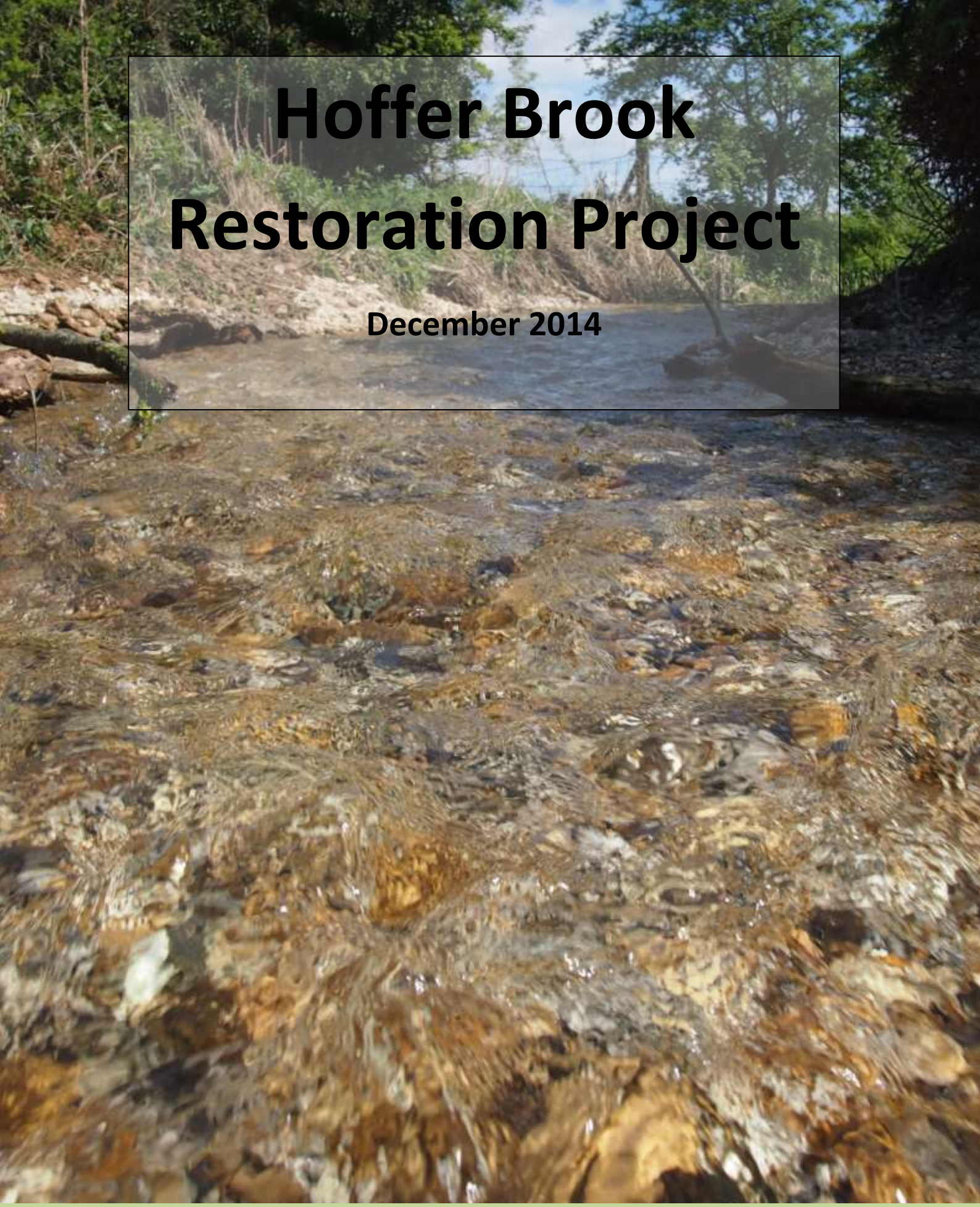

Hoffer Brook Restoration Project

December 2014

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Bedfordshire Cambridgeshire Northamptonshire

South Cambridgeshire District Council

Hoffer Brook Restoration Project

Techniques: bed raising (with plastic mesh), shoal creation, channel narrowing, de-silt, tree work, bank repair (using cut turfs), fencing and cattle drinks
Project location: Between Harston and Foxton
River: Hoffer Brook, tributary of the River Rhee
County: Cambridgeshire
Project start date: Feb 2013
Project end date: May 2014
Length: 1.6km
Upstream grid ref: TL416491
Partners: The project was implemented by South Cambridgeshire District Council and the Wildlife Trust BCN with support and assistance from the Environment Agency and the two landowners.

Site background: The Hoffer Brook is approximately 8km in length. It rises from the chalk aquifer near Thriplow. The brook runs through a relatively flat arable landscape with no known point sources of pollution such as sewage treatment works or urban run-off. The water quality of the brook is therefore assumed to be good. The brook should be considered as a degraded chalk stream – a habitat of potential national importance.

The flow of the brook can be supported by an artificial discharge point between Foxton and Newton, an area known locally as Chardle's Springs. This artificial discharge is operated by the Environment Agency when flow in the brook and River Rhee becomes low. The recent drought of 2010-12 saw the middle and upper reaches of the brook run dry, but the brook does not dry out in its lower reaches.

Much of the brook's bed is soft silt with chalk outcrops. Historic dredging has resulted in a channel which is too wide and too deep, exacerbated by a reduced flow in recent years due to abstraction from the aquifer. Any natural gravel deposits that once existed seem to have been removed by dredging.

There are three features in the lower reaches affecting flow:

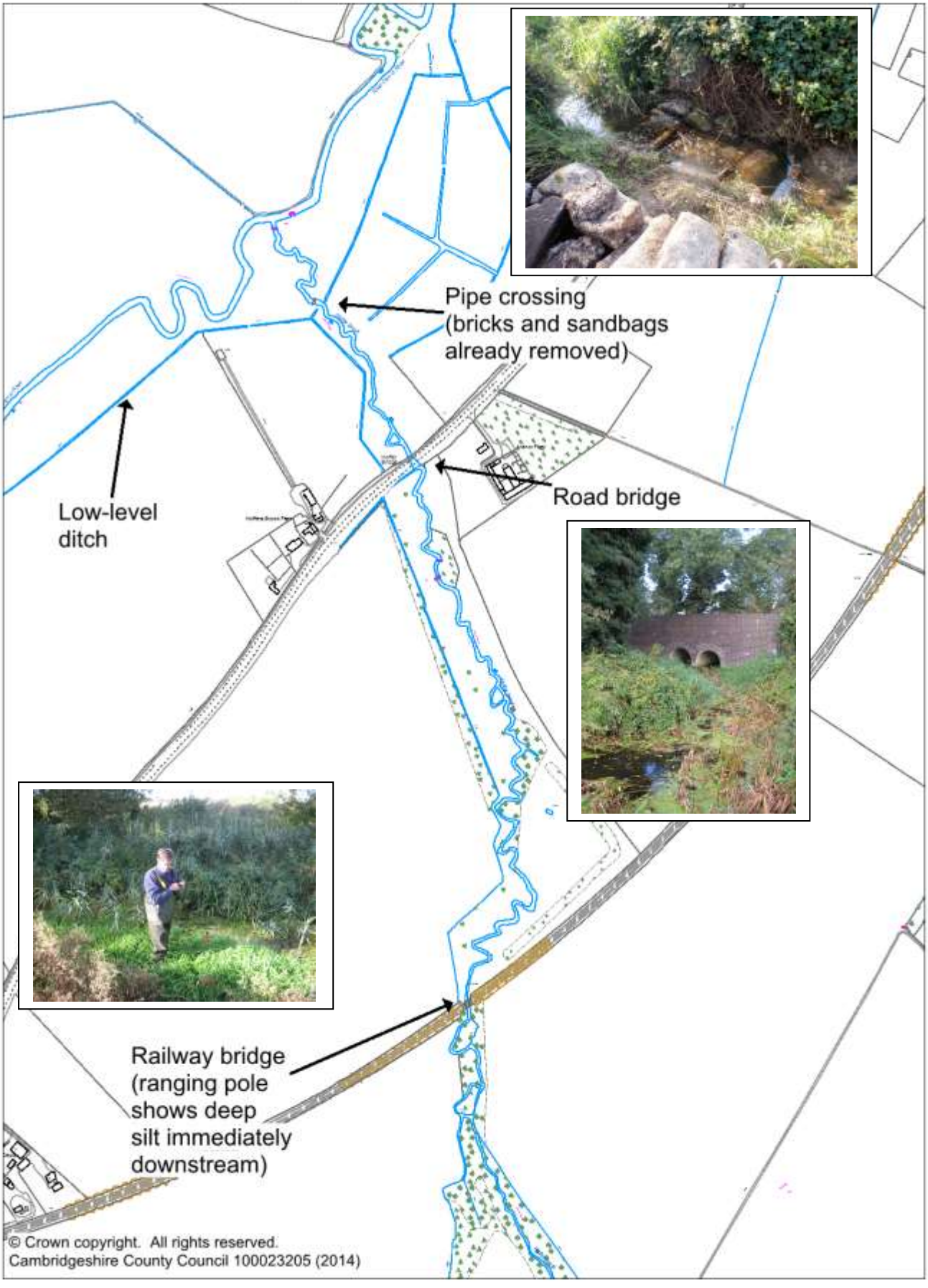
- A railway bridge with a sharp drop in bed level downstream. The lowest area of gravel ends here and the bed becomes very silty and soft;
- A road bridge whose foundations impound flow;
- A pipe carrying a lower level ditch underneath the stream, which impounds flow and inhibits fish passage.

Maintenance of the lower reaches is the responsibility of South Cambridgeshire District Council. Due to the low flood risk management has been minimal in recent decades.

The brook was known to support a brown trout population many decades ago but in recent times the only fish populations observed have been pike, bullhead, stickleback and brook lamprey. A pipe crossing downstream was thought to restrict the upstream passage of fish but in recent years minnows, gudgeon and roach/dace have been observed on rare occasions. The brook is considered to be much below its potential to support natural fish stocks.

Most of the land adjacent to the lower section of the brook is grazed by cattle. This has led to bank erosion and excessive siltation. The soft bed of the channel is also unsafe for livestock.

Hoffer Brook Site Map



Objectives:

The restoration project aimed to meet the following objectives in a way that did not compromise necessary land drainage. The aim was to achieve a healthier watercourse, able to cope well with all flow levels and with improved benefits to wildlife.

- Create a greater diversity of instream habitats;
- Improve fish passage and introduce spawning areas;
- Reduce sediment inputs and bank damage as a result of poaching by livestock;
- Create a more natural and sustainable flow through sensitive clearance of silt and woody debris and repair of damaged banks;
- Prevent overflow of brook into lower level drainage channel.

Design:

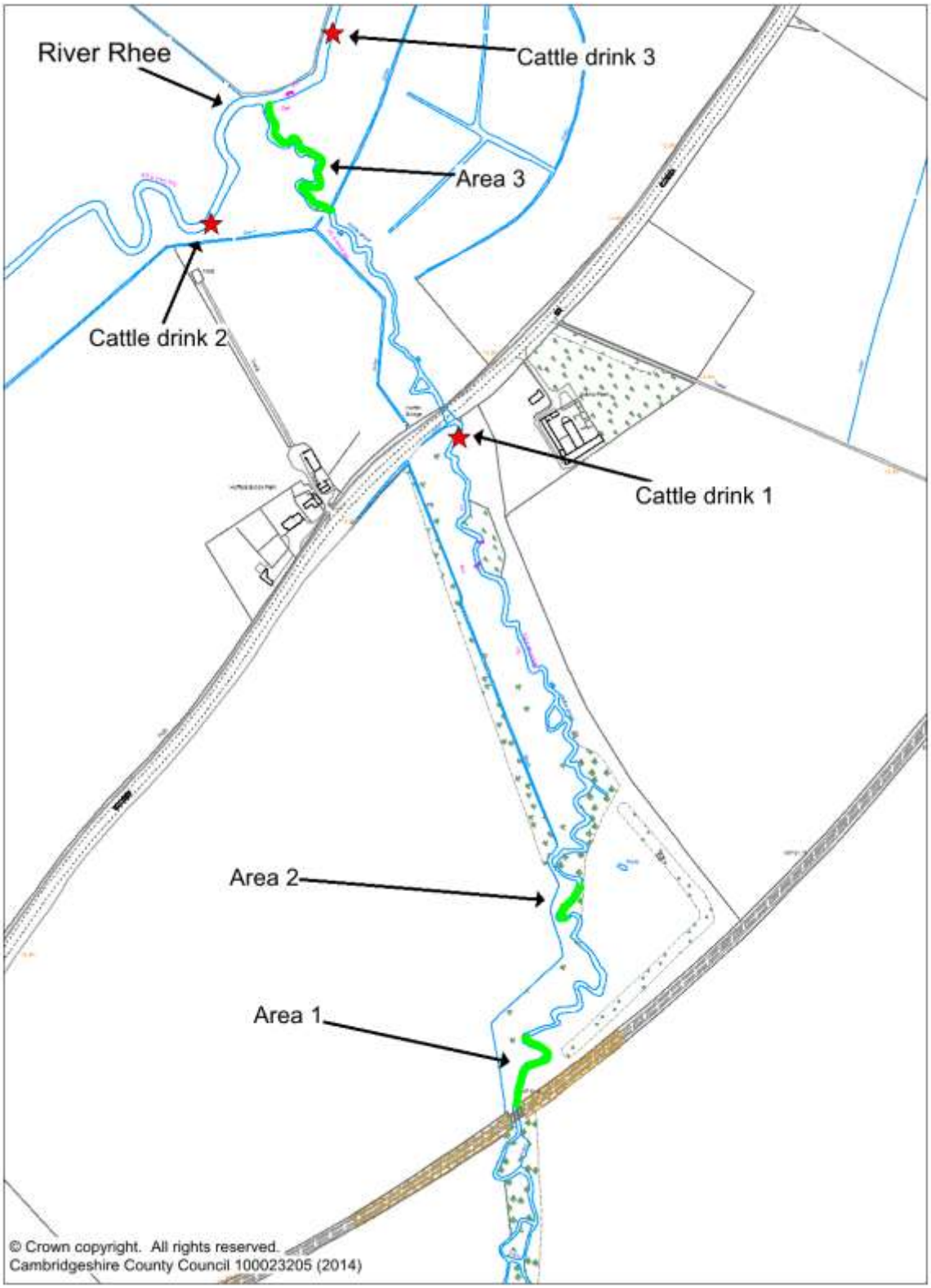
Separate actions include:

- **Raise bed levels** – to create a more natural river bed and remove some of the over-deep sections. Use of gravel for this purpose to improve habitat diversity and provide potential spawning areas for fish;
- **Repair damaged banks** – to reduce sediment input and create a more sustainable bank profile, and to prevent water flowing from the brook to the low level ditch;
- **Livestock fencing and cattle drink creation** – to restrict cattle access to fenced drinking areas and protect banks from further damage;
- **Improve fish passage** – by creating a smooth gravel glide in place of the drop caused by the pipe crossing. This will also provide spawning habitat;
- **Re-profile banks** – by using historically dredged material to create meander point bars. To diversify bank conditions for marginal plants and increase the flow rate on the outside of meanders;
- **Tree work** – to remove impoundment due to logjams at the lower end of the brook plus some thinning and canopy lifting to encourage growth of bankside and marginal plants;
- **Sensitive de-silt** – to remove some of the deep silt which has accumulated over decades without management so that some areas can remain scoured clean.

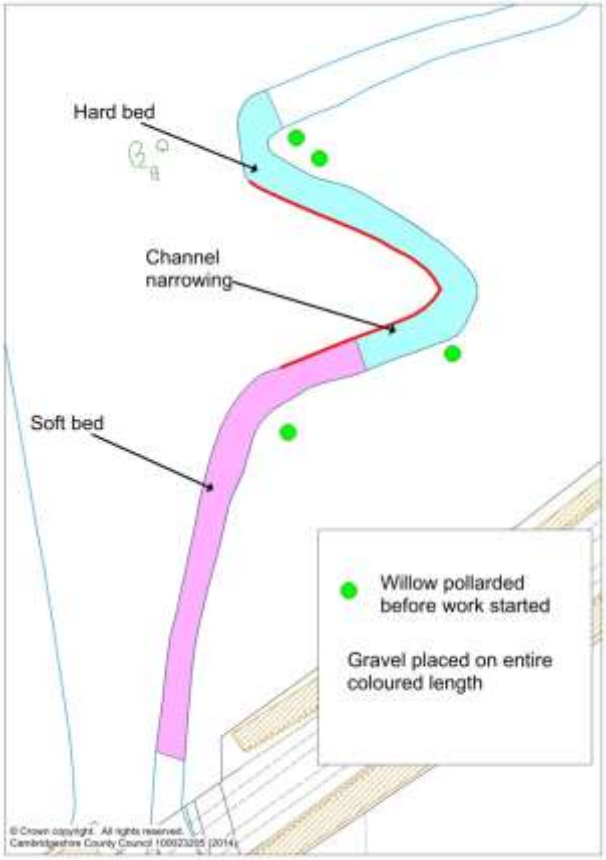
The majority of the stretch between the railway bridge and the River Rhee was carefully de-silted at the very start of the project, leaving channel features such as shelves of marginal vegetation intact.

Following this work took place at 3 main locations (see map below).

Hoffer Brook Work Areas



Area 1:



The bed at the upstream end was soft, deep silt, which gravel was likely to sink into. However, it was a key area for bed-raising due to a deep hole immediately downstream of the railway bridge. The soft silt continued for approximately half the length of the bed raising.

This challenge was addressed by laying plastic mesh over the silt and adding the gravel on top. The plastic mesh was joined in sections with cable ties and secured to the banks with posts and rope. Gravel placement raised the original bed level by approximately half a metre. Woody debris was also used, and fixed in place under gravel.

During gravel placement a hole developed in the mesh, probably at a join, and although the bed looked solid it was possible to sink into the hole. A week later, the gravel had locked together and there was no sign of the hole at all; the whole bed was firm.

Before work started

After de-silt and mesh placement

With gravel and woody debris

Channel narrowing was also carried out at Area 1, with posts and faggot bundles, backfilled with brash, then with soil and silt from the work area.

Before

Faggot narrowing backfilled

5 months later

Four willows were pollarded to allow machine access. Pollarding extends the life of the tree as well as letting more light reach the water. Pollard willows are a feature of Cambridgeshire's river landscape and can support unusual invertebrate communities.

In this area, the brook was already fenced to keep cattle out, so only fence posts which had been removed for machine access were replaced. A pond in a different part of the field was made deeper to hold water for drinking.

Area 2:

On this stretch, a machine was used to re-profile the bank and to add gravel to create a point bar on the meander. This created a pinch point which speeds up the water on the outside of the bend and provides a better variety of bank conditions for marginal plants. Woody debris from fallen trees was repositioned into the channel to protect the banks and increase flow diversity.

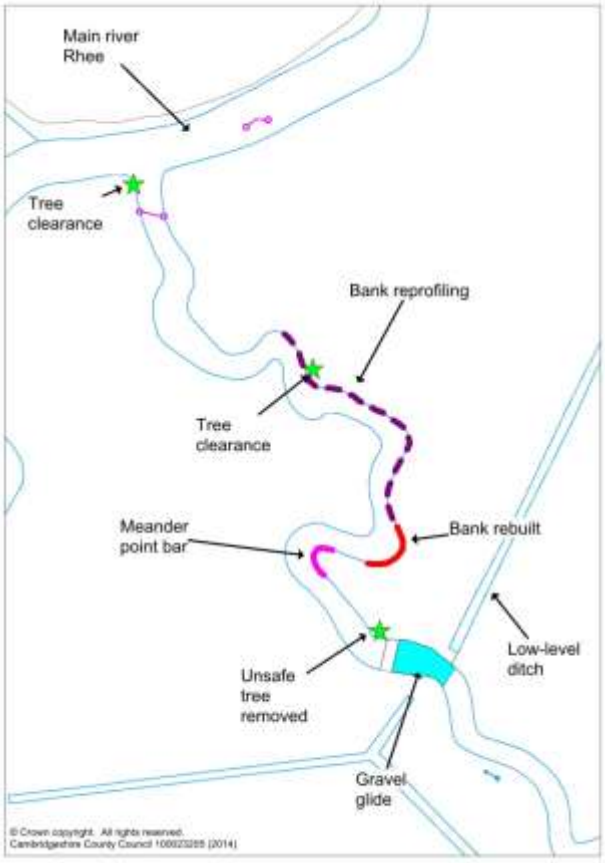
Woody debris added to channel

Addition of gravel

Re-shaped point bar

Gravel was used downstream of the point bar to raise the bed slightly. This section was later fenced to prevent cattle access. Areas damaged by machine access were seeded with a grass and wildflower mix.

Area 3:



This lower reach was the most damaged by cattle poaching. The main tasks were:

- To create a smooth gravel glide over the pipe carrying the low level ditch under the brook;
- To build up a severely poached section of bank, which was allowing water to overflow from the brook into the low-level ditch;
- To create a meander point bar;
- To re-profile banks using cut "turfs";
- To fence the entire length to keep cattle out;
- Tree work to remove a dangerous tree, to clear sections of channel which are impeding drainage and to lift the canopy. Some of the wood was used to strengthen the bank.

Gravel glide:

An old culvert carrying the ditch under the brook had been replaced by two concrete pipes, then covered in cement sandbags and rocks. Even when the sandbags were removed, the concrete pipes impounded water and made fish passage difficult. Gravel was used to make the slope smoother, being raked by hand over the pipe to ensure there was no damage. This also created a good area for fish spawning and the riffle will improve oxygenation of the water. An old farm bridge crosses the brook just downstream of this point. The gravel did not continue under the bridge so that the deep water here would give it some protection from flooding.

Pipe with stones removed

Completed gravel glide

7 months later (December)

Bank re-building and fencing:

This section of brook was the main cattle drinking point. Severe poaching had lowered the bank so that water tended to flow across the field into the low-level ditch rather than along the brook. The low-level ditch flows under the main river and joins it downstream of a nearby mill. This two-level system needs to function for current use of the land to continue.

The bank here was rebuilt using wood, soil and silt won locally and compressed by the machine to create a firm shape. The entire right (east) bank was then fenced to exclude cattle. Restricting cattle to dedicated drinks (in this case on the nearby main river as there was no suitable location on the brook) reduces erosion and reduces the amount of silt going into the watercourse.

Before – showing poached marshy area and lower access point

Re-building in progress

Finished bank

Meander point bar:

The bank was re-shaped on a tight bend to narrow the channel slightly and raise the bed with gravel.

Before

After – with gravel and re-shaped bank

Tree work:

Two trees had fallen across the channel and these were removed, but woody debris was used wherever possible to provide a more diverse river habitat without causing flooding.

Bank re-profiling:

Vegetation management and de-silting were required by the landowner and drainage authority (South Cambridgeshire District Council). This was carried out in a sensitive way so as not to over-deepen the channel. "Turfs" of vegetation were used to stabilise and help repair poached banks.

"Turf" cut from marginal vegetation

"Turf" placed at bank edge

Section of re-profiled bank

Cattle drinks:

Cattle drinking areas were created or improved as part of managed access to the water. Three fenced drinks were built and a pond enlarged.

Example of improved cattle drink

Pond before work

Pond after work

Subsequent performance / monitoring:

The mesh seems to be working very well to support the gravel, and it is intended to monitor over a number of years with the intention of noting what happens when the mesh, posts and rope finally fail. All the pasture has been grazed since the project was completed and the cattle drinks are working, although they would perhaps have been improved by more gravel or a concrete hard standing.

Invertebrate monitoring has shown that the new gravel areas, which were rapidly colonised by freshwater shrimp and blackfly larvae, are already home to mayfly larvae, caddis larvae and water beetles. Invertebrate monitoring will continue at least on the upper reaches.

While no trout redds were found in December 2014, the gravel glide still looks like excellent spawning habitat and it is hoped trout will find it in time.