2 Enhancing Redundant River Channels

2.1 Creation of backwaters

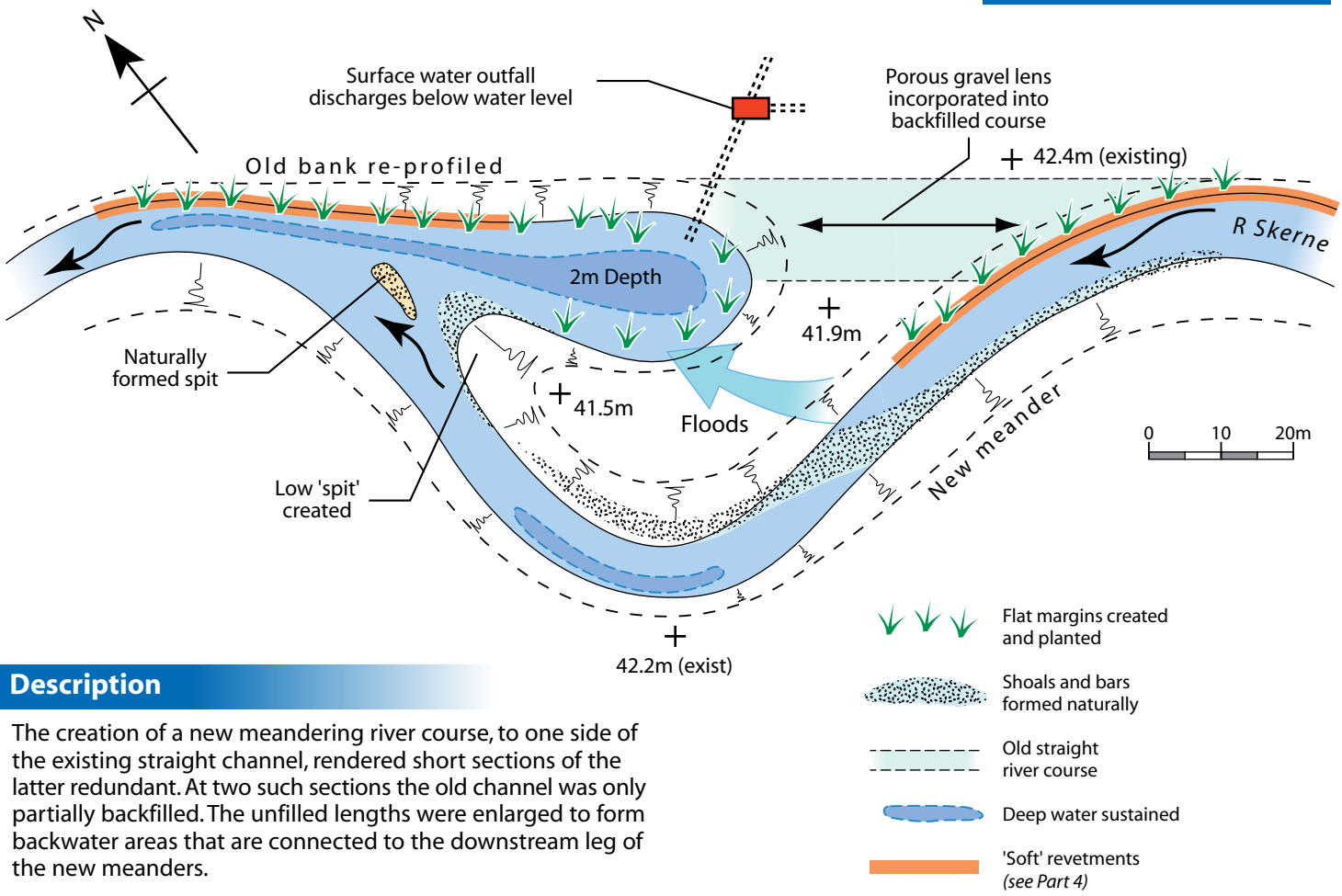
RIVER SKERNE

LOCATION - DARLINGTON, CO DURHAM, NZ301160

DATE OF CONSTRUCTION - AUTUMN 1995

COST – £3,000

Figure 2.1.1
PLAN OF BACKWATER AT BEND N2



Description

The creation of a new meandering river course, to one side of the existing straight channel, rendered short sections of the latter redundant. At two such sections the old channel was only partially backfilled. The unfilled lengths were enlarged to form backwater areas that are connected to the downstream leg of the new meanders.

Design

The redundant lengths of channel were trapezoidal in section and needed to be enlarged and reprofiled to achieve their full ecological potential. Both were similarly designed - the largest is shown in *Figure 2.1*.

A normal water depth of 2m was needed in the centre to prevent emergent plants from occupying the whole water area. Conversely, shallow depths around the sides were needed to encourage both marginal and emergent plants. The margins also provide a natural safety buffer against children accidentally reaching deep water.

Development of a series of cross-sections to provide the variable depths led to the plan form shown, which is typically 'onion' shaped. The top width is greatest where the excavation is deepest. The effect is exaggerated further by widening the shallow edges adjacent to the greatest depths.

The hydraulic design of the meander ensures progressive submergence of the backwater during floods. *Figure 2.1* indicates the way in which the land between the backwater and the river channel is profiled to ensure that the downstream leg (and the backwater) submerges before floods flow directly across the meander corridor. Floods sweeping over the backwater flow on downstream, merging with the main river flow. The complex currents that result at this stage affect the patterns of sediment deposition at the junction of the backwater with the main river channel. Large eddies inevitably arise, and these can easily cause sediments to settle out right across the junction, eventually closing it off from the river completely. The floodwater currents passing through the backwater help to reduce this risk; it was anticipated that a shallow spit of sediments would form, but not complete close the backwater. The formation of such a spit was reflected in the profiling of the land at the junction.

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Following excavation and final profiling, the flat shallow ledges were intermittently planted with appropriate species sufficient to encourage their spread. A major surface water outfall was also located within the backwater after reconstruction (*see Technique 9.1*).

A final feature of the backwater is a simulated lens of gravel incorporated into the backfilled original straight channel. Such lenses can occur naturally during the formation of meanders. The purpose of the artificial lens is to encourage a small flow of river water to seep through to the backwater at all times. The amount of flow is dependent upon the difference in water levels between the backwater and the upstream river, which in this location is very small.

Subsequent performance 1995 – 2001

The backwaters are a strikingly successful feature of the project. They not only add to overall visual amenity but attract much bird life because of the diversity of habitats especially at the junctions. People are attracted to the backwater to feed the birds which further encourages them. The eddy currents anticipated are much in evidence, and have led to the natural formation of the small spit highlighted. This is a desirable feature that should help to maintain deep water because of the narrowing effect and increased velocity.

Large Backwater – November 1996