5 Controlling River Bed Levels, Water Levels and Flows

5.1 Bifurcation weir and sidespill

RIVER COLE

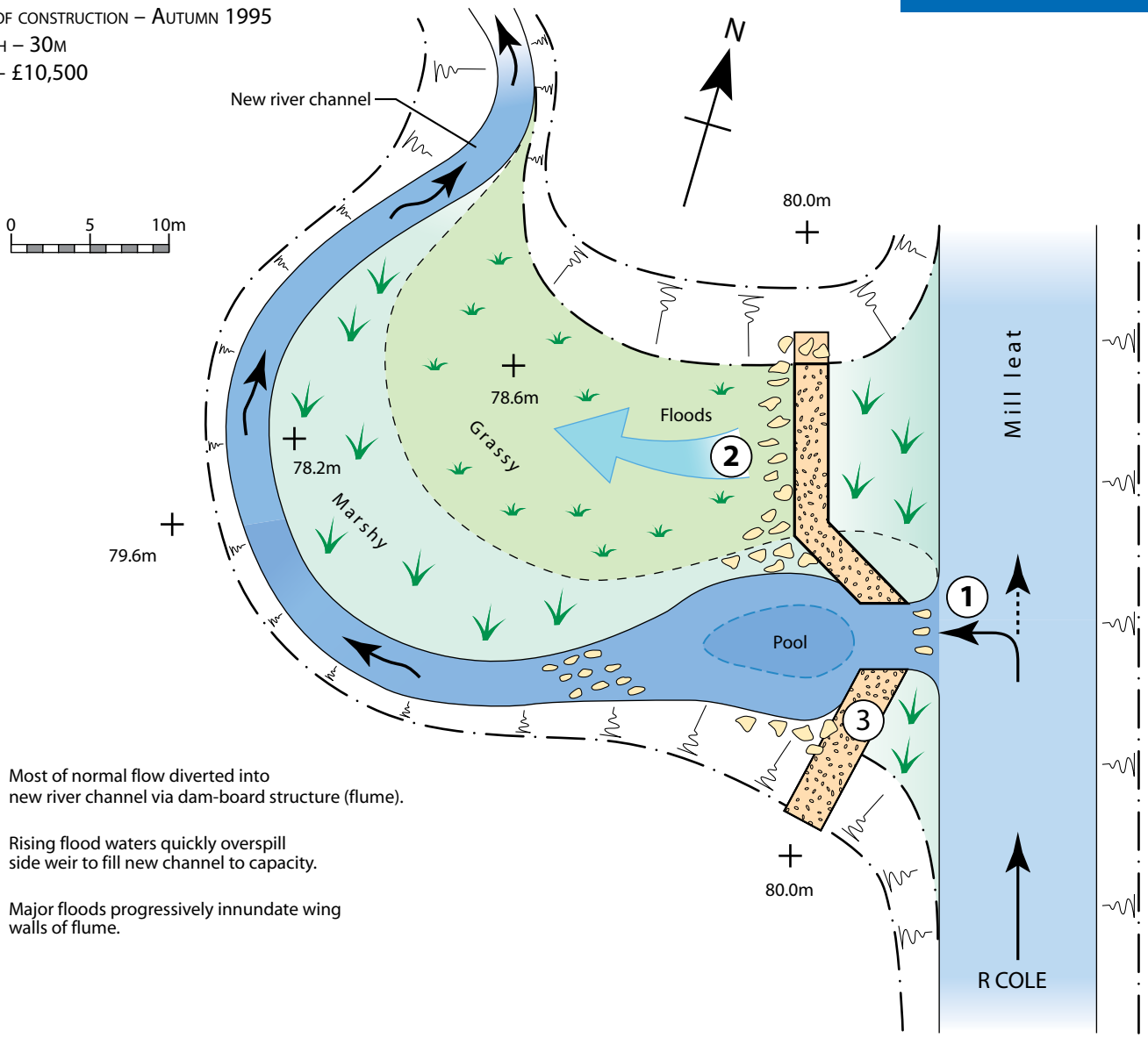
LOCATION – COLESHILL, OXON/WILTS BORDER, SU234935

DATE OF CONSTRUCTION – AUTUMN 1995

LENGTH – 30M

COST – £10,500

Figure 5.1.1
PLAN OF BIFURCATION WEIR



1. Most of normal flow diverted into new river channel via dam-board structure (flume).
2. Rising flood waters quickly overspill side weir to fill new channel to capacity.
3. Major floods progressively innundate wing walls of flume.

Description

Most of the flow in the river needed to be diverted from the mill leat, where it is impounded at a high level, into a newly created, free flowing channel that branches from it (*see Technique 1.1*). A structure was needed to meet the following criteria:

- control the level and volume of water retained in the leat;
- control the volume of water diverted to the new channel;
- maintain stable structural conditions when inundated by floods;
- create a visually attractive feature with ecological value;
- safeguard flow to the new channel should the mill sluices be suddenly opened.

A further hydraulic requirement was that the new channel should have filled with floodwater via the new structure just before the mill leat itself overspilled at a point some 250m further downstream.

A designed 'high level' overspill exists here (at 79.2m) to initiate general inundation of the floodplain. If the new channel was only partially full at such time, then floodwaters would drop into it causing serious scour of the banks, risking breaching between the new channel and the leat.

Controlling River Bed Levels, Water Levels and Flows

5

Design

The normal range of summer/winter base flows weir over a pair of damboards housed in a simple concrete flume. The top level at which the boards are set was critically determined to give precise control over the division of low flow between the new channel (90%) and the mill leat (10%), as well as control of the water level in the latter. A free fall of water over the boards is necessary to achieve this.

The normal water level in the new channel is controlled by its longitudinal bed gradient, determined independently (*see Technique 1.1*), a water level differential of c. 0.6m usually exists across the structure. The new channel begins as a deep pool leading into a long sweeping bend. The pool is sustained by floodwaters passing through the flume.

A rock/gravel riffle was created at the downstream lip of the pool. The pool is lined with rock close to the structure to safeguard against underscour. Beneath the flume, a 0.2m diameter pipe ensures that at least a small flow of water continues should the level in the leat drop below the damboards.

Control weir (*location* (1) *on plan*)

Figure 5.1.2
ELEVATION OF DOWNSTREAM SIDE OF WEIR

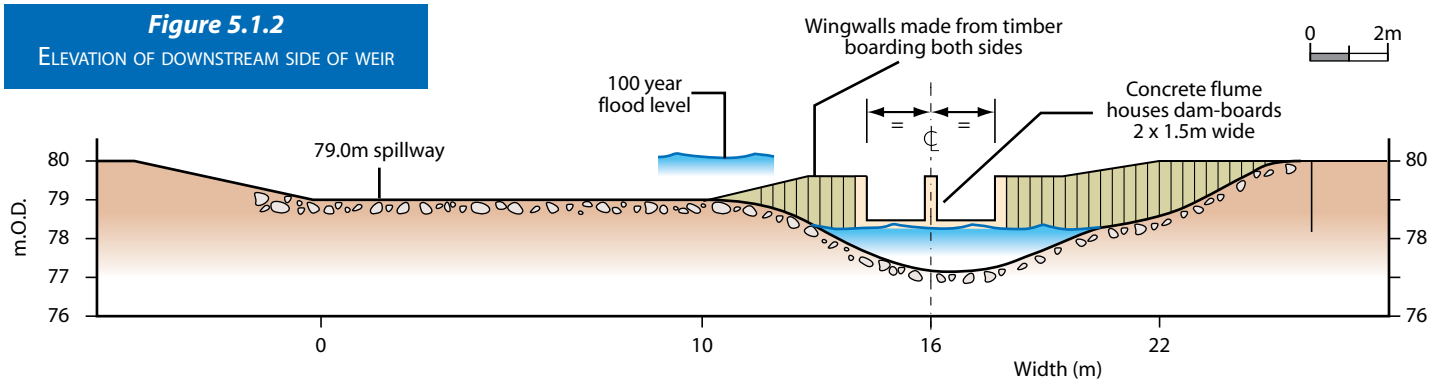
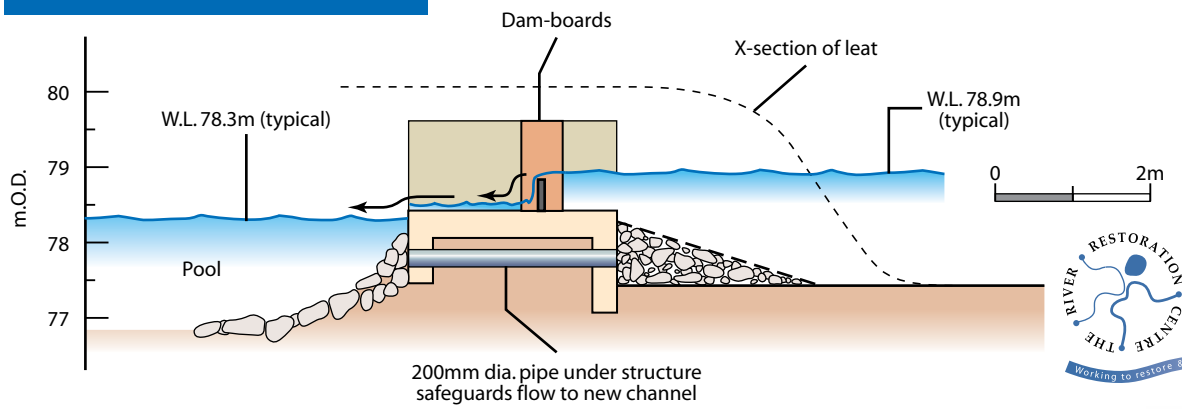


Figure 5.1.3
SECTION THROUGH DAM-BOARD STRUCTURE



THE RIVER RESTORATION CENTRE
Working to restore & enhance our rivers

5 Controlling River Bed Levels, Water Levels and Flows

The hydraulic capacity of the flume is small (to suit base flows) so a 10m wide spillway is incorporated alongside to feed sufficient floodwater to fill the new channel. The crest level is only 0.1m above the normal water level in the leat so it operates frequently. Below the spillway, a large area of land is gently graded out towards the new channel which sustains marshy conditions around its inner margins. This low lying area is largely flooded before overspill occurs, ensuring a fairly smooth combining of floodwaters passing downstream. Water in the new channel rises quickly, ensuring the overspill is completely submerged (drowned) at an early stage of a rising flood, thereby further reducing scour potential.

The spillway is defined by two parallel lines of road kerbs infilled with stone/gravel (a small amount of rock is incorporated along the downstream edge of the kerb line where eroding eddy currents are strongest). Reeds growing upstream of the structure also help to ensure stability and improve 'natural' blending between hard and soft elements.

Wingwalls link the flume to the spillway, and to the adjacent banks of the leat, through a smooth transition of levels. Large floods will inundate these walls so they are designed as weirs in their own right. Two parallel lines of vertical wooden planking are joined via walings and tie rods, infilled with clay, and topped with stone/gravel. The wingwalls are thereby free-standing structures that simply abut the sidewalls of the flume.

The spillway and wingwalls form a 'natural' footpath and are linked over the flume by a temporary wooden bridge.

Subsequent performance 1998 – 2001

The structure has functioned exceptionally well and fulfils all design criteria. The complex configuration of channel and landforms combine with diverse patterns of flow currents to sustain a variety of habitat niches as well as an overall feature of landscape interest. Snipe are commonly seen probing the marshy areas intrinsic to the design. The National Trust (owners) plan to undertake landscape planting, and to provide a permanent bridge to further enhance the location. The abundance of fish in the new channel suggest that migration is ocurring satisfactorily.

Spilllway alongside bifurcation weir – April 1997

Flood filled channel downstream of bifurcation weir