

## Geotechnical Division Case Study Pont Herber Fechan

### Soil nailing, embankment reinstatement and erosion prevention works to the River Ceiriog

The site is located along the along the River Ceiriog near Chirk adjacent to the B4500. The road is the main access to the Ceiriog Valley and a diversionary route for part of the A5. It is therefore a significant transport route and extremely important for the local community.

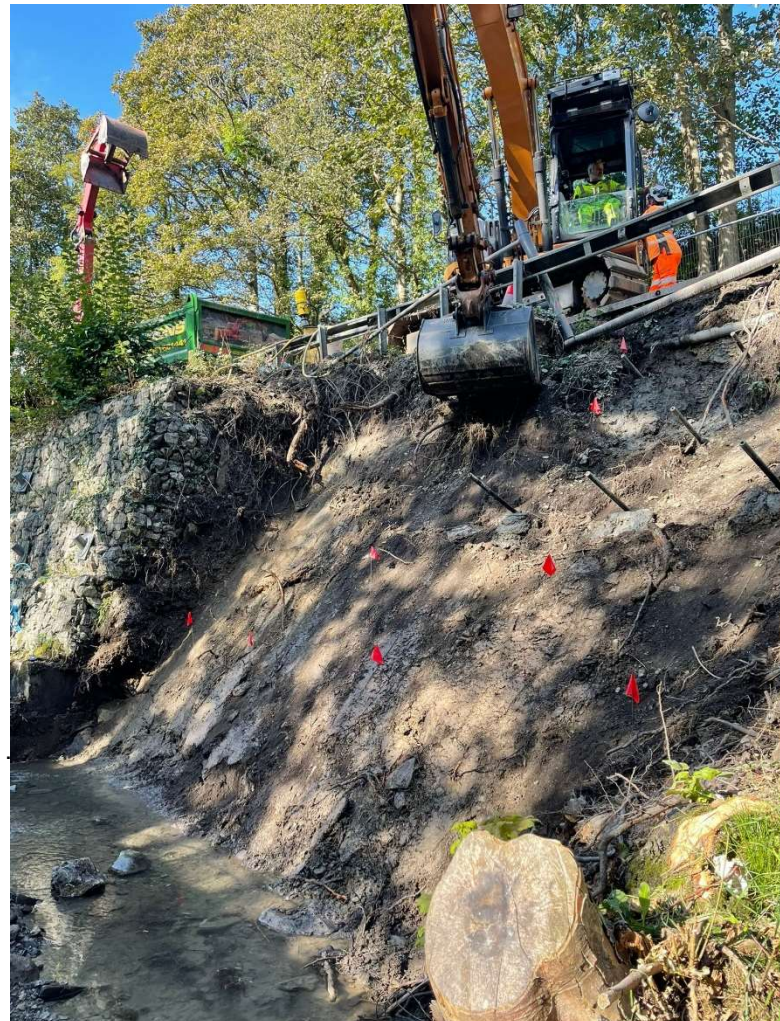
The Ceiriog is a main river and forms part of the Dee Valley Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC). It is ecologically sensitive and supports numerous protected species and therefore the design and construction works, although important needed to be sympathetic to the environment.

The scheme was design and build, tendered on a reference design produced by Wrexham Borough County Council (WCBC). On consultation with Natural Resources Wales (NRW), it was apparent that the reference design would not be acceptable to them, due to the hard engineering nature of the solution proposed – gabion walling.

Griffiths were able to work with our designer Jubb Consultants to design a softer solution, consisting of soil nails, mesh and rip rap stone, which would become vegetated over time, lessening the visual and environment impact – this was accepted by NRW. This solution also satisfied the requirements of WCBC to stabilise the slope and road above.

The in river working required the use of a dam system and pump to provide a dry working area. A Portadam system consisting of modular legs and sheeting material was employed due to it lightweight and rapid installation times. Giving confidence to NRW that minimal disturbance to the riverbed would occur and in the event of predicted flooding, the dam could be quickly removed. The works were carried out outside of fish spawning season, fish rescue was employed during dam installation.

Ecological surveys, which included surveying the river and surrounding areas for significant distance beyond the worksite were completed together a Habitat Regulation Assessment and SSSI assent as part of the approval process for the works.



Pictured above: view of embankment reprofiling, removal of slip and installation of soil nails, working with a dam to control river levels.

The works consisted of the removal and regrade of the existing slope back to competent material. This was completed using a 13T excavator from road level. The excavator was placed on bog mats to spread the load of the plant and prevent further slope instability from occurring. Care was taken around the existing vehicle restraint system (VRS), BT and water services. Pump extracted water from the dig was passed through a silt buster system before being returned to the river downstream of the worksite.

The slope was stabilised with 54No. 38mm diameter soil nails, up to 9m long, installed in a 76mm bore. Works were progressed using a long reach 13T excavator, allowing the nails to be installed such that the loading from the excavator was not directly above the most vulnerable areas of the slope until they had been stabilised. All grouting works for the soil nails were completed within a proprietary bund system to prevent loss of grout to the river and potential pollution. Griffiths employed an emergency plan for the works, had a pollution boom ready strung across the river to be lowered if necessary and had liaised with local downstream fisheries to be able to shut off penstock intakes in the event of an emergency.

Erosion control matting consisting of a 3D matrix and coir matting were pinned to the slope prior to the placement of a high tensile steel mesh known as TECCO. The system was finished with boundary wire ropes and tensioned to 5 ton to provide active restraint to the face.

Once the slope had been stabilised Griffiths utilised a 21T long reach excavator with zero tail swing from WM Plant Hire together with grab attachment. This allowed a larger excavator with greater lifting capacity to be used, even when working with a very narrow lane closure. The excavator was used to place rip rap stone, weighting up to 2T a piece. The stones were embedded into the river channel and arranged to fill the hollow resulting from the original slope failure, allow the crest to be reinstated and a transition to be installed between the soil nailed solution and the historic hard engineered gabions adjacent. All in river works were completed by the fish spawning season embargo with no pollution incidents.

Works along the crest consisted of installing new highway drainage out falling to a nearby culvert, installation of VRS in socketed concrete strip foundation for easy maintenance. Installation of kerb line to direct surface water from the highway and prevent wash-over erosion of the bank., localised limb removal to overhanging trees and resurfacing works to the B4500.



Pictured above:  
Panoramic showing reinstated riverbank, with soil nailing, mesh and rip rap.

Pictured above:  
Fig 1) Original erosion, slip and loss of shoulder support to road above.  
Fig 2) Full completed works from road level showing VRS and drainage works.

## Project at a glance

Client: Wrexham Borough County Council  
Location: Pontfadog, North Wales  
Completed: November 2021  
Value: £400k