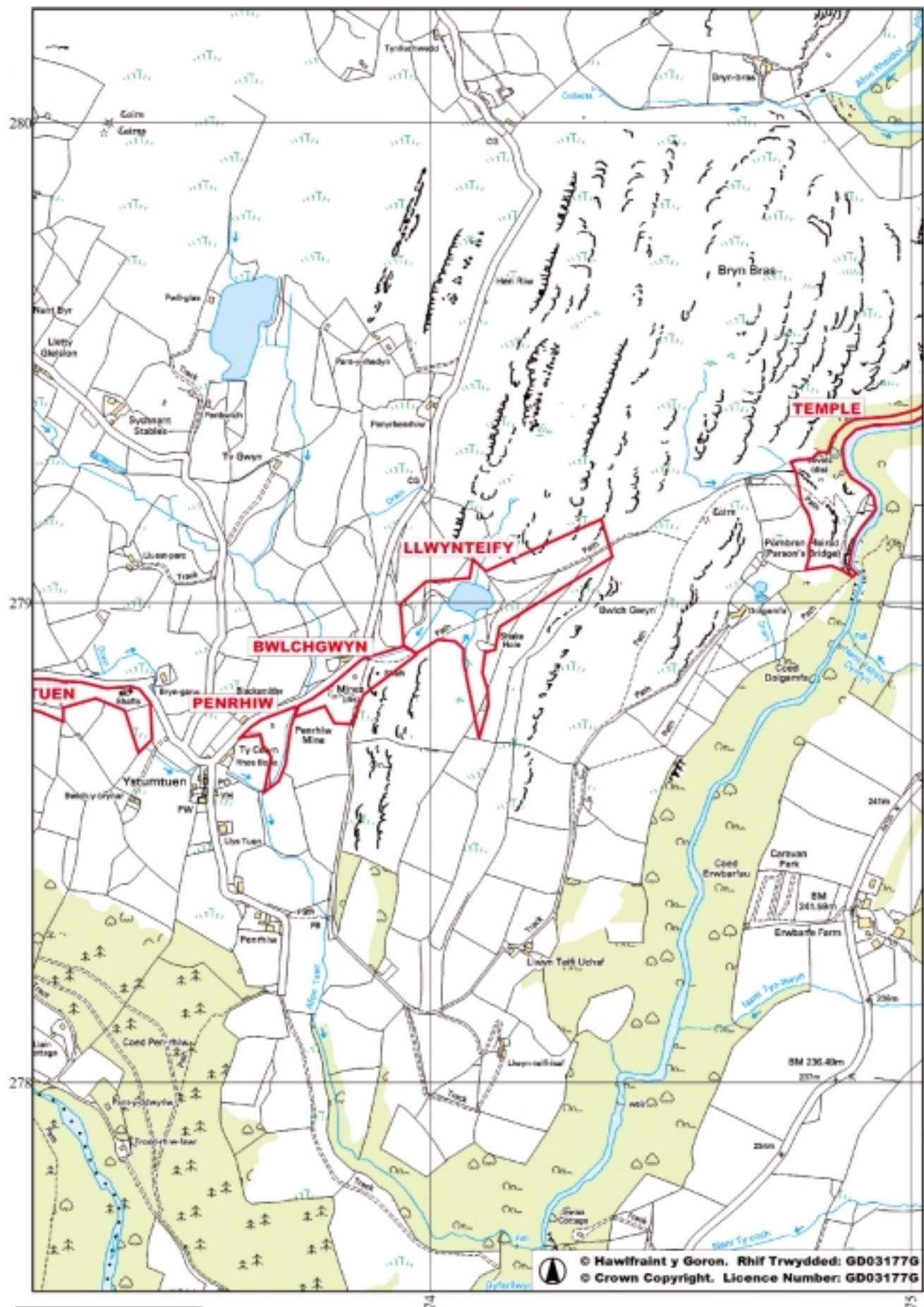
Pentir Pumlumon Tourism

An integral part of the Castell line-of-lode mine workings, closely associated with Bwlchgwyn. Said to be linked to the Temple Mine by a manway access to the north-east, but drained by the Cwmrheidol Cross-cuts to the south-west. An atmospheric site containing the features from several centuries of mining operations, and greatly adding to the quality of this upland landscape. Already accessible via waymarked public footpaths from Parson's Bridge, and planned as part of the route of the proposed Miner's Way through N.E. Ceredigion. Low-key interpretation is desirable as an interest point along the route, perhaps in association with the proposed RIGS designation.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

LLWYNT EIFY



Approximate Scale - 1:10,000

103 Metal Mine Strategy for Wales

MINE NAME: LLYWERNOG

Archaeological

Welsh Mines Society

Part of this site is a Scheduled Ancient Monument (Cd 158). A number of significant structures survive on this museum site. There are also significant earthworks related to the working of the site, including those for the watercourses feeding the pumping and winding waterwheels. Sub-surface archaeological features are to be expected across the entire site.

The scheduled monument is constituted by two separate areas, at the north and east of the site. The northern area includes a circular stone powder store with corbelled roof, a waterwheel winding pit dating from 1865 and Engine Shaft which it served, and a stone-lined gulley for pumping rods to another waterwheel pit and bob pit to the south. From the shaft, covered stopes follow the vein to west and east. The separate eastern area contains a rock cut shaft and Balcombe's Level (the first 15m of the level are reconstructed and excluded from the SAM). The site is of national importance as a well preserved group of scarce lead mine features. There is important group value with the offices, crusher house, ore dressing shed and southerly wheel-pit, which are occupied by the Museum and are listed.

Any remedial work will have an impact on the site. A full archaeological survey is required before work commences.

Cadw

Scheduled Ancient Monument (Cd 158) and listed buildings:

Rock crusher house - Dates from the mid-19th century.

Listed as a rare surviving lead mine crushing house and for group value with the SAM and other listed buildings at this well preserved mine.

Ore dressing shed and bin - probably dates from the mid-19th century. Listed as a rare surviving lead mine ore dressing shed and for group value with the SAM and other listed buildings at this well preserved mine.

Mine offices - Built c1869-70. Listed as a rare surviving lead mine office and for group value with the SAM and other listed buildings at this well preserved mine.

Gunpowder magazine - Is of a traditional form and probably dates from the early 19th century. Listed as a rare surviving lead mine powder magazine and for group value with the SAM and other listed buildings at this well preserved mine.

Cambria Archaeology (Dyfed Archaeological Trust)

Part of site is scheduled as above. Remains: wheel-pit, adits, buddles, crusher house, shaft and leats.

The Mid-Wales Mining Museum

The upper part of the site has been scheduled by Cadw 1/1/6608. Refer to Cadw above for full description.

The mine is a typical small, water-powered ore mine whose working history spans three centuries from 1744 to 1914. The mine site has since been preserved in its entirety, both in terms of restoration of the buildings, underground workings at and above adit level, to the preservation of the mine waste spoil tips which are an important feature to the landscape of the mine site.

Mineralogical

No comments

Biological (Habitat / Species)

Countryside Council for Wales

Habitat/species unknown - CCW require a biological survey to be conducted.

Other

Welsh Mines Society

The site is run as a museum and visitor attraction.

Cadw

The site was established as a museum of lead mining by Peter Lloyd Harvey from 1973, and many features have since been restored or reconstructed.

The Mid-Wales Mining Museum

The site, since 1973, has been utilised as a museum of lead and silver mining with public underground access. It is the only properly registered and managed mine site within the important mining district formally known as Cardiganshire.

The underground workings accessible by the public show a typical example of a mineralised fault line, dipping steeply northwards, with a traditional north-east strike, and with the hanging wall a clearly defined feature. These underground workings have not been designated, as it would inhibit the development potential for further public access.

A flooded engine shaft also has provided a good habitat for a range of amphibians, including toads, frogs and common newts. Other works related to water-control have been largely implemented already but we would be interested in creating an environmental demonstration area to show reed bed filtration in operation as part of the on-site interpretation.

Ceredigion Council

Council suggest that reed beds would be the most likely remediation.

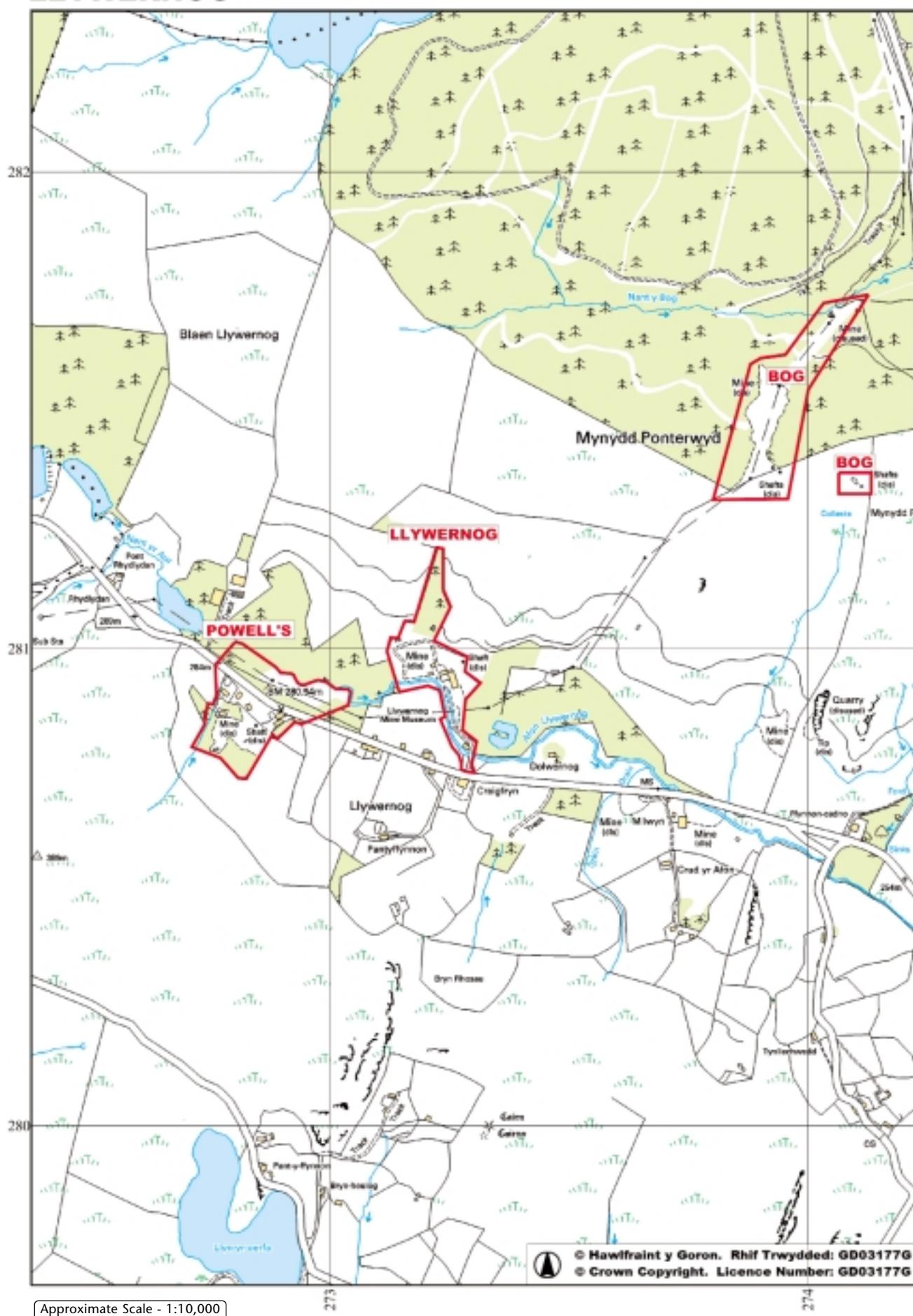
Pentir Pumlumon Tourism

Plans to rebuild a 50ft diameter overshot water-wheel on this site are continuing, with a proposal to refurbish & reopen the original high-level leat system to provide a reliable supply of water.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

LLYWERNOG



MINE NAME: LOGAULAS

Archaeological

Welsh Mines Society

This is an early working, pre 18th century, active through into the 19th century. A series of open-works and shallow shafts are in evidence along the line of the lode deposit. A number of earthwork features survive on the site, largely related to the use of water power. Dressing floors on the site will be early features as later ore preparation was carried out at the mouth of the Lefel Fawr.

The smithy, part of a whim circle and another building, possibly stables, are the only surviving structures at the old mine and are of some interest: Further east, at the new mine there are several open shafts, wheelpits and leat, ore slides, tramways and other structures which ought to be identified before any remedial works take place.

This mine is a significant feature in the landscape of Upland Ceredigion. Any remedial work could damage the landscape value of the site. A detailed topographical survey and a full archaeological assessment are required.

Cadw

Archaeological interest not known to Cadw, but requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

Acknowledged archaeological interest but no features were listed.

Mineralogical

Countryside Council for Wales

The site is recommended to be a Regionally Important Geological Site (RIGS). The spoil tips and main open-cut are of regional geological interest. The cerussite specimens which the mine produced in the 19th century are a rare example of contemporary specimen material having been saved. Specimens in the Natural History Museum represent some of the best UK examples of this mineral. Cerussite may still be seen, both in-situ in veins along the sides of the main open-cut and also in the spoil tips.

The mineralogical interest at this site is both in-situ exposures in the open-cut working and also in the spoil tips. Remedial works involving the in-filling of any open workings or removal/capping of the spoil tips would severely compromise the interest.

Biological (Habitat / Species)

Countryside Council for Wales

The site is not proposed for SSSI, but is important with areas requiring preservation.

Area 1: 15 rare Adder's Tongue plants at SN 7460 7250
Reservoir 2: Sea Campion plants.

Area 4: A mortar rich mound between the road and the cut has three rare lichens.

Area 5: Sea Campion plants.

There is also a rare (Red Data Book) moss (*Ditrichum plumbicola*) which is also a UK BAP Priority species. The location of this moss is unclear. The site was visited in early 2000, but the habitat at the grid reference given in the

DWT 1993 report looks entirely unsuitable for this moss. There is however what appears to be eminently suitable habitat in another section of the mine complex, SN 7410 7100, though during a quick survey the species could not be located. A survey for this species and others should definitely be carried out in advance of any remediation work.

Other

Countryside Council for Wales

A footpath traverses the NE part of the site.

Ceredigion Council

One of elements of upland Ceredigion historic landscape together with other settlement and field pattern features in Ceredigion Upland Historic Landscape area. Together with group of mines on Level Fawr, Pontrhydygros.

Level Fawr drainage adit (1785) longest level in mid-Wales communicates through Logaulas to Glog Fawr. Important for hydrogeology of area.

Pentir Pumlumon Tourism

A distinctive set of outcrop shafts & open-cuts, together with areas of ancient dressing floors, building remains, wheel-pits and leats. Tailings lagoons and complex systems of water management are evident. A site which forms an important component in the mining landscape of the Ystwyth Valley, with workings that pre-date the deep drainage afforded by the Level Fawr when it holed through in 1834. The mine has very visible geological features, both in the opencut workings at surface, and sub-surface in the Level Fawr itself. The mine is a classic location for fine crystals of Cerussite, some of which survive in the collection of the Natural History Museum. The site is to be included in the route of the proposed Miner's Way through N.E. Ceredigion and will form an important feature in the local Lisburne Mines Trail, with appropriate low-key interpretation.

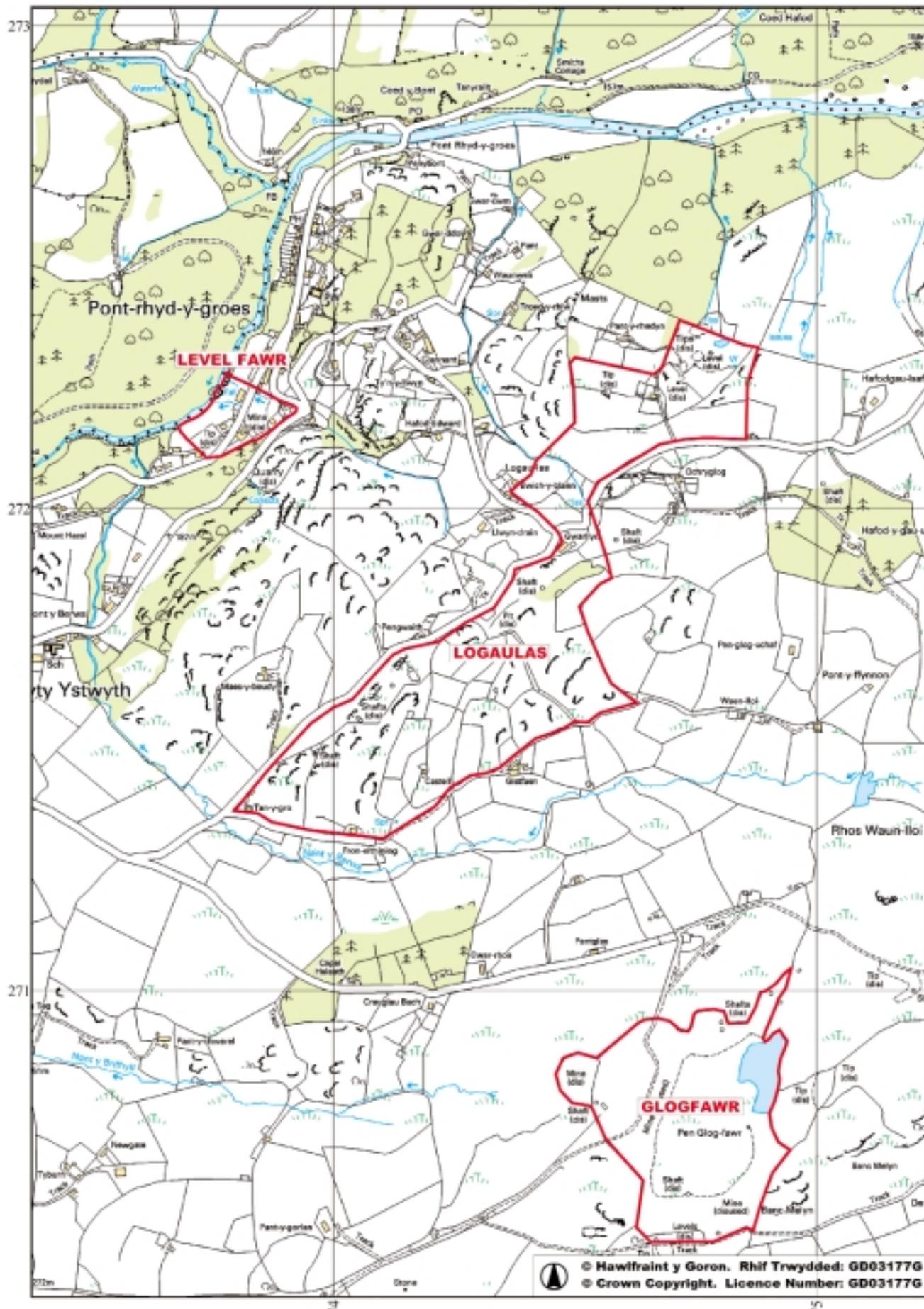
Welsh Mines Society

When Level Fawr cut the lode in 1823 it provided a convenient route for the discharge of water and the carriage of ore to the processing plant which eventually ceased in the late 1890s. There are very shallow workings here and great care must be exercised along the course of the lodes. The surface is in multiple ownership.

Welsh Development Agency

In 1978 the WDA ranked this site 20th, in addition it was also noted that the site was impacting the environment.

LOGAULAS



Approximate Scale - 1:10,000

27

27

MINE NAME: MINERA (Deep Day Level)

Archaeological

North Wales Caving Club

Have proposed clearing the obstruction in the Deep Day Level which is expected to return important archaeological features. Archaeological objectives include the surveying, photograph and report on all workings entered. As well as to catalogue all artefacts, and if appropriate recover items to the Minera visitor centre or Wrexham Museum.

Welsh Mines Society

Please refer to the response from the North Wales Caving Club.

Cadw

Archaeological interest is not known at this site but it requires further assessment, as there are Scheduled Ancient Monuments nearby at Minera Mine.

Clwyd-Powys Archaeological Trust

A detailed topographical survey is required with a full archaeological assessment before any remedial work is commenced.

Wrexham Museum

Nant Minera mine opens out into the river Clywedog just up from the Deep Day Level. It is the Deep Day Level that has the most overflow and is probably the cause of concern. This area is an historic landscape of metal mining extending back to the early medieval and possibly Roman periods. The extent of the workings is not completely known and requires further assessment. Any works affecting the sub-surface remains of this site would require a minimum of a watching brief to record evidence before its destruction. Prior to any works a desktop study would be required to determine the level of mitigation required. No works should be undertaken without full consultation with the Wrexham Archaeological Service.

Mineralogical

Countryside Council for Wales

The site is considered outside the area of geological interest.

Biological (Habitat / Species)

Wrexham Museum

The lesser horseshoe bat is known to roost in the tunnel/adit at Nant Mill, hence there are likely implications for other adits in the locality of this mine. Surrounding broadleaf woodland and semi-improved grassland (from Phase 1 Habitat Survey by CCW) is potentially a (non-statutory) wildlife site. The site requires further assessment for possible designation.

Countryside Council for Wales

The site, in view of its location, is likely to support species of amphibian, reptile and mammal protected under the provisions of the Wildlife and Countryside Act 1981 and in some cases the EC Habitats and Species Directive. This is substantiated with records that indicate the great crested newt, bats and badgers within 1km of this mine.

The site also potentially could support calaminarian grassland and habitat types as listed on the EC Habitat

and Species Directive. Further assessment would be required for this site.

Other

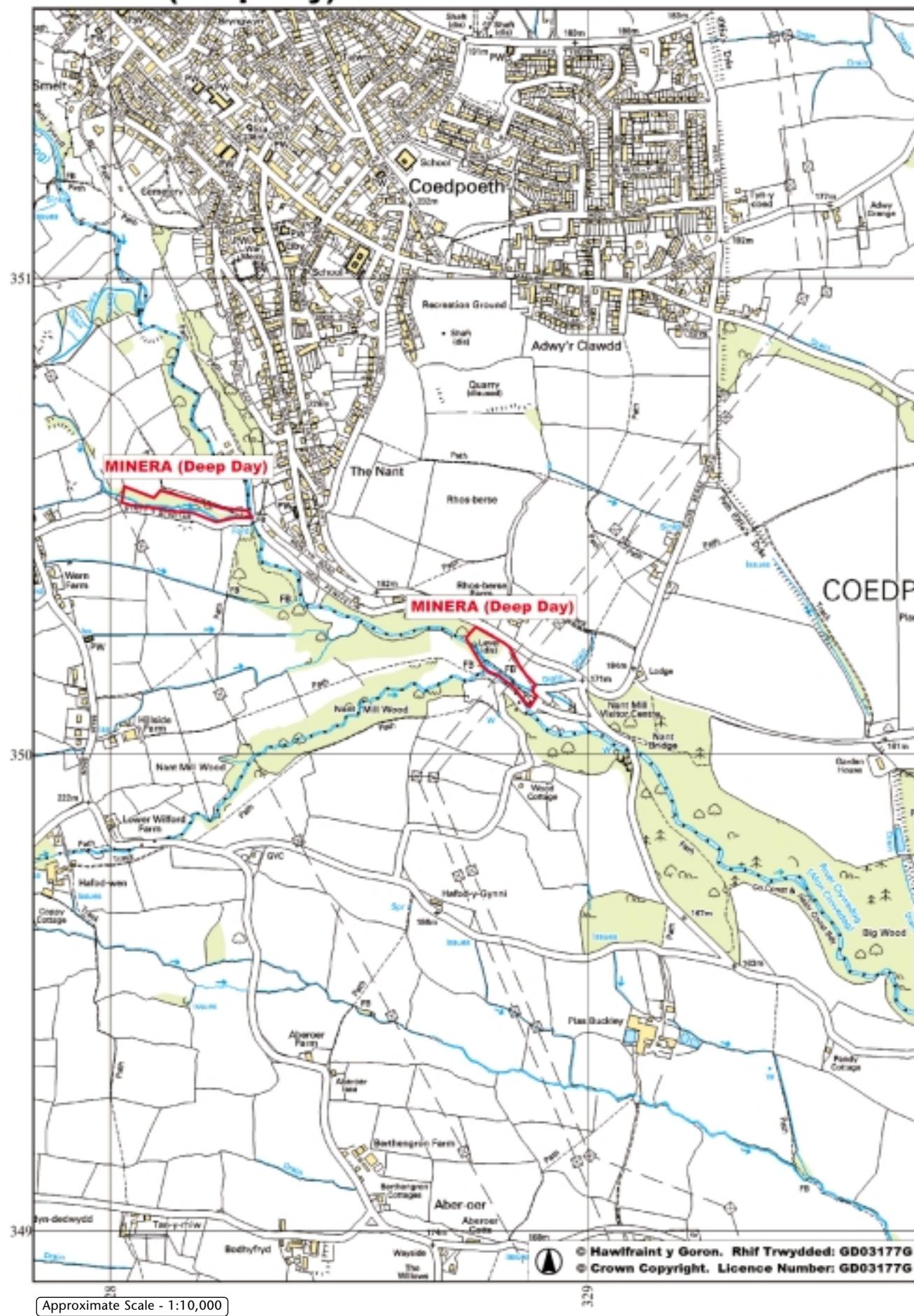
North Wales Caving Club

The high zinc water quality problems in the Clywedog can be attributed to the collapse of part of the Deep Day level. The result of this blockage was that the water has backed up behind the obstruction, flooding old workings before finding its way out onto the surface some 70 feet. This discharge now makes up 90% of the flow at the Stry y Scweir dingle above the Nant ford, which has been identified by the Environment Agency Wales as being the major source of zinc loadings to the river. The North Wales Caving Club has proposed restoration of the Deep Day Level which has many benefits, not least of which has the potential to significantly reduce the heavy metal loadings into the River Clywedog.

Welsh Development Agency

In 1978 the WDA ranked this site 7th, in addition it was also noted that the site was impacting the environment. This site has since been subject to land reclamation works with WDA grant aid.

MINERA (Deep Day)



Approximate Scale - 1:10,000

MINE NAME: MYNYDDGORDDU

Archaeological

Welsh Mines Society

The site is not proposed for scheduling but significant features including the structures and earthworks related to the application of water power, adit and shaft mounds, and dumps connected with ore preparation, will be found on this site. To the south of the stream are the earthworks for watercourses connected with the Penycefn (Court Grange) Mine.

Any remedial work is likely to disturb the features found on this mine and there is the potential for damage to sub-surface archaeological features. A detailed topographical survey and full archaeological assessment is required before work commences.

Cadw

Archaeological interest not known to Cadw, but site requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

Remains: wheel-pit, crusher house and reservoir plus Bronze Age landscape features.

Mineralogical

Countryside Council for Wales

The site is recommended as a Regionally Important Geological Site (RIGS). The spoil tips associated with the mine are of regional importance both for their primary and secondary mineralogy, the former including fine examples of the late (A2) mineral assemblages and the latter including the exceedingly rare nickel antimonate known as bottinoite.

The mineralogical interest at this site lies wholly within the spoil tips, much of which has been removed in recent years to make farm tracks and, most recently, the track leading up to a wind farm. Remedial works including spoil tip removal/capping and land reclamation schemes would further compromise the interest and are most undesirable.

Biological (Habitat / Species)

Countryside Council for Wales

The site is not proposed for SSSI, but is lichenologically important with areas requiring preservation.

Eight rare lichens -

Area 3: One lichen on spoil heaps

Area 5: Five lichens around the wheel-pit area

Area 6: Three lichens on the ore-bin

Area 7: Two lichens on the Ash trees

Other

Ceredigion Council

Access is via a farm track, not accessible to the public.

There is a tailings reservoir near the river plus slime pits.

Site is approximately 400m from the Troed-rhiw-seiri a llyn mynydd-gorddu SSSI site.

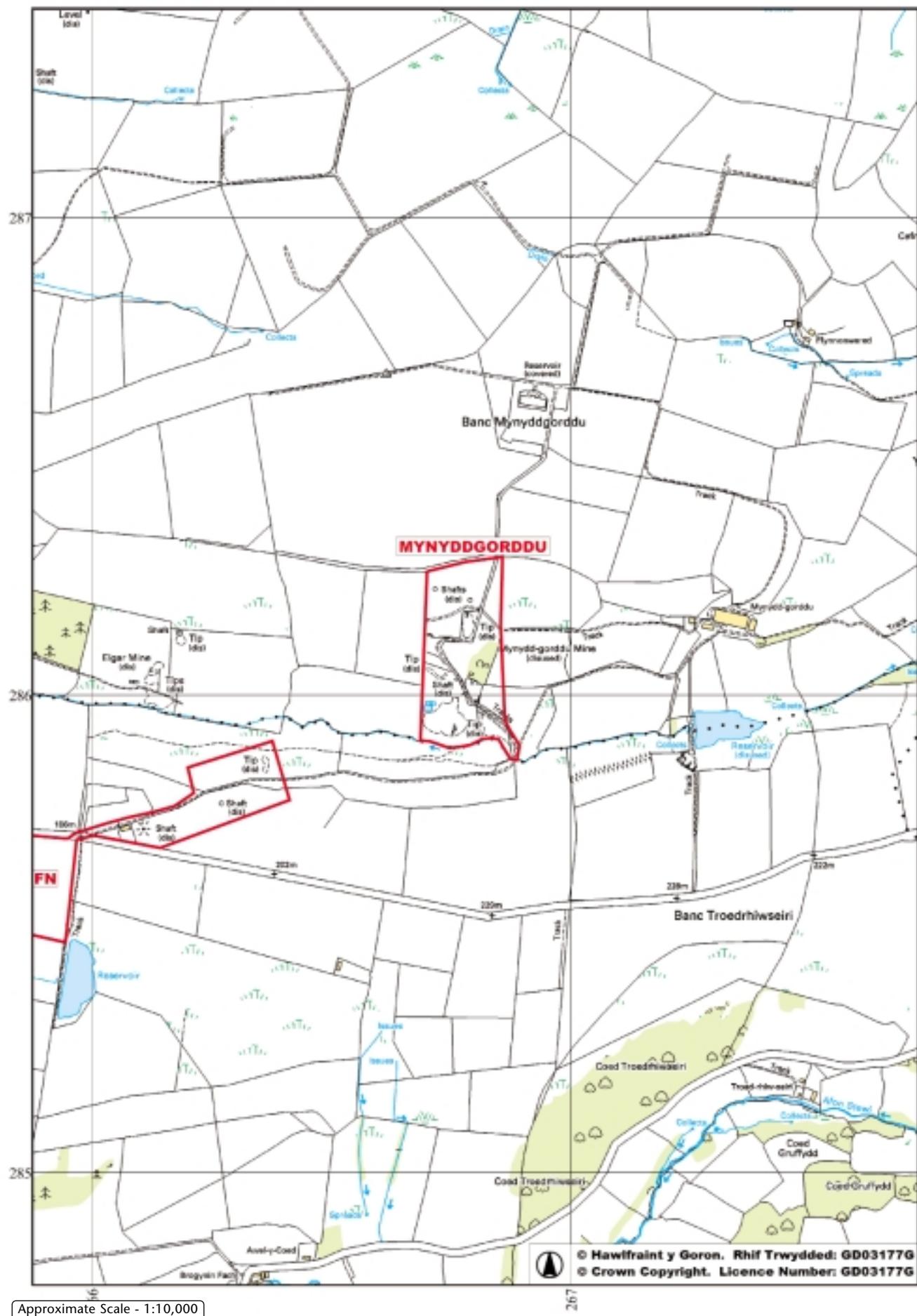
Welsh Mines Society

Has lain badly neglected and been used as a convenient source of cheap hardcore for many years; this, rather than remedial work, is the main threat to the site along with the usual problems associated with the dumping of domestic and agricultural refuse. The ownership of the minerals is unknown.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

MYNYDDGORDDU



MINE NAME: NANTYCREIAU

Archaeological

Welsh Mines Society

It is not proposed that the site be scheduled. Features related to the shafts adits and open-works, along with earth-works for a system of watercourses should be identifiable on this site. Much is now lost in the forestry but warrants further investigation as there will be features relating to early, i.e. 18th century and possibly earlier, working.

Much of the site is now lost in the forestry and the landscape value is consequently minimal. Nevertheless a detailed topographical survey is required with a full archaeological assessment before any remedial work is commenced.

Cadw

Archaeological interest not known to Cadw, but requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

Remains: ruinous wheel-pit and crusher house, trial pits, spoil tips, levels, quarry, dry-stone culvert and open-cut working.

Forest Enterprise

There are a number of structures and shafts, which require special management. FE have an agreement with the Welsh Archaeological Trusts and any works require their input and recommendations for management. An annual exchange of the SMR data is part of this agreement and each District holds GIS and database information and management plans for each feature.

Mineralogical

Countryside Council for Wales

This site is recommended as a Regionally Important Geological Site (RIGS). The remote site is of regional importance because it is one of the finest localities in the Central Wales Orefield for the study of late (A2) mineralisation. Primary mineralisation consists of sphalerite-galena-quartz (A2-a), sphalerite-calcite (A2-c), and pyrite-marcasite-quartz (A2-f).

The mineralogical interest lies in spoil tips located on either side of the Nant y Creiau. Some of the spoil has been used in the construction of local forest tracks. Removal/capping of the tips would severely compromise the mineralogical interest at this site.

Biological (Habitat / Species)

Countryside Council for Wales

The site is not proposed for SSSI, but is lichenologically important (10 rare lichens) with areas requiring preservation. There is also a rare species of moss and the site is a habitat for Peregrines and Crossbills (both Schedule 1 species).

Area 1: Five lichens on spoil tip above the stream on a west facing slope.

One lichen on a smaller mound of spoil on the west side of the stream.

One lichen on the outer west wall near the south-west corner of the large wheel-pit.

Area 2: At the north-east end of this area, a metre from the east bank of the stream, there are two lichens on a low wall constructed out of boulder spoil.

Area 3: Three species of Club Moss occur on the shaded, north-west facing side of the ravine.

Area 4: Two lichens on spoil (one of which may be an undescribed species).

Area 5: One lichen (nationally rare and new to Wales) around one of the fence posts at the east end.

Forest Enterprise

Standard works management plans need to be consulted before any remediation is proposed.

Other

Countryside Council for Wales

The site is owned by Forest Enterprise

Ceredigion Council

Although site is inaccessible to vehicles except by private forestry tracks, public rights of way pass near site, on routes to Llynedd Ieuan SSSI. Potential as part of upland bike trails.

Forest Enterprise

This site has several public footpaths and is well used in general by the public, especially by long distance walkers.

Much of the spoil and shafts lie within forested land and any works would involve clearance of trees, even if just for access. From a landscape and woodland point of view there would need to be in depth consultation with FE. Of course any alteration to current forest management plans will require a Forest Design Plan amendment for submitted via FE for approval by the Forestry Commission.

Should any remediation works be required and planned, full consultation with FE will be required at an early stage. This will also allow for early consultation with the local population.

Pentir Pumlumon Tourism

An extremely remote working located deep in the Myherin Forest (Forest Enterprise). The site contains numerous features of merit, including adit and day levels, shafts, together with wheel-pits, stone-lined culverts, and the washed-out remains of extensive dressing floors. The mine, located in an enclosed valley-head, is of great, if unknown, antiquity. The Roman Camp at Cae Gaer lies about 2.5 miles to the east, which may have some significance. The lode outcrop, in a water-worn ravine, would have been readily visible at an early period.

Sub-surface workings are accessible and show large and colourful deposits of Smithsonite (Calamine). A public footpath gives access to the site and could be developed as a local trail linking the Castell Mine with Devil's Bridge. Detailed archaeological survey work on this site is essential, together with the rationalisation of the stream bed, which has regularly flooded and washed out material from the dressing floors. The site has scope for low-key interpretation and for controlled sub-surface access for educational purposes, in co-operation with Forest Enterprise.

NANTYCREIAU cont

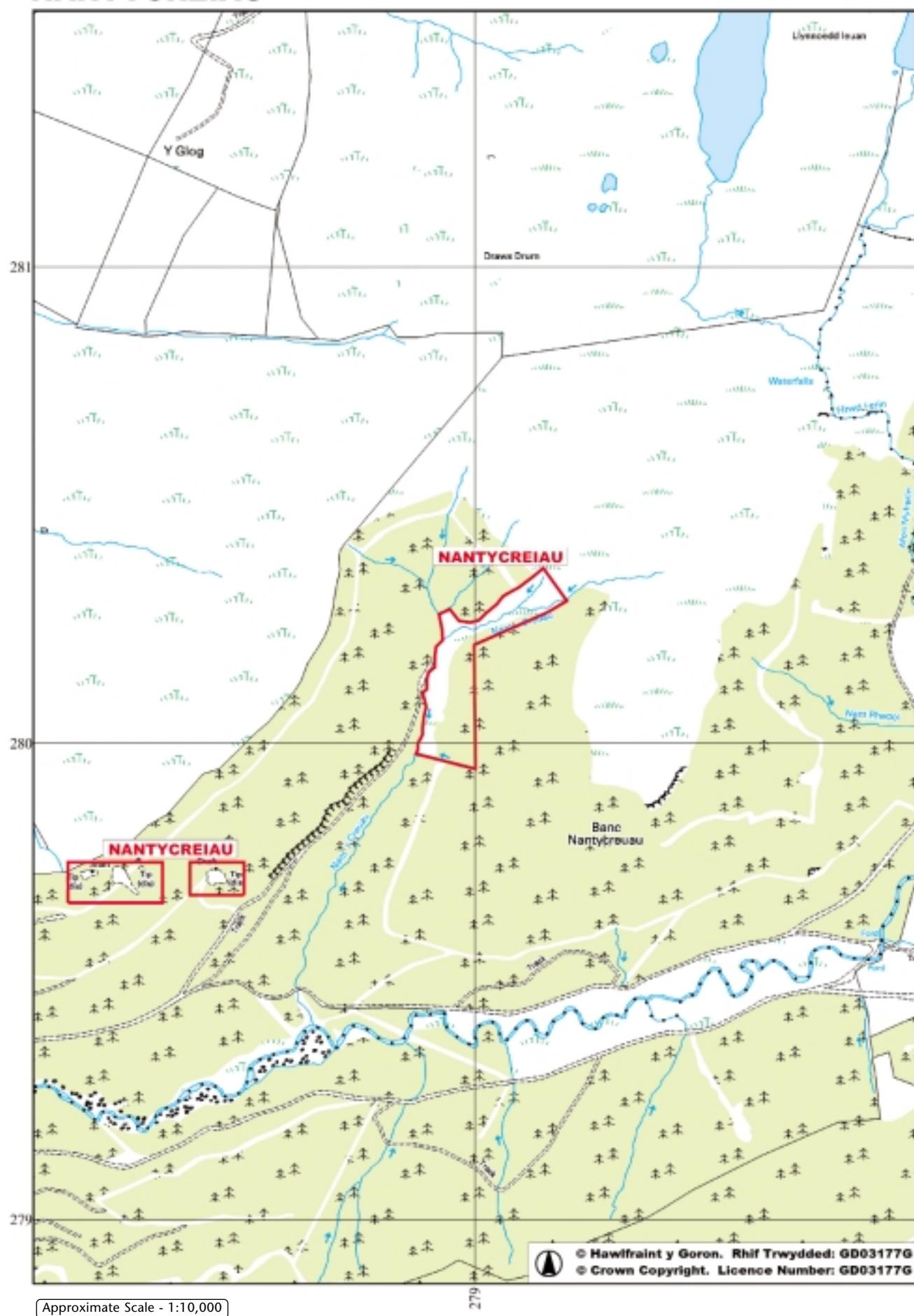
Welsh Mines Society

There has always been a problem with flash flooding in this ravine and even large features such as the wheelpit are now almost completely buried. The surface is owned by Forest Enterprise whilst the minerals are reserved to the Crown. This was a good mine but its development was impeded by its remote location; It is conceivable that further economic reserves exist at depth.

Welsh Development Agency

In 1978 the WDA ranked this site 50th, in addition it was also noted that the site was impacting the environment.

NANTYCREIAU



Approximate Scale - 1:10,000

MINE NAME: NANTYMWYN

Archaeological

Welsh Mines Society

The Angred Shaft, its Engine House, and the associated spoil heaps are a scheduled ancient monument (Cm 215)

There are considerable remains from many phases of activity including, so far undated, ancient remains along the outcrop of the main lode. They include the spoil dumps from a number of shafts and adits, the earthworks relating to watercourses and possible hushing channels, and structures / earthworks relating to ore preparation sites. In the upper, Pen Cerrig Mwyn, section of the site is the evidence for medieval working, including hammerstones and fire setting. Surviving structures on the site include the Angred Shaft Engine House and the extensive mountings for the Sulphide Corporation Mill of the 1930s.

Down stream from the Upper Boat Level are extensive dumps from the dressing floors. Earlier reclamation work has already revealed evidence for the upper dressing floors and a variety of ore preparation techniques. Further evidence could be found in the area downstream from the Upper Boat Level.

Much of the site has already been damaged by earlier reclamation work and the removal of material for hardcore. The site is nevertheless of significant landscape and archaeological value and any remedial work should take that into consideration. A detailed topographical survey and full archaeological assessment is required before any remedial work is undertaken.

Cadw

Scheduled Ancient Monument (Cm 215). Mid 19th century winching engine house with adjacent boiler house and chimney stack. In front of the building is the depression of the main mine pumping shaft with two associated conical tips of waste material. There are also the remains of a small reservoir and leats to the south-west of the boiler house, used for water supply to the boiler. Further features require assessment and may merit scheduling in the immediate vicinity.

Cambria Archaeology (Dyfed Archaeological Trust)

Remains include an engine house, chimney and 1920s Corporation Mill. Scheduled Ancient Monument (Cm 215).

Mineralogical

Countryside Council for Wales

This site is a proposed SSSI, and is the largest base metal mine in the southern part of the Welsh Caledonides. It is of national importance because it offers an excellent opportunity to compare the southern outlier of the Central Wales Orefield, with the main part of the orefield some distance to the north. The selected area of spoil tips is rich in sulphide mineralisation which has a multiphase paragenesis with elements resembling both the early and late (A1 & A2) phases of metallogenesis.

About 75 percent of the dumps were carted away long ago for hard core but the material remaining is considered to be of high mineralogical interest. Further removal/capping of the remaining spoil would severely compromise the

scientific value of the site. Installation of on site treatment plant is viewed as the most desirable option.

Biological (Habitat / Species)

Countryside Council for Wales

The site is proposed as a high priority for SSSI.

Sea Campion on the spoil and walls and alongside the stream in the south-west area of the mine.

Rare lichen on the side of an old stone platform in the SW end of the mine.

Green hairstreak butterfly was seen flying over the spoil just north of the Upper Boat Level and is considered a good habitat area.

Settling ponds are important habitat for dragonflies, damselflies, and are spawning grounds for the common frog and are visited by herons. The settling ponds are leased by

Dyfed Wildlife Trust as a nature reserve for species listed above.

Possible bat habitat - whilst no definite bat records exist for this site, the Clouston report (1988) identifies 'Rhandinnwyn' as supporting bats. Since no underground workings were identified at the mine site within the village of Rhandinnwyn (0.75km away), these records may, in fact, relate to Nantymwyn.

Other

Countryside Council for Wales

The site was surveyed in 1991 during a feasibility study for possible reclamation by Richards, Moorehead and Laing. Geological conservation value for the site was highlighted at this time.

Caravan park exists on site with public footpaths across south of the site and access by forest tracks. The site also has 'County Trust' conservation status. Ownership of the site is split between the Forestry Commission, Economic Forestry Group and Dyfed Wildlife Trust lease a small area (settling ponds)

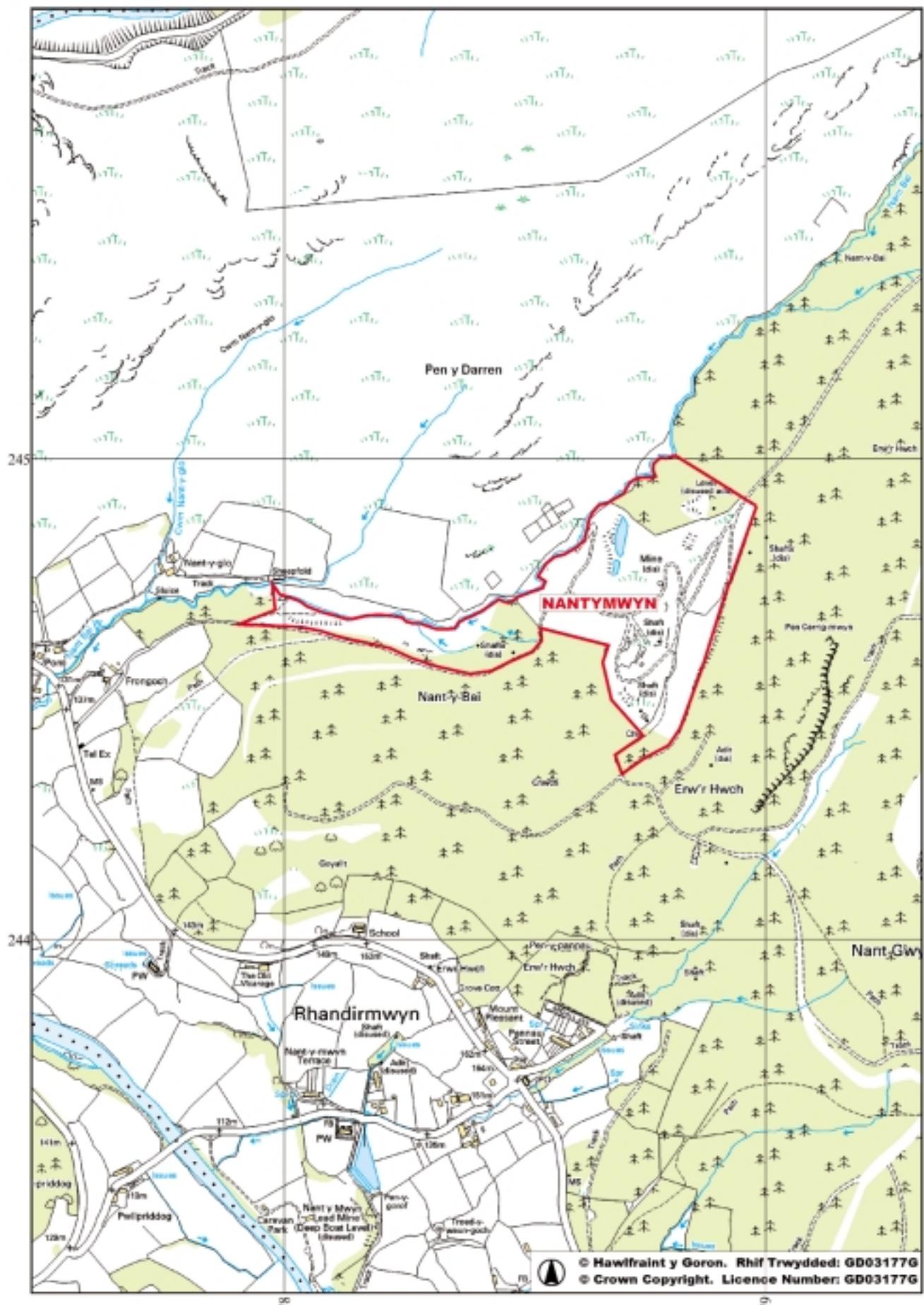
Welsh Mines Society

There appears to be a considerable head of water above the Lower Boat Level and until this is examined and rectified accordingly, no further development ought to be permitted around its portal. The mineral rights over the whole mine area are reserved to The Earl of Cawdor. Most of the surface is owned by The Economic Forestry Group but around Rhandirmwyn village the land is in multiple ownership.

Welsh Development Agency

In 1978 the WDA ranked this site 13th, in addition it was also noted that the site was impacting the environment.

NANTYMWYN



Approximate Scale - 1:10,000

278

279

MINE NAME: PARC

Archaeological

Snowdonia National Park Authority

Worked sporadically from 1855 to 1963, this 6 hectare site, with the exception of the spoil tipping tramways at SH 7870 6020 and the mining building at SH 7870 6020 which is likely to have originated during the earlier stage of the mines operation, has no other known or recorded archaeological remains.

Gwynedd Archaeological Trust

This mine site has been extensively remediated to solve water quality problems leaving very little archaeological evidence on the surface. There is a mine adit at SH 7874 6006, and two structures of uncertain significance at SH 7271 5986 and SH 7867 5982 respectively.

Welsh Mines Preservation Trust

The area immediately behind and above the adit portal is a large open stope, and located on a platform over the stope is an information panel, which outlines the local ecology and the geology. This was erected as part of a land reclamation scheme initiated by the Snowdonia National Park Planning Authority and Forest Enterprises (the landowner). The scheme was financed by the WDA. There is a large concrete dam in the adit (full height and width with piping through it) erected to regulate water surges from the mine workings.

Mineralogical

Countryside Council for Wales

The remaining in-situ exposures and spoil tips are of regional importance (RIGS) because they provide an example of vein mineralisation in the Lower Palaeozoic rocks of Snowdonia. Of particular interest is the crustiform-banded sulphide and carbonate minerals found on the spoil tips which clearly display the depositional sequence sphalerite-dolomite-galena-calcite. Any remedial works involving the infilling of open-cuts or removal/capping of spoil tips would severely compromise the interest.

Biological (Habitat / Species)

Snowdonia National Park Authority

Part of the area known as compartment 1 is currently being considered for inclusion in the Gwydyr Mines and Bats Sites pSAC. There is considerable scope for metallophyte plants such as the scarce Alpine penny-cress and the Broad-leaved helleborine both of which are found within compartments 1 and 2. Reworking of lead mine spoil and reclamation pose a particular threat to Alpine penny-cross which is typically a pioneer colonist of metalliferous mine wastes.

A bat survey in 1991 cites the main No.3 drainage adit as being a most important habitat for bats as it provides one of the few unobstructed accesses into the mine. The Lesser horseshoe bats are a primary feature of the the Gwydyr Mines and Bats Sites pSAC.

Countryside Council for Wales

Part of the site has been proposed as a possible SSSI and candidate SAC for both the Lesser horseshoe bat as well as for the rare bryophytes, lichens and vascular plants growing on the toxic mine spoil. Any disturbance of this

spoil would have a negative impact on this flora. The No.3 adit has been shown to be of importance for hibernating bats. Due to the special conservation status a field meeting is recommended in the near future to discuss any remediation plans.

Other

Snowdonia National Park Authority

The National Parks Authority (NPA) is the Mineral Planning Authority for the area, and also owns part of the site. The site was subject to a major reclamation scheme in the early 1970's. Further works were carried out underground in 1991 to prevent catastrophic flood events. The NPA have full details of works carried out. Any further planned remediation measures may require the NPA to be notified and planning permission. The NPA has prepared a management plan for the land in its ownership.

While the reclamation works have significant improved water quality, the receiving waters of the Nant Gwydyr are still exceeding acceptable levels set by EC Directives, however much of the source of this contamination is believed to be emanating from Nant Uchaf Mine immediately upstream.

Although no public rights of way cross the site itself, the Gwydyr Mines Trail skirts around the western site boundary. This trail can also be accessed via a strip of land acquired from the Park Authority by the Forest Enterprise. Public access is not encouraged onto large parts of the site due to the risk posed to public health and safety. However an internal footpath does provide access via the Forest Enterprise track to the No.3 adit via a wooden gate in the boundary fence.

Although there is currently no interpretation on the site itself, there is an interpretation panel at the Forest Enterprise Car Park immediately above, to the south of the site. An interpretation leaflet accompanies the Gwydyr Mines Trail and is available from the Betws y Coed Information Centre. The site is also continues to attract university research into the affects of reclamation.

Welsh Development Agency

In 1978 the WDA ranked this site 4th, in addition it was also noted that the site was impacting the environment. This site has since been subject to treatment with WDA grant aid.

PARC



MINE NAME: PARYS

Archaeological

Amlwch Industrial Heritage Trust

The Parys and Mona mines on Mynydd Parys constitute an industrial archaeological monument of international importance, the workings originating in the Bronze Age (ca. 3500y BP) and dominating world copper markets in the 1780s. Underground production ceased in the 1880s but a deep exploratory shaft has recently been sunk by Anglesey Mining pic with a view to future production should economic conditions permit. A survey of the industrial archaeology, (Gwynedd Archaeological Trust Report No.292, 1998) identified over 400 features of archaeological significance on Mynydd Parys.

Of these features the following six have so far been made Scheduled Ancient Monuments by Cadw:

The Great Open cast	(No. AN111D)
Windmill	(No. AN111A)
Pearl shaft engine house	(No. AN111 B)
Central precipitation pits	(No. AN111C)
Dyffryn Adda reverberatory furnace	(No. AN135 (Ang))
Mona Smelting site	(in process)

However, there are numerous other features (kilns, mine yards, powder houses, shaft heads, working floors, etc.), together with (currently) 2km of accessible underground workings, all of which are in urgent need of conservation and research. Further scheduling is anticipated as research identifies and prioritises specific features.

Moreover, as a whole, the mountain comprises one of the newly recognised 'Landscapes of Outstanding Historic Significance' in Wales. The whole area is under future consideration within the new 'European Route of Industrial Heritage' (ERIH) in the UK, and ultimately as a potential 'World Heritage Site'.

The prime consideration at Mynydd Parys is the conservation of this important historic mine site, and also the facilitation of research and tourism. The site is unusual in being large, and therefore complex, but relatively undisturbed; it therefore needs to be conserved as a total entity. To this end the Trust will be commissioning Conservation and Management plans. The Trust would therefore wish in general to avoid any modifications which would damage its structural integrity.

In particular, the several million tons of surface spoil are an intrinsic feature and an important component of the industrial mining history. The spoil essentially recording through its stratification, lithology and shaft association the historical development of the mines. If possible the spoil should remain undisturbed by any redistribution, capping, or attempts (unrealistic) at revegetation. Such an exclusion zone would cover most of the mountain, but the peripheral areas would be available for remediation.

Cadw

This is a mine of international importance. The site contains two areas of Scheduled Ancient Monument areas (AN111 and AN135), plus many listed buildings. See Amlwch Industrial Heritage Trust.

Gwynedd Archaeological Trust

A Gwynedd Archaeological Trust report carried out in 1997

identified a total of 466 archaeological sites associated with the mining at Parys Mountain. A number of these are scheduled. The mine and part of Amlwch also forms a landscape identified in the recent non-statutory (Cadw / ICOMOS / CCW) Register of Landscapes Of Outstanding Historical Interest in Wales. Any remediation of the waste spoil would adversely affect an archaeological resource of great value, containing mining techniques from the Bronze age to the 19th century.

Mineralogical

Amlwch Industrial Heritage Trust

These unique environmental features give rise to 5 geological SSSI.

The mountain already attracts large numbers of school and university students on account of its unique ore deposits, including anglesite ($PbSO_4$) and a range of other unusual sulphate minerals. It is the only UK example of a "volcanic associated massive sulphide" deposit ('VMS' - 'Kuroko' type) and displays associated features (slumped pyritic beds, hydrothermal silica, etc.) and structures, (nose of an isoclinal syncline).

Countryside Council for Wales

It has been recommended by the National Museums and Galleries of Wales consultant's that the SSSI designation be extended to encompass the majority of spoil. Parys mountain is undoubtedly one of the most famous mineralised sites in Wales.

The mineralisation is dominated by pyrite and occurs within lensoid ore bodies, and as slumped sulphides, stockworks and disseminations. The pyrite is associated dominantly with chalcopyrite, but blende, galena, minor lead-bismuth sulphosalts and tetradymite group minerals occur. As the most famous mineral deposit in Wales, with a form quite unique in Great Britain, Parys Mountain will remain the subject of much active research work.

The features of geological interest are located both in-situ exposures and in the spoil tips. Therefore remedial works involving the infilling of open-cuts or removal/capping of spoil tips would severely compromise the interest.

Biological (Habitat / Species)

Amlwch Industrial Heritage Trust

These unique environmental features give rise to 7 biological (lichen) SSSI and attract large numbers of school and university students as a result of its extreme acid environment. This is one of the most acidic naturally occurring environments recorded (pH as low as 2.1) with high levels of heavy metals, and has an associated specialised microflora (bacteria and algae) and metaltolerant lichen flora.

Countryside Council for Wales

Flora

Any disturbance to spoil in and around the SSSI's is potentially damaging to lichen interests. Rock exposures must be left uncovered and accessible in SSSI areas as lichens can be found covering any hard surfaces (e.g. rocks, masonry). There is also SSSI designated area covering old precipitation pits/settlement ponds (SH452897) now managed under a Tir Gofal agreement. There is no grazing allowed, with the intention to allow it to develop into a willow carr and reed swamp.

PARYS cont

Wading birds/water fowl currently uses the area. Hence any reduction in water supply would reduce suitability of habitat.

Fauna

Barn owl roost at SH 4380 9140 in a small building containing a reverberatory furnace (expected to soon be designated a SAM). Disturbance (heavy machinery noise or inappropriate lighting) could cause barn owl to desert, hence consultation required for and works in this area. Water vole and great crested newt habitats. No survey data is available for these species and a survey would be taken prior to any remediation work commencing.

CCW would require consultation regarding any proposals at this site.

Other

Amlwch Industrial Heritage Trust

The Amlwch Industrial Heritage Trust (AIHT) was established in 1996, specifically to conserve, research, and present to the public the industrial mining heritage of Mynydd Parys and the associated maritime heritage at Porth Amlwch. To this end grants of the order of £200k (from ERDF Obj.5b; WDA & Landfill Tax, etc.) have been gained so far and enabled the construction of Heritage Trails, car park, viewing platform, Information Centre, and production of leaflets. Further major grant applications have been submitted to further conserve the sites and develop research (e.g. a Field Study Centre at Dyffryn Adda on the northern flank of Mynydd Parys) and tourist facilities (e.g. at Porth Amlwch).

The Trust is incorporating pollution control into its management plans, whilst recognising that the extreme acidity and heavy metal pollution are a scientific asset in terms of teaching and research into AMD remediation. In fact the original copper precipitation process was itself a partial remediation process which the Trust would wish to re-introduce for research, production and tourism, and to supplement by a range of experimental and established modern wetland procedures. The silted up precipitation ponds at Dyffryn Adda are ideally suited to such a purpose, and the site could also host a Field Study Centre. We would therefore welcome drainage measures within such a framework. This aspect is developed below in the context of the possible dewatering Mynydd Parys.

Mynydd Parys is an important international scientific and heritage resource, and the Trust is developing extensive plans for the management of the mines and the historic landscape generally.

Anglesey Mining plc

Own much of the surface area and lease all of the mining rights at the site. This company has been active on the site since 1984, but its exploratory workings (which involve no discharges) are separate from the 'old' workings on the mountain, which remain mostly flooded.

Anglesey Council

The council is endeavouring to facilitate, with other members of the working group, remedial works to an underground dam in the joint level at Dyffryn Adda which is holding back water and flooding workings (above the

45 fathom level) in Pary/Mona mines. There is also potential to develop solutions to the treatment of acid mine drainage which will be of interest to public and scientific bodies.

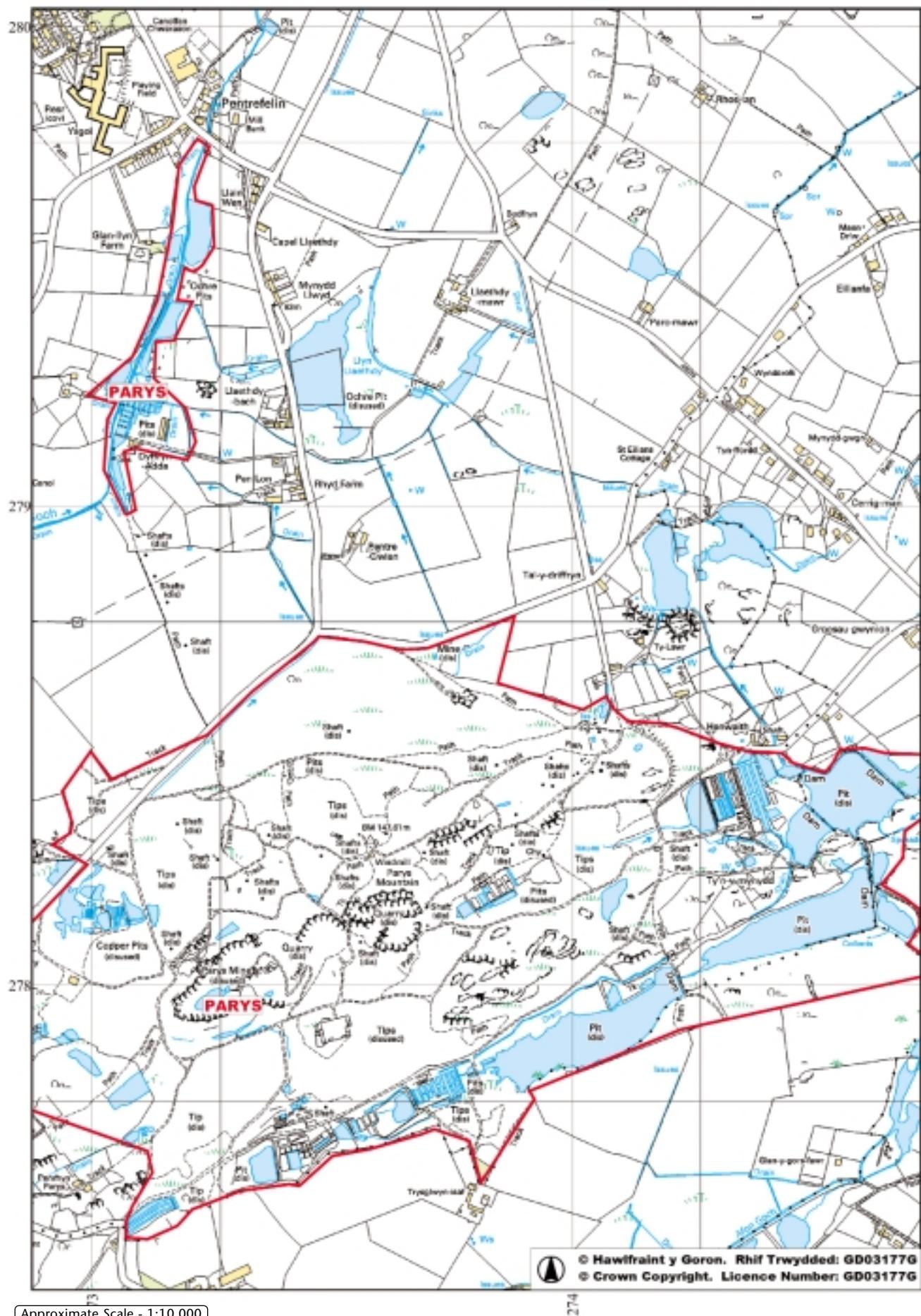
Crown Estates

The Crown (with Wardell Armstrong appointed as mineral agents) has ownership of gold and silver only. This is not a Mines Royal and to date there is no record of gold or silver revenues to the Crown Estate. Anglesey Mining plc has a lease from the Crown Estate in anticipation of gold and silver extraction and rental payments have been made in respect of the lease.

Welsh Development Agency

Special uses for this site include tourism and links to Amlwch Port. In 1978 the WDA ranked this site 2nd, in addition it was also noted that the site was impacting the environment.

PARYS



Approximate Scale - 1:10,000

MINE NAME: PENRHIW

Archaeological

Welsh Mines Society

Penrhiew is one of a group of ancient mines, worked through to the late 19th century, on the high ground north of the Rheidol - see also Bwlchgwyn and Llwyntifi. They were, at times, worked as one concern and the features evident on one sett cannot be viewed in isolation from those on adjoining setts.

Many features still survive which can be readily identified with Lewis Morris's sketches dating from the 1740s and illustrated in Dick and Davies, Lewis Morris and the Cardiganshire Mines, (Aberystwyth, 1994). Features found on the Penrhiew sett date from at least the early 18th century through to the late 19th century. A central feature of the sett was the masonry collar of the Penrhiew Engine Shaft, the crusher house and an adjoining waterwheel pit. The collar was destroyed in the redevelopment of the central part of the site as a woodworker's workshop, although the site of shaft is still evident. The walls of the crusher house and wheel pit appear to have been incorporated in the workshop building. Other features, which might be found during remedial work, include the earthworks related to watercourses, whim rounds, tramways and hand-tipped shaft mounds, along with the residues from ore dressing processes. The latter will include hand cobbed debris from 18th century operations plus the tailings from later 19th century ore processing. Sub-surface archaeological features are to be expected across the whole site.

All the features found on these setts, are distinctive elements in the landscape of this remote part of upland Ceredigion. As such they were prominent in the designation of upland Ceredigion as a 'Landscape of Outstanding Historic Interest'. Maintaining that landscape should be at the forefront of any plans for remedial action.

Remedial work will inevitably lead to the disturbance of archaeological features. A detailed topographical survey followed by a full archaeological assessment is essential before work is started. Despite the damage to the central part of the site it must still be considered in its landscape setting. Ill-considered remedial work could effectively ruin an element in the historic landscape of upland Ceredigion.

Cadw

Archaeological interest not known to Cadw, but the site requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)
Remains: shaft collar, wheel-pit, crusher house.

Mineralogical

No comments

Biological (Habitat / Species)

Countryside Council for Wales

The site contains two rare lichen (*Phaeophyscia varia* and *Placopsis 'lambii'*) on an area of metal-rich spoil by the stream. Most of the biological interest has been destroyed with the conversion of old mine buildings to a workshop/residence and surrounding land to garden.

Other

Welsh Mines Society

This site was prominent amongst those landscape features which led to 'upland Ceredigion' being designated as a 'Landscape of Outstanding Historic Interest' although it has now been destroyed by redevelopment. Despite the damage the possibility remains of promoting the area to visitors, providing a much needed boost to the local economy.

Is one of the Ystumtuen mines which drains into the No. 6 adit that discharges at Cwm Rheidol. There are particularly shallow workings at Penrhiew which continue to admit water from the river despite efforts to prevent this; unless attended to, there is a real risk that the whole of the River Tuen will run into the old mine, flushing the contents out of the No. 6 adit and into the River Rheidol. A six metre length of Armco culvert was stored at Bwlchgwyn, by the NRA, for such emergencies. Also, at two locations, the integrity of the road to withstand great loading could be considered questionable. The mineral rights are owned partly by the Nanteos Estate and partly by the Mineral Holdings Co. whilst the surface is in multiple ownership.

Ceredigion Council

A feasibility study into the capping of shafts and remediation of contaminated land has been carried out as part of a wider study into the Ystumtuen and Cwm Rheidol system. It is essential that all the system is addressed as one scheme as they are hydraulically linked with Cwm Rheidol, Ystumtuen and Bwlchgwyn/Llwyntifi mines.

Part of a group of upland metal mines in mining settlement of Ystumtuen with potential interest as features near footpath system. SSSI Bryn Bras to north of mine site.

Countryside Council for Wales

Several buildings have been restored and are now used as a workshop(?) and inhabited dwelling places.

Pentir Pumlumon Tourism

An important element in the upland mining landscape of north Ceredigion, and one of the Castell line-of-lode workings. Penrhiew has been the subject of large-scale and illegal removal of surface dump materials for hardcore. The demolition of the Engine Shaft/Bob Pit collar occurred some years ago, whilst the crusher-house survives incorporated into a rather incongruous carpentry workshop. The site contains an open-cut and stope through which a manway connected down into the main workings. This feature still survives and was last utilised in 1919. The site of the 19th and early 20th century workings effectively overlies those of earlier periods. To the south-west these early features, including primitive dressing floors and hand-tipped shaft mounds along the outcrop, become more common at surface or immediate sub-surface horizons. Stopes beneath the bed of the River Tuen have traditionally leaked water down into the mine, causing the conditions that washout and deposit ochre in the Cwmrheidol cross-cuts. Remedial work in recent times has partly resolved the problem but the Penrhiew engine shaft is no longer accessible for sub-surface engineering solutions.

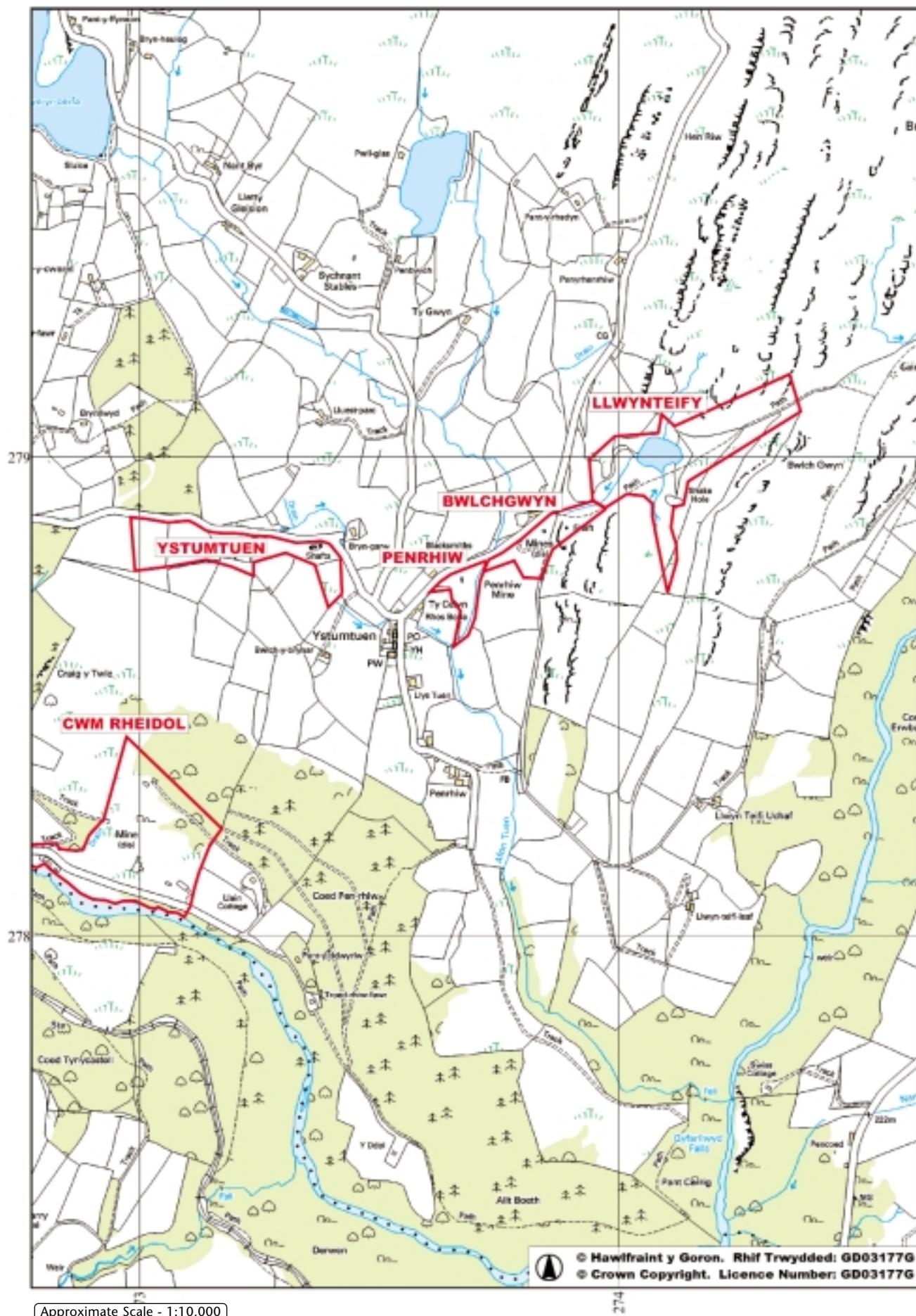
PENRHIW cont

The entire line-of-lode site from Cwmrheidol through to the Temple Mine requires a methodical archaeological investigation, with the recording and consolidation of appropriate features. Penrhiw is accessible to the public by road and footpath. The route of the proposed Miner's Way will pass through the site, giving ample opportunity for low-key interpretation.

Welsh Development Agency

In 1978 this site was not included in the WDA risk assessment.

PENRHIW



Approximate Scale - 1:10,000

MINE NAME: PENYCEFN

Archaeological

Welsh Mines Society

Penycefn, or Court Grange Mine, is an early site worked from at least the late 17th century. No significant structures remain on the site; most features survive only as earthworks. There is nevertheless considerable potential for sub-surface archaeological features across the site.

Any remedial work will inevitably disturb significant features on the site. A detailed topographical survey and full archaeological assessment is required before work commences.

Cadw

Archaeological interest not known to Cadw, but the site requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

Medium sized workings. All shafts filled. Remains: single building and a leat.

Mineralogical

No comments

Biological (Habitat / Species)

Countryside Council for Wales

There are no noteworthy habitats or species.

Other

Countryside Council for Wales

There is a B&B near the site, which provides easy access for the guests.

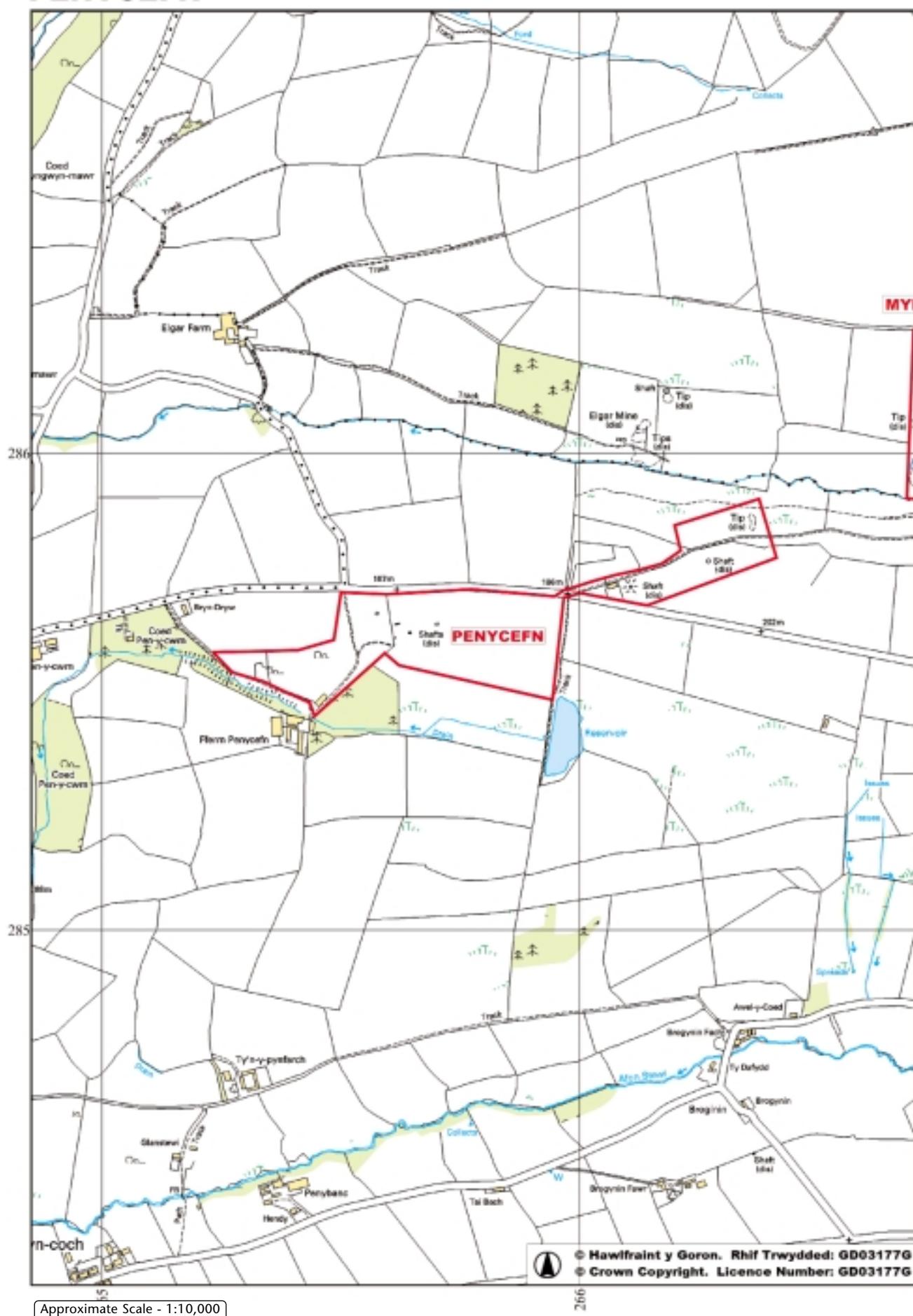
Ceredigion Council

No known rights of way. Water runs directly through fine tailings coming out of shaft, all shafts are filled. There is good potential for remediation.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

PENYCEFN



MINE NAME: POWELL'S

Archaeological

Welsh Mines Society

A number of features will be found on this site, including evidence for the application of both steam and water power and the earthworks of watercourses connected with the latter. Some structures have survived in domestic use and there are a number of shafts with associated dumps on the site.

The remains consist of a cluster of buildings located alongside the road, there is also the stump of a chimney. A large vertical engine shaft lies within the woods, near a powder house, and this is occasionally used for domestic dumping. Alongside the A44 road is a pump shaft, sunk on the underlie, which meets the drainage adit a few metres below the surface and ought to be monitored or strengthened before the road subsides. The former office and manager's house has been converted to an imposing residence whilst retaining its Victorian character. On the floor of the valley, across the road, is a substantial dump of jig tailings which are being washed into the Llywernog brook and require remedial work to stabilise or encapsulate them.

Any remedial work will disturb the features on site - a detailed topographical survey and full archaeological assessment is required before work commences.

Cadw

Archaeological interest not known to Cadw, but the site requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

Mine associated with nearby Llywernog. Remains: 3 shafts plus spoil heaps.

Mineralogical

No comments

Biological (Habitat / Species)

Countrywide Council for Wales

The site is not proposed for designation. The section of the site to the north of the road contains Stag's Horn Clubmoss (4 plants) and Crowberry plants. The section of the site to the south of the road is unknown. CCW recommend further survey is carried out prior to any remediation works.

Other

Countrywide Council for Wales

The mine site is bisected by the A44. The spoil to the north of the road has been levelled on the top and is now used for horse jumping. The site to the south side of the road has not been surveyed.

Ceredigion Council

Main workings to south of A44 are on private land and not visible. Group of mine buildings have been maintained for private use. Presume that contamination source is fine spoil to north of A44 on Afon Llywernog.

Pentir Pumlumon Tourism

A remarkably well-preserved set of mine workings, including a complex of buildings including mine workers housing, a wheel-pit, steam engine-house, base of square chimney stack, ore bins, and the walled collar of the pump shaft immediately alongside the A44. On the lode outcrop, further up the hillside, are an open-cut with two further shafts, one with a brickwork collar and bob pit. The site was last worked in conjunction with Llywernog Mine until the 1890's. Dressing floors are located on the north side of the trunk road, and a large area of fines and tailings is the main source of pollution in the River Llywernog. The Powells Adit discharged north of the A44, but its portal has been obscured. The mine was known for the acidity of its drainage water and wooden pump pipes were in use at one time to prevent corrosion. It is suggested that further attempts be made to gain access to the site for a thorough survey and that work should be undertaken to locate the buried adit portal. Sufficient space exists in the valley floor to create an effective reed-bed filtration system and the adit water can then be identified and contained prior to treatment. Tailings have for years been washing into the River Llywernog with the result that the flow is in a bed of fine mine waste for much of its course upstream of the Llywernog Mine site.

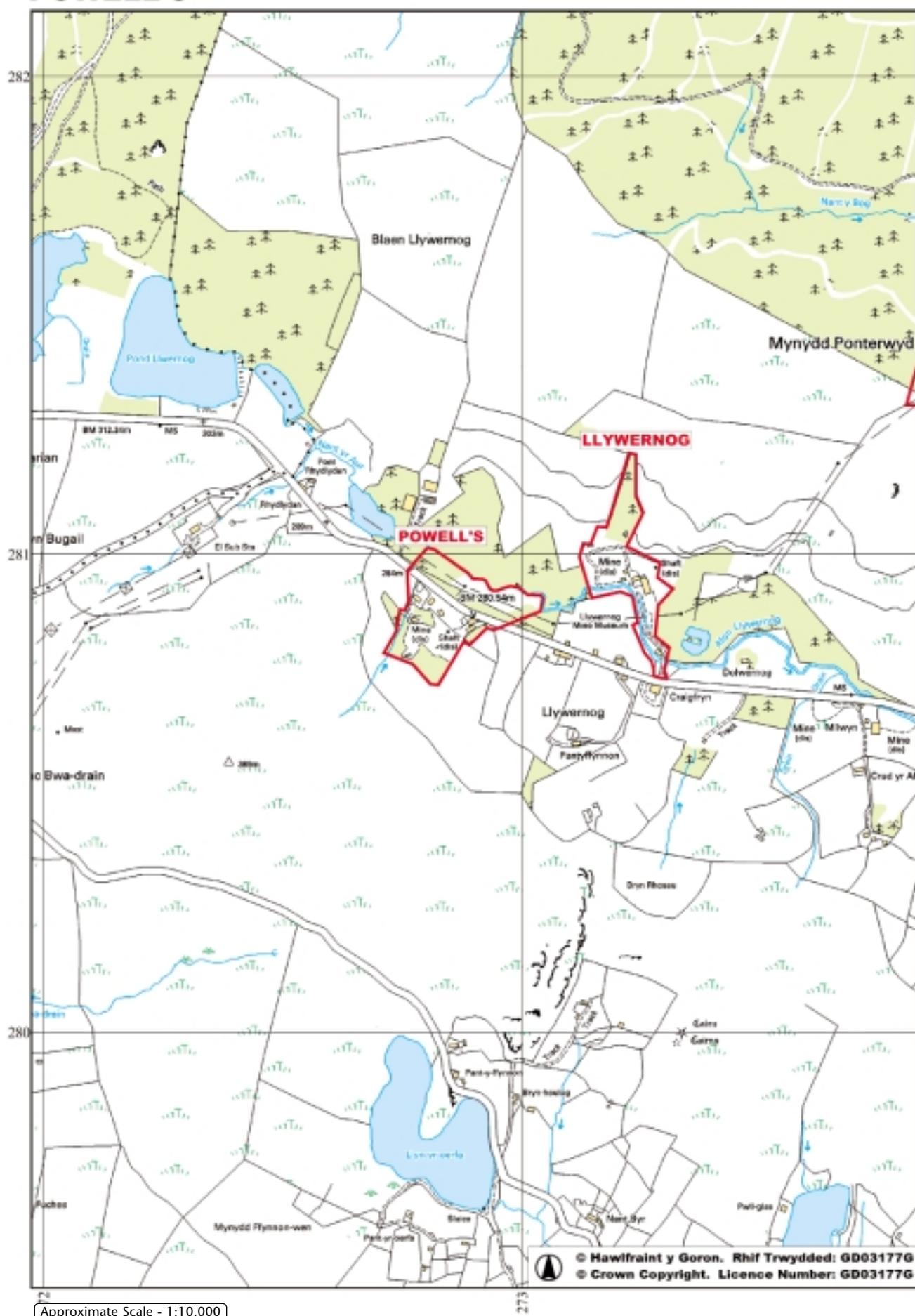
Welsh Mines Society

It is possible that the site could be usefully deployed as a trial plot and would form an interesting annexe to the Llywernog Museum. The ownership of the tailings dump is uncertain.

Welsh Development Agency

In 1978 the WDA ranked this site 47th, in addition it was also noted that the site was impacting the environment.

POWELL'S



Approximate Scale - 1:10,000

MINE NAME: RHEIDOL UNITED

Archaeological

Welsh Mines Society

There are a number of significant features on the Rheidol United site. The dressing floors on the valley bottom below the Gwaithgoch working have been reclaimed and grassed over but a number of structures related to ore preparation processes have survived. On the hillside above are the dumps from the various adits, and a number of related openworks and stopes.

To the south-east of the Gwaithgoch workings are two series of adits at Rhiwrugos and Allt Ddu (the Erwtomau and Allt Ddu mines). Associated with these adits are dressing floors and a small number of surviving structures.

Any remedial work could have a significant impact on the landscape and archaeological value of these sites. The dumps and structures associated with this mine are prominent features in the landscape with the upper elements of the mine being closely visible from the Vale of Rheidol Railway. As such they have a role to play in the interpretation of the area's history. Any remedial work must be carried out with this in mind. A detailed topographical survey and full archaeological assessment are required before work is carried out.

Cadw

Site is not known to Cadw, potentially archaeologically sensitive and therefore requires assessment. This is especially the case in Dyfed where the archaeological trust mine study has not so far been followed up with recommendations to Cadw for scheduling.

Cambria Archaeology (Dyfed Archaeological Trust)

This site encompasses a group of mines workings recorded as Gwaithgoch, Rhiwrugos (Erwtomau) and Allt Ddu. Part of the site is a SSSI / NNR and candidate SAC.

Mineralogical

No comments

Biological (Habitat / Species)

Countryside Council for Wales

The site is lichenologically important, and parts are within a SSSI/cSAC, with areas requiring preservation.

Area 3: Two rare lichens on the top walls of the collapsed and rubbish filled wheel pit.

Area 4: All five rare lichens exist in this area.

One dominates the spoil at the foot of the slope
One to the east of the fence running across the
spoil running half-way up the hill and was the first
mine at which this new species had been
recorded.

Two colonised on the railway rock cutting (with
one new to the British Isles - previously only
recorded in Italy).

One spread on to soil below.

Area 13: One species of a nationally rare bryophyte (moss)

Note: The Grayling Butterfly was recorded at this site but no information was recorded regarding its precise location.

Other

Countryside Council for Wales

There is a footpath across bottom section along the stream starting from the fish ladder and a steam railway track across top section of site.

Ceredigion Council

Valued as part of a group of mine workings, transport systems and mining settlements in Cwm Rheidol. There are plans to promote a cycle route through Cwm Rheidol from Pontarfynach, and Ystumtuen, and the valley is a destination for walkers as cyclists.

Group of workings on south side of Cwm Rheidol, site cut by Vale of Rheidol railway, with site of former dressing floors on south bank of Afon Rheidol, however, not certain what has been identified as source of contamination on this site.

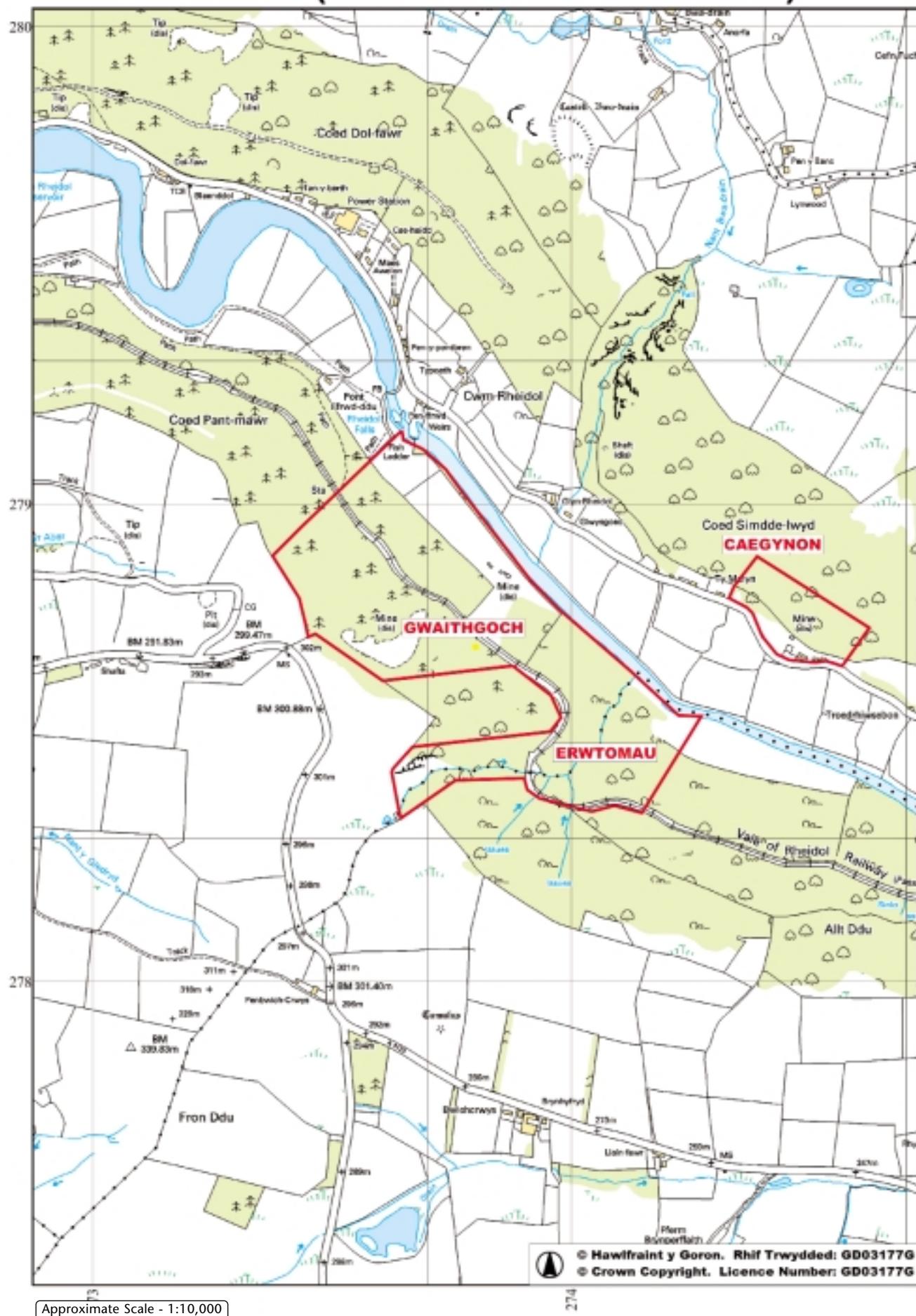
Pentir Pumlumon Tourism

A series of workings by Shaft and Adit in the afforested southern slope of the Rheidol valley. The extensive mine remains are bisected by the track of the Vale of Rheidol Railway, and various features of the mine can be viewed from the train. Workings date from the 18th to the 20th centuries, with the last venture at Erwtomau being supplied by the rail link until 1918. Prospecting was again being carried out in the 1930's in this section of the mine. The workings, largely enclosed by woodland, are typical of the mining landscape of the Rheidol Valley. Adit levels abound, and much of the development rock on the dumps has become weathered and covered by moss and lichen. The site should be the subject of archaeological survey and the consolidation of features as appropriate. Public access is straightforward via a network of footpaths and low-key interpretation is desirable. The route of the proposed Miner's Way through N.E. Ceredigion will pass along the floor of the valley, and the workings will be viewed as a landscape feature on the hillside, along with the narrow-gauge mineral railway. Sub-surface features are worthy of survey and controlled access to certain levels may be possible for both this and educational purposes, subject to the agreement of Forest Enterprise.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

RHEIDOL UNITED (GWAITHGOCH & ERWTOMAU)



MINE NAME: TEMPLE

Archaeological

Welsh Mines Society

The site is not currently proposed for scheduling, however there are significant structures and earthworks on this site primarily related to the application of water power. Also on site are entries to various underground features. Down stream from the pumping and winding wheel pit are the dressing floors with associated mountings and earthworks, evidence for the ore preparation processes used.

Temple mine, its waterwheel pit and associated leat, are in a dramatic setting. Any remedial work could damage the landscape and archaeological value of the site. Careful consideration of the issues is required before remedial work is carried out and the basic requirements of a topographical survey and archaeological assessment need to be carried out.

Cadw

Archaeological interest not known to Cadw, but the site requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

The mine is part of the Llwyntefi sett. Remains: derelict buildings, wheel-pit, crusher house, ore slides, buddles, tramway, dressing floor, leats. The most impressive remains are the wheel-pit and dressing floor.

Mineralogical

No comments

Biological (Habitat / Species)

Countryside Council for Wales

The site is a SSSI / SAC which is lichenologically important with areas requiring preservation.

Nine rare lichens as follows.

Area 1: Three lichen in the wheel-pit 'B'.

Two lichen on a wet rock face beside the footpath above the crusher house.

Area 2: One lichen in wheel-pit 'C'.

Four lichens on spoil near 'D'.

It is also an important bryophyte site, because of the woodland surrounding the northern part of the site.

Choughs are suspected at around SN 7470 7930, but no nesting site has been located.

Other

Welsh Mines Society

There are no plans to promote the site, but it is well placed for low level interpretation. This impressive site is in spectacular location in the Rheidol gorge with access only being possible by foot. Poor access has left the mine buildings in a wonderful state of preservation and any problems ought to be dealt with by good management rather than by a reclamation scheme. The old leat is a superb feat of engineering which follows the river Rheidol for several hundred metres upstream, into an otherwise inaccessible gorge, and is worthy of conservation. The Middle Adit, alongside the footpath by the wheelpit, was eventually driven under the neighbouring Llwyntefi mine

and appears to drain the eastern part of it. Also; It ought to be noted that a disruption of the discharge from Bwlchgwyn and Penrhiew through the Cwm Rheidol Number 6 adit may well come to surface through this adit and create significant pollution of the Rheidol. This mine was originally part of the long defunct Penglaise Estate and it is believed that the site is owned without reservation of the minerals to a third party.

Countryside Council for Wales

There is a footpath through the site (but it is not a right of way). The site is close to Parson's Bridge which is used regularly by bikers.

Ceredigion Council

One of the most spectacularly sited mines in Wales with stone structures bordering gorge of Afon Rheidol in a narrow wooded valley. Links to west by footpath with group of mines in the Ystumtuen area, and to east with church and standing stones at Ysbyty Cynfyn. No public right of way across site but near river crossing on Parson's Bridge.

Structures include walls of dressing mill with bumble circles and large 40' wheelpit. No spoil remains on site and so presume source of contamination is from mine drainage. Due to landscape sensitivity of site would suggest minimal intervention and great care with design of any scheme.

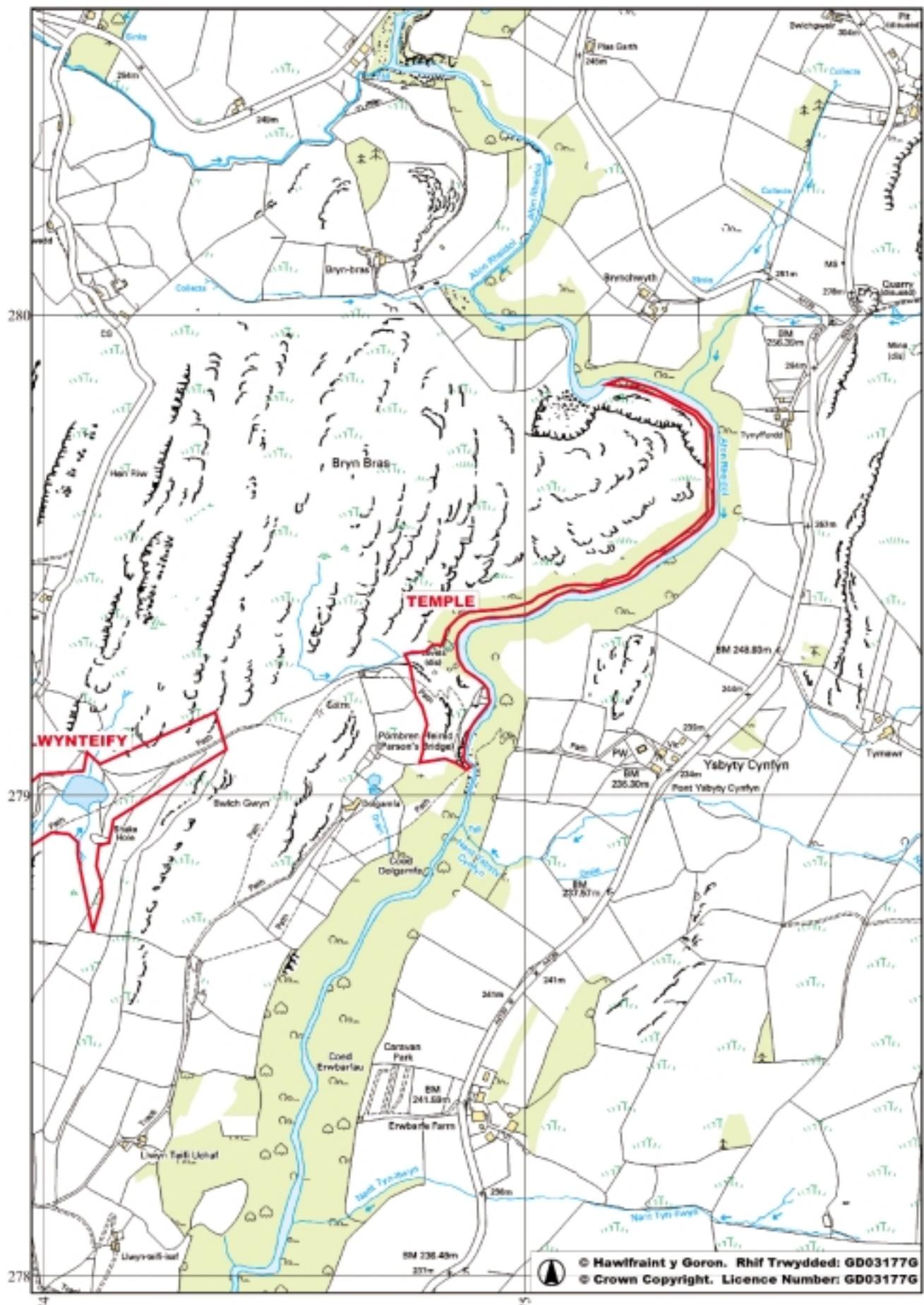
Pentir Pumlumon Tourism

Located in the Rheidol gorge, these workings clearly illustrate the ingenuity of mining engineers in Victorian times. Significant masonry features continue to exist, including two wheelpits, ore slides, bumble circles, the line of a conventional tramway and that of the incline by which the mine was kept supplied. The plant was necessarily unconventional owing to the geographical constraints of the location, and the site demands careful consolidation and interpretation. Sub-surface, the workings contain interesting features including an underground pump shaft & balance bob, together with a riveted compressed air receiver. At the top of the steep hill-slope are the ruins of the smithy, office, and winch housing for the incline, linked by cart track to Ystumtuen. This is an important site, which should be maintained at the highest possible level of conservation by its owners, the CCW. Parson's Bridge lies on the route of the proposed Miner's Way through N.E. Ceredigion, and a permissive footpath is being developed to link with the Temple Mine site. Comprehensive interpretation of the features is highly desirable. A cross-cut north from No.2 Adit cut the Castell Lode and anecdotal evidence would suggest a link with Llwyntefi, the possible source of the pollution in the Temple Deep Adit. Controlled access for educational purposes should be maintained as part of the CCW management strategy.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

TEMPLE



Approximate Scale - 1:10,000

MINE NAME: TY'N-Y-FRON

Archaeological

Welsh Mines Society

Given the short time scale, the time of year, and the inaccessible nature of this site, it was not possible to assess the surviving evidence on the mine. However it is expected that a significant number of features, including structures and earthworks, survive on the mine. C14 (radiocarbon) dating of material from this mine suggests working in the Bronze Age.

Although hidden in woodland, this site will have significant landscape value and is an essential element in any interpretation of the history of the Rheidol valley. Remedial work would inevitably impact on that and the archaeological value of the site. A detailed topographical survey and archaeological assessment is required before any work commences.

Cadw

Archaeological interest not known to Cadw, but the site requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

Ore came from Ty'n-y-fron levels by tramway. Remains: mine shaft and spoil heaps.

Mineralogical

No comments

Biological (Habitat / Species)

Countryside Council for Wales

The site is not proposed for designation but it does contain three rare lichens which require preservation:

Area 1: on spoil heaps.

Area 5: on a stream soil bank and on the rock face beside the waterfall.

Other

Ceredigion Council

Landscape feature and value as part of a group of mine workings, transport systems and mining settlements in Cwm Rheidol. There are plans to promote a cycle route through Cwm Rheidol from Pontarfynach, and Ystumtuen, and the valley is a destination for walkers and cyclists.

Adjacent to Coedydd a Cheunant Rheidol SSSI and SAC.

Pentir Pumlumon Tourism

The most western working on the Castell line-of-lode mines, developed very largely as an adjunct to the neighbouring Rheidol Mine, and linked to it by a horse-worked tramway. Most of the features, including the substantial, flooded, ochre-filled adit, the open-cut and shaft, date from the 1900's. Sub-surface stopes show deposits of massive Pyrite/Marcasite remaining in pillars, with 'flowers' of Sulphur covering most exposed surfaces. The strong smell of sulphur associated with these workings is more reminiscent of a volcanic region, and something of a geological curiosity in Ceredigion. A public footpath from Cwmrheidol to Bwadrain passes the mine, and some low-key interpretation might be of interest in the larger context of the proposed RIGS designation.

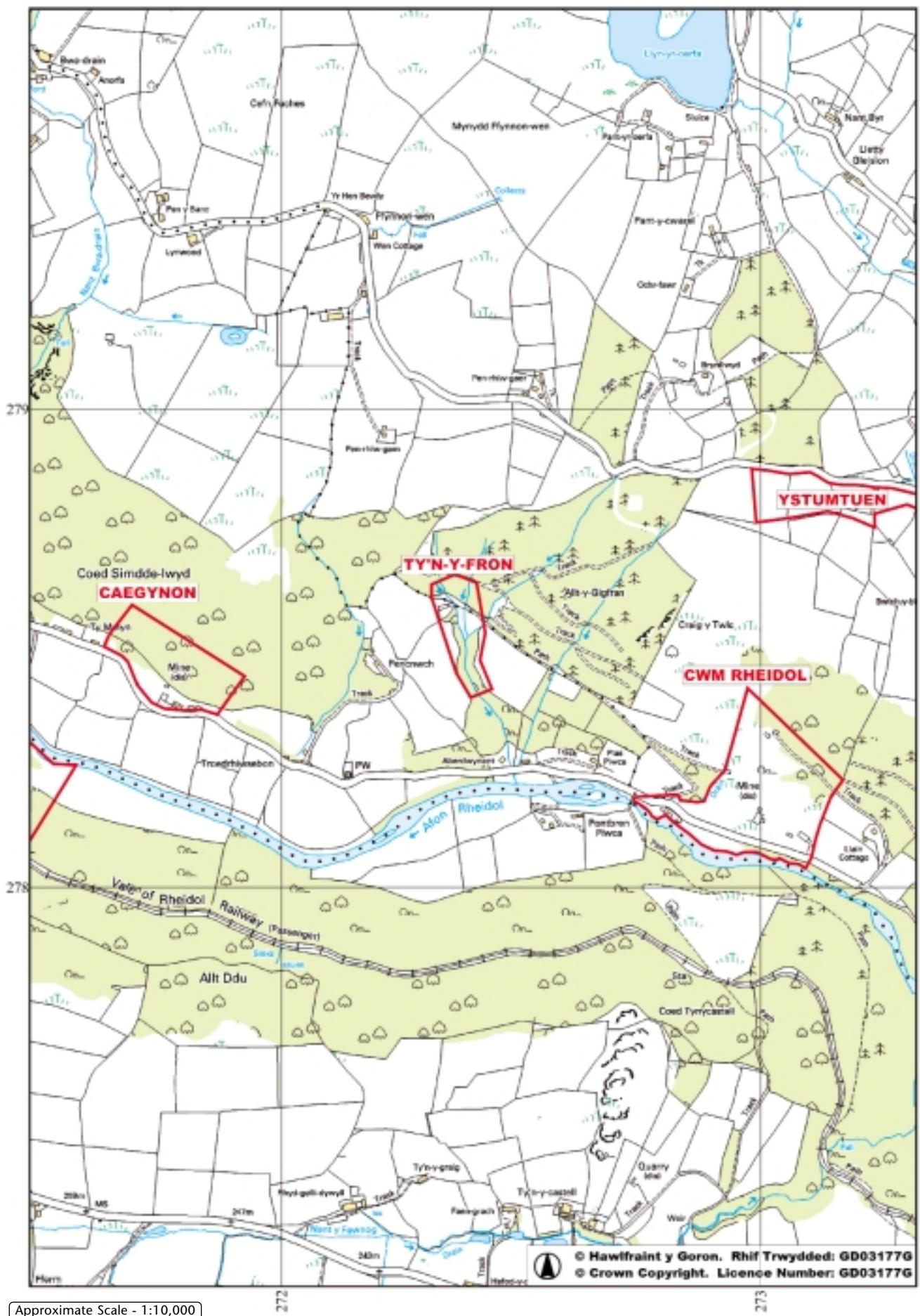
Welsh Mines Society

Was worked as a western annexe to the Cwmrheidol mine prior to 1914 but also displays signs of ancient mining. The tramway to Cwmrheidol is an interesting modern feature whilst the cavernous open stope intersects ancient galleries and shallow workings. The workings are not extensive and do not connect with any other workings. A particularly fine lode exposure exists in the shallow adit where successive phases of mineralisation can be seen in situ. The same type of acid ochreous discharge problems as occur at Cwmrheidol exist here, but on a lesser scale, on account of both mines working the same lode. The site ownership is complex with the minerals and surface in multiple ownership. Some remedial works have already taken place to prevent the stream from running into the open workings which then washed ochreous deposits out of the deep adit and into the river Rheidol.

Welsh Development Agency

In 1978 this site was perceived as not doing significant environmental harm, therefore not ranked by WDA.

TY'N-Y-FRON



Approximate Scale - 1:10,000

MINE NAME: WEMYSS

Archaeological

Welsh Mines Society

This site cannot be viewed in isolation from the adjoining site, Frongoch. The surface features include many related to the operations at Frongoch, including the ore preparation plant erected in 1898, which was connected to Frongoch by an inclined tramway, the bed of which is still in evidence, and the site of the pumping waterwheel (now covered over). The earthworks associated with the workings on the Wemyss sett extend from the boundary with Frongoch westwards to the Nant Cwmnewyddion. Crossing the site are the earthworks for a number of watercourses, some connected with the 'powerhouse' and the associated reservoir at the western extremity of the site.

The Wemyss site has considerable landscape and archaeological value. Any remedial work should take that into consideration. Remedial work is likely to uncover a number of features, some of which, e.g. the pumping waterwheel pit, have only recently been covered over. A detailed topographical survey and full archaeological assessment is required before work commences.

Cadw

A historically important mine, with substantial remains which should be assessed for scheduling.

Cambria Archaeology (Dyfed Archaeological Trust)

The mine was worked in conjunction with Frongoch. Remains: foundations of massive mill building/dressing floor, wheel-pit and sections of leat.

Mineralogical

No comments

Biological (Habitat / Species)

Countryside Council for Wales

This site is lichenologically important with areas requiring preservation. The site contains six rare lichen plus Sea Campion plants.

Area 1: Two lichens on flat areas of spoil beside the road. Area north-east of the road: Sea Campion - alongside the road and particularly below the remains of the crushing mill. Four lichens - on the old dressing mill buildings

Other

Welsh Mines Society

There are no plans to promote this site, but interpretation should be considered in conjunction with Frongoch.

There is an obvious environmental problem in having a large pile of jig tailings dumped alongside a stream, this was once piped but eventually failed due to lack of main-tainance.

Ceredigion Council

Part of a group of mines important for their landscape value in Pontrhydygroes-Cwmnewydion area.

Foundations and floors of late 19th century dressing mill, part of a group of significant mining remains in this area. Linked for most of working history to Frongoch.

Plans have been considered for the removal to Frongoch of the large dressing spoil heap below the mill site, at an estimated cost of £2M including encapsulation at Frongoch.

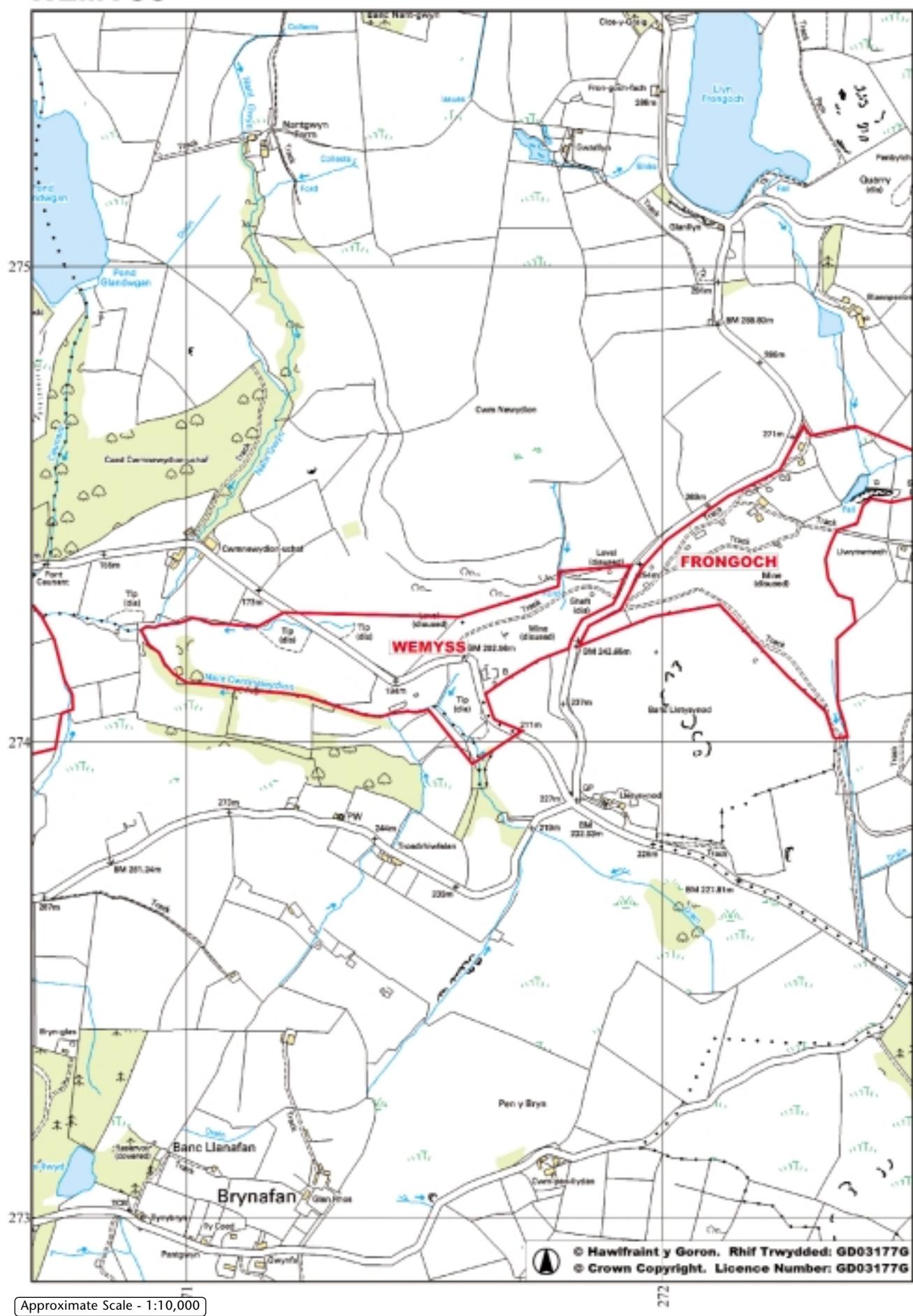
Pentir Pumlumon Tourism

A major mine site with many surviving features, including shaft collars, adit portals, leats, wheel-pits, powder houses, open-cuts and the tiered remains of the massive dressing mill, constructed in the 1900's, to treat ore from Frongoch. The main adit to Frongoch passes sub-surface through part of this sett. Wemyss Mine is capable of being developed into an important heritage resource within the mining landscape of Ceredigion. Ore dressing techniques of many periods can be identified here, and the site is clearly visible from public roads. Wemyss is on the proposed route of the Miner's Way through N.E. Ceredigion and will form a powerful component of the more localised Lisburne Mines Trail. Recent earthmoving works has resulted in some features being degraded. The Wemyss Mine site should be acquired by some agency, consolidated and interpreted for the long-term benefit of the community. In terms of pollution control, the large-volume discharge from the Frongoch Adit could be greatly reduced by effectively creating lined culverts or ditches on the site of the main Frongoch site, and diverting this water south-eastwards, via New Row, to the Ystwyth.

Welsh Development Agency

In 1978 the WDA ranked this site 8th, in addition it was also noted that the site was impacting the environment.

WEMYSS



MINE NAME: YSTUMTUEN

Archaeological

Welsh Mines Society

Many features still survive which can be readily identified with Lewis Morris's sketches dating from the 1740s and illustrated in Dick and Davies, Lewis Morris and the Cardiganshire Mines, (Aberystwyth, 1994). While no structures survive on this site there are a range of earthworks and other features related to the shallow working of this mine, some dating early, pre 18th century, activity.

This mine is an integral part of the historic mining landscape of the area. The surface features are also entirely pre-19th century, as the working of the mine from the middle of the 19th century was effected from Aldersons Level on the Cwm Rheidol site. Any remedial work has the potential to damage this early mining landscape. Some intervention on the site has already been carried out to divert surface water away from the workings. If it is intended to re-enter the area of early workings to carry out further work to divert surface water, a detailed topographical survey and full archaeological assessment would be required before work commences.

Cadw

Archaeological interest not known to Cadw, but the site requires assessment.

Cambria Archaeology (Dyfed Archaeological Trust)

Mine worked in conjunction with Penrhiw, Bwlchgwyn and Llwyntefi. Remains: 1746 whim shaft and 1705 cross cut adit.

Mineralogical

Countryside Council for Wales

The site is being proposed as a Regionally Important Geological Site (RIGS). It is viewed as a unique site in the context of the recent review carried out by the NMGW on behalf of CCW. The Castell Lode at this mine contained much late marcasite, which contaminated the lead ore. The fine-grained yellow spoil tips at the western end of the site are of rotted marcasite, which reveals much fresh galena upon washing away the sulphurous clay and quartz gangue. This is a fine example of the effect that primary mineralogy and its weathering characteristics may have on mining and the environment.

The mineralogical interest at the site lies wholly in the spoil tips. Removal/capping of the tips would destroy the interest. A preferred option would be the construction of an on-site treatment plant.

Biological (Habitat / Species)

Countryside Council for Wales

This site is lichenologically important with areas requiring preservation. In the Open-cuts (E) within Area C, there are five rare lichens on the sheer rock faces of the open-cuts.

It was noted in June 1992, that until a few years previously, Choughs nested in the shaft at SN738789, but the nest support collapsed and the pair do not seem to have returned to the locality.

Other

Countryside Council for Wales

Water pollution drains to Cwm Rheidol Adit No. 6. RIGS adoption could be incorporated into a mining itinerary taking in Bwlchgwyn, Llynteify and the Cwm Rheidol adits.

Ceredigion Council

A feasibility study into the capping of shafts and remediation of contaminated land has been carried out as part of a wider study into the Ystumtuen and Cwm Rheidol system. It is essential that all the system is addressed as one scheme as they are hydraulically linked with Cwm Rheidol, Ystumtuen and Bwlchgwyn/Llwyntefi mines.

Part of a group of upland metal mines in mining settlement of Ystumtuen with potential interest as features near footpath system.

Pentir Pumlumon Tourism

A classic ingredient of the Ceredigion mining landscape, and one of the Castell line-of-lode mines. Ancient and generally undisturbed workings lie in this area towards the edge of the Rheidol Valley. Deep sub-surface the two adits drain water to Cwmrheidal, and allow access into these 18th century workings, largely clogged with ochre deposits. Great scope for careful archaeological investigation of the features which include open-cuts and hand-tipped shaft mounds. The designation of this area, in conjunction with the line-of-lode workings to Llwyntefi, as a RIGS site, should also be backed up with the interpretation of the heritage features. Ystumtuen, as a community, could benefit greatly from a co-ordinated cultural heritage product, which might also justify the reopening of the former YHA Youth Hostel as a mines-related field-study centre.

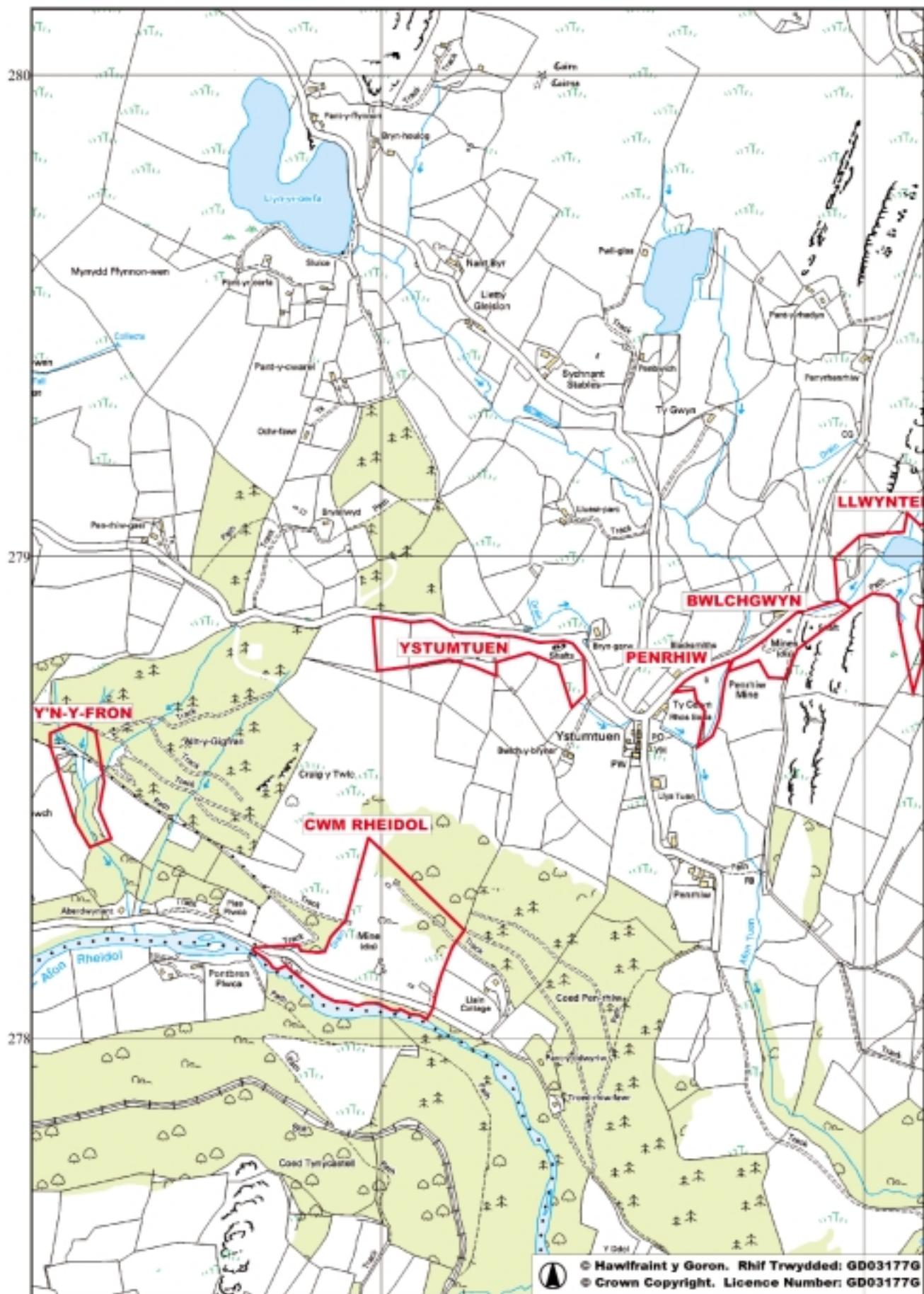
Welsh Mines Society

Some of the earthworks on this site appear to be remnants of piles of ore, left to weather to liberate the galena from the marcasite which encrusted it, these are historically important remains and ought not to be interfered with. The remedial works have succeeded in diverting much of the water which was entering the mine and draining out through the No. 6 adit at Cwm Rheidol. It is thought unlikely that further work will be necessary on the old mine except possibly at the western end where there are two old shafts sunk on the course of the lode but in boggy ground. The minerals were formerly a possession of the Nanteos Estate but were purchased by the Mineral Holdings Corporation in the mid 1930's.

Welsh Development Agency

In 1978 the WDA ranked this site 15th, in addition it was also noted that the site was impacting the environment.

YSTUMTUEN



Approximate Scale - 1:10,000