Glasdir Copper Mine MP3 Audio Trail: Script

Track 1: Introduction

Welcome to the Glasdir Copper Mine MP3 audio trail. The main trail starts from the Glasdir car park and follows the Red waymarkers. This route involves walking a series of steep slopes and steps. A shortened version of the trail, taking in track 2, 6, 7 and 8, starts from the all-ability car park up towards the Forest Garden and follows the Blue waymarkers along a flat trail suitable for wheelchairs and pushchairs. It is recommended that you stay on the waymarked trails as the old mine workings and structures can be unsafe. If you're ready to explore lets head off along the trail in search of the next MP3 post.

[50 secs]

Track 2: You are never very far from copper

Would you believe me if I told you that some greasy fingerprints were the difference between success and failure for the copper mine that once operated in the hillside above you? Ok, it was a little more complicated than that, but it was a technique developed by the mill owners, following an oily chance discovery, which quite simply changed the world - although, unless you are a metallurgist (that is, someone who studies the properties of metals) you are unlikely to be aware of the revolution it caused.

It is fair to say that you are never very far from copper. Already today you would have relied on this metal to deliver your electricity and water. And whilst rummaging around for some loose change for the bus fare, or that pint of milk, then you will no doubt have sorted the ten and twenty p's from the ones and twos.

As we explore Glasdir's copper mining remnants you will discover that this now quiet valley had the world's eyes on it at the turn of the 20th century. It was from here that the Elmore family developed an invention that was described as *"perhaps the greatest single metallurgical improvement in the modern era."* - not bad for a little mine in the Welsh mountains!

Unfortunately, unforeseen circumstances led to its premature closure in 1915. Output, whilst often erratic, was on a high, nonetheless, the nationality of the new owners and the date was significant. So what led to its demise? This answer will become clear later on in the audio trail.

But lets begin at the start of the story. Even before the foundations of the now derelict processing mill were laid, ore was quarried high on the hill directly above it. A hole, the size of two tennis courts, is still evident today. And the resultant ore was transported down on an incline in small trucks and sent along a tramway. Head to the next MP3 post, following the way markers, to discover its destination.

[2 mins 25]

Track 3: A tall chimney pierced through the roof

In its ‘natural state’ the ore at Glasdir contained only a tiny percentage of copper. To save transporting large amounts of copper-free rock, some of the processing took place in the quarry before its descent to the tramway, and then down a second incline to this point.

Trucks were lowered from the drum house at the top of the incline, which we will visit at the end of the audio trail, and down the left hand side of the large wall you can see on the right of the path. The wall formed part of an open-sided structure that had a roof, supported by two stone pillars above, sloping steeply towards you. See if you can spot the evidence.

A tall chimney, belonging to a smelter, pierced through the roof and it was here that the metal was separated at high temperature from the rock. The resultant copper ingots were then taken down the track behind you, across the road and down to the river by pony. Here, using punt-like boats called ‘lighters’, the precious cargo was floated down stream at the mercy of the tide.

Have you noticed the glass-like rock beside the MP3 post? This ‘slag’ is the molten by-product of the smelting process. In the 1850’s it is likely there were only a handful of men working at Glasdir, so everything took place on site. With the construction of the mill, the processed ore, called concentrate, was sold to smelting companies in Widnes, Cheshire.

Let’s now follow the line of the former lower tramway towards the processing mill. As you make your way to the next MP3 post to hear about the vicar who tried to electrify a village, do you notice anything usual about the land on the left?

[2 mins]

[MP3 post position: by molten slag]

Track 4: The local vicar with grand designs

The area between you and the river was a dumping ground. Mill waste, known as ‘tailings’ were carried in wooden aqueducts and released through sluice gates. To aid dispersal into the river and beyond, the waste - which had already been mixed with water in the milling process - was further diluted by the small stream you can see crossing the path.

The ever-growing mass of fine grey powder not only resembled shallow sand dunes in appearance, but like their coastal counterparts, the plants struggle to cope with the conditions. Besides the very acid soil and lack of food, the high concentrations of minerals evident in the tailings make it very difficult for plants to thrive here even today.

In 1898 a court case was brought against the mill owners who protested that the continued disposal of ‘crushings’ into the river were filling up salmon traps.

However, it was the intervention of the local vicar that had the most harmful affect on fish stocks. In 1930, well after the mine had closed, the clergyman saw an opportunity to use the large amount of water, channelled to this area of the hillside, for the benefit of his parish.

Look down towards the riverbank on your left; can you see the rusty corrugated iron sheets? This small building contained two Pelton wheels – a type of water turbine. What the vicar hadn’t accounted for was that the old mill workings, from where the water was piped, were heavily contaminated and having turned the wheels to generate electricity for nearby Llanfachreth village, the polluted water flowed into the river and killed all the fish. Inadvertently, the vicar’s scheme had directly killed more aquatic life in one day, than the mine had done in over 70 years of operation!

As you make your way to the mill and your next stop, you will see the water pipe on your right, which fed the fated hydroelectric scheme.

[2 mins 10]

[MP3 post position: where stream flows over the path]

Track 5: Lower mill level

Fortunately, a more successful system of power was installed here at the mill. Can you see the square concrete block below the railings on the left hand side? This was the mounting block for a Crossley gas engine. The smoky, yellow gas from coal burned in the circular retort next to the machine provided the fuel.

The engine powered all the machinery in the mill. As you slowly make your way through the remains of the building look for bolts protruding from the floor on the left. Twenty ‘stamps’, each over five metres in height were mounted here on timber frames. These huge and noisy ‘hammers’ were driven by a horizontal shaft and then allowed to fall under their own weight – pounding the raw material that was fed into them. After the first set of bolts you can still see the channel for a flywheel that drove them.

Having entered the mill at the top, the ore was broken by ear-splitting ‘crushers’ into fist-sized pieces on the level up and to your right. It was then transported in water as a ‘pulp’ to the stamps to be pounded into a gravel-like consistency. Look out for a square channel in the wall on your right, at head height, where the pulp would have been carried. From here, it would continue downhill for the concentration phase.

Shaking tables further refined the pulp before it was taken to the circular bowls at the bottom of the mill. Iron balls revolved in the ‘buddles’ to create a very fine powder, the most refined they could get it – until 1898 that is. But you will have to wait until stop 7 to discover that story. Remains of barrels containing the ‘concentrate’ are still evident in the recess halfway along the lower level – look closely and you should be able to make them out.

As you venture nearer to the other side of the mill, you will see wooden timbers in the floor on the right? Tram rails were attached directly to these joists, and close to the exit, a set of points sent trucks either to the door or possibly to another shute in the corner.

One thing is for sure, the peace and tranquillity of today – except perhaps for the occasional jet fighter – would be in complete contrast to the constant din of rock being crushed, pounded and shaken all day long.

Turn left at the junction at the top of the path ahead for a short diversion to the next MP3 post, in front of the entrance to the old mine.

[2 mins 50]

Track 6: Do you want a quick route to the sea?

When the Glasdir Copper mine first opened in the 1890's the ore was dug from a vertical shaft sunk into the ground high on the hill above but, there came a point when it was actually easier to dig a tunnel into the hillside from this point and save transporting all those tons of rock out of the quarry and down the hill.

In front of you, the now blocked up mine entrance, or adit, provided access to miles of tunnels carved within the hillside. At its deepest point, the mine descends more than 150 metres – which is lower than sea level! Imagine how lonely and detached life was like for the miners that far down, whose job it was to chisel away the copper-laden ore – and then bring it to the surface.

Just before the turn of the century, nearly 200 men were earning a living here. If they managed to survive the rock falls, the flooding and the toxic gases that lurked in the dark and damp tunnels, there was no guarantee there would be work for them. Some years bought bountiful yields of copper, but when a vein dried up the search was on to tap into a new source. If there was no copper, there was no work – and as a result staff numbers rose and fell like the tide.

To the left of the entrance you will see the concrete and stone wall of a reservoir. Water from the mountainside was collected here and used in the milling process. The water in the reservoir is bright blue from the copper, washed down from the disturbance in the quarry above. Today it is believed the mine is full of water from top to bottom, so if you hear a rumble don't get too close to the entrance – unless you want be part of a new waterfall feature!

But this wasn't the first copper extraction in the area. At Dolfrwynog, approximately 2 miles north of here there is a peat bog through which copper rich waters have filtered for hundreds of years. As a consequence of this process the 'turf' dug there in the early 1800's was considered so rich in copper that it was transported "in its natural state" directly to Swansea for smelting.

Now continue to follow the waymarkers to the next MP3 post

[2 min 40]

Track 7: Tired men would have pushed iron tubs

Look up to your left and on the skyline you should be able to make out the relict structure of the quarry drum house. When the ore was quarried on top of the hill, the material was sent down the incline to the highest point of the processing mill that we will visit at the next stop. When the main adit was opened this feature became redundant.

All along this path you will have noticed a channel, called a leat, carrying water from the reservoir to the mill, to aid the crushing process. The path that eases our journey today was a narrow gauge railway. Tired men on long shifts would have pushed individual ‘tubs’ - round-bottomed and chunky trucks - filled with about 1 tonne of ore, along here to the mill. Many of the railways sleepers are still preserved beneath the path.

As you make you way to stop 8 at the top of the mill, keep an eye to the left of the path. Although most of the buildings were clad in corrugated iron, you will still see evidence of stone walls and pillars that supported the structures. We can assume this stone was taken from the small quarry you will pass.

[1 min 30]

[MP3 post position: where wooden railings on left of path end, approx halfway between adit and mill]

Track 8: Greasy fingerprints that changed the world

This was the heart of the operation. Mined ore was mixed with water and sent through chutes into the levels below, where it was crushed, stamped, shaken and stirred repeatedly by a multitude of angry machines - all in an attempt to separate the metals from the rock. The noise would have been incredible.

By the time it had reached the bottom of the mill, the ore was a fine powder. The shaking and stirring processes worked on displacing and washing the lighter waste material away from the heavier precious metals. But even after all this, rock still made up the bulk of the powder.

In 1898, two years after the Elmore family bought the mine, the new owners revolutionised metal extraction by developing a process that, whilst much refined, is still in use today. Francis Elmore noticed that the very minerals they were trying to isolate from the rock had been retained on greasy marks and handprints as it splashed and sloshed its way through the mill.

Imagine a bottle of salad dressing nicely shaken and ready to pour. Leave it to settle and the oils and herbs float on top of the other liquids. The Elmore's realised that when the ground powder was mixed with oil, the copper floated to the top and the waste rock sank to the bottom – and hey presto the 'Flotation method' was born.

Over the years this practise has been improved and today it is believed 80% of all the billions of tones of minerals extracted around the world are processed using the floatation method that started in Glasdir.

Within a few years of their discovery the Elmore's sold the mine, mainly in response to the levy issued to ore producing mines to help pay for the newly introduced old age pension. In spite of this, the new owners were successful in making the mill more productive, but it wasn't until the First World War was well underway that locals realised their copper mine neighbours were from Europe – and more specifically Germany. It didn't take too long for word to spread and the mine was closed!

The main trail now continues ahead, towards a steep flight of steps following the Red waymarkers. On the way to stop 9 we will pass a fenced section in the path, which was the intake for the pipe that fed the vicar's water turbines. The All ability trail returns along the tramway following the Blue waymarkers back to the car park.

[2 mins 40]

Track 9: The drum house

In the days before the mill, ore quarried from the top of the hill would have been brought along the tramway onto a turntable at this point. The small wooden tram would be attached to a rope that was wound round a large drum suspended between the two walls.

As the brakeman lowered the loaded tram down to the smelters at stop 2, a second empty tram would be returning back up the slope on a counterbalance system ready to be taken back to the quarry. And so the whole cycle would begin again.

We have now come to the end of our tour of this famous little copper mine. All that is left for you to do now is enjoy the rest of your visit as you return back to the car park by following the red waymarkers.

We do hope you have enjoyed learning about how Glasdir copper mine changed the world in its own little way. You can hear more about Coed y Brenin's rich history on four other trails in the Forest Park. The audio trails were funded by The Rock Trust, a Meirionnydd Based Charity, and they are all available to download free.

[1 min 40]