

GRIFFITHS

civil engineering and construction

Rail Division Case Study **Afon Wen Sea Defence**

When Network Rail identified an opportunity to conduct urgently required works to a stretch of sea defence in north Wales, they called on Griffiths to develop a solution at short notice. Faced with a very tight timeframe that meant it was impossible to gain a Marine Licence, Griffiths developed a design and methodology to suit.

Located between the villages of Afon Wen and Llanystumdwy on the Llŷn Peninsula, Afon Wen Sea Defence is a 1,260m long asset that protects a stretch of the Cambrian Coast railway line and the salt marsh behind it from flooding and coastal erosion.

The sea defence includes two main sections. One section is a stone mortar wall fronted by a relatively new concrete apron with an exposed sheet pile toe. The other section is formed of rock armour protection.

Following an assessment of the sea defence in 2014, Network Rail identified a requirement for renovation as significant sections were found to be in a poor condition due to defects directly attributable to coastal erosion. The sea had scoured the lower sand layer and undercut the cliff face resulting in translational/slumping failures to the cliff,

and eroding the crest line to within 5m of the nearest running rail of the railway line.

The rate of erosion/degradation increased significantly during 2019 and 2020, and this was accelerated by severe storms in February and August 2020. The earthworks Risk Evaluation Matrix (REM) for the asset was considered High Risk for scour. Such was the seriousness of the erosion that, without urgent intervention, the next significant storm could have impacted the track support zone or even undermined the track.

As Network Rail had a 16-day blockade planned for the Barmouth Bridge works (also delivered by Griffiths) it was decided to utilise this opportunity to address the urgent works to Afon Wen Sea Defence.

Network Rail approached Griffiths to develop a remedial design solution and gain any required

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environmental consents. However, due to the tight timeframe it was not possible to gain a Marine Licence. Therefore, Griffiths developed a methodology to conduct the works above the Mean High Water Spring Line on the beach. This meant coming down through the rock armour to avoid working on the beach. The methodology took into account the tidal levels and local topography at site and working shift patterns were developed to mitigate the impact of high tide on working times.

Once the design and methodology was approved, and with the blockage only weeks away, Griffiths worked to ensure the required 6000 tonnes of rock armour for the 120m stretch was delivered to site and sorted ahead of the blockade. This amounted to 550 deliveries of stone largely sourced from quarries within a 10-mile radius of the project, and delivered to the site using local haulage companies.

To overcome the challenge of access and moving the large amount of material required to get the job done within the blockade, Griffiths stored excavators at a nearby quarry to ensure the rock armour could be moved to site in time.

As soon as the blockade was in place, Griffiths utilised 24/7 working to place the rock armour using 50T, 36T, 22T and 14T excavators. In total 10,000 staff hours were worked with zero lost time injuries/incidences.

On completion of the rock armour installation works Griffiths utilised a Unmanned Aerial Vehicle (UAV) to complete the 'as built' survey, preventing the potential need to access difficult-to-reach areas.

Another innovation employed for the works was the installation of Findlay Irvine Remote Condition Monitoring (RCM) systems. Consisting of tilt sensors and cameras, RCM can be deployed to high-risk sites to provide early warning systems for loss of railway support / coastal erosion.

The delivered design delivers a 1 in 200 year return design.



Pictured above:

TOP: The extent of erosion at the site prior to works starting.

MIDDLE: The methodology for the works saw excavators working from the rock armour to avoid working on the beach without the required Marine Licence.

BOTTOM: Griffiths deployed the Findlay Irvine Remote Condition Monitoring (RCM) system of tilt sensors and cameras to provide early warning of loss of railway support/coastal erosion at Afon Wen.

Project details at a glance

Client: **Network Rail West & Wales Capital Delivery**

Location: **Llyn Peninsula, north Wales**

Completed: **November 2020**

Value: **£1.2m**

Contract: **NR4**