River Chess Catchment Restoration Plan

Smarter Water Catchment Programme

Date: Nov 2025

Working in partnership

This document has been drafted by AtkinsRéalis on behalf of Thames Water and draws upon the work carried out by the River Chess Partnership.

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EXECUTIVE SUMMARY

The River Chess Chalk stream, located north-west of London, contains unique and diverse habitats, however, the river is currently under pressure and suffering from poor ecological health. The vision is that by 2035 the River Chess catchment will be a thriving, resilient and ecologically vibrant part of the Chilterns. The landscape will support a healthy balance between nature and communities benefitting wildlife, farming and people that sustain the special qualities of this globally rare Chalk stream.

Over the past 5 years, the Thames Water funded Smarter Water Catchments initiative has united stakeholders in a collaborative effort to develop and deliver the River Chess catchment restoration plan for 2025 – 2035. This plan is structured in two parts: Part 1 outlines the restoration objectives, baseline characteristics, statutory designations and drivers; Part 2 describes the pressures and impacts, highlights opportunities for improvement, and prioritises measures to help achieve the catchment vision.

Through stakeholder workshops priority reaches, those contributing most to ecological pressures and impacts within the catchment, were identified. These reaches include Reach 4 and 5 (near Chesham and Chesham Sewage Treatment Works) and Reach 11 (between the M25 and confluence of the River Colne).

A wide range of improvement measures were identified by stakeholders and grouped by type. Measure types include physical measures (e.g. river restoration and pond creation), engagement and education measures (e.g. the development of school resources and training of citizen scientists), access measures (e.g. improved signage and walking routes), and monitoring, maintenance, and management measures (e.g. treatment of invasive non-native species). Measures were prioritised within each group based on their contribution to achieving physical benefits or the overall scale of benefit (both physical and social benefit). Each measure was also assigned a 'working together' score, reflecting its potential for collaborative delivery, education, or engagement. Further considerations, such as feasibility, cost, landowner receptiveness, and site-specific constraints, were also recorded to support effective planning and implementation.

Priority physical measures with high multiple benefits identified include weir removal and the creation of a nature park involving water meadow and river restoration. Engagement and education measures with a large scale of influence include the development of farming clusters and upskilling people with the River Chess catchment. Access measure priorities include improvements along the Chess Valley walk. Monitoring, maintenance, and management measures focus on surveying and treatment of Invasive Non-Native Species across the catchment.

Where measures have a lower priority or benefit, they remain important for delivering smaller scale or quick wins and will contribute to achieving the catchment restoration objectives. Further investigations into designation of riverine wildlife sites and overflows from Sewage Treatment Works, were also prioritised by the stakeholders.

This is a living document, designed to evolve as new information and opportunities emerge. The stakeholders remain committed to working together to deliver this plan and creating a healthier, more resilient River Chess catchment.

PART 1

1 Introduction

Chalk streams are globally important systems containing unique and diverse habitats. The River Chess Chalk stream, located north-west of London, is renowned for its vegetated margins, clean gravel bed and crystal-clear, oxygenated waters. Plants like the white-flowered water crowfoot grow abundantly in its fast flow, and fish such as brown trout lay their eggs in the river bed. However, the River Chess is currently under pressure and suffering from poor ecological health. The Flagship Chalk Streams Catchment initiative is a ten-year programme to improve the health of Chalk streams and their catchments. The initiative was developed to demonstrate what is possible when catchment partners work together to deliver improvements at a catchment scale.

The River Chess was already one of the Smarter Water Catchments (SWC) adopted by Thames Water. As part of the SWC initiative a ten-year catchment plan for the Chess was published in March 2021 and a State of the River Chess report summarising understanding of the catchment and opportunities for the future was published in March 2022.

This document has been produced as a revised catchment restoration plan from 2025 to 2035. This document outlines: the vision and objectives for the River Chess (Part 1); the current understanding of pressures and impacts; and identifies and prioritises measures to be taken forward to help improve the catchment and achieve the objectives (Part 2).

1.1 Vision for the Chess catchment

The collective vision is that by 2035 the Chess catchment will be a thriving, resilient and ecologically vibrant part of the Chilterns. The landscape will support a healthy balance between nature and communities benefitting wildlife, farming and people that sustain the special qualities of this globally rare Chalk stream.

1.2 Developing the catchment restoration plan

As partners across the Chess catchment, we have come together to create a clear strategy and identify objectives under four key themes which aligns with the Colne Catchment Plan (the Environment Agency Management Catchment in which the Chess sits). Our key themes were updated at the end of 2024 and are:

- Improving water quality
- Managing flows
- Nature recovery
- Working together

1.3 Objectives

Our objectives for the Chess catchment plan are linked to our key themes; these have been prioritised collaboratively through workshops with our partners.

Water quality objectives:

- Understand and address sources of nutrients in the River Chess
- Reduce the impact of harmful substances that could affect the health of the River Chess

Managing flows objectives:

- Increase flow resilience in the catchment by re-establishing natural morphological and hydrological processes
- Implement nature based solutions to address pollution, run-off and flood risk in the Chess catchment

Nature recovery objectives:

- All priority Invasive Non-Native Species under active control or eradicated from the Chess catchment
- Ensure wildlife can move more freely throughout the Chess catchment by improved condition, extent and connectivity of identified habitats
- Secure greater widespread adoption of measures to improve soil health

Working Together objectives:

- Continue to pioneer Citizen Science Work on the Chess which can be rolled out to other Chalk Streams
- Increase the engagement of local people to enhance and protect the Chess catchment
- Establish robust cross-sectoral collaborations that empower delivery partners to successfully implement landscape recovery initiatives.

1.4 Our partnership

Over the past 5 years, the SWC initiative has brought together a number of stakeholders, all working together through the Catchment Based Approach framework. We have engaged with hundreds of stakeholders from across the catchment encouraging them to take part in this initiative. Key partners who have helped to develop this Restoration Plan and those that will work together on its delivery are listed below:

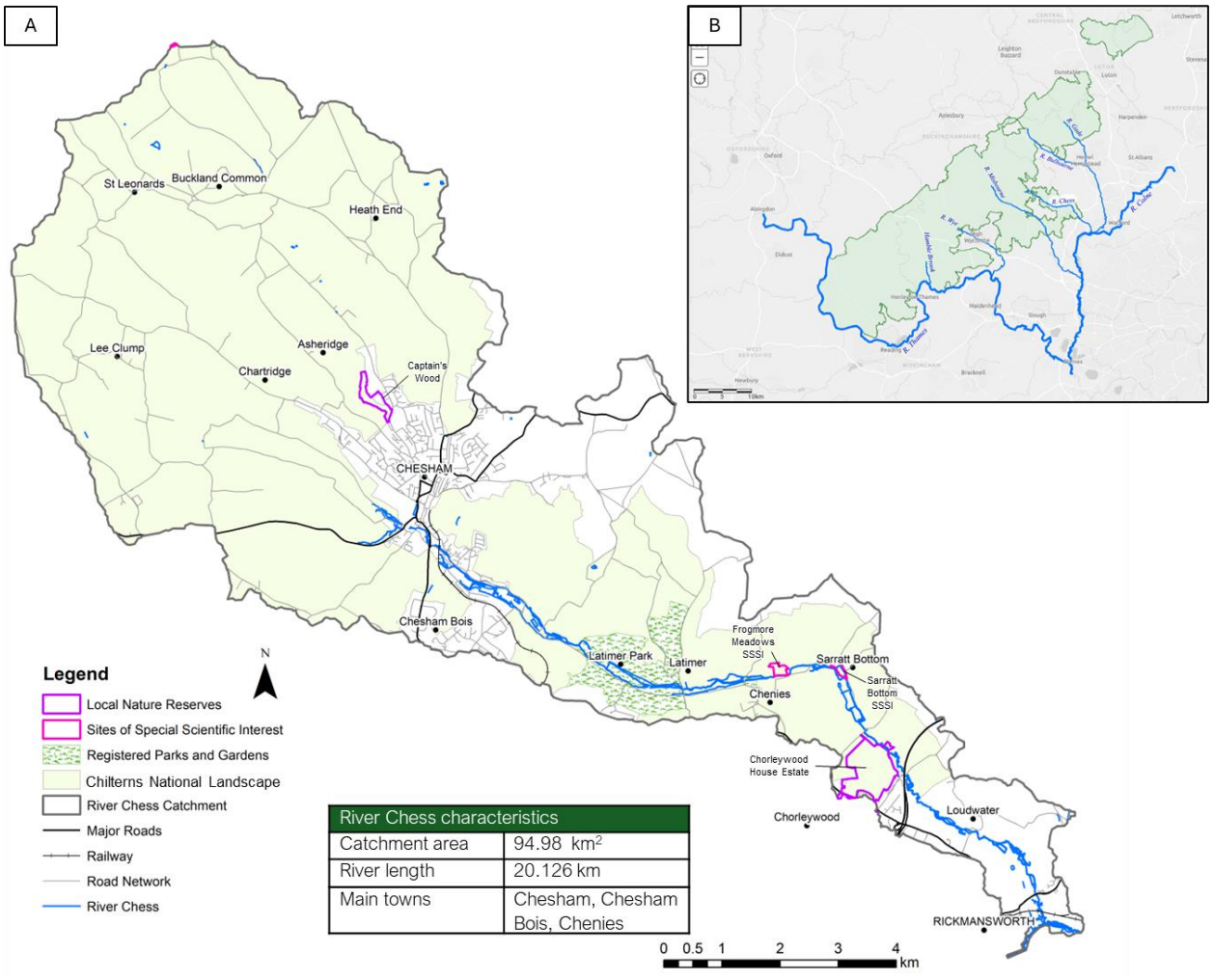
Affinity Water
Amersham Birdwatching Club
AtkinsRéalis
Berks, Bucks & Oxon Wildlife Trust
Blackwell Farm
Buckinghamshire Council
Buckinghamshire Highways
Chenies Fly Fishers
Chenies Parish Council
Chesham & District Natural History Society
Chesham Environmental Group
Chesham Renaissance CIC

Chesham Town Council
Chiltern Society
Chilterns Chalk Streams Project
Chilterns National Landscape
Environment Agency
Forestry Commission
Freshwater Habitats Trust
Hertfordshire & Middlesex Wildlife Trust
Hertfordshire County Council
Latimer Park Fly Fishers
Loudwater Residents Association
Mott Macdonald
Queen Mary University of London
Restore Hope
River Chess Association
Sarratt Parish Council
Sustainable Chesham
Sustrans
Three Rivers District Council
UK Centre for Ecology & Hydrology

2 Catchment description

2.1 Overview

The River Chess is located north-west of London in the UK. The River Chess is one of nine rivers draining in a general south-easterly direction from the Chilterns (Figure 1). It rises from several springs at the base of hills around Chesham, and flows through the Chilterns National Landscape, before joining the River Colne in Rickmansworth (Figure 1).

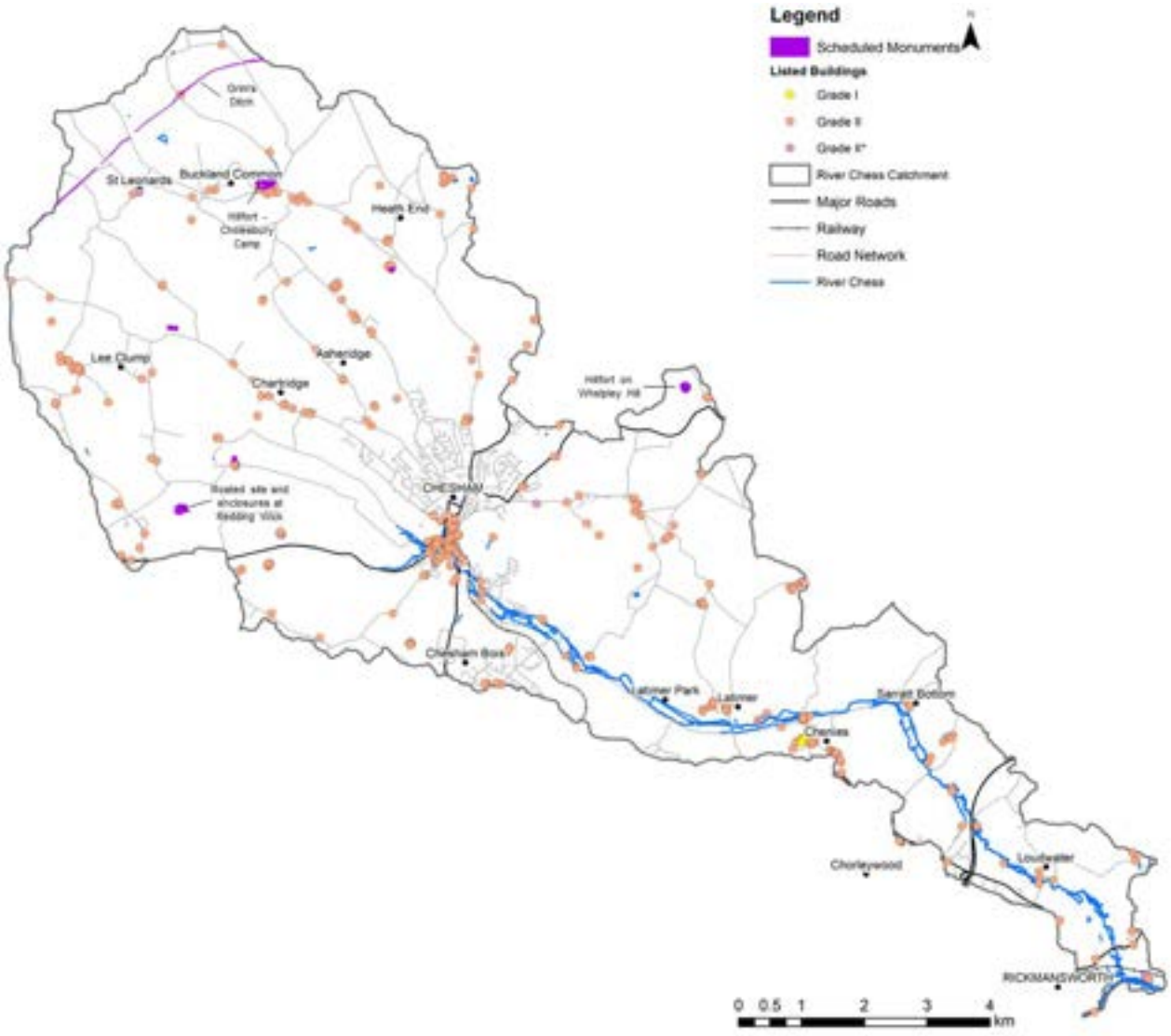


Notes: contains data from - The Environment Agency, Natural England, Historic England, Department for Transport and Ordnance Survey, River Chess Story Map - https://storymaps.arcgis.com/stories/4930144e1d6343eea98b6dbdb120921c

Figure 1 - Overview of the River Chess catchment. A) River Chess catchment area and key designations including - Chilterns National Landscape, Registered Parks and Gardens, Sites of Scientific Interest and Local Nature Reserves. B) Chilterns National Landscape with nine Chalk streams of significance.

The River Chess catchment contains a rich cultural heritage (Chess Partnership, 2022). Key archaeological features are shown on Figure 2. The earliest post-glacial hunter-gatherers in the Mesolithic were drawn to the reliable clean waters and abundant springs of the River Chess. The first farmers of the Neolithic, over 5,500 years ago, planted in the rich soils of the valley bottom. By the later prehistoric period, the entire catchment was well populated, and monuments in the form of hillforts and 'Grim's Ditch' (a linear earthwork believed to be a

territorial boundary) were constructed (Figure 2). During the Roman administration of the area, well established farmsteads, villas, and roads served a thriving region of grain and iron production. Burnt flint mounds from the Bronze Age highlight a riverside ritual site, not far from where later inhabitants would construct St Mary's Church at the now deserted Flaunden village. Physical power was invoked from the River Chess over the course of the last millennium as mills were constructed to process grain into flour and rag into paper. As a result, the Chalk stream has been shaped and reshaped for purposes such as the flooding of managed water meadows and watercress beds.



Notes: contains data from - The Environment Agency, Historic England, Department for Transport and Ordnance Survey.

Figure 2 - Heritage features within the River Chess catchment.

2.2 Geology and Hydrogeology

The bedrock geology of the River Chess catchment consists of Chalk from the Cretaceous period, overlain by alluvium (clay, silt and sand) in the valley bottoms, representing recent (Holocene) deposition by the river (Figure 3). Superficial deposits are also seen in the upper parts of the catchment, commonly referred to as Clay with-Flints (Gallois, 2009). Other superficial deposits include Pleistocene gravels, which form terraces in the lower parts of catchment, deposited by historic courses of the River Thames (Aston & Mason, 2023). The permeable geology means most of the water that falls on the ground naturally seeps into the soil, eventually reaching the Chalk aquifer. This limits overland flow and potential drainage pathways in the upland areas and therefore these are typically dry.

The River Chess is groundwater-fed by a combination of springs and artesian[1] boreholes. Springs were often used in the past as the sites of watercress beds. Based on the Catchment Based Approach (2021) Chalk stream typology the River Chess is defined as a Group A classic slope-face Chalk stream (a stream which flows from and across Chalk). In the upper parts of the catchment the river is 'intermittent', as sometimes it flows and sometimes it does not, also referred to as a 'winterbourne'.

The underlying Chalk aquifer therefore strongly influences the flow regime, which is predominantly groundwater fed evidenced by the river's high base flow index (0.95)[2] at the Rickmansworth gauge (UK Centre for Ecology & Hydrology, 2024). Mean flow at this gauge is 0.54 m3/s, whilst QMED (median annual maximum flow) is 1.13 m^3/s (UK Centre for Ecology & Hydrology, 2024).

2.3 Ecology

The River Chess is an essential habitat for important invertebrates, fish and plants (Chess Partnership, 2022). The River Chess supports the last population of water vole native to the Chilterns (The River Chess Association, 2024). It is well regarded for its brown trout which require good water quality, oxygen rich water and clean gravels for spawning. Brown trout also feed on insects both in the river and flying above it. Other fish species found in the River Chess include Grayling and Bullhead. There are several small syndicated (private), fisheries along the Chess which are a mixture of still water (online and offline lakes) and river fishing. Stocking of trout is restricted to two sections of river and the lakes at Latimer Park. Invertebrates are found along the River Chess and are important to the river because they provide the food source for fish, which in turn provide food for other animals and birds.

Stream water crowfoot (*Ranunculus penicillatus*) and brook water crowfoot (*Ranunculus peltatus*) are found within the river channel. Brook water crowfoot is a characteristic semi aquatic plant of winterbourne stretches of Chalk streams. In contrast, stream water crowfoot is found only in permanently flowing sections.

Ospreys have been sighted in the Chess catchment migrating to and from Africa in spring and autumn. They feed on fish, making the Chess an ideal stopping point. Other bird species found in the Chess catchment include Great White Egret, Little Egret, Green Sandpiper, Grey Heron, Stonechat and Water Rail which thrive off the river. Other plant species found along the Chess

[1] An artesian borehole brings groundwater to the surface without pumping due to natural pressure within the underlying aquifer.
[2] Base flow index value of 0.95 indicates that 95% of long-term stream flow is comprised of baseflow - the slow continuous contribution of groundwater to the river.

include purple loosestrife (*Lythrum salicaria*), hemp agrimony (*Eupatorium cannabinum*), water forget-me-not (*Myosotis scorpioides*) and branched bur-reed (*Sparganium erectum*).

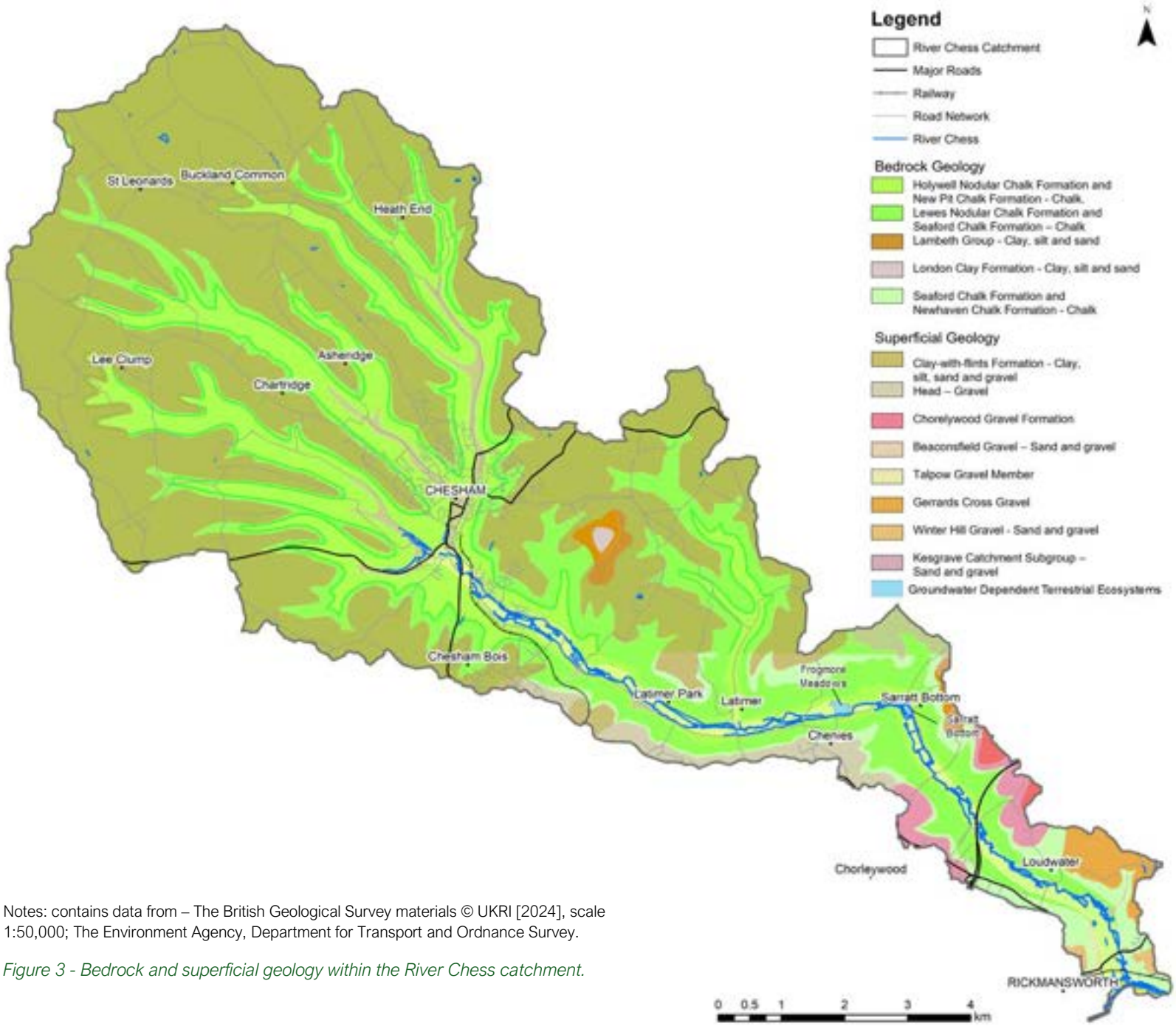
Invasive non-native species (INNS) along the River Chess include Japanese knotweed *(Reynoutria japonica)*, Himalayan balsam (*Impatiens glandulifera)* and orange balsam (*Impatiens capensis)* (Chess Partnership, 2022). Several previously unrecorded species such as American skunk cabbage and giant knotweed have also been recorded. Of these, orange balsam was most widely distributed. Although, not officially classified as an invasive species, orange balsam was recorded due to landowner concerns about its increased presence on the river in recent years. Following analysis of the potential impact of each species on the river, control efforts were initially prioritized on Himalayan balsam and Japanese knotweed in the Chesham area before working downstream (Chess Partnership, 2022).

Invasive invertebrate species American signal crayfish (*Pacifastacus leniusculus*) were introduced into the upper Chess in the late 1980s. They quickly spread throughout the river, wiping out the native, white-clawed crayfish. Signal crayfish are having a significant impact on native species, mainly as predators of bottom-dwelling invertebrates and fish eggs (Chess Partnership, 2022). Signal crayfish also burrow into the riverbanks which can affect the riverbank structure leading to excess fine sediment delivery on the riverbed, which can impact fish spawning habitats.

2.4 Land use and soils

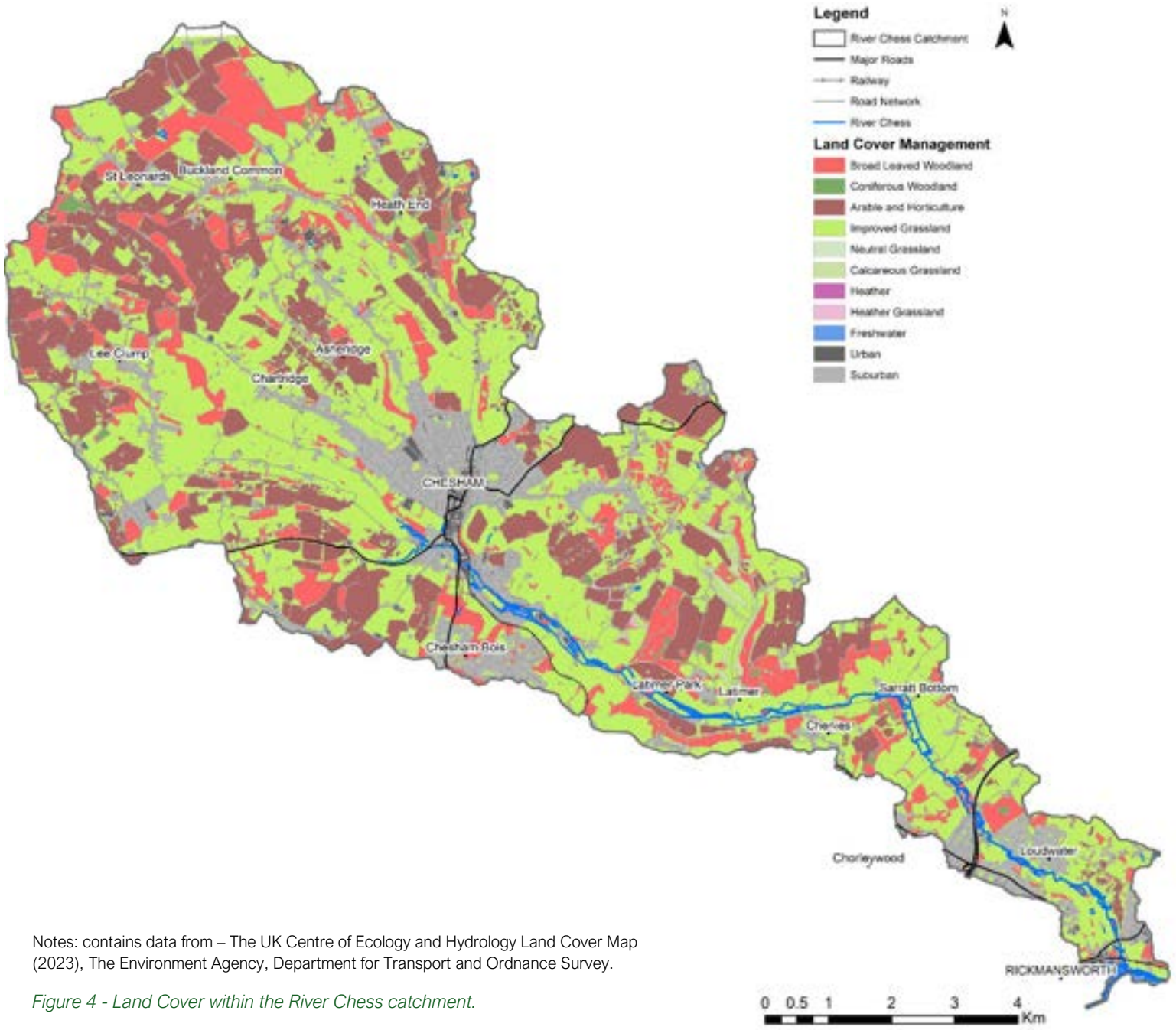
Land use within the catchment currently comprises 12% suburban, 36% arable/horticulture, 34% grassland and 18% woodland. The extents of these are illustrated in Figure 4 (UK Centre for Ecology & Hydrology, 2024). In the upper catchment, soils are a mixture of slightly acid loams and clay with some impeded drainage, and fertility is intermediate (Cranfield University, 2024). These soils support a mix of pasture, arable farming, and woodland. Arable farming for cereals (wheat and barley with some oats) and oilseed rape is concentrated on these slopes in areas where soils are thicker. Field beans are grown as a rotation crop, and food for gamebirds is also grown in small strips in the landscape, next to hedgerows and within fields.

Further downstream, the three valleys around Chesham are characterised by freely draining slightly acid, but base-rich soils of high fertility (Figure 5) (Cranfield University, 2024). Downstream from Chesham Bois the free-draining soil becomes lime-rich and loamy, supporting pasture for sheep and cattle and spring and autumn-sown cereal crops, along with lime-rich deciduous woodland. On the east bank, these free-draining lime-rich soils continue to the confluence with the River Colne. On the west side, freely draining slightly acid loamy soils predominate with neutral and acid pastureland, and deciduous woodland.



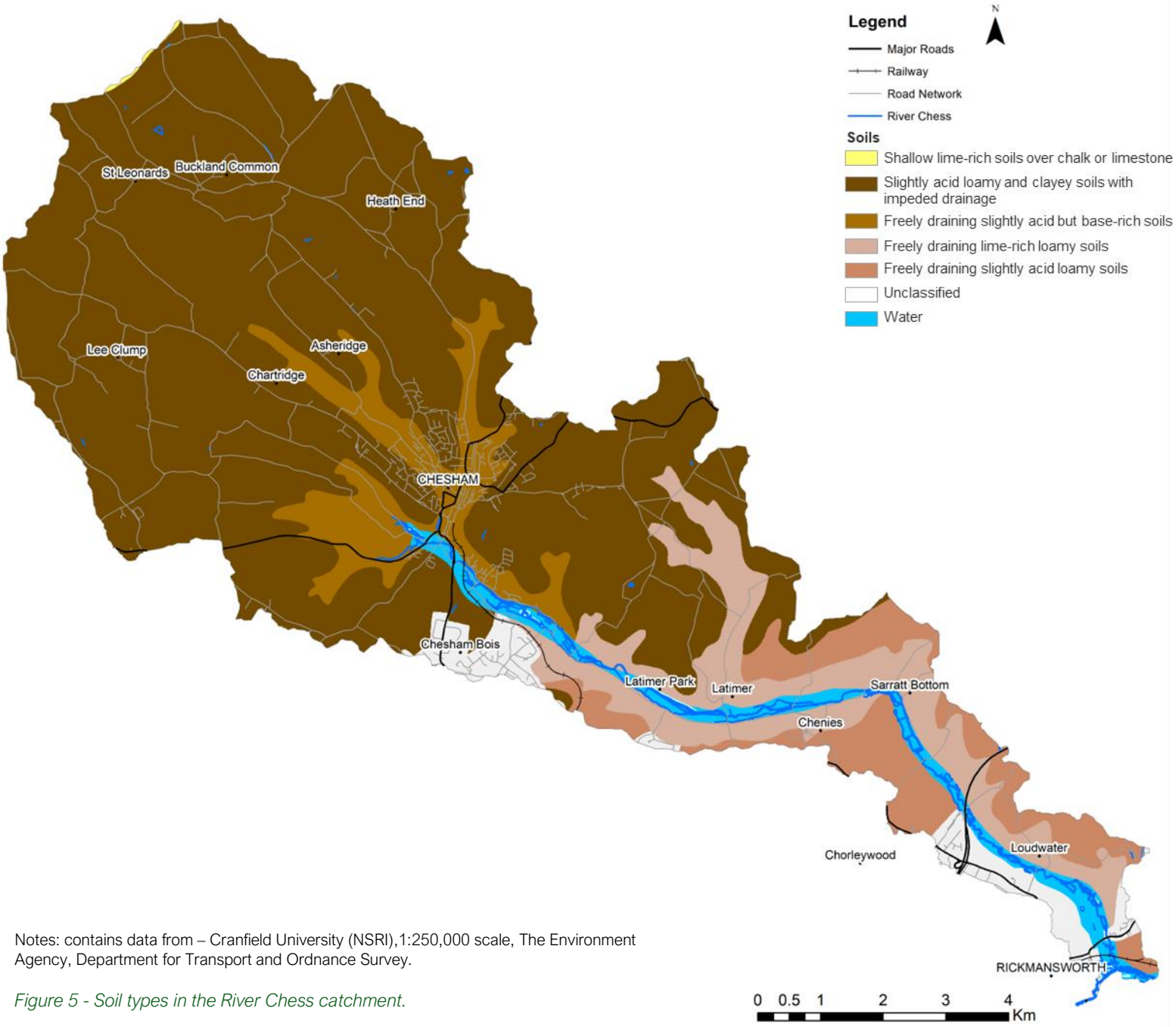
Notes: contains data from – The British Geological Survey materials © UKRI [2024], scale 1:50,000; The Environment Agency, Department for Transport and Ordnance Survey.

Figure 3 - Bedrock and superficial geology within the River Chess catchment.



Notes: contains data from – The UK Centre of Ecology and Hydrology Land Cover Map (2023), The Environment Agency, Department for Transport and Ordnance Survey.

Figure 4 - Land Cover within the River Chess catchment.



Notes: contains data from – Cranfield University (NSRI),1:250,000 scale, The Environment Agency, Department for Transport and Ordnance Survey.

Figure 5 - Soil types in the River Chess catchment.

2.5 Fluvial Geomorphology

The River Chess and its surrounding floodplains have been historically modified. Numerous mills and associated structures were constructed for industry (Figure 6). These have modified the natural profile of the river, reduced flow velocities, impounded water behind structures and diverted water. In places, the river was widened or diverted to provide flow for watercress beds. Consequently, the river has undergone significant straightening and channelisation resulting in an unnatural planform that is disconnected both longitudinally and laterally.

Fine sediment issues (particles less than 2 mm diameter) have been highlighted as having a negative effect on the fish, invertebrate and plants in the River Chess. It is likely that current fine sediment storage within the River Chess is higher than it should naturally be (Mott MacDonald, 2024). Initial investigations suggest that the sources of fine sediment within the river could originate from bank erosion (Rothamsted Research, 2023). Surface run-off is not believed to represent a significant sediment source due to the limited pathways connecting these sources to the river (Rothamsted Research, 2023). Despite this, Mud Spotter surveys (a survey that identifies the sources and pathways of mud/sediment being transported into rivers during or shortly after rainfall) reveal instances of highly turbid water during heavy rainfall along specific tributaries.

2.6 Ponds and standing water

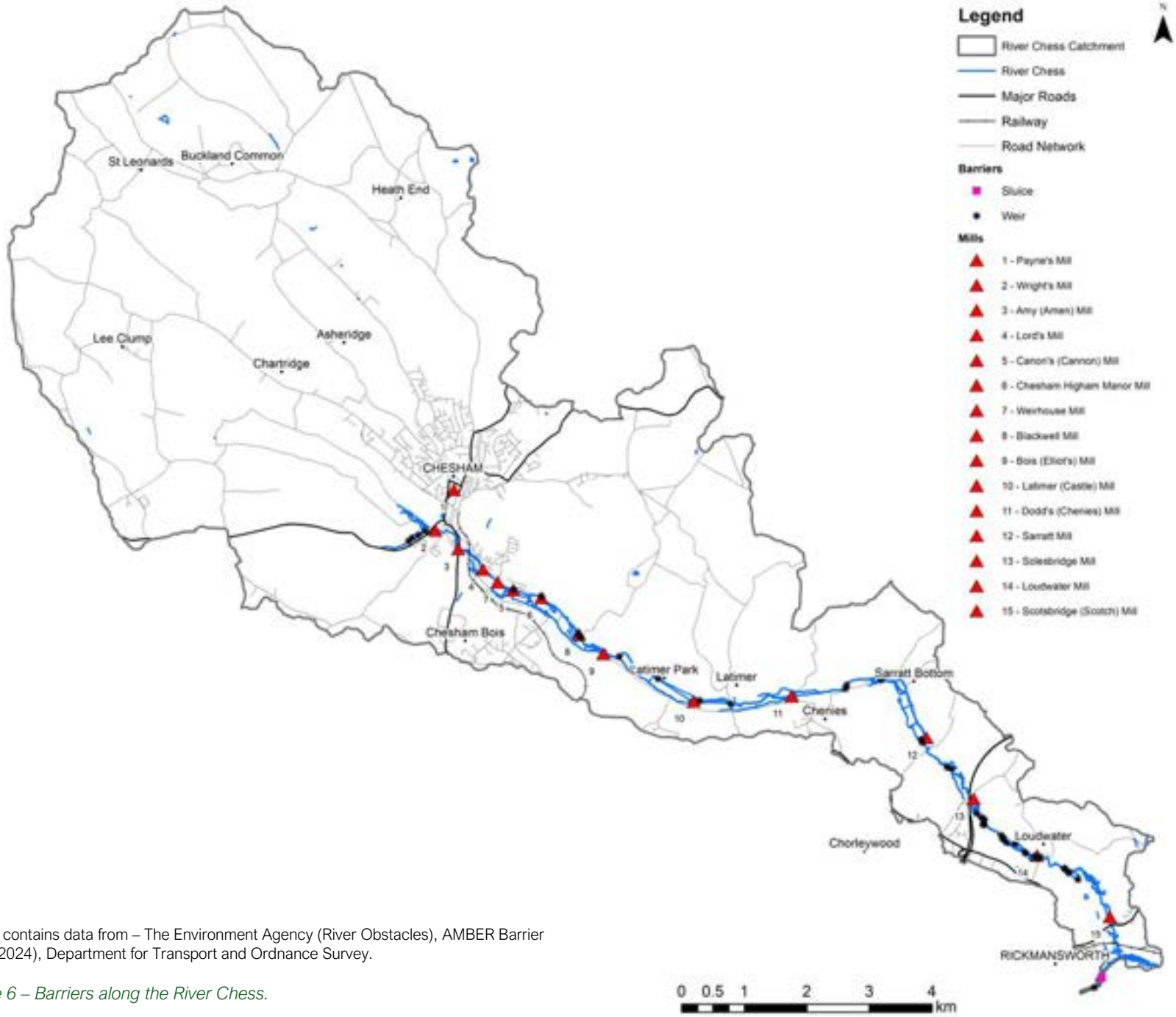
There are numerous ponds and standing water features within the River Chess catchment that provide habitats and support the freshwater species within the catchment. There is ongoing work within the catchment to identify priority ponds as well as locations for new ponds.

2.7 Water company assets

There are two sewage treatment works (STW) at Chesham and Chenies. Chesham STW serves a population equivalent of 35,200 and comprises primary, secondary, and tertiary treatment (for additional suspended sediment, ammonium, and phosphorus removal) with a permitted dry weather flow (average daily flow during a period without rain) of 10,407 m^3/day (Thames Water). In December 2024, the phosphorus permit limit reduced from 2 mg/l to 0.25 m/l. This treated effluent provides between 40 - 80% of water to the river depending on discharge conditions, thus the satisfactory operation of Chesham STW is critical to the River Chess ecosystem health. Chenies is a small, rural STW, serving a population equivalent of 159 and has primary and secondary treatment with typical flows of 50 m^3/day comprising <0.1 - 0.3% of flows in the river (estimated average calculated for 2021, as reported in the Chilterns Chalk Stream Water Quality baseline report).

Storm tank overflow discharges and effluent from STWs have impacted water quality and phosphorus levels within the River Chess. Across 2022 and 2023 seven overflow spills were recorded in the catchment for a total duration of 22.93 hours. Significant work has already taken place to upgrade the assets in and around Chesham across the 139 km long sewer network, however further work may still be required to meet changing regulatory requirements and the catchment vision. The Chesham catchment is expected to meet all government storm overflow targets by 2030-2035.

Water has been abstracted from the underground Chalk aquifer for public water supply. There are four public water boreholes, three of these boreholes are in, and around, Chesham in the upper catchment, and the fourth is near Chorleywood in the lower catchment. The catchment has an Abstraction Sensitivity Band of 3 (Environment Agency, 2024) indicating that it is highly sensitive to abstraction (based on combination of physical macroinvertebrate and fish typology information).



Notes: contains data from – The Environment Agency (River Obstacles), AMBER Barrier Atlas (2024), Department for Transport and Ordnance Survey.

Figure 6 – Barriers along the River Chess.

2.8 Monitoring

As part of the Smarter Water Catchment initiative monitoring of the catchment has extended beyond the existing Environment Agency ground water and surface water monitoring points to build up a detailed picture of the current condition of the river. Monitoring has also been carried out to capture how the river responds to improvement works. Monitoring is being delivered by the Catchment Partnership and citizen science groups. Examples of current monitoring include:

- ChessWatch - In 2019, four real-time sensors were installed into the River Chess to measure different aspects of water quality. These measurements include water temperature, dissolved oxygen levels, electrical conductivity, pH and turbidity.
- Modular River Survey (MoRPh) - this survey technique explores physical habitat quality of both the river channel and riverbank. This method is starting to be used to measure the success of restoration work.
- Riverfly - freshwater invertebrate surveying, designed to classify and count different invertebrate groups.
- SmartRivers - invertebrate species diversity and abundance, whilst also identifying the impacts of organic pollution, nutrient enrichment, sediment, chemicals and flow stress through a water quality scorecard.
- Earthwatch Freshwater Blitz – looking at water quality near Chesham.
- Water vole monitoring - Every two years in collaboration with the Wildlife Trust, River Chess Association and Chilterns Chalk Streams Project, surveys are completed along the River from May to September, looking for signs of the rare water vole.
- MudSpotter - is a citizen science surveying technique developed by Queen Mary University of London that enables non-specialists to gather scientific data on sediment entering river systems.
- Reptiles & Amphibians Monitoring – recording the presence and location of different species.
- INNS surveys – mapping the locations and occurrence of invasive species along the River Chess.
- Farmland Bird Count – surveys are being undertaken according to the Game and Wildlife Conservation Trust's national recording methodology. Focus is on farms that are members of the Chess Valley Farmer Cluster and aims to measure the impact of on-farm conservation work.
- The Floods & Droughts Research Institute (FDRI) are installing instrumentation across the catchment which will facilitate advances in our understanding of how, when and where floods and droughts occur, enabling improved predictions, robust assessment of impacts and implementation of appropriate mitigation measures.
- Flow monitoring to support and supplement Environment Agency flow data collection.

Alongside monitoring, bespoke assessments have been carried out to better understand baseline characteristics of the catchment, examples include:

- Sediment source apportionment study to understand sources of fine-grained sediment in the River Chess
- Fine sediment analysis of bed sediments – to understand bed material composition impact on plant fish and invertebrate species
- Water and sediment quality study at specific locations to understand water quality longitudinal variability, during high and low flow conditions and whether it was linked to sewer misconnections

- Reviews of existing data (e.g. SCIMAP[3], water quality etc.) to inform current baseline of river condition and water quality

[3] SCIMAP - Sensitive Catchment Integrated Modelling and Analysis Platform. This data helps us to identify where in the landscape diffuse pressures (e.g. fine sediment, flooding) are coming from and hence where mitigation actions might be most effective.

3 Designations and drivers

3.1 Water Framework Directive Status

Under the Water Framework Directive (WFD) rivers are monitored by the Environment Agency to determine the condition of inland, transitional and coastal surface water bodies. The Environment Agency classify rivers from 'High' to 'Bad' status or potential (if designated as an artificial or heavily modified water body).

Each surface water body status is classified based on overall ecological status or potential (for artificial or heavily modified water bodies), and chemical status. Some of the parameters used to classify the status are primary and drive the overall status directly, others are supporting parameters. It should be noted that the Environment Agency do not complete assessments for all elements in every classification; these elements are listed as 'do not require assessment' (e.g. chemicals as they were not assessed in 2022 due to mid-cycle classifications). Groundwater bodies are made up of quantitative and chemical overall statuses.

The River Chess WFD Water Body (GB106039029870) is not designated as artificial or heavily modified. It has a catchment area of 94.98 km^2 and is situated in the Colne Management and Operational Catchment in the Thames River Basin District. The Lower Thames (Cookham to Egham Teddington) Safeguard Zone (SWSZ4016) is present within the catchment. As of Cycle 3, the Chess water body had an overall status of 'Moderate' (2022).

The Chess was classified overall as 'Poor' in Cycle 1 (2009 - 2014) of the assessment against WFD requirements, improving to 'Moderate' in Cycle 2 (2013 - 2019). The classification of the water body's ecological status improved from 'Poor' in Cycle 1 to Moderate in Cycle 2 and has been maintained as such into the most recent assessment in Cycle 3 (2022). Phosphate has remained 'Poor' throughout. The hydromorphological quality element status has been assessed as 'Supports Good' across all Cycles whereas the chemical status was classified as 'Good' in Cycle 2 from 2013 to 2016 and decreased to 'Fail' in 2019. The Cycle 3 chemical status was also classified as 'Fail'. This is a result however of the methods assessing chemical status changing to include four groups of global pollutants (uPBTs[4]) as of 2019, causing the chemical status in all water bodies across the UK to 'Fail'. As such chemical status is not comparable to previous Cycle assessments.

There are no investigations into the classification status of this water body across any of the assessment Cycles. The Reasons for Not Achieving Good (RNAGs) for the Chess water body are predominately because of point source and physical modification in the catchment from the water industry and agriculture and rural land management, respectively.

The following tables (Table 1, Table 2, Table 3) lay out the classification status for the Chess WFD Water Body (GB106039029870) over the three Cycles recorded:

- Cycle 1 from 2009 to 2014;
- Cycle 2 from 2013 to 2016 and 2019; and
- Cycle 3 covering 2019 and 2022.

Table 3 additionally includes the objectives for the Chess water body. Table 4 identifies and provides detail of the RNAGs for the Chess water body's Cycle 3 assessment.

[4] Global pollutants (uPBTs) – PBDEs, mercury, polycyclic aromatic hydrocarbons and polyfluoroalkyl substances.

Table 1 - Chess Water Body WFD Classification Cycle 1

Classification Item	2009	2010	2011	2012	2013	2014
Overall water body	Moderate	Poor	Poor	Poor	Poor	Poor
Ecological	Moderate	Poor	Poor	Poor	Poor	Poor
Biological quality elements	Moderate	Poor	Poor	Poor	Poor	Poor
Fish	Moderate	Moderate	Poor	Good	Good	Moderate
Invertebrates	High	High	Good	Good	Good	Good
Macrophytes	-	-	-	-	Moderate	Moderate
Phytobenthos	-	Poor	Poor	Poor	Poor	Poor
Physico-chemical quality elements	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Ammonia (Phys-Chem)	High	High	High	High	High	High
Biochemical Oxygen Demand (BOD)	-	-	-	High	High	-
Dissolved oxygen	High	High	High	High	High	High
Phosphate	Poor	Poor	Poor	Poor	Poor	Poor
Temperature	Good	High	High	High	High	High
pH	High	High	High	High	High	High
Hydromorphological supporting elements	Supports good	Supports good	Supports good	Supports good	Supports good	Supports good
Hydrological regime	Does not support good	Does not support good	Does not support good	Does not support good	Does not support good	Does not support good
Morphology	Supports good	Supports good	Supports good	Supports good	Supports good	Supports good
Specific pollutants	High	High	High	High	High	High
Ammonia (Annex 8)	High	High	-	-	-	-
Copper	High	High	High	High	High	High
Iron	-	-	High	High	High	High
Zinc	High	High	High	High	High	High
Chemical	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment
Priority hazardous substances	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment
Priority substances	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment

Table 2 - Chess Water Body WFD Classification Cycle 2

Classification Item	2013	2014	2015	2016	2019
Overall water body	Moderate	Moderate	Moderate	Moderate	Moderate
Ecological	Moderate	Moderate	Moderate	Moderate	Moderate
Biological quality elements	Moderate	Moderate	Moderate	Moderate	Moderate
Fish	Moderate	Moderate	Moderate	Moderate	Moderate
Invertebrates	-	High	High	High	High
Macrophytes and Phytobenthos combined	Moderate	Moderate	Moderate	Moderate	Moderate
Macrophytes sub element	Moderate	Moderate	Moderate	Moderate	Moderate
Physico-chemical quality elements	Moderate	Moderate	Moderate	Moderate	Moderate
Ammonia (Phys-Chem)	High	High	High	High	High
Biochemical Oxygen Demand (BOD)	High	-	-	-	-
Dissolved oxygen	High	High	High	High	High
Phosphate	Poor	Poor	Poor	Poor	Poor
Temperature	High	High	High	High	Good
pH	High	High	High	High	High
Hydromorphological supporting elements	Supports good	Supports good	Supports good	Supports good	Supports good
Hydrological regime	Does not support good	Does not support good	Does not support good	Does not support good	Does not support good
Morphology	Supports good	Supports good	Supports good	Supports good	Supports good
Specific pollutants	Moderate	Moderate	High	High	High
Copper	High	High	High	High	High
Iron	-	-	High	High	High
Triclosan	Moderate	Moderate	High	High	High
Zinc	High	High	High	High	High
Chemical	Good	Good	Good	Good	Fail
Priority hazardous substances	Good	Good	Good	Good	Fail
Benzo(a)pyrene	-	-	-	-	Good
Cadmium and Its Compounds	Good	Good	Good	Good	Good
Di(2-ethylhexyl)phthalate (Priority hazardous)	Good	Good	Good	Good	Good
Dioxins and dioxin-like compounds	-	-	-	-	Good
Heptachlor and cis-Heptachlor epoxide	-	-	-	-	Good
Hexabromocyclododecane (HBCDD)	-	-	-	-	Good
Hexachlorobenzene	-	-	-	-	Good

Hexachlorobutadiene	-	-	-	-	Good
Mercury and Its Compounds	-	-	-	-	Good
Nonylphenol	Good	Good	-	-	-
Perfluorooctane sulphonate (PFOS)	-	-	-	-	Good
Polybrominated diphenyl ethers (PBDE)	-	-	-	-	Fail
Tributyltin Compounds	Good	Good	-	-	-
Priority substances	Good	Good	Good	Good	Good
Cypermethrin (Priority)	-	-	-	-	Good
Fluoranthene	-	-	-	-	Good
Lead and its compounds	Good	Good	Good	Good	Good
Nickel and its compounds	Good	Good	Good	Good	Good
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment

Table 3 - Chess Water Body WFD Classification and Objectives Cycle 3

Classification Item	2019	2022	Objectives
Overall water body	Moderate	-	
Ecological	Moderate	Moderate	Moderate 2015
Biological quality elements	Moderate	Moderate	Moderate 2015
Fish	Moderate	Good	Good 2027
Invertebrates	High	High	Good 2015
Macrophytes and Phytobenthos combined	Moderate	Moderate	Moderate 2015
Macrophytes sub element	Moderate	Moderate	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Acid neutralising capacity	-	High	-
Ammonia (Phys-Chem)	High	High	Good 2015
Biochemical Oxygen Demand (BOD)	-	High	-
Dissolved oxygen	High	High	Good 2015
Phosphate	Poor	Poor	Moderate 2027
Temperature	Good	High	Good 2015
pH	High	High	Good 2015
Hydromorphological supporting elements	Supports good	Supports good	Supports good 2015
Hydrological regime	Does not support good	Does not support good	Supports good 2027 – low confidence
Morphology	Supports good	Supports good	-
Specific pollutants	High	High	High 2015
Copper	High	High	High 2015
Iron	High	High	High 2015
Triclosan	High	High	High 2015
Zinc	High	High	High 2015
Chemical	Fail	Does not require assessment	Good 2063
Priority hazardous substances	Fail	Does not require assessment	Good 2063
Benzo(a)pyrene	Good	-	Good 2015
Cadmium and Its Compounds	Good	-	Good 2015
Di(2-ethylhexyl)phthalate (Priority hazardous)	Good	-	Good 2015
Dioxins and dioxin-like compounds	Good	-	Good 2015
Heptachlor and cis-Heptachlor epoxide	Good	-	Good 2015
Hexabromocyclododecane (HBCDD)	Good	-	Good 2015

Hexachlorobenzene	Good	-	Good 2015
Hexachlorobutadiene	Good	-	Good 2015
Mercury and Its Compounds	Good	-	Good 2015
Nonylphenol	-	-	-
Perfluorooctane sulphonate (PFOS)	Good	-	Good 2015
Polybrominated diphenyl ethers (PBDE)	Fail	-	Good 2063
Tributyltin Compounds	-	-	-
Priority substances	Good	Does not require assessment	Good 2015
Cypermethrin (Priority)	Good	-	Good 2015
Fluoranthene	Good	-	Good 2015
Lead and its compounds	Good	-	Good 2015
Nickel and its compounds	Good	-	Good 2015
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015

Table 4 - Chess Water Body Identified Reasons for Not Achieving Good (RNAG) Cycle 3 (all RNAG'S are assigned an ID number which is included below to help with finding further details through the catchment data explorer). Note the RNAGs have been updated, and some information is still to be confirmed (TBC), updates were provided by the Environment Agency – June 2025.

Classification Element	SWMI	Activity	Category	ID
Phosphate	Point source	Sewage discharge (continuous)	Water Industry	562524
Phosphate	Point source	Sewage discharge (intermittent)	Water Industry	*TBC*
Macrophytes and Phytobenthos Combined	Point source	Sewage discharge (intermittent)	Water Industry	*TBC*
Macrophytes and Phytobenthos Combined	Point source	Sewage discharge (continuous)	Water Industry	548813
Macrophytes and Phytobenthos Combined	Flow	Groundwater abstraction	Water Industry	548817
Hydrological Regime	Flow	Groundwater abstraction	Water Industry	562523
Macrophytes and Phytobenthos Combined	Physical modification	Flood protection - other operational management	Urban and transport	548816
Macrophytes and Phytobenthos Combined	Diffuse source	Riparian/in-river activities (including bankside erosion)	Agriculture and rural land management	548814
Polybrominated diphenyl ethers (PBDE)	measures delivered to address reason, awaiting recovery	Not applicable	No sector responsible	548812

3.2 Other designations & drivers

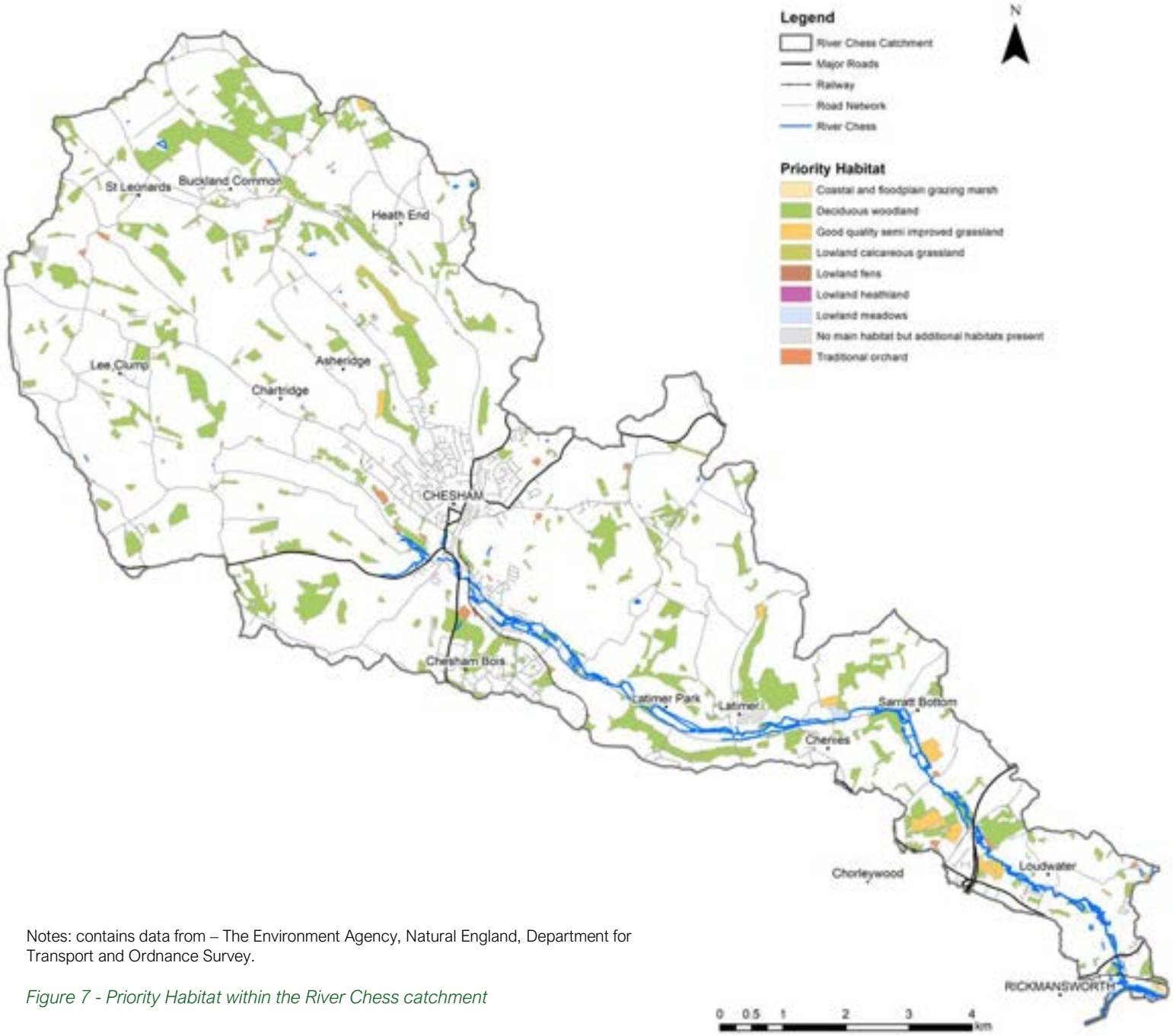
The Chess water body largely falls under the Chilterns National Landscape and the Chilterns National Character Area, covering both Buckinghamshire and Hertfordshire counties.

Within the Chess catchment (Figure 1), there are two Local Nature Reserves at Captain's Wood (13.9 ha) and Chorleywood House Estate (64.3 ha). There are two Sites of Special Scientific Interest (SSSIs) in the river floodplain at Frogmore Meadows (4.6 ha) and Sarratt Bottom (3.2 ha) which are also Groundwater Dependent Terrestrial ecosystems (Figure 3). However, neither of these SSSIs are designated for their aquatic flora and fauna. There are two registered park and gardens at Chenies and Latimer, respectively (DEFRA, 2024). There are two Priority Habitat Creation and Restoration projects within the catchment additionally: the Sarratt Meadows weir removal (2013/2014) to maintain and improve Chalk river condition and the Sarratt Bottom Meadow Restoration (2010/2011) creating a new coastal and floodplain grazing marsh habitat.

Natural England mapping shows 1612.6 ha of priority habitat in the Chilterns National Landscape within the Chess catchment, including deciduous woodland (1044.25 ha), lowland calcareous grassland (15.99 ha) and traditional orchard (18.94 ha). Ancient Woodland is present across the catchment. The condition of these habitats is largely unknown as data only exists for priority habitat within SSSIs or Higher-Level Stewardship Schemes. Priority habitat is shown in Figure 7.

Priority habitats of particular interest located close to the river include lowland fens, wet meadows and floodplain grazing marsh which offer water attenuation and cleansing opportunities. Riparian woodland is another valuable habitat that has not yet been mapped and needs further consideration, especially for its role in enhancing resilience against climate change induced increases in river water temperature.

There is an ambition to better understand the condition and map the location and number of Local Wildlife Sites (LWS) within the River Chess Catchment.



Notes: contains data from – The Environment Agency, Natural England, Department for Transport and Ordnance Survey.

Figure 7 - Priority Habitat within the River Chess catchment

PART 2

4 Introduction

Part 2 of the River Chess Catchment Restoration plan provides details on the pressures and impacts within the River Chess catchment and identifies measures to tackle and address these issues. Measures are prioritised based on their contribution to achieving the catchment objectives outlined in Section 1.3, which are focused around four themes:

- Improving water quality
- Managing flows
- Nature recovery
- Working together

Part 2 of the River Chess catchment restoration plan also provides details on next steps including potential monitoring and funding routes. This document is intended to be a live document that can be updated as actions are progressed, and new information becomes available.

4.1 River Restoration Framework

A river restoration planning framework developed by the UK River Restoration Centre[5] was followed to identify and prioritise river restoration actions within the River Chess catchment (Figure 8). The framework aims to identify and understand the main issues (pressures and impacts) within a catchment to prioritise actions, which address catchment objectives (rather than tackling restoration opportunistically or reactively at a pressure or point of impact). This framework is also published in the draft British Standards Institute 'Guidance standard on a strategic approach to river restoration' (British Standards Institute, 2023). The framework is split into four areas which are described in Sections 4.1.1 to 0 below and structure Part 2 of the River Chess Catchment Restoration plan.

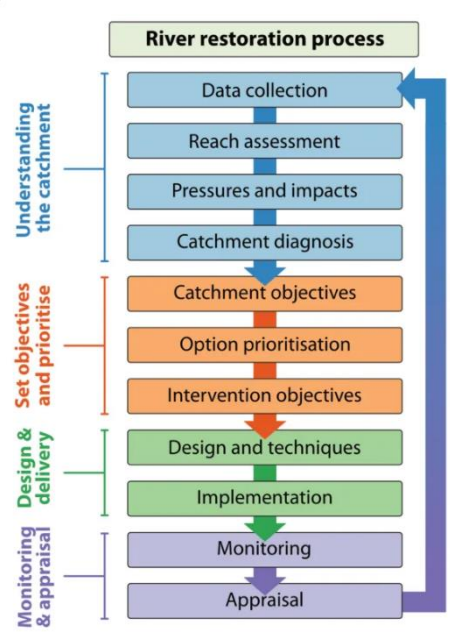


Figure 8 - Catchment planning / river restoration framework. Source: The UK River Restoration Centre[5].

4.1.1 Understanding the catchment

The key partners and stakeholders (Section 1.4) within the River Chess catchment have developed an in-depth understanding of the pressures (e.g. weirs, realignment, embankments, pollution) and their impacts (e.g. change to hydrological or sedimentological processes, forms and features in-channel and on the floodplain, habitats and species) at the local, reach and catchment scale. This information is used to diagnose the prominent catchment wide issues and set the objectives. The key pressures and impacts within the River Chess catchment are summarised in Section 5.

[5] The UK River Restoration Centre. Available at: www.therrc.co.uk/catchment-planning [Accessed 18-02-25]

To facilitate the understanding of pressures and impacts, the river network was split into homogenous river reaches (shorter lengths with similar characteristics). Reaches were divided based on previous reach delineations carried out by the stakeholders (Heppell, 2021) and changes in hydrology (e.g. winterbourne, perennial), channel form and land cover (e.g. urban / rural) to reflect changes in river processes and forms, rather than a statistical segmentation approach (e.g. principal component analysis). Reaches therefore vary in length (from upstream to downstream) depending on these characteristics. Splitting the river network into reaches provides a well-established and structured approach for assessing the condition of the catchment and setting targeted, reach-specific objectives.

4.1.2 Set objectives and prioritise

Objectives for the River Chess catchment restoration plan are linked to the key themes and have been agreed collaboratively through stakeholder workshops (Section 1.3). The objectives are summarised in Section 1.3. The aim of the prioritisation process was to select measures that will result in the greatest contribution to achieving the objectives. A prioritisation scoring method was developed based on The River Restoration Centre approach and is described in Section 7.

4.1.3 Design and delivery

Specific river restoration design and delivery techniques will need to be produced for any selected measures that are progressed. This catchment restoration plan does not go into specific detail on the design and delivery of measures, instead this action would be developed by the catchment partnership once there is an agreement on measures to be taken forward.

4.1.4 Monitoring and appraisal

The purpose of a monitoring and appraisal programme is to describe and quantify the changes that have occurred because of the restoration action and needs to be planned at the outset of a project. Specific monitoring for individual measures or schemes is not provided in this document, instead a framework to develop, support and build on existing monitoring is outlined in Section 8.

4.2 Partnership working

To date, the key partners and stakeholders within the River Chess catchment have undertaken extensive work (understanding pressures and impacts, identification and delivery of improvement actions), so many stages of the river restoration framework (Figure 8) are complete or in progress.

To support the compilation of Part 2 of the restoration plan, existing information (e.g. pressures, restoration measures) was collated and mapped. Workshops were held with the stakeholders to update the current state of the River Chess and identify, review and prioritise restoration measures. The following workshops were held:

- Workshop 1: 7th January 2025 – Identifying & scoping future projects and investigations
- Workshop 2: 31st January 2025 – Prioritisation of the workplan
- Workshop 3: 12th June 2025 – Refinement and agreement of the prioritisation approach
- Online meeting: 17th October 2025 – Agreement of how to present the physical measure priority lists with the Catchment Plan.

The outputs from the workshops feed into the River Chess Catchment Plan described in the sections below.

5 Pressures and impacts

5.1 Summary

The River Chess Chalk stream is renowned for its diverse habitats, clean gravel bed and oxygenated waters. However, the River Chess is under pressure and suffering from poor ecological health. This section describes the current pressures and impacts within the catchment across the themes of water quality, managing flows, nature recovery and working together.

Information described below has been collated from previous investigations carried out by the stakeholders (Section 2.8), using freely available information (e.g. Catchment Based Approach Data hub[6]) and discussions from stakeholders during the workshops. Whilst this information provides a good understanding of baseline pressures and impacts within the catchment, not all pressures and impacts are fully understood within the catchment (e.g. due to location, or lack of data/understanding). This should not deter delivering restoration measure implementation, however, highlights the need for further investigations to better understand pressures and impacts and system functioning (this will be discussed in Section 6.4). The baseline understanding of the catchment condition is therefore developing and should be updated to reflect new information (e.g. adding, updating or removing pressure information).

Pressures and their impacts are spatially variable with some pressures being catchment wide or diffuse (e.g. presence of INNS) whereas others are localised or point specific (e.g. channel straightening or a weir). The key catchment issues linked to the objectives and themes are summarised in Table 5.

Table 5 - Top catchment issues linked to the Catchment Restoration plan objectives and themes

Theme	Objectives	Key catchment issues
Water Quality	• Understand and address sources of nutrients in the River Chess • Reduce the impact of harmful substances that could affect the health of the River Chess	• Poor water quality • Elevated levels of nutrients and sediments • Harmful substances affecting river health
Managing flow	• Increase flow resilience in the catchment by re-establishing natural morphological and hydrological processes • Implement nature-based solutions to address pollution, run-off and flood risk in the Chess Catchment	• Lack of flow resilience • Lack of natural morphological and hydrological processes due to physical modifications • Flooding and rapid run-off • Poor soil health
Nature recovery	• All priority INNS under active control or eradicated from the catchment • Ensure wildlife can move more freely throughout the Chess catchment by improved condition, extent and connectivity of identified habitats	• INNS presence • Poor connectivity longitudinally and laterally • Poor river condition and habitats • Poor soil health

[6] Catchment Based Approach Data Hub. Available at: www.data.catchmentbasedapproach.org/ [accessed 21/02/25]

Theme	Objectives	Key catchment issues
	• Secure widespread adoption of measures to improve soil health	
Working together	• Continue to pioneer Citizen Science work on the Chess, which can be rolled out to other Chalk Streams • Increase the engagement of local people to enhance and protect the Chess Catchment • Establish robust cross-sectoral collaborations that empower delivery partners to successfully implement landscape recovery initiatives.	• Lack of public awareness of issues affecting the river and their relationship with the catchment. • Regulatory challenges.

Pressures have been grouped into theme 'types' summarised Table 6 and are mapped in Figure 9A-C, in addition a long list of individual pressures is outlined in Table 7. The maps and tables are based on information collated from freely available information sources and from stakeholders during Workshop 1 and 2 and may not represent all pressures in the catchment (e.g. some might not have been identified/recorded). This map is intended to be a live resource that should be updated with new information as the understanding of pressures and impacts is developed or pressures are resolved.

Table 6 - Pressures by theme as identified during the stakeholder workshops

Theme	Pressure Type
Water Quality	Pollution
	Sediment Input
Managing Flows	Water Quantity
	Flood Risk
Working Together	Accessibility
Nature Recovery	INNS
	Modified Habitat
	Connectivity Barriers

A

River Chess Smarter Water Catchment

Thames Water

AtkinsRéalis

River Chess Catchment

Pressures
Upper catchment

Key

Identified pressures

- Accessibility
- Connectivity Barriers
- Flood risk
- INNS
- Modified Habitat
- Pollution
- Water Quantity
- Sediment Input

Identified pressures (areas)

- Flood Risk
- Modified Habitat
- Pollution
- Sediment Input

River Obstacles

- Weir
- Mills
- Combined Sewer Overflow (CSO)
- Wastewater Treatment Works

Invasive Non-Native Species (23-24)

- Gunnera
- Himalayan Balsam
- Japanese Knotwood
- Skunk Cabbage

- Flooding Hotspots
- Catchment Boundary
- Reach breaks

OS MasterMap

- Buildings
- Heritage And Antiquities
- Land
- Rail
- Roads Tracks And Paths
- Structures
- Water
- Railway

Date of production: 19/02/2025	Version: 1.0	Drawn by: K Thompson

Data Sources
Environment Agency, Natural England, Ordnance Survey, Rivers Trust

0 375 750 1,500
Metres
Scale (at A0): 1:32,000

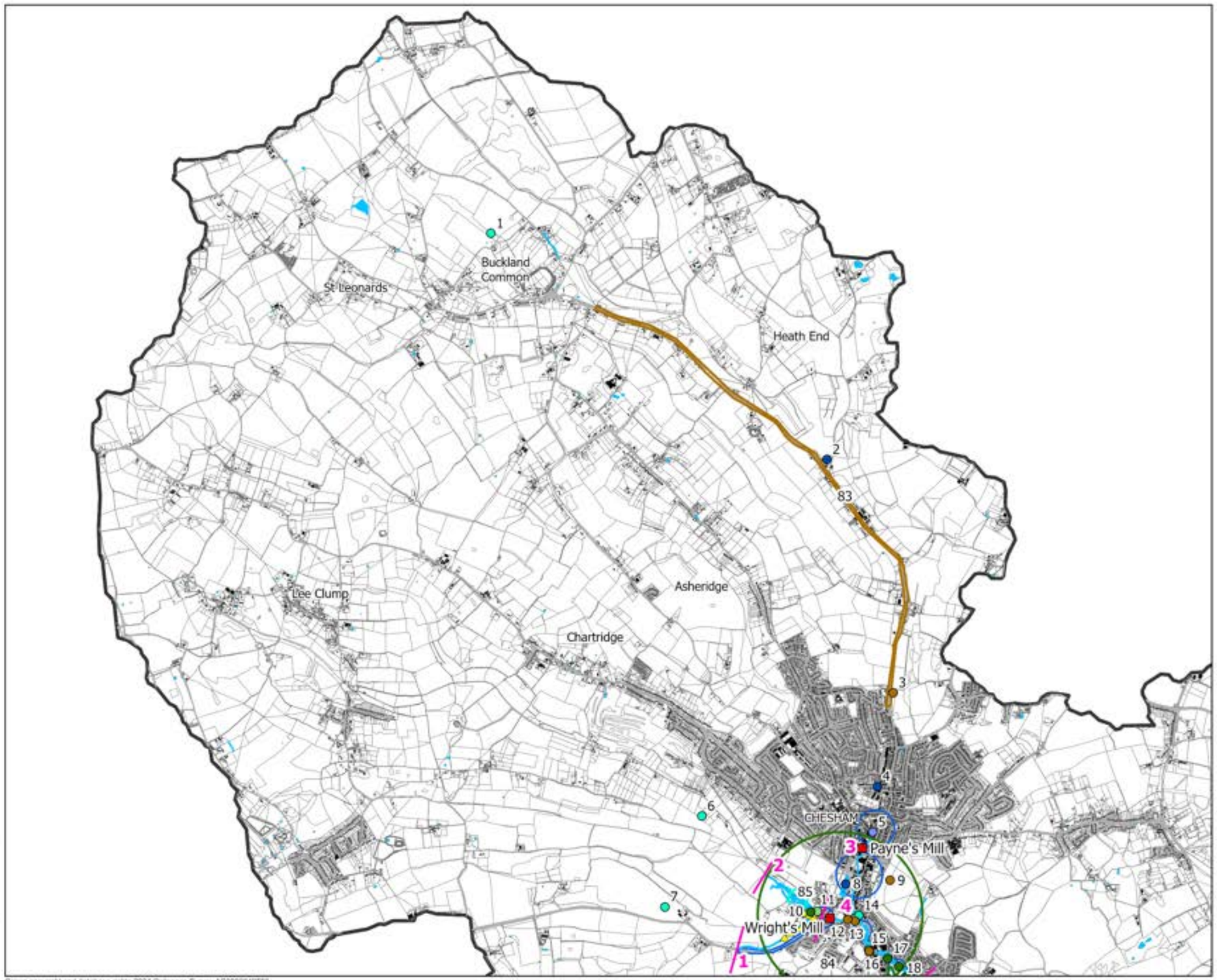


Figure 9 A - Maps A-C show the locations of pressures across the River Chess. Pressures are colour coded to distinguish pressure types. As well as catchment pressures, the map shows the mills, river obstacles, and flooding hotspots in the catchment collated from freely available information.

B

River Chess Smarter Water Catchment

AtkinsRéalis

River Chess Catchment

Pressures
Middle catchment

Key

Identified pressures

- Accessibility
- Connectivity Barriers
- Flood risk
- INNS
- Modified Habitat
- Pollution
- Water Quantity
- Sediment Input

Identified pressures (areas)

- Flood Risk
- Modified Habitat
- Pollution
- Sediment Input

River Obstacles

- Weir
- Mills
- Combined Sewer Overflow (CSO)
- Wastewater Treatment Works

Invasive Non-Native Species (23-24)

- Gunnera
- Himalayan Balsam
- Japanese Knotwood
- Skunk Cabbage

- Flooding Hotspots
- Catchment Boundary
- Reach breaks

OS MasterMap

- Buildings
- Heritage And Antiquities
- Land
- Rail
- Roads Tracks And Paths
- Structures
- Water
- Railway

Date of production: 19/02/2025	Version: 1.0	Drawn by: K Thompson

Data Sources
Environment Agency, Natural England, Ordnance Survey, Rivers Trust

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Scale (at A0): 1:17,500

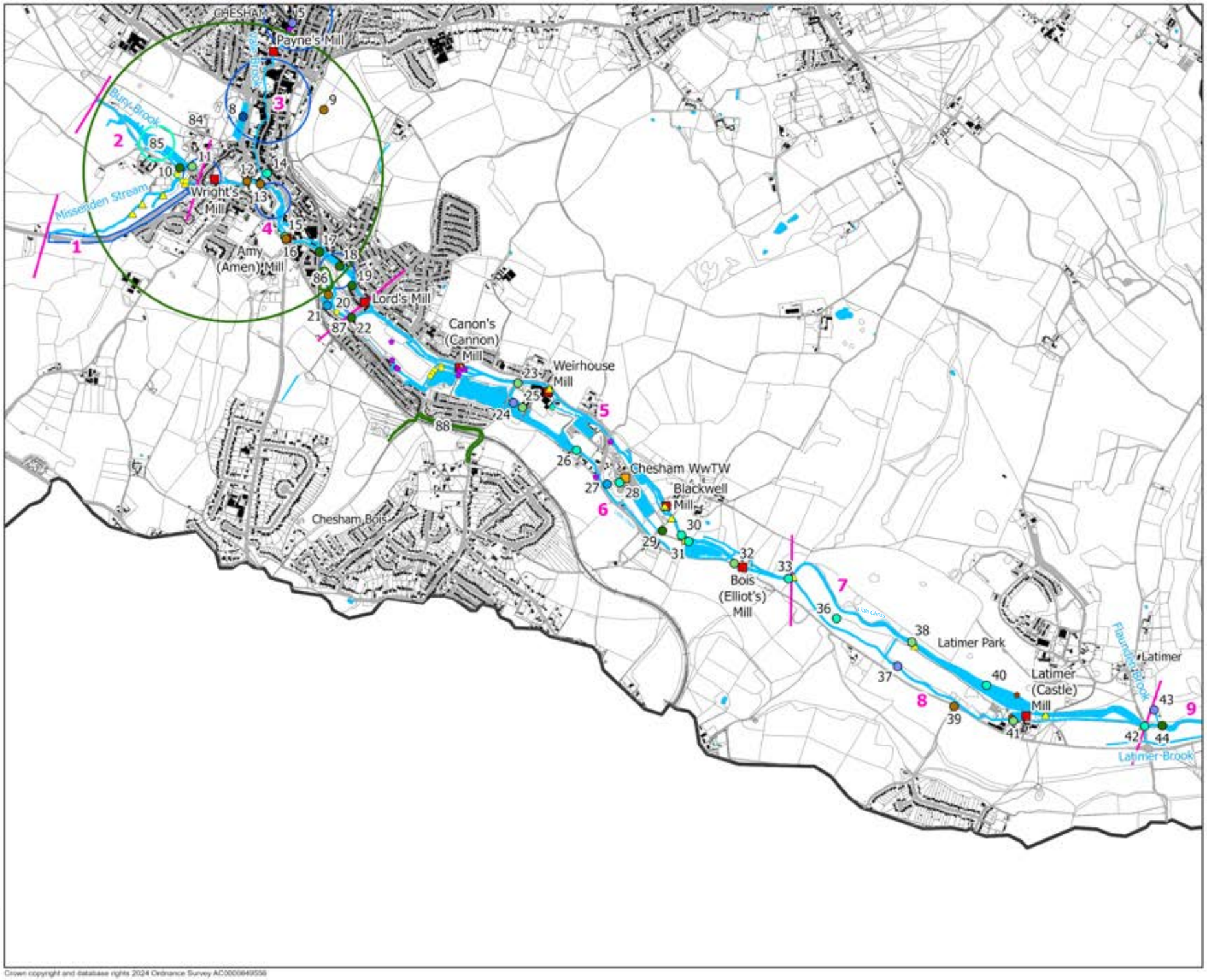


Figure 9 B - Maps A-C show the locations of pressures across the River Chess. Pressures are colour coded to distinguish pressure types. As well as catchment pressures, the map shows the mills, river obstacles, and flooding hotspots in the catchment collated from freely available information.

C

River Chess Smarter Water Catchment

Thames Water · AtkinsRéalis

River Chess Catchment
Pressures
Lower catchment

Key

Identified pressures
- Accessibility
- Connectivity Barriers
- Flood risk
- INNS
- Modified Habitat
- Pollution
- Water Quantity
- Sediment Input

Identified pressures (areas)
- Flood Risk
- Modified Habitat
- Pollution
- Sediment Input

River Obstacles
- Lock
- Weir
- Mills
- Combined Sewer Overflow (CSO)
- Wastewater Treatment Works

Invasive Non-Native Species (23-24)
- Gunnera
- Himalayan Balsam
- Japanese Knotwood
- Skunk Cabbage
- Flooding Hotspots
- Catchment Boundary
- Reach breaks

OS MasterMap
- Buildings
- Heritage And Antiquities
- Land
- Rail
- Roads Tracks And Paths
- Structures
- Water
- Railway

Date of production: 12/07/2025	Version: 2.0	Drawn by: H Joyce

Data Sources
Environment Agency, Natural England, Ordnance Survey, Rivers Trust

0 250 500 1,000
Metres
Scale (at A0): 1:20,000

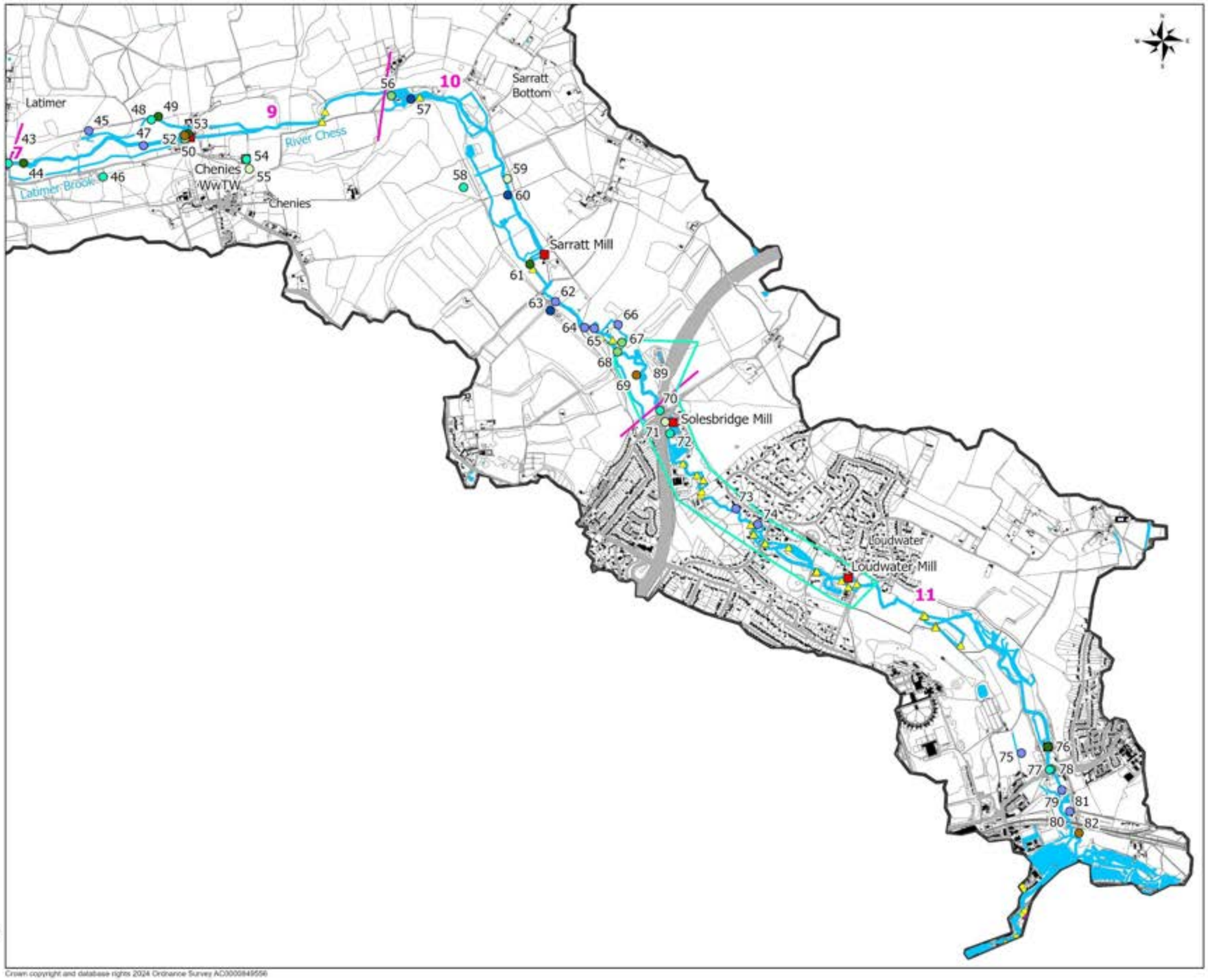


Figure 9 C - Maps A-C show the locations of pressures across the River Chess. Pressures are colour coded to distinguish pressure types. As well as catchment pressures, the map shows the mills, river obstacles, and flooding hotspots in the catchment collated from freely available information.

Table 7 - List of catchment pressures collated from previous work and stakeholder workshops.

ID	Pressure	Pressure Type
1	Run-off from arable land during high groundwater levels	Pollution
2	Hawridge abstraction	Water quantity
3	Vale Brook - fine sediment input and sedimentation	Sediment input
4	Alma Road - restart of abstraction	Water quantity
5	Vale Brook culverted	Modified habitat
6	Surface run-off	Pollution
7	Run-off into Bury Pond from Pednor Road	Pollution
8	Abstraction	Water quantity
9	Vale Brook - sedimentation	Sediment input
10	Vale Brook - groundwater flooding	Flood risk
11	Weir and culvert - complete barrier to fish passage	Connectivity barriers
12	Sediment input from bridge	Sediment input
13	Vale Brook culvert discharge - source of sediment	Sediment input
14	Red Lion car park – surface run-off	Pollution
15	Barrier to fish movement	Connectivity barriers
16	Neptune's roundabout - fine sediment input and road run-off	Sediment input
17	Flooding along road (due to it being a low point) during out of bank flows	Flood risk
18	Maintenance issue increasing flood risk	Flood risk
19	Culvert from penstock sluice	Flood risk
20	Fine sediment and road run-off input	Sediment input
21	Japanese knotweed (local)	INNS
22	Flow constriction at Bois Moor Road bridge	Flood risk
23	Culverted bypass channel with syphon creating barrier to fish passage	Connectivity barriers
24	Physical modification - overwide channel	Modified habitat
25	Weir is a partial barrier to fish passage and minor impoundment	Connectivity barriers
26	Run-off from Holloway Lane into Little Chess	Pollution
27	Japanese knotweed	INNS
28	Chesham sewage treatment works – phosphates and nitrates discharge	Pollution
29	Culvert capacity not adequate during high flow events	Flood risk
30	Wastewater treatment works permit change and implications on water quality	Pollution
31	Chesham sewage treatment works - emerging contaminants: flea treatment, pharmaceuticals, plastics	Pollution
32	Syphon taking Little Chess under main river could be a barrier to fish passage	Connectivity barriers
33	Narrow divide between Little Chess and Chess. Water quality concern	Pollution
34	Acetamiprid observed in emerging contaminants downstream of Chesham sewage treatment works	Pollution
35	Pressure from land use.	Pollution
36	'New' channel linking contaminated main river to clean lakes.	Pollution
37	Physical modification – channel re-aligned and perched	Modified habitat
38	2 weirs are significant barriers to fish and impound flow causing sedimentation	Connectivity barriers
39	Bell Lane - fine sediment input from road run-off	Sediment input
40	Low dissolved oxygen in summer in lake	Pollution
41	Culvert causes habitat fragmentation and partial barrier to fish	Connectivity barriers
42	Stoney Lane - road run-off	Pollution
43	Flaunden Brook partially culverted and in poor condition	Modified habitat
44	Ford contributes to flooding and is a source of fine sediment input	Flood risk

ID	Pressure	Pressure Type
45	Degraded banks	Modified habitat
46	Run-off risk from farming land use	Pollution
47	Physical modification: overwide, slow flows, sedimentation.	Modified habitat
48	Poaching	Pollution
49	Dodds Mill flooding hotspot	Flood risk
50	Weir	Connectivity barriers
51	Run-off sediment input, footpath erosion	Sediment Input
52	Flooding, high groundwater seepage	Flood risk
53	Footpath flooding hotspot	Flood risk
54	Chenies sewage treatment works – phosphate input.	Pollution
55	Safer path required around sewage treatment works for Chess Valley Walk	Accessibility
56	Weir	Connectivity barriers
57	Wells affected by Affinity Water pumping station	Water quantity
58	Unknown source of phosphate - further investigation needed	Pollution
59	Degraded banks causing flooding along Chess Valley Walk	Accessibility
60	Low groundwater levels (catchment wide). Marsh does not function as expected	Water quantity
61	Sluice gate prone to flooding	Flood risk
62	Poaching and bank erosion from dogs and walkers	Modified habitat
63	Pumping station cone of depression (ground water levels reduced) extends ~1.8 km upstream	Water quantity
64	Poaching, dog ingress, eroded and damaged bank	Modified habitat
65	Overshaded channel and dredged	Modified habitat
66	Overwide channel actively managed by landowner.	Modified habitat
67	Weir (1 m drop)	Connectivity barriers
68	Weir	Connectivity barriers
69	Sediment input and overwide channel	Sediment input
70	Southbound M25 run-off not captured by Sustainable Urban Drainage feature.	Pollution
71	Unattractive section of Chess Valley Walk	Accessibility
72	Culvert outflows contribute to poor water quality	Pollution
73	Physical modification of river channel	Modified habitat
74	Unnatural riparian zones	Modified habitat
75	Perched channel, poaching due to walkers, bank erosion.	Modified habitat
76	History of flooding	Flood risk
77	Risk of road run-off from A412 road bridge	Pollution
78	Intermittent issue with water quality during rainfall events	Pollution
79	Mill - concrete lined straight channel, siltation, no marginal habitat	Modified habitat
80	Overwide and straight channel	Modified habitat
81	Himalayan balsam	INNS
82	Sediment and possible contaminant input. Unknown source	Sediment input

5.2 Pressures and impacts in detail

Pressures and impacts are spatially variable across the River Chess catchment (Figure 9). For example, in the upper catchment (Figure 9A) pressures are linked to agricultural run-off, in contrast near Chesham (Figure 9B), urbanisation and channel modifications have altered the natural processes, connectivity, and forms. Elsewhere in the catchment (e.g. downstream of Chesham STW) storm overflows and emerging pollutants present a different kind of pressure (Figure 9C). Some pressures and their impacts are catchment wide and do not necessarily have a specific source location and are not mapped; as highlighted by the stakeholder workshops, these include INNS (e.g. signal crayfish, mink), agricultural pollution, pressures around ponds and small water bodies, and general disconnection between residents and the river. This list is not exhaustive and other catchment wide pressures may be present.

5.2.1 Managing Flows

Managing flows pressure and impacts relate to flood risk, flow quantity and flow resilience. The highest concern for flood risk is in the upper catchment in Chesham, where the highly constrained nature of the Chess (due to physical modification) causes fluvial flooding in several locations (Figure 9A and Figure 10). The drainage system can also be overwhelmed in heavy rainfall events leading to surface flooding. Climate change that may affect the frequency and magnitude of extremes, as well as affecting low flows within the catchment, therefore ensuring rivers are resilient to climate change is a focus of this theme.

There is a long history of water abstraction from the catchment for drinking water supply commencing in the 1880s. The upper Chess was the focus of an AMP6 low flow investigation by Affinity Water and Thames Water from 2015 to 2020; a requirement which arose from the Environment Agency's National Environment Programme.

Under PR19/AMP7 Affinity Water have a statutory obligation to improve the hydrological regime of the Chess through action at Alma Road and Chartridge Road pumping stations. Since publication of the low flow investigation report, Affinity Water ceased abstraction for drinking water from these two boreholes at the top of the Chess (together comprising c. 7.27 ML/day). One abstraction ceased in January 2018, and the other in August 2020. This cessation of abstraction was announced on 27 September 2020. Consequently, Affinity and Thames Water are monitoring flow and groundwater levels in the upper catchment to assess any changes to flows in the River Chess along with changes to the aquifer.

Thames Water have also committed to ceasing abstraction at Hawridge (currently c. 2 ML/day with a current annual licence of 9.09 ML/day); this is part of a large capital programme and is currently planned for delivery in late AMP8.

There is one further public water supply borehole owned by Affinity Water in the middle reaches of the catchment close to Chorleywood. There are no current plans to cease abstraction from this location.

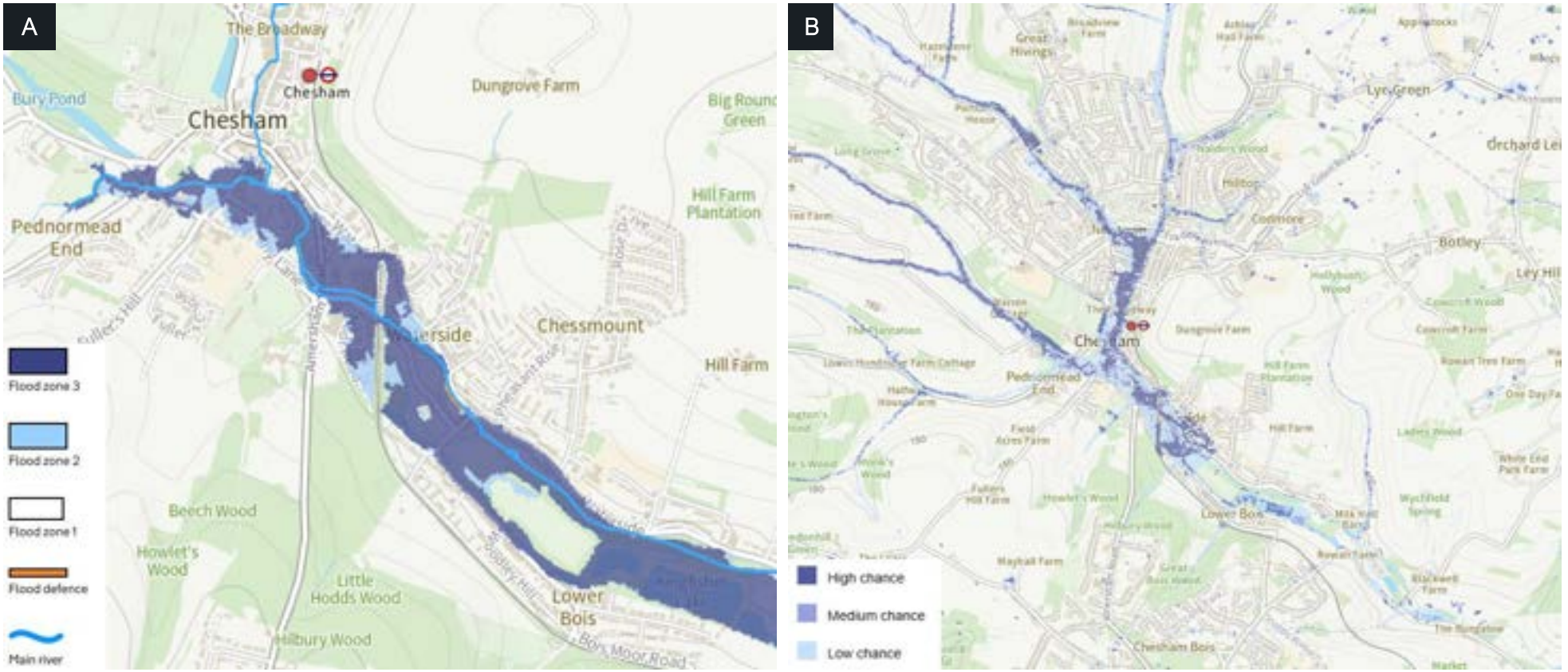


Figure 10 - GOV.UK Flood Maps. A) Flood map for planning showing flood zones 1-3 representing risk of fluvial flooding with 3 being High Risk, 2 Medium Risk, and 1 Low Risk; B) Surface Water flood map showing High, Medium, and Low chance of flooding.

5.2.2 Nature Recovery

The River Chess and its surrounding floodplains have been historically modified, with numerous mills and associated structures. These have altered the natural profile of the river, reduced flow velocities, impounded water behind structures and diverted water. In places, the river has been widened or diverted to provide flow for watercress beds. Consequently, the river has undergone significant straightening resulting in an unnatural planform, disconnection from floodplains and multiple barriers (Figure 9A-C).

The open-source Rivers Trust map of River Obstacles[7] (based on 2015 data) shows the presence of 11 mills and 31 weirs along the catchment. Eleven key barriers were identified by the stakeholders (Table 6) and are highlighted for further investigation or enhance/removal in Table 10. The significance of these eleven barriers varies as some are passable to salmonids but not smaller fish. Strategic removal of barriers that would allow connection of a greater length of river may seem an obvious path to follow; for example, assessing, and addressing (if necessary) fish passage at the Labyrinth weir in Rickmansworth would allow connection to the wider river network as it is located at the confluence with the River Colne. However, a holistic approach that looks at combining weir removal with nature recovery opportunities or targeting reaches of the river where good landowner engagement may facilitate project delivery, is also advisable. Aside from connectivity barriers, 16 key locations with significant physical modification affecting the river health were identified; it is worth noting that some of these areas also have connectivity barriers present, which provides opportunity for strategic delivery of restorations together with obstacle removal (e.g. at Lord's Mill).

Further to physical modification, INNS presence is widespread across the catchment. Examples include signal crayfish, Himalayan balsam and Japanese Knotweed, with many more both aquatic and terrestrial INNS present.

Extensive work has been undertaken to understand the nature recovery pressures within the catchment, for example an INNS strategy[8] and wildlife corridor strategy[9] to develop a baseline understanding of wildlife through the catchment and breaks in connectivity of habitat.

5.2.3 Water Quality

Unmodified (natural) Chalk streams have excellent water quality. They are fed by spring water held in Chalk aquifers; because of this they contain dissolved calcium carbonate and other beneficial nutrients that support a unique, diverse ecology. Water quality within the River Chess is, however, impacted by different sources of pollution, including surface run-off from roads, agriculture, urban areas and rural areas, sewage effluent discharge, storm overflows, and pollution incidents. Of these sources of pollution, the main contributors are agriculture, road run-off, and sewage discharges.

During the stakeholder workshops, participants were asked to identify locations in the catchment affecting water quality. Ten key locations for run-off were noted, along with twenty-four individual locations for pollution, excluding the sewage treatment works. The presence of offline sewage (i.e. septic tanks) was also highlighted, which may have an impact on groundwater through seepage. As outlined in section □, a further investigation into the sources, pathways and receptors of water quality pressures is required along with development of

[7] The Rivers Trust – River Obstacles Map [Accessed 19/02/2025)]
[8] Chess INNS strategy (March 2024)
[9] Wildlife Corridor Strategy (2024)

mitigation measures. It is worth noting that extensive work has already been undertaken, including ongoing sonde monitoring by Thames Water, a baseline assessment of water quality in the River Chess[10], a report on groundwater zones at risk [11] and a System Management plan for impacted groundwater[12].

5.2.4 Working Together

The Working Together theme underpins the engagement and delivery of improvements within the River Chess catchment. Yet, Working Together issues may be under-represented due to the other three themes and objectives focus on physical improvements. The importance of this theme, however, is paramount and will have long-term benefits to the catchment. The main issues highlighted by stakeholders in the Working Together theme include:

- Poor maintenance practices by riparian landowners (e.g. insensitive gardening, poor agricultural practices, inappropriate disposal of harmful materials).
- Lack of education on how to be a responsible riparian landowner.
- Poor regulatory control over land use that affects the catchment (e.g. governance over excess sediment run-off)
- Lack of public awareness of the uniqueness of Chalk stream habitats and the impact that day-to-day activities can have on river systems.
- Improvements required to walking routes (e.g. creation of new walking routes, address flooding hotspots along Chess Valley Walk, divert dangerous and unattractive sections of the Chess Valley Walk, etc.).
- Education about drainage and connection to the river (e.g. Yellow Fish campaign, permeable drives, managing run-off at a garden scale, etc.).

5.3 Reach contribution to catchment wide issues

As described in Section 4.1.1, the catchment was split into reaches to help understand and process pressures and impacts information (Figure 9). During the workshops stakeholders ranked how reach pressures and impacts contributed to the catchment-wide issues on a high, medium or low impact scale (Table 8). The aim of this task was to understand which reaches could be a focus for delivering river restoration measures that would help in tackling the issues. The results of this ranking are summarised in Table 8 for the three themes which focus on physical pressures (the working together theme is not ranked). Reach 4 (near Chesham), 5 (downstream from Lord's Mill) and 11 (downstream of M25) have the highest contribution to the catchment wide issues. Reach 9 and 10 had the lowest contribution to overall catchment issues partly because they were in a more rural part of the catchment.

[10] Prof Kate Heppell, Chilterns Chalk Streams Project. A baseline assessment of water quality in the River Chess (with maps produced by Dr Wendy Morrison, Chilterns Conservation Board). March 2022
[11] Groundwater zones at risk - JBA Report
[12] Thames Water. Groundwater Impacted System Management Plan. January 2022

Table 8 - Reach scale pressure & impacts contribution to the catchment wide issues (developed and agreed during workshops with stakeholders).

Theme / Parameter / Reach	Water Quality		Managing Flows		Nature Recovery								Summary	
	Poor water quality	Sources / elevated levels of nutrients / harmful pollutants	Flow resilience (quantity/duration of flows)	Flooding and run-off	Connectivity - Water dependent	Connectivity - terrestrial	Natural processes (hydrological & geomorph) and forms	Soil health	Habitat condition - Water dependent	Habitat condition - terrestrial	INNS - Plants	INNS - animals	Count of 'H'	Rank of 'H' count
Upper catchment	H	M	H	H	N/A	H	N/A	H	N/A	H	M	H	7	**8**
1	L	L	L	M	L	M	M	H	M	H	L	H	3	**2**
2	L	L	L	H	L	M	M	M	M	H	H	H	4	3
3	H	M	H	H	M	H	H	L	H	H	M	H	8	**9**
4	H	L	M	H	H	H	H	L	H	H	M	H	8	**9**
5	H	H	L	H	H	H	H	H	M	H	H	H	10	**12**
6	M	L	L	M	H	M	H	L	H	H	M	H	5	**7**
7	M	L	L	L	H	L	H	M	L	H	L	H	4	**3**
8	H	H	L	M	L	L	M	L	L	H	M	H	4	**3**
9	M	L	L	L	M	M	L	L	L	H	L	H	2	**1**
10	L	L	L	L	H	L	H	M	L	H	L	H	4	3
11	H	M	H	H	H	H	H	L	H	H	M	H	9	**11**

Notes: L = Low impact (blue shading), M = Medium impact (yellow shading), H = High impact (red shading) to catchment wide issues. See Figure 9A-C for reach locations. Summary column represents the count of High contributions for each reach and associated ranking. A ranking of 12 indicates the reach has a high number of pressures & impacts contributing to the wider catchment issues.

6 Restoration action in detail

6.1 Overview

This section outlines restoration actions (referred to as measures herein) that have been identified by the stakeholders to address the pressures and impacts and work towards achieving the catchment objectives (Section 1.3). This section is structured as follows:

- Section 6.2 summarises the known funded, completed or in progress measures. Water Industry funded projects are also included. Funded projects are those that have full funding from design to delivery. In progress measures refer to actions that are currently being built/implemented.
- Section 6.3 summarises measure opportunities identified by the stakeholders. These measures are not funded and are at a concept stage (e.g. an idea, but do not have funding to take forward).
- Section 6.4 lists the further investigations/studies that have been identified to increase understanding of the catchment pressures and impacts.

The measures and further investigations identified are focused around the four themes managing flows, water quality, nature recovery and working together. Measures were identified by the stakeholders based on their understanding of the pressures and impacts in the catchment, building on previous work. During the Workshops existing measures were updated and new measures were identified. Therefore, the list of measures and further investigations is not exhaustive. Additional actions may be needed to fully understand and address the pressures and impacts in the catchment. These lists are intended to be updated as new information becomes available.

This information is displayed in figures and tables which are provided on pages 44 - 60. The site-specific funded, completed, in progress or measure opportunities are mapped in Figure 11A-C which consists of three maps one of the upper (A), middle (B) and lower catchment (C) to aid with viewing the information. The data are shown as numbered points, where further information was available for the measure (e.g. length or area) this is also included on the map.

Table 9 and Table 10 provide details on the individual measures (e.g. location, description, theme); this includes measures that are mapped in Figure 11 A-C and measures that are not locational specific (e.g. are catchment wide, so are not mapped).

A

River Chess Smarter Water Catchment

AtkinsRéalis

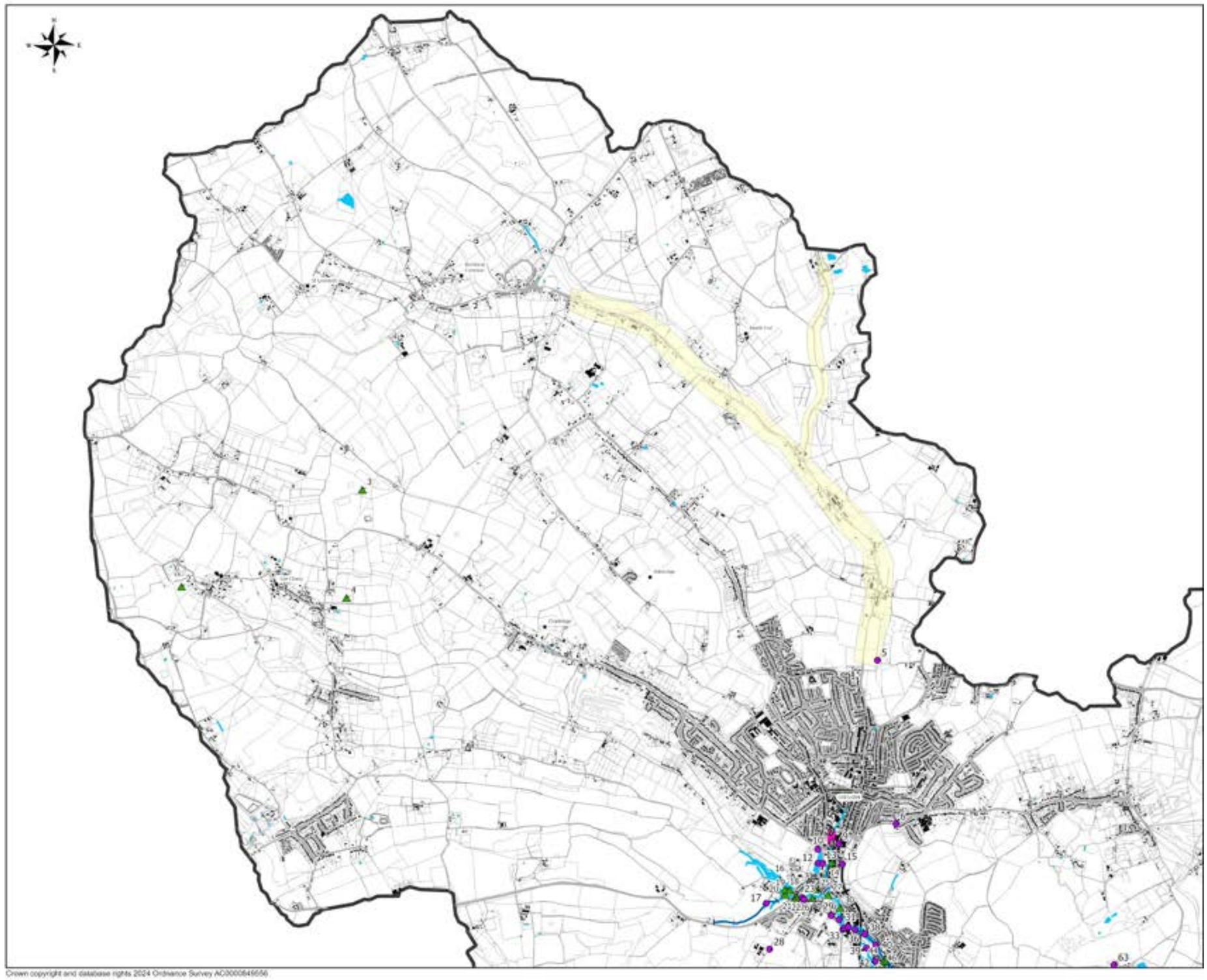
River Chess Catchment
Upper catchment

Key

- Restoration Opportunities
- Further Investigations
- Funded, in progress or complete
- Restoration opportunities - length
- Restoration opportunities - area
- Catchment Boundary

OS MasterMap

- Buildings
- Roads Tracks And Paths
- Land
- Water
- Railways



Date of production: 04/11/2025	Version: 2.0	Drawn by: H Joyce

Data Sources
River Chess Smarter Water Catchment Partnership. Thames Water. Ordnance Survey

0 250 500 1,000 Metres

Scale (at A3): 1:32,562

Figure 11 A – Restoration opportunities, further investigations and funded, in progress or completed projects in the River Chess catchment, the catchment is split into three areas A) upper, B) middle and C) lower. Numbers refer to individual measures, further details are provided in Table 9 and Table 10 (note these tables also contain catchment wide measures which are not mapped).

B

River Chess Smarter Water Catchment

AtkinsRéalis

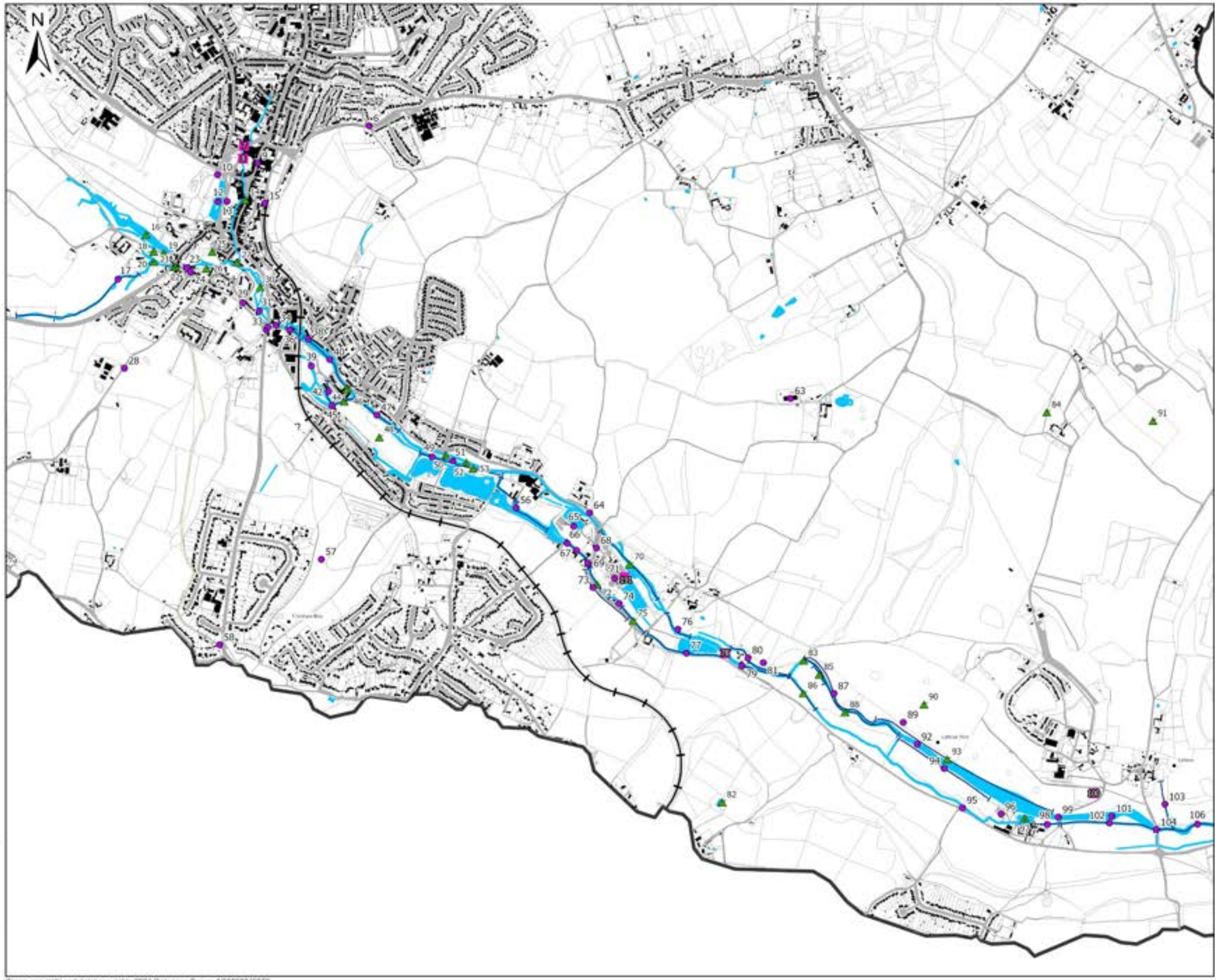
River Chess Catchment
Middle catchment

Key

- Restoration Opportunities
- Further Investigations
- Funded, in progress or complete
- Restoration opportunities - length
- Restoration opportunities - area
- Catchment Boundary

OS MasterMap

- Buildings
- Roads Tracks And Paths
- Land
- Water
- Railways



Date of production: 04/11/2025	Version: 2.0	Drawn by: H Joyce

Data Sources
River Chess Smarter Water Catchment Partnership, Thames Water, Ordnance Survey

0 130 260 520 Metres

Scale (at A3): 1:16,969

Figure 11 B – Restoration opportunities, further investigations and funded, in progress or completed projects in the River Chess catchment, the catchment is split into three areas A) upper, B) middle and C) lower. Numbers refer to individual measures, further details are provided in Table 9 and Table 10 (note these tables also contain catchment wide measures which are not mapped).

C

River Chess Smarter Water Catchment

AtkinsRéalis

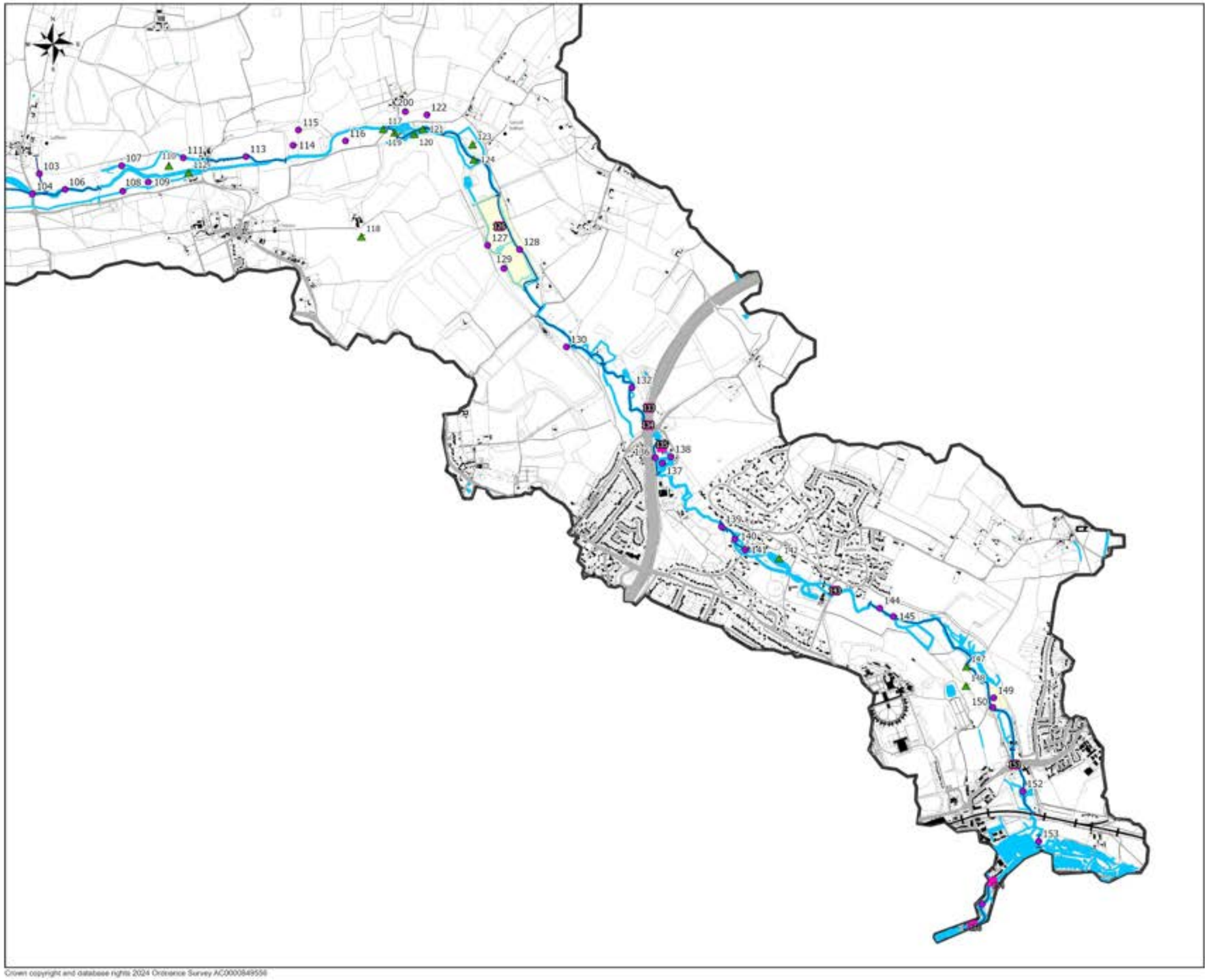
River Chess Catchment
Lower catchment

Key

- Restoration Opportunities
- Further Investigations
- Funded, in progress or complete
- Restoration opportunities - length
- Restoration opportunities - area
- Catchment Boundary

OS MasterMap

- Buildings
- Roads Tracks And Paths
- Land
- Water
- Railways



Date of production: 04/11/2025	Version: 2.0	Drawn by: H Joyce
Data Sources River Chess Smarter Water Catchment Partnership, Thames Water, Ordnance Survey		

0 165 330 660 Metres

Scale (at A3): 1:21,236

Figure 11 C – Restoration opportunities, further investigations and funded, in progress or completed projects in the River Chess catchment, the catchment is split into three areas A) upper, B) middle and C) lower. Numbers refer to individual measures, further details are provided in Table 9 and Table 10 (note these tables also contain catchment wide measures which are not mapped).

6.2 Funded, completed or in progress measures

Projects that are funded, completed or in progress are shown in Table 9 and Figure 11. Based on the available information (collated from stakeholders, previous River Chess catchment plan and through online searches on projects in the catchment) a total of 50 projects were identified that were funded, completed or in progress. These measures were distributed across the catchment, with some measures focusing on tackling individual pressures whilst others were catchment wide interventions or investigations.

The managing flows theme measures focused on culvert alterations to reduce flood risk (e.g. near Vale Brook, Pednor Road), undertaking low flow investigations, controlling levels (e.g., Lord's Mill) and investigations to understand the impact of groundwater infiltration into the sewer network. These funded, completed or in progress measures aim to help reduce flood risk but also support improvements towards flow resilience within the catchment.

The nature recovery theme measures focused on specific river restoration actions such as in-stream habitat enhancement, channel re-naturalisation and weir removal (e.g. at Chesham Moor, Sarratt Bottom weir removal). Other measures that have been carried out are associated with creating or improving existing habitat (e.g. pond restoration/creation, hedge planting, daylighting, INNS removal) and improving land management techniques (e.g. grazing management and fencing at Mill Farm Meadow).

Water quality themed measures have focused on understanding and preventing pollution as well as improving land management practices to help control and reduce fine sediment run-off.

Working together theme measures have involved improvements to walking routes around the River Chess (e.g. Chess Valley Walk regeneration), as well as increased engagement of the community with local water bodies (e.g. Impress the Chess) and increased engagement of the River Chess improvement vision and objectives.

Table 9 - Funded, in progress or completed projects with the River Chess catchment. Listed projects/measures have been compiled from stakeholders and available sources of information.

Theme	Number of measures
Managing Flows	10
Nature Recovery	32
Water Quality	6
Working Together	2

Note: This table contains potentially sensitive information and has therefore been summarised for this report.

6.2.1 Future water industry funded projects

Within the AMP8 (2025 – 2030) Water Industry National Environment Programme (WINEP), Thames Water and Affinity Water will be delivering environmental projects within the River Chess catchment. Table 11 and Table 12 summarise Thames Water and Affinity Water funded projects for the 2025-2030 period.

Table 11 - Thames Water AMP8 WINEP projects.

Action Name	Action Description	Completion Date
Reduce metal loading	Chesham STW, zinc (dissolved), 33.4	31/03/2027
Reduce Nonylphenol loading	Chesham STW, Nonylphenol, 0.38 ug	31/03/2027
Chess baseline monitoring and benefits assessment	Large catchment investigation	31/12/2026
Chess (d/s Broadwater bridge) River Restoration Scheme	Implement a river restoration scheme to promote natural morphological processes	31/03/2030
Decco Weir Fish Pass	Implement a solution to make the impeding structure passable to fish	31/03/2030
Cannons Mill Weir Fish Pass	Implement a solution to make the impeding structure passable to fish	31/03/2030
Weirhouse Mill Fish Pass	Implement a solution to make the impeding structure passable to fish	31/03/2030
Little Chess Piped Offtake Fish Pass	Implement a solution to make the impeding structure passable to fish	31/03/2030
River Chess (Cress Bed Villas) River Restoration Scheme	Implement a river restoration scheme to promote natural morphological processes	31/03/2030
Chesham Sewage Treatment works	UMON4c	31/12/2026
Chesham Sewage Treatment works	MCERTS certification of an AMP7 U_MON3 driver output overflow operation monitor (U_MON3a)	31/12/2025
Storm Overflows investigation at Chesham Sewage Treatment works	ThW0048	30/04/2027

Table 12 - Affinity Water AMP8 WINEP projects

Outcome	Location	Action
Achieving water body objective status within a catchment	Chess	AMP8 River improvement works as part of the Colne operational catchment holistic C&NBS scheme
Achieve good status, protected area, prevent deterioration and/or imp objectives for groundwater quantity, quality and/or land contamination	Colne groundwater including Chess catchment	AMP8 land management focused C&NBS for multiple benefits including prevention of deterioration of groundwater (nitrate), Chalk stream health and biodiversity as part of the Colne operational catchment holistic C&NBS scheme delivered in combination with river restoration

6.3 Restoration opportunities

The stakeholders (based on their understanding of the catchment) identified 106 opportunities to improve the catchment (Figure 11A – C and Table 10). This list is not exhaustive and there are spatial gaps (where access is unknown/not available, or there is a lack of information). As such, this list should be updated with any new opportunities and the prioritisation carried out to understand the priority of the measure (Section 7).

The opportunities are split into different measure types:

- Physical measures: that work on improving, enhancing or creating new habitats (e.g. river re-alignment, pond creation).
- Engagement and education measures: measures that focus on increasing awareness, education and engagement of the catchment amongst different groups within the catchment (e.g. developing farmer cluster, educating riparian landowners on how to maintain riparian zones, developing school resources).
- Access measures: measures that focus on improving access routes within the catchment (e.g. walking trails and information about walking routes, signage).
- Monitoring, maintenance and management measures: measures that ensure the enhancements are maintained, the system is monitored and any management required is carried out (e.g. INNS management, citizen science monitoring).
- Unassigned measures: measures that do not fall into the above categories are kept within the 'unassigned measures' tab within the prioritisation spreadsheet for the River Chess stakeholders to determine.

Table 10 – Number of measure opportunities identified within the River Chess catchment. Measures with specific locations (e.g. physical measures are shown on the maps in Figure 11A-C).

Theme	Number of measure opportunities
Managing Flows	17
Nature recovery	53
Water quality	12
Working together	24

Note: This table contains potentially sensitive information and has therefore been summarised for this report.

6.4 Further investigations

A thorough understanding of the catchment is critical for the success of future restoration efforts. Table 13 outlines 18 further investigations identified from ongoing work and expanded upon by stakeholders during the workshops. The investigations have been sorted into the four themes. Water quality has the highest number of proposed further investigations with 9 options put forward, followed by nature recovery with 6, and managing flows with 3.

Table 13 - Further investigation opportunities for the restoration of the River Chess catchment.

Theme	Number of Further Investigations
Managing Flows	3
Nature Recovery	6
Water Quality	9
Working Together	0

Note: This table contains potentially sensitive information and has therefore been summarised for this report.

7 Prioritisation of restoration actions

7.1 Prioritisation approach

The prioritisation approach used was based on the River Restoration Centre's approach (Figure 8). Identified measures that were not funded, in progress or completed (listed in Table 10) were prioritised.

A single scoring approach for all measure types was initially tested; however, it did not allow effective comparison of the diversity of measure type benefits. As a result, measures were prioritised within measure type groups:

- Physical measures were assessed for their multiple physical benefits (e.g. benefits towards the nature recovery, water quality, and managing flow themes and objectives).
- Engagement and education, access, and monitoring, maintenance and management measures were broader scale measures that may over time have benefits on the physical and social environment. Therefore, these, measures were scored on their potential scale of benefit.
- All measure types were assigned a score for their potential in fostering working together benefits.
- Further investigations were ranked by the individual stakeholders on a scale of 1 (low priority) to 5 (high priority) and an average was taken to provide an overall priority list.

During the scoring process further information was also recorded for each measure on feasibility, cost, scale of benefit, landownership, contribution to addressing the RNAGs, constraints and contribution to local nature recovery strategies, to help with interpretation. Figure 12 provides an overview of the prioritisation approach and further considerations captured. The output of the prioritisation process was an Excel spreadsheet with different tabs for individual measure type prioritisation. This prioritisation approach was as objective as possible to enable a transparent and consistent scoring of the measures; further details on scoring are provided in Section 7.1.1.

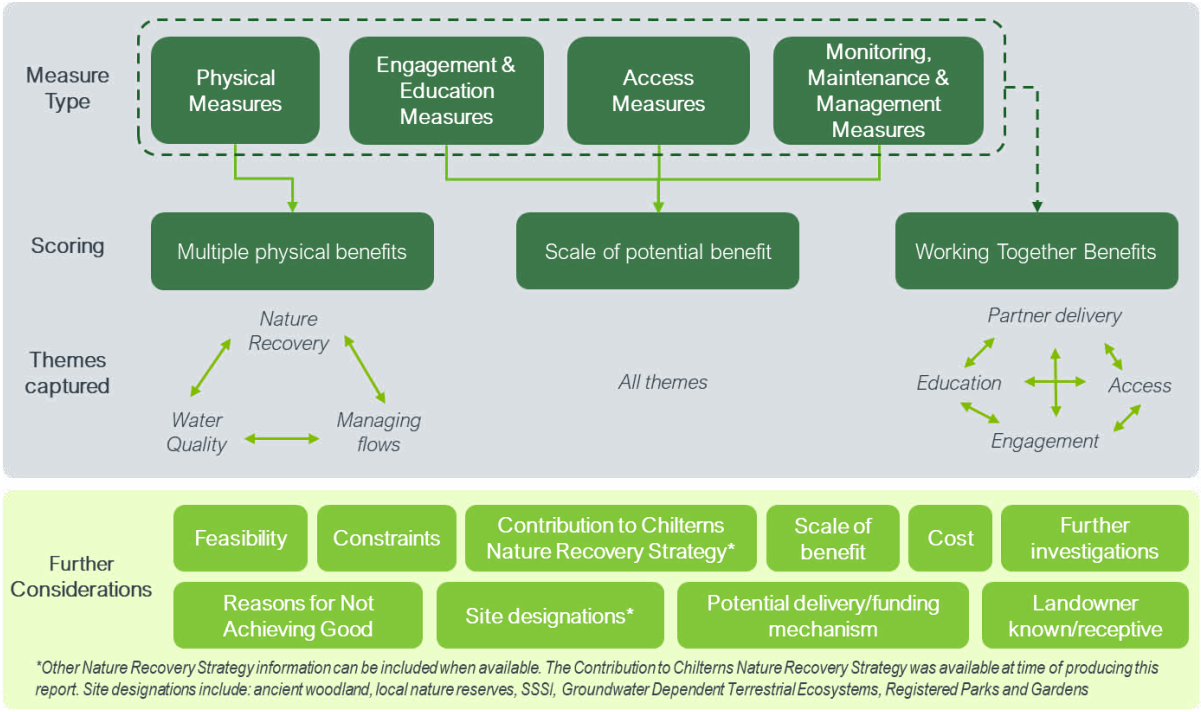


Figure 12 – High level overview of the prioritisation approach. A physical measure is scored based on its contribution to nature recovery, water quality and managing flows (multiple physical benefits). Engagement and education, access, monitoring, maintenance and management measures are scored on their scale of benefit. All measures are assigned a working together score. Further considerations are recorded for all measures.

7.1.1 Scoring

7.1.1.1 Physical Measures

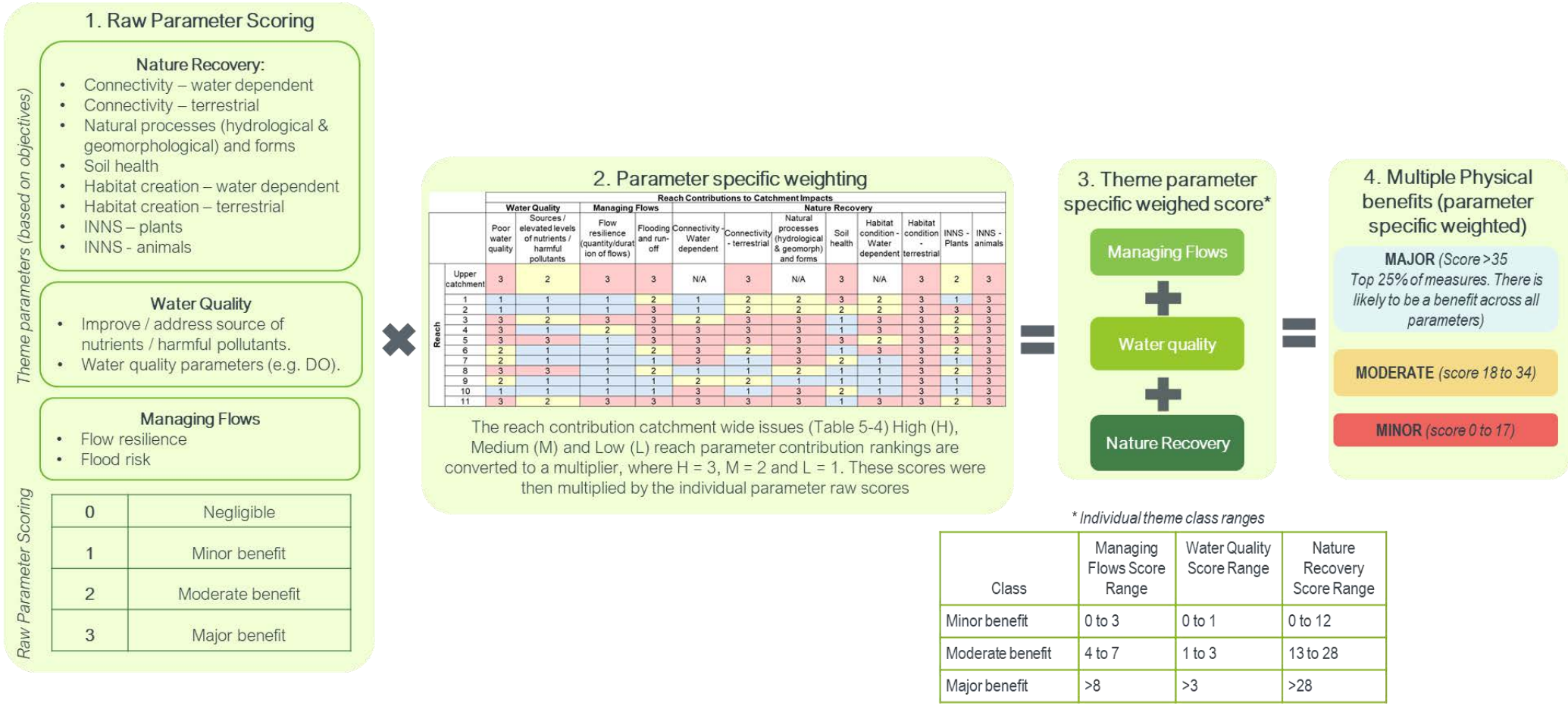
Physical measures were scored based on their contribution to the nature recovery, managing flows and water quality theme objectives, resulting in a 'multiple physical benefits' score. A set of parameters were defined for each theme to score each measure against based on the catchment objectives; these definitions are summarised in Table 14. The individual parameters were scored on a scale of 0 – 3, with 0 being a negligible contribution to the parameter definition and 3 being a major benefit (Figure 13). The raw parameter scores were weighted based on the reach and specific parameter contribution to the catchment wide issues to help highlight measures that will have the biggest impact in reaches which are contributing most to the issues observed within the catchment. To weight the scores, the reach contribution to catchment wide issues of High (H), Medium (M) and Low (L) (Table 8) were converted to multipliers, where H had a value of 3, M had a value of 2 and L had a value of 1. These scores were then multiplied by the individual parameter raw scores, resulting in a specific weighted parameter score (Figure 13). For example, if a measure lies on Reach 5, the raw connectivity – water dependent score is multiplied by the Reach 5, connectivity – water dependent reach contribution to catchment wide issues weighting.

The resultant weighted specific parameter scores for each theme were summed to calculate the total benefit score per theme. The scores from nature recovery, managing flows and water quality themes were then summed to calculate the total parameter specific weighted multiple physical benefits for each measure towards achieving the catchment objectives. The multiple physical benefits and individual theme scores are classified into a minor, moderate, or major benefit categories. The thresholds of these categories were determined based on the spread of the data, with options having a major benefit to the objectives generally representing the highest 25 % of the scores.

Note: raw parameter scores are shown within the River Chess prioritisation spreadsheet to enable the calculation of the parameter weighted specific score.

Table 14 – Multiple physical benefits scoring parameter definitions

Theme	Parameter	Definition
Nature Recovery	Connectivity - water dependent	The measure improves the connectivity of the river and its floodplain e.g. lateral (floodplain connectivity), longitudinal (e.g. barrier removal), vertical (e.g. remove reinforced bed).
	Connectivity - terrestrial	The measure improves the connectivity of existing terrestrial habitats and supports the migration of species (including priority species) between habitats (e.g. grassland reversion, wet woodland planting etc.).
	Natural processes (hydrological & geomorphological) and forms	The measure improves natural processes (e.g. encourages sediment transport / erosion / deposition). The measure encourages improved flow diversity (e.g. different flow velocities). The measure improves / enhances / creates natural forms/features within the channel (e.g. channel narrowing in over-wide sections, bar/berm creation, large wood).
	Soil health	The measure improves soil health (e.g. infiltration rate, retain / cycle nutrients such as carbon, nitrogen phosphorus, helps to filter / buffer pollutants, improve physical soil structure and stability (reduce erosion).
	Habitat creation - water dependent	The measure creates new habitats to improve aquatic biodiversity in the catchment (e.g. wetland creation, backwaters or restore channel).
	Habitat creation terrestrial	The measure creates new habitats to improve terrestrial biodiversity in the catchment e.g. woodland, arable reversion.
	INNS - plants	The measure controls invasive non-native plant species, both in terms of their number and distribution (e.g. Himalayan balsam, Japanese knotweed)
	INNS - animals	The measure controls invasive non-native animal species, both in terms of their number and distribution (e.g. signal crayfish, deer, mink, grey squirrels)
Managing Flows	Flow resilience (quantity / duration flows)	The measure contributes to increasing flow resilience e.g. due to abstraction, retain water, slow flow, and storing more water during extremes.
	Flood risk (incl. run-off, groundwater, fluvial, sewage)	The measure helps retain water, slow the flow, intercept flow, facilitate infiltration, thereby reducing risk. The measure makes space for groundwater in appropriate locations to slow flow and retain water, thereby reducing flood risk.
Water Quality	Water quality	The measure addresses sources of nutrients / reduces harmful pollutants entering the river (e.g. buffer strips intercepting flow pathways, treatment wetlands, sustainable drainage systems). The measure improves other water quality parameters including Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO), Ammonia and Temperature.



** Individual theme class ranges*

Class	Managing Flows Score Range	Water Quality Score Range	Nature Recovery Score Range
Minor benefit	0 to 3	0 to 1	0 to 12
Moderate benefit	4 to 7	1 to 3	13 to 28
Major benefit	>8	>3	>28

Figure 13 - Scoring Approach for assessing multiple physical benefits of a physical measure. Diagram shows parameter specific weighted class ranges. Note individual theme score results (point 3) can also be split into Major, Moderate, or Minor benefits.

7.1.1.2 'Education and engagement', 'access' and 'monitoring, maintenance and management' measures

The measure types: 'education and engagement', 'access', and 'monitoring, maintenance and management' were scored based on their scale of potential benefit on a 'Major', 'Moderate' and 'Minor' scale (Table 15). These measures were not physical measures, so were scored differently. For example, if Measure ID 157 INNS management, was scored as a physical measure type it would have a 'Minor' overall priority because it has negligible / minor impact on managing flow and water quality parameters. Whilst the INNS measure provides high benefit for the INNS parameter and there is a benefit associated with reduced fine sediment delivery from signal crayfish; it would score low on other parameters. INNS management is a key action across the catchment that requires active and long-term investment to reduce INNS ensuring the success of other measures. Hence these measure types were scored on a broader scale of benefit approach.

Table 15 – 'Education and engagement', 'access' and 'monitoring, maintenance and management' measure scoring parameters.

Parameter	Scoring
The measure supports/enables large-scale (multiple reach / catchment) benefits, helping to achieve the River Chess objectives.	Major
The measure will support reach scale benefits, contributing to the River Chess objectives.	Moderate
The measure will support/enable localised scale benefits, supporting the River Chess objectives.	Minor

7.1.1.3 Working Together benefits

All measure types were assigned an independent Working Together benefit score using a binary scale of 0 (measure does not contribute to the parameter) and 1 (the measure contributes to the parameter). Working Together parameter definitions and scoring approach are summarised in Table 16 and Figure 14. Note Working Together scores are not combined with other measure type scoring, these scores are shown as separate columns to aid interpretation of the different measure benefits.

Table 16 – Working Together physical benefits scoring parameter definitions

Theme	Parameter	Definition
Working Together	Community engagement/ volunteering	The option can involve members of the local community, e.g. through volunteering, to contribute towards the goals of the option.
	Partner delivery	There is an opportunity for collaborative working and delivery with partner organisations.
	Educational opportunity	The measure presents an opportunity to educate the local community e.g. about the SWC initiative, about pollution etc.
	Recreation/ public access	The measure improves/ creates public access (recreation).

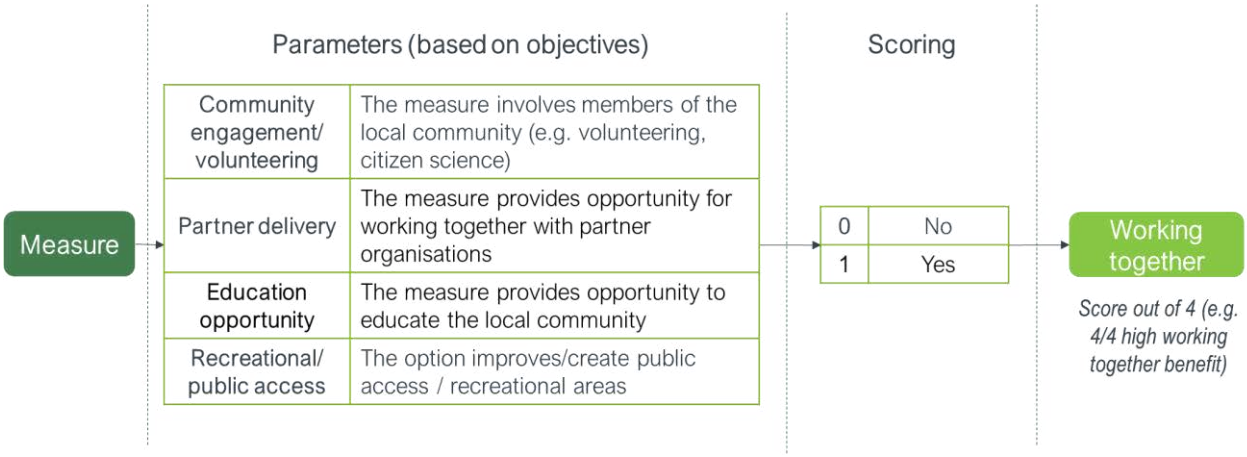


Figure 14 – Working Together scoring approach

7.1.1.4 Further considerations

Further considerations (Figure 15) were recorded for each measure during the scoring process, such as determining the scale of each measure's impact as well as the measure's feasibility for implementation, cost, and its contribution to the Chilterns Nature Recovery Strategy. It was also noted whether the measure description was an investigation (e.g. further study).

Feasibility

Active	Measure actively in progress & will need ongoing investment
Short term	Least complicated measures. Assumes landowner is already on board and receptive.
Medium term	Mid-level complexity measures. Measures require some level of design + consenting but generally can be produced and progressed in good time. Landowner is assumed known, initial discussions may not have been held with the landowner yet.
Long term	Complex measures requiring further detailed investigations. Landowner not known or not receptive.

Cost

£	£0 - £10,000
££	£10,000 - £50,000
£££	£50,000 - £100,000
££££	£100k - £250k
£££££	£250k +

Site Designations

Does the measure lie within a designated site e.g. ancient woodland, local nature reserves, SSSI, Groundwater Dependent Terrestrial Ecosystems, Registered Parks and Gardens.

Scale of benefit

Localised only to site (e.g. point scale)
Reach
Multiple reaches
Catchment

Contribution to Chilterns Nature Recovery Strategy*

**Other nature recovery strategies can be added when they are available*

Themes	How captured
Woodland and trees	Measure recorded as Yes / No contribution to achieving Chilterns Nature Recovery outcomes
Rivers, streams and wetlands	
Farmed land	
Grassland	
Common land	

Improvements to RNAG's

The current Reasons for Not Achieving Good (RNAG's) are listed and the measure is recorded as Yes (1) / No (0) in potential to improving the RNAG's.

Delivery/funding mechanism

Potential funding route for delivery of the measure

Landownership

Is the landowner known? Is the landowner receptive to works?

Constraints

Constraints that may impact the delivery of measures e.g. access, utilities, heritage

Heritage value

Will the measure help improve Heritage value?

Further investigations

Further investigations are high priority actions that will help to better understand baseline condition.

Figure 15 – Further considerations captured during the measure scoring.

7.1.1.5 Further investigations

Further investigations are actions that will help with understanding the conditions or processes within the catchment that can inform new or update existing opportunities. Further investigations were ranked by the individual stakeholders on a scale of 1 (low priority) to 5 (high priority) and an average was taken to provide an overall priority list.

7.2 Prioritisation results

The results of the prioritisation scoring are described below and are shown in Figure 16 A- C, Table 17 and Table 19. Stakeholders reviewed the prioritisation results and provided feedback on whether scores should be adjusted and why, whether any measures should be grouped together to maximise benefit (e.g. measures that are in the same landholding) and whether there were any additional measures that needed to be captured.

Further considerations (e.g. scale of impact, cost, feasibility of measures) are provided for all measure types as context to help plan delivery of the measures. Some measures will be 'quick wins' whereas other measures that have major benefits will require further investment and planning. Such measures may extend beyond the duration of this 10 year catchment plan. These measures should not be discounted because of this but should be planned.

7.2.1 Physical measure benefits

Measures with highest multiple physical benefit parameter weighted score are most likely to contribute to achieving the catchment objectives (e.g. they score highly across all theme parameters, and are on reaches with high contribution to catchment impacts) and therefore are a priority (Figure 16 A- C, Table 17 and Table 19). The measures with the highest multiple physical benefits generally incorporate multiple restoration actions (e.g. weir removal, channel re-alignment, habitat creation), score highly across the different themed parameters and therefore are likely to have a proportionally higher impact on achieving the overall catchment objectives.

A key issue identified during the stakeholder workshops and through the review of pressures and impacts within the catchment was physical barriers for fish movement. Of the top 10 major physical benefitting measures four include reference to weir alteration, bypass as well as habitat enhancement.

Measure's benefits vary spatially across the catchment, with measures with 'Major' benefit being focused on reaches that had the highest contribution to the catchment wide issues (such as Reach 5 and 11), as the scoring approach weights measure impacts this way.

Of the physical measures, 28% (n = 21) have a 'Minor' benefit as these measures may not contribute to all the individual parameters in the catchment objectives and may be on reaches with lower contribution to the catchment wide issues. Nonetheless, these measures are important and should be considered in the longer-term planning of actions. These measures for example include creation of woody structure, riparian enhancements, SUDS and hedgerow improvements.

Table 17 - Top 10 priority physical restoration measures by theme within the River Chess Catchment.

Theme	Measure Type
Nature Recovery	8
Managing Flows	1
Water Quality	1

Note: This table contains potentially sensitive information and has therefore been summarised for this report.

7.2.2 Engagement and education measures

The engagement and education measures were scored a 'Major' (n = 10) or 'Moderate' (n = 6) benefit/priority class (Figure 16A-C). Major priority/benefit measures focus on developing the farmer cluster (e.g. create farm management plans, engage with more farms), and education and upskilling of the people within the catchment (e.g. creation of river champions, development of school programmes, development of courses and workshops).

7.2.3 Access measures

Three measures were assigned a 'Major' benefit/priority, these measures focus on improvements to the Chess Valley Walk and promotion of access routes within the wider Chess catchment (Figure 16A-C). Moderate and Minor scoring measures were ranked where the scale of benefit was more localised (e.g. developing a controlled crossing of Rectory Hill, and localised footpath improvements).

7.2.4 Monitoring, maintenance and management measures

Monitoring, maintenance and management measure types were scored a 'Major' (n = 3) and 'Moderate' (n = 3) benefit/priority class. 'Major' benefit/priority measures include INNS management – survey and treatment of INNS across the catchment which requires long-term funding and support (Figure 16A-C). Other 'Major' priority measures include Insecticide control and monitoring and establishing Chesham as a Nature Town.

7.2.5 Working together benefits

All measures were scored on a binary scale (yes/no) if they could contribute to community engagement/volunteering, partner deliver, educational opportunities, or recreational/public access. There is potential that working together measures will lead to longer term benefits which in turn benefit the physical parameters. The scoring approach has not captured these potential benefits as it aims to be objective and transparent at this stage.

Some of the measures with major benefits also have a high working together score where there is opportunity for partner delivery, education, access and community engagement. However, for some major benefit projects, the working together score is lower as it may be on private land, or the measure delivery may require specialist equipment/contractors so there are fewer opportunities for engagement. Despite this, all measures have a degree of benefit towards the working together theme and if options with major benefits are taken forward consideration of how to maximise working together objectives should be incorporated in the design process as this can help with longevity of the scheme.

7.2.6 Further investigations

Stakeholders ranked individual further investigations on a scale of 1 (low priority) to 5 (high priority) and an average of these rankings were taken to produce a priority list (Table 18). The top ranking investigations were associated with the designation of riverine wildlife sites as a strategic step forward for long term protection of the river, to gather support from regulators and raise local awareness of the value of the catchment. Water quality investigations were ranked highly as a priority for the catchment. A good understanding of sources of pollution and how to manage them is key to develop lasting solutions that complement physical restoration of the river. This links back to the pressures identified in Section 5, which highlighted agricultural pollution, road run-off, and discharges from sewage treatment works as affecting the river health. A further priority is improving the understanding of barriers to fish and species movement. This already is, and has historically been, a priority in the catchment, but further investigations could delve deeper into issues such as assessing existing fish passes for their passability.

Table 18 - Further Investigations and priority ranking (1 = low priority, 5 = high priority)

Theme	Number of Further Investigations	Average Ranking
Managing Flows	3	2.3
Nature Recovery	6	3.8
Water Quality	9	3.1
Working Together	0	0

Note: This table contains potentially sensitive information and has therefore been summarised for this report.

7.2.7 Prioritisation summary

The vision for the River Chess catchment is to create a thriving, resilient and ecologically vibrant part of the Chilterns. The landscape will support a healthy balance between nature and communities benefitting wildlife, farming and people that sustain the special qualities of this globally rare Chalk stream. The list of measures identified and prioritised (whilst potentially not a complete list of measures) will help achieve the objectives and restore a more naturally functioning system. Due to the extensive history of modification within the River Chess catchment, it is however, unlikely that the system will be fully re-naturalised to a pre-modified or 'reference' state (e.g. it may not be possible to remove or bypass all weirs). Instead, a more naturally functioning river system can be achieved, by understanding the catchment, prioritising and working towards delivering the measures collaboratively.

A

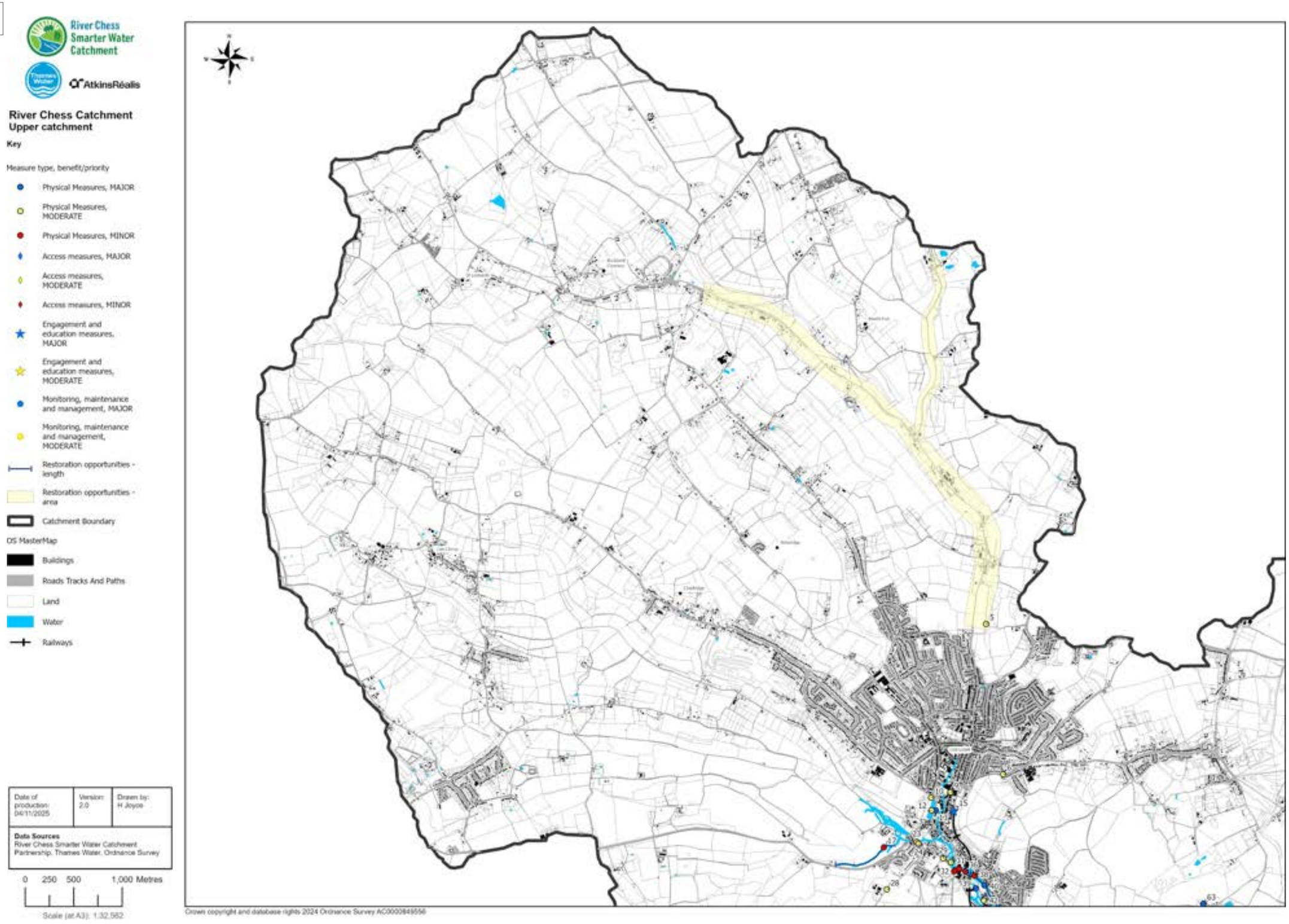


Figure 16 A – Measure benefits in the River Chess catchment, the catchment is split into three areas A) upper, B) middle and C) lower. Numbers refer to individual measures further details are provided in Table 19 (note these tables also contain catchment wide measures which are not mapped).

B

River Chess Smarter Water Catchment

Thames Water · AtkinsRéalis

River Chess Catchment
Middle catchment

Key

Measure type, benefit/priority

- Physical Measures, MAJOR
- Physical Measures, MODERATE
- Physical Measures, MINOR
- Access measures, MAJOR
- Access measures, MODERATE
- Access measures, MINOR
- Engagement and education measures, MAJOR
- Engagement and education measures, MODERATE
- Monitoring, maintenance and management, MAJOR
- Monitoring, maintenance and management, MODERATE
- Restoration opportunities - length
- Restoration opportunities - area
- Catchment Boundary

OS MasterMap

- Buildings
- Roads Tracks And Paths
- Land
- Water
- Railways

Date of production: 04/11/2025	Version: 2.0	Drawn by: H Joyce

Data Sources
River Chess Smarter Water Catchment Partnership, Thames Water, Ordnance Survey

0 130 260 520 Metres

Scale (at A3): 1:16,989

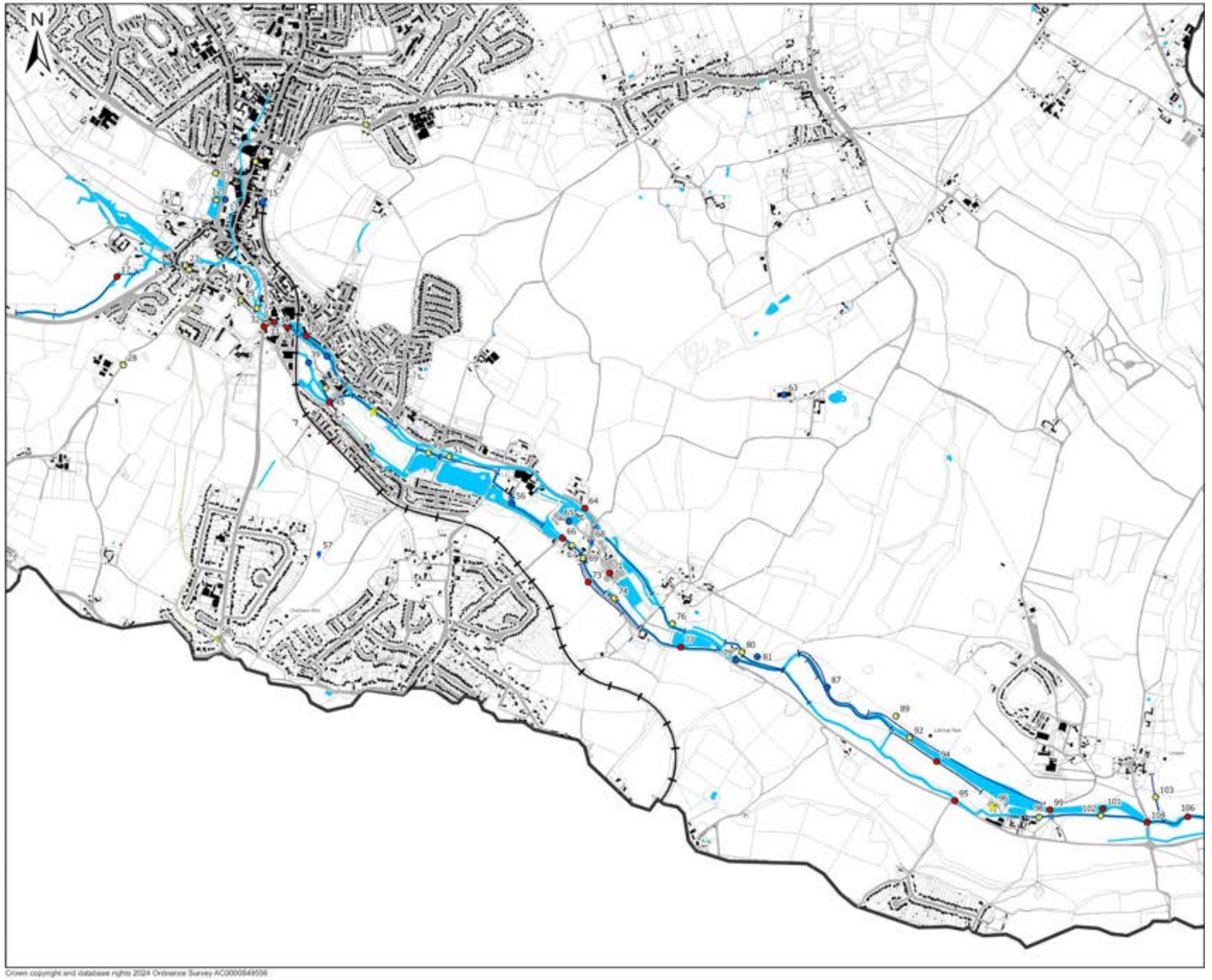


Figure 16B – Measure benefits in the River Chess catchment, the catchment is split into three areas A) upper, B) middle and C) lower. Numbers refer to individual measures further details are provided in Table 19 (note these tables also contain catchment wide measures which are not mapped).

C

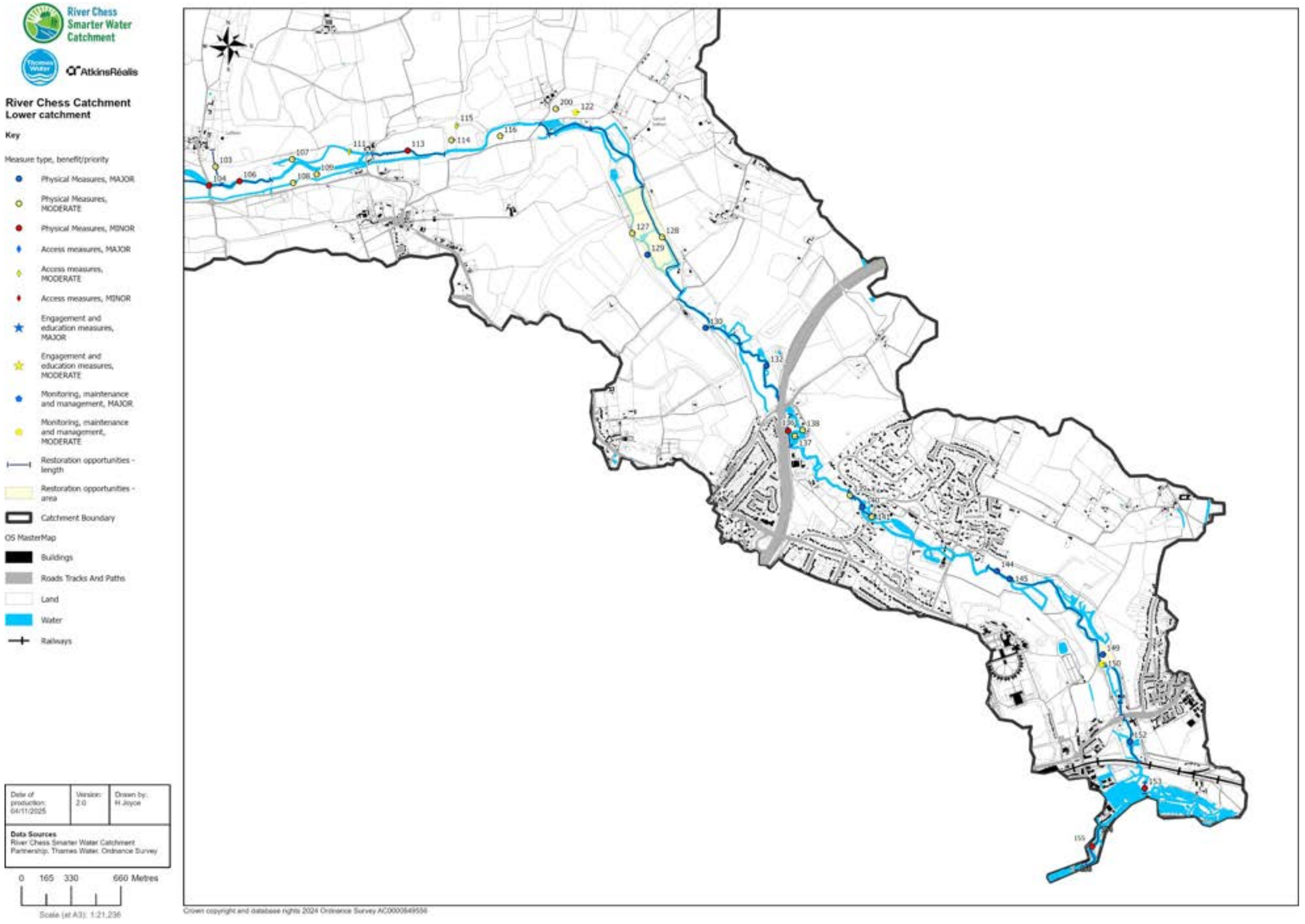


Figure 16C – Measure benefits in the River Chess catchment, the catchment is split into three areas A) upper, B) middle and C) lower. Numbers refer to individual measures further details are provided in Table 19 (note these tables also contain catchment wide measures which are not mapped).

Table 19 - Prioritisation of measures based on their contribution to the catchment objectives.

Measure Type	Priority/ Benefit	Number of opportunities per theme				Total
		Managing Flows	Nature recovery	Water quality	Working together	
Access Measures	MAJOR				3	3
	MODERATE				5	5
	MINOR				1	1
Engagement and education measures	MAJOR				10	10
	MODERATE		1		5	6
Monitoring, maintenance and management	MAJOR		2	1		3
	MODERATE		2	1		3
Physical Measures	MAJOR	1	14	2		17
	MINOR	6	11	4		21
	MODERATE	10	23	4		37
Total		17	53	12	24	106

Note: This table contains potentially sensitive information and has therefore been summarised for this report.

8 Monitoring and evaluation

Monitoring is an integral part of any restoration project to evaluate project success (linked to project criteria), as well as helping to inform any further works required. Monitoring requires a structured approach and should be planned during the restoration planning process (Figure 8). Extensive monitoring has been carried within the River Chess catchment (as summarised in Section 2.8) and therefore future monitoring should build on existing work.

The River Restoration Centre 'Practical River Restoration Appraisal Guidance for Monitoring Options' (PRAGMO) provides a structured approach to help plan and select monitoring techniques. Figure 17 provides a workflow that should be followed to set up a monitoring scheme. The workflow involves several stages around firstly setting SMART objectives for the monitoring, before determining the criteria you are monitoring against (e.g. project objectives, catchment objectives). Once objectives and criteria for monitoring have been selected indicators to monitor can be identified, and techniques for monitoring these indicators can be established. The timing (e.g. season), frequency and duration of monitoring activities is essential towards achieving effective monitoring. The timescale for monitoring will depend on the type of works carried out and project objectives and therefore are project specific. Further details on developing a monitoring plan, monitoring techniques, timescales for monitoring can be found here: Monitoring Guidance | the River Restoration Centre.

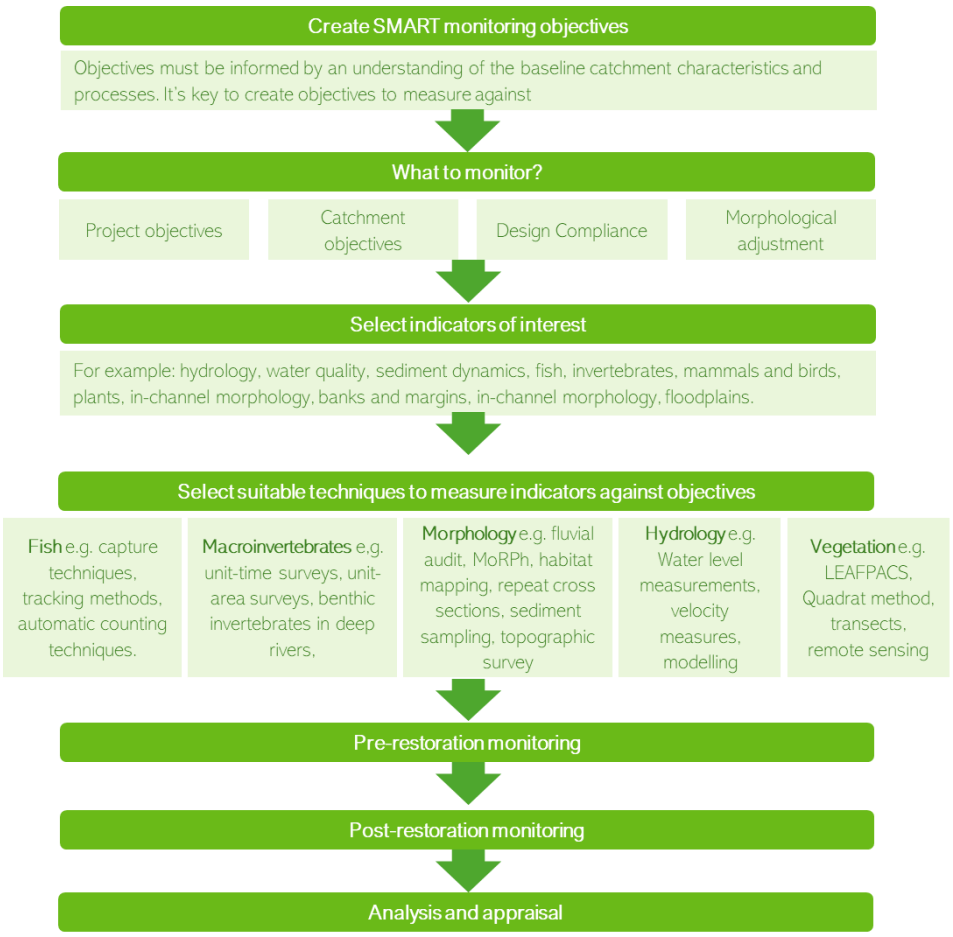


Figure 17 - Flow chart to help structure and plan monitoring (adapted from https://wiki.therrc.co.uk/index.php/3._Navigation)

9 Funding opportunities

9.1 Water company funding opportunities

Thames Water: In AMP7 (2020 – 2025), Thames Water invested £3m in the River Chess Smarter Water Catchment initiative. A project seeking to take a systems-based view of the environment, collectively addressing multiple challenges and co-delivering solutions that make the most of opportunities on an even bigger scale. Thames Water remain committed to the Catchment Based Approach and will continue to invest in the 27 Catchment Partnerships across their region to build their capacity and capability. Funding has been confirmed for Year 1 of AMP8 (2025 – 2030) for the continuation of critical resources within the Chess catchment, as well as up to £300,000 for projects which contribute to meeting business priorities. The company will seek to provide additional funding as soon as a final determination has been accepted. In addition, there may be opportunities to work in partnership on the delivery of schemes within both Affinity Water and Thames Water's AMP8 WINEP e.g. river restoration projects.

Affinity Water: funding opportunities from Affinity Water are still to be confirmed.

9.2 Wider funding opportunities

Environmental Land Management Scheme: Defra are currently rolling out three schemes that together comprise the Environmental Land Management Schemes:

- Sustainable Farming Incentive (SFI) which will pay farmers to adopt and maintain sustainable farming practices that can protect and enhance the natural environment alongside food production, and also support farm productivity (including by improving animal health and welfare, optimising the use of inputs and making better use of natural resources)
- Countryside Stewardship (CS) / Countryside Stewardship Higher Tier (CSHT) which will pay for more farmers and land managers to manage land in a way that: protects, restores or enhances the environment, mitigates the effects of climate change. There will be an extra incentive through CS Plus for land managers to join up across local areas to deliver bigger and better results. DEFRA have published preview guidance for Countryside Stewardship Higher Tier (CSHT). The CSHT actions and capital items will allow you to:
    - manage woodland and agroforestry
    - create, restore and manage wetlands, coastal habitats, lowland peat, moorland and grassland
    - manage waterbodies, such as lakes, ponds and rivers
    - prevent flooding or improve resilience to flooding
    - support species recovery of specific animals and plants
    - provide permissive access to the public
    - protect and restore historic or archaeological features
- Landscape Recovery which will pay for bespoke, longer-term, larger scale projects to enhance the natural environment.

The schemes will collectively pay farmers and land managers to deliver, alongside food production, significant and important outcomes for the climate and environment that can only be delivered by farmers and other land managers in the wider countryside.

The Thames Regional Flood and Coastal Committee (TRFCC): The committee was established to bring together relevant bodies to improve understanding of flood and coastal risk. The TRFCC focuses on ensuring there are plans in place as well as investment in flood and coastal

risk management that is risk based, best value for money and providing benefits to communities. There are funds available for local NFM projects. The first phase was for projects up to £50k in value, with £1 million of local levy awarded in December 2020 to the delivery of these small scale NFM schemes. The second phase will be for larger projects, up to £450k and the third phase will look to support the delivery of several sub-catchment scale projects that reduce flood risk and contribute towards evidence gaps through monitoring. An additional £1.2 million of levy funding has been extended until 2027 and allocated to support further small-scale NFM schemes, with TRFCC working in partnership with the Wildfowl and Wetlands Trust.

National Highways: From 2020 to 2025, National Highways are investing £936 million to four funding streams focused on making improvements that will make the biggest difference and deliver lasting benefits. One of these funding streams is environment and wellbeing, within which there is an objective to stop harmful discharges running off roads into ground and surface water, while restoring damaged and modified water bodies.

Heritage Lottery Fund: Projects can include those which improve habitats or conserve species, as well as helping people to connect to nature in their daily lives. Projects of all sizes that connect people to the UK's heritage are considered, with grants from £10,000 up to £10million.

Forestry Commission and Woodland Trust: There are several grants and other incentives for woodland creation, maintenance, management and tree health. These include:

- Woodland Creation Planning Grant provides funding to prepare a Woodland Creation Design Plan, which is UK Forestry Standard (UKFS) compliant. Landowners, land managers and public bodies can apply to the FC to support the planning of woodland creation.
- England Woodland Creation Offer is a flagship grant scheme for farmers and land managers to encourage investment in woodland creation. These woodlands will help to mitigate climate change, deliver nature recovery and provide wider environmental and social benefits.
- HS2 Woodland Fund provides funding for woodland creation and restoration of plantations on ancient woodland sites (PAWS). The land will need to be within a 25-mile zone of phase one of the HS2 route from London to the West Midlands. From May 2023 the woodland creation element will be delivered via EWCO.
- Urban Tree Challenge Fund provides capital funding to plant and establish large 'standard' trees in urban and peri-urban areas. The fund will provide three years of establishment payments following planting of the trees.
- Local Authority Treescapes Fund is a grant scheme for local authorities (LAs), to drive an increase in non-woodland tree planting across our landscapes. The fund is focused on replanting trees outside of woodlands including trees in hedgerows, parklands, riparian zones, urban areas, beside roads and footpaths as well as small linear woodlands, copses, and shelterbelts.

HS2 Funding: There are two Community and Environment Funds (CEF) created to provide benefit to disrupted communities situated along the HS2 route, CEF Local and CEF Strategic. The CEF Strategic fund focusses on larger projects across communities to address broader concerns, up to £250,000. The funding programme is targeted for the voluntary and community sectors to realise tangible benefits to the community and primarily focusses on supporting a wider variety of lower value awards for greater environmental, social and economic impact, up to £100,000.

Heathrow Runway Funding: A Giving Back Programme was set up in January 2023, comprised of three core pillars focussing on community, employment and the environment and includes eight community investment initiatives that support new and existing projects. The Heathrow

Community Take Off Fund supports the Giving Back Programme, allocating funds to support projects that deliver environmental improvement.

BNG credits / private finance: A financial contribution can be made to count towards the mandatory 10% BNG which will be used to fund biodiversity enhancements across England. This is only an option where on-site or off-site units are unable to deliver BNG. Funds from the purchase of statutory credits will be invested in habitat creation or enhancement, as set out in the Environment Act 2021. Private finance funding may be available from local organisations and groups.

Esmée Fairbairn Foundation: Funding is provided in pursuit of three aims: 'Improving Our Natural World', 'A Fairer Future', and 'Nurturing Creative, Confident Communities'. The impact goals of the Foundation for 'Our Natural World' include funding priorities for freshwater, nature friendly farming, and fishing in tandem with nature. Most grants are given for three to five year timescales with a minimum grant amount of £30,000. There is no maximum grant amount. Since 2020 the Foundation is focussing on allocating grants for fewer organisations with greater support available over a longer period. The average grant amount given in 2024 was £187,030 with 'Our Natural World Grants' totalling £14.9 million across 70 grants.

10 Next Steps

This document presents a revised catchment restoration plan from 2025 to 2035 for the River Chess catchment to help achieve the vision and objectives. This document is intended to be a live document that is updated when new information is available (e.g. pressures, measures that are delivered, new opportunities). The key next steps to take this plan forward are outlined below:

- Discuss and agree the governance structure amongst the partnership.
- Review prioritised measures, agree on, and plan the next steps to take priority measures forward.
- Identify and agree on funding and delivery mechanisms for the options taken forwards.
- Conduct further investigations to understand pressures and impacts and support measure development.
- Perform a gap analysis to identify and refine pressures and impacts, and measures (e.g. review all barriers, identify and reach out to unknown landowners.
- Update this document as new information becomes available.

11 Glossary

Term	Definition
Bank re-grading / re-profiling	Reshaping river banks to natural profiles.
Bed raising	Adding material to raise the level of the bed, this technique is often carried out on incised (over-deep) channels to improve floodplain connectivity.
Berm / marginal shelf	A feature that is relatively flat and is the transition between a bar and higher level shelf (e.g. terrace) found at the river channel margins[13]. Berms or marginal shelves can occur naturally in (i) actively meandering channels; or (ii) recovering rivers, naturally restoring a low-flow channel width following over-widening. Berms / marginal shelves are often created to narrow over-wide channels.
Bypass channel	Creation of a naturalised channel around a barrier to restore fish passage.
Coppicing	Cutting of trees to increase light to the channel and encourage new growth, this maintenance technique is often repeated every few years.
Daylighting	Restoring buried or culverted rivers and streams back to their natural, surface-level state (e.g. removal of culverts and/or pipes).
Flood alleviation / Flood risk management	Measures/activities that help store or slow the flow of water thereby helping to reduce flood risk.
Gravel augmentation	Adding gravel or other material to the river to raise the height of the bed or create habitat features (e.g. bars, or riffles).
INNS	Invasive Non-Native Species are plants, animals, fungi, or microorganisms that have been introduced (intentionally or accidentally) outside their natural range and that cause harm to the environment, or human health. Examples of INNS in the Chess catchment include Himalayan balsam and signal crayfish.
Low flow channel	The part of the channel that contains flow during normal or low flows (e.g. during dry weather, or baseflow conditions) this low flow channel is often narrower than the full channel width.
QMED	Quantile of the Median Extreme Discharge – the median annual maximum flow.

[13] Environment Agency (2022) River habitat survey guidance manual- https://www.gov.uk/government/publications/river-habitat-survey-guidance-manual#full-publication-update-history accessed July 2025

Revetment (bank protection, coir rolls etc)	Material used to protect the banks from erosion (this can be natural or artificial). Coir rolls are a natural / green form of bank toe/face protection made from coconut husk.
Realignment	The creation of a new river channel, excavation of an old channel and/or re-positioning/re-meandering of a channel e.g. a modified channel.
River restoration	Measures that re-establish natural physical processes (e.g. variation of flow and sediment movement), features (e.g. sediment sizes and river shape) and physical habitats of a river system (including submerged, bank and floodplain areas)[14].
Sinuosity	This reflects the bendiness of a river and how it much it bends or curves relative to a straight line.
SSSI	A Site of Special Scientific Interest is a protected area, designated for its important wildlife, habitats, geology, or landforms. These sites are legally protected to conserve their unique features and biodiversity.
Sustainable Urban Drainage Systems (SUDs)	SUDS are a set of water management practices to manage surface water runoff close to where it falls, reduce flood risk by slowing and storing runoff, improve water quality by filtering pollutant and enhance biodiversity and amenity in urban environments[15]. SUDS techniques include measures such as swales, ponds, constructed wetlands, rain gardens, permeable pavements etc.
Technical / formalised fish pass	Constructing engineered structures over a barrier to restore fish passage (e.g. baffle-based, fish lifts, or vertical slot passes).
Two-stage channel	Typically this is where the channel contains a shelf at a lower height within the banks. This lower shelf creates a narrow low-flow channel. During higher flows water can spill onto the shelf and is still retained within the channel banks.
Wetland scrape	A shallow, excavated depression created in low-lying land to hold water temporarily or seasonally, mimicking natural wetland conditions.

[14] International Union for Conservation of Nature (2016): 'River Restoration and Biodiversity' available: https://www.ecrr.org/Portals/27/River%20Restoration%20and%20biodiversity_web_1.pdf Accessed July 2025.

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River Chess
Smarter Water
Catchment