Heritage
Recording Services Wales

Cwm Rheidol Lead Mine, Ystumtuen - Ground Investigation Works

Archaeological Watching Brief

By

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HRSWales
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ARCHAEOLOGICAL WATCHING BRIEF

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Prepared for:

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On behalf of:

The Coal Authority

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The following report presents the results of an Archaeological Watching Brief during ground investigation works in the form of a series of trial pits at the Cwm Rheidol Lead Mine, Ystumtuen, Ceredigion (centered on OS grid reference SN 7297 7821), in advance of and to inform development proposals for Blow-out Prevention Works.

In summary, the watching brief during the groundwork investigation works in the two areas managed to establish the character of the below ground surface in the targeted areas. Of the seven (7) trial pits excavated only one of the trenches exposed a significant find, Trial Pit No.7, where a length of un-mounted tram rail became exposed, protruding in the south facing section of the trench. The tram rail was left in situ as it appeared to be fairly long and would have damaged the section of the trench. However, its presence clearly demonstrates that there are significant mine working remains in the form of finds still present within the spoil and scree surrounding Adit No.9, finds which will need to be given careful consideration in any future ground works in this area.

1 Introduction

1.1 The following report presents the results of an Archaeological Watching Brief during ground investigation works in the form of a series of trial pits at the Cwm Rheidol Lead Mine, Ystumtuen, Ceredigion (centered on OS grid reference SN 7297 7821), in advance of and to inform development proposals for Blow-out Prevention Works.

1.2 The specific objectives of this work were to:

- Undertake a watching brief during all groundwork for the cutting of seven (7) trial pits. This entailed archaeological supervision during all penetrative groundwork for the proposed trial pits.

1.3 The Technical Appendices for this report contains the following information:

Appendix I: Figures;
Appendix II: Photographs
Appendix III: Archive Cover Sheet

Site Location & Description *(see Figures 1 - 4)*

1.4 The Cwm Rheidol mining complex is 15km east of Aberystwyth, Ceredigion, and includes the mines of Ystumtuen, Penrhiw, Bwlchgwyn and Llwynteifi. The earliest definitive reference to mining in the area dates from 1698 at Ystumtuen, and over the following centuries the mines were developed and worked intermittently under numerous owners and various combinations. By the late 19th century these four mines were all connected underground, enabling the extensive workings to drain to the River Rheidol via adits No. 6 and No. 9, which emerge on the steep valley slopes at Cwm Rheidol. Here, a mill processed the ore to remove the waste rock before it was carried on an aerial ropeway to the Vale of Rheidol Railway on the opposite side of the valley, and then on to Aberystwyth.

1.5 Today the underground workings continue to drain from adits No. 6 and No. 9, both of which are highly acidic and contain significantly elevated concentrations of metals including zinc, lead and cadmium. These discharges are subsequently contributing to the River Rheidol failing European Water Framework Directive (WFD) standards for zinc and cadmium for 18km downstream of the mine to its tidal limit. The Rheidol catchment is impacted by many other abandoned metal mines and also fails WFD standards for zinc and cadmium upstream of Cwm Rheidol. The results of ecological impact assessments to date have been equivocal with fish population studies showing surprising tolerance of salmon to zinc concentrations in the Rheidol, which average more than ten times WFD standards in places.

1.6 The Cwm Rheidol Metal Mine is located within the Registered Historic Landscape (RHL) of Uplands Ceredigion and lies directly within the Historic Character Area (HCA) of the Rheidol Valley (HCA 131) but is linked by sub surface mining to the Rheidol Valley Woodland (HCA 55) and Ystumtuen (HCA 59). There are no designated scheduled or listed sites within the red line study area.

Background Information

1.7 In 2007 National Resources Wales (NRW) diverted a stream to prevent it flowing into a shaft, reducing the volume of contaminated discharge. This was followed in 2008 by the draining down of adit No. 9 to reduce the risk of a catastrophic minewater blow-out, which has occurred periodically in the past. In 2009 NRW captured the discharges from both adits in pipes, preventing them from eroding the spoil tips and mobilising more metals. The pipes transfer the discharges to a pilot-scale Vertical Flow Pond (VFP) passive treatment system.

1.8 NRW commissioned the HERO Group at Newcastle University to carry out laboratory trials to assess the suitability of various substrates for the pilot VFP. These included ochre pellets (from coal minewater treatment residues) and paper waste, but the best results were obtained using mixtures of farm manure, woodchip and digested sewage sludge with crushed whelk shells or limestone. This combination successfully promoted microbial reduction of sulphate and precipitated metals as sulphides, but required "feeding" with methanol to sustain performance in the longer term. A similar mixture, with cockle shells, is being used in the pilot VFP treatment system, which has been in operation since September 2010. Removal rates of up to 99% have been achieved for zinc, lead and cadmium, although there is significant fluctuation in zinc removal, which averages ~60%.

1.9 NRW have periodically removed the build-up of ochre from the surface of the treatment media to maintain flow through the system. It may therefore be preferential to pre-treat the adit discharges to remove iron before they enter a full-scale VFP. NRW have calculated the size of a full-scale VFP required to treat the two discharges, and in 2014 commissioned CH2M Hill Ltd to assess the availability of land to construct such a treatment system as well as a pre-VFP ochre treatment pond. NRW are continuing to monitor the site to better understand the long-term performance and maintenance requirements of the VFP, and to reduce the risk of any future mine water blow-out.

Benefits of Remediation Works

1.10 Approximately 8 tonnes of harmful metals would be prevented from entering the River Rheidol each year.

- The River Rheidol will be more likely to achieve Good Ecological Status, although there are other mining pressures on the catchment that will need to be addressed.
- Reduced metal load to the Cardigan Bay Special Area of Conservation.
- The stream diversion has reduced surface water ingress to the mines, reducing the volume of contaminated discharge.
- The pipeline has reduced erosion and the mobilisation of metals from the spoil tips.
- The pilot VFP will further our understanding of passive treatment for heavy metals removal.

1.11 In order to design a suitable treatment system NRW are seeking a methodology to compile a longer term metal mines remediation programme across Wales as a whole. The programme will identify potential annual progression of sites towards remediation over the next fifteen years, incorporating

checks at critical decision points to ensure only sites which are technically feasible and pass cost benefit assessments progress.

1.12 As a result of this remediation programme, a feasibility study of the Cwm Rheidol Metal Mine was undertaken in early 2019 and the Cultural Heritage and Archaeology of the mine will play an important role in any decision and design making processes for the proposed blow-out prevention works.

Development Proposals

1.13 Because of the potential risk of a blowout at Adit No.9, as a mitigation strategy measures are to be constructed to direct any flow from the adit toward a 'lagoon' to the south adjacent to the Afon Rheidol as well as undertaking works to the adit itself, which may require slope stabilisation works to the rear of the adit and excavation of the adit structure into the hillside. The ground investigation works were required to understand the stability of the existing slopoes, the access track and the platform area in front of the adit. To further inform the design making process a program of ground investigation works is to be undertaken. These works are split into two phases.

1.14 *Phase 1* investigations are to confirm the nature of the scree material and to inform the Contractor to determine the method for obtaining the results for Phase 2. Works locations are shown in the attached figure drawing.

1.15 The Contractor will undertake two (2) trial pits on the existing scree slope around Adit 9, Two (2) trial pits on the access track and three (3) trial pits within the 'lagoon' area.

1.16 Trial pits are to be a maximum of 2 meters in depth and will not undermine and adjacent slope, track or other feature. Trial pits are to be reinstated to match existing levels and finish upon completion of the *Phase 1* Works. The excavation of each of these trial pits will be supervised under archaeological watching brief conditions

1.17 The *Phase 2* works will consist of five (5) dynamic bore-hole tests around the entrance to Adit 9 and the Lagoon area. The tests shall extend to 10m below surface or to refusal. Testing shall be undertaken at 1m intervals. These dynamic test will not be supervised under archaeological watching brief conditions. However the data gathered from these tests will be made available and included in the final archaeological report.

Historical & Archaeological Background *(see Figures 5 - 7)*

1.18 What follows is a summary history of the Ystumtuen Mines taken from David Bick's work in 1975, Simon Hughes work undertaken in 1993 and Ioan Lord's recent 2018 work, with further references made to William Waller's and Lewis Morris's survey in the 18th Century. This section is also a transcript from an earlier feasibility study undertaken on the Cwm Rheidol Lead Mine by this author in early 2019.

1.19 The Ystumtuen Mine, also known as the Cwm Rheidol Led Mine was one of the largest mines in the Valley. It contained high amounts of Pyrite and Marcasite. It was also a high producer of Zinc. Over the years the mining of this has resulted in the exposed pyrite and marcasite lodes to react with oxygen and water and has decayed into sulphuric acid laden with polluting metals including zinc, cadmium and aluminium. Intermixed with this cocktail is dissolved ferrous iron which has oxygenated to form yellow ochre (LORD 2018).

1.20 The history of the Cwm Rheidol Lead & Zinc Mine (NPRN: 33828 / PRN: 5472) is a fairly complicated one, intimately and physically connected to all of the other mines in the landscape surrounding Ystumtuen, both below ground and on the surface. The history is also sometimes confounding given that it is strewn with continually changing owners, shareholders and investors with financial concerns, as well as the perplexity over frequently changing mine names and titles.

1.21 The earliest definitive references to mining in the Ystumtuen area are found in the Nanteos Estate documents, where a lease was granted to Sir Humphrey Mackworth and William Waller in 1698. In the same year Waller describes the Lead Mines of *Yftimtean*, where he had superintended the driving of a fifty yard cross cut into the Sun Vein (South Lode). From the intersection with the lode he had driven 33 yards along the lode and was working a rich bunch at 50 yards below the surface.

1.22 However, by 1704 Mackworth's enterprises failed and on the 22nd of February the mine was re-let by Powell of Nanteos to *The Company of Mine Adventurers*.

1.23 In 1709 the *Company of Mine Adventurers* fell into disrepute on account of fraudulent accounting, Waller was dismissed from his post and Mackworth kept a low profile within the Company from then on.

1.24 The Mines Adventurer's lease expired in 1727 and their agent is recorded as having destroyed the pumps, infilling open workings and removing cranches. At about this time some attention was given to following the lodes to the east and a minor discovery of ore was made at the neighbouring property of Pen y Berth or Berth Ddu, later to become the Penrhiw Mine, but still within the confines of the Nanteos Estate. However, in their search for ore, they explored beyond the Crown Boundary and discovered a productive vein at Bwlch Gwyn about the year 1735.

1.25 By 1742, some 500 tons of ore had been raised from the new mine with the royalties being paid to Thomas Powell and no authority to work the mine having been granted by the Crown. The whim shaft was ultimately sunk to about 75 metres / 246 feet to connect with the Ystumtuen No. 3 or 46 fathom level.

1.26 By 1754 the Ystumtuen Mine was abandoned and then leased to one Chauncey Townsend. In 1770 James Townsend, Chauncey's son, appointed Thomas Bonsall as his manager. Bonsall took over control of many of the sites circa 1780 and ran them in a rather ruthless and uncaring manner. His mismanagement was usually in the form of bad working practices. Few records have survived

regarding the history and development of the Ystumtuen, Penrhiw and Bwlchgwyn Mines during the latter half of the eighteenth century.

1.27 By 1810 the Bwlchgwyn ownership problems appear to have been resolved with the Crown having granted the mine to the Powells of Nanteos.

1.28 A valuable insight into the mines of the area is provided by Walter Davies in 1815 who simply describes 'Ystum Tien' as an old mine, granted by the Crown to the Nant Eos family.

1.29 In 1822 the Alderson Brothers & James Raw moved from Swaledale to Cardiganshire to establish a mining business; commencing with the Cwmystwyth Mine, and then joined in 1824 by the Ystumtuen Mine. Initially, this exercise was most productive and justified the building of a lead smelter at Devil's Bridge in 1827 but, lead prices then declined rapidly which resulted in their insolvency in 1834.

1.30 In order to overcome the water problem at Ystumtuen Mine, the Aldersons & Raw partnership commenced driving a deep adit cross cut from the Rheidol Valley which, after 432 metres, was to intersect the lode at about 140 metres below the outcrop. This task appears to have taken about 3.5 years to complete and is believed to have been started in 1824 (LORD 2018).

1.31 This adit is known by a multitude of names :- Aldersons Level, the 78 Fathom Level, the Deep Adit, *Level Fawr* and most recently as the *Cwmrheidol No. 6 Adit* (PRN: 96416).

1.32 Other developments which took place during this period, to permit natural drainage, were that two winzes were put down 13 fathoms / 23.7 metres from the shallow level at the bottom of the Whimsey Shaft to a new drift called Raw's Level - later to be called the 40 fathom or the No. 3 level. About 8 fathoms / 14.6 metres below this Owen's or Reese's level, later called No. 4 or the 48 fathom level, was driven as a drift to both the east and west with a 17 fathom shaft dropping into the No. 6 or Alderson's Level. This was later known as the No. 1 Rise.

1.33 In 1834, when the Aldersons were declared bankrupt, Lewis Pugh of Aberystwyth purchased the remaining 10 years of the lease on the Nanteos Mines, which included Ystumtuen and Bwlchgwyn.

1.34 Under Pugh's tenure, the worst accident recorded in the area occurred in the March of 1839 when four men were drowned. According to the Mining Journal of the 20th April, they were drowned by holing into an old flooded shaft in the Ystumtuen Mine, but a local clergyman records that the cause was due to a scaffold breaking beneath four men and precipitating them into a sump.

1.35 Lewis Pugh's tenure ended in 1844 and the Nanteos Estate then granted the mines to the highly reputable firm of John Taylor & Son. The Ystumtuen, Penrhiw and Bwlchgwyn Mines were owned by the Nanteos Estate, and the three appear to have been let together for the previous century. However; in the mid 19th century, Penrhiw passed out of the Nanteos Estate and into the hand of the Williams family of Llanfrothen.

1.36 The documentation of these mines is greatly improved after 1845 when Sir Robert Hunt started compiling the Mineral Statistics as part of the function of the Geological Survey. These show the output of individual ores, the ownership and management of the mines on an annual basis and assist greatly with subsequent chronicling. It is recorded that in 1845 the Penrhiw & Ystumtuen Mine were being worked jointly as the Nanteos Mine under the auspices of John Taylor and that Penrhiw produced 46 tons of rather inferior grade lead ore by the efforts of 36 persons.

1.37 Between 1850 and 1854, very little appears to have changed at these mines. Nanteos remained fairly buoyant and eventually merged with Penrhiw in 1855 and some minor interest was being shown in the Tynyfron Mine but this did not result in any development.

1.38 The merging of Nanteos with Penrhiw appears to have been precipitated by the possibility of being able to drain Bwlchgwyn through the 46 fathom level of the Penrhiw Mine. Alderson's Adit or the No. 6 Level was then driven east towards the Penrhiw 46 fathom level; the levels holed through in the April of 1856 but the Penrhiw 46 lay about 5.4 metres / 18 feet above the No. 6 which was smoothed out by building a long ramp between the levels rather than tipping the ore into a chute and thus creating unnecessary double handling.

1.39 In 1859 the amalgamated mines of Ystumtuen, Penrhiw and Bwlchgwyn were let to J.H. Murchison & Co. who ran them as 'The Nanteos Mines'.

1.40 In 1869 Murchison produced a revised report on mining as an investment within which are his version of the operations which he had formerly managed. The mines were now known as The Nanteos Consols Mine and were under the management of Thomas Phips Thomas - a rather unsavoury colleague of Murchison who was also involved in some rather shady dealings with the Francis Brothers of Goginan and J. J. Attwood, a solicitor cum financier who had moved to Aberystwyth……Under Murchison, the Bwlchgwyn Mine seems to have fallen into a state of dilapidation as the Nanteos Estate were very concerned about the condition of the buildings shortly after Attwood had taken the lease. Attwood also made a proposal to the Estate that they let him convert the Bwlchgwyn offices into a mine agent's house which does rather reflect how little was being done at Bwlchgwyn Mine.

1.41 Below ground, in 1861 a 24 foot diameter waterwheel and wheelpit was installed underground at Level Fawr at the 10 Fathom Level to pump and draw water. This wheel was assembled entirely underground in candle light. Unfortunately it was only in operation for just over 1 year after the level was declared worthless. The 10 Fathom Level and wheelpit was accessed in 2017 by the Welsh Mines Preservation Trust. A reconstruction drawing of the waterwheel is given by Ioan Lord in his recently published work. On the surface, the railroad through the No. 6 adit terminated at the head of a double acting incline which lead to the dressing floors (PRN: 96420). The mill was (PRN: 96419) driven by a 30 foot waterwheel of 3 foot breast to which was attached a set of 30 inch rolls to reduce the ore to a sufficient size for the jigging machines and buddles.

1.42 The neighbouring Tynfron Mine had still not been amalgamated with the Ystumtuen / Cwmrheidol Mine and was being developed under the management of Robert Northey, of Bwlch Consols Mine, at this time.

1.43 In the early 1870s, lead had risen to the same high value as it commanded in the 1850's, but by 1880 had slumped to its 1830 price and this decline continued until about 1895. It was not until the stimulus and subsidies of the First World War that the value of lead rose to 1850 and 1870 levels. To promote the Cardiganshire lead mines, Captain Absalom Francis published his '*History of the Cardiganshire Mines*', in 1874, which contains further accounts of these mines.

1.44 In the 1870s, the Aberystwyth and Ystumtuen Mines were again let to new companies in 1875 and Bwlchgwyn in 1878. The Ystumtuen Lead & Sulphur Mining Co. only survived for part of 1875 and '76 and the mine was taken up by the Ystumtuen Lead Mining Co. Ltd. later that year. They relinquished their lease in 1881. George Green, a local foundry owner took up the lease in 1882 but relinquished it the following year. Ystumtuen then lay idle in 1884 and '85 and was amalgamated with Penrhiw in 1886, Tynyfron was then included within this Sett in 1890. The Bwlchgwyn Mining Co. was re-formed in the June of 1890 by Captains Nicholas Bray and James Phillips of Goginan, formerly the lessees of Tynyfron. This venture was even shorter lived than their previous attempt and was suspended in the following year.

1.45 The 1890s was a decade of miserable prices for base metals and only the Penrhiw Mine, amalgamated with Ystumtuen & Tynfron managed to avoid liquidation by suspending the work, they were forced to lay off their miners in 1894 and the dressers in 1895.

1.46 The Penrhiw, Ystumtuen & Tynyfron Mining Co. relinquished their rights in 1899 and in 1900 the Tynfron and Ystumtuen Mines were taken up by the Belgian owned Rheidol Mining Co. Ltd., both mines were managed by F. De Bal.

1.47 Initially, both mines appear to have been undergoing maintenance, development and refitting as there is no record of production on either site. It would appear that this company almost completely rebuilt the dressing mill and finished off the driving of the No. 9 Adit. Beneath the old Ystumtuen Mine, by way of the Cwmrheidol adits, they employed 12 miners to put the mine in order and at Tynyfron 8 miners were employed; Whilst on the surface at Cwmrheidol, a further 12 men appear to have been engaged to put the plant in order.

1.48 By 1901 the number of employees had increased to 36 underground and 40 on the surface at Cwmrheidol with no one at Tynyfron. A bulk sample from Ystumtuen Mine was milled and yielded 10 tons of 70 % Lead Ore and 68 tons of 36.7 % Zinc Ore. F De Bal and Henry Nottingham managed the mines, with the old mine surveyor, Henry Francis being retained.

1.49 De Bal departed from Tynfron and Ystumtuen in 1902 leaving the management to Henry Nottingham. Neither site produced any ore despite there being 39 men employed below ground and another 18 on the surface. In 1901 Francis re-surveyed Ystumtuen and Tynyfron as a single site, but

there are manuscript additions on his original map which suggest that it was the working plan for the developments which took place after this date. These additions include the No. 9 Adit (PRN: 96424) and the tramway (PRN: 96425) to Tynyfron and it must be concluded that the large labour force which was taken on was for the purpose of these developments. Other additions included a Crushing House (PRN: 96427) and a further dressing floor to the south (PRN: 96432). The new dressing floor included a stationary and a revolving picking table, a stone breaker, a chat mill, 10 Trommels, 7 five compartment Jiggers, 8 four compartment Jiggers, 2 Wilfey Vanning Tables, 1 Jones Sliming Table a3 Round Buddles (LORD 2018). The Dressing Mill complex was constructed of timber frame clad in corrugated iron set on stone and concrete foundations. The mill was built on the hillside in the form of six terraces. It was lit by electricity powered by hydro from a turbine house built on the riverbank to the south in 1901. Water was brought to the turbine via a large leat some 10 foot deep and wide in places, much of it adapted from an earlier leat that served the Caecynon Mine. This leat ran parallel with the river before crossing it using a spanning aqueduct mounted on masonry and concrete pillars, now absent but recorded photographically by the RCAHMW in the 1980s. From here the leat then left the ground and the water was taken along a 200 foot long wooden flume *(see Figures 32 - 34).*

1.50 In 1903 the company produced zinc blende valued at £6,020. Peak production for the Rheidol Mining Co. was reached in 1905 when 46 tons of lead and 1537 tons of zinc ores were produced and sold for £10,609, this gave employment to 70 miners and 36 surface workers.

1.51 In addition to this, Pyrite was also being sold, but the annual production is not given, however, the quantity appears to have been about 1/3rd of the blende tonnage. viz: about 400 tons in 1904 and 500 tons in 1905. The output of the Cwmrheidol Mine then started to decline after 1905 and apparently work at Tynyfron Mine was suspended from 1903 until 1912.

1.52 The Great War created problems for the Rheidol Mining Co., and coupled with the response of the British Government in shrouding domestic mineral production in a cloak of secrecy has resulted in very little information being available on these mines during this period.

1.53 There was no activity at Cwmrheidol in 1915 whilst Penrhiw is recorded as having sold 76 tons lead concentrate and 33 tons of zinc blende from the efforts of 12 men underground and 7 on the surface. Penrhiw was in production in 1916 and can only have sold a few tons of ore and it would seem that Cwmrheidol Mine was still suspended on operating only on a care and maintenance basis.

1.54 A valuable insight into the state of affairs at Cwmrheidol is provided by Astley, a government geologist, who visited the site on the 30th of August 1917 and noted that the mine had been closed since 1914.

1.55 The same year the mine was purchased by Anderson & Anderson of London, a company who may have been involved with improvements in the dressing of poor ores. They employed 26 below ground and 12 on the surface in 1920, this was reduced to 1 below and 12 above in 1921, and when they sold the site in 1922, 2 men were employed below ground with another 6 on the surface. There

are no records of production available during these years but it cannot have been a significant amount and it is unlikely that any development work took place. Conveyances also show the involvement of one Alfred James Hodgkinson Carrington on the 27th of September 1918, but he appears to have taken a passive role until the mid 1920's.

1.56 In 1923 the Saron Anthracite Collieries Ltd. of London took over the Rheidol Mine from Anderson & Anderson and employed 2 miners with 2 surface workers. This was reduced to a single miner and two surface workers in the following year and in 1925 and '26 only David Mason of Ystumtuen was employed as the caretaker.

1.57 Saron then appear to have relinquished the mine, but there is evidence to suggest that they let it to A.J.H. Carrington, a Consulting Mining & Civil Engineer of Lancaster Gate, London. Carrington appears to have been assembling a portfolio of mines in the Rheidol Valley since the end of the Great War with the intent of working them collectively.

1.58 In the September of 1926, Carrington supplied details of the Rheidol and other mines to John Agnew of Consolidated Goldfields, one of the most eminent engineers in the world at that time, with the running of a joint venture project in mind. However, the financial climate was wrong and insufficient details could be given regarding the tonnages and grades of the reserves remaining in the mine.

1.59 In May 1938 The Saron Anthracite Collieries Limited sold the mine to Maurice Moulton Dandrick of Austin Friars House in the City of London, but with Carrington and the Andersons to have Rights of Way over it.

1.60 Dandrick was a European refugee who had fled to London in the mid 1930's. His background was never fully revealed, he always tried to give an air of affluence and superiority but his character and behaviour was deemed to be devious and filled with half-truths.

1.61 Dandrick it seems saw the mine as a good business opportunity, especially with the increasing hostilities in Europe, and very soon after the declaration of war in 1939, he was trying to persuade The Ministry of Supply to give him money to assist the war effort. Had he not been in financial difficulty at the time, and asked for a realistic sum he may have received a better response.

1.62 Several government geologists visited the Rheidol Mine in 1940 and failed to substantiate the picture which Dandrick had set. The mine was only partly accessible and had not been worked or maintained for years and yet it was stated that he had spent tens of thousands of pounds on care and maintenance. The geologists were only able to view the lode in one place and the results of their sampling was rather disappointing. The pyrite, which was much needed to ensure the domestic supply of sulphur, was contaminated with zinc and silica and was only of "acceptable" quality. Dandrick tried to re- write the geologists reports on the mine to promote it and again saw nothing wrong with this. The Cwmrheidol plant was said to be used as a central ore dressing facility for his other mines; Professor David Williams of the Royal School of Mines was told by Dandrick that they had produced 500 tons of lead concentrate from a new mine near Tre'r Ddol but Williams was

familiar with the site and considered that it had probably only produced about 25 tons of crude ore containing maybe 5 or 10 tons of concentrate (HUGHES 1993).

1.63 In April 1951, Dandrick pressed the Board of Trade to help develop the mine but they turned him down. At about this time, the portal of No. 9 collapsed.

1.64 Throughout the later 1950's Dandrick seems to have been content with the revenue which ochre sales were bringing in from the mine. By this date the mill had been emptied and three undercover settling tanks had been constructed to collect ochre from the No. 6 Adit. These settling tanks are still present on the site.

1.65 In the early 1960s Dandrick was running three companies on the strength of the Cwmrheidol Mine. By mid 1960 Dandrick had sold part of the mine as a joint venture to a contractor, wherein an agreed amount of work would be done on the mine. The contractors moved onto the site to commence deep core drilling at the portal of the No. 6 Adit. When this was completed, the contractors moved to the portal of the No. 9 Adit and commenced clearing a drilling platform. Up to this point, Dandrick was resident at Cwm Rheidol but then moved to London and never returned to the area.

1.66 Originally, this drill platform was only supposed to be about 4 metres square but the manager decided that it would be more convenient if it was 7 metres square and then thought that 10 metres square would be better. The portal of No. 9 Adit had collapsed in the 1950's and it was not appreciated that a considerable head of water had accumulated behind the fall.

1.67 During the final stages of excavation, the digger driver noticed that ochreous water was being emitted from fresh tension gashes and went to report the matter to the mine manager, Mr Grant. However, very soon a large volume of highly acidic ochreous water blew out the remains of the plug and caused considerable pollution to the River Rheidol. Due to a number of other factors, Grant was replaced with Mr Matt Blick as mine manager.

1.68 Blick then repaired the open portal of No. 9 adit, cleared the ochre, re-laid the old rails, installed an air main and compressor, and finally cut a chamber for a drill rig at 358 metres / 1175 feet in. Six or eight men were employed on these works. With the drill rig now located about 40 metres south of the South Lode in the No. 9 Adit the length of the hole which was necessary was reduced to 99 metres / 325 feet. Three holes were drilled from this chamber before the mine was once again abandoned in the autumn of 1970.

1.67 Since then, the mine has stood idle, Continental Mining became involved with Andex Mines of Vancouver and the operation was taken over by Shannon Mining & Manufacturing circa 1973. Shannon was eventually wound up when it transpired that it was part of a scandalous international fraud. Maurice Dandrick died in about 1975 and his solicitor, Derek Sparrow, continued to administer the Mineral Holdings Corporation until it was wound up in the late 1990s (HUGHES 1993).

1.68 Archaeological & Research Work

1.69 Although the significant historic descriptions and plans by both William Waller and Lewis Morris have offered invaluable information about the Ystumtuen Mines of the 17th and 18th centuries, it wasn't until the beginning of Industrial Archaeology that interest in lead mining in Wales began to emerge as a serious archaeological concern. One of the pioneers of this interest in lead mines of mid-Wales was of course the late David Bick who wrote a series of informed books in the mid 1970s, a series that are now seen as essential to any library on the history of lead mining. David Bick also wrote books on William Waller and Lewis Morris and as such helped spur interest in the history and archaeology of lead mines in Wales. David Bick was also the founder of the Welsh Mines Society in 1979, from which was born the Welsh Mines Preservation Trust in 1991, who have worked closely with Cadw and the Royal Commission (RCAHMW) over the years to help preserve and record these forever decaying mines.

1.70 In 1993 Robert Protheroe-Jones of the National Museum of Wales undertook a survey of the Cwm Rheidol Lead Mine as part of the Ceredigion Metal Mines Survey. This survey as well as recording the condition and character of the lead mines, also raised some important issues regarding the condition and preservation of the mines across Ceredigion as whole. In 2002 Paul Sambrook of the Dyfed Archaeological Trust (DAT) undertook the Cambria Archaeology Metal Mines Project, which intended to address scheduling issues raised by the Protheroe-Jones rapid survey. Regarding the Cwm Rheidol Lead Mine, the 2002 DAT report describes the mine as being "amongst the best preserved of the mine sites in the district in terms of surface remains. The Crusher House and ore preparation area are well preserved and the bulk of the mine area relatively undisturbed, despite the loss of elements of the standing structures recorded here during the 1970s and 1980s, such as timbers and tin sheet roofing and walling…. The mine remains an impressive landscape feature, particularly due to the reddish hue of some spoil tips derived from the processing of ochre mined at the nearby Tynyfron site……It is recommended that the mine be considered for scheduling on the basis of the range and condition of the structures and mining features that survive, as well as their high landscape value" (SAMBROOK 2002, p9). Still, neither the mine, nor any of its standing structures, has been given scheduled status. However, although the mine is not a designated site, it is considered to be of schedulable quality and given that the mine lies within a significant Historic Character Area within a registered historic landscape then it is considered to be a high value site, where preservation of standing surface remains are an important consideration.

1.71 More recently, Ioan Lord published his book *'Rich Mountains of Lead: The metal mining industry of Cwm Rheidol and Ystumtuen'*, in which the history of the mines in the Cwm Rheidol are fully described and illustrated with old photographs and plans of the mines and their levels. As well as having recorded much of the underground of the mines in the valley Lord has also made invaluable surface plans.

1.72 In Feb/March 2019 HRS Wales undertook the heritage and archaeological element of a comprehensive feasibility study for the Coal Authority on behalf of Natural Resources Wales as part of proposed remediation works associated with the existing metal pollution in the Rheidol River.

Geology

1.15 The geology of the area falls within the Undifferentiated Llandovery Rocks consisting of Mudstone, Siltstone and Sandstone.A fault at rockhead also runs from Cwm Rheidol and Ystumtuen and continues northeast.

2 Aims & Objectives

2.1 The aims of the watching brief, as defined by the CIfA (2014) were to:

- Allow a rapid investigation and recording of any archaeological features that are uncovered during the proposed groundwork.

- Provide the opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the watching brief are not sufficient to support the treatment to a satisfactory or proper standard.

3 Methodology

Watching Brief

3.1 The archaeological watching brief was undertaken by HRS Wales staff using current best practice from 19th - 20th September 2019.

3.2 All work was carried out by a suitably qualified archaeologist with relevant level membership of the Chartered Institute for Archaeologists (CI*f*A) and followed the CI*f*A Standard and Guidance for an archaeological watching brief (CI*f*A 2014).

3.3 All proposed groundwork was undertaken under close and constant archaeological supervision. All groundwork by the contractor was undertaken using a mechanical digger with a toothless grading bucket. In areas of woodland a toothed bucket was used to remove tree stumps.

3.4 All archaeological deposits or features when encountered were to investigated and recorded. All finds recovered during the watching brief were to be bagged and a grid coordinate was taken using a handheld GPS device in order to locate the findspot with the OS national grid.

3.5 Any recording required was to be carried out using HRS Wales recording systems (pro-forma context sheets etc), using a continuous number sequence for all contexts.

3.6 Where considered necessary plans and sections were drawn to a scale of 1:50, 1:20 and 1:10 as required and related to Ordnance Survey datum and published boundaries where appropriate.

3.7 All features identified were tied in to both the OS National Grid and all local site and ground plans.

3.8 Photographs were appropriated in digital format, using both a 18 mega-pixel DSLR camera in RAW format, to be exported later to TIFF format.

4 Results of Watching Brief *(see Figure 4)*

4.1 The archaeological watching brief was undertaken over a period of two(2) days from 19th September to the 20th September 2019.

4.2 Because of the potential risk of a blowout at Adit No.9, as a mitigation strategy measures are to be constructed to direct any flow from the adit toward a 'lagoon' to the south adjacent to the Afon Rheidol as well as undertaking works to the adit itself, which may require slope stabilisation works to the rear of the adit and excavation of the adit structure into the hillside. The ground investigation works were required to understand the stability of the existing slopoes, the access track and the platform area in front of the adit.

4.3 In total seven(7) trial pits were to be excavated, three(3) in the area of the 'lagoon', one(1) immediately southeast of Adit No.9 in a platform area, one(1) immediately west Of Adit No.9 at the base of a slope and two(2) positioned along the former tramway track immediately west of Adit No.9 that links Cwm Rheidol Lead Mine with the former Tynyfrom Lead Mine. Each trial pit was to measure approximately 1m x 2m and reach a maximum depth of approximately 2 meters.

4.4 In order to gain access for the machine and subsequent drilling platform to the 'lagoon' area, a temporary access track was made through an area of woodland on the bend of the trackway that climbs the slope from the road leading to the former trackway that links Cwm Rheidol Lead Mine with the former Tynyfron Lead Mine.

4.5 All number enclosed in () refer to contexts encountered.

4.6 Temporary Access Track

4.7 Groundwork for the creation of a temporary access track was undertaken by a machine using a 2 meter wide grading bucket. Following clearance of a short length of woodland the machine scrapped the ground surface and then created a ramp using scree and spoil over existing twin walled pipes that take water away from Adit No.6. This allowed access to a small platform area overlooking the 'lagoon' area. Again, the machine then had to scrape part of the scree/spoil to create a ramp down into the lagoon area in order to undertake the excavation for the Trial Pits (No's. 1-3). The creation of this temporary access track exposed no archaeological features and the only deposits exposed were scree and spoil made up of sandstone grit and mudstone. No finds were exposed.

4.8 Trial Pit No.1

4.9 This trial pit was excavated at the far east end of the 'lagoon' area. This trial pit measured approximately1.5m x 2m and reached a depth of 2.10m. The first approximately 1.2 meters of deposit encountered in this trench was a loose orange/yellow sandstone grit (100). Directly below this to the base of the trench was a loose mudstone (101). No finds became exposed in this trench.

4.10 Trial Pit No.2

4.11 This trial pit was excavated at the far southern end of the 'lagoon' area. This trial pit measured approximately1.5m x 2m and reached a depth of 2.00m. The first approximately 0.60 meters of deposit encountered in this trench was a loose orange/yellow sandstone grit (200). Directly below this was a lense of mid grey/blue powdered slate or mudstone (201). This apparent lense deposit measured only 0.10m in depth. Directly below this deposit was a loose sedimentary deposit made up of consecutive layers of sand, silt and grit, suggestive of years of water and mine-water run-off from the spoil heaps to the north This sedimentary layer continued to the bottom of the trench. No finds became exposed in this trench.

4.12 Trial Pit No.3

4.13 This trial pit was excavated at the far west end of the 'lagoon' area. This trial pit measured approximately 1.5m x 2m and reached a depth of 2.00m. The first approximately 0.40 meters of deposit encountered in this trench was a loose pale yellow sandstone grit containing irregular shaped stones with roots from gorse vegetation (300). Directly below this was a yellow/orange sand and grit (301). Directly below this deposit was a further fine lense of yellow sandy grit (302), which sits directly over a deposit of loose irregular mudstones averaging between 0.05 - 0.10m in size (303). No finds became exposed in this trench.

4.14 Trial Pit No.4

4.15 This trial pit was positioned at the far west end of the of the track/former tramway leading to Adit No.9. This trial pit measured approximately1.5m x 2m and reached a depth of 1.80m. The first approximately 0.10 meters of deposit encountered was a compacted mudstone surface (400). Directly below this compacted deposit was a fairly loose natural mudstone with strata leaning from north to south (401). No finds became exposed in this trench.

4.16 Trial Pit No.5

4.17 This trial pit was positioned in the central area of the of the track/former tramway leading to Adit No.9. This trial pit measured approximately1.5m x 2m and reached a depth of 1.80m. The first approximately 0.10 meters of deposit encountered was a compacted mudstone surface (500). Directly below this compacted deposit was a fairly loose natural mudstone with strata leaning from north to south (501). No finds became exposed in this trench.

4.18 Trial Pit No.6

4.19 This trial pit was positioned at the base of a slope at the far east end of the track/former tramway leading to Adit No.9. This trial pit measured approximately1.5m x 2m and reached a depth of 2.00m. The first approximately 1 meter of deposit encountered was a stable deposit of mining waste consisting of mudstone grit intermixed with an orange and grey clay (601). Directly below this was a fairly loose natural mudstone with strata leaning from north to south (601). No finds became exposed in this trench.

4.20 *Trial Pit No.7*

4.21 This trial pit was positioned on a small platform area alongside Adit No.9. This trial pit measured approximately1m x 2m and reached a depth of 1.90m. The first approximately 0.75m of deposit encountered was a loose sandstone grit (700). Within this deposit, protruding from the south facing section by approximately 0.40m was a short length of former iron (Fe) tram rail. This mine working find is positioned approximately 0.40m below the surface. This tram rail does not appear to be laid, but is a loose remnant of a former tramway that has become part of mine spoil. Directly below this was a further loose sandstone grit (701). Toward the base of this last deposit (701), at the far east end of this trench, was a modern un-perforated white drainage pipe, approximately 0.20m in diameter. No further finds became exposed in this trial pit.

5. Conclusion

5.1 The archaeological watching brief during groundwork investigation works in the two areas at the Cwm Rheidol Lead Mine, managed to establish the character of the below ground surface in the targeted areas. Of the seven (7) trial pits excavated only one of the trenches exposed a significant find, Trial Pit No.7, where a length of un-mounted tram rail became exposed, protruding in the south facing section of the trench. The tram rail was left in situ as it appeared to be fairly long and would have damaged the section of the trench. However, its presence clearly demonstrates that there are significant mine working remains in the form of finds still present within the spoil and scree surrounding Adit No.9, finds which will need to be given careful consideration in any future ground works in this area.

6 Acknowledgements

Thanks to;Ross Mcdermott for all his patience and understanding during the groundwork.

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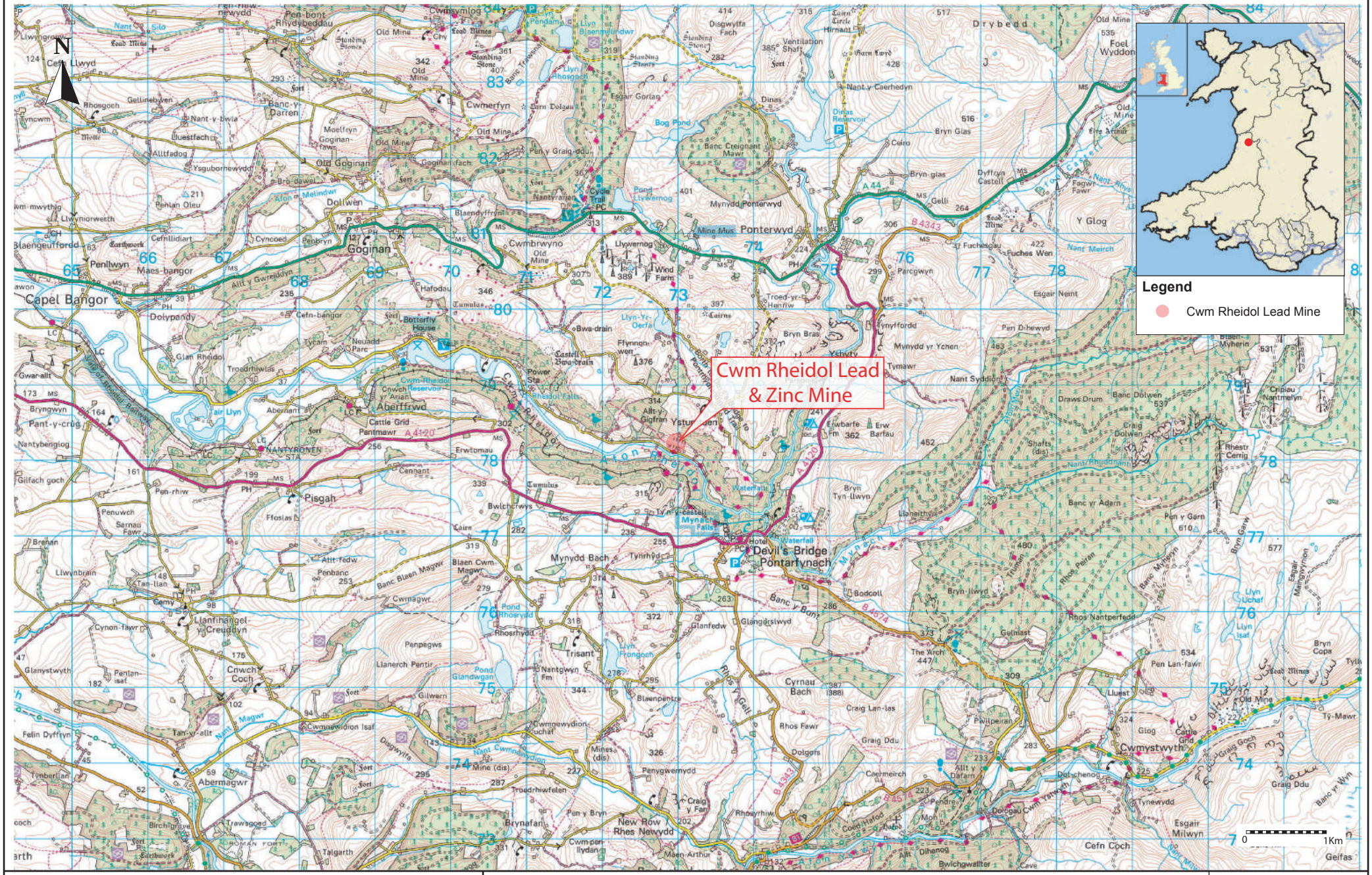
Cartographic Sources

- Ordnance Survey 1st Edition map of 1886 (1:10560);
- Ordnance Survey 2nd Edition map of 1906 (1:10560);
- Ordnance 1964 (1:10560);

APPENDIX I:
Figures



Project Title: Cwm Rheidol Lead & Zinc Mine - Feasibility Study	
Date: Sept 24th 2019	**Approx. Scale** (@ A4):
Drawn by:	**Drawing No.**

Figure 1.

Location Map (OS 1:50,000 Landranger)

Heritage Recording Services Wales

Project Title: Cwm Rheidol Lead & Zinc Mine - Feasibility Study	
Date: Sept 24th 2019	**Approx. Scale** (@ A4):
Drawn by:	**Drawing No.**

Figure 2.

Location Map (OS 1:25,000 Explorer)

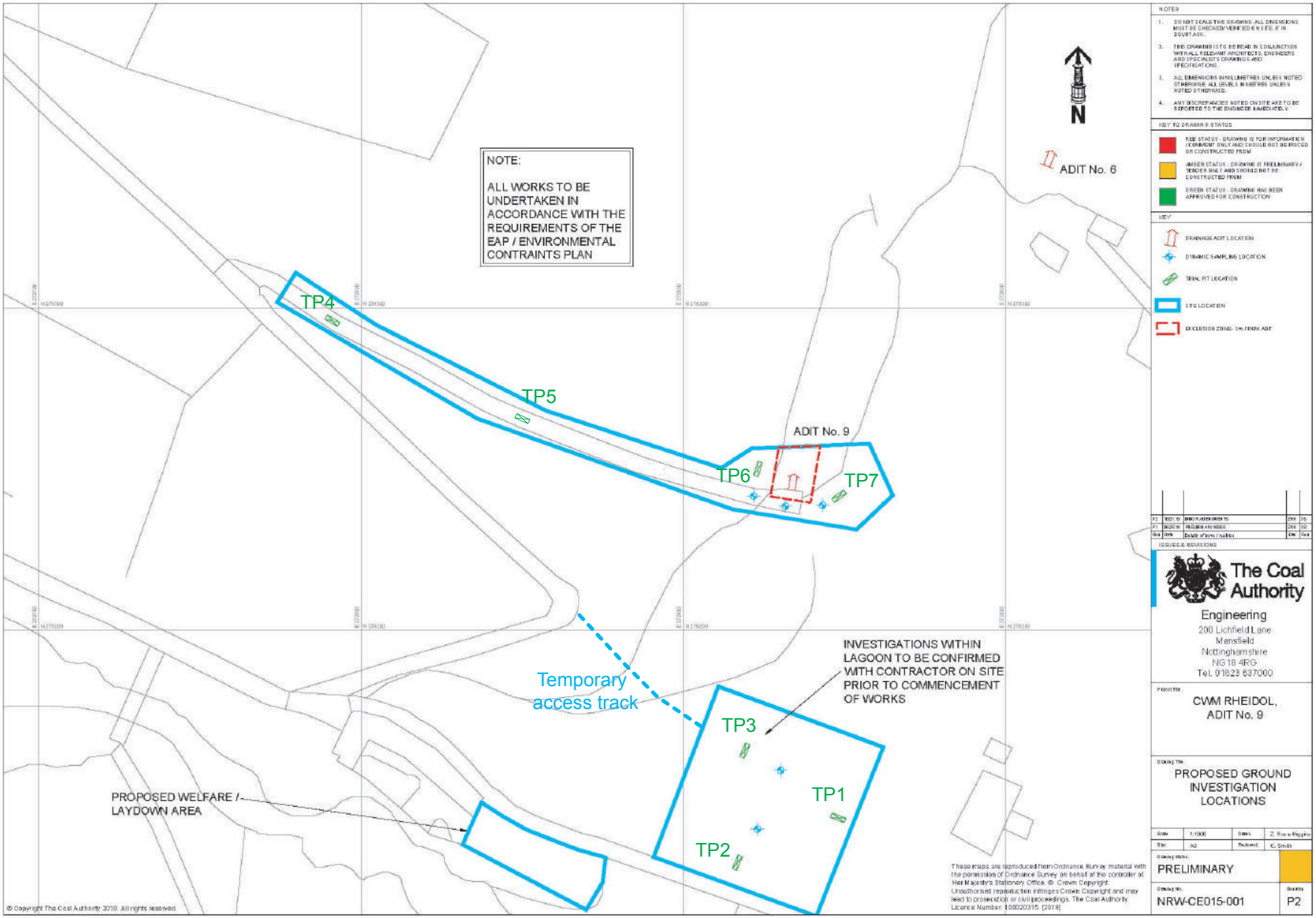
Heritage Recording Services Wales

Project Title: Cwm Rheidol Lead & Zinc Mine - Feasibility Study	
Date: Sept 24th 2019	**Approx. Scale** (@ A4):
Drawn by:	**Drawing No.**

Figure 5.

Aerial photo (2014) within Cwm Rheidol Lead Mine showing proposed areas 1 and 2 where ground investigation required.

Heritage
Recording Services Wales

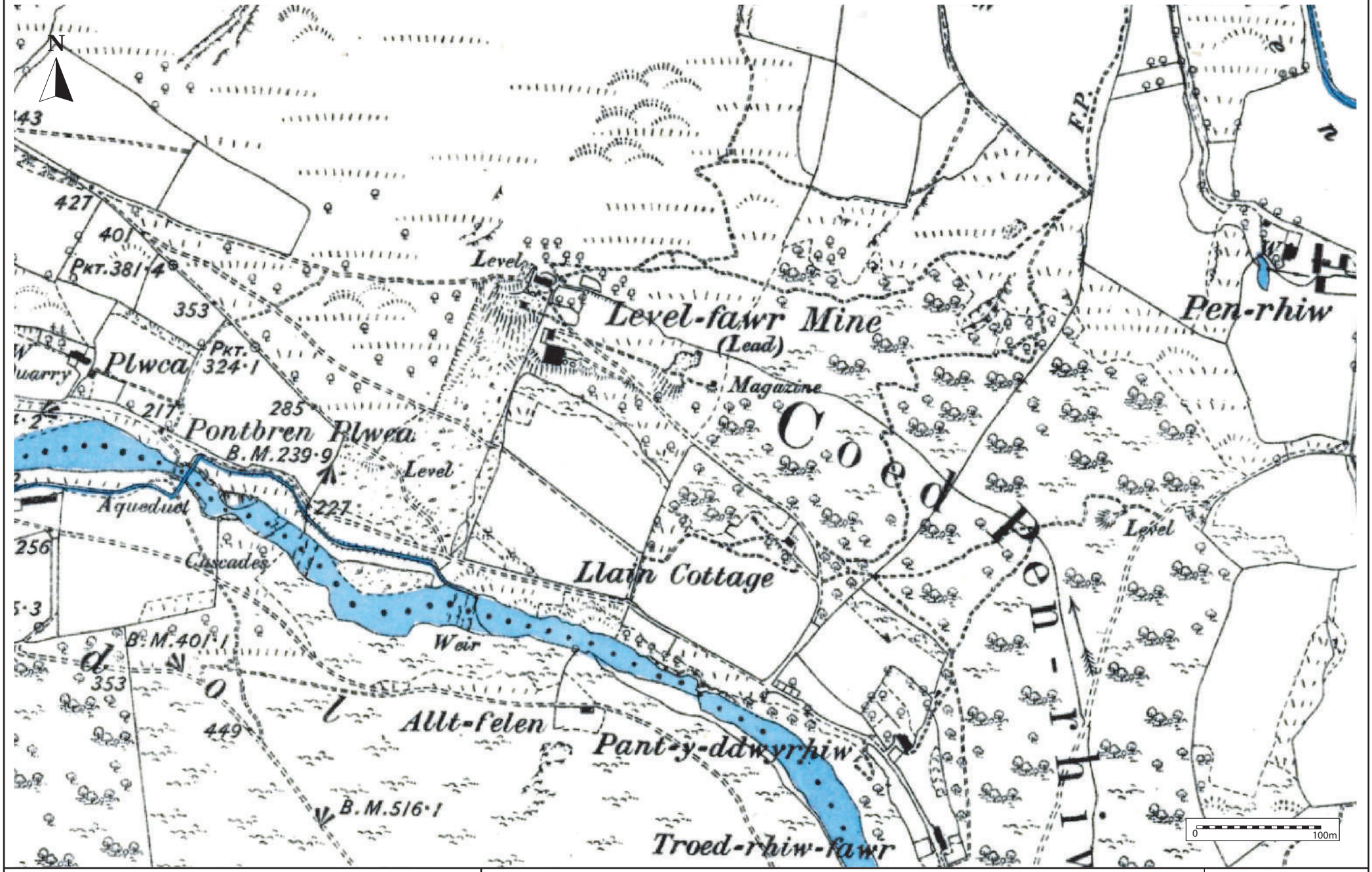


Project Title: Cwm Rheidol Lead Mine, Ystumtuen	
Date: Sept 24th 2019	**Approx. Scale** (@ A4):
Drawn by:	**Drawing No.**

Figure 4.

Proposed ground investigation locations. Position of trial pits marked in green.

Heritage Recording Services Wales

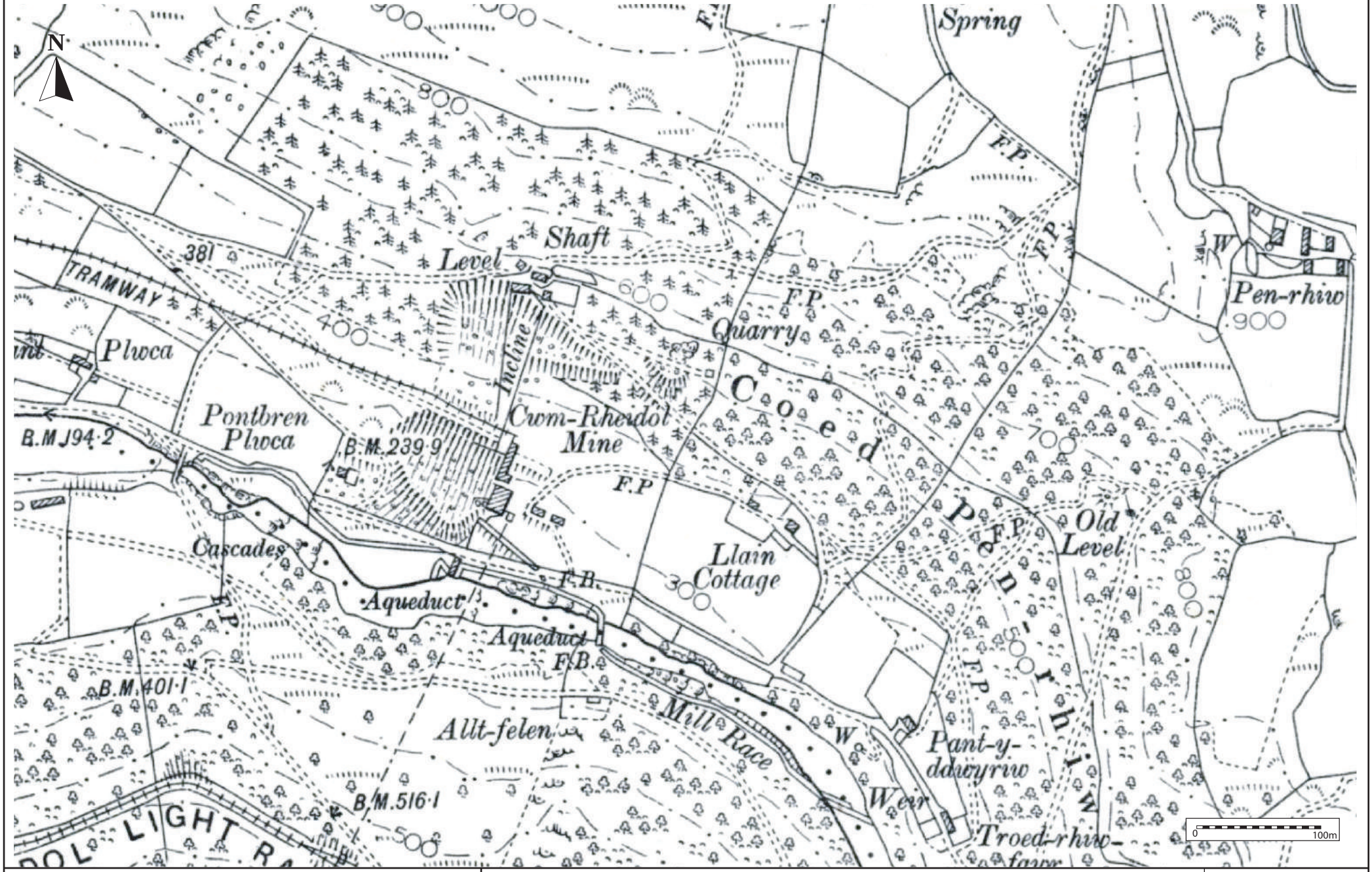


Project Title: Cwm Rheidol Lead Mine, Ystumtuen	
Date: Sept 24th 2019	**Approx. Scale** (@ A4):
Drawn by:	**Drawing No.**

Figure 3.

Enlarged view of Level-Fawr Lead Mine (later Cwm Rheidol Lead Mine) as shown on Ordnance Survey First Edition Map (1886).

Heritage
Recording Services Wales



Project Title: Cwm Rheidol Lead Mine, Tstumtuen	
Date: 24th Sept 2019	**Approx. Scale** (@ A4)**:**
Drawn by:	**Drawing No.**

Figure 4.

Enlarged view of Cwm Rheidol Mine (formerly Level-Fawr Lead Mine) as shown on Ordnance Survey Second Edition Map (1906).

Heritage
Recording Services Wales

Project Title: Cwm Rheidol Lead Mine , Ystumtuen	
Date: 24th Sept 2019	**Approx. Scale** (@ A4):
Drawn by:	**Drawing No.**

Figure 5.

Enlarged view of Cwm Rheidol Mine (formerly Level-Fawr Lead Mine) as shown on Ordnance Survey 1964 Edition Map.

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Recording Services Wales

APPENDIX II:
Photo plates

Plate 01. Access point through trees leading to Trial Pit No's 1 - 3 in area of 'lagoon'. Looking east.

Plate 02. Access point through trees leading to Trial Pit No's 1 - 3 in area of 'lagoon'. Looking east.

Plate 03. Area of proposed acces track clearance leading to proposed Trial Pits in lagoon area. Looking northwest.

Plate 04. Working shot through woodland area for access track.. Looking west.

Plate 05. Working shot through area of spoil and scree for proposed temporary access track leading to lagoon area. Looking southeast.

Plate 06. Working shot through area of spoil and scree for proposed temporary access track leading to lagoon area. Looking northwest..

Project Title: Cwm Rheidol Lead Mine, Ystumtuen		**Photo Plate No's.** 01- 06
Date Taken: 19th Sept 2019	**Approx. Scale** (@ A4):	
Appropriated by: RSJ	**Drawing No.**	Heritage Recording Services Wales

Plate 01. Access point through trees leading to Trial Pit No's 1 - 3 in area of 'lagoon'. Looking east.

Plate 02. Access point through trees leading to Trial Pit No's 1 - 3 in area of 'lagoon'. Looking east.

Plate 03. Area of proposed acces track clearance leading to proposed Trial Pits in lagoon area. Looking northwest.

Plate 04. Working shot through woodland area for access track.. Looking west.

Plate 05. Working shot through area of spoil and scree for proposed temporary access track leading to lagoon area. Looking southeast.

Plate 06. Working shot through area of spoil and scree for proposed temporary access track leading to lagoon area. Looking northwest..

Project Title: Cwm Rheidol Lead Mine, Ystumtuen		**Photo Plate No's.** 01- 06
Date Taken: 19th Sept 2019	**Approx. Scale** (@ A4):	
Appropriated by: RSJ	**Drawing No.**	Heritage Recording Services Wales

Plate 07. Working shot during cutting of Trial Pit No.1 in area of 'lagoon'. Looking westwards.

Plate 08. Working shot during cutting of Trial Pit No.1 in area of 'lagoon'. Looking southwest..

Plate 09. Completed Trial Pit No.1 Looking southwest.

Plate 10. Completed Trial Pit No.1 Looking west.

Plate 11. Working shot durig cutting of Trial Pit No. 1. Looking northwards.

Plate 12. Completed Trial Pit No.2 Looking west.

Project Title: Cwm Rheidol Lead Mine, Ystumtuen		**Photo Plate No's.** 07- 12	Heritage Recording Services Wales
Date Taken: 19th Sept 2019	**Approx. Scale** (@ A4):		
Appropriated by: RSJ	**Drawing No.**		

Plate 13. Working shot during cutting of Trial Pit No.3 in area of 'lagoon'. Looking westwards.

Plate 14. Completed Trial Pit No.3 Looking west.

Plate 15. Working shot during creation of temporary access track across drainage channel from Adit No.9. Looking west.

Plate 16. Area of proposed Trial Pit No. 7 in area eat of Adit No.9. Looking westwards.

Plate 17. Working shot durig cutting of Trial Pit No. 7. Looking westwards.

Plate 18. Completed Trial Pit No.7. Note remains of former traml rail protruding through spoil in south facing section. Looking west.

Project Title: Cwm Rheidol Lead Mine, Ystumtuen		**Photo Plate No's.** 13- 18	Heritage Recording Services Wales
Date Taken: 19th Sept 2019	**Approx. Scale** (@ A4):		
Appropriated by: RSJ	**Drawing No.**		

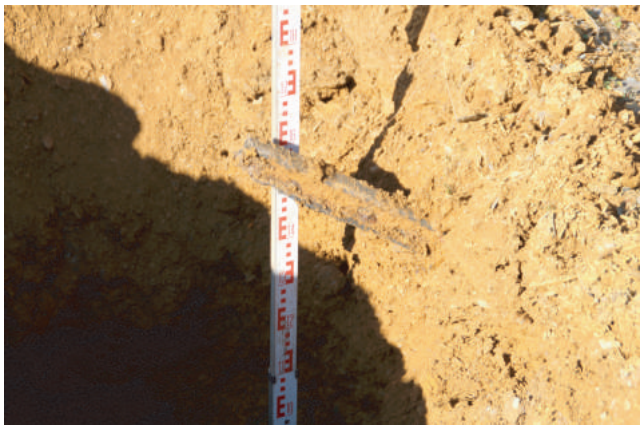

Plate 19. Detail shot showing remains of tram rail protruding through spoil close to Adit No.9. in Trial Pit No. 7. Looking westwards.

Plate 20. Working shot during cutting for Trial Pit No. 6. Looking northwest.

Plate 21. Completed Trial Pit No.6. Looking eastwards.

Plate 22. Area of proposed Trial Pit No. 5 in central area along former tramway route from Adit No.9 to former Tynyfron Lead Mine.

Plate 23. View of completed Trial Pit No. 5. Looking eastwards.

Plate 24. Area of proposed Trial Pit No. 4 in central area along former tramway route from Adit No.9 to former Tynyfron Lead Mine.

Project Title: Cwm Rheidol Lead Mine, Ystumtuen		**Photo Plate No's.** 19 - 24	Heritage Recording Services Wales
Date Taken: 20th Sept 2019	**Approx. Scale** (@ A4):		
Appropriated by: RSJ	**Drawing No.**		

Plate 25. Completed Trial Pit No. 4 at west end of former tramway linking Adit No.9 with former Tynyfron Led Mine. Looking east.

Plate 26. Completed Trial Pit No. 4 at west end of former tramway linking Adit No.9 with former Tynyfron Led Mine. Looking east.

Project Title: Cwm Rheidol Lead Mine, Ystumtuen		**Photo Plate No's.** 19 - 24	Heritage Recording Services Wales
Date Taken: 20th Sept 2019	**Approx. Scale** (@ A4):		
Appropriated by: RSJ	**Drawing No.**		

APPENDIX III:
Archive Cover Sheet

ARCHIVE COVER SHEET

Cwm Rheidol Lead & Zinc Mine, Ystumtuen, Ceredigion

ARCHIVE DESTINATION - RCAHMW

Site Name:	Cwm Rheidol Led & Zinc Mine, Ystumtuen, Ceredigion
Site Code:	CRLM/2019/WB
PRN:	5472
NPRN:	33828
SAM No.	
Other Ref No.	HRSW Rpt No. 210
NGR:	SN 7297 7821
Site Type:	Lead & Zinc Mine.
Project Type:	Archaeological Watching Brief
Project Manager:	Richard Scott Jones
Project Date(s):	Sept 19th - Sept 20th 2109
Categories Present:	None
Location of Original Archive:	HRSW
Location of Duplicate Archive:	RCAHMW
Number of Find Boxes:	N/A
Location of Finds:	N/A
Museum Ref:	N/A
Copyright:	HRS Wales
Restrictions to Access:	None

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