

## 12.6 Complete removal of a small low head weir

### RIVER GREAT OUSE

LOCATION - BUCKINGHAM, SP 69473350

DATE OF CONSTRUCTION - JUNE 2016

LENGTH - 5m (100m including bank works)

COST - £7,500 (but part of an existing £35,000 bank stabilisation scheme)

<b>Type</b>	Low energy, clay
<b>Status</b>	Failing for fish (driver physical habitat modification). HMWB. Moderate (2016)
<b>Waterbody ID</b>	GB105033037860
<b>Designation</b>	None
<b>Monitoring</b>	Fixed-point photos



Intact 0.5m concrete weir – 2012

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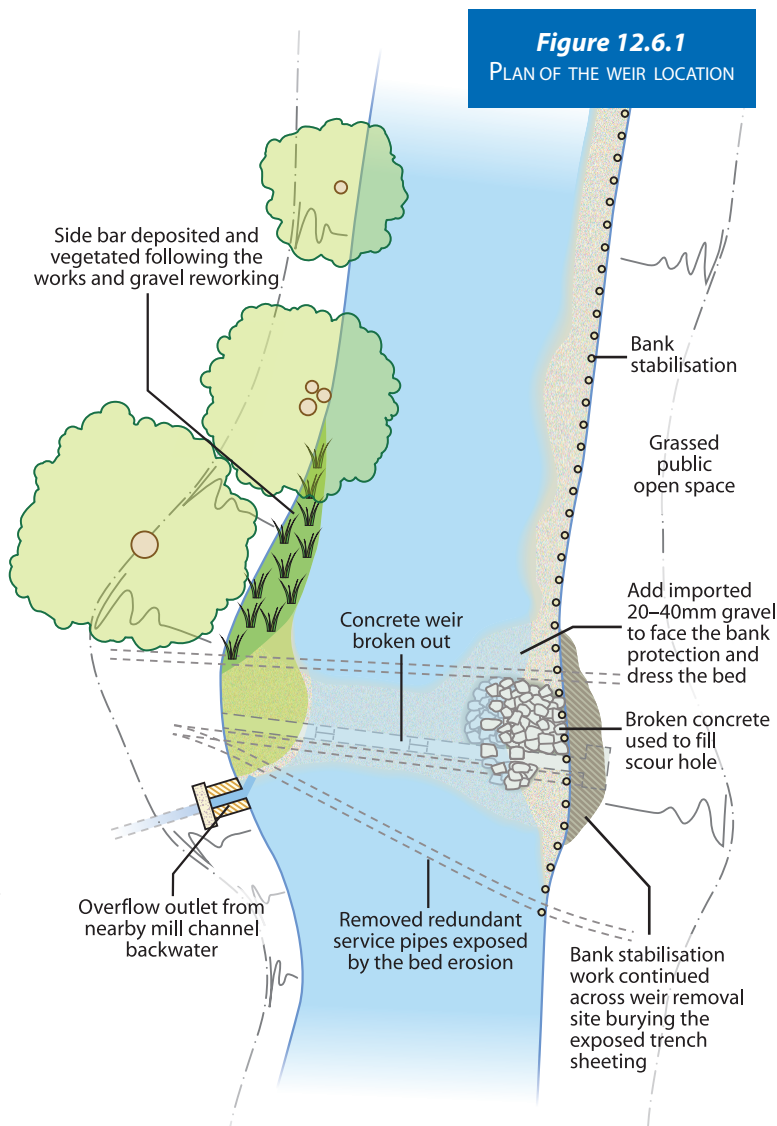
### Description

The River Great Ouse flows for approx. 20km before reaching Buckingham. Through the town the river has undergone significant alteration over the centuries - realignment, bank protection and impoundment by weirs, but still retains a linear riverside park.

At Chandos Park, a 15.5m long concrete weir retaining a depth of 0.5m was assessed during an early WFD investigation as preventing fish passage and impacting river morphology. The weir was already in danger of being outflanked where high flows and access by dogs had combined to cut a low channel around the structure's right edge where it transitioned into the grassed earth bank. The concrete weir had previously been extended, most likely as a result of similar bank erosion and outflanking.

In April 2016, the weir developed a void below the previously extended section, undermining the structure and dewatering the river above. Environment Agency staff removed the two sets of wooden sluice boards to reduce the head of water and to visually assess the implication of removal on the upstream impounded levels (a weir pool, University grounds and residential gardens).

Over the next few weeks the void continued to enlarge creating a significant 2m deep scour hole on the downstream side. By May all of the low flow volume was passing under the weir, effectively making it redundant. Removal was deemed to be the most desirable and cost effective solution to restore natural processes, improve fish passage and improve public safety.



**Figure 12.6.1**  
PLAN OF THE WEIR LOCATION



The Environment Agency undertook an impact assessment that considered the effect of reduced impoundment on channel stability and habitat quality. Weirs are often convenient locations for service pipes to be laid across rivers. A number of pipes that were not previously visible or recorded had become exposed by the erosion at the weir and the EA undertook the investigation of these (confirmed as redundant).

The riparian land owners, Buckingham Town Council and University of Buckingham jointly funded the £7,500 removal work which was added to a pre-existing riverbank stabilisation contract just due to start on the immediate downstream bank. The cost of the work was significantly reduced by adding it to the existing contract.

## Design

Sedimats were installed downstream in three rows and checked on a regular basis to reduce fines being transported downstream. However, due to the nature of the weir failure there was very little in the way of silt built up behind the weir itself as it had already washed out.

The works involved were:

1. Working in the wet, break up and remove concrete weir using 13 tonne 360 excavator and breaker attachment.
2. Smaller concrete remnants used to infill the 2m deep scour hole. Larger concrete sections removed from site to a licensed waste facility.
3. Trench sheeting found beneath the weir extension. Folded over and buried in the void and bank.
4. Bank toe protected with a post and geotextile retaining line to tie in with the failed toe board replacement and regrading work.
5. Remove the identified redundant service pipes associated with the weir.
6. Grade existing bed gravels into voids and use 20-40mm imported gravels to dress the scour hole, concrete fill and to create shallow gravel bars at both bank edges.
7. Right bank edge formed by extending the low level chestnut stake and geotextile bank protection, and covering the remnant sheet piling. Upper earth bank regraded to gentle slope and seeded.



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Weir concrete used to fill scour hole – June 2016

## Removing or Passing Barriers

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Large scour hole beneath weir – May 2016



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Trench sheeting and concrete fill buried behind bank revetment line – June 2016





## Subsequent performance – 2014 to 2019

Following the barrier removal, water, sediment and fish can easily pass through the site. A vegetated gravel bar has developed on the left bank where the weir's scour had previously widened the river.

After the first year there was some immediate settlement and reworking of the gravel bed, exposing an old buried upstream concrete apron. This is currently acting as a low level bed check and is not particularly visible. No maintenance has been required or is expected.

The regraded and stabilised bank is part of a popular park used by recreational visitors (dogs and children play on the riffle and shallow gravel bars).

The riffle was observed being used by coarse fish (chub and minnow) for spawning and feeding, until a total fish kill in summer 2018.



Location of removed weir after a year – July 2016

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### Four fixed point photos tracking the progress of the work



Failed weir – April 2016

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Weir removed – June 2016

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Imported gravel covering the concrete fill and creating accessible 'beaches' – Sept 2016

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Recovery after 3 years – March 2019

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## Removing or Passing Barriers

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### Lessons - for wider application

Usually, detailed background morphological and ecological survey work is necessary to ensure that the design allows for natural adjustment following the removal. Here, due to the timescale and urgent need to address the safety issues associated with the failed weir, this process was sped up and carried out by experienced EA geomorphology and fisheries staff.

Specifically, in this case, there was only a small difference between upstream and downstream water levels and bed levels. The boards could be removed to simulate reduced upstream levels, there were no protected species or high quality habitats present and all of the service pipes were redundant.

The quality of retained sediment within the impoundment of the structure would usually need to be assessed, especially in an urban setting. Due to the low head of the weir and its foregone failure, very little fine sediment was visible



Recovery after 3 and a half years – Oct 2019

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## Contacts

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