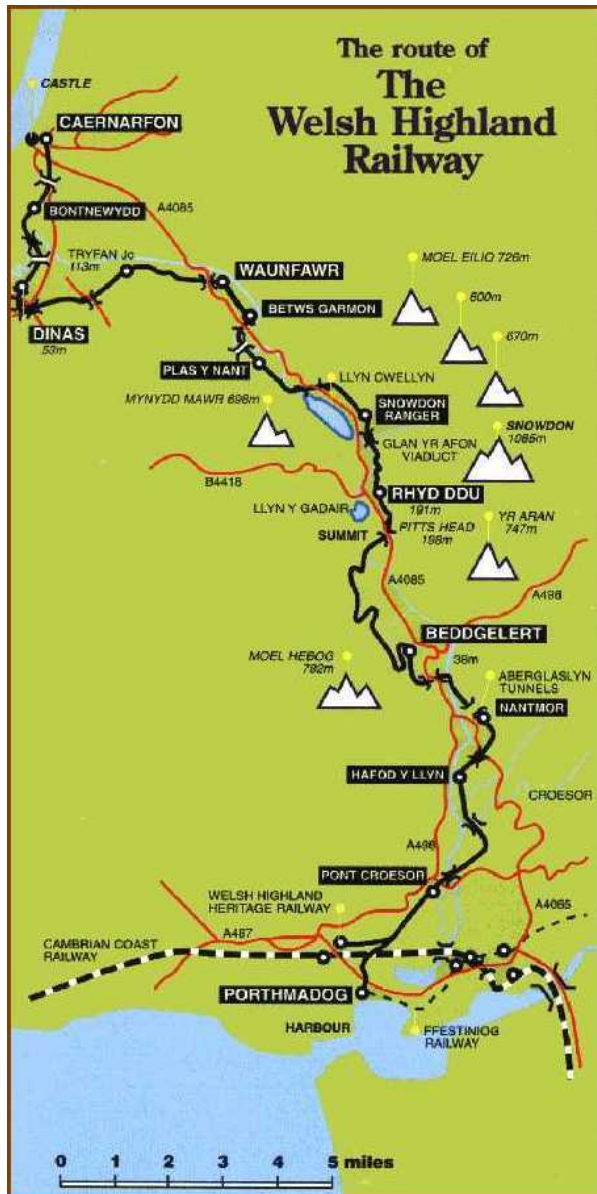


Welsh Highland Railway

Introduction



One of the most significant heritage railway projects in the UK is nearing completion. After ten years of work, the Welsh Highland Railway (WHR) between Caernarfon and Porthmadog has been reinstated along its original route, a total of 25 miles through the spectacular scenery of Snowdonia.

Infrastructure works for Phase 4 of the project, from Rhyd Ddu to Porthmadog, have recently been completed. Commissioning this last section of the route is now in progress, with the first through services due to start in summer 2009. At Porthmadog, WHR services will interchange with the existing Ffestiniog Railway, creating an overall tourist railway network of over 40 miles in length. The cost of the completed project will be around £25 million, funded by a mixture of public grants and private donations.

Arup has had a major role in Phase 4 of the project, by far the biggest section of route and with the most engineering challenges. We have provided multi-disciplinary design services from our Wrexham office and from Bristol office for the highly complex Porthmadog Cross Town Link. Specialist support in railway operations and signalling design has been provided from Arup Campus.

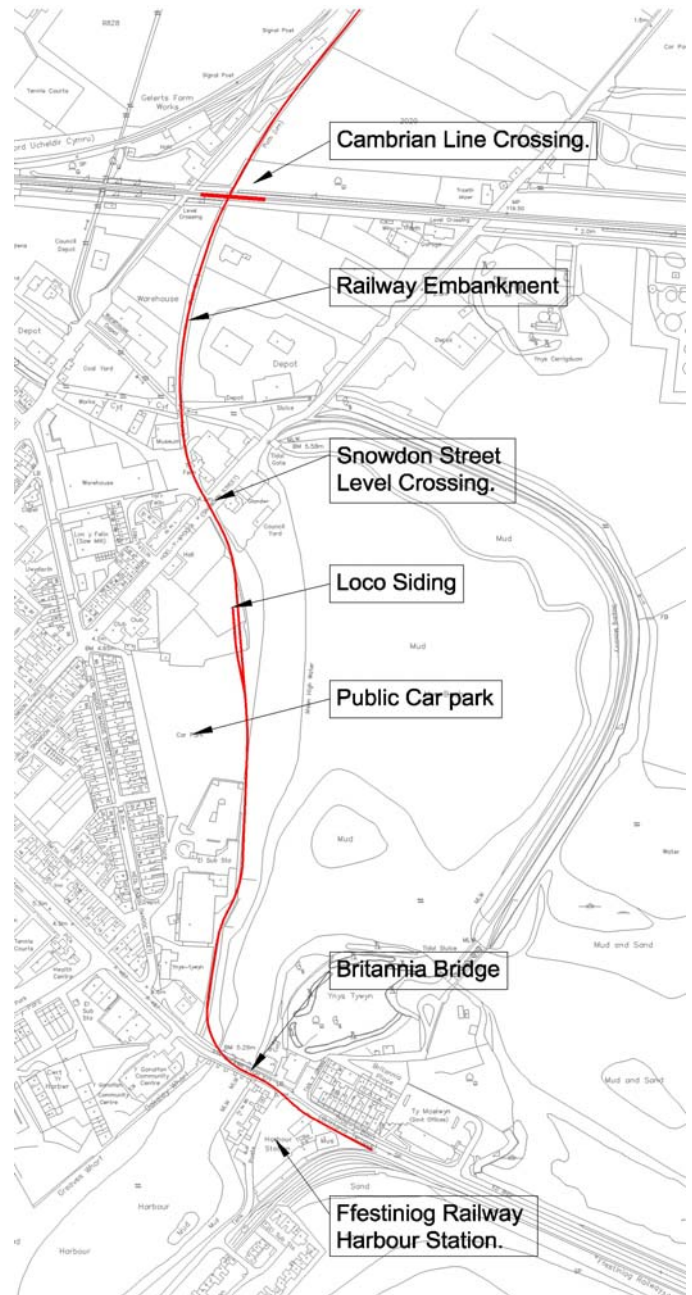
As the full re-opening of the line approaches, there will be an increasing amount of public awareness and media attention. The number of articles appearing in the railway press will also increase.

The purpose of this article is to give an overview of the combined Arup involvement, for which full technical details will be compiled and published in due course.

Porthmadog Cross Town Link

For the Porthmadog Cross Town Link (see route plan), approximately 2km of route has been installed on a mixture of tramway and ballasted track construction. This has involved many interfaces and physical challenges, including:

- (a) Interface with remodelling the Ffestiniog Railway Harbour Station.
- (b) Works to Britannia Bridge to widen the existing structure, including reconstruction of the river wall within tidal waters.
- (c) Tramway section in the A487 trunk road, including embedded rails in the bridge deck, associated roadworks and traffic controls. Maintaining traffic flows during the peak tourist season has been a major issue.
- (d) Ballasted track through public open space, including diversion of public footpath and modifications to public car park. Extensive sewer protection works.
- (e) Snowdon Street level crossing, tramway section, road intersections and associated traffic controls.
- (f) Minor works to existing under-bridge across watercourse, including rebuilding parapets.
- (g) Ballasted track along existing embankment, including works to side slopes and replacement of toe structures with gabion walls.
- (h) Interfaces with the main line railway where the WHR crosses the Cambrian line. Installation of mixed-gauge at-grade crossing under a separate contract.
- (i) Ballasted track along embankment to the north of the Cambrian Crossing.
- (j) Route wide infrastructure including boundary fencing and S&T ducts for WHR train controls.



Flat crossings are increasingly rare and the Cambrian Crossing is the only mixed-gauge crossing on the national UK network, making it a high profile aspect of the Cross Town Link.



Installing the Cambrian Crossing

The installation of the crossing took place in late autumn 2006, in advance of the main works. This followed a long process of design and approvals and working closely with Network Rail to ensure compliance with railway standards. The design team included operations and signalling specialists who drew up procedures to ensure safe operations of the crossing between the two rail companies.

Works at Britannia Bridge were the most complex and challenging part of the Cross Town Link design. Through a Transport and Works Act Order (1999), works had been authorised to take the railway over the existing bridge, which also provides the main point of entry into Porthmadog for tourist traffic.

Major structural works were necessary to widen the bridge deck to accommodate the WHR alignment on a tight 50m radius. This involved reconstruction of the existing retaining wall in the tidal river to support the new bridge deck. An essential part of the design is the road and train controls necessary to ensure safe interaction between WHR trains, road vehicles and pedestrians. These include wig-way type road signals for an open level crossing, to be implemented by the HMRI through a Level Crossing Order.



Britannia Bridge



Arup provided full design services and assisted WHR in seeking consents from Welsh Assembly Government, local authorities and HMRI. We were also responsible for contract procurement and administration of the works, completed by Carillion Civil Engineering in September 2008.

Sustainability was an important factor for the project. Locally recovered slate materials were used in gabion walls, to re-form embankments where there were land and space limitations. Existing masonry retaining walls, culverts and bridge abutments were assessed and re-used. Bridge parapets were built using re-used materials or locally-sourced stone where necessary.