Timberlake Allotments Open Space

River Improvement Plan

GROUNDWORK
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Contents

Introduction

The Rediscovering the River Colne Project

Rediscovering the River Colne is a ground breaking project that aspires to bring the River Colne to the heart of Watford and its people. The project will see the Colne corridor become a positive asset within the borough, enabling it to reach its full potential for both local people and wildlife.

The project aims to provide sustainable solutions to resolve the issues affecting the river and to regenerate the public spaces it flows through, providing a healthy river corridor, with clean water, diverse wildlife and low flood risk that is accessible to all and of high amenity value to local people.

The project builds on the knowledge of key stakeholders in the Colne Catchment Action Network in order to remain in keeping with Watford's diverse communities, natural assets and local wildlife., whilst linking into catchment wide initiatives that contribute to improving the health of the river network from the Chiltern Hills to the River Thames.

The Colne Catchment Action Network (ColneCAN)

The Colne Catchment Action Network is one of over a hundred catchment partnerships operating across the UK as part of The Catchment Based Approach policy framework launched by Defra in 2013. ColneCAN brings together water companies, local authorities, charities, anglers, conservationists, local residents and businesses to ensure catchment-wide thinking and local action. The partnership unites local stakeholders in achieving six aims for improving the river catchment: to control invasive species, to involve people with their local water-bodies, to improve wildlife corridors, to improve water quality, to manage flow, and to work together.

Note to Local Planners

This plan aims to assist local planning authorities in developing policies for river environmental protection. We encourage local planners to include policies to protect the River Colne's water quality, biodiversity and landscape in addition to making provisions for access and recreation around the river corridor. We urge local authorities to consider the role of The Town and Country Planning Act 1990, S106 funding and the Community Infrastructure Levy to facilitate the environmental improvements identified in this report

Timberlake Allotments

Timberlake Allotments is an open space owned by Watford Borough Council and Affinity Water on the River Colne in North Watford. The site provides a mosaic of different habitats including river corridor, pond, reedbed, woodland and scrub and is a popular walking route for local people.

The section of the river is designated as a Local Wildlife Site 84/014 for flowing waters (rivers and streams); species.' Local Wildlife Sites are non-statutory sites designated at a county level as being of conservation importance and often recognised in Local Authority development plans. The aim of this identification is to protect such sites from land management changes, which may lessen their nature conservation interest, and to encourage sensitive management to maintain and enhance their importance.

Site Plan

Timberlake Allotments land ownership

Habitat and Geomorphology

The following text summarises the results of the botanical survey and modular river surveys undertaken by the project team. The full results of each survey can be found within the appendices of this report.

Land Use

The land to the west of the river corridor is comprised of a private allotment site owned by Watford Borough Council. A public footpath skirts the perimeter of the allotments providing access along the river corridor between Knutsford Playing Fields and Radlett Road Recreation Ground. The land to the east of the river corridor is a publicly accessible informal open space owned by Affinity Water. The site provides a network of footpaths that run adjacent to the river corridor, wetland features and through areas of woodland, providing a second walking route between Knutsford Playing Fields and Radlett Road Recreation Ground.

River Channel Profile and Course

The river follows its original course through the site, buts its profile has been modified over time. In 1990 the river was redesigned to facilitate the construction of the Watford M1 Link Road. As a result the channel became trapezoidal, relatively straight and overly wide for the predicted minimum flows (NRA, 1996). The west bank is between 2-3 meters tall and has a steep (>45°) gradient in many locations. The eastern bank is smaller in stature and is between 1-2 meters tall, providing a more natural bank that gradually inclines towards the waters edge. The river banks are likely to have been built up to prevent flooding in the wider urban area. The result of this is an incised river channel with poor connectivity to its floodplain.

The wetted width of the river varies between 4-8 meters with the bankfull width of the river being between 9 – 13 meters. The depth of the river is around 0.3 m deep in most locations but in some places can range to over 1m. The deeper and wider areas of river channel are likely to be the product of historic modifications undertaken for flood defence purposes. The result of this is a low energy river where natural morphological processes do not freely occur.

Floodplain Habitat

The topography of the floodplain to the west of the river is around 2-3 meters higher than the river bed. As a result of this, the river is not able to laterally expand onto the floodplain during times of high flow. This has resulted in an elevated floodplain that is dry in nature, with few wetland features. Due to the presence of the existing footpath and the allotment site there are few opportunities to improve the floodplain in this location.

The topography of the floodplain to the east of the river ranges between 1-2 meters higher than the river bed, meaning that this area would be inundated with water during a flood event. The floodplain is diverse in habitats with the main feature being a pond with common reed lined margins. The pond was originally created in 1990 as part of the M1 Link Road scheme to store excess river water at high flows. The pond was later modified by the NRA to function as a backwater, with downstream connectivity to the river, in order to provide recruitment habitat for coarse fish (NRA, 1996). The NRA carried out this work to offset the damage caused by the M1 Link Road Scheme, which resulted in fish populations crashing in this part of the river.

Today, 20 years after its creation, the pond does not provide habitat that is intrinsically diverse, but is still extremely important in terms of the niches it provides for wildlife. The pond has not received management in many years and as a result common reed has encroached over areas of open standing water. The pond no longer serves the river as an online back water as the channel that once connected the pond to the main river is now dry. Intervention is required to prevent the pond drying out further and to reverse the effects of years of deterioration.

Timberlake Allotments habitat map

Pond area

The pond area is enclosed by a woodland fringe which has been diversified by additional planting of hedgerow and canopy species particularly on the southern side. Species such as Dogwood, Elder, Hazel, Hawthorn, Blackthorn, Wild Cherry and Guelder Rose provide good nesting and foraging opportunities for birds. Within the open area around the pond there are patches of rank grassland and Bramble scrub which exhibit higher levels of botanical diversity. Grassland forbs such as Yarrow, Meadow Vetchling, Ox-eye Daisy, Bird's-foot Trefoil, endure amongst the False Oat-grass dominated sward in pockets amongst the developing Bramble scrub.

A ditch runs to the east of the pond and woodland adjacent to the Stevenson's Way. The ditch is fed by a surface water outfall from the road but has been observed to remain dry, even after periods of prolonged rainfall. The ditch has no connection with the adjacent pond.

Away from the pond, to the north of the site is a low lying area of river bank that provides damp and boggy conditions. The area does not provide particularly diverse plant life and is dominated by stinging nettles and broad-leaved dock. Opportunities should be identified to improve botanical diversity in this area.

Bank Face Habitat

The banks of the river are comprised primarily of earth, with occasional silt bars lining the bottom third of the bank face. Although they have been reshaped, they are not enforced with any hard revetment. The profile of the banks ranges from steep to gentle.

Typical bank face habitat

Steeper areas of river bank are less favourable for the colonisation of aquatic plant species. Marginal features such as berms, unvegetated side bars and vegetated sidebars are present throughout the watercourse, which demonstrates that the river is slowly recovering from the effects of modification. Although sediment is beginning to stabilise in the river's margins, large areas of loose silt are also present, showing that intervention is required to catalyse the river's recovery.

The banks of the river receive a high degree of shading but still support a good range of species where light levels are highest. White Willow is frequent, particularly on the eastern bank with Crack Willow more frequent on the western bank. Some of these have been pollarded and coppiced in the recent past to vary light levels to the woodland floor and river channel. The ground flora under the riverside trees is species poor and dominated by Stinging Nettle, Cleavers and Cow Parsley, as is often found in wet woodland habitat. Occasional stands of Himalayan Balsam are also present but are currently not outcompeting native species due to regular management by local volunteer groups.

Where the channel is more open diverse range of emergent species is found with Reed Sweet-grass common and notable populations of Butterbur Flag Iris, Water Mint, Branched Bur-reed and Common Club-rush at the Northern end by the bridge. Japanese Knotweed was also noted in this area and will need controlling.

Open area of river with good habitat

River Bed Habitat, Substrate and Flow

Throughout the majority of the site, the river is a low energy watercourse with a uniformly smooth flow type. There is little variation in bed topography with the average depth of the river being around 0.4m. The river's substrate is predominantly comprised of silt with occasional traces of sand and gravel pebble. The dominance of silt substrate reflects that the river has a poor ability to appropriately sort and grade sediment into morphological features. Intervention is required to catalyse morphological processes and to provide a self sustaining, dynamic water course.

Typical slow flowing, shaded area

Occasional areas of good flow and substrate are found as the river progresses towards Link Road. The river's flow is at its fastest in sunlit areas where vegetation has pinched the width of the channel, providing occasional areas of gravel riffle and pool habitat. Both submerged vegetation and emergent vegetation are present in these areas, providing structural habitat for a variety of aquatic wildlife to utilise. By observing areas where the river is showing signs of recovery, informed decisions can be made to improve the river channel elsewhere. Intervention is required in slow flowing shaded areas in order to promote natural morphological processes and to increase light levels to aid the establishment of vegetation.

Artificial structures

Two outfalls are present along the river channel but have not been observed to regularly pollute the river. The locations of the outfalls are illustrated on page 4.

Two road bridges are present to the North and South of the site. The river beneath each bridge is overly wide, shaded and slow flowing.

Outfall to North of site

Invasive Species

Himalayan balsam is present throughout the river channel on site, but does not dominate over native species due to diligent regular management from the Knutsford Green Gym volunteer group. If the regular management were to cease, Himalayan balsam would rapidly recolonise and spread throughout the site.

Japanese Knotweed is present on the western bank of the river at the north of the site adjacent to the road bridge. This area should be treated to ensure the species does not spread elsewhere.

The site should be surveyed for invasive plant species each year using the CVFC invasive species reporting application and management works carried out accordingly.

American signal crayfish burrows were found throughout the site. The species is common place in the Colne Catchment. Crayfish Burrowing mobilises sediment which has a negative impact on both water quality and habitat. The species should be monitored via the Rediscovering the River Colne Environmental Monitoring Project.

American signal crayfish

Historic Habitat Improvement Works

This section of the Colne was extensively modified during the construction of the Watford Link Road in 1990. These modifications included bed regrading channel deepening and widening. The modifications to the river channel reduced the habitat diversity of the river and resulted in severely degraded conditions for fish, invertebrates and other wildlife.

As part of the landscaping proposals for the scheme, the pond located to the east of the river was created. The pond was created with a single inlet channel from the main river designed to allow water from the main river to over spill into the ponds to maintain water levels. Initially the inlet channels were set at too high a level to facilitate this, except under exceptionally high flood levels. Consequently the ponds remained dry from the time of construction.

In 1993 a habitat reinstatement scheme was implemented by the former National Rivers Authority (now Environment Agency) to improve the river channel where habitat and geomorphology had been degraded.

In 1996 a habitat enhancement scheme was implemented to improve the pond by connecting it to the main river as a backwater. This consisted of creating a new inlet for the pond with a two staged profile. The bed level of the channel and pond were designed to match those of the connection point with the main river. This allowed water from the main river to fill the ponds without impact on surface water flows. This enabled a connection between the river and pond throughout the year, allowing fish and invertebrates to migrate freely between them. The average depth within the backwater at normal flows was 1m. A 1m wide marginal shelf was also installed within the pond to increase habitat complexity within the backwater itself.

Fisheries surveys undertaken the year after the backwater was created showed that the feature had been rapidly colonised by juvenile coarse fish, with 8 species present in good numbers. The backwater was noted to offer particularly good recruitment habitat with the majority of the fish population being comprised of juveniles which primarily occupied the littoral zone of the lake.

1997 Fish Survey Results

FISH SPECIES	No. captured	% of total catch
Chub	12	10
Dace	2	2
Gudgeon	1	0.1
Minnow	11	9.3
Perch	.....	.....
Roach	17	15
Stickleback	71	63
TOTAL	114	100

Backwater maturation 1996-1997


Plate 4. March 1996


Plate5. October 1996


Plate 6. June 1997

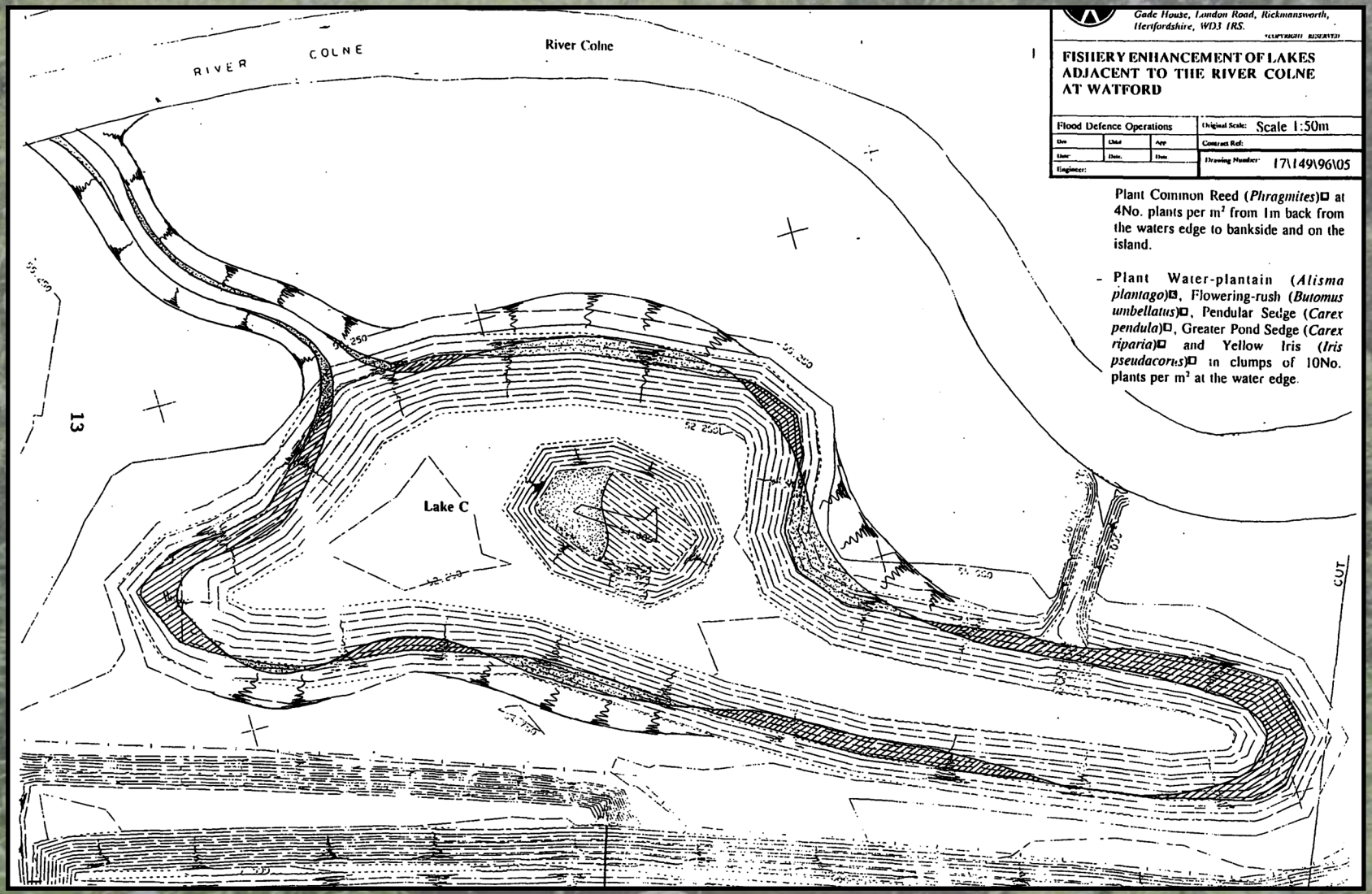
Gade House, London Road, Rickmansworth, Hertfordshire, WD3 1RS.

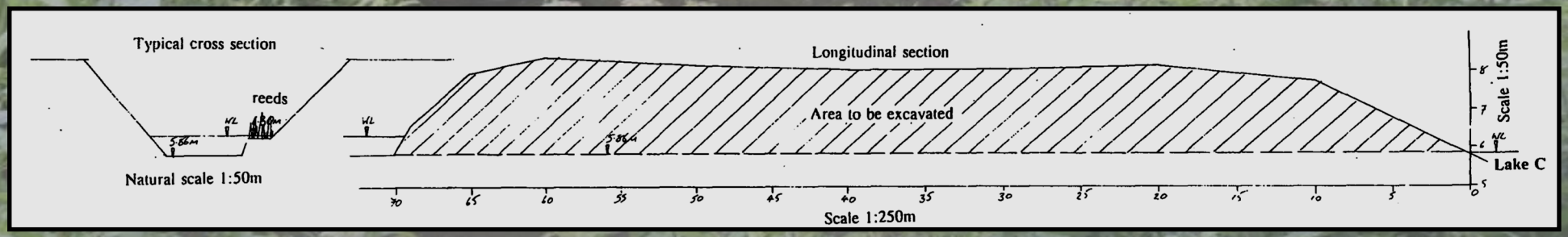
FISHERY ENHANCEMENT OF LAKES ADJACENT TO THE RIVER COLNE AT WATFORD

Flood Defence Operations			Original Scale: Scale 1:50m
Drn	Chkd	App	Contract Ref:
Date:	Date.	Date	Drawing Number: 17\149\96\05
Engineer:			

Plant Common Reed (*Phragmites*) at 4No. plants per m² from 1m back from the waters edge to bankside and on the island.

- Plant Water-plantain (*Alisma plantago*), Flowering-rush (*Butomus umbellatus*), Pendular Sedge (*Carex pendula*), Greater Pond Sedge (*Carex riparia*) and Yellow Iris (*Iris pseudacorus*) in clumps of 10No. plants per m² at the water edge.





Site Ecology

Site Criteria

The section of the river is designated as a Local Wildlife Site for flowing waters (rivers and streams); species.' Local Wildlife Sites are non-statutory sites designated at a county level as being of conservation importance and often recognised in Local Authority development plans. The aim of this identification is to protect such sites from land management changes, which may lessen their nature conservation interest, and to encourage sensitive management to maintain and enhance their importance.

The site is designated for the following features: A long stretch of the River Colne with well vegetated margins supporting a good diversity of emergent and submerged flora. Species recorded include Reed Sweet-grass, Purple Loosestrife, Lesser Pond-sedge, Branched Bur-reed, Fool's Water-cress and of particular interest are Common Club-rush and Flowering-rush, both uncommon in the county. Lining the river banks there are occasional trees and shrubs, mainly Hawthorn willow, Alder, Hybrid Black Poplar and Sycamore Water Voles have been recorded along the river.

Bats

The bat survey conducted by the project team (HMWT, 2019) identified three species of bat at the site: common pipistrelle, soprano pipistrelle and daubentons. The presence of common pipistrelle and soprano pipistrelle are to be expected and are common throughout the Colne Valley. Noctules are large, far ranging bats and can occur over suitable feeding areas or more likely in this case, passing over the site. The bat population is likely to be limited at the site due to it's urban nature, associated light pollution and poor water quality.

Water Voles

No signs of water voles were recorded during the most recent survey undertaken by the project team (HMWT, 2019). The nearest known population of water voles is about 3km downstream, at Croxley Hall Fishery. Overall, there is probably enough reasonable habitat to allow water voles to move through Watford, but relatively few places that would allow a population to establish and thrive.

Otters

The otter survey conducted by the project team (HMWT, 2019) did not identify any evidence of otters at the site. Otter spraint was recorded at two sites downstream however. It is presumed that the spraint was deposited by Otters prospecting up the River Colne from what is believed to be an established population in the mid-Colne Valley. Otter populations are likely to increase in Watford should the Colne's fish populations become more resilient .

Coarse Fish

The site is home to a number of coarse fish species including Chub, Roach, Dace, Gudgeon, Minnow and Stickleback. Although a number of species are present, there are many parameters that limit the fish population in terms of age class structure, species assemblage, density and biomass. These include: poor water quality, lack of spawning habitat, lack of recruitment habitat, lack of adult habitat and the presence of signal crayfish.

Bird Life

At the time of survey, the project team identified the following bird species at the site: Blackbird, Wren, Chifchaff, Blue Tit, Great Tit, Robin, Chaffinch, Jay, Reed Warbler, Great Spotted Woodpecker, Cetti's Warbler (HMWT, 2019).

Butterflies

At the time of survey, the project team identified three species of butterfly: Meadow Brown, Marbled White and Ringlet (HMWT, 2019).

Site Water Quality

River flies

A range of aquatic invertebrates are present and emerge in their flying form in spring and summer to provide an essential food source for fish, birds and bats. The river fly population is currently limited due to poor water and habitat quality.

River fly Monitoring

Water quality is monitored on a monthly basis at the site via the Anglers Riverfly Monitoring Initiative (ARMI). ARMI is a citizen science initiative that facilitates regular monitoring of river water quality by trained volunteer monitors, to complement the more detailed work carried out by the EA.

The method involves taking a three minute kick sample using transects that are reflective of the habitat available at the monitoring site. Eight target groups of aquatic invertebrate 'indicator species' are monitored and a score is generated based on their abundance and the number of individuals recorded. The score can be used to detect any severe perturbations in river water quality providing an evidence base to address sources of pollution.

Timberlake Allotments Results

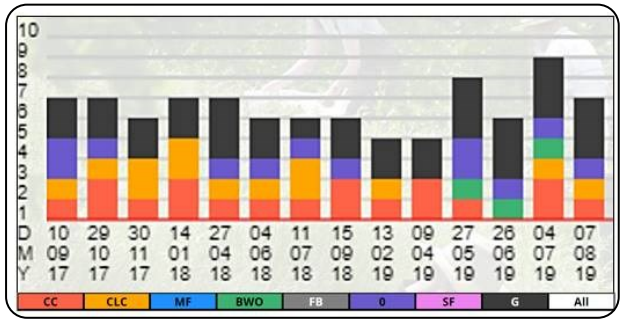
Timberlake allotments returns an average ARMI score of 4.43. This is a slightly higher score than the nearest sites upstream (Knutsford Playing Fields, 3.43) and downstream (Radlett Road, 2.83). Despite the slight improvement in water quality between the Knutsford and Timberlake sites, there is an overall trend of declining water quality throughout Watford. The average score returned at the most upstream monitoring site in Watford (Bushy Mill Lane) is 5.57 and the next five sites downstream of this location return significantly lower scores.

There are two outfalls present at the most northern and southern ends of the site (see plan for location), neither of these has been observed to pollute the river on a regular basis, which may suggest why the site returns slightly higher scores than the two sites immediately up and downstream where regular pollution incidents have been observed (CVFC, 2019).

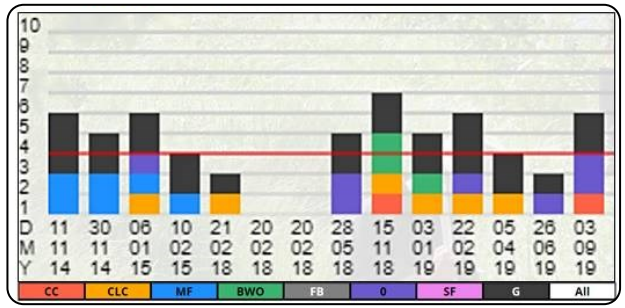
Additional Monitoring Activities

The *Rediscovering The River Colne Project* intends to extend the river fly monitoring network to reflect all sites in Watford and to facilitate additional monitoring activities to improve understanding of pollution in Watford. The project facilitates a regular meeting, known as Watford Water Quality Forum, between Watford Borough Council, Thames Water, The Environment Agency, Groundwork, The CVFC and Community Connections Projects CIC. The forum works to identify and deliver improvements to surface water and waste water infrastructure in Watford.

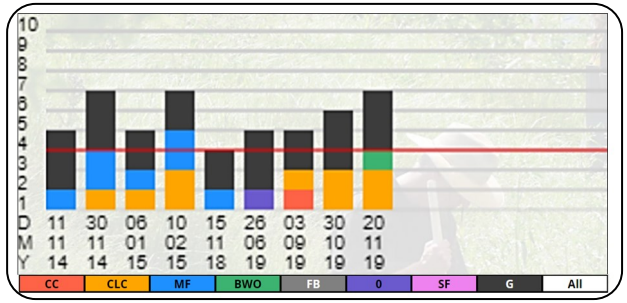
ARMI Results



Bushey Mill Lane ARMI results (1.2km upstream)



Knutsford Playing Fields ARMI results (0.9km upstream)



Timberlake Allotments ARMI results

Habitat Improvement Recommendations

Floodplain

Pond area

Habitat in the pond area is deteriorating due to the following factors.

1. A lack of management has lead to the reed bed expanding across the pond leading to a reduction in the area of open standing water.
2. The growth of the reed bed has increased siltation to the extent that the outlet of the pond is now blocked with reeds and compacted sediment, preventing connection with the main river.

The following actions have been identified to improve the pond area and to increase its lifetime as a functional wetland.

1. A topographical survey of the bed of the pond and river channel should be undertaken to identify whether it is feasible to reconnect the pond to the river as a backwater. The topographical survey should also identify shallow areas of the pond where desilting and reed removal is required.
2. A long reach excavator should be used to remove areas of reed and sediment in the shallowest areas of the pond, to create a larger area of open standing water. The margins of the pond should remain a shallower depth than the centre to encourage the growth of emergent vegetation in appropriate places. If feasible, the bed of the pond and outlet channel should be lowered and appropriately grad ed to provide a constant connection with the main river channel, so the pond can be utilised as a backwater by aquatic wildlife.
3. Once enhancement is complete, the reed bed should be cut on rotation each winter (10% per year), to retain this important habitat and to prevent the colonisation of woody species. New vegetation colonising areas of open water should also be removed each year.

Other considerations

1. A sediment analysis should be undertaken in any area where the disturbance of sediment is proposed to determine whether works can progress and whether materials can be reused.
2. An area should be identified outside of the flood zone to distribute excavated materials. Possible locations include:
   - The Stevenson's Way road embankment on the eastern perimeter of the site.
   - The area surrounding the wetland feature at Radlett Road Recreation Ground.

Grassland and Scrub

The grassland and scrub adjacent to the river and pond is diverse in species and provides productive habitat for invertebrates. This area should be managed to maintain the diversity of species present by undertaking the following actions each year:

1. Cutting and clearing a third of the vegetation each year in autumn will halt the successionary process and conserve a more diverse forb content than would otherwise develop.
2. Cut and cleared materials should be used to create habitat piles within the scrub fringe for the benefit of sheltering amphibians, reptiles and small mammals.

The small area of grassland on the eastern bank to the north of the site lacks in botanical diversity and is damp in nature. The area could be diversified via the creation of wetland scrapes to promote the growth of a more diverse range of wetland plant species and to provide a space for wildlife to flourish during wet months of the year. Once excavated, the ponds could be planted with plugs translocated from other sites in the area with similar abiotic conditions.

The wetland scrapes should be dug by hand by local volunteer teams such as the Knutsford Green Gym.

Legend:

1	2	3	4	5	6
Thin trees/increase light	Cut and clear scrub	Coppice woodland	Install wooded debris	Desilt & reconnect pond	Manage reedbed

Timberlake Allotments habitat improvement map

Woodland Area

The woodland fringe to the east and north of the pond is densely populated with mature trees and saplings competing with each another for light and space. The periodic coppicing of trees would diversify the age of different trees and stools in the woodland, encourage individual trees to live longer and would increase the diversity of ground cover.

Other considerations

All coppiced materials should be retained for the creation of habitat features within the main river channel.

River Channel

The following issues affecting the river channel have been identified in this location:

1. Where the river channel is shaded, marginal vegetation is not present to stabilise sediment. This has resulted in some areas of the river becoming wide and slow flowing with visible areas of loose silt covering the gravel bed.
2. There is little variation in the depth and little sinuosity due to the channel's straightened profile.
3. There is little variation in flow type, with the flow of the river being smooth and slow flowing.
4. The river channel lacks suitable habitat for bat roosting.

In order to improve the river in this location the following interventions are required:

1. Tree removal work should be carried out in areas where the river is over shaded and prone to siltation.
2. The encroachment of the remaining woodland should be prevented by periodic coppicing of self-set material i.e. maintain the current vegetative margin balance and prevent increase in shading to the channel.
3. Wooded debris, in the form of brush berms and flow deflectors should be introduced to the river channel in appropriate locations to increase sinuosity, diversify flow, stabilise sediment, increase physical habitat complexity and to increase scour of the riverbed.
4. Small pools could be created downstream of each flow deflector installed. The gravel from each pool could be redistributed to form sediment bars or riffle features. This will increase variation in depth and diversify flow.
5. Bat boxes should be erected on suitable trees by the water course. Bat boxes should be Schwegler 2F-DP and located in deep shade and dappled sunlit glades, with good flight access, to attract target species e.g. Daubenton's, soprano pipistrelle and Nathusius' pipistrelle. These should be located on the southern bank of the river to avoid disturbance.

Water Quality

Improved Water Quality Monitoring

The two outfalls at the site should be included within The Rediscovering The River Colne's Environmental Monitoring Project. It is recommended that an annual outfall safari should be undertaken for all surface water outfalls in the Watford area to ascertain a baseline for the condition of all outfalls in Watford. This should be followed up with monthly river fly monitoring and chemical analysis at key sites within the project area to ascertain the regularity in which pollution incidents occur and their effect on the aquatic environment. Please see the Rediscovering the River Colne's Environmental Monitoring Feasibility Study report for further information.

Watford Water Quality Forum

A forum has been created through the rediscovering the Colne Project to provide a long term strategy for resolving water quality issues in Watford. The Watford Water Quality Forum provides a regular meeting between Thames Water, The Environment Agency, Watford Borough Council, Groundwork, The Colne Valley Fisheries Consultative and Community Connections Projects CIC in order to identify and rectify issues with waste water infrastructure in Watford.

Water Framework Directive (WFD)

What is the WFD?

During the 1990s the European Commission recognised that we needed an integrated and comprehensive way of managing the water environment and so the Water Framework Directive (WFD) came into existence. It has been part of UK law since 2003.

The original aim of the WFD was for all rivers, lakes, reservoirs, streams, canals, estuaries, coastal and groundwater (known as water bodies) to be in good ecological health by 2015. However, the EU has recognised that it will be an almost impossible task to reach this goal by 2015, so in most cases this deadline has been extended to 2021 or 2027.

What is a healthy water body?

A healthy water body has thriving populations of fish, invertebrates, plants and diatoms (microscopic algae). They depend upon a healthy flow of water and a variety of natural habitats. All of these are affected by the levels of pollution and nutrients in the water, and the shape and structure of the water body. The Environment Agency uses many different measures to assess the ecological health of a water body. They include:

- the variety and numbers of different types of animals and plants living in the water body
- the state of the water itself, such as the temperature.
- the amount of oxygen, how acidic or alkaline it is (the pH), and the concentration of nutrients like ammonia and phosphate
- the concentration of polluting chemicals from human activity, such as arsenic, cyanide and the breakdown products of pesticides
- and for Heavily Modified and Artificial Water Bodies, whether it could be made more natural without interfering with the way it is used.

These are combined to come up with an overall classification for each water body. The classifications are:

High	Good	Moderate	Poor	Bad

When the status of a water body is Moderate, Poor or Bad, the Environment Agency investigate the reasons why it is not in good ecological health.

Current WFD Status

- The overall WFD classification for *The Colne (Ver to Gade)* waterbody is **moderate.**
- It's chemical classification is **good.**
- Its ecological classification is **moderate.**

Reasons for Not Achieving Good Status

The Colne (Ver to Gade) waterbody is currently not achieving *good status* due to the following factors:

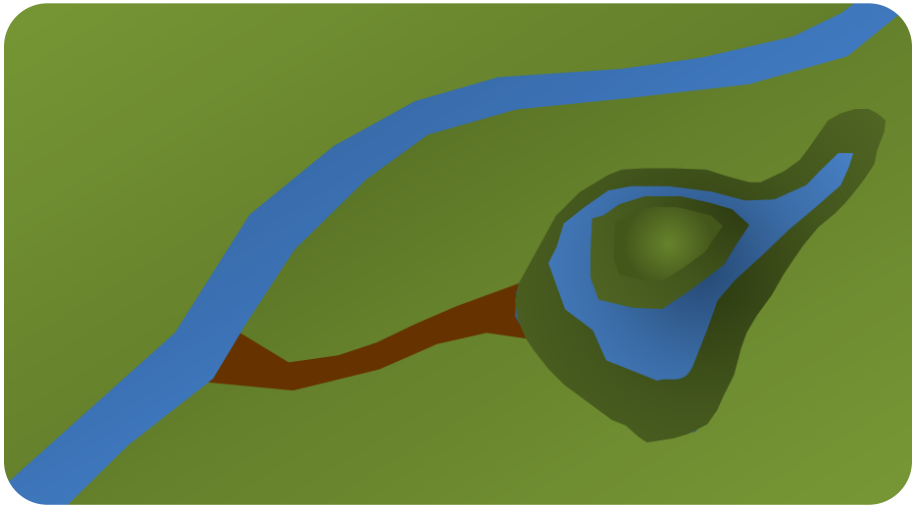
1. Changes to the river's natural flow and water levels due to abstraction from the water industry.
2. Continuous pollution from waste water related to the water industry.
3. Physical modifications to the watercourse arising from urban transport and infrastructure.

Activities Listed in this plan which address these issues

1. Wooded debris installation (P16)
2. Backwater restoration (P11)
   Improved Water Quality Monitoring (P13)
   Watford Water Quality Forum (P13)
3. Backwater restoration (P11)
   Tree works (P13)
   Wooded debris installation (P13)
   Pool/riffle creation (P13)

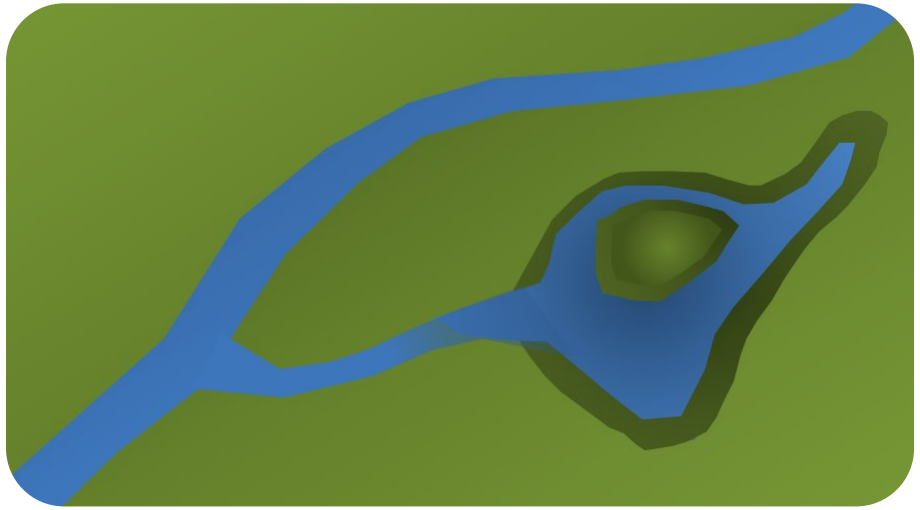
Backwater Restoration

Before Restoration:



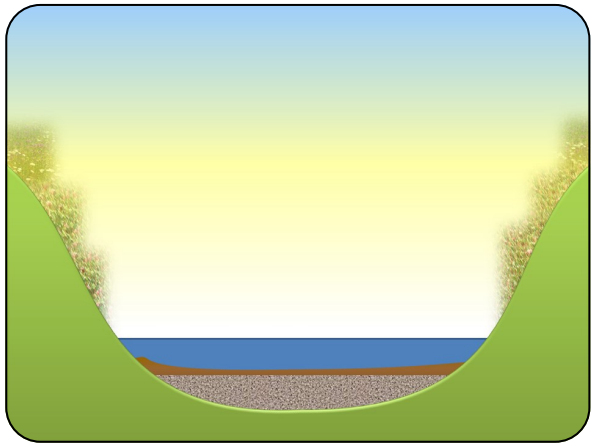
- The backwater is currently disconnected from the main river due to the accumulation of organic debris and silt in the pond area and outlet channel.
- The siltation of the outlet channel and pond has raised the bed level of the features, providing a bathymetric barrier between the pond and main river.
- The outlet channel is impeded further by the presence of a reedbed that blocks its connection with the pond area.
- Due to a lack of management, reeds are encroaching to the centre of the pond, reducing the area of open water and further raising the bathymetric level of the pond.

After Restoration:



- The bed level of the pond and outlet channel is lowered to match the bed level of the adjacent river channel.
- Water is able to back up the channel from the main river, providing a constant connection between the two features.
- The reed bed is reduced to create a larger area of open water and to prevent the outlet channel from blocking.
- The reedbed is be cut on rotation, annually, to maintain the balance between vegetated areas and open water.
- If a connection with the river cannot be facilitated, the pond should be enhanced in isolation via desilting and reed bed management to prevent it from drying out further.

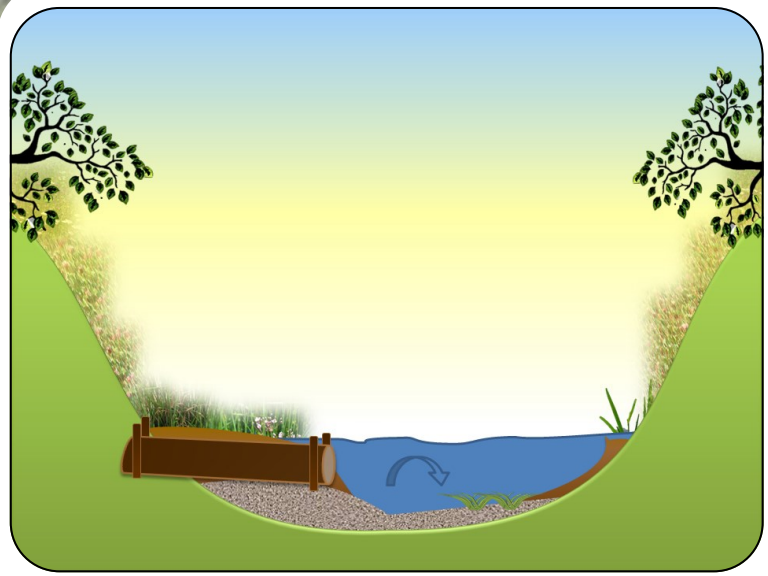
Brush Berms and Flow Deflectors



The river channel has a modified profile and uniform depth. Siltation occurs in over shaded areas where emergent plant species are not present to stabilise loose silt in the margins of the river.

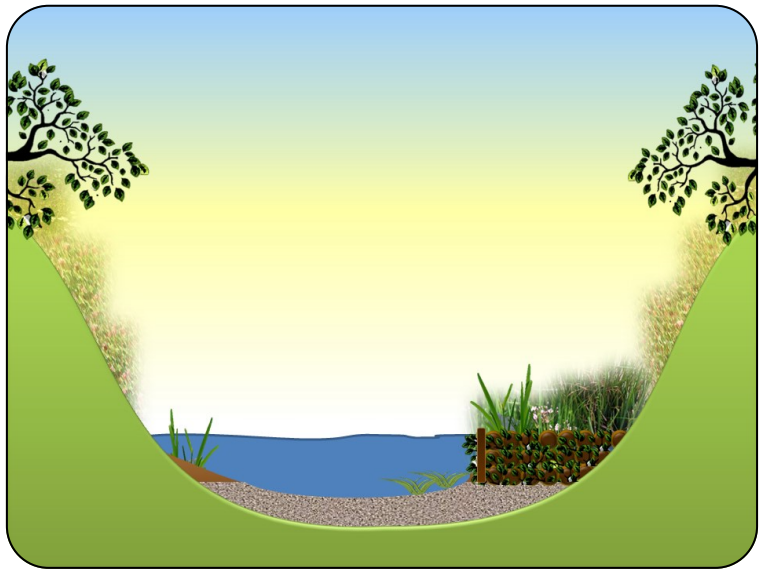
Over shading trees can be coppiced and repurposed to create brush berms and flow deflectors within the channel to mimic natural sinuosity, stabilise sediment and to create a variety of depths and flow types.

These features can be easily installed by local volunteer teams. An environmental permit must be obtained from the Environment Agency in order to undertake this activity.



Flow deflectors are used to pinch the width of the river which reduces siltation, creates scour and facilitates a variety of different flow types.

They are created by securing tree trunks to the bed of the river with chestnut posts and galvanised steel wire. A pool feature can also be created downstream of each deflector's location to provide a variety of depths. Materials won from excavating pools can be repurposed to create riffles or side bars, which further increase physical habitat complexity.



Brush berms can also be installed to pinch the width of the river and can be used to mimic natural sinuosity. They provide useful low lying areas for aquatic plants to colonise in addition to providing physical structures for aquatic wildlife to shelter.

They are created by using tree branches to reshape the river, which are secured in place with chestnut posts and galvanised steel wire.

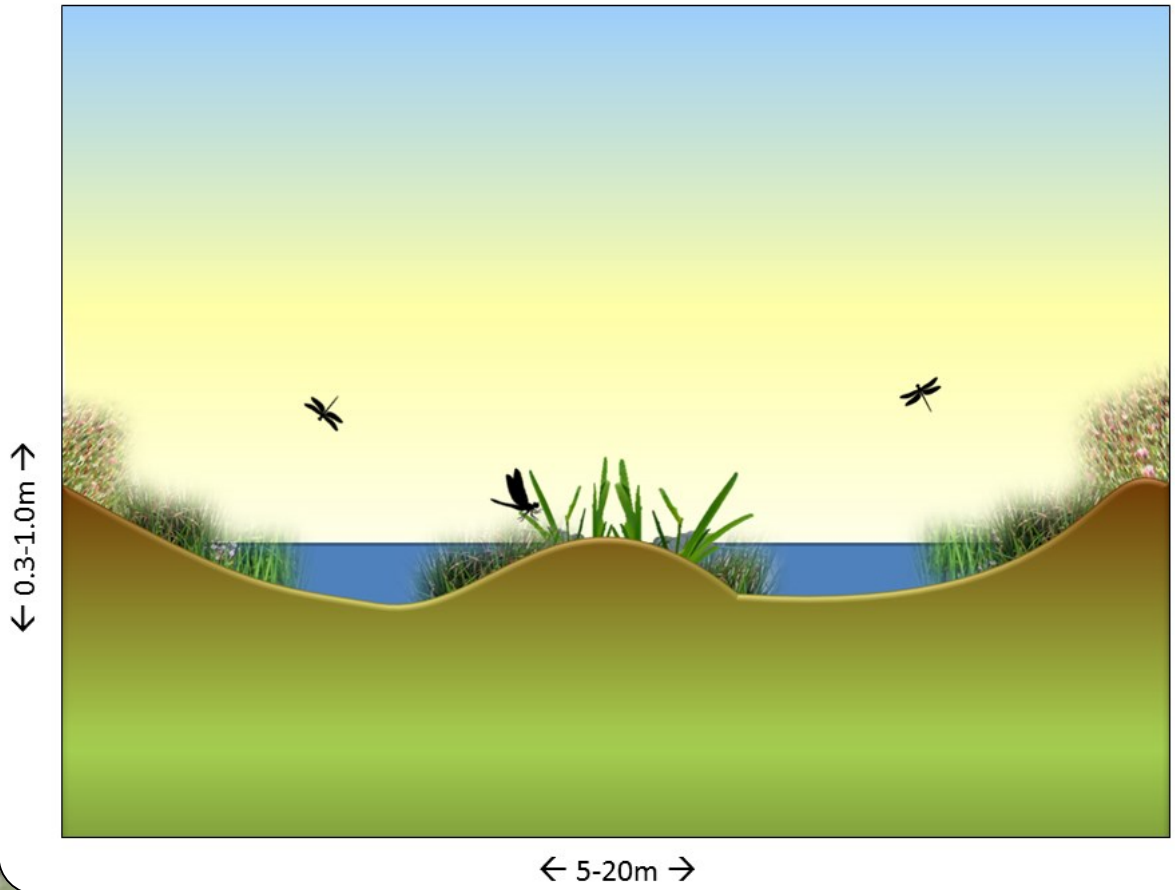
Wetland Scrapes

Scrapes are shallow ponds with gently sloping edges that hold rain or flood water seasonally and remain damp for the majority of the year. They provide valuable habitat for a range of wildlife and can be created in areas of damp grassland and floodplain.

Fields in wet areas have often historically been ploughed and drained resulting in uniform topography and few low lying areas. This has resulted in many important seasonal habitats for wildlife becoming lost. Wetland scrapes mimic these habitats, providing a space for wildlife to flourish during wet months of the year. They support high densities of invertebrates which provide an important food source for birds and amphibians and can provide a diverse range of plant species for the benefit of other species such as water voles and dragon flies.

Design Considerations

- Scrapes can be excavated by hand by volunteer groups and should be shallow depressions of varying depth between 0.3 and 1.0 meters deep.
- The banks should slope gently to allow the colonisation of aquatic plant species and to allow wildlife to safely enter or exit.
- Each scrape should be a minimum of 20m².
- Cattle grazing provides good management providing it is not too intensive and does not coincide with the bird nesting season.



Bat Box Installation

Schwegler 2F Bat Boxes

Species such as the Lesser Noctule and the Common Noctule, as well as Daubenton's, Nathusius's Pipistrelle and Bechstein's Bat, are typical representatives of bats that live in woods and forests. They prefer bat boxes as closed systems, as in nature they prefer, for example, woodpecker cavities and hollow tree branches. However, as old, diseased or dead trees tend not to be available or rather are removed from managed forests, natural roosts for Bats have become scarce.

Bat boxes can provide a remedy and are readily accepted by the animals. So-called "House Bats" are mainly those that like to roost in buildings, for example, in roller shutter boxes, behind window shutters, niches and gaps. These are, above all, Serotine, Mouse-Eared and Pipistrelle Bats. These Bats prefer, for example, flat boxes or round boxes with several hanging panel partitions.

The box has a special double front panel, made of long-term resistant, grooved wooden boards, which creates a particularly popular and readily acceptable roost for crevice-inhabiting Bats, for example Nathusius' Pipistrelle, Daubenton's and Pipistrelle Bats.

The bat box can be easily converted into a 2F Bat Box without double front panel or a 2M Nest Box for Birds at any time. The front panel can be removed for inspection and cleaning.

Site Action Plan

Backwater restoration and riparian tree works

Activity	Action		Comments	Delivered by:
All	1.	Procure contractor to undertake project design and permitting.	Three contractors to tender for the initial phase of the project. The tender should cover the following activities: 1. Tree works (Backwater area and river corridor) 2. Backwater restoration works	Groundwork
Backwater restoration	2.	Undertake topographical survey to assess the feasibility of reconnecting the back water to the main river.	• The survey should highlight whether a constant connection between pond and river can be maintained. • If a constant connection cannot be maintained, the option to connect the river and pond should be abandoned in favour of desilting the pond and managing the reedbed.	Contractor
Backwater restoration	3.	Undertake sediment analysis to establish whether materials in backwater area are contaminated.	• The results of the analysis should establish whether materials can be reused on site or disposed of in landfill.	Contractor
Backwater restoration Tree works	4.	Produce designs for back water or pond enhancement.	The following construction drawings should be produced should be produced 1. Site plan *Illustration showing the location of each improvement proposed on site (backwater and riparian tree works)* 2. Topographical Survey *Survey of site topography around key construction areas.* 3. Cross sections and longitudinal sections for backwater area and connection point with river corridor. *A cross sectional diagram produced for key areas.*	Contractor

Backwater Restoration Tree Works	5.	Apply and obtain bespoke environmental permit to cover works.	The following documentation is required for an Environmental Permit application. 1. The construction drawings listed previously. 2. Site management plan *Document containing all aspects of site management.* 3. Construction Methodology *Method of construction for each activity proposed.* 4. Sediment analysis results *With interpretation illustrating what materials can be used for.* 5. Water Framework Directive Compliance Assessment *WFD compliance evaluated for each activity proposed.* 6. Environmental Risk Assessment *Environmental risk and mitigation identified for each activity.* 7. Site Risk Assessment *Risk to workers/site users and appropriate mitigation identified.*	Contractor
Backwater restoration	6.	Procure contractor to deliver construction phase.	Three contactors to tender for construction phase of project. The tender should cover the following activities: 1. Backwater restoration or pond enhancement works. 2. Riparian tree works	Groundwork
Backwater restoration Tree works	7.	Deliver capital improvement works as per design specifications	**Likely construction methodology for each activity:** **Tree Works:** 1. Trees are cut and cleared as per design. *Willow to be used to create hibernacula for reptiles, amphibians and invertebrates on Affinity Water Site. Excess materials to be chipped and spread on informal pathways or removed from site.* 2. Other species to be retained for the creation of wooded debris	Contractor

Continued from previous page	**Backwater restoration works:** 1. A long reach excavator should be used to lower the bed level of the pond to the levels specified in the construction design. 2. The outlet channel of the pond should be desilted and regraded to provide a constant connection with the main river. 3. Reeds should be removed in areas where they encroach to the centre of the pond to provide a greater area of open water. **Pond Enhancement Works:** In the event that the pond cannot be reconnected to the main river the following improvement works should be undertaken: 1. The pond should be desilted to increase the depth of the feature and to prevent it from drying out . 2. Reeds should be removed in areas where they encroach to the centre of the pond to provide a greater area of open water.	Contractor

Wooded debris installation, Minor Tree Works, Bat Box Installation and Wetland Scrape Creation

Activity	Action		Comments	Delivered by:
Wooded Debris Installation Minor Tree Works	1.	Produce design illustrating chosen locations of brash berms, flow deflectors, hinged trees, pools and riffles, minor tree works.	The following construction drawings should be produced should be produced: 1. Site plan *Illustration showing the location of each improvement proposed on site.* 2. Cross sections and longitudinal sections for each improvement	Groundwork
Wooded Debris Installation Minor Tree Works	2.	Apply and obtain bespoke environmental permit to cover works.	The following documentation is required for an Environmental Permit application. 1. The construction drawings listed above *2.* Site management plan *Document containing all aspects of site management.*	Groundwork

Continued from previous page			3. Construction Methodology *Method of construction for each activity proposed.* 4. Water Framework Directive Compliance Assessment *WFD compliance evaluated for each activity proposed.* 5. Environmental Risk Assessment *Environmental risk and mitigation identified for each activity.* 6. Site Risk Assessment *Risk to workers/site users and appropriate mitigation identified.*	
Wooded Debris Installation Minor Tree Works	3.	Undertake improvement works with local volunteers.	**Likely Construction Methodology** Trees in shaded locations of the river channel should be coppiced to provide materials for the creation of brash berms and flow deflectors. Willow should not be used as it will regrow and require persistent management. **Brush Berms** Design Considerations: In order to ensure that brash berms do not cause blockages or excessively limit the water storage capacity of the channel they should be installed following these specifications: 1. Brash berms should extend no further than one third of the width of the river channel in any location. 2. Brash Berms should be no higher than 25% of the river's banks in any location they are placed. 3. Brash berms should be spaced at least 10meters apart to avoid creating pinch points in the river. 4. All berms should be installed via the method specified overleaf.	Knutsford Green Gym & Community Connections Projects CIC

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Installation method Contractor

1. The area of the berm is marked out by two rows of chestnut or hazel posts.
2. This area is backfilled with wooded debris (hawthorn). The heavy trunk ends of branches are placed facing upstream. The light 'leaf' ends are faced downstream so that the berm is hydrodynamic. As the berm is filled, new pieces of wood are locked and woven in behind existing pieces so that the berm will hold together as one structure when river levels rise.
3. When the berm is positioned correctly, it is secured by looping galvanized steel wire over each pair of posts surrounding the berm (bank side to river side). Additional steel staples are also used to secure the wire to the posts.
4. The loops of wire are then strained so that they are held tightly over the berm.
5. Each row of chestnut posts is hammered down with a fencing maul, permanently securing all material positioned in the berm under the loops of strained wire they are attached to.
6. Finally the berm is checked for material that may come loose and cause blockages elsewhere in the river channel. Excess wood sticking out from the berm is also trimmed to improve hydrodynamics.

Flow Deflectors

Design considerations

1. In order to ensure that flow deflectors do not cause blockages or excessively limit the water storage capacity of the channel they should be installed follow these specifications:
2. Deflectors should extend no further than one third of the width of

Continued from previous page			3. Deflectors should be no higher than 25% of the river's banks river in any location they are placed. 4. All deflectors should be installed via the method specified below. **Installation Method** 1. A cross section of tree trunk/branch is obtained and positioned facing upstream from the margins of the river. 2. Every meter, two pairs of posts are hammered into the river bed on either side of the deflector so that it is secured firmly along its length. 3. Galvanized steel wire is looped around both sets of posts and secured with heavy duty metal staples. The wire is then strained so that it is strung tightly between each pair of posts, with no slack. 4. Each pair of posts is then hammered further into the river bed so that the strained galvanized steel wire pins the deflector permanently to the bed of the river.	
Bat Boxes	4.	Install bat boxes with local volunteers	**Design Considerations** 1. Bat boxes should be Schwegler 2F-DP 2. Should be located in deep shade and dappled sunlit glades, with good flight access, to attract target species. 3. Should be located on the southern bank of the river to avoid disturbance. 4. Bat boxes should ideally be placed between 3m-6m in height on a tree. 5. Bat boxes should be located approximately 20m apart across the site.	Herts and Middlesex Wildlife Trust

Continued from previous page			**Installation Method** 1. Batboxes should be installed by a minimum of two people (one to attach box to tree, one to hold ladder / supervise. 2. Bat boxes are attached to trees simply by mounting on a screw or	
Wetland Scrape Creation	5.	Create Wetland Scrape with local volunteers	**Installation Method** 1. The scrape should be excavated using hand tools by local volunteers 2. The scrape should provide softly graded banks and be planted with a suitable array of native aquatic plant species.	

Ongoing management actions

Activity	Action		Comments	Delivered by:
Reedbed Management	1.	Cut reedbed on rotation.	Once enhancement is complete, the reed bed should be cut on rotation each winter (10% per year), to retain this important habitat and to prevent the colonisation of woody species. New vegetation colonising areas of open water should also be removed each year.	Knutsford Green Gym / Community Connections Projects CIC
Grassland/Scrub Management	2.	Cut and clear grassland and scrub area surrounding backwater on rotation	1. Cutting and clearing a third of the vegetation each year in autumn will halt the successionary process and conserve a more diverse forb content than would otherwise develop. 2. Cut and cleared materials should be used to create habitat piles within the scrub fringe for the benefit of sheltering amphibians, reptiles and small mammals.	Knutsford Green Gym / Community Connections Projects CIC
Coppice Woodland	2.	Coppice Woodland as required	1. Coppice trees and shrubs in late winter or early spring, just before they come into active growth.	
Control INNS	2.	Survey and control invasive species each year,	The site should be surveyed using the CVFC INNS application and control work conducted accordingly.	Knutsford Green Gym / Community Connections Projects

Estimated Costs

Backwater Restoration / Enhancement and Riparian Tree Works

Activity	Items	Cost	Total
Design and Permitting for backwater restoration/enhancement and tree works	Survey Work	£1,000	£9,000
	Design Work	£5,000	
	Sediment Analysis	£2,000	
	Permitting	£1,000	
Tree Works	Tree clearance, coppicing, treatment of stumps	£15,000	£15,000
Backwater Restoration / Enhancement	Plant hire labour	£15,000	£47,000—£237,000
	Materials	£15,000	
	Plant hire, fuel and insurance	£2,000	
	Site security and welfare	£3,000	
	Track matting	£2,000	
	Scenario 1: Disposal of materials to landfill (if contaminated) Approximate disposal cost = £85 per m³ (Approximate volume = 2,300m³)	£200,000	
	Scenario 2: Movement of materials (if not contaminated)	£10,000	
TOTAL			**£71,000—£261,000**

Wooded Debris Installation, Minor Tree Works , Bat Box Installation

Design and Permitting for Wooded debris work	Design Work	£2,000	£3,000
	Permitting	£1,000	
Construction of wooded debris features and minor tree works	Staff time (20 days)	£5,000	£5,000
	Materials	£1,000	£2,000
Installation of bat boxes	Staff time (4 days)	£1,000	£1,300
	Materials	£300	
TOTAL			**£11,300**

Total Project Costs

Activity	Lower estimate	Upper estimate
Backwater restoration and riparian tree works	£69,000	£229,000
Wooded debris installation, Bat Box Installation, Minor Tree Works	£11,300	£11,300
TOTAL	**£71,000**	**£261,000**

Ongoing Annual Maintenance Costs

Contractor maintenance	Tree works	£2,500	£6,000
	Invasive species removal	£1,000	
Volunteer maintenance	Staff time for volunteer day facilitation (12 days per year)	£3,000	£7,000
	Tools and equipment	£500	
TOTAL			**£7,000**

*All estimated costs are based on recent quotes from local contactors for similar activities but should be regarded as approximate figures.

Site Access Plan

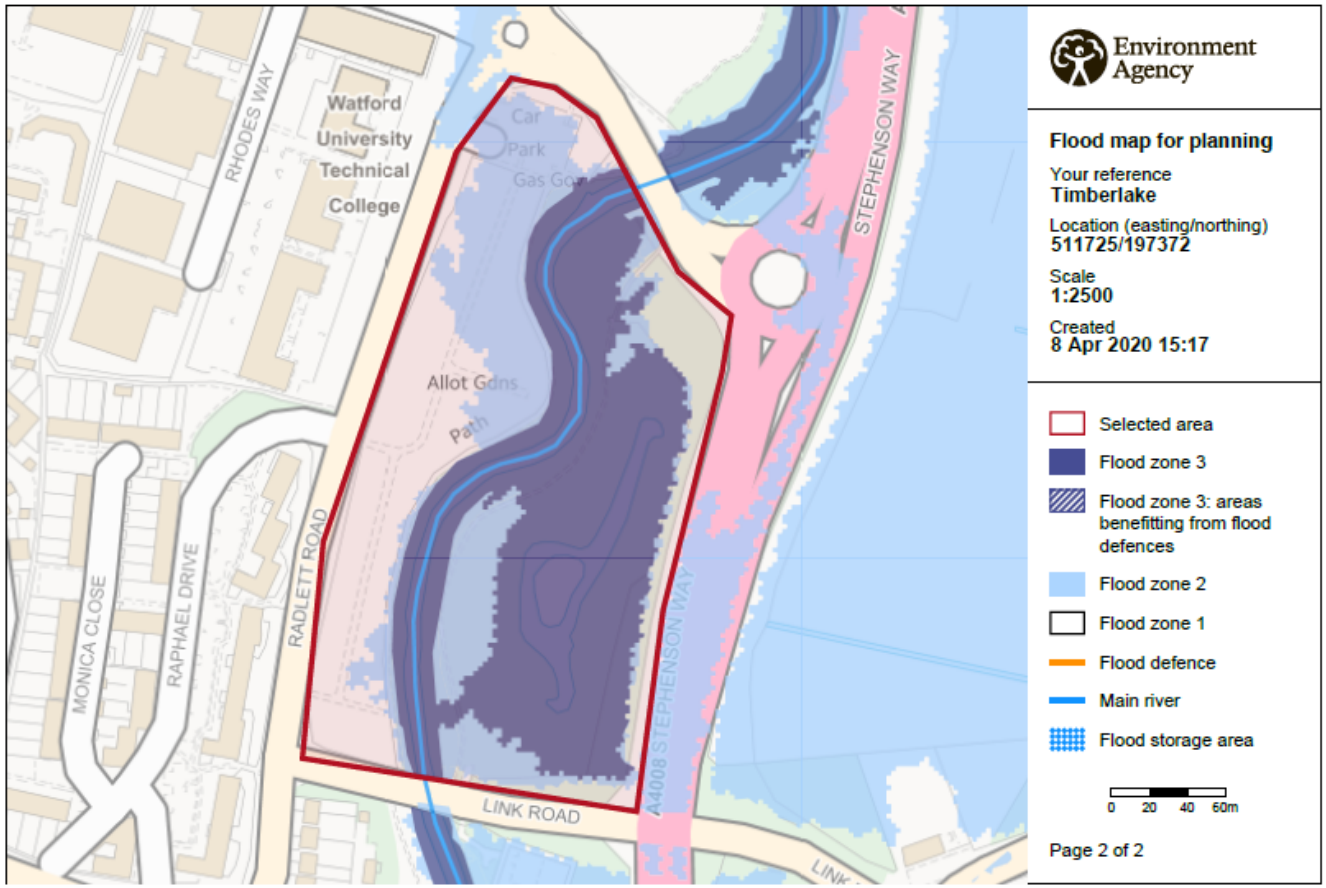
The Western floodplain is accessible for small plant from the road and car park to the north of the site. It should be noted that street lighting is present along the footpath which will limit the size of plant that can access. The Eastern floodplain is accessible for large plant from Link Road, but tree clearance may be required.

Utilities Search

Sewer—Foul | Sewer—Surface | Underground power line & street lighting

The locations of utilities should be interpreted as an initial guide in order to inform further design work. It is recommended that a new utilities search is conducted by the appointed contractor before construction works commence.

Flood Map



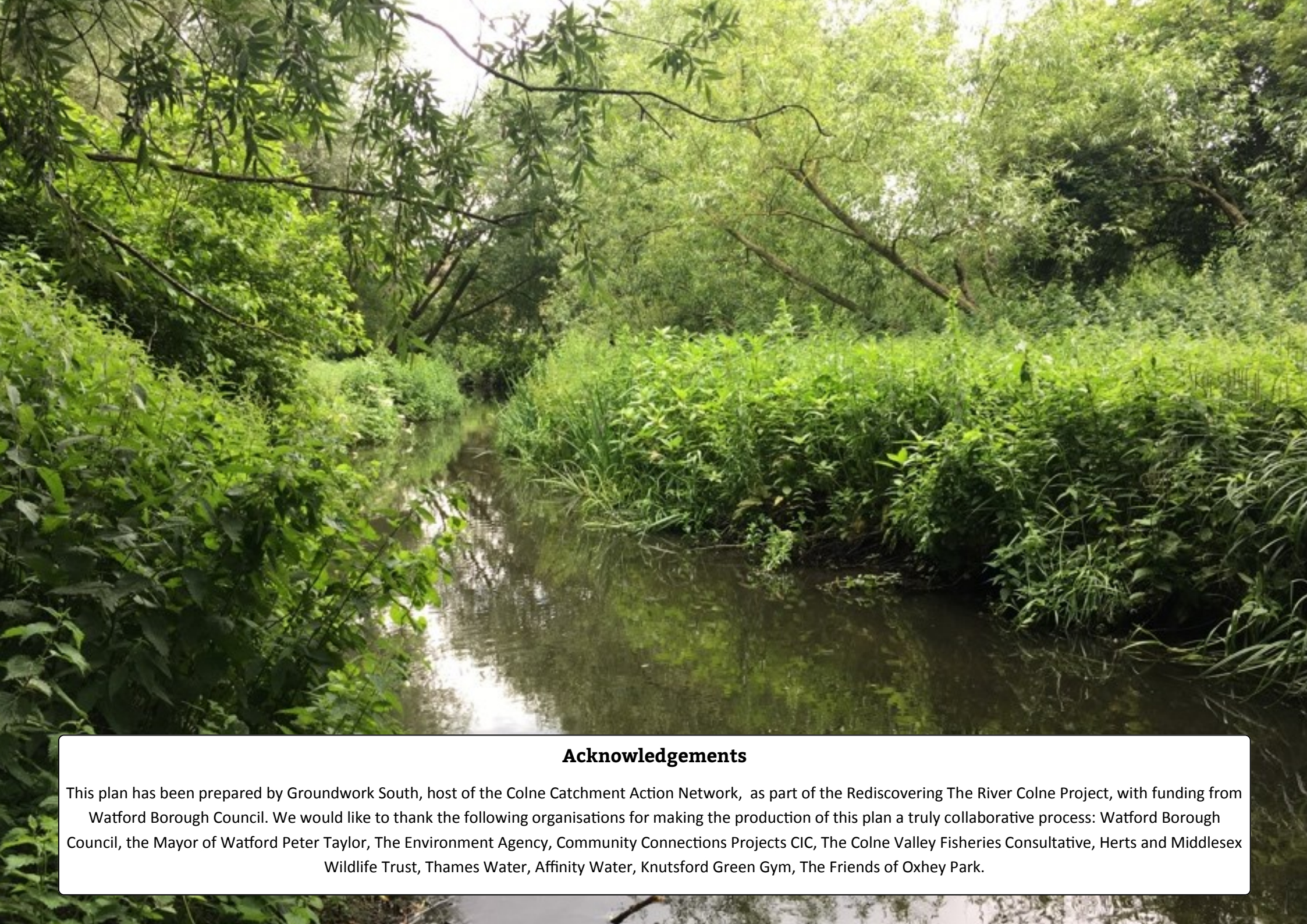
The majority of the Western floodplain is in flood zone 1 due to its high topography.

The majority of the Eastern floodplain is in flood zone 3. The backwater restoration works proposed in this area should help to increase floodwater storage capacity. Materials arising from construction must be redistributed elsewhere or sent to landfill. To avoid increasing the risk of flooding in this area.

Any works proposed within the main river channel should not encourage out of channel flow and should not cause any significant obstruction or impoundment.

References

1. Herts and Middlesex Wildlife Trust (2019) Water Vole survey of the River Colne through Watford.
2. Herts and Middlesex Wildlife Trust (2019) Botanical survey and management for River Colne in Watford
3. Groundwork South (2019) Knutsford Playing Fields modular river survey 2019.
4. Community Connections Projects CIC (2019) Riverfly Monitoring Report.



Acknowledgements

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