5 Controlling River Bed Levels, Water Levels and Flows

5.4 Simulated bedrock outcrops

RIVER MARDEN

LOCATION - TOWN CENTRE AT CALNE, WILTSHIRE ST 998710

DATE OF CONSTRUCTION - 1999

LENGTH – 100m

COST – NOT AVAILABLE

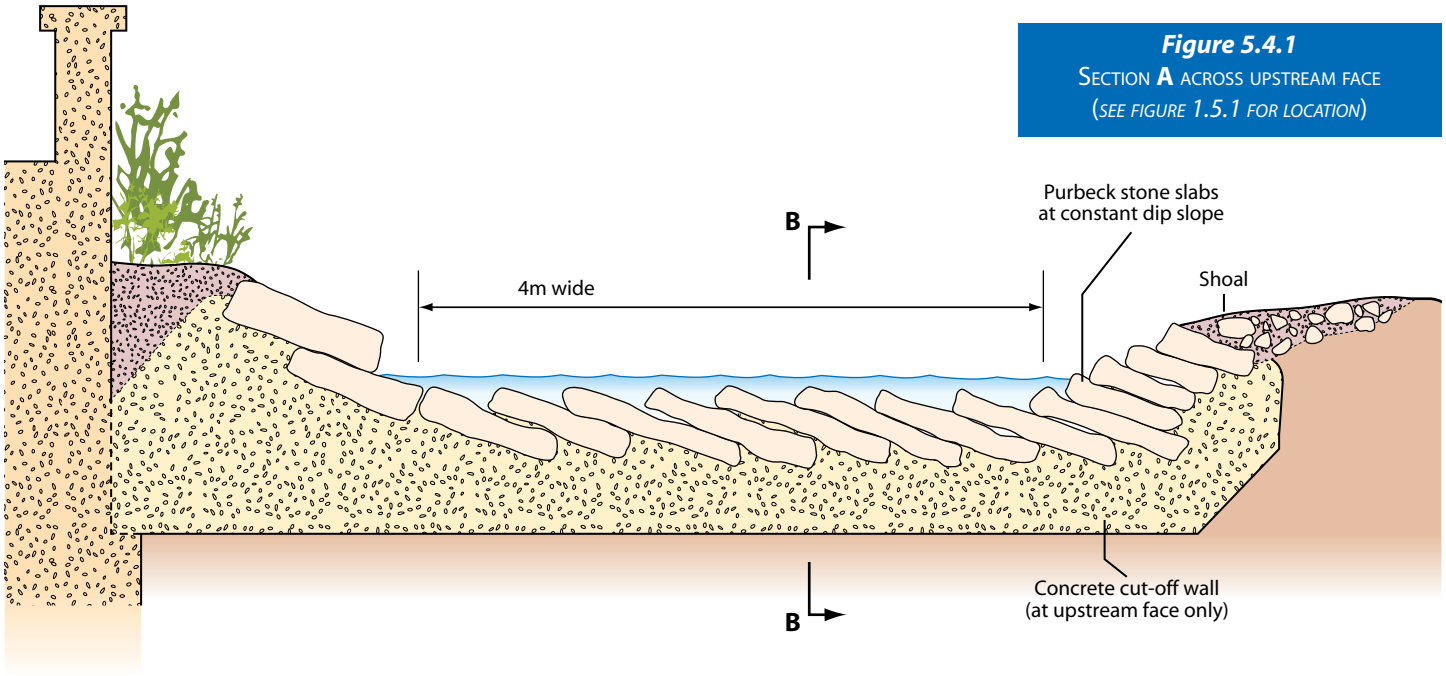

Figure 5.4.1
SECTION **A** ACROSS UPSTREAM FACE
(*SEE FIGURE 1.5.1 FOR LOCATION*)

Description

A straight, concrete lined, section of river channel was diverted and restored in the form of a double meander. *Refer to Technique 1.5* for a plan and full description of the project.

The bed of the restored meandering channel needed to be stabilised against scour because of its steep gradient (1 in 140 mean) and the consequential high water velocities that exceed 2 metres per second during flood conditions. Two simulated rock outcrops were built into the bed to provide stability.

Simulated rock outcrop with downstream pool

Design

The influence of the two rock outcrops can clearly be seen in *Figure 1.5.2* (*see Technique 1.5*); the longitudinal profile of the restored reach. The mean bed gradient is modified by projecting the outcrops above this profile and creating deeper pools both upstream and downstream of each. The purpose of the outcrops is to 'fix' the bed at two points thus checking any tendency of the river bed to scour deeper and to wash away the stone substrate introduced over the underlying clays. A varying hydraulic regime is created in keeping with the aims described for the project (*see Technique 1.5*).

The design of the rock outcrops is the subject of this technique.

Flat slabs of Purbeck limestone had been selected for a variety of purposes throughout the site and for use in the two outcrops. The slabs needed to be laid with a constant angle of dip and needed to provide a gently sloping face over which the water would tumble down to the lower level. A practical method of arranging the slabs needed to be developed; the outcome is shown in *Figures 5.4.1 and 5.4.2*

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

Firstly, the upstream row of slabs was laid carefully to line and level in a bed of concrete. The concrete secures the required crest level along the tips of the slabs and also forms a cut-off wall that prevents water from flowing under the structure which can otherwise cause collapse. The angle of dip and the thickness of individual slabs determine the size of the jagged 'notches' created along the crest. Slab thickness of between 10cm and 15cm were found to be best suited. The slabs are extended upwards into each bank to become part of the revetments indicated on the site plan (*see Technique 1.5*).

Successive rows of stone were then laid parallel to the above, working down the slope, with the final row being stepped down to a level below any likely scour depth. These rows were all bedded in gravel reject stone to introduce flexibility to the lower structure and to improve the opportunity for plants to root between the stones, e.g. *Ranunculus*.

The random nature of stone slab size and thickness meant that a certain amount of selection was needed to achieve a reasonably tight fit where each abuts another, but this was not unduly critical. The structure is sufficiently robust and flexible to ensure security without resorting to the use of concrete or mortar in joints. Each outcrop was built in a day by 3 men and a machine for lifting.

Subsequent performance 1995 – 2001

The structures have achieved the main purpose of stabilising the river bed against scour without any problems. The appearance is excellent and will improve once vegetation is established between the stone slabs.

The effect of the jagged notches created by laying the stones at an angle is to generate an audible tumble of water over the whole structure. The concentration of flow down these irregular notches is likely to prove helpful to the passage of fish.

Original Information Provider:
RRC

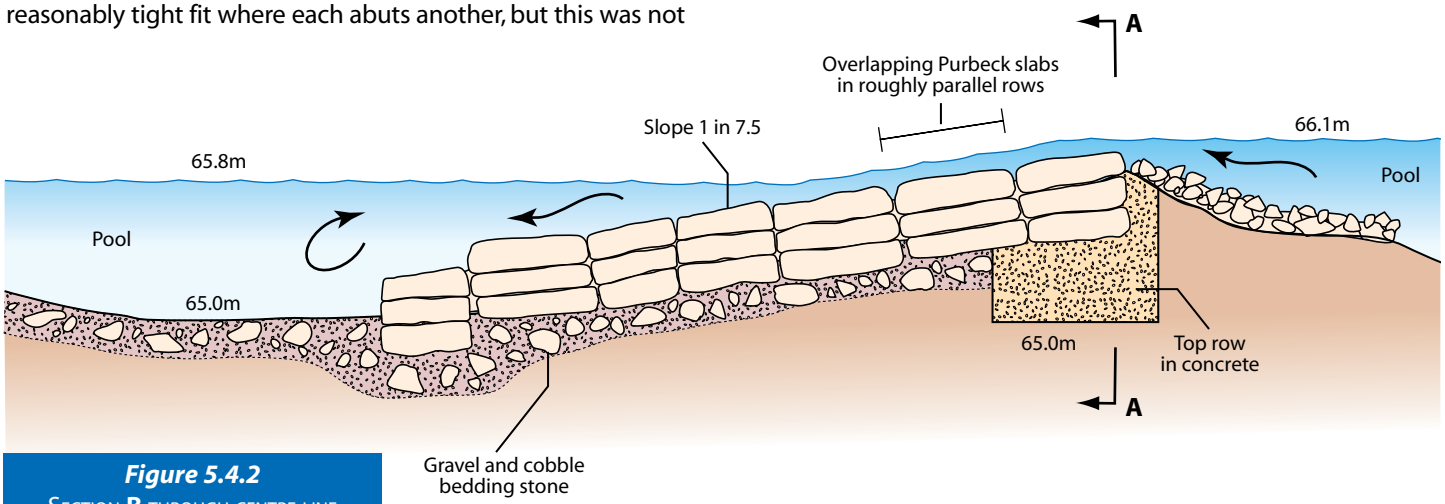

Figure 5.4.2
SECTION **B** THROUGH CENTRE LINE

The outcrops provide stability to the bed and banks as well as aesthetic interest

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5.4 River Marden 2013 Update

River Marden	Medium energy, chalk
WFD Mitigation measure	**Click Here** to view details
Waterbody ID	GB109053022060
Designation	None
Project specific monitoring	None

The simulated bedrock outcrops have proved to be fully functional in stabilising the channel section and profile. They also provide considerable diversity of flow velocity and direction and have resulted in an increase in habitat diversity.

The Geodata Institute at Southampton University had input into the sizing and selection of bed material which had all to be imported. Great care was taken in selecting the right type of rocks for the scheme. A number of potential Purbeck quarries were visited to sample and select key rock pieces, particularly for the steps on the terrace, and due to the need to match existing local stone within the conservation area setting. When constructing the river works, the consultant and landscape architect played an active role in personally briefing the contractor's workmen to show how the stones needed to be laid to follow strata lines. Whilst design drawings were useful it was the 'hands on' site explanation that proved most beneficial for communicating the aims and objectives of the scheme, followed by regular site visits during construction of the riffles for instance.

The scheme is an excellent example of urban river restoration achieved to a high standard within a conservation area.

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Contacts

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