

Abandoned Mine Case Study: Dylife Lead & Zinc Mine



Dylife Mine is located 13km northwest of Llanidloes, Powys, on the mountain road to Machynlleth. It has been identified as a major source of metals to the Afon Dyfi catchment and is responsible for the Afon Twymyn failing to achieve European Water Framework Directive standards for zinc, lead and cadmium.

Dylife exploited lead and zinc from three mineral lodes: the Dylife, Esgairgaled and Llechwedd Ddu. The earliest workings are possibly of Roman date and may have been linked to the nearby Roman fortlet of Penycrocbren. The earliest known reference to mining at Dylife dates to the early 1600s, with activity continuing intermittently, through the boom years of the mid-1800s when the largest water wheel in mainland Britain was erected, up until the 1930s. This extensive mining history has left a legacy of bare spoil heaps, shafts, adits and ruinous structures including wheelpits and leats.

The Afon Twymyn and Nant Dropyns flow through the mine site and spoil heaps, converging at the old dressing floors before passing through a road embankment, itself believed to be constructed of mine waste. These water courses are ephemeral dependent on the severity of rainfall events, often being lost to ground and the mine workings before re-emerging further downstream with increased metals concentrations. This makes quantifying the pollution sources particularly challenging.

Recent investigations have utilised stilling wells and dilution flow measurements to improve our understanding of the site. These identified the Hirnant Tips to the south of the road embankment as the principal source of metal loading. Erosion of the dressing floors at the confluence of the Twymyn and Dropyns and loss of these watercourses to the workings were also found to be significant sources.

Following a review of work to date, the Coal Authority identified Dylife as one of four mines to progress through a full feasibility study to appraise potential remediation options. Remedial works might involve conveying the Afon Twymyn and Nant Dropyns across the mine workings, significantly reducing the volume of water encountering the workings and mine waste and therefore the amount of pollution that can be mobilised. A small-scale hydroelectric scheme could be implemented to take advantage of the diverted flows, with the power being used on-site for residual minewater pumping and/or treatment.





Impact on receiving watercourses

Length impacted: 20km

WFD water body ecological status:

- Twymyn – Upper Moderate (Zn, Cd, Pb)
- Twymyn – Lower Moderate (Zn, Cd)

In addition, capture of the contaminated tip drainage and conveyance to an appropriate treatment system will be needed. Treatment could be active, such as electrochemistry, or passive depending on volume and quality. However, land availability for a passive system is limited downstream by the Ffrwd Fawr waterfall and Twymyn Gorge. Measures to reduce the volume of tip drainage will also need to be assessed, along with stabilisation and protection of the dressing floors to reduce the quantity of contaminated sediments being washed downstream.

The site contains a rich historical mining landscape and is also designated as a Site of Special Scientific Interest. Any remedial measures will need to be sympathetic to these features and look to enhance them if possible.

Monitoring data

	Twymyn upstream mine	Twymyn downstream mine
Flow (L/sec)	79	274
pH	7.0	6.8
Zinc ($\mu\text{g/L}$)	18	795
Lead ($\mu\text{g/L}$)	3.0	251
Cadmium ($\mu\text{g/L}$)	0.08	4.9
Zinc (kg/yr)	45	6866
Lead (kg/yr)	7.4	2166
Cadmium (kg/yr)	0.2	42

Benefits of remediation

- Approximately 9 tonnes of harmful metals could be prevented from entering the Afon Twymyn and subsequently the Afon Dyfi each year.
- A reduced contaminated sediment load to the Afon Twymyn and Afon Dyfi.
- The receiving and downstream water body will be more likely to achieve Good Ecological Status, although there are other mining pressures in the Twymyn catchment that will need to be addressed e.g. the Afon Fachdre and Nant Caeconroi.
- A micro-hydro scheme utilising diverted river flows could power an active treatment system.
- Opportunities to enhance heritage and SSSI and support aims of the Dyfi Biosphere Reserve.
- Surface water management and prevention of sediment erosion could aid downstream flood mitigation.

For more information on Dylife Mine contact dylife@welshmetalmines.co.uk

