

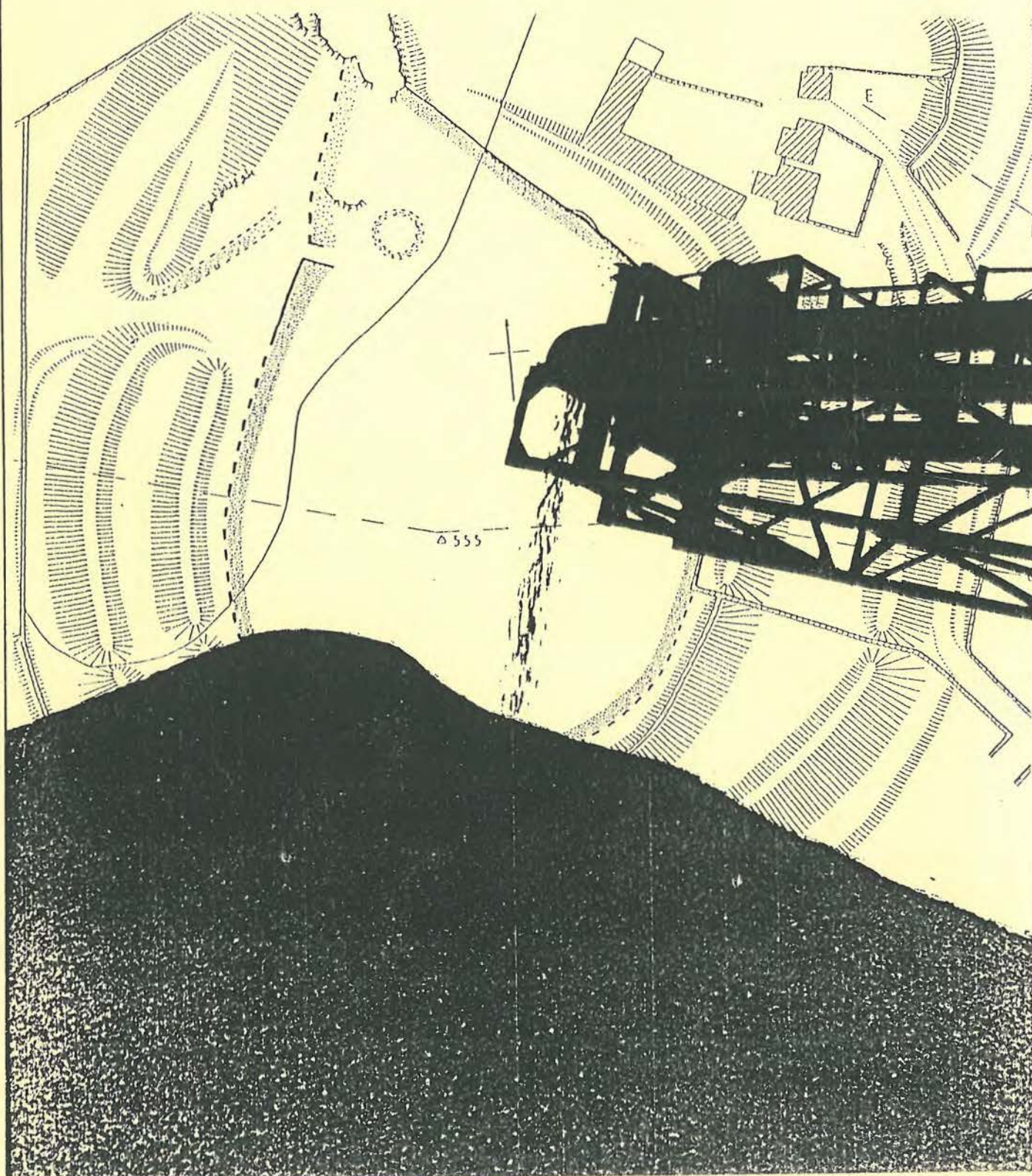
Rep 23a

SMR 6
COPY GAT 26

MINERALS

AN ARCHAEOLOGICAL ASSESSMENT

GWYNEDD ARCHAEOLOGICAL TRUST



MINERALS

AN ARCHAEOLOGICAL ASSESSMENT
OF
MINERAL EXTRACTION SITES AND RESOURCES IN GWYNEDD
OUTSIDE
THE SNOWDONIA NATIONAL PARK

GWYNEDD ARCHAEOLOGICAL TRUST 1991

— Couldn't these
be numbered.
One gets a little lost
reading through the text

CONTENTS

No list of figures.

Introduction	1
Methods	1
Report Format	2
Geology	2
Minerals Extracted	3
History	6
The Planning Framework	8
Archaeology	10
Future Demand	13
Gazetteer of <u>Sites</u> ^{quarries} with Archaeological Potential	14
Recommendations	19
Index of <u>Sites</u> ^{what sites?}	21

The word 'site' is used for both a
'quarry/mineral extraction area', and for
archaeological sites: it is very confusing.

INTRODUCTION

This report summarises the results of a survey and archaeological assessment of all active, potentially active and dormant mineral extraction sites in Gwynedd (outside the Snowdonia National Park). The work was initiated by a concern that the 117 existing permissions covering about 17 sq km of this area incorporated no archaeological conditions, and that current and future shortfalls of minerals, in particular sand and gravel, could not be met without exploiting new reserves in areas of known archaeological sensitivity. The situation is examined and a number of recommendations and proposals for further work put forward.

Funding from Cadw: Welsh Historic Monuments and the willing co-operation of the Minerals Section of the Gwynedd County Council Planning Department are gratefully acknowledged.

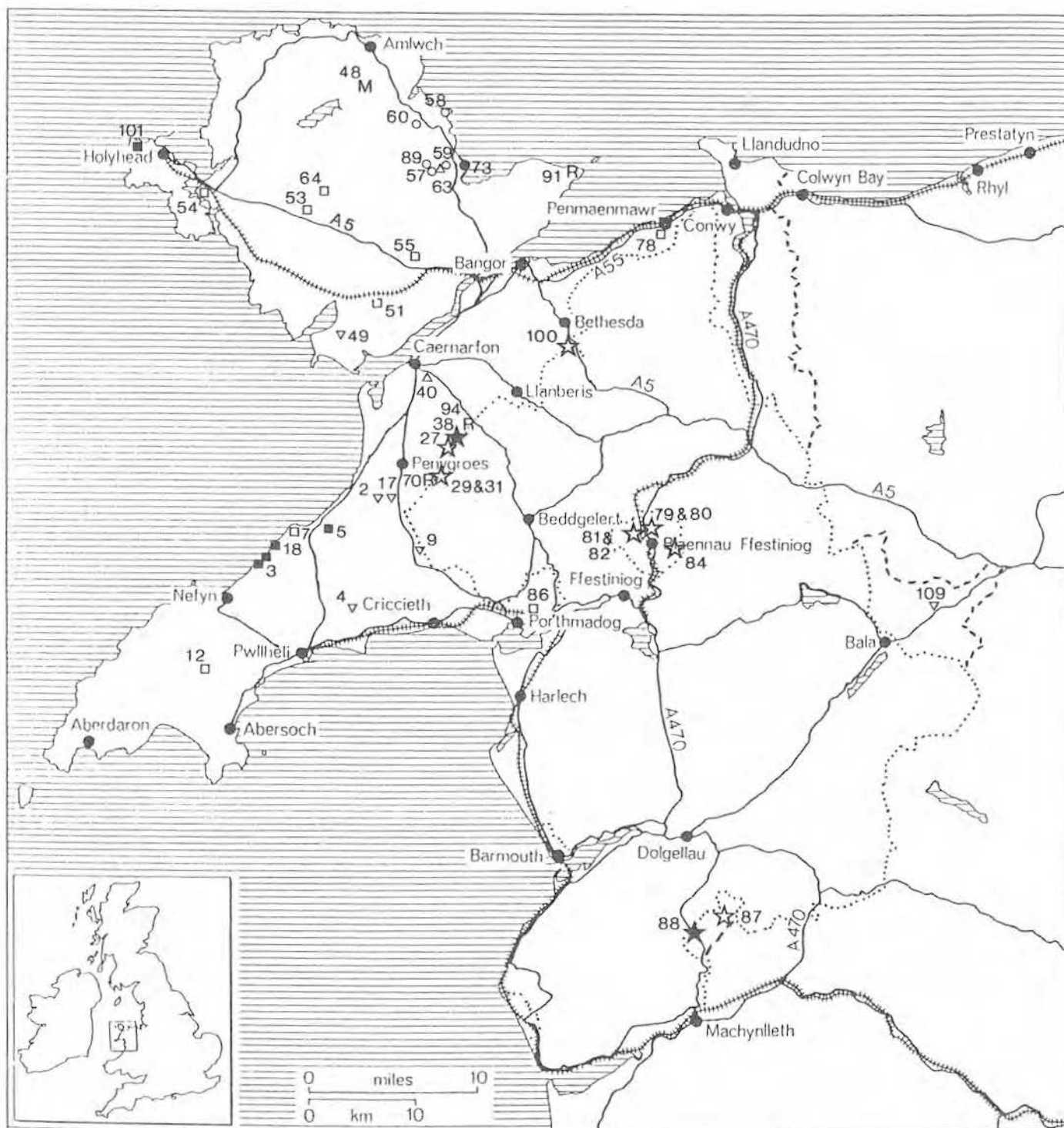
METHODS

Desk-top searches of the Gwynedd Archaeological Trust's Sites and Monument Record (SMR) and the Gwynedd County Council's Minerals Database Structure were undertaken. The information gathered was combined in paper record form and displayed on maps showing known archaeological sites and planning permissions for all active, potentially active, or dormant mineral extraction sites in the survey area. Meetings were held with the Minerals Section of the Gwynedd County Council Planning Department and archive records in University College of North Wales, Bangor were consulted where necessary.

Each site was visited and an inspection made of the workings and any undisturbed ground remaining within the current planning consent boundaries for known, or hitherto unrecorded, archaeological sites. Where mineral operators disclosed that a new planning application, or an application to extend an existing permission, was forthcoming, an appropriate area around the workings was examined. As time and resources were limited, some of the more extensive slate quarry sites in the Llanberis, Nantlle and Ffestiniog areas had to be covered in less detail.

A total of 84 extraction sites were visited (Fig. 1, Sites 1 - 109) and 10 new or potential archaeological sites identified, including a further 15 extraction sites with remains of industrial archaeological significance (Fig. 2).

Pending further work suggested in the Recommendations (p. 19), an

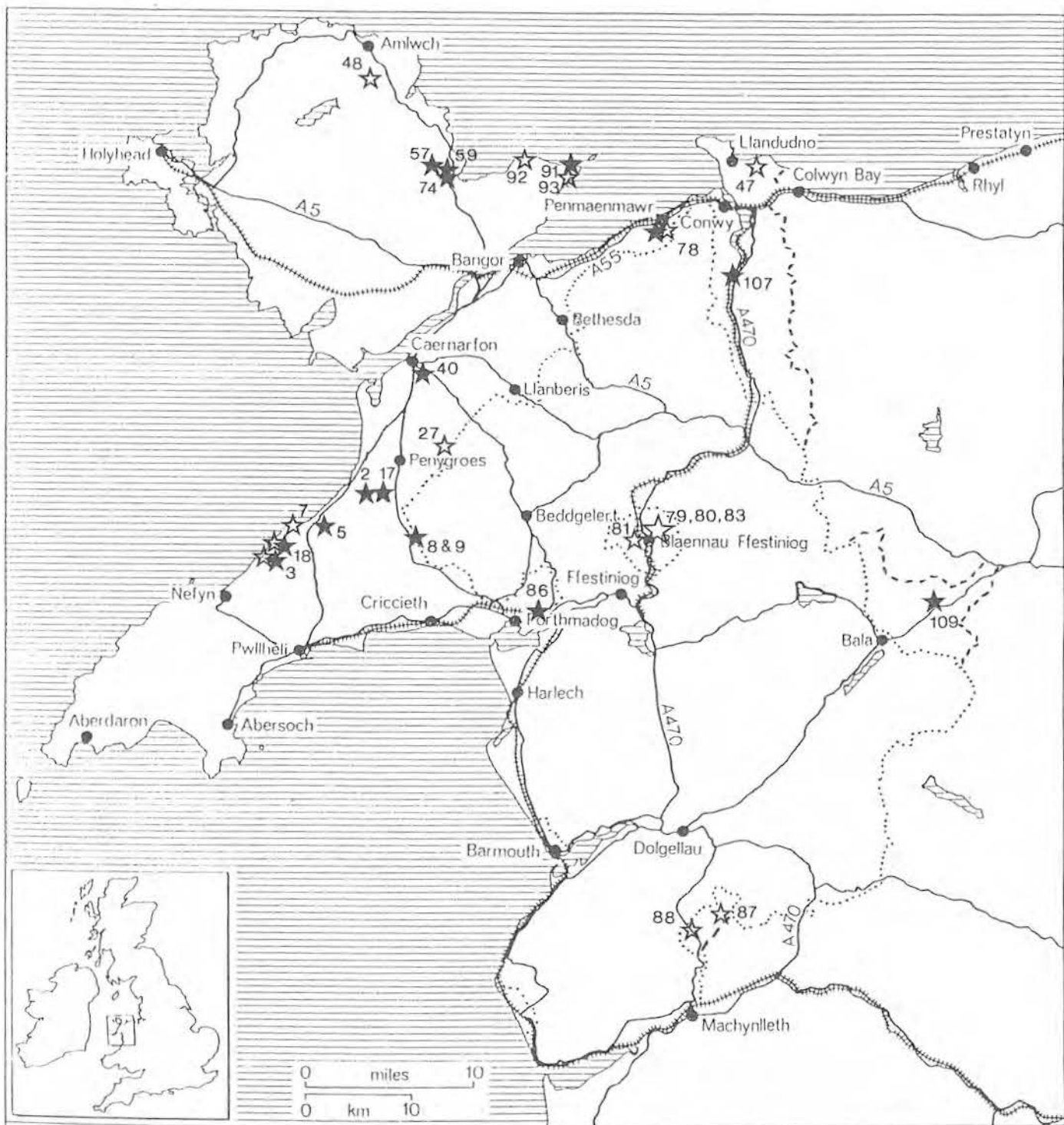


MINERALS ① EXTRACTION SITES WITH VALID CONSENTS

- Limestone
- Igneous
- ☆ Slate
- ▽ Sand & Gravel
- M Metal Ores
- △ Miscellaneous
- R Reclamation / Reworking
- Black symbols = Dormant Sites

----- SURVEY / NATIONAL PARK BOUNDARY

SITE KEY PAGE 21



MINERALS ② EXTRACTION SITES WITH ARCHAEOLOGICAL POTENTIAL



INDUSTRIAL



PRE-INDUSTRIAL

Shouldn't this come later - after the section on fieldwork.

..... SURVEY / NATIONAL PARK BOUNDARY

SITE KEY PAGE 21

archive of paper records and photographs has been assembled and relevant information on the archaeology incorporated into the Trust's SMR and made available to the Minerals Section of the Gwynedd County Council Planning Department.

REPORT FORMAT

The geological background, the principal types of minerals extracted and their industrial histories (within the survey area) are summarised. Planning legislation in relation to mineral extraction generally and present procedures for the protection of archaeological sites are examined. Some changes and improvements are suggested. The validity of consents pertaining to individual sites are examined and certain aspects of the archaeology of the extraction sites covered by the survey are described. Future levels of mineral demand are noted and the likely archaeological implications considered. A comprehensive gazetteer of sites and areas requiring further archaeological work or assessments is followed by the main conclusions and recommendations which arise out of the survey.

GEOLOGY

The complex and varied geology of the survey area has endowed it with an abundance of several commercially important minerals. The rocks exposed are relatively old (400-1000 million years) and have undergone such compression and distortion that even the sedimentary rocks are generally hard and, together with the igneous and metamorphic types, are suited to quarrying and for industrial usage. The Neolithic axe factories at Graig Lwyd and Mynydd Rhiw bear testimony to the early importance of the area in this respect.

Suitable sources of hard rock occur throughout the survey area; limestone mainly in east Anglesey, and slate, the most important type, at its optimum quality in the 'Cambrian Slate Belt', where until recently there was a major extractive industry.

The rocks also contain important deposits of metal ores which have been exploited intensively for over three thousand years, in particular during the eighteenth and nineteenth centuries. They include the massive copper/zinc/lead deposits at Parys Mountain in Anglesey, and the smaller copper deposits of the Great Orme.

In detail !
Such an abundance of hard rocks has produced a rugged landscape, which in more recent geological times has been glaciated and mantled with extensive deposits of fluvio-glacial sands and gravels. The most commercially significant resources of sand and gravel today occur on the periphery of the Snowdonian mountains and in central and east Llŷn.

MINERALS EXTRACTED

For the purposes of ^{which} the survey, extraction sites have been assigned into one of seven broad classes, primarily based on geological type; but also, to some extent, reflecting the type of activity and degree of environmental impact involved. The sites are shown in Fig. 1 and the classes are as follows:

Igneous

Geological types -	hard rocks, intrusive igneous types, mainly granite.
Availability -	localised sources throughout the survey area.
Extraction -	opencast quarries, 7 currently working.
Products -	hard-core, building stone and roadstone.
Distribution -	mainly supplying local needs.
Current resource status -	some local shortages within existing planning consents, but overall, almost limitless supplies available.

Limestone

Geological types -	bedded Carboniferous limestones, sandstones, shales and conglomerates.
Availability -	south and east Anglesey, Creuddyn peninsula (Great and Little Ormes).
Extraction -	opencast quarries, 4 limestone and 1 sandstone quarries currently working.
Products -	hard-core, building and decorative stone.

Distribution - mainly supplying local needs.

Current resource status - some local shortages within existing planning consents, but overall, almost limitless supplies available.

Slate

Geological types - slates comprising metamorphosed Cambrian and Ordovician bedded formations.

Availability - the 'Cambrian Slate Belt' in the Bethesda, Llanberis, Nantlle and Ffestiniog areas; comparable Ordovician formations in the Corris area.

Extraction - opencast quarries (Bethesda, Llanberis and Nantlle areas), opencast quarries and mines (Ffestiniog and Corris areas); total of 10 sites currently working.

Products - hard-core, building, roofing and decorative stone.

Distribution - supplying local needs, but increasingly exported outside the area, both at home and abroad.

Current resource status - adequate supplies for most purposes within existing planning consents.

Sand and Gravel

Geological types - fluvio-glacial sands and gravels, coastal sand dune formations.

Availability - extensive fluvio-glacial deposits on the margins of Snowdonia, in east and central Llyn; localised deposits in Anglesey and some other areas. Extensive coastal sand dune formations throughout the survey area.

Extraction - opencast pits and quarries, almost exclusively fluvio-glacial sources, 5 sites currently working.

Products - building sand and aggregates.

Distribution - supplying local needs.

Current resource status - projected shortages within existing planning consents, in particular sand which has to be imported into the area from elsewhere. Overall, adequate resources for the foreseeable future, but less than previously thought.

Metals

Geological types - metal ore deposits contained in various rock formations, mainly copper/zinc/lead combinations with traces of the nobler metals.

Availability - extensive deposits, principally Parys Mountain, Anglesey and the Great Orme.

Extraction - mining, 1 site about to start working.

Products - crushed ore exported for smelting elsewhere.

Distribution - N/A.

Current resource status - unknown, any project's viability is dependent on world metals market.

Miscellaneous

Geological types - clay, peat, marl etc.

Availability - localised deposits.

Extraction - opencast quarries and pits, 2 currently working.

Products - bricks and garden products.

Distribution - local and beyond.

Current resource status - adequate resources within the existing planning consents for the foreseeable future.

Reworking/Reclamation

Geological types - waste material from the extraction of mainly Igneous and Slate resources.

Availability - at existing, dormant or disused extraction sites.

Extraction - removal and/or the reworking of tips, 6 currently working.

Products - as noted above and crushed slate for coating roofing felt.

Distribution - as noted above.

Current resource status - considerable resources at some sites.

HISTORY

A brief history of mineral extraction within the survey area is of relevance as so many of the sites examined contain industrial archaeological remains. The history of the slate industry and many of the metal ore mines is fairly well known, but little has been documented about the other extractive industries of which remains of parallel importance have survived. Records exist ^{documented} ~~at~~ in local archives for some of the sites visited, and ~~could~~ provide useful information on some of the industrial features noted.

examination of these

Igneous

The prehistoric exploitation of suitable rock outcrops at Graig Lwyd and Mynydd Rhiw for Neolithic stone axe production has been noted. Apart from specialist or refined products, however, building stone is relatively abundant throughout the survey area without recourse to quarrying, ^{although} ~~but~~ records attest to the importation during historical times of decorative stone from elsewhere, e.g. Old Red Sandstone from Cheshire used in Conwy Castle.

Extensive quarrying of igneous sources rapidly developed in the nineteenth century to provide metallurgy for tarmacadamed roads, building stone, railway ballast and hard-core for large projects such as the harbour breakwater at Holyhead (conveniently supplied by the nearby, and aptly named, Breakwater Quarry). Material was also exported by rail and sea to the expanding towns and cities of England and beyond. However, the sharp decline in demand after the wars led to the closure of all but a few of the more accessible quarries which have continued to supply local needs.

Limestone

Apart from lime production which was predominantly a local activity, the history of limestone quarrying is similar to that of igneous rock: rapid expansion occurring in the nineteenth century to supply building stone for the new towns and cities

outside the area. The importance of bulk transport by rail and sea is also manifest in its development, as several quarries were sited to take advantage of the latter on the cliffs and headlands of east Anglesey. Some quarries were (almost exclusively) opened to supply the massive quantities of stone needed for huge projects such as the Manchester Ship Canal (Site 92, Tan Dinas (Dinorben) Quarry). After the First World War, however, demand fell and the industry shrank to the few surviving quarries inland which have continued to supply local needs.

Slate

It is said, that the slates first exported were laid down at the mouth of the Ogwen river. *Sion Tudur*, who was the Register of the Ecclesiastical Court of St. Asaph, and a Bard, who flourished in A. D. 1580, in a poetical address to Rolant Thomas, LL. D. Dean of Bangor from A. D. 1578 to 1588, requests him to procure him a ship load of slates from Aber Ogwen; which proves that slates were shipped out there so late as at that period, though they are all now shipped at Aber Cegin.

(*Observations on the Snowdon Mountains*, William, W., 1802)

Second only to agriculture, ^{economic} slate ^{importance} became the ^{extraction} major industry of the area in the nineteenth century, ^{similar to the position of} comparable to coal in South Wales, ^{Products} and reaching world-wide markets, ^{high} a peak of production just before the First World War. Many aspects of its history have been studied in detail, but others, such as the early stages of its development in the eighteenth century, are poorly documented and little understood. The legacy of quarries, waste tips and mines bears an indelible testimony to the role played by slate in the life of the area until very recently. Unfortunately, on all but a handful of sites, much of what was of industrial archaeological value has been cleared and removed.

The present resurgence in the use of slate as an attractive building stone has meant the survival of some quarries and renewed interest shown in other, disused or dormant, sites. Former waste is also used for hard-core, or can be profitably reclaimed, and the space created used for much needed local development. ^{these} All processes ~~which~~ continue to pose a threat to what survives of the industrial archaeology of this important class of site.

Sand and Gravel

Little is known of the history of this industry whose commercial development is a recent phenomenon, ~~as it~~ ^{was} expanded to supply aggregates to build sites such as the Trawsfynydd Nuclear Power

Station (Site 8, Llystyn) and the Dinorwic Pump Storage Scheme (Site 1, Cefn Graeanog). Continuing demand, in particular ^{for} sand for building and of the correct *ph* balance for making certain types of pre-cast concrete, will ensure the survival of the industry well into the future.

Change this to 'Some gold etc. occur inside but'

Metal

so do many other things, like nice pavilions.

No hard evidence for this

Gold and ores of lead occur mainly outside the survey area, but copper ore has been regularly worked on the Great Orme and Parys Mountain since the Bronze age. The latter site was systematically worked in the Roman period, confirmed by numerous copper 'cake' ingots found in the area, some bearing official government stamps. Documentary evidence records Medieval interest in at least the Great Orme mines, before both sites were extensively exploited following the Industrial Revolution in the eighteenth and nineteenth centuries.

The history of the Parys Mine, which at one time was the largest excavation in the world (the Great Opencast), is fairly well known, but several of the contemporary processes and the industrial archaeological remains which have survived are little understood and require further study, particularly as modern reworking of the mine threatens to obliterate many of the features present.

Iron ores are found in the area, but they have attracted only sporadic attention, being of relatively poor quality. Trials and limited mining for minerals such as manganese have also occurred from time to time. At present, aluminium ore is imported from abroad and smelted in a large plant at Holyhead.

Miscellaneous

Brick and tile making occurred at Caernarfon in the Roman period, an activity which almost certainly continued in later times, but nothing is known. A number of brickworks were established in the survey area during the nineteenth century, notably Porth Wen, Llanbadrig, on the north coast of Anglesey; now a Scheduled Ancient Monument (A 109). Today, there is only one, at Caernarfon, and exporting its products to a wide market beyond the local area.

were they? I think participate

THE PLANNING FRAMEWORK

Mineral extraction requires planning consent under ~~the~~ various Planning Acts, notably The Town and Country Planning (Minerals)

This sentence is too long
Act 1981. Certain operations are permitted without permission under the General Development Order which includes Classes of activity entitled Development by mineral undertakers, Mineral exploration and Removal of material from mineral-working deposits; however, ^{there are} several restrictions prevail in the area of the survey as much of it has been designated as Areas of Outstanding Natural Beauty (Fig. 6, coastal Anglesey and Llyn), an Environmentally Sensitive Area (Fig. 6, Llyn), or locally, as Sites of Special Scientific Interest.

Planning *for extraction or whatever, where it* *usually includes*
Assuming permission is granted, current practice in Gwynedd, as elsewhere, is for the planning authority to impose conditions, to regulate the way the site is worked, to safeguard the surrounding environment and to ensure appropriate restoration after the site has been worked. Since the formation of the Trust in 1974, archaeology has been considered at an early stage in the process and, in a number of instances, the County Planning Department have drawn up conditions to protect unscheduled archaeological sites.

Now a full document
The County's current policy on minerals is contained in the Gwynedd Structure Plan (Draft Written Statement and Exploratory Memorandum, June 1990). The ~~archaeologically relevant~~ *relevant to archaeology* sections are as follows:

"11.2 Mineral Exploration

11.2.1 A range of exploratory operations have been defined as "permitted development" under Part 22 of the G D O 1988, as amended, for which planning permission is not required. However, for locations in Areas of Outstanding Natural Beauty, Sites of Special Scientific Interest, areas of Archaeological interest) *These have never actually been defined, have they?* (statutory and non statutory)...planning permission is still necessary for exploration work..."

and,

"11.3 Mineral Exploitation

POLICY DD6

PROPOSALS FOR THE WINNING AND WORKING OF MINERALS WILL BE ASSESSED AGAINST THE FOLLOWING CRITERIA...THE EFFECT ON FEATURES OF ARCHAEOLOGICAL, ARCHITECTURAL AND HISTORIC INTEREST..."

These policies and arrangements for archaeology have worked tolerably well, although it has not always been possible to prevent sites from being quarried, and several have had to be excavated in advance of destruction (Fig. 3, Sites 1 and 17). So far, the costs have been borne by The Welsh Office, through Cadw: Welsh Historic Monuments; however, the Trust can no longer expect funds to come entirely from the government, and developers must now accept a responsibility to provide a substantial proportion of the costs of recording threatened archaeological sites on the basis that the "polluter pays".

Not only the Trust, but planners, Cadw + developers too.

either by
This can be achieved by the planning authority ~~with~~ conditions incorporated into the planning consent, or by legal agreement. The procedures have already been accepted by the minerals industry in the CBI's Minerals Code of Practice (a revision of which is shortly to be issued), and the relevant policies are indicated in England as DOE Planning Policy Guidance PPG16 - Archaeology and Planning (Nov 1990). A similar document has recently been drafted and circulated for consultation by the Welsh Office and will be issued in the spring of 1991. The Trust fully intends to follow the guidelines released in any final document, and to use them as a basis for all future negotiations with the County Planning Department over mineral (and other) planning applications.

The current fairly *ad hoc* arrangements with the County Planning Department over threatened archaeological sites, therefore, need to be revised, up-dated and brought in line with the new framework of "developer funding". An appropriate juncture may be the County Council's Mineral Resources Review, whereby, under the provisions of the Town and Country Planning (Minerals) Act 1981, the County Council is bound to prepare a policy review on mineral resources every set number of years. It is understood that a review is currently in progress.

ARCHAEOLOGY

This is plus recently
(Unfortunately, several important archaeological sites have already been destroyed by mineral extraction (Fig. 3). The following is a list of all the pre-industrial sites known to have been lost in the survey area. Significant stray finds are also included. Archaeological excavations were arranged at the sites marked *, but only limited salvage work was possible at those marked #. Sites where industrial archaeological remains have been lost are not included.

1. CEFN GRAEANOG, Clynog

- # Cefn Graeanog I Iron age/Romano-British hut-group
- * Cefn Graeanog II Iron age/Romano-British hut-group
- * Cefn Graeanog medieval farmstead
- * Two cairns

3. CARREG Y LLAM, Pistyll

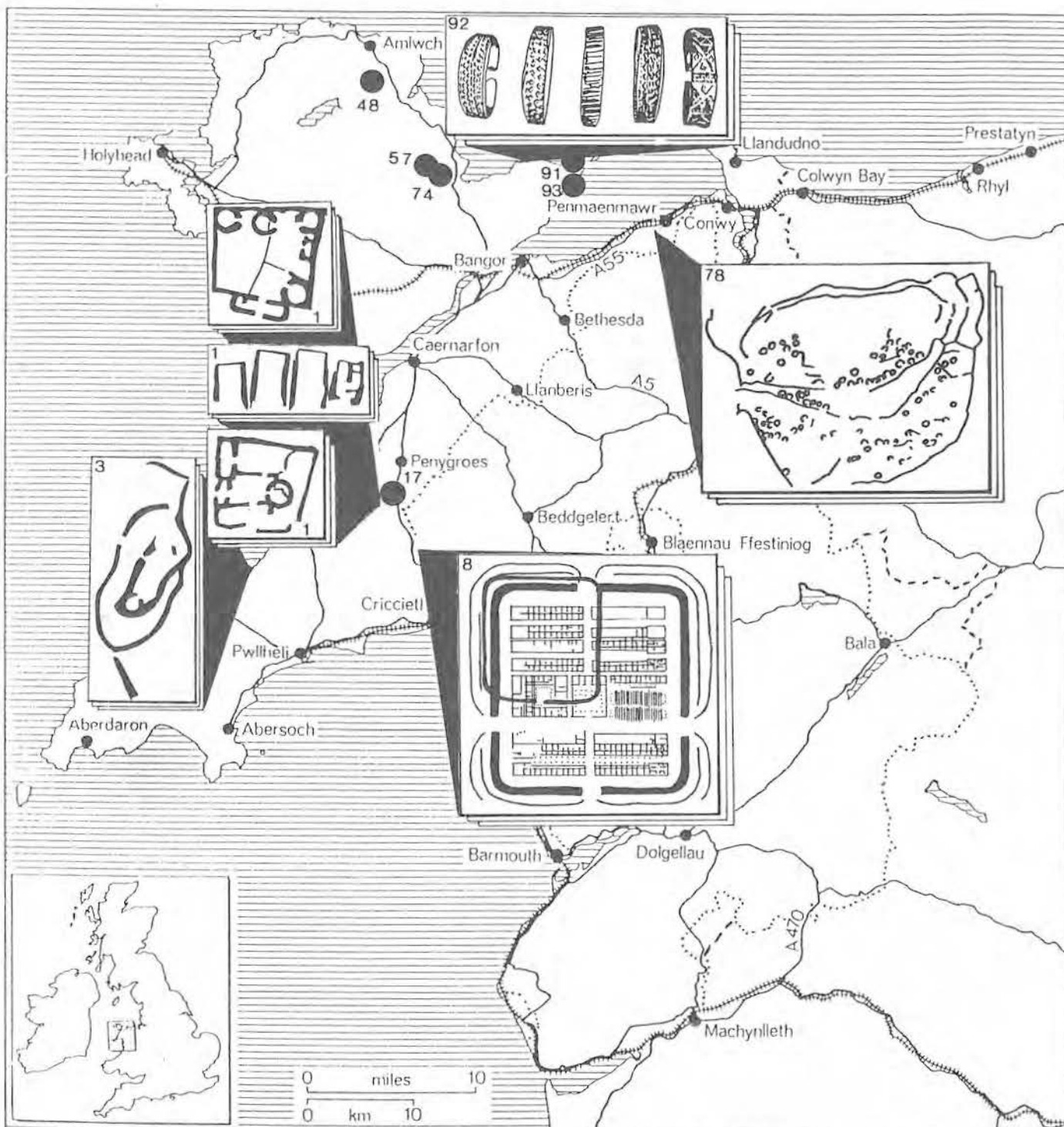
- * Iron Age/Romano-British coastal fort

8. & 9. LLYSTYN GWYN/GANOL, Dolbenmaen

- # Roman auxiliary fort

17. GRAEANOG, Clynog

- * Bronze age burnt mound



MINERALS ③ DESTROYED SITES - PRE INDUSTRIAL

- | | |
|---|--|
| 1. Two Iron age/Romano-British hut-groups
Medieval farmstead
Two cairns | 57. "Castell Gadarn" prehistoric defensive enclosure
Bronze age burnt mound |
| 3. Iron age/Romano-British coastal fort | 74. Early Christian long cist cemetery |
| 8. Roman auxiliary fort | 78. Neolithic axe factory
Iron age/Romano-British hillfort |
| 17. Bronze age burnt mound | 91. Iron age/Romano-British hut-group & field system |
| 48. Evidence of early mining | 92. Viking silver armlets |
| | 93. Bronze age barrow and urns |

48. PARYS MOUNTAIN, Amlwch
18/19th C mining remains both on the surface and underground
57. RHUDDLAN BACH, Llanfair Mathafarn Eithaf
Site of "Castell Gadarn" (prehistoric defensive enclosure?)
Burnt mound
74. BWLCH FARM (TY'N Y FELIN), Llanfair Mathafarn Eithaf
Part of an Early Christian long cist cemetery
78. PENMAENMAWR, Penmaenmawr
Parts of the Neolithic axe factory
Braich-y-Dinas Iron age/ Romano-British hillfort
91. DINMOR PARK, Llangoed
* Iron age/Romano-British hut-group and field system
92. TAN DINAS (DINORBEN), Llanddona
Five Viking (10th C) silver armlets (now in the National Museum of Wales) - site of find destroyed
93. FLAGSTAFF, Llangoed
Bronze age barrow with urns

Most of the rescue excavations were undertaken by the Trust and it is hoped that provisions for this will continue with "developer funding" outlined in the previous section. Difficulties may arise, however, not with new concessions, but with permissions granted in the past which contain no archaeological conditions. The survey has identified a number of active extraction sites whose consent areas contain archaeological remains, many of which require further assessment before deciding on a suitable archaeological response.

The position is similar on a number of disused or abandoned extraction sites with valid consents containing archaeological remains. There are also some sites with archaeological remains where the validity of the original consent is in doubt.

Doubts over consents are likely to arise because of various provisions in the Planning Acts. In summary, the 1947 Town and Country Planning Act allowed existing enterprises to continue more or less as they were; however, the 1971 revision of the Acts deemed that any dormant consent which could not be proved to have been activated before 31 March, 1979 would lapse and become extinguished. *Is this right?*

Doesn't read very well.

/ Clear as this was intended to be, problems arise because it is often difficult for the planning authority to prove whether or not a consent was worked within the time stipulated in the 1971 Act. This is because large companies still own or lease many of

the dormant quarry sites in areas where new applications would not now be permitted, and they claim to have undertaken the minimum activity necessary to fulfil the conditions of the Act, thereby keeping their original consent valid. Two dormant consents in the survey area contain Scheduled Ancient Monuments (Site 5, Tan y Graig - Cn 109 and Site 107, Llwydfaen - Cn 92).

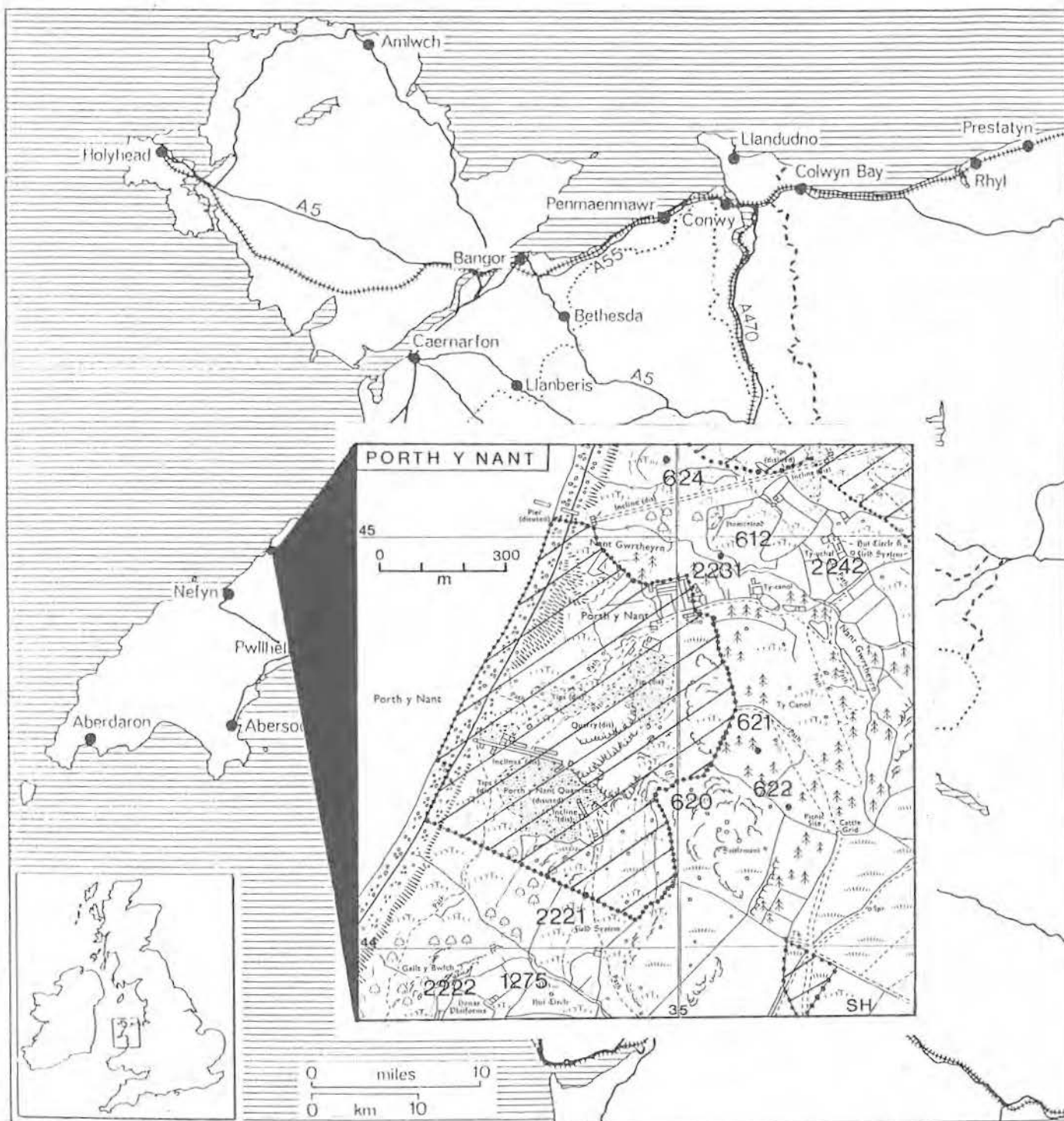
Twenty one extraction sites in Gwynedd are covered by Interim Development Orders. IDOs served as temporary planning permissions to continue an activity that was known to have been in existence prior to the full implementation of the 1947 Act (but subject to the extinguishing provisions of the 1971 Act). They include both active and dormant sites, and where they apply, the conditions attached to them are usually minimal and it is extremely difficult to apply conditions retrospectively. This makes them much more profitable to work than a modern consent and in recent years large companies have been holding on to them because of their value.

The archaeological remains in all these situations are, therefore, under threat and require further assessment to decide the most appropriate response should mineral extraction recommence. Any means of instituting 'retrospective' protection should be fully explored with the Gwynedd County Council Planning Department as part of their minerals policy review. The Trust has identified a particular concentration of known and hitherto unrecorded archaeological sites in the area of Site 3, the dormant Porth y Nant Quarry, Pistyll, and recommends that a rapid survey and further assessment be undertaken (Fig. 4).

Several extraction sites contain important industrial archaeological remains. The larger slate and metal ore sites are well known, however, remains of equal importance have often survived in the granite and limestone quarries of north Lleyn and east Anglesey respectively. These sites have received scant attention to date and some examples of the kind of material which survives have been included in the survey. Particular attention is drawn to Site 93, Flagstaff Quarry, Llangoed (Fig. 5, Plate 2), where there is a serious threat from vandalism.

Industrial remains are in just as much danger of destruction as pre-industrial or "conventional" archaeological sites. The Trust has no resources at present to deal with industrial archaeology, but in view of the urgency of threats to some of the features noted, a rapid appraisal of surviving remains and archive sources for the Lleyn granite and Anglesey limestone sites is proposed. This would at least provide a convenient data-base for others with the relevant resources and expertise to use in future.

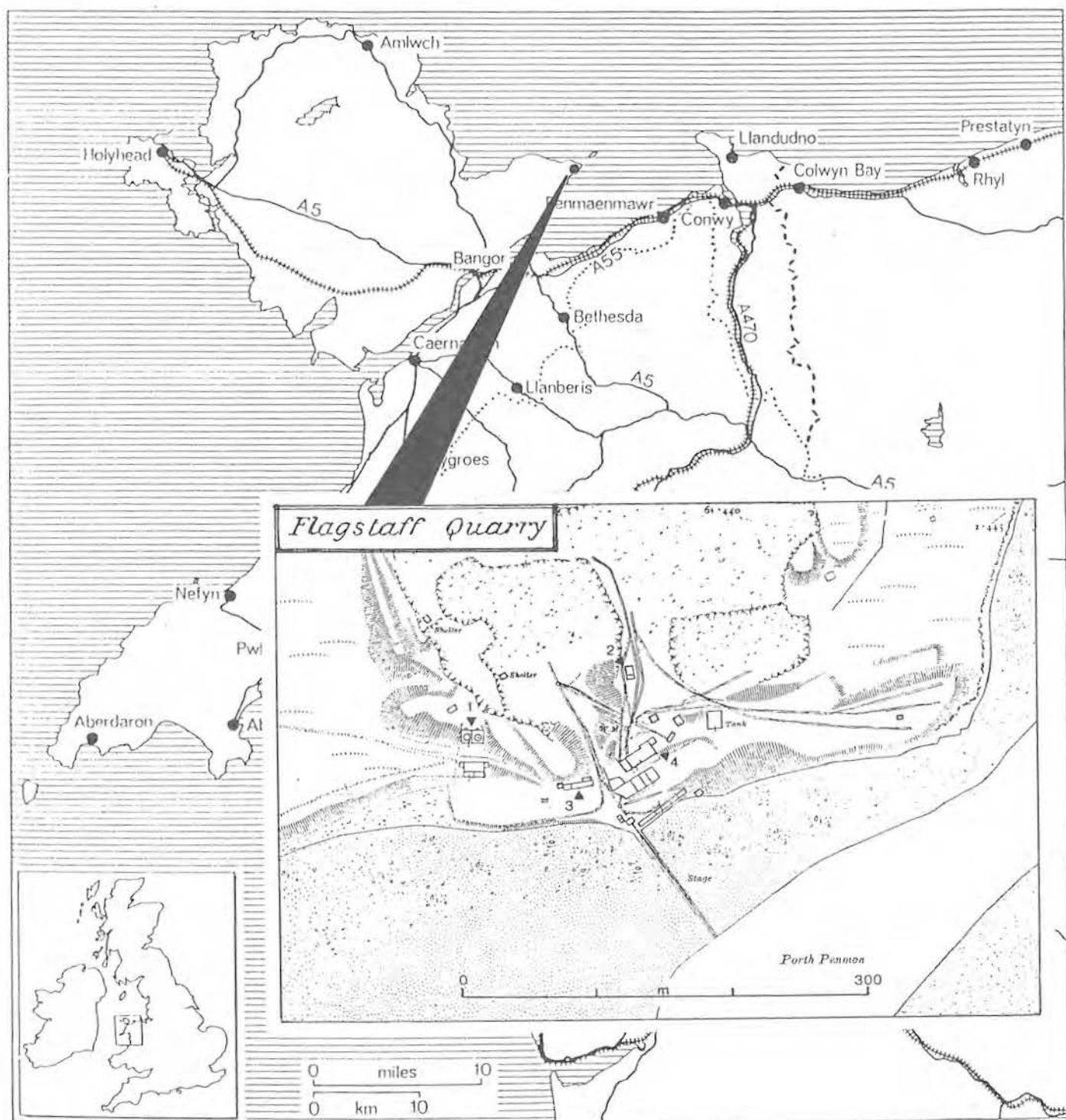
In spite of planning controls, misunderstandings will always



MINERALS ④ PORTH Y NANT QUARRY - ARCHAEOLOGICAL SITES S M R Extract

6 1 2	Hut circles and Enclosures	1 2 7 5	Hut circle
6 2 0	Hut circles and Enclosures	2 2 2 1	Long huts and Field system
6 2 1	Long huts and Enclosures	2 2 2 2	Platform houses
6 2 2	Long hut	2 2 3 1	"Fynwent" Chapel, Nant Gwrtheyrn
6 2 4	Tumulus "Bedd Gwrtheyrn"	2 2 4 2	Hut circle and Field system

..... SURVEY / NATIONAL PARK BOUNDARY



MINERALS ⑤ INDUSTRIAL ARCHAEOLOGY - FLAGSTAFF QUARRY

- 1 KILNS
- 2 STABLES
- 3 OFFICES
- 4 CRUSHER

..... SURVEY / NATIONAL PARK BOUNDARY

occur. Sometimes operators work beyond permitted areas, confusion arises over boundaries, or a failure of communication occurs. In every case, archaeological sites may be threatened. There have been two cases recently of damage to archaeological sites, one scheduled, despite planning conditions for their protection. Greater contact between the Trust, the planning authority and the mineral operators may help reduce these instances in future.

FUTURE DEMAND

This section briefly examines what is known about the likely future demand for minerals in the survey area and the possible archaeological implications.

The reserves of minerals worked have been noted above (pp. 3-5) and the amounts are broadly in line with the provisions of the *Gwynedd Structure Plan* (Draft Written Statement and Explanatory Memorandum, June 1990) which states that (section 11.3.13):

"There is a need for an adequate supply of aggregate mineral reserves with planning permission in the County to meet the agreed estimates of future demand. In the case of sand and gravel it is accepted that there should be a stock of permissions sufficient for at least ten years extraction while in the case of crushed rock it is recognised that reserves sufficient to cater for estimated demands over a 20 year period or more may be more appropriate..."

and (section 11.3.16),

"There are sufficient crushed rock reserves within the County to meet anticipated future levels of demand in the North Wales market without further significant impacts on the landscape and environment of Gwynedd. it is recognised that further land will have to be released from time to time to maintain sufficient reserves of sand and gravel. In view of the extensive range of environmental constraints it is considered that Gwynedd is not a suitable location for the development of very large scale aggregates extraction."

Space → and also (POLICY DD12),

"SPECIAL CONSIDERATION WILL BE GIVEN TO THE PROTECTION OF THE PARTICULAR CHARACTER OF LIMESTONE AREAS WHEN ASSESSING PROPOSALS FOR THE WINNING AND WORKING OF LIMESTONE IN GWYNEDD"

Clearly, the areas requiring the greatest degree of archaeological vigilance are those in which there are proven resources of sand and gravel and where new permissions will be granted. Such areas have recently been identified in east Llyn

by the Engineering Geology Unit, Department of Earth Sciences, University of Liverpool - *Assessment of Sand and Gravel Resources in the Eastern Lley Peninsula, North Gwynedd, North Wales, 1988* (Fig. 6, Area A). Areas in central Lley may also be surveyed for similar resources (Fig. 6, Area B).

The Trust believes that rapid survey in these areas, to check on known sites and identify further remains, is the best way to provide up-to-date information to determine the most effective archaeological responses in any future planning consents. It is recommended that the first survey be undertaken in one of the most threatened areas at Llystyn, Dolbenmaen (Sites 8 and 9, p. 15, Fig. 7)

GAZETTEER OF SITES WITH ARCHAEOLOGICAL POTENTIAL

The following gazetteer contains all the mineral extraction sites identified where ~~there is~~ a need or potential for further archaeological work (Fig. 2).

has been identified

2. HENBANT BACH, Clynog: Sand and Gravel

This valid concession of 8ha has not been worked. There were no archaeological features visible above ground, but an assessment by geophysical survey and trial trenches is desirable on the more level areas prior to determining an appropriate archaeological response.

3. CARREG Y LLAM, Pistyll: Granite

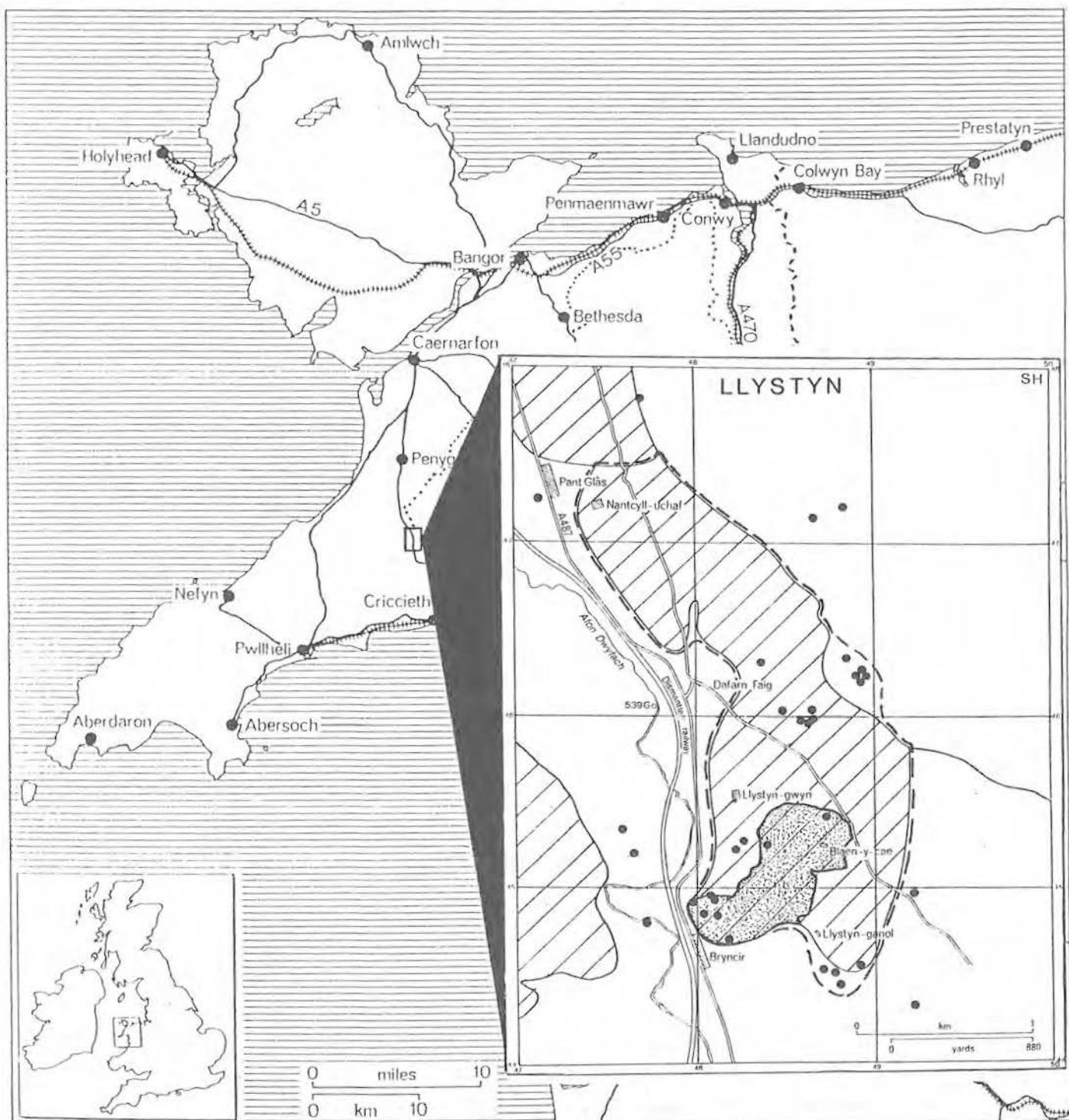
The quarry is dormant, but the consent is believed to be valid. Archaeological features within the consent area, possibly associated with the destroyed hillfort of Carreg y Llam (Fig. 3), require survey. The quarry workings contain a crushing plant and a pier which should be recorded as features of industrial archaeological interest.

3. PORTH Y NANT, Pistyll: Granite (Fig. 4)

The quarry is dormant, but with an extensive (57ha) consent area believed to be valid. Several known and unrecorded archaeological sites extend into the consent area and require survey. The quarry workings contain a range of buildings and features of industrial archaeological interest which should be recorded.

5. TYDDYN HOWEL AND TAN Y GRAIG, Llanaelhaearn: Granite.

Although the original consent is considered to have expired, a new application is forthcoming. The original consent includes part of the Gyrn Ddu hut-group which is a Scheduled Ancient Monument (Cn 109) and an archaeological assessment of any new application would be essential in the area of this monument.



MINERALS ⑦ FUTURE RESOURCES - LLYSTYN RAPID SURVEY



PROVEN SAND & GRAVEL DEPOSITS



EXISTING QUARRIES

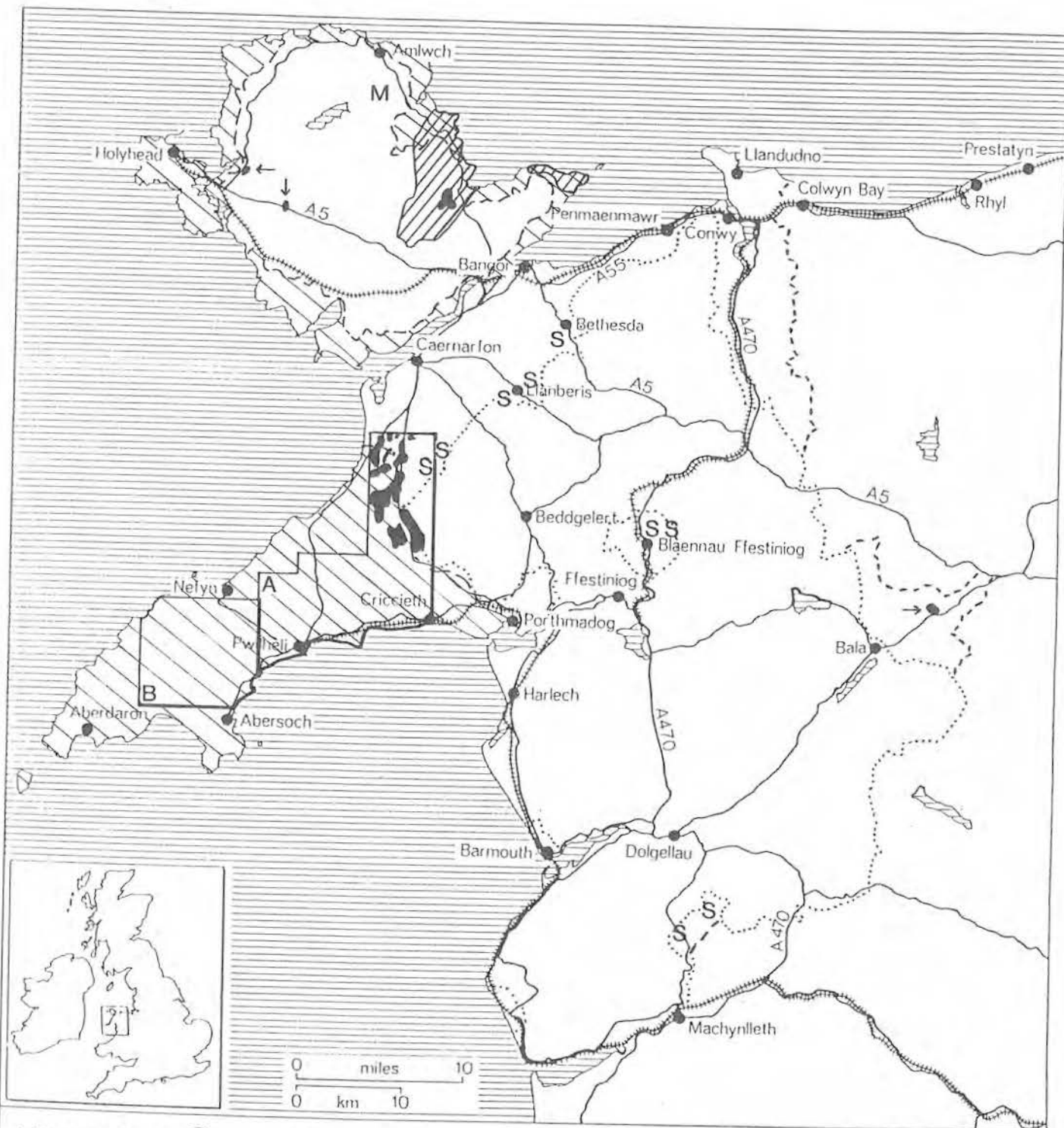


ARCHAEOLOGICAL SITES



RAPID SURVEY - 1991-2

..... SURVEY / NATIONAL PARK BOUNDARY



MINERALS ⑥ FUTURE RESOURCES

- A RESOURCE STUDY AREA
- B - ditto - PROPOSED
- M METAL ORES
- S SLATE
- PROVEN SAND & GRAVEL DEPOSITS
- ▨ LIMESTONE

SAND & GRAVEL

AONB / ESA

..... SURVEY / NATIONAL PARK BOUNDARY

7. TREFOR (YR EIFL), Llanaelhaearn: Granite

This large formerly productive site is currently being worked on a small scale, but with an increase in activity expected by the operators. The disused crushing plant and other industrial archaeological features need to be recorded.

8. & 9. LLYSTYN AND BLAEN-Y-CAE, Dolbenmaen: Sand and Gravel (Fig.7)

The Llystyn quarries which unfortunately destroyed the Pen Llystyn Roman fort (fig. 3) are exhausted and partly reinstated, but Blaen-y-cae, the latest concession, is currently active and contains one archaeological site protected by planning conditions. Further resources have been identified in the surrounding area and it is likely that future demand could be met by their permitted extraction. The area has already yielded several important archaeological sites and finds and there is a clear potential for more discoveries. Future developments, therefore, should be anticipated at the earliest possible stage and a survey undertaken to identify archaeological remains above ground in the areas most likely to be affected by extraction. This would enable the most suitable strategies for future archaeological assessments to be quickly determined.

17. GRAEANOG, Clynnog: Sand and Gravel

This pit is worked as an extension to the original quarry at Cefn Graeanog. A burnt mound was excavated by the Trust in 1983 and a geophysical survey and further assessment of the area west of this would now seem desirable, in advance of quarrying.

18. TRWYN-Y-GORLECH AND CAE'R NANT, Pistyll: Granite

These quarries comprise a dormant 60ha consent area believed to be valid. Waste material from a disused incline has encroached onto a known hut-group site, whilst structures of industrial archaeological interest require recording.

27. PEN YR ORSEDD, Llanllyfni: Slate

This is an active quarry with a considerable amount of industrial archaeological remains surviving. There are several buildings with items of plant and machinery still intact, notably a rare Ingersoll Compressor dating from the turn of the century. There are also a number of blondins or aerial ropeways above the larger quarries. A comprehensive assessment is required to establish the level of record necessary. The owners are very sympathetic; however, the site is being badly vandalised and some items urgently need to be moved to safer locations.

34. DOROTHEA, Llanllyfni: Slate

The condition and future of the Dorothea Beam Engine, a Scheduled Ancient Monument (Cn 165), continues to be a matter of concern.

37. DINORWIG AND MARCHLYN, Llanberis/Llanddeiniolen: Slate

Parts of the disused Dinorwig quarry have been scheduled - The Workshop Complex (Gilfach Ddu) Slate Museum (Cn 163), The 'A' Incline and Anglesey Barracks (Cn 177) and The Vivian Slate Quarry (Cn 198); however, little survives of the remainder of

this vast site which was much altered by the construction of the CEGB Dinorwig Pump Storage Scheme.

40. PEBLIG AND SEIONT BRICKWORKS, Caernarfon: Clay pit and brickworks

A possible burnt mound was identified and an assessment by geophysical survey and, if necessary, trial excavation is required to establish its status and any other archaeological remains in the remaining unworked areas of the consent.

47. NANT-Y-GAMAR, Llandudno: Limestone

This dormant quarry has a pair of lime kilns which require recording.

48. PARYS MOUNTAIN, Amlwch: Copper/zinc/lead ores

Recent trials have indicated the presence of ore deposits beneath ground of commercial quality and quantity. Proposals for their treatment above ground, however, entail the obliteration of earlier features, including filling some of the unique precipitation ponds. The mining company is not averse to preserving some of the remains and is willing to enter into discussions with the relevant bodies, but a recent appraisal of the site prepared for the Trust highlighted the need for a more broad-based, co-ordinated approach, involving an extensive survey of the visible remains, the cataloguing of the widely scattered material and archive sources which exist, and the bringing together of all interested parties to devise a strategy for the long term conservation and management of the site. There have been no developments since this proposal was put forward, but it is understood that Cadw is currently in the process of scheduling parts of the site.

57. RHUDDLAN BACH, Llanfair Mathafarn Eithaf: Limestone

Extraction is currently approaching the limits of the consent area. Recent planning applications to open new quarries to the south at PRYSAN have been rejected, but it is understood that future applications could be more favourably considered, once reserves at RHUDDLAN BACH have been finally exhausted. In anticipation of these developments, the Trust has identified a number of archaeological sites at PRYSAN and feels that archaeological assessments should be included in any future planning permissions, in order to determine the most appropriate archaeological responses.

59. BRYN ENGAN, Llanfair Mathafarn Eithaf: Limestone

A planning application for an extension is pending consideration by the planning authority. The Trust has stipulated that an assessment is required within the area of the proposed extension.

78. PENMAENMAWR, Penmaenmawr: Granite

This is an old-established and extensive quarry next to an area of outstanding monument concentration. The landscaping of old waste tips in the vicinity of the Neolithic axe factory sites is currently being checked and may entail further archaeological work.

79. LLECHWEDD, Ffestiniog: Slate

This active site is also a successful tourist attraction and has a large potential for industrial archaeology, but the owners refused permission to visit. Any remains should be assessed to determine the level of record required. The large, undisturbed area to the north of the present workings will also need assessment for pre-industrial remains, should planning permission be sought for expansion in future.

80. MAEN OFFEREN, Ffestiniog: Slate

Permission to visit was refused, but it is believed that this active site has a potential for industrial archaeology which should be assessed to determine the level of record required.

81. OAKLEY AND GLODDFA GANOL, Ffestiniog: Slate

This active site is also a major tourist attraction. There is some archaeological potential, apparently safeguarded by the company's own conservation interests, but an independent assessment is desirable.

83. DIFFWYS CASSON AND FOTTY BOWYDD, Ffestiniog: Slate

Permission to visit was not granted, but it is believed that these quarries, now dormant and owned by the same company as Site 79, contain considerable amounts of industrial archaeological remains. An assessment is essential to determine the level of record required. A large unworked area to the north of the quarries also needs to be assessed for pre-industrial remains, if planning permission is sought to expand in future.

86. MINFFORDD, Penrhyndeudraeth: Granite

The quarry has extended its activity outside the area of the current consent. Potential archaeological features were noted to the east, where a planning application to regularise the current situation and for a new extension to the quarry may be sought. The features noted comprise walls and boundaries obscured by dense scrub and requiring closer investigation than was initially possible. A survey is therefore required in order to assess what further action may be necessary.

87. ABERLLEFENNI, Corris: Slate

This active slate mine has several industrial archaeological remains surviving above ground (Plate 1). Further visits and an appraisal are essential to establish the level and extent of survey required.

88. GAERWEN, Corris: Slate

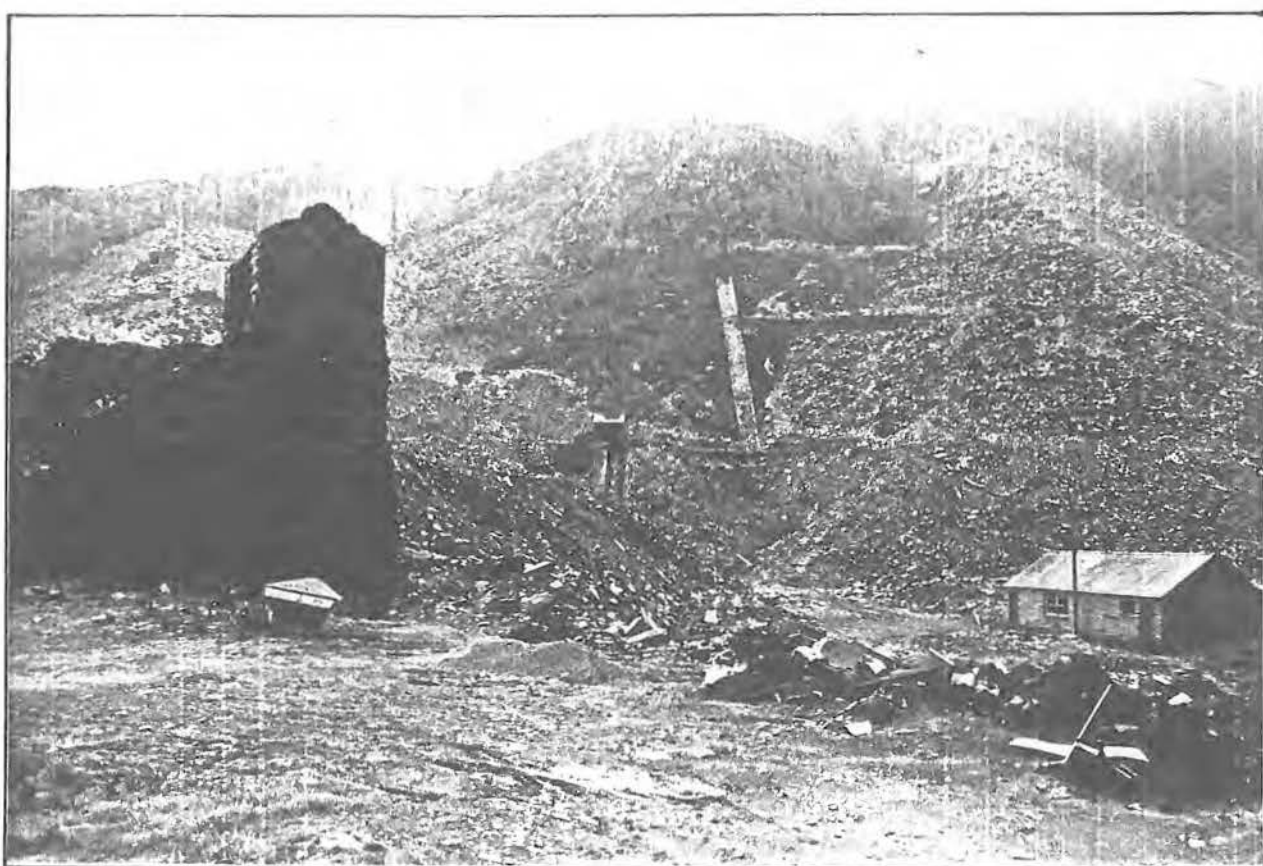
The site comprises a dormant mine where the consent is believed to be valid. There are a number of industrial archaeological features above ground which require recording (Plate 1).

91. DINMOR PARK, Llangoed: Limestone

Whilst quarrying has ceased, stockpiles of material are still being removed. The surrounding area contains a number of hut-group sites which have considerable potential for environmental evidence. Any future applications to extend the quarry, although



Site 88 Gaerwen Slate Quarry - incline winding house



Site 87 Aberllefenni Slate Mine - industrial remains

unlikely to be permitted, should be archaeologically assessed.

92. TAN DINAS (DINORBEN), Llanddona: Limestone

This dormant quarry where five Viking silver armlets were discovered (Fig. 3) contains some industrial archaeological features which require recording, including a large diesel engine (Plate 2) of apparently early type, suitable for rescue and restoration.

93. FLAGSTAFF QUARRY, Llangoed: Limestone (Fig. 5, Plate 2)

This quarry has been dormant since before the Second World War and is unlikely to be reopened, however, it contains an unique range of quarry buildings and other features, including a pair of lime furnaces, quarry offices and a stable block. Until recently, the fixtures and fittings were intact, but have been increasingly plundered and vandalised. Recording is therefore most urgent before any further losses are incurred.

99. BRYNGWDION, Llanllyfni: Sand and Gravel

A planning application is awaited following successful trial boring in an extensive, but as yet unspecified area containing considerable reserves. Bryngwdion is cited in the Mabinogi whilst the area also contains a number of known archaeological sites. The Trust would press for archaeological assessments as part of any planning permission, prior to determining the most appropriate archaeological response.

100. PENRHYN, Llandygai: Slate

The greater part of the unworked areas of the permission belonging to this large, active quarry was surveyed for archaeological remains by the Trust in 1989 as part of the Upland Survey - *Survey of Gwaen Gynfi, Marchlyn, Llandygai*. The results will form the basis to any archaeological response, should quarrying expand into these areas in future.

107. LLWYDFAEN, Talycafn: Gravel

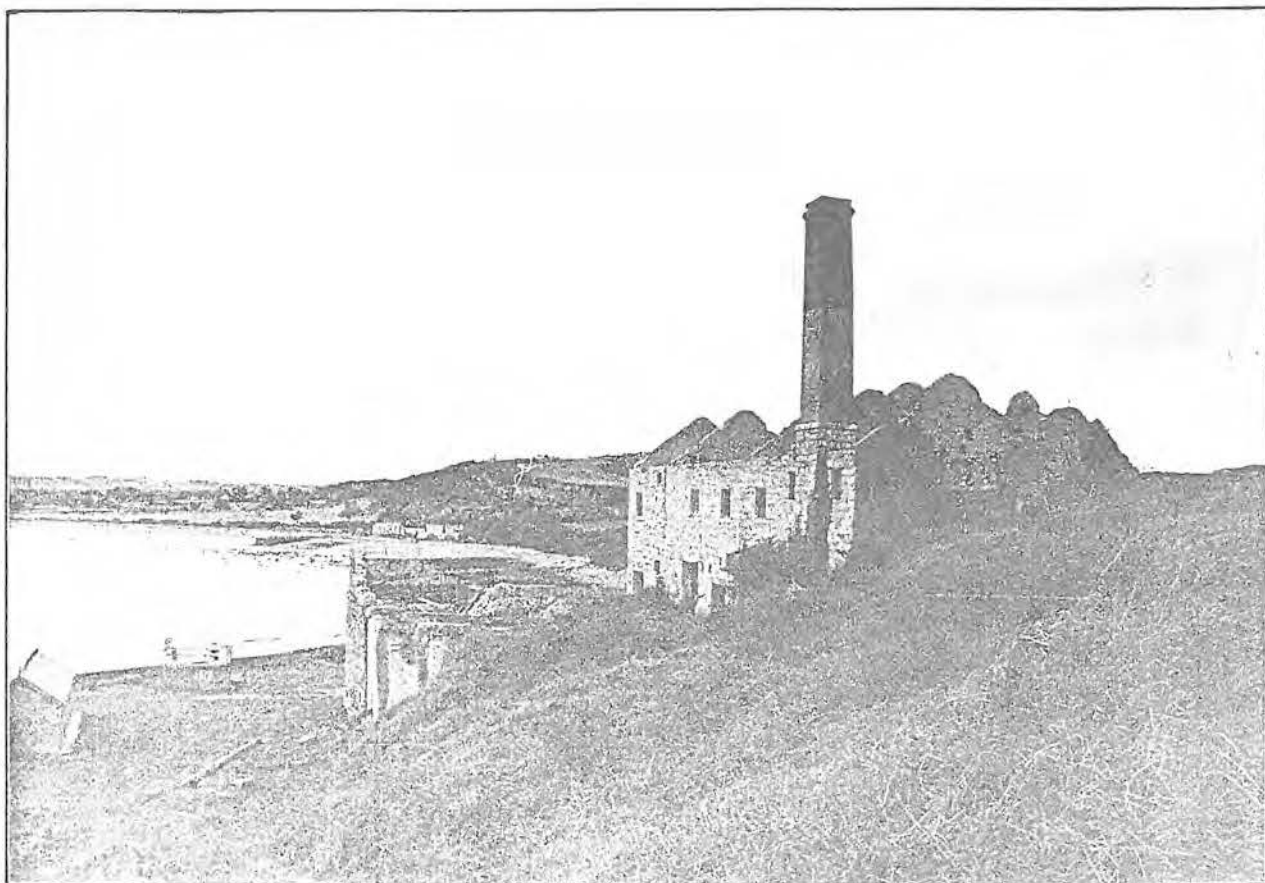
The site is dormant and the validity of the consent is uncertain, however, the permitted area encompasses the whole of Bryncastell Motte which is a Scheduled Ancient Monument (Cn 92).

105. RHOSYDD, Ffestiniog: Slate

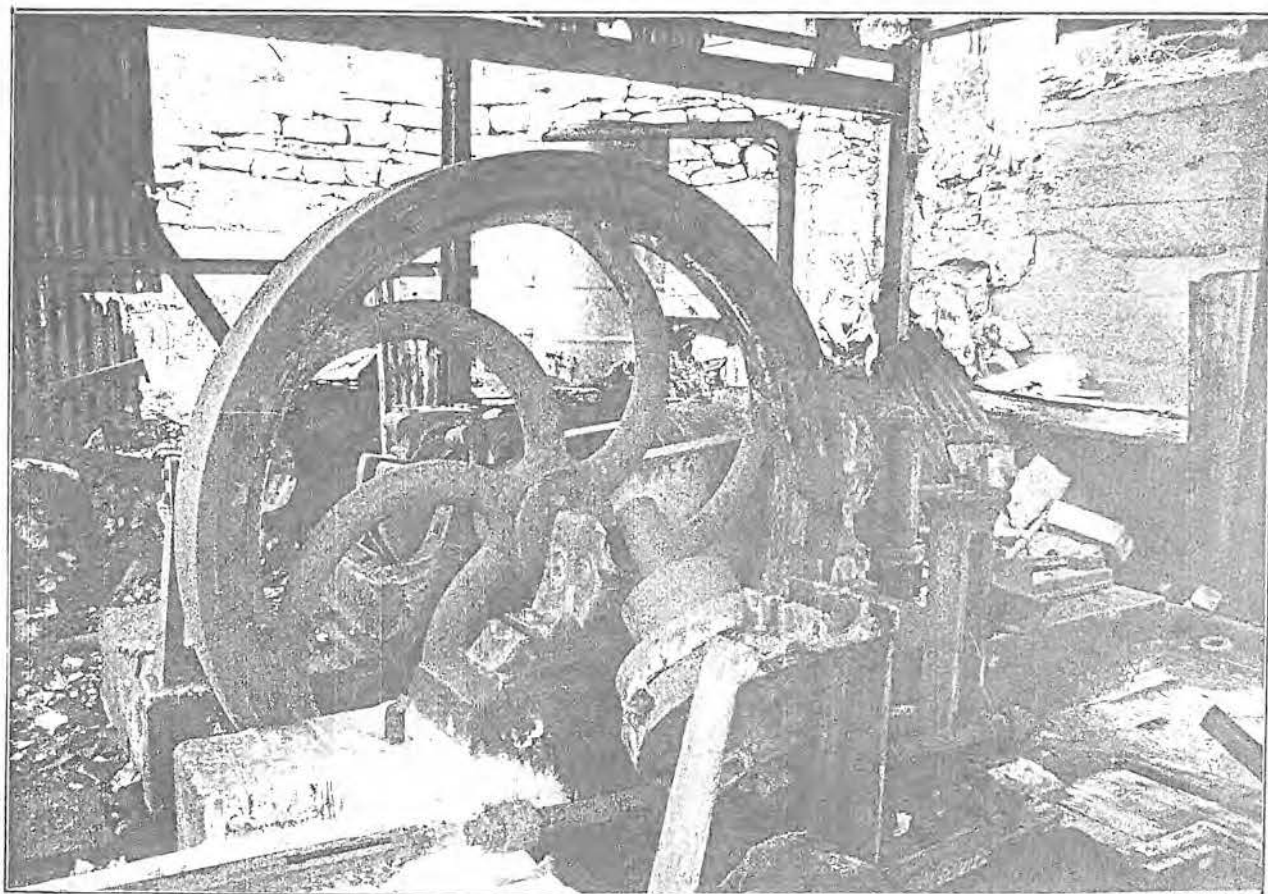
The site was not visited, but it is understood that a planning application to reopen this disused quarry is forthcoming. An archaeological assessment may be required.

109. SARNAU, Llandderfel: Sand and Gravel

A planning application for an extension to this quarry is forthcoming. There were no surface indications of archaeological remains in the area most likely to be affected, but an assessment would be desirable to determine the most appropriate archaeological response.



Site 93 Flagstaff Limestone Quarry - industrial remains



Site 92 Tan Dinas Limestone Quarry - early diesel engine

RECOMMENDATIONS

The following is a summary of recommendations arising out of the survey.

Minerals Planning

1. The Trust strongly urges ~~the~~ Gwynedd County Council to adopt the recommendations of this report as the best way forward to protect the archaeological heritage. This entails:
 - (a) the implementation of developer funding for rescue archaeology in any new mineral concessions granted, in accordance with the guidelines set out in the forthcoming Welsh Office Planning Policy Guidance document on Archaeology and Planning, and the CBI's Minerals Code of Practice;
 - (b) wherever possible, provisions are drawn up to safeguard archaeological sites not otherwise protected within existing active and dormant mineral consents.
2. Direct liaison at officer level between the Gwynedd Archaeological Trust and the Minerals Section of the Gwynedd County Council Planning Department to continue with regular meetings held at six-monthly intervals to appraise developments and formulate archaeological responses at the earliest possible stage.
3. The Trust makes available to the Minerals Section information it holds on archaeological sites in its Sites and Monuments Record for all minerals planning permissions currently regulated by the Planning Department.

Archaeology

4. The Trust has identified the following extraction sites where work is required to determine the most appropriate archaeological responses (full details in the Gazetteer, pp. 13-16).

A. Pre-Industrial Archaeology

(a) Current Planning Consents:

Site 2 - unworked concession, geophysical survey followed, if necessary, by trial excavations;
Site 3 - field survey of features possibly associated with destroyed fort;
Site 17 - geophysical survey followed, if necessary, by trial excavations on the area west of the burnt mound site excavated in 1984;

Site 40 - geophysical survey and trial excavations as required in the unworked parts of the current consent and around a possible burnt mound site;

Site 78 - watching briefs during landscaping of old waste tips;

Site 86 - field survey of potential archaeological features to the east of the quarry where working has extended beyond the current consent.

(b) Future Consents (should planning applications be submitted). Archaeological assessment by relevant methods at:

Site 5 - includes Scheduled site Cn 109;

Site 57 - new areas at Prysan;

Site 59 - further details of application awaited;

Sites 79 & 83 - areas N of the present workings;

Site 91 - in archaeologically sensitive area;

Site 99 - extensive area may be involved;

Site 107 - includes Scheduled site Cn 92;

Site 109 - new application forthcoming.

(c) Rapid field survey of the Llystyn area, Dolbenmaen (Sites 8 & 9, Fig. 7), where proven resources of sand and gravel are most likely to be extracted in the foreseeable future, and where there are a number of known archaeological sites and a high potential for new sites.

(d) Rapid field survey and assessment of the dormant Porth y Nant Quarry, Pistyll (Site 3, Fig. 4), where a concentration of known and hitherto unrecorded sites has been noted.

B. Industrial Archaeology

(a) Survey by the relevant authorities of features noted at the following sites:

Site 47 - limekilns;

Site 48 - underground and surface workings;

Sites 27, 79, 80, 81, 83, 87 & 88 - extensive slate workings.

(b) Rapid appraisal and catalogue by the Trust of the structural remains and archive sources relating to the abandoned granite quarries of north Llyn (Sites 3, 7, and 18) and limestone quarries of east Anglesey (Sites 91, 92 and 93). The case for Site 93, Flagstaff Quarry, is urgent (Fig. 5)

5. Following on to this survey, a similar survey is undertaken of mineral operations within the Snowdonia National Park.

INDEX OF SITES

1. Cefn Graeanog, Clynnog
2. Henbant Bach, Clynnog
3. Carreg y Llam, Pistyll
Porth y Nant, Pistyll
4. 'Rorsedd Bach, Llanystumdwy
5. Tyddyn Howel, Llanaelhaearn
Tan y Graig, Llanaelhaearn
7. Trefor (Yr Eifl), Llanaelhaearn
8. Llystyn Gwyn & Ganol, Dolbenmaen
9. Blaen y Cae, Dolbenmaen
12. Nanhoron, Botwnnog
17. Graeanog, Clynnog
18. Trwyn y Gorlech, Pistyll
Cae'r Nant, Pistyll
27. Pen yr Orsedd, Llanllyfni
29. Twll Coed, Llanllyfni
30. Tan yr Allt, Llanllyfni
31. Twll Llwyd, Llanllyfni
34. Dorothea, Llanllyfni
37. Dinorwig & Marchlyn, Llanddeiniolen/Llanberis
38. Bryn Fferam, Llandwrog
40. Peblig & Seiont Brickworks, Caernarfon
47. Nant y Gamar, Llandudno
48. Parys Mountain, Amlwch
49. Clogwyn, Rhosyr
51. Hengae, Rhosyr
53. Cae'r Glaw, Bryngwran
54. Graiglwyd Ganol, Valley
55. Bwlch Gwyn, Llanfihangel Ysgeifiog
57. Rhuddlan Bach, Llanfair Mathafarn Eithaf
Prysan, Llanfair Mathafarn Eithaf
58. Aber Strecht, Moelfre
59. Bryn Engan, Llanfair Mathafarn Eithaf
60. Creigiau, Moelfre
63. Ynys Uchaf, Llanfair Mathafarn Eithaf
64. Gwyndy, Bodffordd
70. (New) Fronheulog, Llanllyfni
74. Bwlch Farm (Ty'n y Felin), Llanfair Mathafarn Eithaf
78. Penmaenmawr, Penmaenmawr
79. Llechwedd, Ffestiniog
80. Maen Offeren, Ffestiniog
81. Oakley & Gloddfa Ganol, Ffestiniog
82. Cwmorthin, Ffestiniog
83. Diffwys Casson, Ffestiniog
Fotty & Bowydd, Ffestiniog
84. Manod & Graig Ddu, Ffestiniog
86. Minffordd, Penrhyndeudraeth
87. Aberllefenni, Corris
88. Gaerwen, Corris
89. Nant Newydd, Llanaugrad
91. Dinmor Park, Llangoed
92. Tan Dinas (Dinorben), Llanddona
93. Flagstaff, Llangoed

Are these
mineral sites or
archaeological sites?

why are there
gaps in the sequence?

- 94. Hafod y Wern, Betws Garmon
- 99. Bryngwdion, Llanllyfni
- 100. Penrhyn, Llandygai
- 105. Rhosydd, Ffestiniog
- 107. Llwydfaen, Talycafn
- 109. Y Sarnau, Llandderfel

NOTES

The Slate Quarries, which are situated on the South side of the Lakes of Llanberis, are worked under different circumstances ; some of them, being of the nature of a common, are subject to a small acknowledgment only.

