

River Welland: Drayton

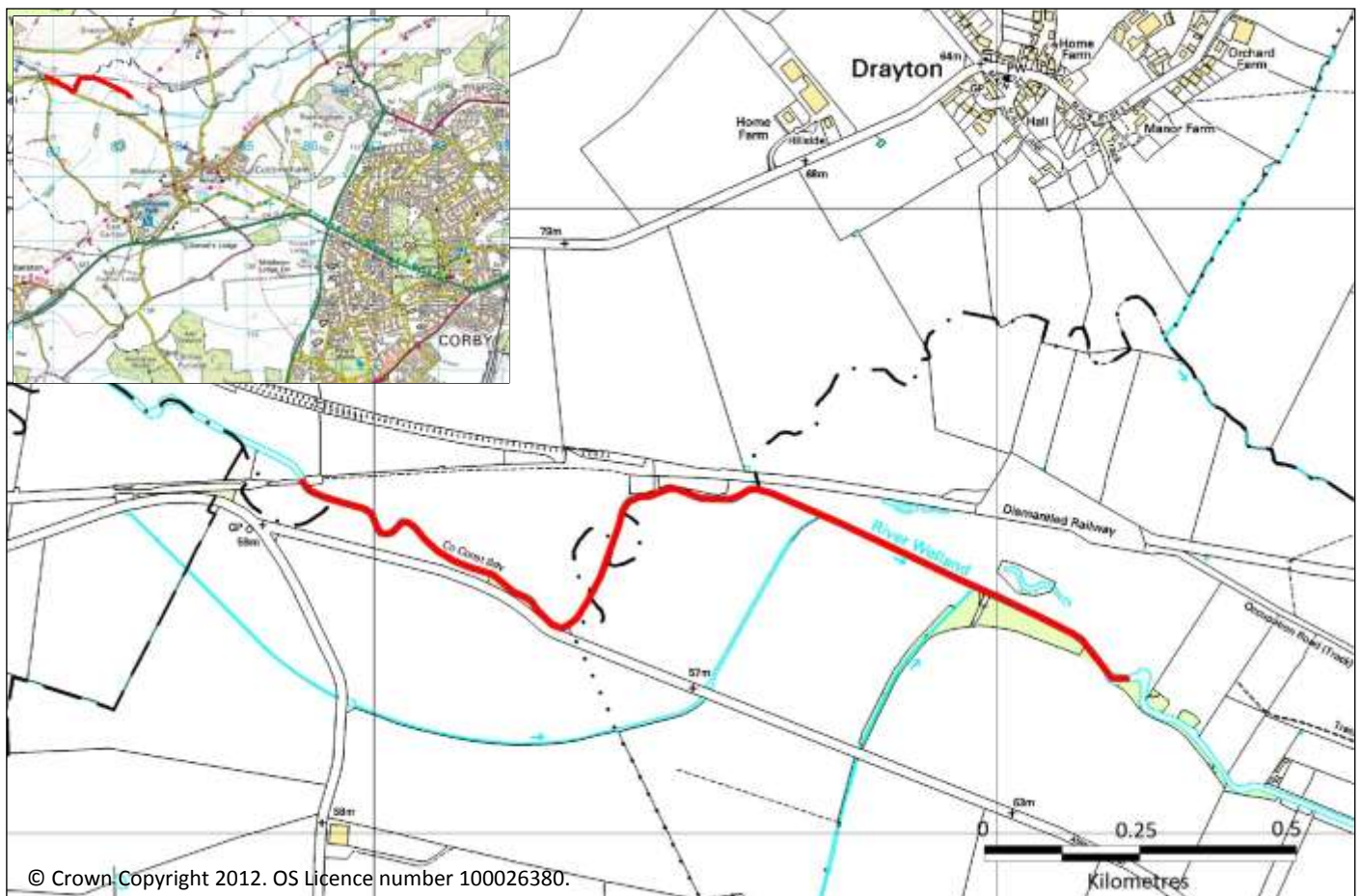
Version 1 (25.02.12)

Location:	Downstream of Ashley Gauging Weir
Upstream Grid Ref:	SP819916
Length:	c 1700m
Completion Date:	Early winter 2011
Cost:	£55,000
Partners:	The scheme was implemented by the Environment Agency with the co-operation and agreement of the adjacent landowners (Matthew and Melanie Robinson and Alister Brooke-Clarke) and in-kind support from the Welland Rivers Trust and the Wild Trout Trust.



Summary of Techniques: Faggot, woody debris and coir roll flow deflectors; channel pinching using faggots, woody debris and coir rolls; introduction of gravels to augment and create riffles; bank toe protection using rock and coir; new cattle drinkers; riverside fencing; selected tree works including crown-lifting and pollarding; new tree and shrub planting; artificial otter holt construction.

Location Map



Background

During the 1970s the River Welland was significantly modified. The natural river morphology was altered to improve land drainage and flood water discharge. The river was deepened; many meanders, pools, riffles and glides were removed; and the river was constricted within high, straight banks. High winter flood flows and poor land management practices now cause significant bank erosion and sedimentation. Prior to modification a high proportion of these nutrient-rich sediments would have been deposited on the floodplain, providing rich grazing pasture, but, as a result of the flood defence works, a large proportion of these sediments now remain in the channel, degrading habitats including fish spawning gravels. As a result the River Welland is currently failing to meet the Water Framework Directive (WFD) objective of “good ecological status” because of high phosphate levels and poor fish populations. Remedial action is required.

To ensure that the river meets WFD objectives in the future the Welland is now one of 10 catchments across England where an integrated approach to catchment management is being piloted. The pilot includes the implementation of a series of river enhancement projects and one of these is the scheme at Drayton.

Pre-project River Habitat Survey

Ecology Link undertook a river habitat survey in March 2011 to inform the design of a habitat enhancement scheme on a 1.7km reach downstream of Ashley Gauging Weir. Survey maps are shown in Annex 1.

Although parts of the river had been significantly straightened and deepened, the reach included a good diversity of features, including meanders, pools, riffles and runs. Aerial photographs show a distinct series of meanders within adjacent fields, and ponds to the north of the river and several old pollard willows identify the former course on the ground. The riverside ponds have now developed stable stillwater plant and animal communities, with recent surveys identifying great crested newts in the largest 'oxbow' pond.

Much of the river bed substrate consisted of gravel, particularly within the shallow faster and straightened parts. Marginal vegetation was present along much of the surveyed section, with beds of common reed and reed sweet grass creating natural narrowing of the channel. Otter prints were found during the survey.

Bankside trees and shrubs, including willows, alder and hawthorn, provided areas of shading and bank stabilisation. Several of the older specimens had shed limbs in to the channel, which, together, with their exposed root systems, was providing useful flow manipulation.

All the adjacent fields were under grazing management, with the arable fields in the locality being situated away from the valley floor. Consequently sedimentation as a result of local arable run-off is not a major issue. However, sediment inputs as a result of bank erosion by livestock were a problem, although these had been significantly reduced by the recent installation of riverside fencing by one of the two riparian owners.



Fig 1. Erosion around the meander



Fig 2. Unsecured woody debris

Fish Population Survey

A fish population survey was carried out on the Welland at Ashley gauging weir in late November 2010. Only two brown trout were captured along with some minor species, mainly consisting of bullheads and stone loach. Using the national classification system for salmonids the site scored an E which represents a poor population of wild brown trout. The survey concluded that *“water quality on the Welland is relatively good; habitat is usually the limiting factor for brown trout alongside the availability of suitable spawning habitat. Improvements in these would benefit the fish in the river”*.

Other Surveys

In addition to the river habitat and fish surveys, Environment Agency biologists undertook an aquatic invertebrate survey prior to the implementation of the scheme to provide baseline data for future monitoring and the Welland Rivers Trust is undertaking an ongoing survey of sedimentation on the riffles in this section. The initial survey results are due in March 2012.

Project Objectives

The findings of the survey work determined that the main objectives of the enhancement scheme would be to:

- Reduce the impact of sediment inputs as a result of erosion caused by livestock
- Create a greater diversity of in-stream habitats through the manipulation of flows
- Encourage the river to meander within its confined trapezoidal channel
- Consolidate woody debris to reduce flood risk whilst retaining the beneficial effects of natural flow deflection
- Improve fish spawning habitat by introducing gravels to augment existing and create new runs and riffles
- Manage older trees, in particular willows, to prevent future collapse
- Plant new trees and shrubs to provide shade for livestock and improved cover for fish

A scheme based on these objectives was prepared by the Environment Agency and Ecology Link as a demonstration project to trial a number of river enhancement techniques.

Consultation and Consents

Although the Environment Agency was of the opinion that it could undertake the proposed improvement as part of its statutory scope of works, the Planning Departments of Harborough District and Corby Borough Councils were notified to determine if planning consent was required. However, both agreed with the Agency's opinion. Drayton Parish Council's views on the scheme were also sought, but none were received.

Following the consultations with the local planning authorities the Environment Agency National Environmental Assessment Service (NEAS) was asked to determine if the project required a formal Environmental Impact Assessment (EIA). NEAS assessed the proposals and classified the scheme as "low risk" consequently an EIA was not required. A notice to this effect was posted on site inviting written representations in relation to the likely environmental effects of the proposed works, but no comments were received.

Finally an internal Environment Agency application for Flood Defence Consent was made and approval was issued on 11 August 2011 (Internal Consent no. ANK/2011/00167).

The Enhancement Scheme

The main elements of the project were implemented in September / October 2011 and the planting was completed in February 2012. A series of three drawings in Annex 2 show the locations of all the elements of the completed scheme. The techniques used are described below. It should be noted that many of the photographs were taken during a period of particularly low flows in January 2012 and under normal winter flows the structures would have been wholly or partially submerged.

In-channel Modification

Flow Deflectors

Faggot bundles, woody debris and coir roll deflectors have been used to increase localised flows. All the deflectors point upstream to reduce the potential for bank erosion. Offset (alternate) deflectors have been used to encourage meandering and paired deflectors have been used to encourage pool and riffle development. Gravels have been introduced around some of the deflectors to accelerate the development of new riffles (see below).

Channel Narrowing/Pinching

The natural channel narrowing caused by marginal vegetation has been consolidated in places by the provision of a flow deflector at the upstream end, or by enclosing sections behind faggots, woody debris and/or coir rolls to create a berm.



Fig 3. Woody debris deflector



Fig 4. Faggot deflector



Fig 5. Earth-filled faggot and coir pinching



Fig 6. Faggot pinching back-filled with brash to trap silt

Wider, less vegetated sections have been narrowed by the provision faggots, woody debris and/or coir rolls. Some “pinches” have either been backfilled with woody debris, brash or earth excavated during the construction of the cattle drinkers, whilst others have been left unfilled. The unfilled enclosures will gradually fill with trapped silt and eventually a consolidated wetland margin will develop. Some of the coir rolls were pre-planted to encourage a more rapid development of marginal vegetation.

Erosion Control

Bank Protection

Short sections of bank, where erosion was most severe as a result of undercutting during high flows, have been protected using large stone revetment. Elsewhere coir rolls, some of which have been pre-seeded/planted, have been used to control erosion at the toe of the bank and encourage rapid establishment of marginal wetland vegetation. In one location a length of re-profiled bank, consolidated behind a length of coir rolls, was planted with common reed.



Fig 7. Large rock bank toe protection



Fig 8. Pre-planted coir bank toe protection backfilled with earth

Cattle Drinkers

The river has traditionally been used to provide drinking water for livestock and this has caused widespread and, in places, severe localised erosion. To reduce this impact new cattle drinkers have been installed in each of the fields adjacent to the river. A drinker has also been installed on the eastern side stream which is introducing a heavy silt load near the bridge at the downstream end of the reach. As the river banks were high and steep a significant amount of earth was excavated during the construction of the drinkers. However, all the excavated material has been used to backfill the enclosures created to pinch the channel (see above).

Fencing

The majority of the left (northern) bank was fenced by the landowner, using wooden posts and 2 lines of barbed wire, immediately prior to the implementation of the scheme to exclude livestock from the river banks and channel. Additional fencing to the same specification has been erected on the right bank as part of the scheme. The fencing will significantly reduce bank erosion and slumping and enable the stabilisation of existing exposed areas through colonisation by terrestrial vegetation. The exclusion of livestock will also allow more extensive marginal wetland vegetation to develop, further consolidating the toe of the bank. Controlled light grazing of the fenced areas to prevent the development of rank grassland and scrub will be possible when ground conditions are suitable.



Fig 9. A typical cattle drinker



Fig 10. The typical stock fencing pattern

Gravel Introduction

Although the majority of the reach has a gravel bed, mixed gravels between 10 and 40mm in diameter have been introduced in places to create and enhance existing runs and riffles. These gravels also provide improved opportunities for spawning fish and habitat for invertebrates. Gravel has also been placed in the mouth of the most easterly tributary stream to provide an off-channel spawning area. Whilst the gravels were placed carefully they will naturally move downstream and modify the channel in response to changing flows.



Fig 11. Gravel placed in the mouth of the tributary



Fig 12. A new gravel riffle

Tree Management

There are individual trees and some denser sections of scrubby woodland on the banks and in places large limbs have fallen, some still partially attached, in to the river. This woody debris is providing natural channel pinching in places, but this has potential implications for flood defence. Excessive amounts of woody debris has been removed and used to provide flow deflection and channel pinching; collected into piles to provide additional deadwood habitat; and some of the larger material has been used to construct an artificial otter holt. Several larger willows have also been re-pollarding to avoid future collapse. Ecology Link recommended a 10-20 year rotational pollarding programme, which would also include the pollarding of young and maturing trees for the first time, to provide a mix of maiden and pollard specimens along the length of the river.



Fig 13. Otter holt constructed by Moulton College students



Fig 14. A repollarded willow

Tree Planting

Groups of native trees and shrubs have been planted along the river bank to provide shade over the channel to further diversify the in-channel habitat and provide refuges for fish.

Future Projects

A fish and eel pass is required at Ashley Gauging Weir.



Fig 15. Ashley Gauging Weir is a barrier to fish and eel passage

Although the current salmonid and coarse fish populations are low, the river habitat enhancements are designed to improve fish stocks. The riparian owners have indicated, when stocks have improved, that they would like to develop the reach as a wild brown trout fishery (stocking is not proposed). This will be investigated following future fish population monitoring.

Monitoring

Baseline fish, aquatic invertebrate and sediment surveys were undertaken prior to the implementation of the scheme. These surveys will be repeated to determine the effectiveness of the works to achieve the project objectives. Visual inspections will also be undertaken, together with a photographic record, to monitor the integrity and performance of the in-stream enhancements and record any changes they are making to river morphology.

Suppliers of Services and Materials

Ecological survey and scheme design

Ecology Link Ltd: www.ecologylink.com

Installation of deflectors, other in-stream works and planting

Woodland and Water Management Ltd: dom@woodland-water.co.uk or Tel. 01327 349073

Cattle drinkers, fencing and tree works

Burton Bros: Tel Tom Burton on 07802 250910

Coir Rolls (also suppliers of faggots and wetland plants)

Water-Lines Solutions: www.water-lines.co.uk

Further Information

For further information about the scheme, including arrangements for visiting, contact:

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Fig 16. The meander before and after, showing new paired faggot deflectors, bank stabilisation and fencing



Fig 17. The straightened downstream section before and after, showing the series of deflectors and the new drinker

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The Water Framework Directive

The Water Framework Directive (WFD) is a major area of work for the Environment Agency. The WFD aims to get all water bodies - lakes and groundwater aquifers as well as rivers - into 'good ecological status' - or better - by 2027, with a series of 'landmarks' (2015 and 2021) to check progress.

The Water Framework Directive became UK law in December 2003. It provides an opportunity for the Environment Agency to plan and deliver a better water environment with the focus on ecology.

The Water Framework Directive will help to protect and enhance the quality of: surface freshwater (including lakes, streams and rivers); groundwater; groundwater-dependent ecosystems; estuaries and coastal waters out to one mile from low water.

The Environment Agency is the lead authority in England and Wales to carry out:

- Improvements on inland and coastal waters through better land management and protect them from diffuse pollution in urban and rural areas
- Drive wiser, sustainable use of water as a natural resource
- Create better habitats for wildlife in and around water
- Create a better quality of life for everyone

The Environment Agency is the leading organisation for protecting and improving the environment in England and Wales. We are responsible for making sure that air, land and water are looked after by today's society, so that tomorrow's generations inherit a cleaner, healthier world.



Glossary

Berm: A low, often wet, ledge or terrace at the edge of the stream that constricts the flow and allows a vegetated wetland margin to develop.

Brash: fine woody material including thin branches and twigs.

Coir: a natural fibre extracted from the husk of coconuts. It can be formed into mattresses and rolls for use in river bank erosion control and vegetation establishment.

Coppicing: cutting of a tree just above ground level resulting in the regrowth of a number of shoots. The shoots are allowed to grow to provide long straight poles which are re-coppiced on rotation.

Faggot: a bundle of brushwood (or brash) tied together into a cylindrical shape. Used as bank revetment; to form flow deflectors; and to promote the deposition of sediment in marginal areas.

Fish pass: Structure to enable fish to gain access past a weir, sluice or other structure that would otherwise be impassable

Flood Defence Consent: consent issued by the Environment Agency to carry out works in, over, under or near a watercourse or flood defences. An application for Flood Defence Consent is needed to ensure that any works do not endanger life or property by increasing the risk of flooding or cause harm to the water environment.

Floodplain: Area of land bordering a river that is prone to flooding

Flow deflector (groyne): a structure projecting in to the river which is designed to constrict water flow and promote scouring and deposition of sediment.

Glide: a section of stream characterised by moderately shallow water with an even flow that lacks pronounced turbulence. Although most frequently located immediately downstream of pools, glides are occasionally found in long, low gradient streams with stable banks and no major flow obstructions. The typical substrate is gravel and cobbles.

Holt: a resting or breeding site for otters. Often found in the root system of large trees, but can also be constructed using **LWD**.

LWD (Large Woody Debris): pieces of naturally derived timber generally held to have dimensions greater than 10cm in diameter and 1m in length.

Meander: a meander is a bend in a watercourse formed as water erodes the outer bank and deposits the eroded sediments on the inside of the bank.

Poaching: river bank damage caused by the hooves of livestock which results in the loss of vegetation and soil erosion.

Pollarding: similar to coppicing, except that the tree is cut at approximately head height to prevent damage by grazing animals. Trees managed in this way are known as **pollards**.

Pool: a deep section of stream bed with very little surface flow, typically located at the outside of a bend.

Revetment: works to protect the bed or banks of a channel against erosion.

Riffle: a length of stream with a steep gravel, pebble and/or cobble dominated bed, a fast flow and a broken water surface, where the water flows swiftly over the completely or partially submerged substrate.

Riparian: along the banks of a watercourse

Run: differs from a riffle in that, although the water surface is broken, the water depth is typically greater and the slope of the bed is less.

Salmonid: Fish belonging to or characteristic of the family Salmonidae, which includes salmon and trout.

Scour: Erosion of the bed or banks of a watercourse by the action of moving water.

Sediment: material ranging from clay to gravel (or even larger) that is transported in flowing water and that settles as the flow slows down.

Shoal: sedimentation within or extending into a stream or other waterbody, typically composed of sand, silt and/or gravels.

Spiling: the use of thin branches to create a woven 'fence' that protects the bank from erosion.

Toe (of the riverbank): where the riverbed meets the bank.

ANNEX 1: River Habitat Survey

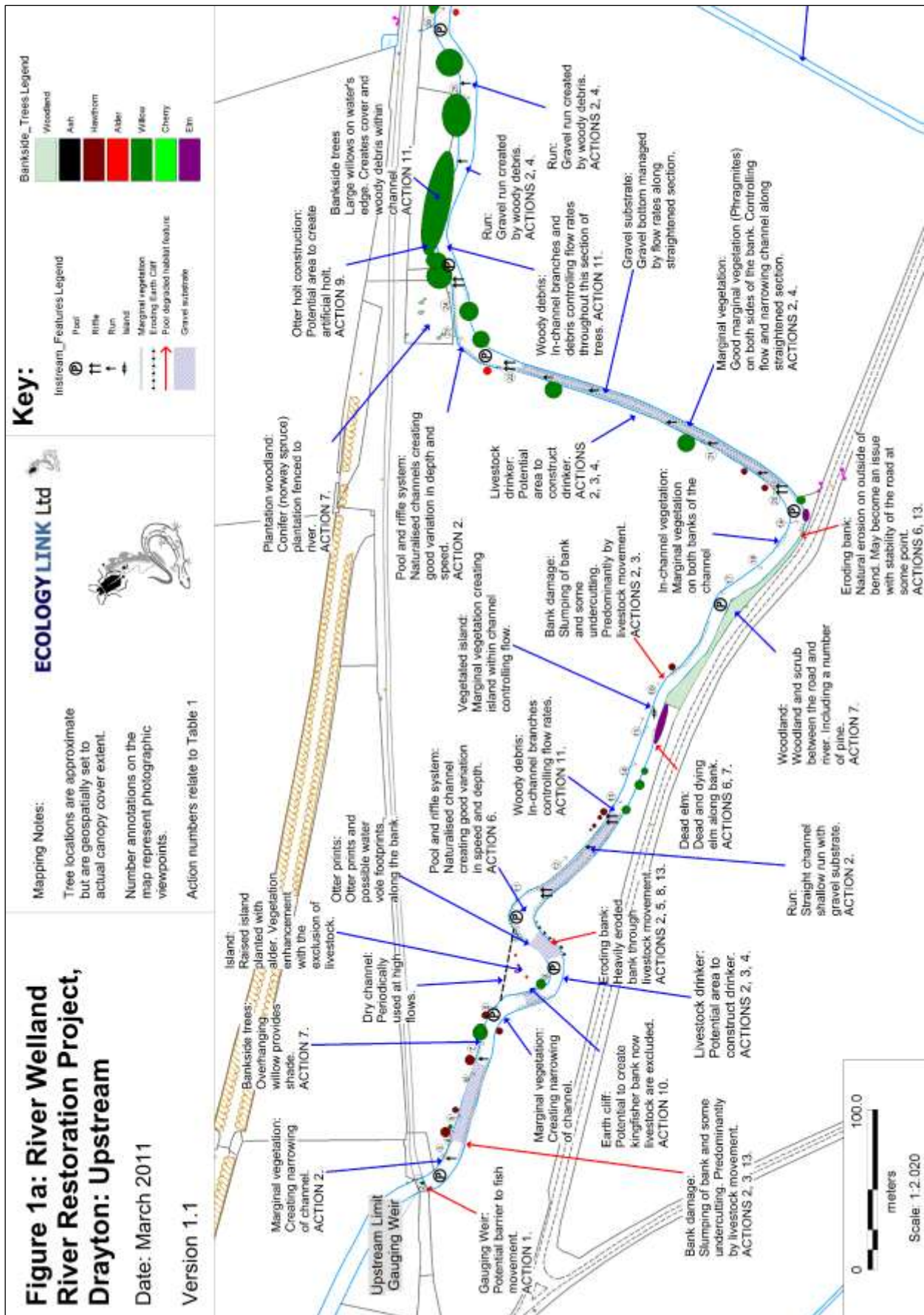


Figure 1b: River Welland River Restoration Project, Drayton: Downstream

Date: March 2011

Version 1.1

Mapping Notes:

Tree locations are approximate but are geospatially set to actual canopy cover extent.

Number annotations on the map represent photographic viewpoints.

Action numbers relate to Table 1

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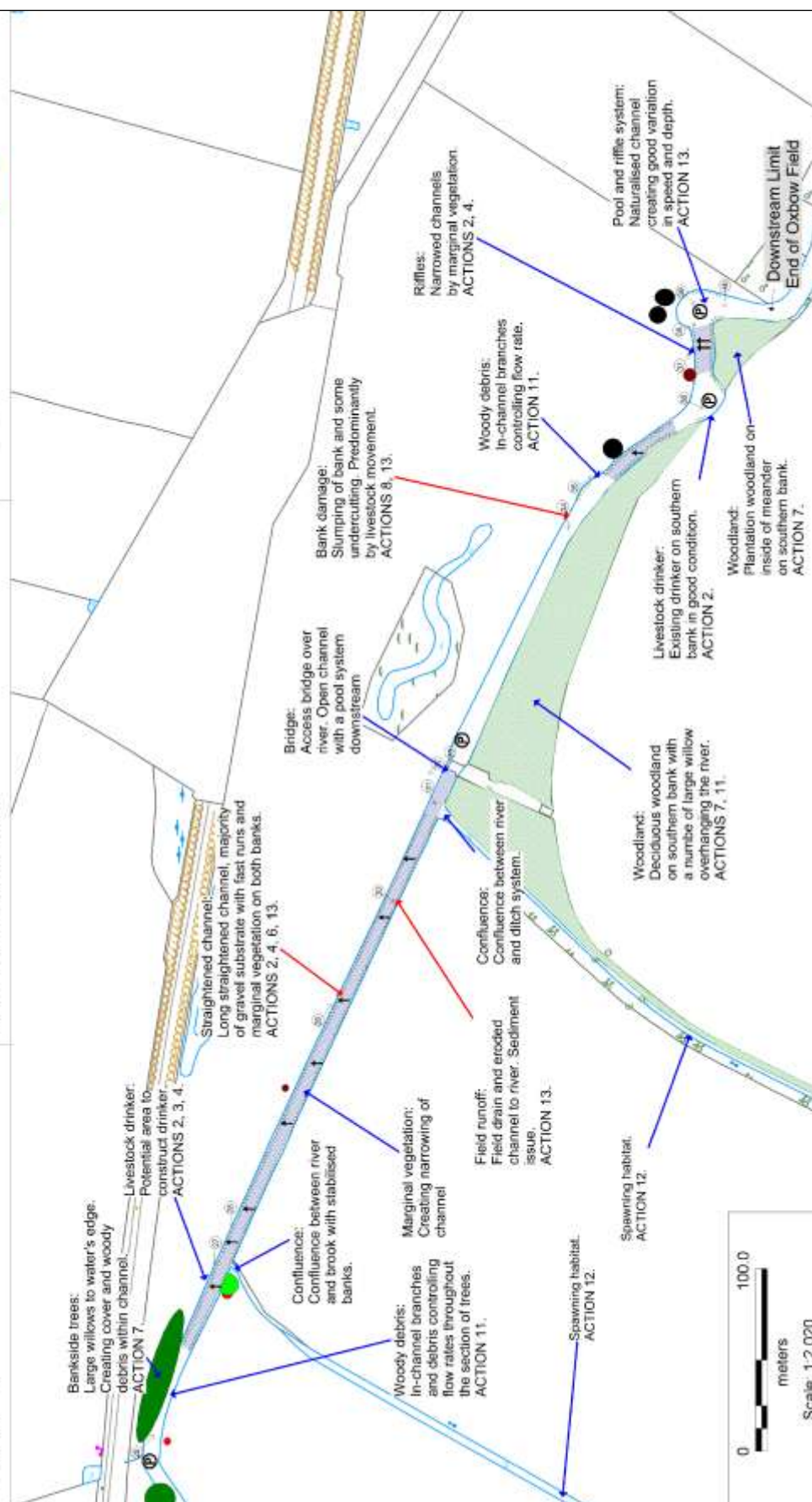


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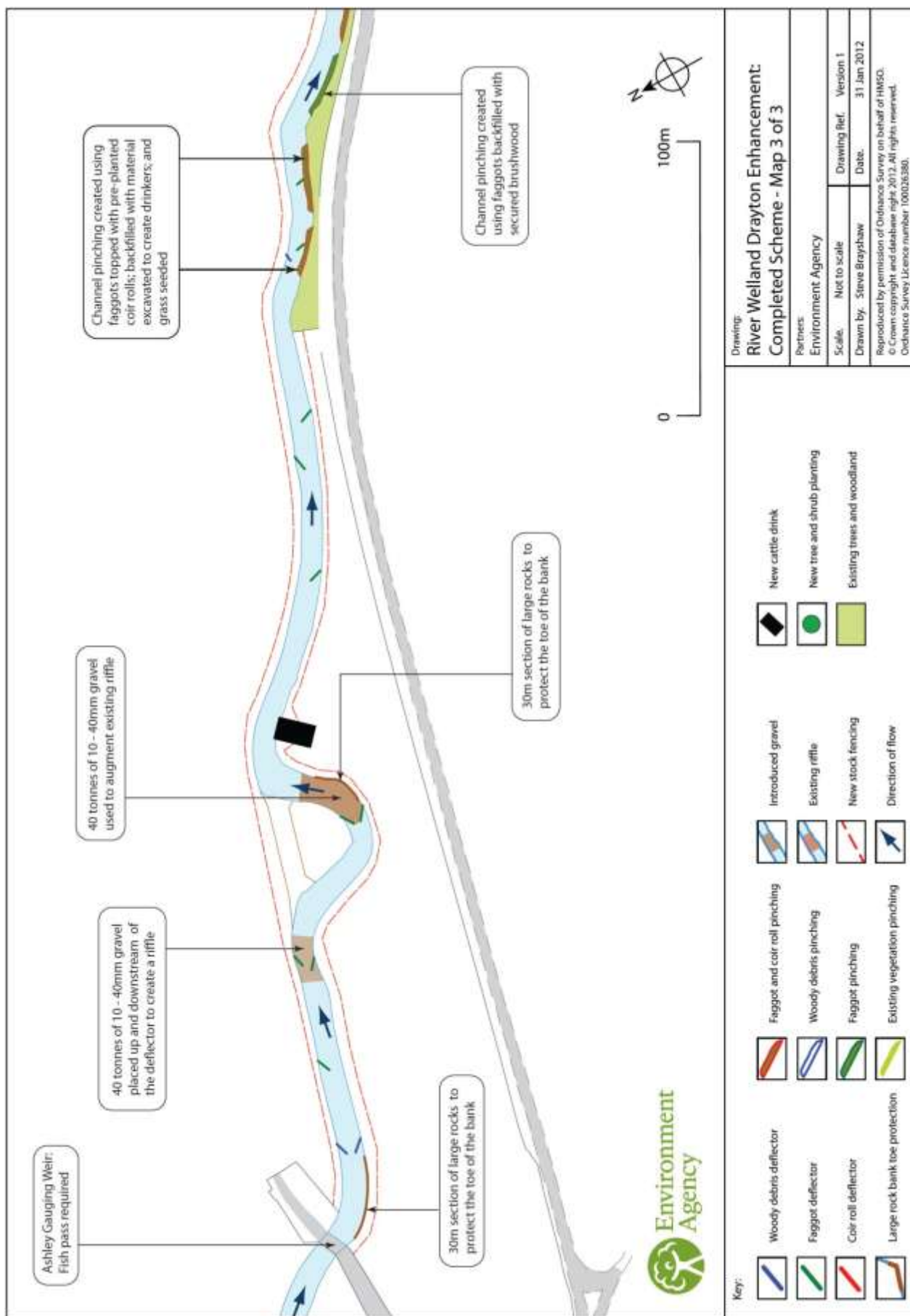
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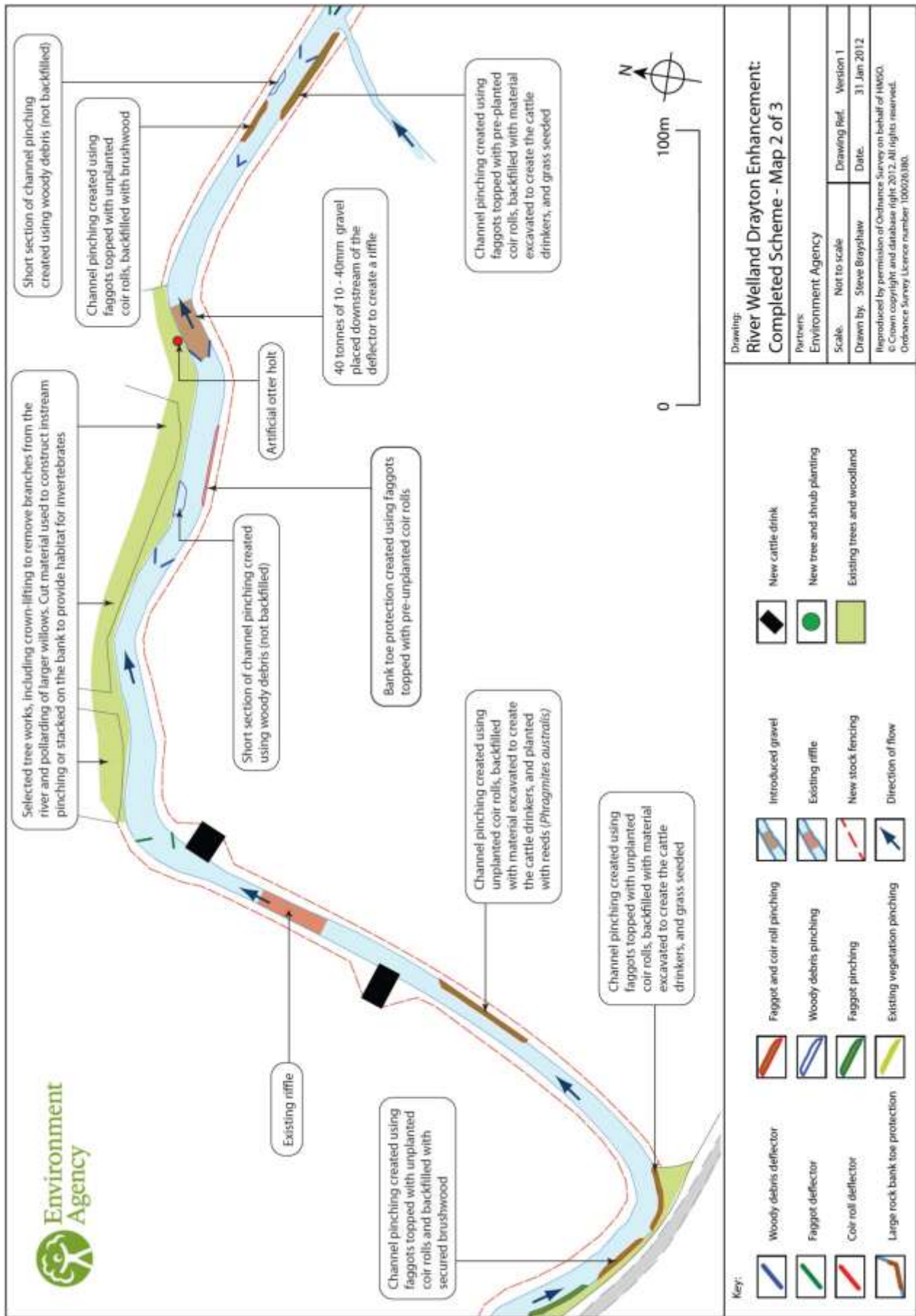


Bankside_Trees Legend



ANNEX 2: The Completed Enhancement Scheme



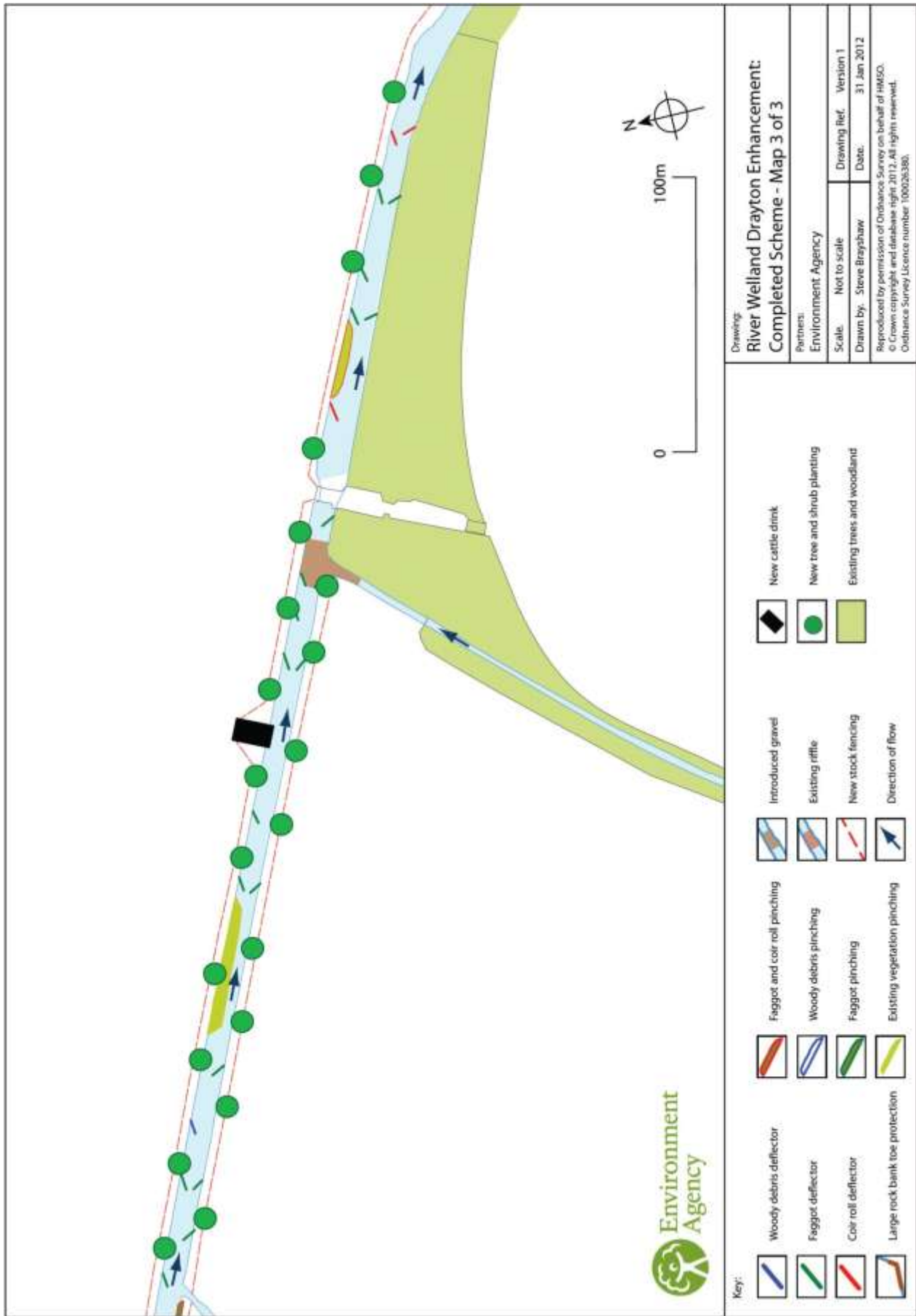


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