FRONGOCH METAL MINE GEOTECHNICAL TEST PITS ARCHAEOLOGICAL WATCHING BRIEF 2012

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SUMMARY

One of the largest mines in North Ceredigion, Frongoch is a lead and zinc mine situated near Pontrhydygroes in central Wales. Underground mining started at Frongoch in the mid 1700's and the mine was then worked almost continuously until 1903. It is estimated that with an estimated output of over 100,000 tons of lead and zinc ore, Frongoch was the most productive mine in Ceredigion. From 1924 to 1930 the huge dumps of waste material were reworked on a substantial scale and are now largely removed. The ruins of Cornish engine houses and other mine buildings now stand as a testament to a once thriving industry, whilst surrounding them is a near waste land pitted with the scars of the former mine workings.

Frongoch Mine (NGR SN7213 7440) has been discharging zinc and lead into the River Ystwyth catchment every year for the last century, making it one of the largest sources of heavy metal pollution in Wales. The Frongoch Metal Mine Remediation project has been established by the Environmental Agency to reduce and prevent the extent of metal discharge from the site.

The detailed design of the remediation scheme has yet to be agreed. To assist in the design of the remediation scheme, Atkins Limited engineering company excavated 8 test pits across the area of the mine workings. Given the national importance of the remains of the Frongoch Mine, Dyfed Archaeological Trust Field Services were appointed by the Environment Agency to carry out a watching brief during the excavation of the test pits, to ensure they were not located upon significant archaeological remains or any structures associated with the mine.

Due to the depth and instability of the material through which the test pits were excavated, it was not possible to enter the test pits to record the deposits accurately at any time. All recording had to be done remotely a safe distance from the sides of the trench.

Test Pit 3 confirmed the high potential for disturbing archaeological deposits in this area, and emphasised the difficulty in avoiding archaeological deposits if undertaking ground works in areas near the scheduled mine buildings and the former dressing floors of the mine. Test Pit 1, fell within an area defined as high archaeological potential, but due to the instability of the material through which the pit was excavated few archaeological deposits could be clearly identified.

Worked and shaped wood was recovered from a number of the trenches, including possible wooden conduits and indicate that manmade structures are still present below ground and could easily damaged by further remediation works.

All of the test pits were located purposefully to avoid known archaeological features, and other than buried features, no known remains were disturbed. Test Pit 5 revealed a possible ditch that may be associated with the former tramway which had been avoided by the test pit location. This showed that with careful positioning of any future works the disturbance of most archaeological features could be avoided.

Test Pits 6, 7 & 8 were situated in an area of low archaeological potential and no features of archaeological significance were seen during their excavation.

1. INTRODUCTION

1.1 Project Commission

1.1.1 The Frongoch Metal Mine Remediation project has been established by the Environmental Agency to reduce and prevent the extent of metal discharge from the site. To assist in the design of the remediation scheme Atkins Ltd engineering company have excavated 8 test pits across the area of the mine workings.

1.1.2 The Environment Agency previously commissioned Dyfed Archaeological Trust Field Services to produce an archaeological assessment of the mine and this established 6 separate zones of archaeological potential (DAT-FS 2012). These range from the northwest section of the mine that is designated as a Scheduled Ancient Monument (Ceredigion 146) to areas of fairly low archaeological potential. Three of the proposed test pits lie within an area of high archaeological potential (as defined in the assessment) and a further 5 lie within areas of medium or low potential.

1.1.3 Paul Edwards, on behalf of the Environment Agency, commissioned Dyfed Archaeological Trust Field Services (DAT-FS) to undertake the archaeological watching brief during groundworks at the site.

1.1.4 The watching brief was undertaken to adequately record any significant archaeological features encountered during groundworks associated with the test pitting scheme, thereby protecting the potential archaeological interests. A written scheme of investigation (WSI) was prepared by Dyfed Archaeological Trust Field Services prior to the works commencing.

1.2 Scope of the Project

1.2.1 The project objectives as laid out in the WSI were:

- *To monitor the ground works in order to ensure that the test pits are not located upon significant archaeological remains or any structures associated with the mine.*
- *To identify the presence/absence of any archaeological deposits.*
- *To establish, where possible, the character, extent and date range for any archaeological deposits to be affected by the proposed groundworks.*
- *To produce an archive and report of any results.*

1.2.2 A watching brief was undertaken during the excavation of the test pits over 2 days (8th and 9th February 2012).

1.3 Report Outline

1.3.1 This report describes the location of the site along with its archaeological background before summarising the watching brief results and the conclusions based on those results.

1.4 Abbreviations

1.4.1 Sites recorded on the Regional Historic Environment Record[1] (HER) are identified by their Primary Record Number (PRN) and located by their National Grid Reference (NGR). Dyfed Archaeological Trust Field Services – DAT-FS; Written Scheme of Investigation - WSI

1.5 Illustrations

1.5.1 Record photographs are included at back of the report. Printed map extracts are not necessarily reproduced to their original scale and are illustrative only.

[1] ***Held and managed by Dyfed Archaeological Trust, Shire Hall, Llandeilo, Carmarthenshire, SA19 6AF.***

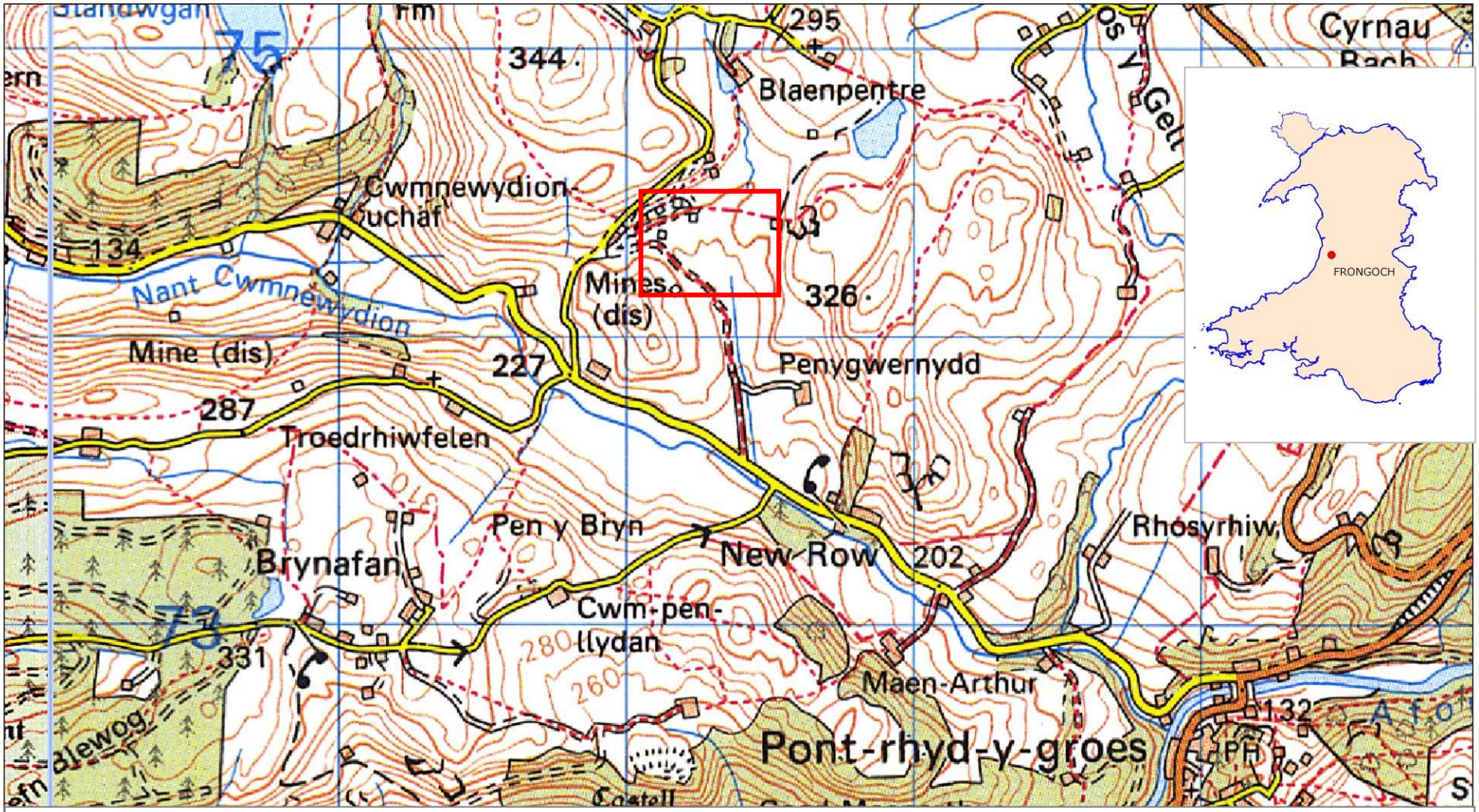

Figure 1: Location map of Frongoch Metal Mine site from the Ordnance Survey

2. THE SITE

2.1 Location and Topography

2.1.1 Frongoch Metal Mine is situated in a remote upland area northwest of the village of Pontrhydygroes, Ceredigion (Figure 1) at NGR SN7213 7440.

2.1.2 Frongoch Mine lies within an extensive upland area of moorland between 240 and 260m above sea level. Apart from conifer plantations and small stands of broadleaf woodland, it is virtually a treeless landscape. The field pattern is one of large, irregular enclosures. The earth banks that once divided the enclosures are now redundant or augmented with wire fences.

2.1.3 The physical remains of mining are much in evidence and form an important element of the historic landscape. Frongoch Mine buildings are of national importance, though in a poor state of preservation. The northern part of the site is now used as a sawmill. Associated with the mine are further landscape components such as spoil heaps, reservoirs and leats. The reservoirs in particular are dramatic elements of the landscape.

2.2 Industrial Archaeological Background

2.2.1. The continuous development that has occurred over the years at Frongoch, followed by the large scale removal of the waste dumps in the 1920s has left a varied collection of ruins dating from the mid-19th century through to the early part of the 20th century. These include the remains of three engine houses, a crusher house, a stamp 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. There are no structures that can be attributed to the period before the Taylors acquired the mine in 1834.

Most of the buildings are situated on higher ground along the northwest edge of the study area, but from beneath the tips and dumps across the rest of the area can be seen the walls of other structures that are not always as easy to identify.

2.2.2 The northwest section of the mine site, adjoining the road and containing two of the engine houses along with the crusher house and an office, is designated as a Scheduled Ancient Monument (Ceredigion 146).

2.2.3 The main buildings within the scheduled area are working from south-west to north-east:

1) An office, the last phase of which was built c.1900. This building has largely collapsed apart from the main masonry areas of the walls.

2) A pumping engine house *c*.1863. On its southeast side are 2 balance bob pits running in almost opposite directions, adjoining the shaft itself. The building is largely reduced to the main areas of masonry walls, and of these the more solidly-built pump house (on the northeast) survives better than the adjoining boiler house and coal store. The pumping engine house chimney collapsed during a storm in 1990.

3) An older engine house, somewhat more ruined than the other. The northwestern room appears to have been built from larger stones, more

solidly than the remainder, and this survives best, together with a corner of the northern room.

4) A crusher house, originally constructed around 1860, and later used as a winding house, perhaps after it was extended in about 1900. This building survives to a height of about 3m and a makeshift building has been constructed within the three walls of the original building. The wheel pit on the south side is nearly intact.

2.2.4 Other fragmentary structures are to be seen across much of the northern part of the study area, which undoubtedly still offers considerable potential for the survival of sub-surface archaeological remains, despite the loss of much surface evidence. The southern half of the complex was occupied in the main by extensive spoil tips and a large reservoir that supplied water to the ore-processing works at the Wemyss Mine, to which it was connected by a leat that is visible for much of its course. The area of spoil tips has been greatly disturbed during the 20th century and the reservoir has long been drained and its site is now barely identifiable.

3. METHODOLOGY

3.1 The relevant methodology for the watching brief was detailed in the WSI and can be summarised as follows:

- A 'watching brief' was undertaken at the commencement of groundworks at the site that had the potential to expose, damage or destroy underlying archaeological remains.
- The excavation of the test pits was monitored in order to ensure that they were not located upon significant archaeological remains or any structures associated with the mine.
- All archaeological deposits revealed during the groundworks were examined and recorded to an appropriate level.

3.2 The test pits were excavated by machine to an average depth of 4.5m where soil conditions allowed, and had a surface area of approximately 0.6m by 2m.

3.3 The archaeological watching brief consisted of two consecutive days to observe the excavation of the test pits. The work was carried out on the 8th and 9th February 2012.

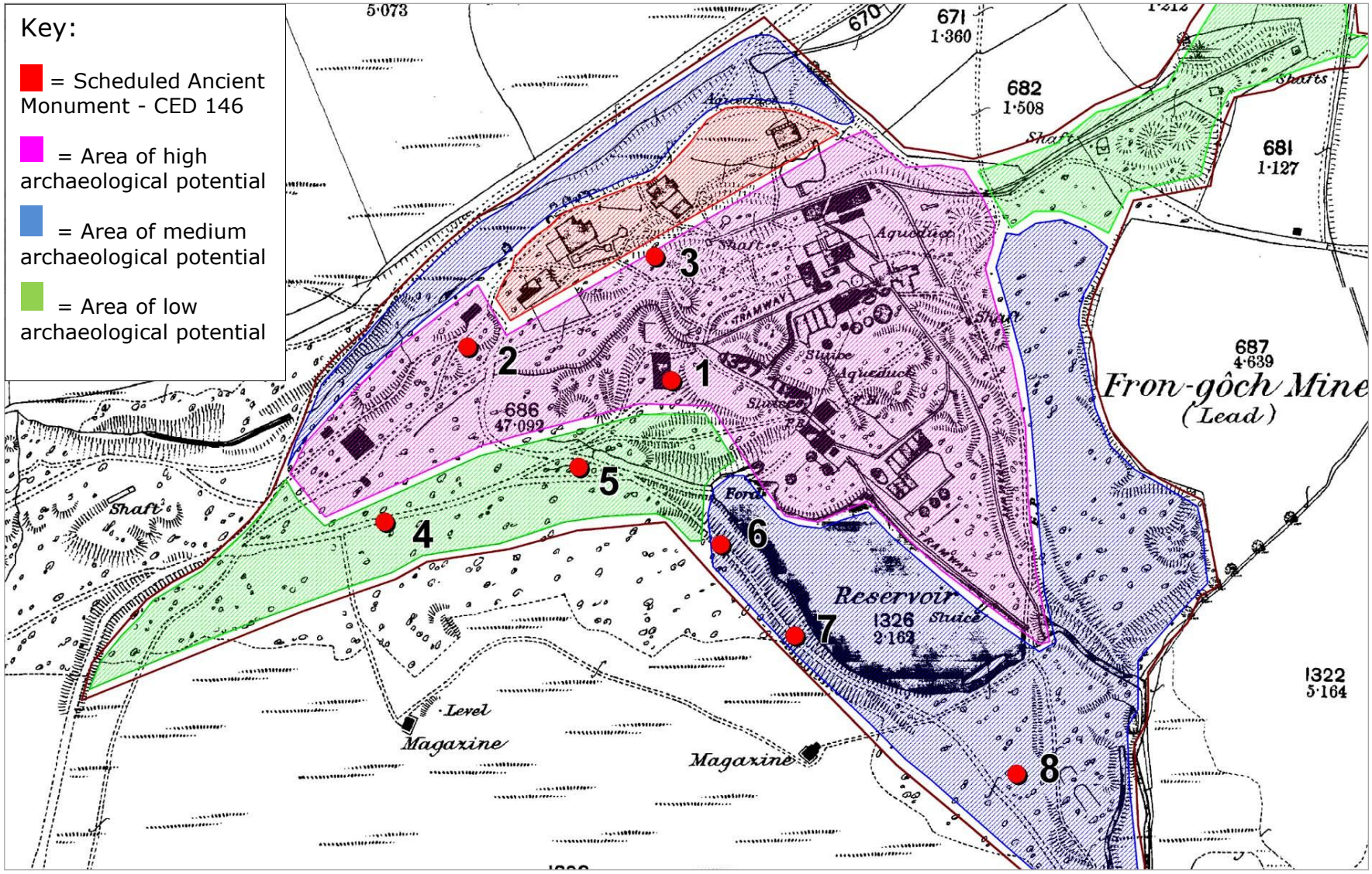

Figure 2: Plan of location of test pits as recorded during excavation. The areas of archaeological potential are as defined by DAT-FS (2012) and overlie an extract of the 1888 1st Ordnance Survey 25-inch map of Cardiganshire.

4 ARCHAEOLOGICAL WATCHING BRIEF RESULTS

4.1 Test Pit 1

Location: SN 72128 74359

4.1.1 Test pit 1 was excavated in the area of mine tailings (Photo 1) in close vicinity to the position of a former store building that can be seen in Figure 2. In 1996 this building, though a ruin, was still identifiable but since then it has been completely demolished and cannot now be identified on the ground. Excavation of the test pit was hampered by the character of the unstable material through which the pit was dug. The fine nature of the tailings and the large quantity of water flowing into the pit caused the sides to collapse and quickly undermine.

4.1.2 It was very difficult to see anything clearly, but in summary from the ground surface down approximately 1.5m of fine tailing material could be seen (Photo 2). Below this appeared to be a hard compact surface, possibly made of concrete. Underneath this surface was a much darker mixed deposit that contained a lot of peaty, humic material containing roots and pieces of wood. At about 3.20m depth within this darker material a wooden structure, conceivably a drain/conduit for water, could be seen in section, probably running in an east-west direction. The machine bucket had cut through it and lifted up what appeared to be wooden stakes that could have come from this structure (Photo 3).

4.1.3 The test pit was excavated to a depth of approximately 4.5m but had to be quickly backfilled as the sides were so unstable.

4.2 Test Pit 2

Location: SN 72021 74381

4.2.1 Test pit 2 measured roughly 2.0m by 0.80m and was aligned approximately northwest-southeast (Photo 4). It was located to the southwest of the ruined 'smithy' building. In section approximately 0.80m of mine waste, containing amongst other materials a great deal of barbed wire, lay above iron rich orange coloured silt that may indicate the presence of an earlier ground surface (Photo 5 & 6). Below this layer appeared to be undisturbed natural sands and shales that were excavated to a depth of 3.0m.

4.3 Test Pit 3

Location: SN72122 74425

4.3.1 Test pit 3 was excavated in the most sensitive archaeological area (Figure 2). The test pit measured roughly 2.0m by 0.80m and was aligned approximately northwest–southeast (Photo 7).

4.3.2 In the west, east and south facing sections could be seen a series of deposits that formed at least 3 layers of compacted tailings separated by layers of similarly sized pieces of ore bearing rock (Photo 8, 9 & 10). These deposits lay between 1.15m and 2.60m below the ground surface (Figure 3). Underneath this group of deposits was conceivably an old ground surface at approximately 2.60m, below which a darker layer containing rounded pebbles and pieces of quartz. Within this darker material at an approximate depth of 2.7m were the remains of a wooden drain/conduit visible in the west facing section of the test pit running in an east-west direction. The test pit was excavated to a depth of approximately 4.0m.

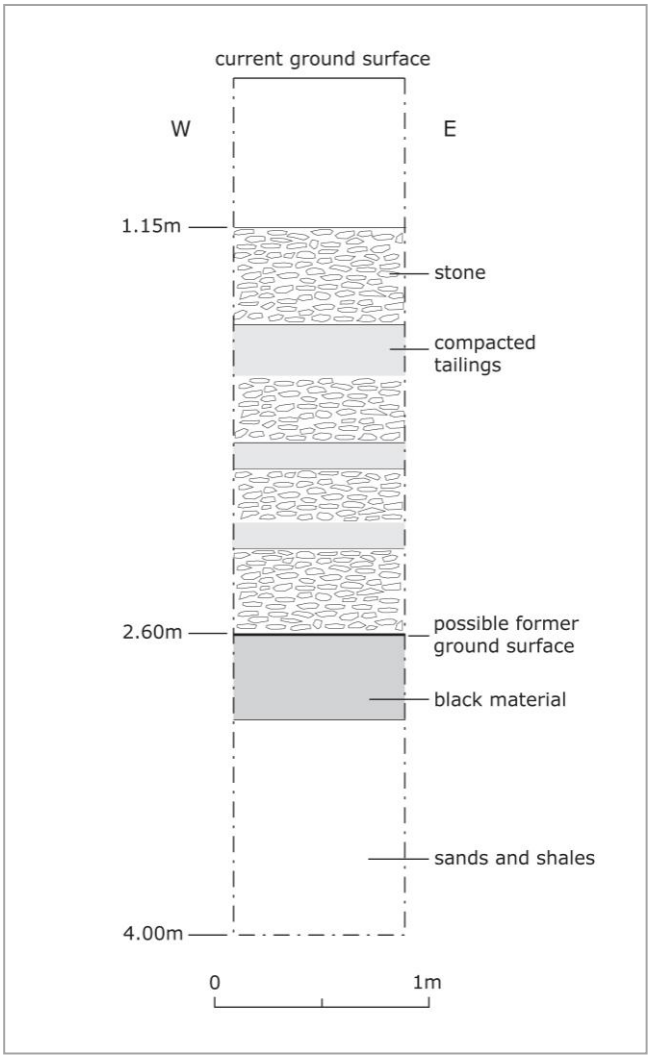

Figure 3: Sketch plan of south facing section of Test Pit 3 showing the accumulated layers of compacted tailings interspersed with layers of ore bearing stone. All measurements are approximate.

4.3.3 Towards the southern edge of the test pit, the machine brought up many large stones, remnants of wooden stakes and other pieces of wood. At this end of the trench the deposits were much looser and less densely compacted than at the northern end of the test pit. It is possible that the large stones and wood represent the vestiges of a revetment against which the compacted layers of tailings and stone abutted, perhaps creating a platform.

4.4 **Test Pit 4**

Location: SN71977 74289

4.4.1 Test pit 4 measured roughly 2.0m by 0.80m and was aligned approximately north-south (Photo 11). The test pit was excavated to depth of roughly 4.5m (Photo 12). No features of archaeological significance were seen during the excavation.

4.5 **Test Pit 5**

Location: SN72078 74315

4.5.1 Test pit 5 measured roughly 2.0m by 0.80m and was aligned approximately east-west (Photo 13). This test pit was excavated in the vicinity of the tramway that extended from Frongoch Mine to Wemyss Mine to the west. Although located to avoid hitting any significant archaeological deposits associated with the tramway, a 'U-shaped' linear

feature or ditch running roughly northeast-southwest was seen clearly in the south facing section, at the western end of the trench. It measured around 0.75-1.00m wide. The bottom of this linear 'ditch' was at approximately 1.50m from the ground surface. It is possible that the 'ditch' ran parallel to the tramway on its north side. It might even have been a result of scraping up material, perhaps on either side, to construct the bank on which the tramway sat. Below this at approximately 1.80m from the current ground surface were signs of an old ground surface, indicated by much darker gravelly material (Photo 14). The test pit was excavated to a depth of roughly 3.0m.

4.6 **Test Pit 6**

Location: SN72149 74274

4.6.1 Test pit 6 measured roughly 2.0m by 0.80m and was aligned approximately northeast-southwest. It was located on sloping ground to the west of the outer track (Photo 15). The test pit was excavated to a depth of roughly 3.5m (Photo 16). No features of archaeological significance were seen during the excavation.

4.7 **Test Pit 7**

Location: SN72186 74226

4.7.1 Test pit 7 measured roughly 2.0m by 0.80m and was aligned approximately northeast-southwest. It was located on sloping ground to the west of the outer track. The test pit was excavated to a depth of roughly 2.7m (Photo 17). No features of archaeological significance were seen during the excavation.

4.8 **Test Pit 8**

Location: SN72299 74153

4.8.1 Test pit 8 measured roughly 2.0m by 0.80m and was aligned approximately east-west. The test pit was excavated to a depth of roughly 3.0m. It was located in the far southeast area of the mine workings. A bright orange, iron rich silt layer seen clearly in section (Photo 18) could indicate the presence of a former ground surface. Above this lay re-deposited mine waste material and below it were layers of natural shales and sands. No features of archaeological significance were seen during the excavation

5. CONCLUSION

5.1 Due to the depth and instability of the material through which the test pits were excavated, it was not possible to enter the test pits to record the deposits accurately at any time. Therefore, all measurements and conclusions are the best assessments that could be made before the test pits were quickly backfilled.

5.2 The results from Test Pit 3 confirmed the high potential for disturbing archaeological deposits in this area, and emphasised the difficulty in avoiding archaeological deposits if undertaking ground works in areas near the scheduled mine buildings and the former dressing floors of the mine. This trench fell in an area of high archaeological potential as shown in Figure 2.

5.3 Test Pit 1, fell within the area defined as high archaeological potential (Figure 2), but due to the instability of the material through which the pit was excavated few archaeological deposits could be clearly identified, although worked shaped wood brought up by the excavator would indicate that manmade structures were disturbed and remain present.

5.4 Other fragmentary structures are to be seen across much of this area of mine tailings, which undoubtedly still offers considerable potential for the survival of sub-surface archaeological remains, despite the loss of much surface evidence.

5.5 Test Pit 2 was located towards the northwestern limit of the area of high archaeological potential (Figure 2) and was positioned to avoid archaeological features. It revealed no significant archaeological deposits, but did show the disturbed nature of the re-deposited material above the natural bedrock in this area.

5.6 Test Pits 4 & 5 were situated in an area of medium archaeological potential (Figure 2) and were positioned to try and avoid known archaeological features. No features of archaeological significance were seen during the excavation of Test Pit 4, but Test Pit 5 revealed a possible ditch that may be associated with the former tramway. This showed that with careful positioning of any future works the disturbance of most archaeological features in this area of medium potential could be avoided.

5.7 Test Pits 6, 7 & 8 were situated in an area of low archaeological potential (Figure 2) and no features of archaeological significance were seen during their excavation.

6. SOURCES

6.1 Maps

Ordnance Survey 1888 - First Edition Ordnance Survey 25-inch map of Cardiganshire.

6.2 Unpublished

Murphy, F., 2012 *Frongoch Metal Mine Remediation Project Archaeological Assessment*, Dyfed Archaeological Trust Report No.2012/11

PHOTOGRAPHS

Test Pit 1

Photo 1: Excavation of Test Pit 1.

Photo 2: View of Test Pit 1 looking east showing sides subsiding into pit.

Photo 3: Wooden stake recovered from Test Pit 1.

Test Pit 2

Photo 4: View of Test Pit 2 looking east.

Photo 5: View of Test Pit 2 looking northeast.

Photo 6: View of Test Pit 2 looking north.

Test Pit 3

Photo 7: View of Test Pit 3 looking northeast.

Photo 8: View of Test Pit 3 looking northeast showing detail of layers of compacted tailings interspersed with layers of ore bearing stone.

Photo 9 (left): View of Test Pit 3 looking northeast showing detail of layers of compacted tailings interspersed with layers of ore bearing stone.

Photo 10 (below): View of Test Pit 3 looking southeast showing detail of layers of ore bearing stone.

Test Pit 4

Photo 11: Excavation of Test Pit 4.

Photo 12: View of fully excavated Test Pit 4 looking approximately east.

Test Pit 5

Photo 13 (left): View of Test Pit 5 looking approximately west.

Photo 14 (below): View of Test Pit 5 looking approximately north.

Test Pit 6

Photo 15: Excavation of Test Pit 6.

Photo 16: View of fully excavated Test Pit 6 looking approximately northwest.

Test Pit 7

Photo 17: View of fully excavated Test Pit 7 fully looking approximately west.

Test Pit 8

Photo 18: View of fully excavated Test Pit 8 looking approximately west.

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Swydd / Position: Archaeologist

Llofnod / Signature F.A. Murphy ..... Dyddiad / Date 13.03.12

Mae'r adroddiad hwn wedi ei gael yn gywir a derbyn sêl bendith
This report has been checked and approved by JAMES MEEK

ar ran Ymddiriedolaeth Archaeolegol Dyfed Cyf.
on behalf of Dyfed Archaeological Trust Ltd.

Swydd / Position: HEAD OF FIELD SERVICES

Llofnod / Signature James Meek ..... Dyddiad / Date 13.03.12

Yn unol â'n nôd i roddi gwasanaeth o ansawdd uchel, croesawn unrhyw sylwadau sydd gennych ar gynnwys neu strwythur yr adroddiad hwn

As part of our desire to provide a quality service we would welcome any comments you may have on the content or presentation of this report

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