8

PROVIDING PUBLIC, PRIVATE AND LIVESTOCK ACCESS

8.4 Restoring a ford as a stock and vehicular crossing point

RIVER OGWEN

LOCATION – 5km south of Bethesda, Gwynedd SH 641615
DATE OF CONSTRUCTION – October 1998
LENGTH – 20m
COST – approx. £1500

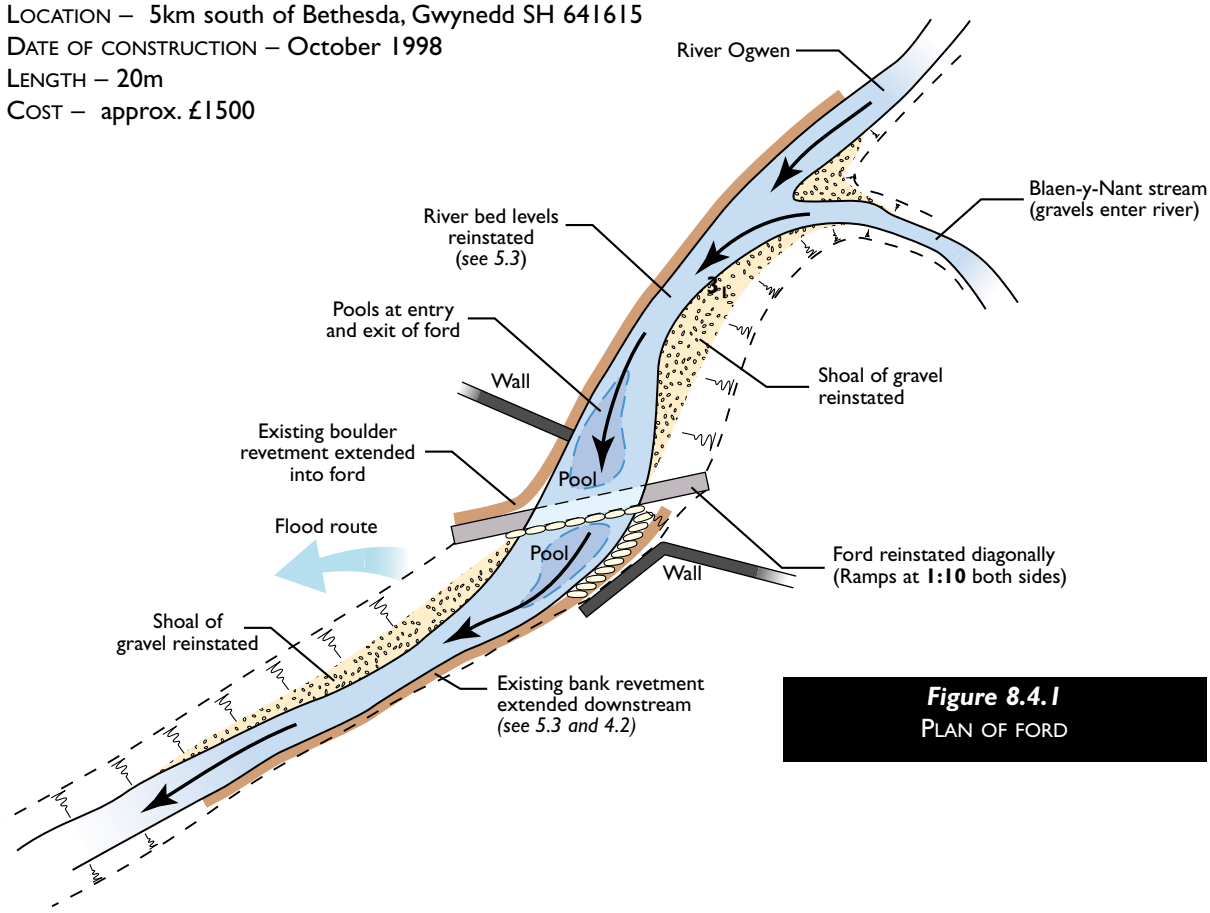

Figure 8.4.1
PLAN OF FORD

View across the deepened river at the old ford location

These techniques were developed to suit site specific criteria and may not apply to other locations

DESCRIPTION

The ford was built as part of comprehensive restoration of the river bed after deepening by dredging in the 1960s (*See 5.3 for full details and a location plan*). The ford forms one of a series of fixed points that stabilise the bed at its restored level.

Old O.S maps indicated a ford had existed prior to dredging but it had been removed during these works; see photo of conditions pre-restoration. The farmer was keen for the ford to be restored as a stock and vehicular crossing point.

DESIGN

The practicalities of sustaining a ford at this location demanded an understanding of the hydraulic and sediment patterns that would exist after the river bed had been raised by about 1m as part of the river bed restoration works. The river conditions at the approach and exit would be important factors. The length of the submerged part of the ford needed to be at least 20m i.e. twice the normal width of the river, in order to ensure that normal water depths were 'fordable', typically 30cm or less. Approach ramps on both sides needed to be flatly graded at about 1 in 10 to suit vehicles and should blend with natural bank profiles rather than be severely cut into them. The overall length of the ford, between bank tops, needed to be 40m to meet these requirements. This compared with just 15m between bank tops for the natural channel.

Study of the old OS maps indicated that the original ford was broadly of the dimensions that were needed but it was still necessary to form a view on why it was sustained by the river and did not narrow through sediment deposition making it unusable. It was well known that many fords constructed at inappropriate sites become unusable due to rapid siltation.

The ford is located between two opposing bends in the river alignment such that shoals of gravel naturally accumulate on the inside of each. The two shoals would typically be joined by an underwater bar of gravel aligned diagonally across the channel. The natural cross-section of the river, drawn across this diagonal bar and up the flat shoal profiles each side, would roughly match the ford profile needed. The sustainability of the shoals and the bar of gravel would depend upon continuing inputs of material to

The restored ford, shoals and riverbed

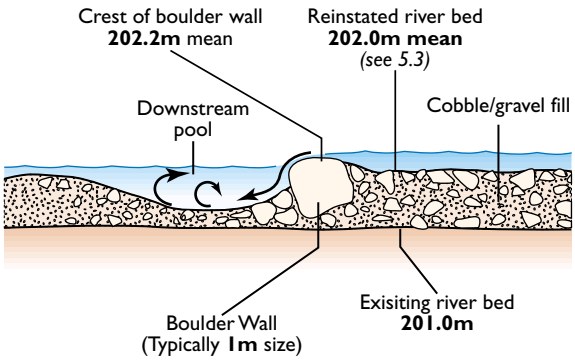

Figure 8.4.2
SECTION THROUGH FORD

the river. The tributary stream located just upstream (Blaen-y-Nant) was known to be the primary source of sediment on this reach of river. It was therefore concluded that a diagonal ford aligned between the opposing bends was sustainable and that it would be typical of the natural fording points adopted by farmers on many gravel bed rivers where similar geomorphology arises. It was necessary to develop the design of the ford in accordance with these principles.

It was decided to define the downstream edge of the submerged length of ford with a line of glacial boulders as shown on figure 8.4.2. This provided the stable bed level that needed to be defined as part of the overall river bed restoration. It was not possible to completely restore the river bed elevations with gravel due to lack of suitable material (*see 5.3*), so the new ford might have washed downstream if the profile had not been fixed by the boulders. They also ensured a clear route across the river remained visible between the ramps on each side. The gravels that were available from previous dredging operations were utilised to restore the two important shoal profiles upstream and downstream of the ford. The river bed was also fully restored with gravel upstream and downstream of the ford with particular attention to the profiling of pools and runs that naturally form at opposing bends (*see plan*).

Downstream crest defined by boulders

A potential threat to the stable profile needed at the ford was the 'migration' of the bends through erosion of the outer banks of each. Serious erosion had arisen further downstream of the ford site but old river bank revetments were evident at the site and upstream of it. Existing revetments of small boulders were repaired and consolidated into the ford. The erosion downstream was repaired using the willow mattress technique featured in this manual (*see 4.2*).

The location of two solid stone walls on opposite banks of the river were a further consideration. The routing of overland floodwaters down the valley would clearly be interrupted by these opposing walls with all flow being concentrated between them coincident with the location of the ford (*see plan*).

Careful study of the topography of the adjoining fields indicated that the natural flood route involved overtopping the bank on the right side of the ford (looking downstream). This bank was carefully graded to blend with a discernible 'gulley' down the field such that floodwater passing between the two walls could easily escape out onto the natural floodway again without causing undue stress at the ford. The arrow on the plan indicates this important floodway.

SUBSEQUENT PERFORMANCE 1998 – 2001

The entire configuration of the ford, shoals, pools and runs has proved to be sustainable, with the ford in regular use by the farmer.

The visual appearance of the ford is excellent as it has sympathetically blended into its location and is not intrusive in anyway.

This success is attributed to the care taken to understand the underlying river geomorphology and the sympathetic adaptation of this in both the historic context of the site and that of the wider river restoration project.

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