

Restoring Meanders to Straightened Rivers

1.6 Opening up a culverted stream

RIVER RAVENSBOURNE

LOCATION - NORMAN PARK, BROMLEY TQ412674

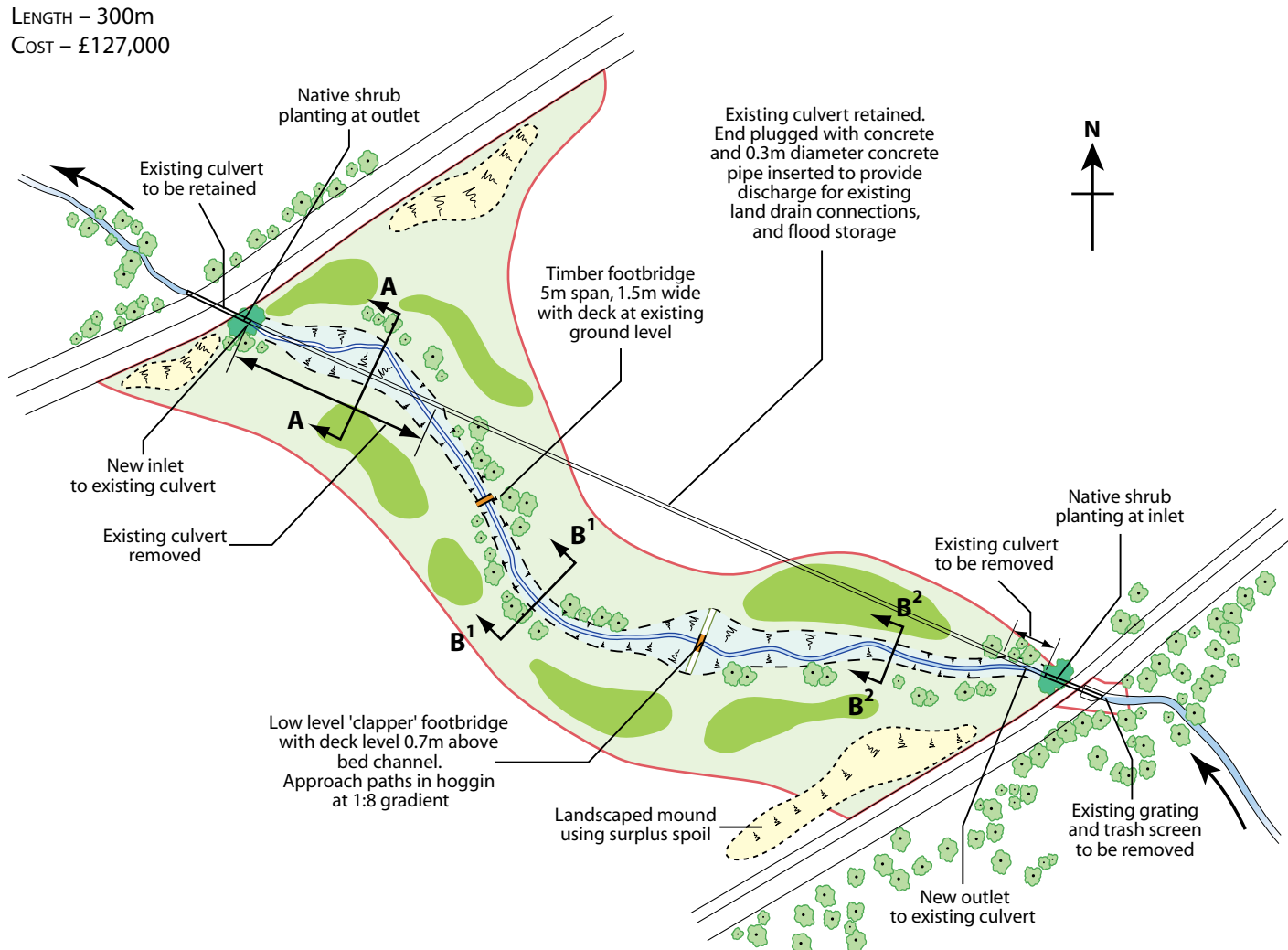
DATE OF CONSTRUCTION - MARCH TO JUNE 2000

LENGTH - 300m

COST - £127,000

Figure 1.6.1

PLAN OF NEW CHANNEL



Description

The Ravensbourne is a spring-fed stream flowing from its source near Keston, on the north slope of the North Downs, northwards through Bromley, Catford and Lewisham to join the Thames at Deptford Creek. In many areas such as Norman Park the stream was confined within a culvert.

Culverting of small watercourses in urban and parkland areas has been common in the recent past. Burying the river was felt to reduce the flooding potential, minimise safety issues associated with open water and maximise land available for development or use as open space/playing fields. Little consideration was given to habitat loss, aesthetic and landscape appeal of rivers or the potential benefits of surface water storage.

The Ravensbourne flowed for 300m through a 1m diameter concrete-lined steel culvert. Smaller land drains, which had been ditches before the area was levelled to form the park, flowed into the culvert at intervals along its length.

Park access tracks and major services, including a gas pipeline and electrical supply cables, crossed the culvert at the north end and a water pipe and local electrical supply cables at the southern end.

Deculverting (daylighting) this section of the Ravensbourne provided an exciting opportunity to restore a more 'natural' stream with diverse in-channel and bankside habitats that link with Scrogginhall Woods just upstream. It also provides an interesting recreational facility for the local public.

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View of headscreen prior to removal



'Daylighting' of the Ravensbourne

Design

Financial justification for the scheme was threefold: reduction in costly maintenance for a culvert, the removal of a trash screen that also required regular clearing and was a safety issue, and an increase in flood storage. There was also a positive environmental gain.

The culvert was severed and approximately 70m of the 300m long culvert was removed, isolating 180m of the remaining section. Two short lengths were left to maintain the existing access track and service crossings. As the culvert was ruler straight, simply excavating the watercourse and removing the concrete would produce a far from natural channel. In addition, culvert removal, backfilling and reshaping is considerably more expensive than plugging and digging an alternative, though longer, course.

The design of the river channel was based on the historical layout, fluvio-geomorphology, flooding considerations and present day use of the park (cricket pitches). To avoid being overly prescriptive, the design drawings were kept relatively simple. The conditions encountered on site meant the final course is slightly different from the design plan (*Figure 1.6.1*). Indicative cross sections were provided at key locations with the main objective always a shallow, safe, accessible bank (*Figures 1.6.2 and 1.6.3*).

The new channel varied in bank slope and bed width, but followed a smooth longitudinal bed profile. By then infilling with an excess of gravel, the stream was allowed to shape its new bed, rather than 'constructing' pools and riffles.

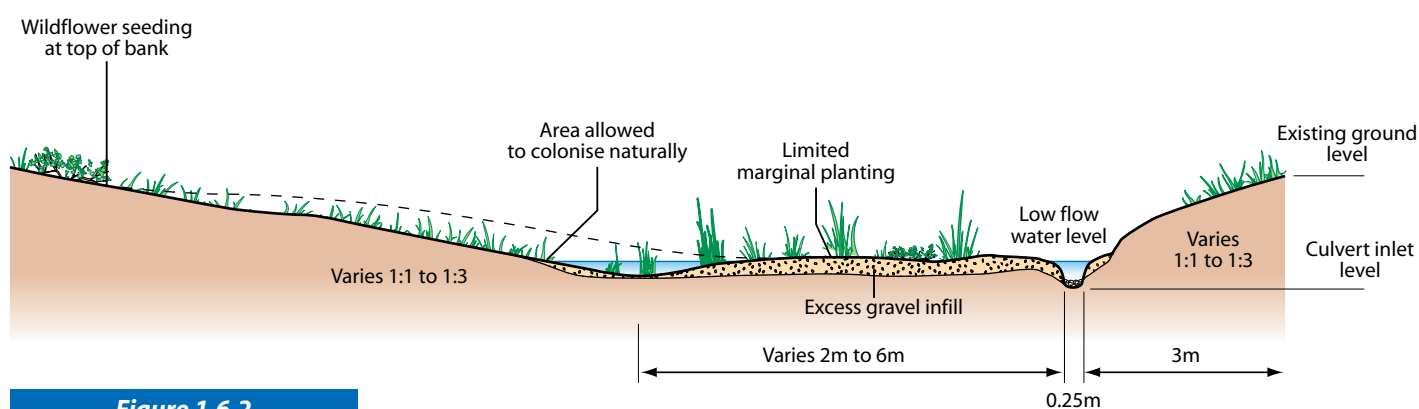


Figure 1.6.2

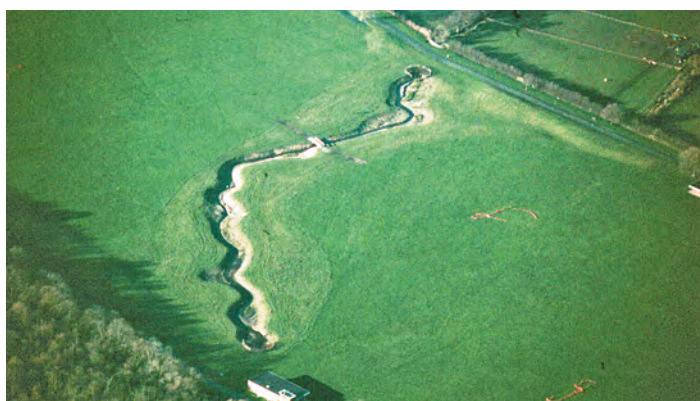
SECTION A THROUGH RAISED BED
AND MARGINAL SHOAL



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Looking downstream at the shallow bank slopes. The severed culvert still visible



The new sinuous course and extent of wildflower seeding

The new course is 12.5% longer than the culvert, sinuous, with varying bed and top-of-bank widths. A shallow (1:8 batter) 'beach' area, as a result of an exposed gravel lens, and new meanders (1:5 inside batters) form the focal points for access to the stream.

When considering this type of scheme, where the stream emerges and then re-enters a culvert, it is good practice to build in 'sediment traps'. These can take many forms and do not have to resemble deep holes or even be maintained once the site has stabilised. At Norman Park the channel was greatly widened at the downstream end of the works forming a damp gravelly area which would act as a silt trap. This also allows the stream to find its own natural path within the confines of the overall channel width.

Spoil from the excavation remained on site, and the landscape architect located the mounds at either end of the new course, to ensure that they were subtle and blended into the park.

Two crossings have been constructed over the new channel, one a 'clapper' type bridge constructed of concrete (but looking like stone) and the other a timber structure. Both provide easy access across the stream and access to the water's edge is made possible along most of the course by shallow bank slopes.

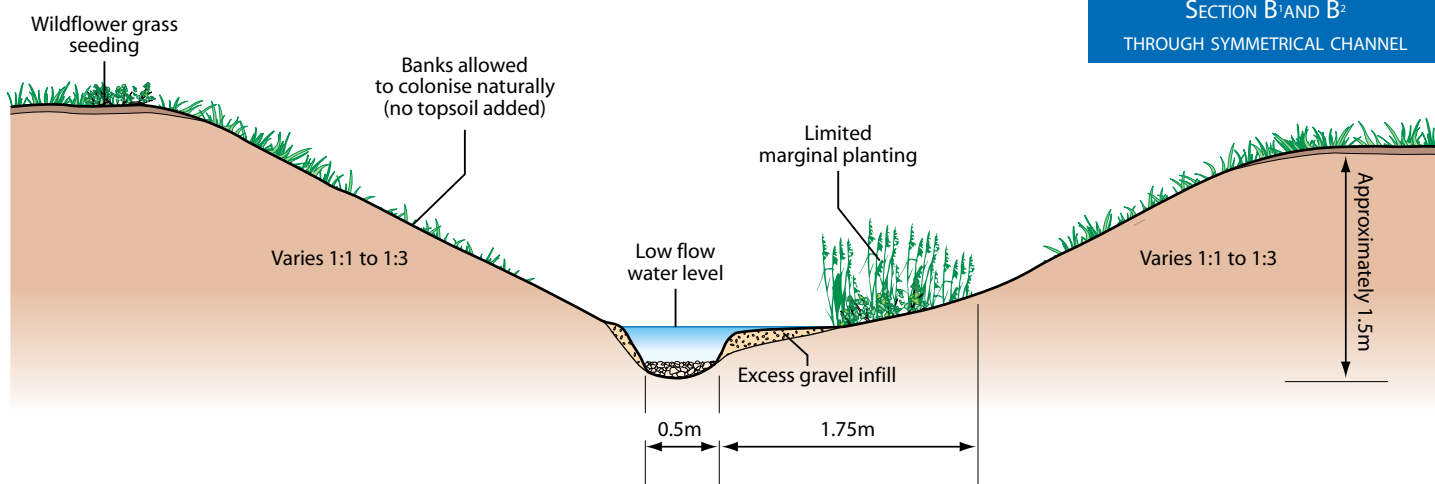


Figure 1.6.3

SECTION B' AND B"

THROUGH SYMMETRICAL CHANNEL

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Planting up the 'wet berm' area
and shielding the culvert
entrance with shrub planting



Topsoil was not replaced on the riverbanks in order to attain a low fertility substrate suitable for the natural colonisation of wildflowers and plants from upstream. A 'buffer zone' between the amenity grassland and the top of the bank was seeded with a low-density wildflower mix from an approved source. This creates a visually pleasing edge to the playing fields and provides a suitable seed source for the banks. On the river's edge native provenance marginal plants were carefully sourced from a local nursery. School children were involved in some of the marginal planting. Wildflower plugs were also planted. The culvert entry and exit were both screened using a variety of native shrub species.

Subsequent performance 2000 – 2001

The park users, particularly dog walkers, now see the open Ravensbourne as a focal point, circling the area and making use of the crossing points. Children and dogs play along the banks even though the site has still to mature.

The gravel bed has been redistributed by the flow creating riffles and pools (down to the clay bed in places).



The marginal planting is suffering disturbance from early use and may take longer than expected to establish a good cover, though this should eventually produce a good diversity of edge habitats. The wildflower plugs have been decimated by crows in search of worms. About a third were removed from the ground and died.

The planting scheme was designed as a balance between creating an instant impact for the local users and allowing the natural processes of colonisation to occur. Even so the local users have stated that they would have liked more immediate impact from the planting.

Initial invertebrate and fish surveys have shown little change, but this should improve with time as the site matures and the marginal and emergent vegetation develops.

The early success of the project can be attributed to the multi-disciplinary project team and the Partnership between the Borough Council and the Environment Agency.

Original Information Providers:
Trevor Odell
Julie Baxter

Completion was celebrated
at a launch ceremony
in June 2000



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1.6 River Ravensbourne 2013 Update

Morphological processes are now able to take place on this de-culverted stretch of the Ravensbourne. Erosion and deposition is occurring within the new meandering channel and flow variability has developed. Areas of fast flow are evident in the shallower riffles and there is slower flowing water at the margins where the water level is deeper. Within a month of the works being completed the gravel had been redistributed as expected. The river had exposed the clay subsoil and has now created a stable channel.

Opening up the culvert has reconnected the river to the floodplain. This provides an opportunity for floodwaters to be stored on the floodplain, reducing the flood risk downstream.

The park area is well used by local people for recreational purposes and a site visit and talk was given at a local school following the works.

River Ravensbourne Low energy, gravel

WFD Mitigation measure

Waterbody ID GB106039023260

Designation None

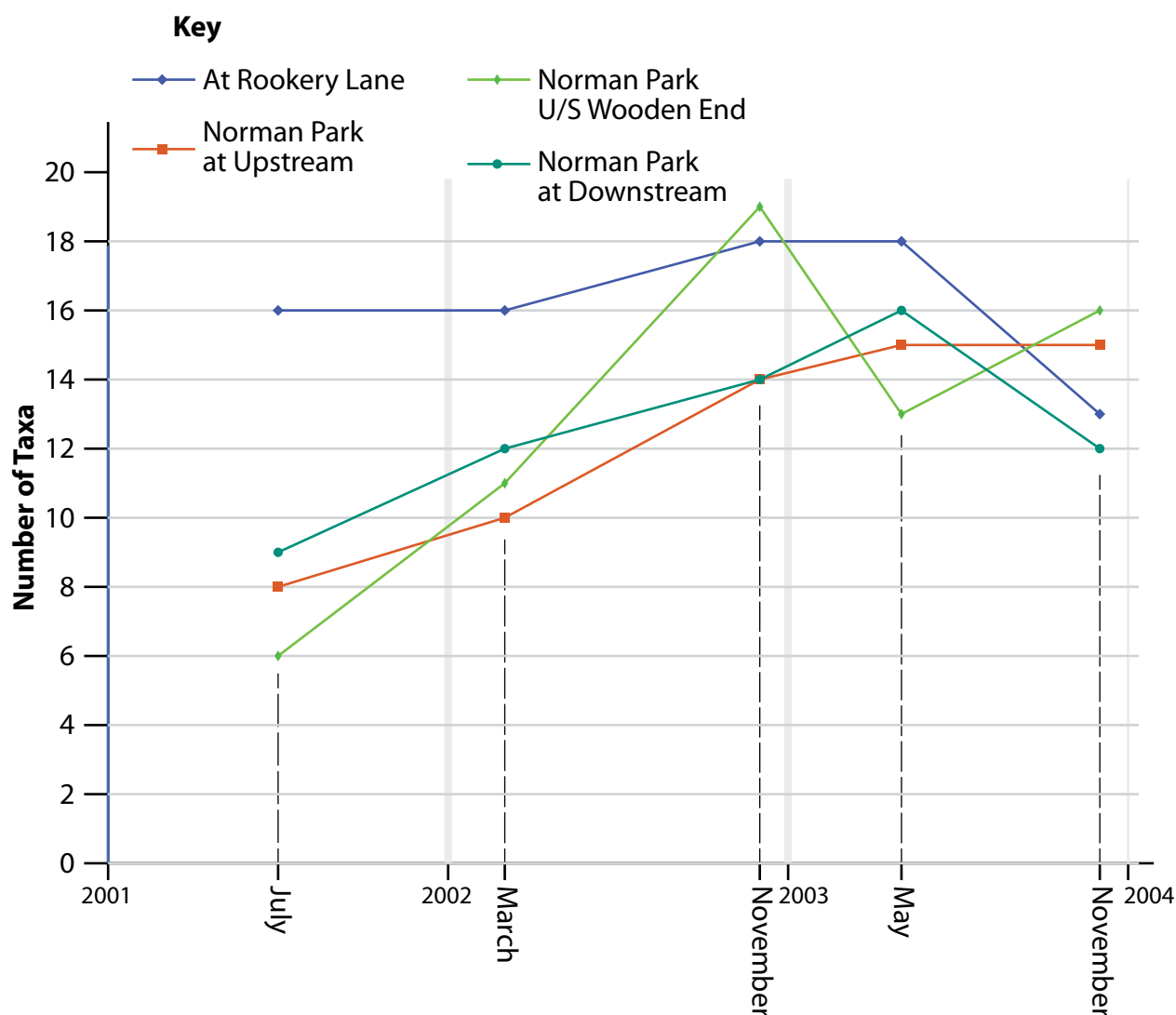
Project specific monitoring Macroinvertebrate

Effective narrowing of the channel, and asymmetric shallowing of the bed has occurred following restoration – 2012



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Macroinvertebrate sampling was undertaken between 2001 and 2003 and this showed an increase in the number of taxa recorded following the works. Further sampling is planned for 2013 in order to compile a more complete dataset.



Changes in the number of invertebrates between 2001 and 2003.

By 2003 numbers for the control site (Rookery Lane) and the restored sites were similar demonstrating ecological improvement in the de-culverted stretch of the river.

(River Ravensbourne, EA data)

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