South East Strategic Reservoir Option (SESRO)

Technical Annex B5.

Water Framework Directive (WFD) Compliance Assessment

Notice

Position Statement

- This document has been produced as the part of the process set out by RAPID for the development of the Strategic Resource Options (SROs). This is a regulatory gated process allowing there to be control and appropriate scrutiny on the activities that are undertaken by the water companies to investigate and develop efficient solutions on behalf of customers to meet future drought resilience challenges.
- This report forms part of suite of documents that make up the 'Gate 2 submission.' That submission details all the work undertaken by Thames Water and Affinity Water in the ongoing development of the proposed SROs. The intention of this stage is to provide RAPID with an update on the concept design, feasibility, cost estimates and programme for the schemes, allowing decisions to be made on their progress and future funding requirements.
- Should a scheme be selected and confirmed in the companies' final Water Resources Management Plan, in most cases it would need to enter a separate process to gain permission to build and run the final solution. That could be through either the Town and Country Planning Act 1990 or the Planning Act 2008 development consent order process. Both options require the designs to be fully appraised and, in most cases, an environmental statement to be produced. Where required that statement sets out the likely environmental impacts and what mitigation is required.
- Community and stakeholder engagement is crucial to the development of the SROs. Some high-level activity has been undertaken to date. Much more detailed community engagement and formal consultation is required on all the schemes at the appropriate point. Before applying for permission Thames Water and Affinity Water will need to demonstrate that they have presented information about the proposals to the community, gathered feedback and considered the views of stakeholders. We will have regard to that feedback and, where possible, make changes to the designs as a result.
- The SROs are at a very early stage of development, despite some options having been considered for several years. The details set out in the Gate 2 documents are still at a formative stage and consideration should be given to that when reviewing the proposals. They are for the purposes of allocating further funding not seeking permission.

Disclaimer

This document has been written in line with the requirements of the RAPID Gate 2 Guidance and to comply with the regulatory process pursuant to Thames Water's and Affinity Water's statutory duties. The information presented relates to material or data which is still in the course of completion. Should the solution presented in this document be taken forward, Thames Water and Affinity Water will be subject to the statutory duties pursuant to the necessary consenting process, including environmental assessment and consultation as required. This document should be read with those duties in mind.

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Glossary

Term	Acronym/Definition
ACWG	All Company Working Group
A/HMWB	Artificial/Heavily Modified Water Body
Baseline	This term describes the existing nature of the water environment and WFD status within the study area at a fixed point in time.
BAP	Biodiversity Action Plan – An internationally recognized program addressing threatened species and habitats and is designed to protect and restore biological systems.
BNG	Biodiversity Net Gain – term used to describe the leaving of the environment in an improved state then at the start of a scheme.
CDR	Conceptual Design Report
Construction	Construction, also referred to as the construction phase, refers to the all activity on and offsite required to implement the proposed development. The construction phase is considered to commence with the first activity on site, for example the creation of site access or site clearance works, and ends with demobilisation.
DCO	Development Consent Order – application for a consent to undertake a NSIP which is made to the PINS.
Defra	Department of the Environment, Food and Rural Affairs – Defra is the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland. Defra is a ministerial department, supported by 33 agencies and public bodies.
dRBMP3	Draft River Basin Management Plan Cycle 3. Publication due in September 2022.
EA	Environment Agency – A non-departmental public body with responsibilities relating to the protection and enhancement of the environment in England.
EU	European Union
Effect	The nature of the change(s) likely to occur as a result of a particular impact.
Enhancement	Measures that seek to improve the landscape of the site and/or its wider setting beyond its baseline condition
EWD	Eastern Watercourse Diversion

Term	Acronym/Definition
Gate 1	The first SRO gate. This stage is for initial concept design and decision making. This gate has been completed for SESRO.
Gate 2	The second SRO gate. This stage is for detailed feasibility, concept design and multi-solution decision making. SESRO is currently at this gate.
Gate 3	The third SRO gate. This stage is for develop design, finalised feasibility, pre-planning investigations and planning applications. The next stage for SESRO.
Gate 4	The fourth SRO gate. This stage is for planning applications, procurement and land purchase. To inform the EIA.
GCS	Good Chemical Status
GEP	Good Ecological Potential
GES	Good Ecological Status
GPP	Guidance for Pollution Prevention
GWDTE	Groundwater Dependent Terrestrial Ecosystems
HMWB	Heavily Modified water body
km	Kilometre
Land use	This term refers to what land is used for and is based on broad categories such as urban, industrial, agriculture or forestry.
Main River	Designated as Main Rivers rather than Ordinary Watercourses. The Environment Agency carries out maintenance, improvement or construction work on main rivers to manage flood risk. Although usually larger rivers and streams, this is not always the case.
Mitigation measures	Improvement measures that need to be delivered in HMWBs to attain Good Ecological Potential
NGR	National Grid Reference
NRW	Natural Resources Wales
NSIP	Nationally Significant Infrastructure Project
Operation	Also referred to as completion, this term describes the operation phase of the completed development and is considered to commence at the end of the construction phase, after demobilisation. The duration of the operation phase is dependent on the nature of the proposed development.

Term	Acronym/Definition
Ordinary watercourse	Any watercourse that is not designated as Main River. Lead local flood authorities, district councils and internal drainage boards carry out flood risk management work on ordinary watercourses.
PINS	Planning Inspectorate
PPGs	Pollution Prevention Guidelines
RAPID	Regulators Alliance for Progressing Infrastructure Development
Raw Water	Non-Potable Water
RBD	River Basin District (RBD)
RBMPs	River Basin Management Plans
Regulation 19	Regulation under WFD. This can be invoked to allow for a project to go ahead even if there are adverse impacts at a water body scale caused by a scheme, provided certain conditions are met.
RNAG	Reasons for Not Achieving Good
SAGIS	The Source Apportionment Geographical Information System. A discrete ArcGIS-based digital information management and visualisation platform which serves as an integrated system for modelling water quality in rivers and lakes. Can be used in conjunction with SIMCAT where it is then known as SAGIS-SIMCAT.
Scheme elements	The different parts of the proposed scheme that make up the whole, such as the reservoir footprint or access road, which need to be assessed individually for their impact.
Sensitivity (of a receptor)	A judgement regarding the susceptibility of a receptor to the change arising as a result of the proposed development and the value attached to the receptor.
SESRO	South-East Strategic Reservoir Option – the proposed scheme
SIMCAT	Simulation of Catchments. Environment Agency's water quality model. Water quality management tool to support decision making for catchment management and discharge control. Can be used in conjunction with SAGIS where it is then known as SAGIS-SIMCAT.
SRO	Strategic Resource Options
SSSI	Site of Special Scientific Interest – A conservation designation denoting to a protected area in the United Kingdom. The Sites are protected by law to conserve their wildlife or geology.

Term	Acronym/Definition
Study area	The area within which it is considered that changes arising as a result of the proposed development would result in the highest and/or most important direct or indirect effects.
WB	Water body
WFD	Water Framework Directive – The Water Framework Directive (2000/60/EC) is a EU directive which was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 ("the WFD Regulation"). It aims to achieve good status of all water bodies (surface waters, groundwaters and the sites that depend on them, estuaries and near-shore coastal waters) and prevent any deterioration to these water bodies. It has introduced a comprehensive River Basin Management Plan system to protect and improve the ecological quality of the water environment. It is underpinned by the use of environmental standards.
Worst case	Reasonable prediction of the scenario that would result in the highest level of effect(s).
WRSE	Water Resources in the South East
WTW	Water Treatment Works
WWD	Western Watercourse Diversion

1. Introduction

1.1 Background

1.1 This document presents a project-specific, Water Framework Directive (WFD) assessment for the proposed South-East Strategic Reservoir Option (SESRO) Scheme ('the proposed scheme'), covering all six options that were assessed in Gate 1. The aims of the document are to provide:

- background information on the proposed scheme and the WFD legislation;
- a baseline understanding of the WFD water bodies that would be affected by the proposed scheme;
- an assessment of the potential for the proposed scheme to cause deterioration in the baseline WFD status of any water body; and,
- an assessment of the potential to impact any proposed water body improvement measures and therefore the ability to meet target WFD objectives.

1.2 The assessment builds upon, and furthers, work undertaken at Gate 1 of the Regulators Alliance for Progressing Infrastructure Development (RAPID) gated process and by Water Resources South-East (WRSE). WRSE undertook a high-level screening assessment of WFD compliance of the SESRO options using the WRSE All Company Working Group (ACWG) methodology.[1] For the WRSE method, a standardised approach was used as part of wider optioneering to assess a range of strategic options. The screening process reviewed the various reservoir concept options and assessed the potential impacts on the various water bodies impacted by the proposed scheme using a scoring system. The assessment undertaken as part of Gate 1 went further by examining each of the proposed options in more detail and assessing whether (and where possible, how) individual scheme elements are likely to impact WFD water bodies. The report was a RAPID deliverable and was undertaken for all six SESRO Strategic Reservoir Options (SRO).[2] The six options were as follows:

- SESRO – 75 Mm³
- SESRO – 100 Mm³
- SESRO – 125 Mm³
- SESRO – 150 Mm³
- SESRO – 30+100 Mm³
- SESRO – 80+42 Mm³

[1] WRSE, 2020, All Company Working Group Water Framework Directive: Consistent framework for undertaking no deterioration assessments, Mott MacDonald 2020

[2] Atkins, 2021a, SESRO Gate 1 Water Framework Directive Assessment.

1.3 The WFD assessment detailed in this document is being completed as part of Gate 2 of the RAPID Gated process. It uses the greater level of design detail that is now available following development during Gate 2, and findings of additional studies to update the Gate 1 WFD assessment. As such, it provides greater confidence and certainty on the likely WFD impacts of the proposed SESRO scheme.

1.4 The assessment presented in this document is provided in respect of the requirements of RAPID. A formal WFD assessment will be undertaken pursuant to the consenting process, based on more detailed information which would be available at subsequent stages in the gated process. As such, mitigation developed at this stage of the process would be re-visited at future Gates and in more detail at the respective planning stage.

1.2 Legislative Drivers

1.2.1 The Water Framework Directive

1.5 The WFD is an EU Directive which was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 ("the WFD Regulation"). As of 31 December 2020 the WFD Regulations became retained EU law, and the references in the WFD Regulations to the Water Framework Directive refer to the version of the Directive that was in force at the time when the WFD Regulations came into force (10 April 2017). Therefore, the principal legal basis is the WFD Regulations which currently mirror the EU Directive. In this report "WFD" refers to WFD Regulations applicable to England and Wales, not the EU Directive.

1.6 The WFD's principal aims are to protect and improve the water environment and promote the sustainable use of water. The headline environmental objectives of the WFD and its daughter directives are to:

- Prevent the deterioration of aquatic ecosystems; and,
- Protect, enhance and restore water bodies to Good Status; which is based on ecology (with its supporting hydromorphological and physico-chemical factors) and chemical factors for surface water, and water quantity and Chemical Status for groundwaters. Where a water body is designated as Heavily Modified, or Artificial, the water body will need to meet Good Ecological Potential.

1.2.2 Surface water bodies

1.7 The WFD sets a default objective for all rivers, lakes, estuaries, groundwater and coastal water bodies to achieve Good Status by 2027 at the latest. For natural surface water bodies, Good Status is a function of both Good Chemical Status (GCS) and Good Ecological Status (GES). The River Basin Management Plans (RBMPs) outline the actions required to enable natural water bodies to achieve these objectives through a programme of measures to address pressures. Artificial and Heavily Modified Water Bodies (A/HMWBs) are considered unable to attain GES due to the physical modifications that are necessary to maintain their function for society or

their 'human use' as they provide important socio-economic benefits. They are, however, required to achieve Good Ecological Potential (GEP), through the implementation of a series of Mitigation Measures outlined in the RBMP which essentially aim to enhance the ecology in the water body without compromising its human use. A/HMWBs still need to attain GCS which, along with GEP will collectively result in Good Status in these water bodies.

1.8 New activities and schemes that affect the water environment may adversely impact biological, hydromorphological, physico-chemical and/or chemical quality elements (WFD quality elements) that could lead to a deterioration in water body status. They may also preclude the implementation or effectiveness of the proposed improvement measures (including Mitigation Measures in A/HMWBs), leading to the water body failing to meet its WFD objectives for GES/GEP. Under the WFD, activities and schemes must not cause deterioration in water body status or prevent a water body from meeting GES/GEP by precluding the ability for these improvement measures (termed Mitigation Measures in HMWBs) to be delivered. Where this cannot be achieved, Regulation 19 would be invoked to demonstrate that the Scheme is:

- of overriding public interest and/or the environmental and social benefits of achieving the WFD objectives are outweighed by the benefits of the Scheme to human health, safety and sustainable development;
- there are no significantly better environmental options that are technically feasible or not disproportionately costly; and,
- all practicable steps for mitigation have been taken.

1.9 The overall ecological status of a water body is primarily based on consideration of its biological quality elements (phytoplankton, macrophytes, phytobenthos, benthic invertebrates and fish) and is determined by the lowest scoring of these elements. These biological elements are 'supported' by the physico-chemical (water quality) and hydromorphological (hydrological or tidal regime, river continuity and morphological conditions, i.e. habitat) quality elements.

1.10 To achieve GCS, a water body must pass a separate chemical status assessment, relating to pass/fail checks on the concentrations of various identified priority substances.

1.2.3 Groundwater bodies

1.11 For groundwater bodies, good status has a quantitative and a chemical component. Both are measured on a scale of good or poor, and a confidence rating is assigned to the status assessment of high or low. Together, these provide a single final classification of either good or poor status. There is also a trend objective set for groundwater water bodies where environmentally significant and sustained rising trends in pollutant concentrations need to be identified along with a definition of the starting point (percentage of level or concentration) for trend reversal. Furthermore, the daughter directive of the WFD specifically concerning groundwater (the

Groundwater Directive) also requires the prevention of any input of priority substances and limiting (or control) of the input of all other substances to groundwater to prevent the deterioration of status.

1.2.4 Regulation 19

1.12 Regulation 19 can be invoked if; 'new modifications' are of overriding public interest and/or the environmental and social benefits of achieving the WFD objectives are outweighed by the benefits of the new modifications to human health, safety and sustainable development; there are no significantly better environmental options that are technically feasible or not disproportionately costly; and, all practicable steps for mitigation have been taken.

1.2.5 Summary of key WFD concepts

1.13 A summary of key WFD concepts is presented in Figure 1.1. This includes a definition of what a water body is in relation to this assessment.

WFD Objectives

The WFD is a European Directive, which sets out a strategic planning process for the purposes of managing, protecting and improving the water environment. The EU Directive was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 ("the WFD Regulation"). As of 31/12/2020 the WFD Regulations became retained EU law, and the references in the WFD Regulations to the Water Framework Directive refer to the version of the Directive that was in force at the time when the WFD Regulations came into force (10 April 2017). In this report "WFD" refers to WFD Regulations applicable to England and Wales, not the EU Directive.

The WFD separates the water environment into discreet spatial units, referred to as 'water bodies'. Water bodies are intended to represent either (i) spatially constrained bodies of water e.g. lakes or groundwater aquifers or (ii) zones of a linear body of water that share similar physical characteristics e.g. the division of larger rivers into discreet reaches that are relatively homogenous in character.

The main aims of the WFD regulations are to:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- Aim to achieve at least 'Good Status' for all waters by 2015 (2021 or 2027) where fully justified within an extended deadline under Article 4.4;
- Promote sustainable use of water;
- Conserve habitats and species that depend directly on water;
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- Help reduce the effects of floods and droughts.

The Environment Agency is the Government's 'competent authority' for implementing the WFD; it monitors, advises and manages many aspects of the water environment though regulating discharges, abstractions and processing environmental permits and licences.

Figure 1.1 Background to the WFD legislation

WFD Classification

The WFD classification for a defined water body is produced by the assessment of a wide variety of different 'elements' which includes:

- 'biological elements' such as phytoplankton, macrophytes, phytobenthos, benthic invertebrates and fish;
- 'supporting elements' that include chemical measurements such as ammonia, dissolved oxygen, pH, phosphate, copper, zinc and temperature; and
- 'supporting conditions' (sometimes referred to as hydromorphology) that assess the physical attributes of the water body such as 'river continuity', 'quantity and dynamics of flow' and 'morphology'.

The assessment given for each element is also accompanied by a measure of certainty in the result. The status classification is published in the RBMP and provides a baseline condition against which compliance and future improvements can be measured.

Figure 1.1 Background to the WFD legislation

1.3 Purpose of report

1.3.1 Aims

1.14 The aims of this document are to provide:

- background information on the proposed scheme and the requirements of the WFD regulations;
- a high-level baseline understanding of the water bodies that would be affected by the proposed scheme, within the context of the WFD;
- an assessment of the potential for the proposed scheme to cause deterioration in the WFD status of any water body directly or indirectly; and
- an assessment of the potential impacts on water body improvement measures and the ability to meet WFD objectives.

1.3.2 Structure of report

1.15 The document is structured as follows:

- Introduction (Section 1);
- Scheme description (Section 2);
- Methodology (Section 3);
- Identification of relevant water bodies (Section 4);
- Level 1 – Basic Screening (Section 5);
- Level 2 – Detailed screening (Section 6);
- Conclusions and recommendations (Section 7).

1.4 Gate 1 Findings

1.16 The Gate 1 WFD assessment was undertaken by Atkins in 2021.[3] The assessment followed the ACWG methodology and the Level 1 – basic screening assessment was completed. The assessment was undertaken for six options, with all of them being located in the same place but varying in size and layout. The options were very similar to those being assessed in Gate 2. The largest change is around the watercourse diversions and mitigation. The alignments for both watercourse diversions have been reviewed, updated and aligned with requirements for both WFD and Biodiversity Net Gain, which was completed for the proposed scheme (B6 Biodiversity Net Gain Assessment). Other updates include more detail on the engineering elements of the reservoir, the Auxiliary Drawdown Channel, flood risk, the exclusion area around the canal, and recreation and access features.

1.17 A summary of Gate 1 findings can be found in Table 1.1. However, from a WFD perspective, the impact associated with all options are largely comparable due to similarities in overlap with the water environment regardless of size, or layout. The main differences being on the scale of the impact with the schemes that have the larger footprints having greater impacts.

Table 1.1 Summary of the Gate 1 assessment findings

Options	Level 1 – basic screening findings	Level 2 – detailed screening findings
SESRO – 75 Mm³	Potential for WFD deterioration. Level 2 assessment required.	The scale of impact on the Cow Common Brook and Portobello Ditch water body was considered to be potentially significant. While water bodies were diverted around the reservoir footprint the contributing network of tributaries and ditches were under the footprint of the reservoir and so required compensation. Impacts were considered to have the potential to prevent target WFD objectives from being achieved. For Childrey Brook and Norbrook at Common Barn water body, the impact was related to watercourse diversion and flow re-distribution.
SESRO – 100 Mm³	Potential for WFD deterioration. Level 2 assessment required.	
SESRO – 125 Mm³	Potential for WFD deterioration Level 2 assessment required.	
SESRO – 150 Mm³	Potential for WFD deterioration. Level 2 assessment required.	

[3] Atkins, 2021a, SESRO Gate 1 Water Framework Directive Assessment.

Options	Level 1 – basic screening findings	Level 2 – detailed screening findings
SESRO – 30+100 Mm³	Potential for WFD deterioration. Level 2 assessment required.	Elements impacted for each of the water bodies include invertebrates, macrophytes and phytobenthos combined (biology), hydrological regime and morphology (hydromorphology).
SESRO – 80+42 Mm³	Potential for WFD deterioration. Level 2 assessment required.	

1.5 Consultation

1.18 Consultation with the Environment Agency has been undertaken at regular intervals uring Gate 2 on the development of this WFD Assessment dfor SESRO (Table 1.2).

Table 1.2 Consultation with the Environment Agency during Gate 2 of the WFD assessment on SESRO

Date	Topic
22/11/2021	SESRO & T2AT Aquatic Environment Assessment Gate 2 Technical Liasion Group (TLG)
09/12/2021	SESRO & T2AT Aquatic Environment Assessment Gate 2 TLG
28/02/22	SESRO WFD & BNG Gate 2 Interim Update
01/03/22	SESRO & T2AT Aquatic Environment Assessment Gate 2 TLG
07/03/22	SESRO WFD & BNG Gate 2 TLG
06/04/22	SESRO WFD & BNG Gate 2 TLG
07/04/22	SESRO WFD & BNG Workshop 3
07/06/22	SESRO, T2AT and T2ST Aquatic Environment Assessment Gate 2 TLG
29/06/22	SESRO WFD & BNG Gate 2 TLG

2. Scheme Description

2.1 Thames Water's SESRO proposed scheme includes the design and delivery of a large reservoir located west of Abingdon, Oxfordshire. SESRO has been identified as one of the Strategic Resource Options (SROs) in Ofwat's PR19 Final Determination. The SESRO concept design is based on the pumped abstraction of water during wet periods from the River Thames at Culham, to be stored in a bunded (non-impounding) reservoir. Stored water would then be available for release back into the River Thames, at Culham, during drier periods to support abstraction downstream to supply London and the surrounding area.

2.2 The proposed scheme is part of a gated process which is administered by the Regulators Alliance for Progressing Infrastructure Development (RAPID) which was formed to help accelerate the development of new water infrastructure and design future regulatory frameworks.

2.3 The scheme is currently at the Gate 2 concept design stage, which is a conceptual, multi-option decision-making stage. Gate 2 focuses on the solutions in more detail with emphasis on ensuring that funding for continued investigation and development of solutions is aligned to water resources planning. As at Gate 1, there are still six different design options being considered as detailed in paragraph 1.2.

2.4 Details for the six different design options are outlined in the Conceptual Design Report (CDR) (Technical Annex A Conceptual Design Report).[4] Four of the reservoir options have a similar form: a single-phase construction, but at different scales from 75 Mm^3 to 150 Mm^3 (Figure 2.1toFigure 2.4). Two further options provide dual phase construction options (30+100 Mm^3 and 80+42 Mm^3, respectively), both of which have a similar footprint to the 150 Mm^3 option (Figure 2.5and Figure 2.6).

2.5 Development of SESRO will require the diversion of existing watercourses. The conceptual design sets out a scheme concept based on diversion of these watercourses into new channels, namely, the Western Watercourse Diversion (WWD), to the west of the scheme, and the Eastern Watercourse Diversion (EWD), to the east of the scheme. These form the basis of all the realigned watercourses effected by the scheme's footprint.

[4] Annex A, Conceptual Design Report

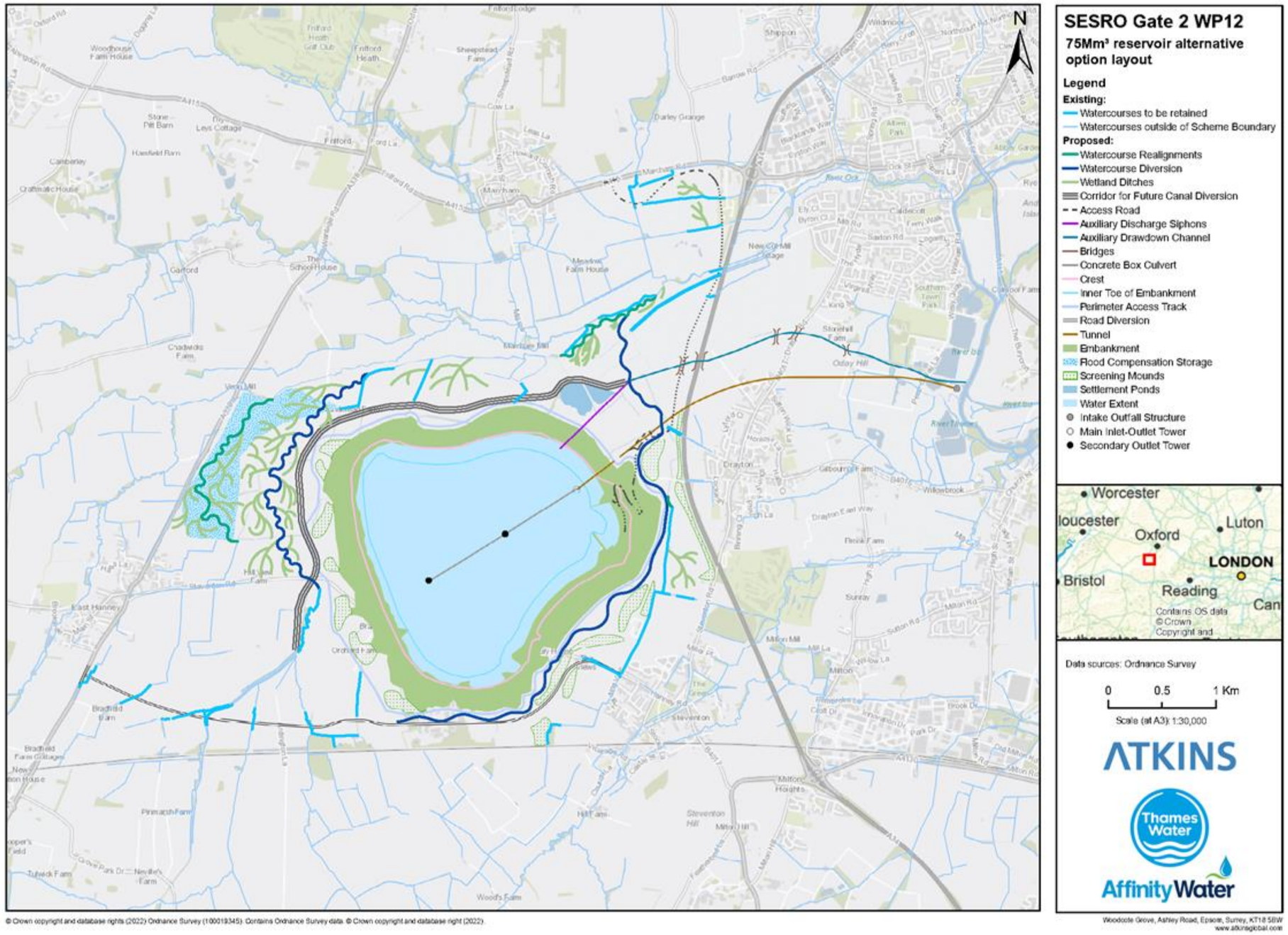


Figure 2.1 75 Mm³ reservoir alternative option layout

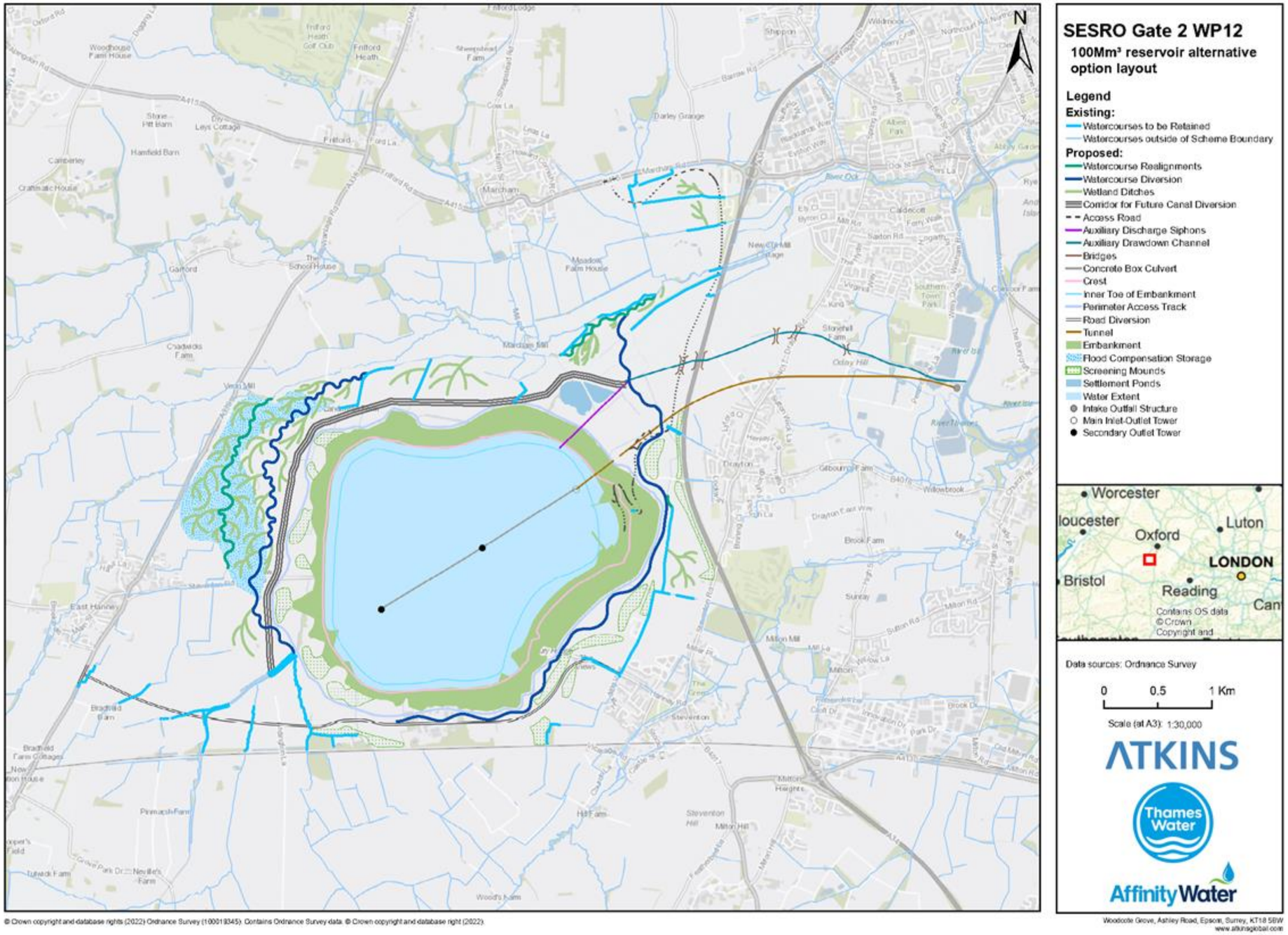


Figure 2.2 100 Mm³ reservoir alternative option layout

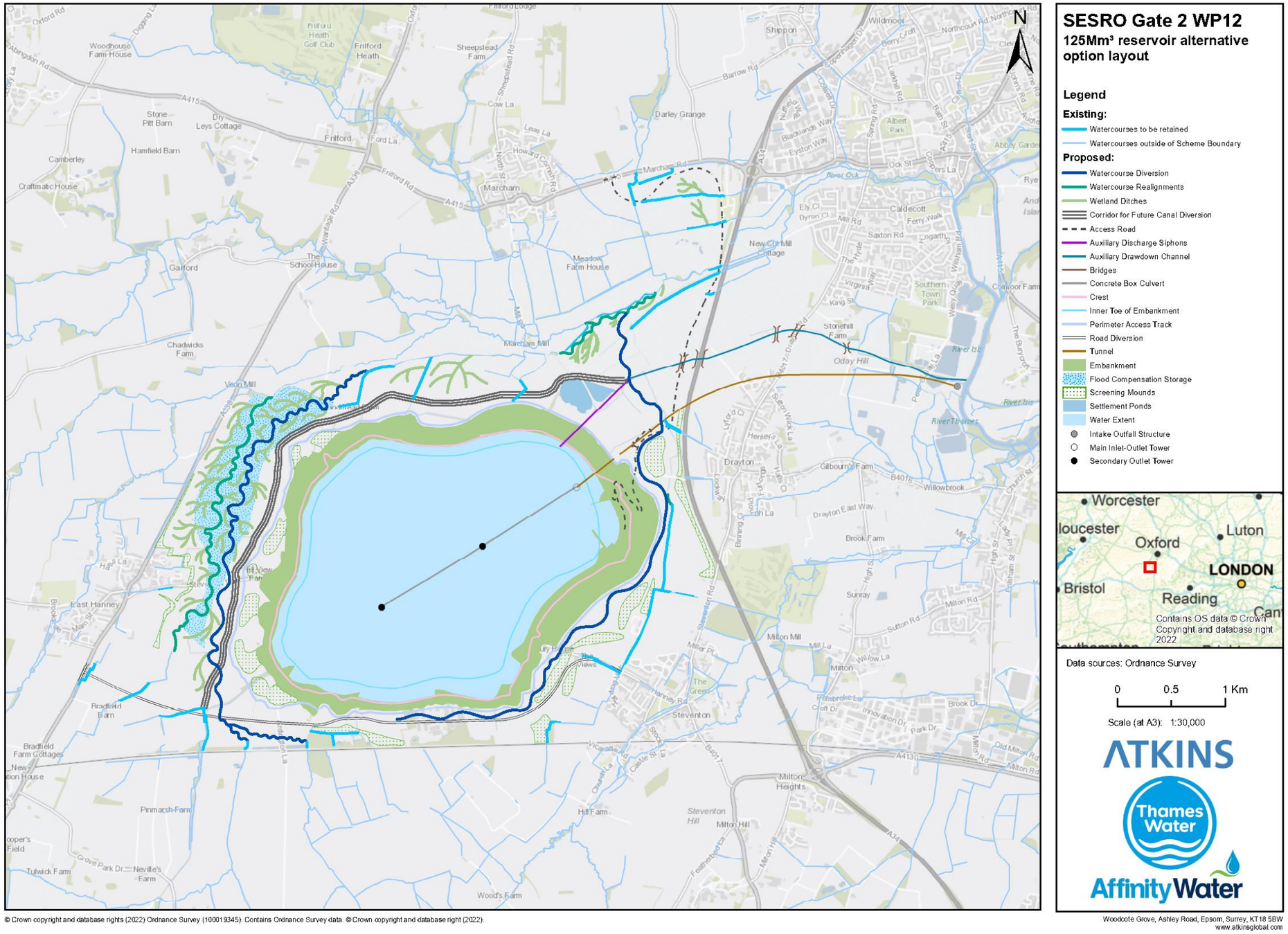


Figure 1.3 125 Mm³ reservoir alternative option layout

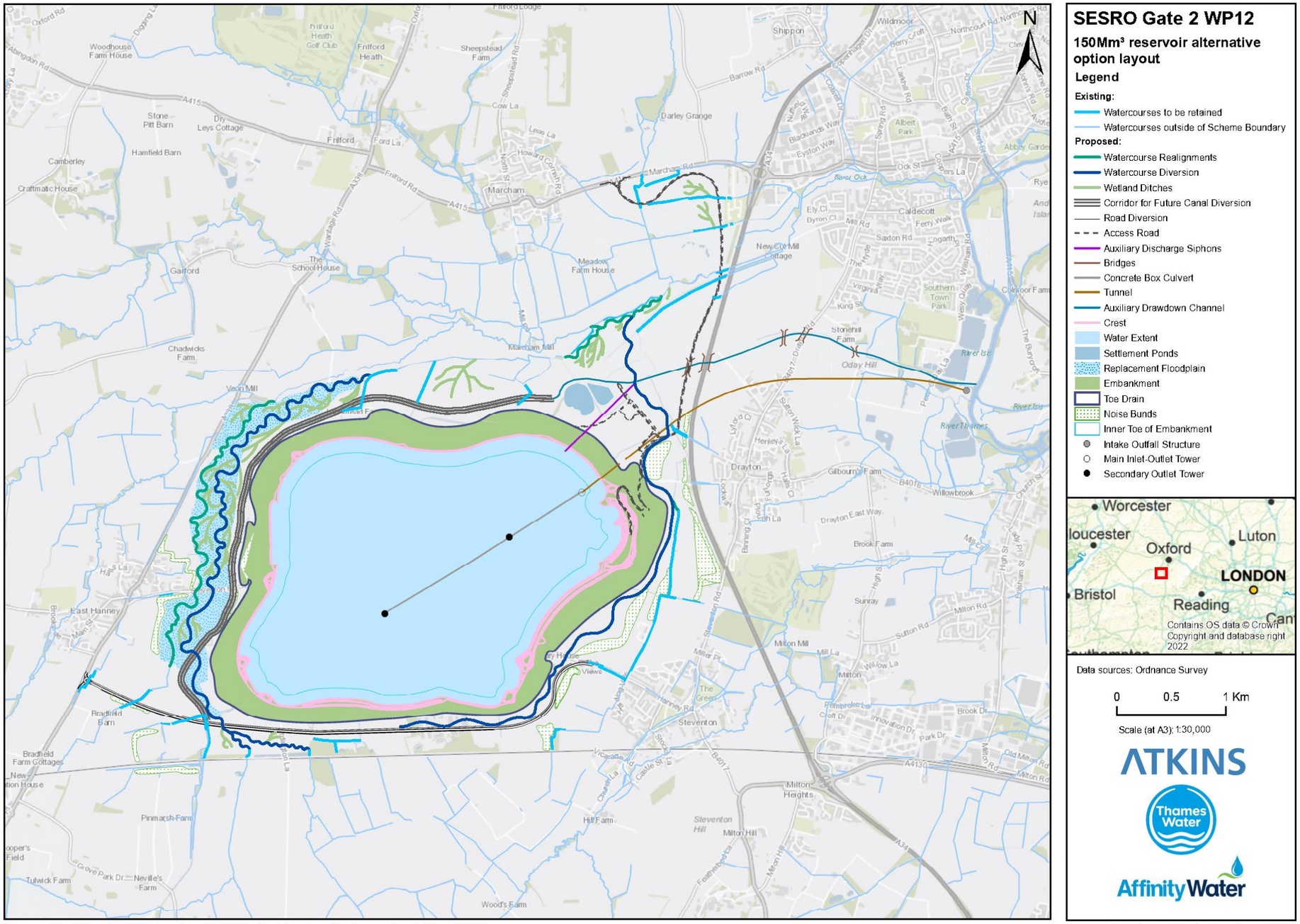


Figure 2.4 150 Mm³ reservoir proposed scheme layout

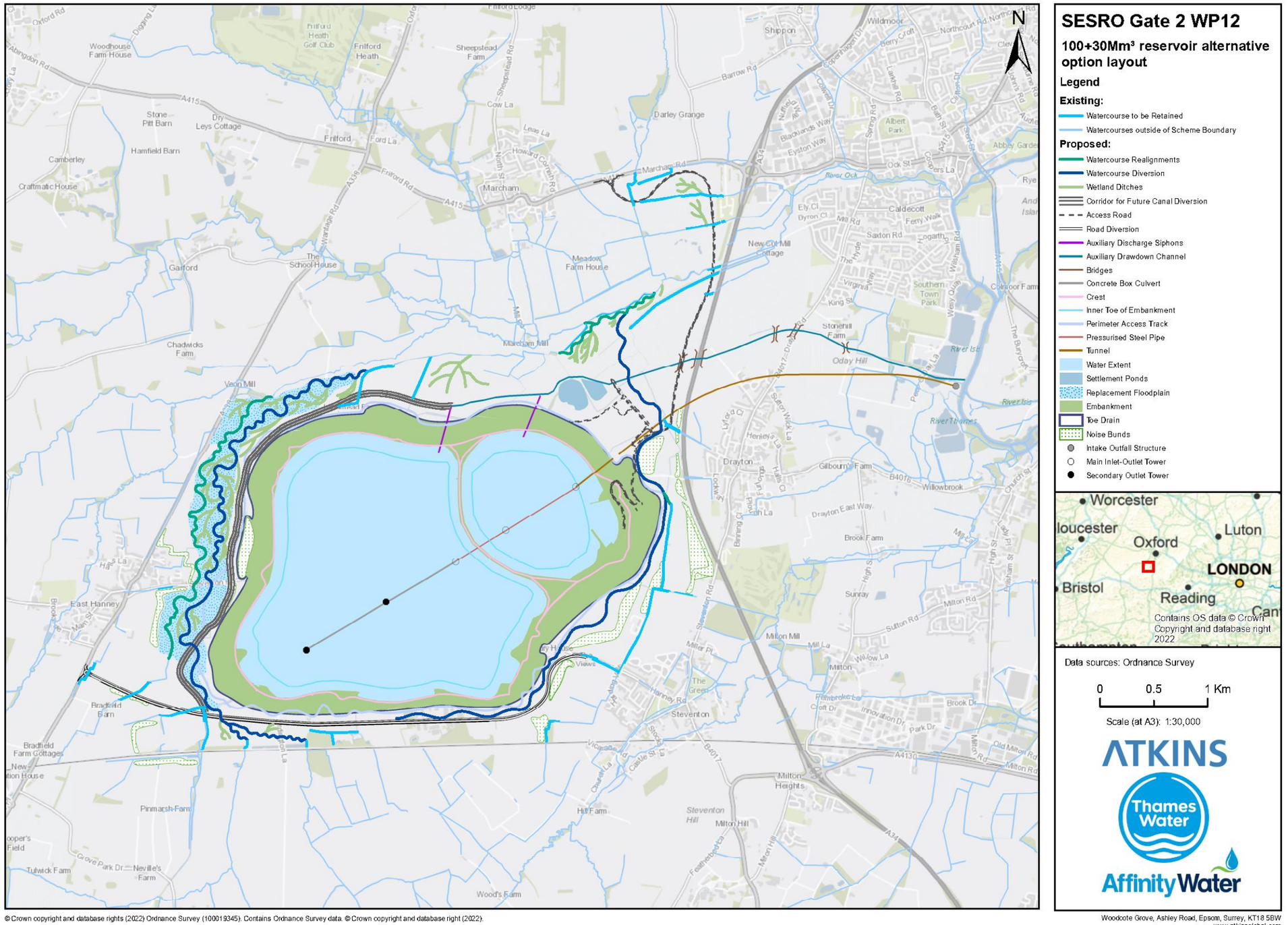


Figure 2.5 100+30 Mm³ reservoir alternative option layout

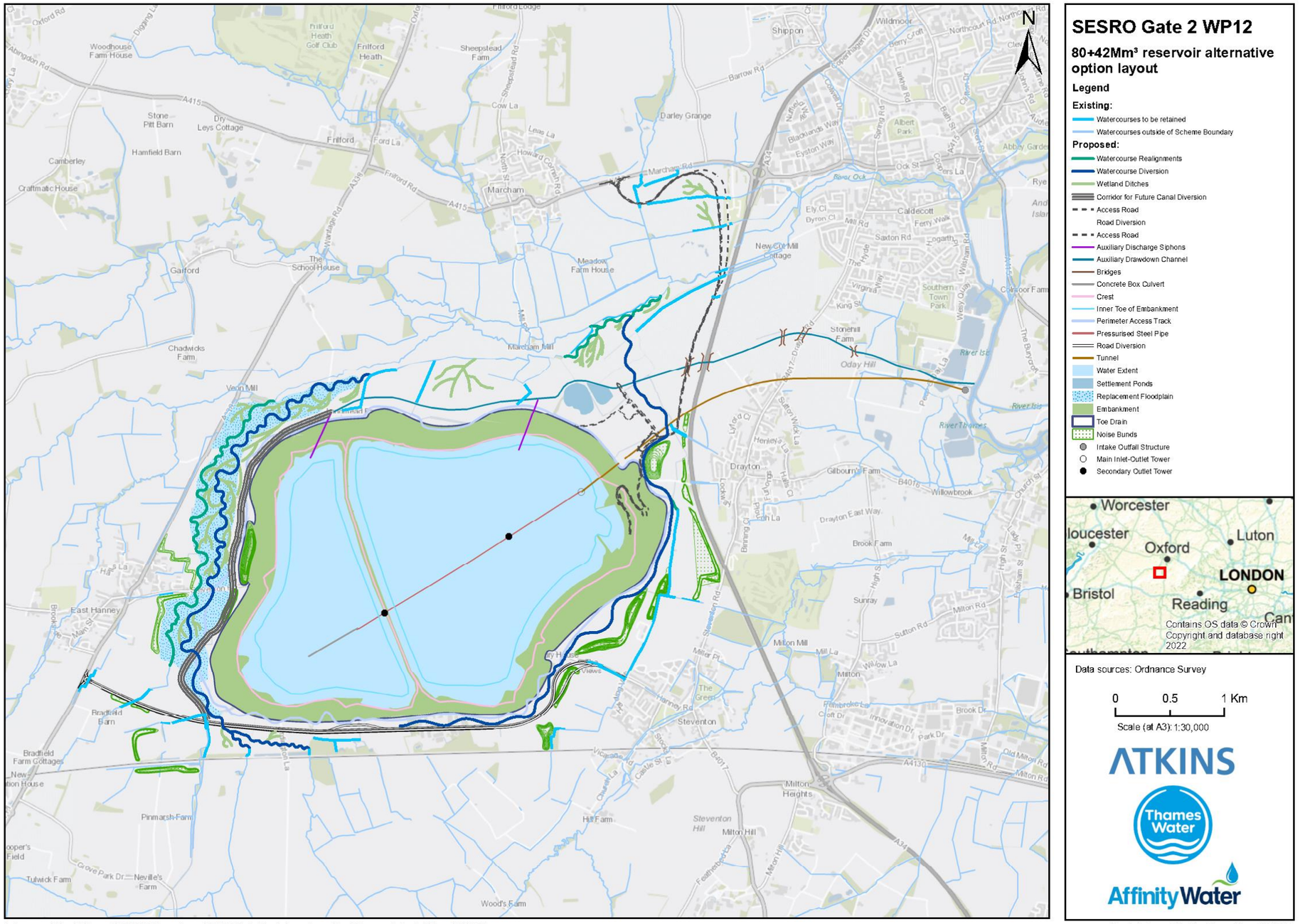


Figure 2.6 80+42 Mm³ reservoir alternative option layout

3. Methodology

3.1 ACWG methodology

3.1 The ACWG guidelines set out an approach and an accompanying reporting spreadsheet for assessing WFD risk for all SROs. An illustration of the gated process taken from these specific guidelines is shown in Figure 3.1.

3.2 The ACWG guidelines identifies three WFD objectives for assessing WFD risk. These are established from Regulation 13 of the original European WFD legislation as follows:

- Objective 1: To prevent deterioration of any WFD element of any surface and groundwater body – in line with Regulation 13(2)(a) and 13(5)(a);
- Objective 2: To protect, enhance and restore each body of surface water, and groundwater, with the aim of achieving the respective good ecological and chemical status if not already achieved, by 22nd December 2021 – in line with Regulation 13(2)b and 13(5)c; and,
- Objective 3: To ensure that the legally binding planned programme of water body Mitigation Measures in the second cycle of River Basin Management Planning (RBMP2) to protect and enhance the status of water bodies are not compromised using 2019 objectives – in line with Regulation 14(a).

3.3 These objectives set out the fundamental WFD Assessment Objectives that have been assessed as a 'test of constraint' for all six SESRO options:

- 75 Mm^3
- 100 Mm^3
- 125 Mm^3
- 150 Mm^3
- 100+30 Mm^3
- 80+42 Mm^3

3.4 There are a number of further WFD Assessment Objectives, set out in the Water Resource Planning Guidelines (WRPG), which are outlined below. These are considered as progressive WFD Assessment Objectives rather than tests of constraint and do not lead to WFD non-compliance if not achieved. These are as follows:

- To assist the attainment of the WFD Objectives for the waterbody – in line with Regulation 13(2)(b) and 13(2)(c);
- To assist the attainment of the objectives for associated WFD protected areas – in line with Regulation 13(6); and,
- To reduce the treatment needed to produce drinking water and look to work in partnership with others; promoting the requirements of Article 7 of the WFD.

3.5 The ACWG methodology template has been completed for all six options which represent significant variation in the overall size and shape, notably, the 150 Mm^3 size, the 75 Mm^3 and the 125 Mm^3 (Appendix A). The Level 1 basic screening of the six SESRO options is summarised in Section 5 of this document. The Level 2 assessment of the six SESRO options is summarised in Section 6.

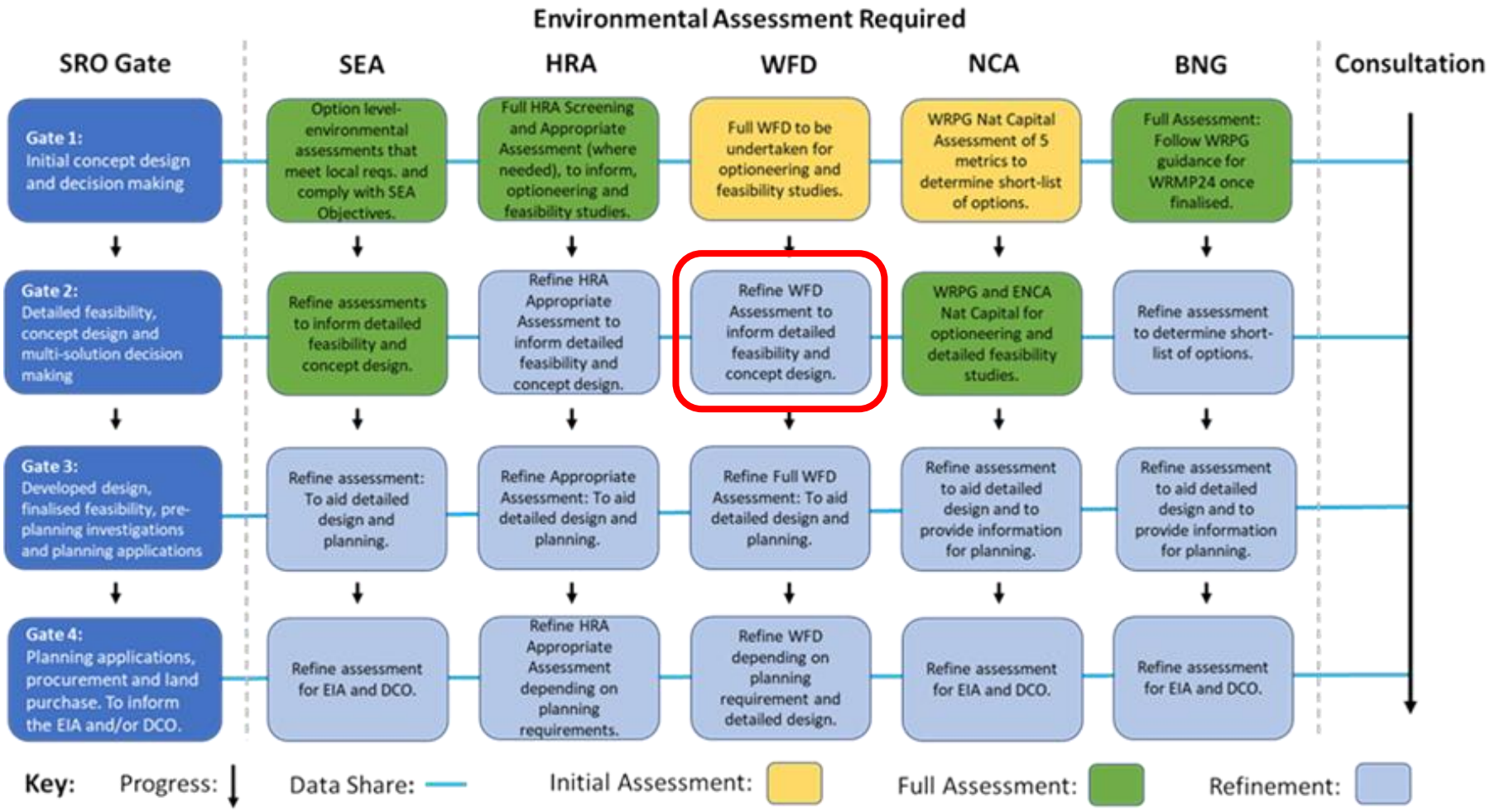


Figure 3.1 ACWG – Levels of assessments required for each SRO Gate

3.6 As part of the Gate 2 assessment, the ACWG assessments from Gate 1 have been reviewed and updated (including reporting and spreadsheets). The Gate 2 assessments involve a review and update of the ACWG assessments which were completed at Gate 1 based on additional design details around the scheme overall but particularly on the watercourse diversions and further baseline information.

3.7 The ACWG methodology has been adopted and follows a staged process.

- List relevant water bodies – identify water bodies which have the potential to be impacted by the Scheme.
- Level 1 – basic screening assessment – a preselected list of activities is assigned to those water bodies identified based on design information.
- Level 2 – detailed screening assessment – where water bodies have been identified as being potentially impacted (as outlined in Chapter 1) they are carried forward to Level 2 where specific activities and potential impacts are assessed against all relevant WFD elements for the three objectives identified above.

3.2 Planning Inspectorate (PINS) WFD assessment methodology

3.8 This assessment follows the ACWG methodology to assess WFD compliance risk during the initial stages of design. [5] However, once the design has been sufficiently progressed such that the project would enter into the formal planning system the project could be designated as a Nationally Significant Infrastructure Project (NSIP) and therefore it would enter the Development Consent Order (DCO) process. WFD compliance would be assessed in respect of the process set out in The Planning Inspectorate (PINS) Advice Note 18.[6] The guidance suggests that a WFD compliance assessment be comprised of three key components:

- Screening assessment – to determine what activities associated with the proposed development require further consideration and what activities can be screened out at this stage of the process:
- Scoping assessment – to identify risks of the proposed development activities to receptors based on relevant water bodies and their quality elements, and;
- Impact assessment – a detailed impact assessment of the water bodies and their quality elements that are considered to be likely affected by the proposed development. Any potential issue for non-compliance would be highlighted at this stage along with consideration to Mitigation Measures and enhancements that would contribute to WFD objectives.

3.9 At the current stage (Gate 2), the assessment is set out to align with the ACWG methodology adopted for all SROs up to and including Gate 3. At Gate 4, this WFD assessment would be refined to support the Development Consent Order (DCO)

[5] WRSE, 2020, All Company Working Group Water Framework Directive: Consistent framework for undertaking no deterioration assessments, Mott MacDonald 2020.
[6] PINS, 2017, The Water Framework Directive, Advice Note 18.

process which would require the assessment to align with the PINS guidance. An illustration of the gated process is shown in Figure 3.1. It is worth noting that the scheme is still very early in the development process and thus we would expect the design and any associated mitigation requirements to be further developed over time.

3.3 Identification of relevant water bodies

3.10 The first step of the ACWG methodology is to identify any water bodies which have the potential to be impacted by the Scheme. For this assessment, any water body containing any part of the reservoir or associated works was included in this assessment, as well as any river water body downstream of the intake outfall structure until the tidally influenced part of the Thames at Teddington where it is assumed that the flows have been re-abstracted. This included surface and groundwater bodies, as appropriate. The name, ID and type of water body are included and the requirement of a groundwater body assessment is determined.

3.4 Level 1 WFD – basic screening

3.4.1 Level 1 WFD – basic screening of surface water bodies

3.11 The Level 1 screening has been completed for all construction works and the combined operating effects of the scheme. The method used for the Level 1 – basic screening assessment screens in those water bodies that have the potential to be impacted by scheme activities based on a scoring methodology outlined in the ACWG methodology and Table 3.1.

3.12 Predefined activities have an associated predefined score from −2 to 3 which can be assigned to each water body based on the option design information and assumed embedded Mitigation Measures as outlined in the ACWG assessment spreadsheet. If a water body achieves a maximum score above 1 (i.e. one or more of the scheme activities has a medium or high impact) they are carried forward to the Level 2 – detailed screening assessment. Where deemed appropriate for this assessment the predefined score has been updated in the Level 1 activities tab of the ACWG methodology spreadsheet using professional judgement. This has been done in order to better represent the impact level of these activities from this particular scheme, or to ensure consistency with the WRSE WFD spreadsheet. The changes made are as follows:

- For the activity “transfer of water via a river, canal or aqueduct” the impact score has been reduced from 2 to 1 for the four water bodies further downstream on the River Thames (Thames Wallingford to Caversham; Thames (Reading to Cookham); Thames (Cookham to Egham); Thames (Egham to Teddington)). This is because although there is the potential for an impact due to transfer of water, it is assessed as being unlikely to be of as high impact downstream of the main scheme.

- The activity “construction of small storage reservoir (set back from watercourse)” was used as the same as "Construction of reservoir (set back from watercourse)" from the WRSE WFD assessment spreadsheet, therefore the impact score has been changed to 2 in order to be consistent with the score in the WRSE WFD spreadsheet.
- The activity “new above ground pipelines (not crossing watercourse)” was added to the list of impacts for consistency as it was in the WRSE WFD spreadsheet.

3.4.2 Level 1 – basic screening of groundwater bodies

3.13 The ACWG assessment spreadsheet does not accommodate the assessment of groundwater bodies. Therefore, the basic screening of groundwater bodies will be completed within this report. The activities outlined in the ACWG assessment will be used to determine potential impact scores to the groundwater bodies. Where there are no relevant activities listed in the ACWG assessment spreadsheet which align with the Scheme activities potentially impacting the water body, the most appropriate activity will be adopted to identify the most likely impact score.

3.14 Although the ACWG methodology screens out water bodies which receive an impact score of 1 or lower, professional judgement will also be used to determine if the methodology applied through the ACWG is sufficiently robust to ensure that potential impacts are not screened out without consideration of their significance. At later stages of the design process, these will be reassessed to ensure design changes have not caused the impact score to increase and/or there is evidence to demonstrate that the conclusions of the ACWG screening process is not sufficiently robust.

Table 3.1 Scoring system adopted in Level 1 – basic screening as outlined in the ACWG Methodology (WRSE, 2020)

Impact	Score	Description
Very Beneficial	−2	Impacts that, taken on their own, have the potential to lead to the improvement in the ecological status or potential of a WFD quality element for the entire waterbody.
Beneficial	−1	Impacts that, when taken on their own, have the potential to lead to a minor localised or temporary improvement that does not affect the overall WFD status of the waterbody or any quality elements.
No/minimal	0	No measurable change in the quality of the water environment or the ability for target WFD objectives to be achieved.
Low	1	Impacts that, when taken on their own, have the potential to lead to a minor localised, short-term and fully reversible effects on one or more of the quality elements but would not result in the lowering of WFD status. Impacts would be very unlikely to prevent any target WFD objectives from being achieved.
Medium	2	Impacts that, when taken on their own, have the potential to lead to a widespread or prolonged effect on the quality of the water environment that may result in the temporary reduction in WFD status. Impacts have the potential to prevent target WFD objectives from being achieved.
High	3	Impacts when taken on their own have the potential to lead to a significant effect and permanent deterioration of WFD status. Potential for high impact on preventing target WFD objectives from being achieved.

3.5 ACWG Level 2 – detailed screening

3.15 Any activity outlined in the Level 1 – basic screening with an impact score greater than 1 which has been highlighted as taking place within a water body, is carried through to the Level 2 – detailed screening assessment. The same impact scoring (Table 3.1) is used to determine if the activity has a potential to impact on any of the WFD elements (Table 3.2) in relation to the objectives outlined in Section 3.1.

3.16 Within the ACWG template, we note the following guide to how we have documented the WFD assessment.

- Assessment has been undertaken against published draft RBMP3 (dRBMP3)(2019) status, RBMP2 Mitigation Measures, and dRBMP3 published

status targets[7], however, RBMP2 Mitigation Measures have been used for the assessment of A/HMWB. The pre-populated data in the ACWG template included status and objectives for other years, i.e. RBMP2 (2015) but these are not applicable as they have been superseded and replaced with dRBMP3 status and objectives.

- For WFD status elements, in the upper section of the worksheet, the relevant WFD objectives that have been assessed against are 'Deterioration between status classes' (Objective 1) and 'Impediments to GES/GEP' (Objective 2).
- Where dRBMP3 (2019) reported status is High or Good, Objective 2 is not applicable and has not been assessed against. The relevant WFD status elements for assessment of Objective 1 and Objective 2 in river water bodies are those in the WFD Regulations.
- For RBMP2 Mitigation Measures, in the lower section of the worksheet, the relevant WFD objective that has been assessed against is 'Compromise WB objectives' (Objective 3).
- For proportionality of assessment, the ACWG template 'potential impacts of asset' have been collated for each 'activity' with one consolidated assessment undertaken for each WFD status element.
- All assessments have been undertaken using the mitigation designed into the SESRO scheme, as documented in Conceptual Design Report (CDR) 2022 (Technical Annex A). Furthermore, this includes the assumptions/mitigations as set out in the ACWG template which recognise compliance with regulations and good design practice. As such, there is no difference between the 'impact' and 'post mitigation impact' in the Level 2 – detailed screening assessment worksheet. Where there is potential for WFD objective non-compliance, additional mitigation actions that may reduce this potential and lead to WFD compliance is indicated in the narrative summary in Section 5.2.1 below, but not included in the WFD compliance assessment as it is not currently committed to, or costed into, the SESRO design. This would however be subject to assessment during subsequent project stages.

[7] Environment Agency, 2022, Catchment Data Explorer. Catchment Data Search: Environment Agency – Catchment Data Explorer

Table 3.2 Relevant Annex V WFD status quality elements from which to assess compliance in river water bodies

Ecological status			
Biological status elements	Fish Invertebrates Macrophytes & phytobenthos combined		
Physico-chemical	Water temperature pH Dissolved Oxygen Ammonia Reactive phosphorus (orthophosphate)		
Specific pollutants	2,4-dichlorophenol 2,4-dichlorophenoxyacetic acid 3,4 dichloroaniline Arsenic Benzyl butyl phthalate Carbendazim Chlorothalonil Chromium (III) (VI) Chlorine	Copper Cyanide Cypermethrin Diazinon Dimethoate Glyphosate Iron Linuron Manganese	Mecoprop Methiocarb Pendimethalin Permethrin Phenol Tetrachloroethane Toluene Triclosan Zinc

Chemical status		
Priority Substances, Priority Hazardous Substances and Other pollutants contributing to chemical status	Alachlor Anthracene Atrazine Benzene Benzo(a)-pyrene (BaP) Benzo(b)-fluor-anthene Benzo(k)-fluor-anthene Benzo(g,h,i)-perylene Brominated diphenylether Cadmium and its compounds	Fluoranthene Hexachloro-benzene Hexachloro-butadiene Hexachloro-cyclohexane Indeno(1,2,3-cd)-pyrene Isoproturon Lead and its compounds Mercury and its compounds Naphthalene Nickel and its compounds

Chemical status		
	Carbon tetrachloride Chlorfenvinphos C10-13 chloroalkanes Chlorpyrifos Cyclodiene pesticides isodrin DDT total Para-para-DDT 1,2-dichloro-ethane Dichloro-methane Di(2-ethylhexyl)-phthalate (DEHP) Diuron Endosulphan	Nonylphenol Octylphenol Pentachloro-benzene Pentachloro-phenol Simazine Tetrachloro-ethylene Tributyltin compounds Trichloro-benzenes Trichloro-ethylene Tricholoro-methane Trifluralin

4. Identification of relevant water bodies

4.1 This section outlines the WFD water bodies which have the potential to be impacted by the six SESRO options. This is in line with the ACWG methodology using the 'List relevant water bodies' section.

4.1 WFD surface water bodies

4.2 The proposed location of the works lies within the Thames River Basin District, which is covered by the Thames River Basin Management Plan.[8] The main site is within the Gloucestershire and the Vale Management Catchment and the Ock Operational Catchment. However, as the volume of water in the River Thames may be altered, due to the abstraction to and discharge from the reservoir, water bodies on the River Thames need to be considered, from the nearby Evenlode to Thame WFD water body as far as the tidal limit (Teddington Weir). These water bodies are in the South Chilterns and Lower Thames Operational Catchments, and Thames and South Chilterns and Maidenhead and Sunbury Management Catchments. These operational catchments are illustrated in Figure 4.1.

4.3 The footprint of the proposed scheme interacts with watercourses within six WFD surface water bodies in the River Ock Operational Catchment. These water bodies are illustrated in Figure 4.3. Figure 4.2 shows a more detailed view of the area around the scheme and illustrates the WFD water bodies affected by the footprint. The position of these watercourses is shown in Figure 4.4. These are labelled with their names where known, and where a contributing watercourse name is unknown a code has been given to it. The watercourses include a large number of ditches that follow field boundaries, some of these are previously straightened channels and flow pathways, others are completely man-made amendments to assist land drainage. There are also several Main Rivers.

4.4 The six WFD water bodies in the Ock catchment are:

- Childrey Brook and Norbrook at Common Barn (GB106039023380);
- Sandford Brook (Source to Ock) (GB106039023410);
- Cow Common Brook and Portobello Ditch (GB106039023360);
- Ginge Brook and Mill Brook (GB106039023660);
- Ock and tributaries (Land Brook confluence to Thames) (GB106039023430); and,
- Thames (Evenlode to Thame) (GB106039030334).

4.5 Previous hydrological modelling work by Thames Water (2007) assessed that the main zone of hydrological influence is the reach of the River Thames between the

[8]Environment Agency, 2015, Part 1 Thames river basin district, River basin management plan. [online] Available at: Thames_RBD_Part_1_river_basin_management_plan.pdf (publishing.service.gov.uk) [Accessed 04/02/2021]

proposed SESRO intake/outfall structure and the confluence with the River Thame, which is covered in the WFD surface water body Thames (Evenlode to Thame). However, there are four further WFD water bodies downstream of the works that may still be affected due to the changes being made to the volumes of water in the Thames from abstraction and discharge and potential impacts on water quality from the discharges. These are:

- Thames Wallingford to Caversham (GB106039030331);
- Thames (Reading to Cookham) (GB106039023233);
- Thames (Cookham to Egham) (GB106039023231); and,
- Thames (Egham to Teddington) (GB106039023232).

4.6 Therefore, a total of ten WFD surface water bodies were initially screened into the assessment in Gate 1.

4.1 WFD groundwater bodies

4.7 Groundwater bodies were reviewed as part of the screening assessment. Two groundwater bodies exist close to the site, namely 1) Shrivenham Corallian (GB40602G60060) which is located north of the footprint (boundary around Marcham and Shippon) and 2) Vale of White Horse Chalk (GB40601G601000) which is located south of the footprint (boundary south of the railway line which goes east to west from Didcot Parkway to Swindon). However, no groundwater body is located within the indicative location of SESRO within the immediate underlying deposits and hence groundwater bodies have been screened out from further assessment. Any extension of the indicative location of SESRO to include the areas of the floodplain around the length impacted by any changes to flow in Childrey Brook would not require the screening of any of the neighbouring groundwater bodies back into the assessment. Further assessment with respect to localised changes in the hyporheic zone would be undertaken during subsequent project stages to assess impacts around watercourse diversions and any Groundwater Dependent Terrestrial Ecosystems (GWDTE).

4.2 Other water bodies

4.8 There is equally no potential for WFD artificial, lake, or transitional water bodies to be affected by the proposed scheme as none are within the indicative scheme boundary or would be even if the indicative scheme boundary was extended to include the areas of the floodplain around any lengths of Childrey Brook experiencing increased flow. Therefore, there are none screened into the assessment. It is worth noting that a footprint of an old canal is within the scheme footprint and the scheme is being developed to allow room for its restoration by others at some point in the future albeit in a slightly different location than its historical position.

4.9 As the project progresses through subsequent stages and a preferred option is selected, if any of the activities, baseline data or design assumptions change, this WFD assessment would be reviewed and updated.

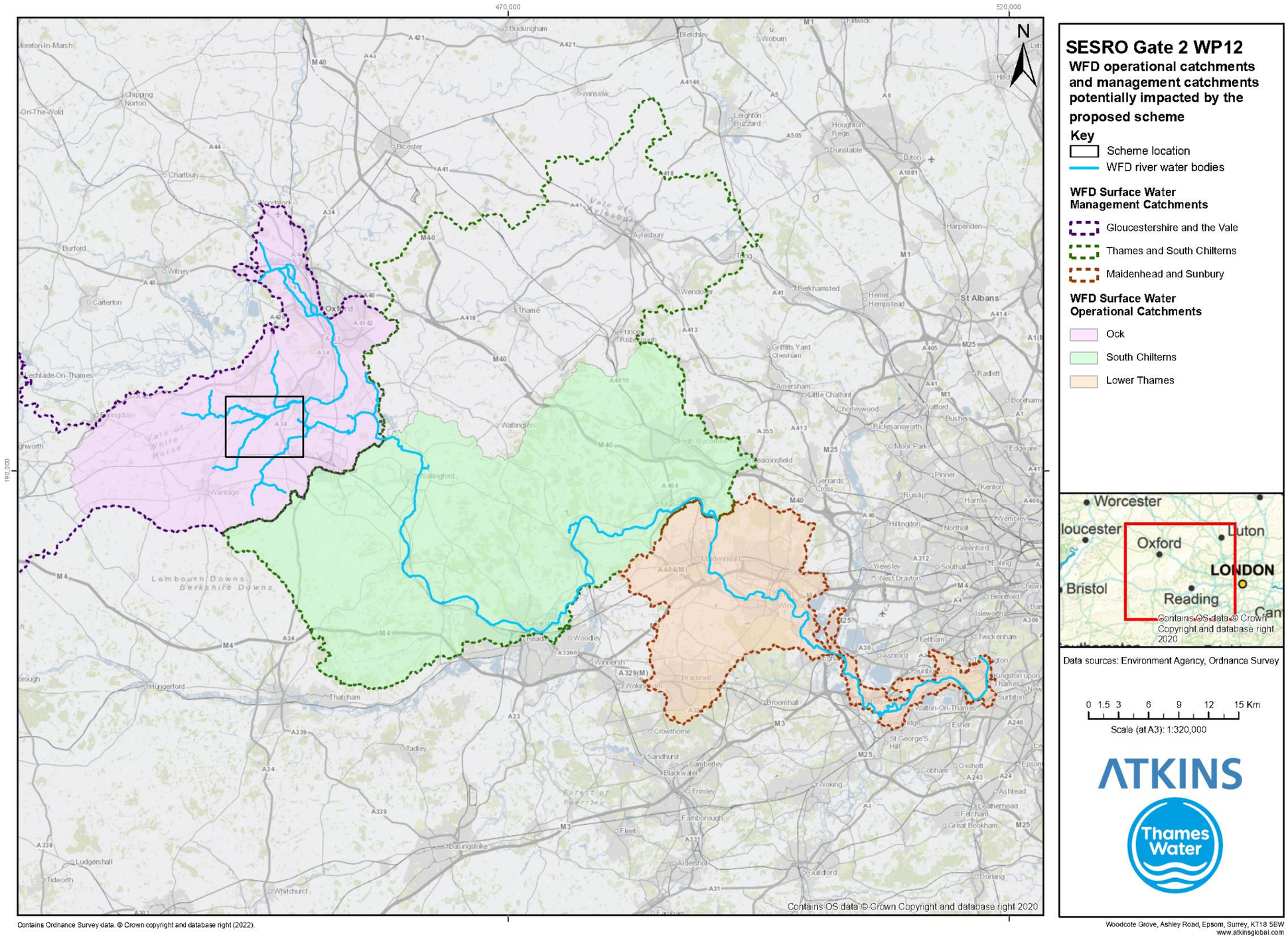


Figure 4.1 WFD operational catchments and management catchments potentially affected by the proposed scheme

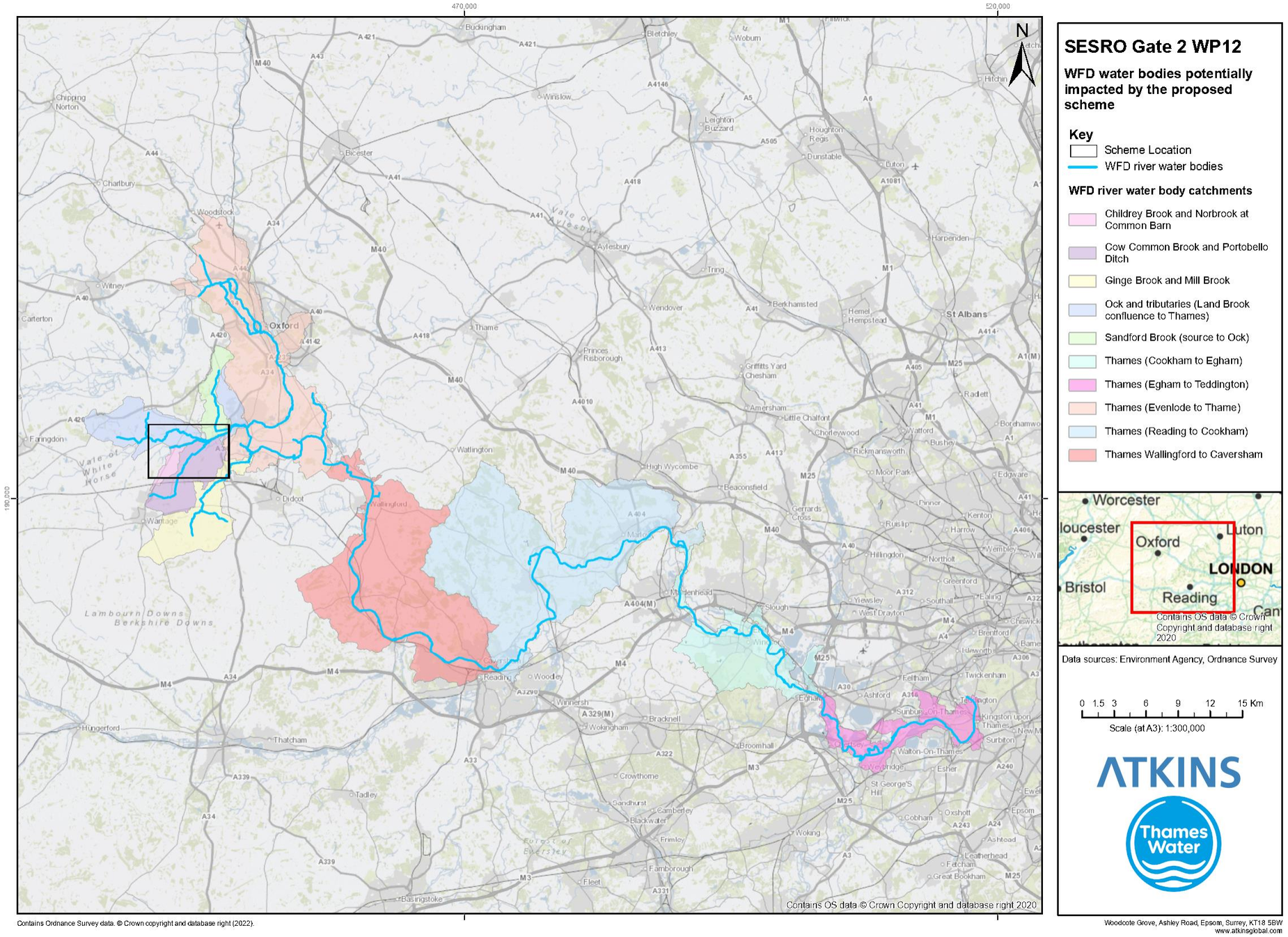


Figure 4.2 WFD water bodies potentially affected by the proposed scheme

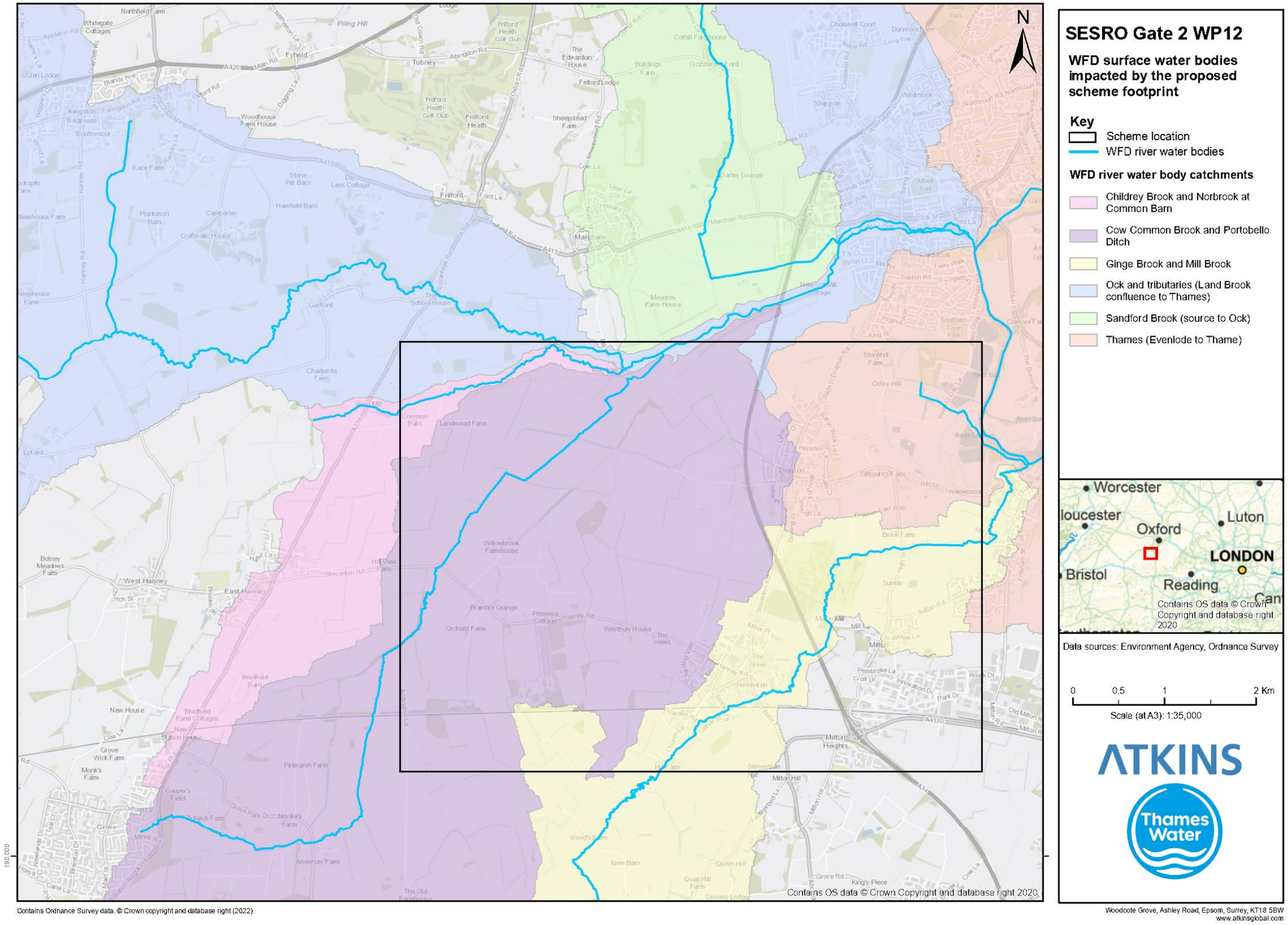


Figure 4.3 WFD surface water bodies potentially affected by the proposed scheme footprint

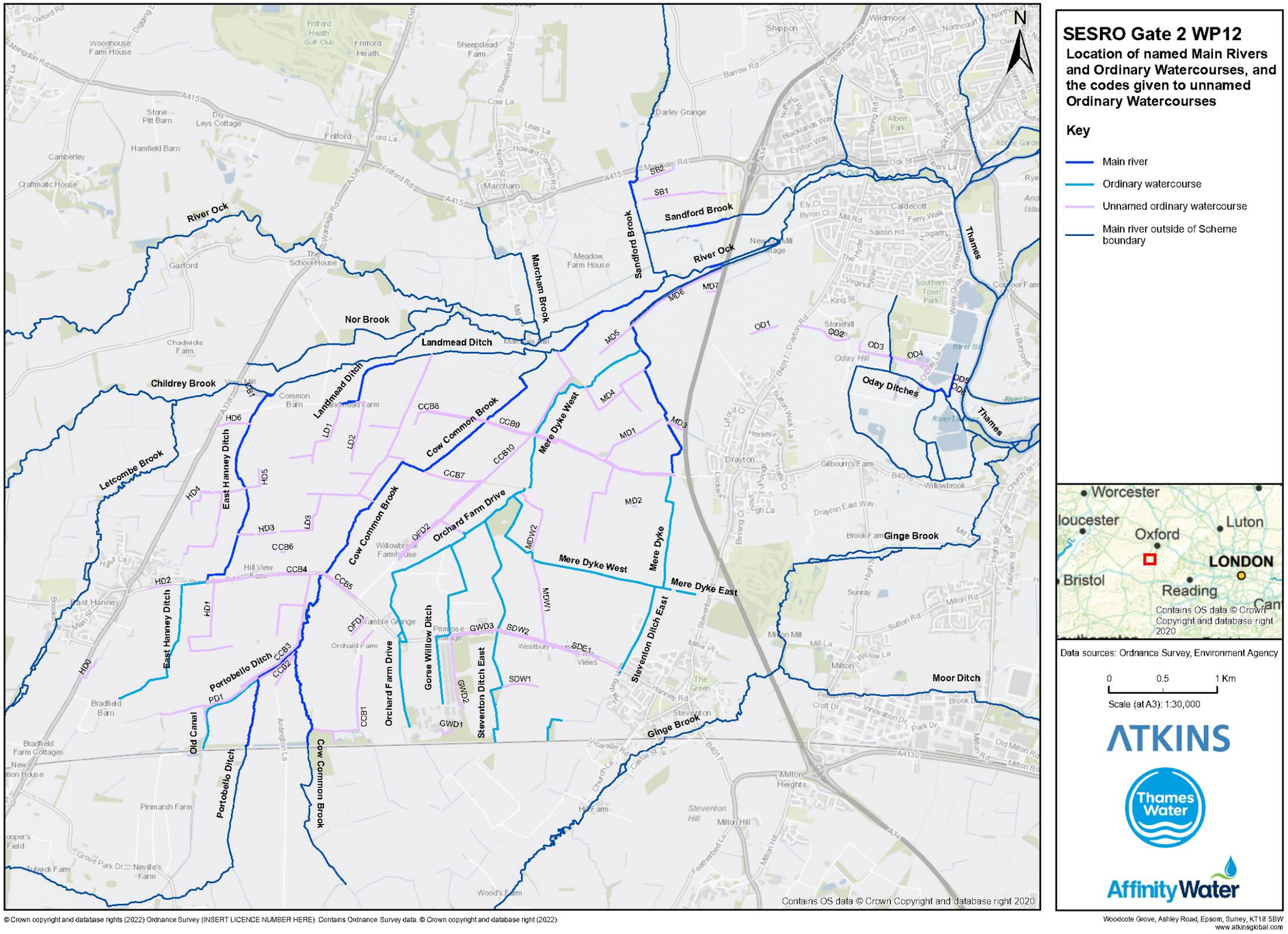


Figure 4.4 Location of named Main Rivers and Ordinary Watercourses, and the codes given to unnamed Ordinary Watercourses

5. Level 1 – Basic screening

5.1 Water body reviews

5.1.1 Introduction

5.1 In accordance with the ACWG methodology, this section provides an overview of the WFD baseline in terms of the status for each of the water bodies as reported in dRBMP3 updating work undertaken in Gate 1.

5.2 It is noted that the gated process will continue beyond RBMP Cycle 3 publication (due September 2022). As a result, the WFD assessment would be updated in subsequent project stages to include the most up to date formal status data.

5.3 Data relating to specific Mitigation Measures for each individual water body have been assessed using the Environment Agency Cycle 2 Measures data.9 A summary of the relevant Mitigation Measures for each option as provided in the Environment Agency's Extended Waterbody Summary Reports are provided in Table 5.11 and Table 5.12. Relevant measures have also been taken from the Thames RBMP (Table 5.13).[10]

5.4 This section outlines the baseline WFD data in relation to the water bodies screened in for each of the options. Activities will be assigned to each water body based on design information and mitigation assumptions and given an impact score as outlined in the ACWG guidance for the Level 1 – basic screening methodology and defined in Chapter 3.4.

5.5 From 2018 additional substances were reported by the Environment Agency within the RBMP framework. These were not formal status elements in RBMP2 although they were brought in during an interim update. However, the dRBMP3 does include a formal status for these new substances and so they are included within this assessment.

5.1.2 Childrey Brook and Norbrook at Common Barn (GB106039023380)

5.6 Table 5.1 provides information from the 2015 Cycle 2 WFD assessment and 2019 dRBMP data for the Childrey Brook and Norbrook at Common Barn surface water body. The water body is not designated as an artificial or heavily modified water body (A/HMWB) and therefore is expected to reach GES.

5.7 The water body is currently at Poor status. This is due to both ecological and chemical status, with macrophytes and phytobenthos at Poor, phosphate at Moderate, cypermethrin at Fail in Priority Substances and polybrominated diphenyl ethers (PBDE) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body is now to reach Good by 2063, the length of time

[9] Environment Agency (2020) 2nd cycle measures not linked to 2021 element outcomes v2 – data.gov.uk
[10] Environment Agency (2015) Thames_RBD_Part_1_river_basin_management_plan.pdf (publishing.service.gov.uk)

required is due to the Chemical status recovery time of Polybrominated diphenyl ethers (PBDE).

5.8 The classification data were taken from the Environment Agency's Catchment Data Explorer (2022) as were the reasons for not achieving GES. However, most of the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. The exception to this is the RNAG for Chemical quality elements. They do still give a good indication of the issues in the catchment and so are listed below:

- Point source – sewage discharge both intermittent and continuous from the water industry responsible for phosphate and macrophytes and phytobenthos;
- Diffuse source – poor livestock management in the agriculture and rural land management category responsible for phosphate and macrophytes and phytobenthos combined;
- Physical modification – land use (arable) in the agriculture and rural land management category responsible for macrophytes and phytobenthos combined; and
- Measures delivered to address reason, awaiting classification, no sector responsible for mercury and its compounds and PBDE.

Table 5.1 Childrey Brook and Norbrook at Common Barn WFD surface water body classification

Water body name	Childrey Brook and Norbrook at Common Barn		
Water body ID	GB106039023380		
National Grid Reference	SU4424195147		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	dRBMP3	Objectives dRBMP3
Overall Water Body	Poor	Poor	Good 2063
Ecological	Poor	Poor	Good 2027
Biological quality elements	Poor	Poor	Good 2027
Macrophytes and phytobenthos	Poor	Poor	Good 2027
Fish	Not assessed	Not assessed	-
Invertebrates	High	High	Good 2015

Water body name	Childrey Brook and Norbrook at Common Barn		
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	Supports Good	Supports Good 2015
Morphology	Supports Good	Supports Good	-
Physico-chemical quality elements	Moderate	Moderate	Good 2027
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	Poor	Moderate	Good 2027
Temperature	High	High	Good 2015
Specific pollutants	Not assessed	Not assessed	Not assessed 2015
Chemical	Good	Fail	Good 2063
Priority substances	Does not require assessment	Fail	Good 2039
Cypermethrin	-	Fail	Good 2039
Fluoranthene	-	Good	Good 2015
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Does not require assessment	Fail	Good 2063
Polybrominated diphenyl ethers (PBDE)	-	Fail	Good 2063
Perfluorooctane sulphonate (PFOS)	-	Good	Good 2015
Benzo(a)pyrene	-	Good	Good 2015
Dioxins and dioxin-like compounds	-	Good	Good 2015
Heptachlor and cis-Heptachlor epoxide	-	Good	Good 2015

Water body name	Childrey Brook and Norbrook at Common Barn		
Hexabromocyclododecane (HBCDD)	-	Good	Good 2015
Hexachlorobenzene	-	Good	Good 2015
Hexachlorobutadiene	-	Good	Good 2015
Mercury and Its Compounds	-	Fail	Good 2040

5.1.3 Sandford Brook (Source to Ock) (GB106039023410)

5.9 Table 5.2 provides information from the 2015 Cycle 2 WFD assessment and 2019 dRBMP data for the Sandford Brook (Source to Ock) surface water body. The water body is not designated as an A/HMWB and therefore is expected to reach GES.

5.10 The water body is currently at Poor status. This is due to both ecological and chemical status, with macrophytes and phytobenthos at Poor, and polybrominated diphenyl ethers (PBDE) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body is to reach Good Status by 2063. The length of time required is due to the Chemical status recovery time of Polybrominated diphenyl ethers (PBDE).

5.11 There are no reasons for not achieving GES for this water body currently on the Environment Agency's Catchment Data Explorer (2022) as they were not updated when the classification data was updated in 2020, therefore they refer to the 2016 classification data, at this point the water body was assessed as being at Good status. There is however a reason given for failing chemical status:

- Measures delivered to address reason, awaiting classification, no sector responsible for mercury and its compounds and PBDE.

Table 5.2 Sandford Brook (Source to Ock) WFD surface water body classification

Water body name	Sandford Brook (Source to Ock)		
Water body ID	GB106039023410		
National Grid Reference	SU4693698504		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	dRBMP3	Objectives dRBMP3

Water body name	Sandford Brook (Source to Ock)		
Overall Water Body	Poor	Poor	Good 2063
Ecological	Poor	Poor	Good 2027
Biological quality elements	Poor	Poor	Good 2027
Macrophytes and phytobenthos	Poor	Poor	Good 2027
Fish	Not assessed	Not assessed	-
Invertebrates	Good	Good	Good 2015
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	High	Supports Good 2015
Physico-chemical quality elements	High	High	Good 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	High	High	Good 2015
Temperature	High	High	Good 2015
Specific pollutants	Not assessed	Not assessed	Not assessed 2015
Chemical	Good	Fail	Good 2063
Priority substances	Does not require assessment	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	Good 2015
Fluoranthene	-	Good	Good 2015
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Does not require assessment	Fail	Good 2063

Water body name	Sandford Brook (Source to Ock)		
Polybrominated diphenyl ethers (PBDE)	-	Fail	Good 2063
Perfluorooctane sulphonate (PFOS)	-	Good	Good 2015
Benzo(a)pyrene	-	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	-	Fail	Good 2040

5.1.4 Cow Common Brook and Portobello Ditch (GB106039023360)

5.12 Table 5.3 provides information from the 2015 Cycle 2 WFD assessment and 2019 dRBMP data for the Cow Common Brook and Portobello Ditch surface water body. The water body is not designated as an A/HMWB and therefore is expected to reach GES.

5.13 The water body is currently at Poor status. This is due to both ecological and chemical status, with macrophytes and phytobenthos at Poor, invertebrates at Moderate, dissolved oxygen at Bad, phosphate at Poor and polybrominated diphenyl ethers (PBDE) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body is to reach Good Status by 2063. The length of time required is due to the Chemical status recovery time of Polybrominated diphenyl ethers (PBDE).

5.14 The classification data were taken from the Environment Agency's Catchment Data Explorer (2022) as were the reasons for not achieving GES. However, most of the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. The exception to this is the RNAG for Chemical quality elements. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from urban and transport and domestic general public responsible for Macrophytes and Phytobenthos Combined, Phosphate and Dissolved Oxygen;
- Diffuse source – poor livestock and nutrient management in the agriculture and rural land management category responsible for Macrophytes and Phytobenthos Combined, Phosphate and Dissolved Oxygen;
- Physical modification – land use (arable) in the agriculture and rural land management category responsible for invertebrates;
- Natural – drought responsible for dissolved oxygen and other natural conditions responsible for invertebrates;
- Suspect data – responsible for Macrophytes and Phytobenthos Combined; and
- Measures delivered to address reason, awaiting classification, no sector responsible for mercury and its compounds and PBDE.

Table 5.3 Cow Common Brook and Portobello Ditch WFD surface water body classification

Water body name	Cow Common Brook and Portobello Ditch		
Water body ID	GB106039023360		
National Grid Reference	SU4341192347		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	dRBMP3	Objectives dRBMP3
Overall Water Body	Poor	Poor	Good 2063
Ecological	Poor	Poor	Good 2027
Biological quality elements	Poor	Poor	Good 2027
Fish	Not assessed	Not assessed	
Invertebrates	Moderate	Moderate	Good 2027
Macrophytes and phytobenthos	Poor	Poor	Good 2027
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	High	High	Supports Good 2015
Morphology	Supports Good	Supports Good	
Physico-chemical quality elements	Moderate	Moderate	Good 2027

Water body name	Cow Common Brook and Portobello Ditch		
Ammonia	High	High	Good 2015
Dissolved Oxygen	Bad	Bad	Good 2027
pH	High	High	Good 2015
Phosphate	Poor	Poor	Good 2027
Temperature	High	High	Good 2015
Specific pollutants	Not assessed	Not assessed	Not assessed 2015
Chemical	Good	Fail	Good 2063
Priority substances	Does not require assessment	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	Good 2015
Fluoranthene	-	Good	Good 2015
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Does not require assessment	Fail	Good 2063
Polybrominated diphenyl ethers (PBDE)	-	Fail	Good 2063
Perfluorooctane sulphonate (PFOS)	-	Good	Good 2015
Benzo(a)pyrene	-	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	-	Fail	Good 2040

5.1.5 Ginge Brook and Mill Brook (GB106039023660)

5.15 Table 5.4 provides information from the 2015 Cycle 2 WFD assessment and 2019 dRBMP data for the Ginge Brook and Mill Brook surface water body. The water body is not designated as an A/HMWB and therefore is expected to reach GES.

5.16 The water body is currently at Moderate status. This is due to both ecological and chemical status, with macrophytes and phytobenthos and fish at Moderate, phosphate at moderate, and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body was to reach Moderate by 2015 so it has reached its objective. The reason for an objective below Good is unfavourable balance of costs and benefits.

5.17 The classification data were taken from the Environment Agency's Catchment Data Explorer (2022) as were the reasons for not achieving GES. However, most of the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. The exception to this is the RNAG for Chemical quality elements. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Macrophytes and Phytobenthos Combined and Phosphate;
- Other pressures – responsible for Macrophytes and Phytobenthos Combined;
- Unknown (pending investigation) – sector under investigation responsible for PFOS; and
- Measures delivered to address reason, awaiting classification, no sector responsible for mercury and its compounds and PBDE.

Table 5.4 Ginge Brook and Mill Brook WFD surface water body classification

Water body name	Ginge Brook and Mill Brook		
Water body ID	GB106039023660		
National Grid Reference	SU4664188618		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	dRBMP3	Objectives dRBMP3
Overall Water Body	Moderate	Moderate	Moderate 2015
Ecological	Moderate	Moderate	Moderate 2015
Biological quality elements	High	Moderate	Good 2027
Fish	Not assessed	Not assessed	-
Invertebrates	High	High	Good 2015
Macrophytes and phytobenthos	Not assessed	Moderate	Good 2027
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	Supports Good	Supports Good 2015
Morphology	Supports Good	Supports Good	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	High	High	Good 2015
Specific pollutants	Not assessed	Not assessed	Not assessed 2015
Chemical	Good	Fail	Good 2063

Water body name	Ginge Brook and Mill Brook		
Priority substances	Does not require assessment	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	Good 2015
Fluoranthene	-	Good	Good 2015
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment
Priority hazardous substances	Does not require assessment	Fail	Good 2063
Polybrominated diphenyl ethers (PBDE)	-	Fail	Good 2063
Perfluorooctane sulphonate (PFOS)	-	Fail	Good 2039
Benzo(a)pyrene	-	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	-	Fail	Good 2040

5.1.6 Ock and tributaries (Land Brook confluence to Thames) (GB106039023430)

5.18 Table 5.5 provides information from the 2015 Cycle 2 WFD assessment and 2019 dRBMP data for the Ock and tributaries (Land Brook confluence to Thames) surface water body. The water body is not designated as an A/HMWB and therefore is expected to reach GES.

5.19 The water body is currently at Poor status. This is due to both ecological and chemical status, with fish at Poor, phosphate at Poor, and polybrominated diphenyl ethers

(PBDE), Perfluorooctane sulphonate (PFOS) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body is to reach Moderate status by 2015, which it has not achieved. The reasons for an objective below good are, disproportionate burdens, disproportionately expensive, ecological recovery time, no known technical solution is available and chemical status recovery time.

5.20 The classification data were taken from the Environment Agency's Catchment Data Explorer (2022) as were the reasons for not achieving GES. However, most of the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. The exception to this is the RNAG for Chemical quality elements. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous and intermittent sewage discharge from the Water Industry responsible for Phosphate;
- Diffuse source – poor livestock and nutrient management in the agriculture and rural land management category responsible for Phosphate;
- Physical modification – land drainage and barriers to ecological discontinuity from agriculture and land use management responsible for fish;
- Unknown (pending investigation) – sector under investigation responsible for PFOS; and
- Measures delivered to address reason, awaiting classification, no sector responsible for mercury and its compounds and PBDE.

Table 5.5 Ock and tributaries (Land Brook confluence to Thames) WFD surface water body classification

Water body name	Ock and tributaries (Land Brook confluence to Thames)		
Water body ID	GB106039023430		
National Grid Reference	SU4962096695		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	dRBMP3	Objectives dRBMP3
Overall Water Body	Poor	Poor	Moderate 2015
Ecological	Poor	Poor	Moderate 2015
Biological quality elements	Poor	Poor	Good 2039

Water body name	Ock and tributaries (Land Brook confluence to Thames)		
Macrophytes and phytobenthos	Good	Good	Good 2015
Fish	Poor	Poor	Good 2039
Invertebrates	High	High	Good 2015
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	Supports Good	Supports Good 2015
Morphology	Supports Good	Supports Good	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	Good	Good	Good 2015
pH	High	High	Good 2015
Phosphate	Poor	Poor	Moderate 2027
Temperature	High	High	Good 2015
Specific pollutants	High	High	High 2015
Chemical	Good	Fail	Good 2063
Priority substances	Good	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	Good 2015
Fluoranthene	-	Good	Good 2015
Others (Priority substances)	Good	Good	Good 2015
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Good	Fail	Good 2063
Polybrominated diphenyl ethers (PBDE)	-	Fail	Good 2063
Perfluorooctane sulphonate (PFOS)	-	Fail	Good 2039
Mercury and Its Compounds	-	Fail	Good 2040
Others (Priority hazardous substances)	Good	Good	Good 2015

5.1.7 Thames (Evenlode to Thame) (GB106039030334)

5.21 Table 5.6 provides information from the 2015 Cycle 2 WFD assessment and 2019 dRBMP data for the Thames (Evenlode to Thame) surface water body. The water body is not designated as an A/HMWB and therefore is expected to reach GES. The reason for the water body not being designated a HMWB is due to the length of the Oxford watercourses (flow-dependent tributaries) exceeding that of the main navigation in this water body.

5.22 The water body is currently at Moderate status. This is due to both ecological and chemical status, with invertebrates at Moderate, phosphate at Moderate, and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body was to reach Moderate status by 2015, which it has achieved. The reasons for such a low objective are: disproportionately expensive, disproportionate burdens, no known technical solution is available and chemical status recovery time.

5.23 The classification data were taken from the Environment Agency's Catchment Data Explorer (2022) as were the reasons for not achieving GES. However, most of the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. The exception to this is the RNAG for Chemical quality elements. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Phosphate and Tributyltin Compounds (as of 2019 Tributyltin compounds are now at Good status, so no longer an issue);
- Diffuse source – poor nutrient management in the agriculture and rural land management category responsible for Phosphate;
- Invasive non-native species – North American signal crayfish responsible for invertebrates;
- Suspect data – responsible for invertebrates;
- Unknown (pending investigation) – sector under investigation responsible for PFOS; and
- Measures delivered to address reason, awaiting classification, no sector responsible for mercury and its compounds and PBDE.

Table 5.6 Thames (Evenlode to Thame) WFD surface water body classification

Water body name	Thames (Evenlode to Thame)
Water body ID	GB106039030334
National Grid Reference	SP4574111361
River Basin District	Thames

Water body name	Thames (Evenlode to Thame)		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	dRBMP3	Objectives dRBMP3
Overall Water Body	Moderate	Moderate	Moderate 2015
Ecological	Moderate	Moderate	Moderate 2015
Biological quality elements	Moderate	Moderate	Good 2027
Macrophytes and phytobenthos	Not assessed	Not assessed	-
Fish	Moderate	Good	Good 2021
Invertebrates	Moderate	Moderate	Good 2027
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	Supports Good	Supports Good 2015
Morphology	Supports Good	Supports Good	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	High	High	Good 2015
Specific pollutants	High	High	High 2015
Chemical	Fail	Fail	Good 2063
Priority substances	Good	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	Good 2015
Fluoranthene	-	Good	Good 2015
Others	Good	Good	Good 2015

Water body name	Thames (Evenlode to Thame)		
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Fail	Fail	Good 2063
Polybrominated diphenyl ethers (PBDE)	Good	Fail	Good 2063
Perfluorooctane sulphonate (PFOS)	-	Fail	Good 2039
Mercury and Its Compounds	Good	Fail	Good 2040
Tributyltin Compounds	Fail	Good	Good 2021
Others	Good	Good	Good 2015

5.1.8 Thames Wallingford to Caversham (GB106039030331)

5.24 Table 5.7 provides information from the 2015 Cycle 2 WFD assessment and 2019 dRBMP data for the Thames Wallingford to Caversham surface water body. The water body is designated as a HMWB and therefore is expected to reach GEP rather than GES.

5.25 The water body is currently at Moderate status. This is due to both ecological and chemical status, with Mitigation Measures assessment at Moderate or less, phosphate at Moderate, Cypermethrin at Fail in Priority substances, and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS), Benzo(b)fluoranthene, Benzo(g-h-i)perylene and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body was to reach Moderate by 2015 which it has achieved. The reasons for an objective below Good are: cause of adverse impact unknown, disproportionate burdens, no known technical solution is available, practical technical constraints prevent implementation of the measure by an earlier deadline and chemical status recovery time.

5.26 The classification data were taken from the Environment Agency's Catchment Data Explorer (2022) as were the reasons for not achieving GES. However, most of the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. The exception to this is the RNAG for Chemical quality elements. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Phosphate;
- Diffuse source – from agriculture and rural land management for Phosphate;
- Physical modification – in the categories of Recreation, Navigation and Local and Central Government responsible for Mitigation Measures Assessment;
- Unknown (pending investigation) – sector under investigation responsible for Benzo(g-h-i)perylene, Benzo(b)fluoranthene and PFOS; and
- Measures delivered to address reason, awaiting classification, no sector responsible for mercury and its compounds and PBDE.

Table 5.7 Thames Wallingford to Caversham WFD surface water body classification

Water body name	Thames Wallingford to Caversham		
Water body ID	GB106039030331		
National Grid Reference	SU5975592031		
River Basin District	Thames		
Management catchment	Thames and Chilterns South		
Operational catchment	Chilterns South		
A/HMWB	HMWB		
Classification	2015 Cycle 2	dRBMP3	Objectives dRBMP3
Overall Water Body	Moderate	Moderate	Moderate 2015
Ecological	Moderate	Moderate	Moderate 2015
Supporting elements	Moderate	Moderate	Good 2027
Mitigation Measures assessment	Moderate or less	Moderate or less	Good 2027
Biological quality elements	Moderate	High	Good 2021
Macrophytes and phytobenthos	Good	Not assessed	Not assessed 2021
Fish	Not assessed	Not assessed	-
Invertebrates	Moderate	High	Good 2021
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Does not Support Good	Supports Good	Supports Good 2021

Water body name	Thames Wallingford to Caversham		
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Acid Neutralising Capacity	High	High	Good 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	High	High	Good 2015
Specific pollutants	Moderate	High	High 2021
Triclosan	Moderate	High	High 2021
Chemical	Good	Fail	Good 2063
Priority substances	Good	Fail	Good 2039
Cypermethrin	-	Fail	Good 2039
Fluoranthene	-	Good	Good 2015
Others (priority substances)	Good	Good	Good 2015
Other Pollutants	Good	Good	Good 2015
Priority hazardous substances	Good	Fail	Good 2063
Polybrominated diphenyl ethers (PBDE)	-	Fail	Good 2063
Perfluorooctane sulphonate (PFOS)	-	Fail	Good 2039
Benzo(b)fluoranthene	-	Fail	Good 2033
Benzo(g-h-i)perylene	-	Fail	Good 2033
Mercury and its compounds	-	Fail	Good 2040
Others	Good	Good	Good 2015

5.1.9 Thames (Reading to Cookham) (GB106039023233)

5.27 Table 5.8 provides information from the 2015 Cycle 2 WFD assessment and 2019 dRBMP data for the Thames (Reading to Cookham) surface water body. The water body is designated as a HMWB and therefore is expected to reach GEP rather than GES.

5.28 The water body is currently at Moderate status. This is due to both ecological and chemical status, with Mitigation Measures assessment at Moderate or Less, phosphate at Moderate, and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS), Benzo(b)fluoranthene and Benzo(g-h-i)perylene at Fail in Priority Hazardous Substances. The objective for the water body was to reach Moderate by 2015 which it has achieved. The reasons for an objective below Good are: disproportionate burdens, Practical technical constraints prevent implementation of the measure by an earlier deadline, no known technical solution is available and Chemical status recovery time.

5.29 The classification data were taken from the Environment Agency's Catchment Data Explorer (2022) as were the reasons for not achieving GES. However, most of the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. The exception to this is the RNAG for Chemical quality elements. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Phosphate;
- Physical modification – in the categories of Recreation and Navigation responsible for Mitigation Measures Assessment;
- Unknown (pending investigation) – sector under investigation responsible for Benzo(g-h-i)perylene, Benzo(b)fluoranthene and PFOS; and
- Measures delivered to address reason, awaiting classification, no sector responsible for PBDE.

Table 5.8 Thames (Reading to Cookham) WFD surface water body classification

Water body name	Thames (Reading to Cookham)
Water body ID	GB106039023233
National Grid Reference	SU8387684421
River Basin District	Thames
Management catchment	Thames and Chilterns South
Operational catchment	Chilterns South
A/HMWB	HMWB

Water body name	Thames (Reading to Cookham)		
Classification	2015 Cycle 2	dRBMP3	Objectives dRBMP3
Overall Water Body	Moderate	Moderate	Moderate 2015
Ecological	Moderate	Moderate	Moderate 2015
Supporting elements	Moderate	Moderate	Good 2027
Mitigation Measures assessment	Moderate or less	Moderate or less	Good 2027
Biological quality elements	High	Good	Good 2015
Macrophytes and phytobenthos	Not assessed	Not assessed	-
Fish	Not assessed	Not assessed	-
Invertebrates	High	Good	Good 2015
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	Supports Good	Supports Good 2015
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Ammonia	High	High	Good 2015
Biochemical Oxygen Demand (BOD)	Moderate	Not assessed	-
Dissolved Oxygen	Good	Good	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	Good	Good	Good 2015
Specific pollutants	High	High	High 2015
Chemical	Good	Fail	Good 2063
Priority substances	Good	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	Good 2015
Fluoranthene	-	Good	Good 2015
Others (priority substances)	Good	Good	Good 2015

Water body name	Thames (Reading to Cookham)		
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Good	Fail	Good 2063
Polybrominated diphenyl ethers (PBDE)	-	Fail	Good 2063
Perfluorooctane sulphonate (PFOS)	-	Fail	Good 2039
Benzo(b)fluoranthene	-	Fail	Good 2033
Benzo(g-h-i)perylene	-	Fail	Good 2033
Others (priority hazardous substances)	Good	Good	Good 2015

5.1.10 Thames (Cookham to Egham) (GB106039023231)

5.30 Table 5.9 provides information from the 2015 Cycle 2 WFD assessment and 2019 dRBMP data for the Thames (Cookham to Egham) surface water body. The water body is designated as a HMWB and therefore is expected to reach GEP rather than GES.

5.31 The water body is currently at Moderate status. This is due to both ecological and chemical status, with Mitigation Measures assessment at Moderate or less, phosphate at Moderate, and polybrominated diphenyl ethers (PBDE), and Perfluorooctane sulphonate (PFOS) at Fail in Priority Hazardous Substances. The objective for this water body was to reach Moderate Status by 2015 which it achieved. The reasons for an objective below Good are, no known technical solution is available, Practical technical constraints prevent implementation of the measure by an earlier deadline and Chemical status recovery time.

5.32 The classification data were taken from the Environment Agency's Catchment Data Explorer (2022) as were the reasons for not achieving GES. However, most of the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. The exception to this is the RNAG for Chemical quality elements. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Phosphate;

- Diffuse source – poor nutrient management in the agriculture and rural land management category and Transport Drainage in the urban and transport sector responsible for Phosphate;
- Physical modification – by local and central government, the water industry and for navigation responsible for Mitigation Measures Assessment; and,
- Flow – surface water abstraction by the water industry responsible for hydrological regime.
- Unknown (pending investigation) – sector under investigation responsible for PFOS; and
- Measures delivered to address reason, awaiting classification, no sector responsible for PBDE.

Table 5.9 Thames (Cookham to Egham) WFD surface water body classification

Water body name	Thames (Cookham to Egham)		
Water body ID	GB106039023231		
National Grid Reference	TQ0099272440		
River Basin District	Thames		
Management catchment	Maidenhead and Sunbury		
Operational catchment	Thames Lower		
A/HMWB	HMWB		
Classification	2015 Cycle 2	dRBMP3	Objectives dRBMP3
Overall Water Body	Moderate	Moderate	Moderate 2015
Ecological	Moderate	Moderate	Moderate 2015
Supporting elements	Moderate	Moderate	Good 2033
Mitigation Measures assessment	Moderate or less	Moderate or less	Good 2033
Biological quality elements	Good	Good	Good 2015
Macrophytes and phytobenthos	Not assessed	Not assessed	Not assessed 2015
Fish	Not assessed	Not assessed	-
Invertebrates	Good	Good	Good 2015
Hydromorphological supporting elements	Not assessed	Not assessed	Not assessed 2015
Hydrological regime	Not assessed	Not assessed	-

Water body name	Thames (Cookham to Egham)		
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Acid Neutralising Capacity	Not assessed	High	Good 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	High	High	Good 2015
Specific pollutants	High	High	High 2015
Chemical	Good	Fail	Good 2063
Priority substances	Good	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	Good 2015
Fluoranthene	Good	Good	Good 2015
Others (priority substances)	Good	Good	Good 2015
Other Pollutants	Good	Good	Good 2015
Priority hazardous substances	Good	Fail	Good 2063
Polybrominated diphenyl ethers (PBDE)	-	Fail	Good 2063
Perfluorooctane sulphonate (PFOS)	-	Fail	Good 2039
Others (priority hazardous substances)	Good	Good	Good 2015

5.1.11 Thames (Egham to Teddington) (GB106039023232)

5.33 Table 5.10 provides information from the 2015 Cycle 2 WFD assessment and 2019 dRBMP data for the Thames (Egham to Teddington) surface water body. The water body is designated as a HMWB and therefore is expected to reach GEP rather than GES.

5.34 The water body is currently at Poor status. This is due to both ecological and chemical status, with Mitigation Measures assessment at Moderate or less, macrophytes and phytobenthos and invertebrates at Poor, phosphate and temperature at moderate, cypermethrin at Fail in Priority Substances and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS) and Tributyltin Compounds at Fail in

Priority Hazardous Substances. The objective for this water body was to reach Poor by 2015. The reasons for an objective below Good are: no known technical solution is available, practical technical constraints prevent implementation of the measure by an earlier deadline, chemical status recovery time and cause of adverse impact unknown.

5.35 The classification data were taken from the Environment Agency's Catchment Data Explorer (2022) as were the reasons for not achieving GES. However, most of the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. The exception to this is the RNAG for Chemical quality elements. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Macrophytes and Phytobenthos Combined, Phosphate and Temperature;
- Diffuse source – poor nutrient management in the agriculture and rural land management category responsible for Macrophytes and Phytobenthos Combined and Phosphate. Transport Drainage in the urban and transport sector responsible for Phosphate;
- Physical modification – by local and central government, the water industry and for navigation responsible for Mitigation Measures Assessment. Water level management in impounded water bodies responsible for temperature;
- Flow – surface water abstraction by the water industry responsible for hydrological regime and low flow (not drought) responsible for temperature;
- Unknown (pending investigation) – sector under investigation responsible for PFOS; and
- Measures delivered to address reason, awaiting classification, no sector responsible for PBDE.

Table 5.10 Thames (Egham to Teddington) WFD surface water body classification

Water body name	Thames (Egham to Teddington)		
Water body ID	GB106039023232		
National Grid Reference	TQ0505668161		
River Basin District	Thames		
Management catchment	Maidenhead and Sunbury		
Operational catchment	Thames Lower		
A/HMWB	HMWB		
Classification	2015 Cycle 2	dRBMP3	Objectives dRBMP3
Overall Water Body	Poor	Poor	Poor 2015

Water body name	Thames (Egham to Teddington)		
Ecological	Poor	Poor	Poor 2015
Supporting elements (Surface Water)	Moderate	Moderate	Good 2033
Mitigation Measures Assessment	Moderate or less	Moderate or less	Good 2033
Biological quality elements	Poor	Poor	Poor 2015
Macrophytes and phytobenthos	Poor	Poor	Poor 2015
Fish	Not assessed	Not assessed	-
Invertebrates	Good	Poor	Good 2015
Hydromorphological supporting elements	Not assessed	Not assessed	Not assessed 2015
Hydrological regime	Not assessed	Not assessed	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Acid Neutralising Capacity	High	High	Good 2015
Ammonia	High	High	Good 2015
Biochemical Oxygen Demand (BOD)	Good	Not assessed	-
Dissolved Oxygen	High	Good	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	Good	Moderate	Good 2015
Specific pollutants	High	High	High 2015
Chemical	Good	Fail	Good 2063
Priority substances	Good	Fail	Good 2039
Cypermethrin (Priority hazardous)	-	Fail	Good 2039
Fluoranthene	Good	Good	Good 2015
Others (Priority substances)	Good	Good	Good 2015

Water body name	Thames (Egham to Teddington)		
Other Pollutants	Good	Does not require assessment	Good 2015
Priority hazardous substances	Good	Fail	Good 2063
Polybrominated diphenyl ethers (PBDE)	-	Fail	Good 2063
Perfluorooctane sulphonate (PFOS)	-	Fail	Good 2039
Tributyltin Compounds	-	Fail	Good 2039
Others (Priority hazardous substances)	Good	Good	Good 2015

5.1.12 Relevant Local Target Measures

5.36 Only one potentially relevant local target measure was mentioned in the Catchment Data Explorer (2022) for all the catchments potentially impacted by the proposed scheme. This is for the South Chilterns Operational Catchment and entails river rehabilitation for brook habitat to mitigate the impact of low flows.

The full list of water body level measures from the water body extended summaries provided by the EA are in Table 5.11. The relevance of each measure to the proposed works is given. This does not provide an assessment on how the scheme supports each measure but instead provides a view on how each measure could support the benefits delivered by the scheme, where appropriate. A measure that covers a wider area – Ock catchment – is provided in

5.37 Table 5.12.

5.38 There are additional measures supplied in the Thames RBMP (Environment Agency, 2015) potentially relevant to the proposed scheme shown in Table 5.13.

Table 5.11 Water body level measures from water body extended summary, provided by EA

WFD water body	Action ID	Title	Measure Aim	Relevance
Childrey Brook and Norbrook at Common Barn	38609	Measure to address agriculture-related RFFs	1. To control or manage diffuse source inputs 2. Reduce diffuse pollution at source 3. Field & Crop – Livestock	Would support overall improvements offered by the scheme through reducing water quality impacts to the realigned watercourses through a reduction in diffuse pollution.
	25867	Implement scheme to reduce the phosphorous loading from Wantage STW through setting a Permit standard	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts to the realigned watercourses.
	38678	Measure to address intermittent discharge failure	1. To control or manage point source inputs 2. Reduce point source pathways (i.e. control entry to water environment) 3. Emergency overflow redesign and rebuild	Would support overall improvements offered by the scheme through reducing water quality impacts to the realigned watercourses.
Sandford Brook (Source to Ock)	None			
Cow Common Brook and Portobello Ditch	None			
Ginge Brook and Mill Brook	None			
Ock and tributaries (Land Brook confluence to Thames)	20959	Advisory campaign using experts to improve maintenance of private septic tanks	1. To control or manage point source inputs 2. Reduce point source pollution at source 3. Prohibit/control use of certain substances/chemicals	Would support overall improvements offered by the scheme through reducing water quality impacts to the River Ock.
	20960	Installation of a constructed wetland at all small STWs	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Install treatment to reduce chemicals	Would support overall improvements offered by the scheme through reducing water quality impacts to the River Ock.
	20957	Reduce diffuse pollution by providing advice to farms	1. To control or manage diffuse source inputs 2. Reduce diffuse pollution at source 3. Manure & Fertiliser management	Would support overall improvements offered by the scheme through reducing water quality impacts to the River Ock.
	20958	Undertake site inspection and where required give advice on private sewage treatment	1. To control or manage point source inputs 2. Reduce point source pollution at source 3. Prohibit/control use of certain substances/chemicals	Would support overall improvements offered by the scheme through reducing water quality impacts to the River Ock.
	38469	Implement scheme to reduce the phosphate loading from Appleton STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts to the River Ock.

WFD water body	Action ID	Title	Measure Aim	Relevance
Thames (Evenlode to Thame)	25877	Improve habitat in all the Oxford watercourses	1. To manage modified habitats 2. Improve condition of channel/bed and/or banks/shoreline 3. Improve and/or maintain natural geomorphological diversity	Would support in improving overall ecological resilience of the River Thames due to an increase in flow downstream of SESRO in times of low flow.
Thames Wallingford to Caversham	21216	Advisory campaign to improve maintenance of private water discharge.	1. To control or manage point source inputs 2. Reduce point source pollution at source 3. Prohibit/control use of certain substances/chemicals	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37977	Bank reprofiling (rehabilitation) for the stretch of the Thames downstream of Wallingford	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37965	Bank reprofiling (rehabilitation) throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37983	Cessation of maintenance throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37979	Change operational regime of weirs and locks to protect and enhance flows and habitats	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37972	Create compensation habitats throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37966	Create shallow margin in front of hard defence throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37924	Create wetland and improve floodplain connectivity at Cleeve	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37926	Create wetland habitat at Tilehurst on left hand bank.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37942	Create riffles and side streams.	Mitigation measure	
	21194	Create small riffles, re-profile banks, fence watercourses, buffer strips throughout	1. Mitigation measure 2. To improve modified habitat	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
			3. Improvement to condition of channel/bed and/or banks/shoreline 4. Increase in-channel morphological diversity	
	21215	First time sewerage scheme to replace septic tanks	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. First time sewerage scheme	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37980	Introduce riparian vegetation/green corridors throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	38649	Measure to address agriculture-related RFFs	1. To control or manage diffuse source inputs 2. Reduce diffuse pollution at source 3. Field & Crop – Arable soils	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37973	Narrow over-wide channels throughout the waterbody	Mitigation measure	Would support in improving overall ecological resilience of the River Thames through enhancing contributing tributaries
	37969	Replace hard defence with soft engineering throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37964	Secure habitat creation through development	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37928	Habitat gains and bank improvements in conjunction with bridge construction	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37944	Identify areas that could be connected to the floodplain	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37984	If dredging occurs, strategically place dredged material.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	21248	Implement scheme to reduce the phosphate loading from Tetsworth STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	21251	Implement scheme to reduce the phosphate loading from Towersey STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38479	Implement scheme to reduce the phosphate loading from Abingdon (Oday Hill Ditch) STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38465	Implement scheme to reduce the phosphate loading from Abingdon STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38469	Implement scheme to reduce the phosphate loading from Appleton STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38471	Implement scheme to reduce the phosphate loading from Banbury STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38463	Implement scheme to reduce the phosphate loading from Benson STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38462	Implement scheme to reduce the phosphate loading from Cassington STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38460	Implement scheme to reduce the phosphate loading from Charlbury STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38467	Implement scheme to reduce the phosphate loading from Chipping Norton STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38461	Implement scheme to reduce the phosphate loading from Cholsey STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor	Would support overall improvements offered by the scheme through reducing

WFD water body	Action ID	Title	Measure Aim	Relevance
			3. Alter/change permits for sewage treatment works	water quality impacts along the River Thames.
	38464	Implement scheme to reduce the phosphate loading from Church Hanborough STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38456	Implement scheme to reduce the phosphate loading from Culham STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38457	Implement scheme to reduce the phosphate loading from Dorchester STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38468	Implement scheme to reduce the phosphate loading from Faringdon STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38458	Implement scheme to reduce the phosphate loading from Finstock STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38466	Implement scheme to reduce the phosphate loading from Goring STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38453	Implement scheme to reduce the phosphate loading from Haddenham STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38459	Implement scheme to reduce the phosphate loading from Milton-Under-Wychwood STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38454	Implement scheme to reduce the phosphate loading from Thame STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	38455	Implement scheme to reduce the phosphate loading from Wheatley STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	38470	Implement scheme to reduce the phosphate loading from Witney STW	1. To control or manage point source inputs 2. Mitigate/Remediate point source impacts on receptor 3. Alter/change permits for sewage treatment works	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37929	Improve connection with the river at Reading Marina.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	21169	Improve foul sewer network via PR14 process.	1. To control or manage point source inputs 2. Reduce point source pathways (i.e. control entry to water environment) 3. Emergency overflow redesign and rebuild	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37978	Introduction of stock-proof fencing to reduce bankside erosion	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37945	Limit dredging activities by Navigation/ Waterways at significant shallows on onside	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37946	Maintain habitat at the tail of Benson Weir.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37982	Modify existing structures throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37951	Opening up of backwater near South Stoke STW	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37959	Preservation of river margins beside railway line near Purley/Tilehurst.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37948	Protect gravels at the confluences of the Bradfords Brook and Mill Brook and with the Thame	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	21114	Protected area action:-Implement scheme to reduce the phosphate loading from Drayton STW	1. To control or manage point source inputs 2. Reduce point source pollution at source 3. Prohibit/control use of certain substances/chemicals	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37954	Protection of flow dependant habitat in Whitchurch weir pool.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37960	Protection of gravel shoal at Caversham weir B	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37956	Protection of margins either side of Sulham Brook to Thames confluence.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37955	Protection of margins on right hand bank below Whitchurch bridge for 150–200 m.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37947	Protection of sandy beach features downstream of Wallingford Bridge.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37962	Protection of shallow area on bend downstream of Caversham weir.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37953	Protection of shallows at head and tail of islands near Beale Park.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37952	Protection of the sediment deposits in Cleeve weir pool.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37958	Protection of weir pool habitat at Mapledurham Lock.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37976	Provide fish passage solutions throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37927	Pursue gains through the planning process around the Reading area.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37974	Reconnect and restore historic aquatic habitats throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37967	Removal of hard engineering structures (e.g. naturalisation) throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37968	Replace existing structures throughout the waterbody with new structural designs	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37925	Restrict navigation to one side of poplar island and Appletree Eyot island.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37981	Retain marginal vegetation throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37975	River bed raising or lowering (regrading) throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37970	Use of engineering techniques to assist natural recovery throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37971	Use soft engineering techniques throughout the waterbody.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37923	Where possible, improve and protect small tributaries coming into the Thames.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37985	Work with landowners to optimise sensitive management practices.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
Thames (Reading to Cookham)	37937	Create wetland habitat/improvement at Bisham.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37935	De-culvert river at Frog Mill inlet, Bisham Brook and put in bypass channel around 2 weirs.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37930	Deliver wetland and backwater habitat creation on the St. Patricks Stream	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37939	Create riffles and side streams.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37950	Create small riffles, re-profile banks, fence watercourses and put in buffer strips	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37943	Identify areas that could be connected to the floodplain	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37961	Secure habitat creation through development	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37933	In-channel habitat improvements at Henerton backwater.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37932	Install fish pass in conjunction with Hydropower proposal at Shiplake weir.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37934	Reconnect ditches at Remenham.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37931	Restrict navigation to one channel around the islands at Borough Marsh.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
	37936	Restrict navigation to one channel around the islands at Frogmill.	Mitigation measure	Would support in improving overall ecological resilience of the River Thames.
Thames (Cookham to Egham)	37890	Amerden Stream. Augment flow using jubilee river and associated in channel enhancement works	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37868	Beach Recharge, import coarse material to dress existing beach areas along river.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37889	Canoe fish connection through Papermill site	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37867	Connect Windsor Marina Lakes to Thames	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37871	Create a fish and wildlife channel at Bell Weir	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37872	Create a fish and wildlife channel at Hedsor Weir	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37870	Create a fish and wildlife channel at Old Windsor Weir	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	41180	EA enforcement actions	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Manage fields and boundaries to reduce runoff, sediment and nutrient losses	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37869	Eton backwater Restoration. Improve lateral connectivity to floodplain habitat.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37877	Fish screen to stop entrainment, Egham intake	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37876	Fish screen to stop entrainment, Hythe End intake	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37875	Fish screen to stop entrainment, Sunnymeads intake, Datchet	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37878	Engaging with navigation users to reduce bank erosion and sediment input	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37918	Habitat enhancement through Eton College	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37915	Improve fish passage at Boveney Weir	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37874	Install fish screen to stop entrainment, TW Datchet intake	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37917	Install fish passes and habitat works at Tangier Mill Stream	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37893	Managed retreat on the towpath opposite Ruddles Pool	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37873	Modify sluice at Bray Mill.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37916	Move impoundment structures upstream at Clewer Mill Stream	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37863	Multi-Species fish pass installation at Boulters mill channel & weir	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37892	Naturalisation of right bank of Monkey island	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37891	Old Mill sluice could be modified to change the flow	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	41179	Payment for Ecosystem Services projects targeting Oxfordshire Ray	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Improve arable and grassland soil management	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37866	Pigeonhill Eyot/bray mill stream phase two enhancement. SU9097779649	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	41178	PR14 catchment management scheme SEW	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Improve arable and grassland soil management	Would support overall improvements offered by the scheme through reducing

WFD water body	Action ID	Title	Measure Aim	Relevance
				water quality impacts along the River Thames.
	41177	PR14 catchment management scheme TW	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Improve arable and grassland soil management	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	41175	Product substitution-AW, SEW and TW	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Improve arable and grassland soil management	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	41176	Reduce diffuse pesticide pollution by EA/NE engaging with farmers	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Improve arable and grassland soil management	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37864	Replace hard banks and establish shallows and emergent plants.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37914	Reprofile the river bank, plant vegetation and create beaches.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37920	Strategic placement of dredged material at Lower Chalvey Ditch	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37919	Strategic placement of dredged material.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37865	Upgrade to multi species fish pass at Bray	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
Thames (Egham to Teddington)	37884	Abbey River, Install fish pass at Abbey Chase	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37808	Add shelter at gravel pit Penton Hook for fish shelter	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37843	Backwater creation/enlargement at Penton Hook	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37809	Backwater enhancements at Mixnams Island Penton Hook	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37895	Beach Recharge, import gravel to dress selected marginal areas of the watercourse.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37827	Broom Road Teddington Natural Beach next to the recreation ground – TLS Project proposed	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37815	Burway Ditch, Abbey mead some floodplain grazing marsh possible	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37826	Canbury Gardens:- 1 mile of natural riverbank, beaches and habitat to rivers edge.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37902	Change maintenance technique to minimise disturbance	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37819	Compensatory habitat at Desborough Island	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37899	Create a fish and wildlife channel to bypass Chertsey weir.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37840	Create low flow channels in over-widened/over-deepened channels	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37842	Create shallow margin in front of hard defence	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37881	Create wetland and backwater features at Hurst Park	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37818	Create wetland and backwater habitats and enhance riverbank	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37879	Design moorings for ecological benefit. E.g., offline revenue moorings.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	38593	Diffuse urban P reduction project	1. To control or manage point source inputs 2. Reduce point source pathways (i.e. control entry to water environment) 3. Sewerage system re-design and rebuild	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37817	Dockett Eddy enhance reinforced bank, work is located on left bank – F & B	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	41173	EA enforcement actions	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Manage fields and boundaries to reduce runoff, sediment and nutrient losses	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37860	Encourage use of environmentally friendly vessel design.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37807	Enhance and extend natural bank at Silver sands, Egham	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37887	Enhancement opportunities through Penton Hook marina redevelopment.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37810	Enlarging Penton Hook backwater on north bank	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37814	Ensure water company modify fish screen at Laleham intake.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	21096	Awareness campaign on managing manure and fertilizer	1. To control or manage diffuse source inputs 2. Reduce diffuse pollution at source 3. Manure & Fertiliser management	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37841	Create reed fringes	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37859	Engaging with navigation users to reduce bank erosion and sediment input	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37850	Recreate a sinuous river channel (re-meandering)	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37898	Recreate a sinuous river channel (re-meandering)	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37852	Replace existing structures with new structural designs	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37820	Habitat Improvement in Backwater from Desborough Cut into Shepperton.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37858	Hampton intake, install fish screens at Thames water intake	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	21426	Implement scheme to reduce the phosphate loading from Chobham STW	1. To control or manage point source inputs 2. Reduce point source pollution at source 3. Prohibit/control use of certain substances/chemicals	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	21427	Implement scheme to reduce the phosphate loading from Lightwater STW	1. To control or manage point source inputs 2. Reduce point source pollution at source 3. Prohibit/control use of certain substances/chemicals	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37894	Install fish pass in conjunction with Hydropower proposal at Teddington weir.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37900	Install fish pass on Teddington boat rollers, Teddington weir	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37855	Install fish pass, Molesey weir	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37856	Install fish pass, Tumbling Bay weir, Sunbury	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37857	Install fish screening at Thames Water Laleham intake.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37821	Install mitigation if hydropower is installed on left bank	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37825	Install new channel to provide access to tributary and create functional flow dependent habitat	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37854	Install technical fish pass, Chertsey weir.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37883	Introduce minimum flow limits on abstractions	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37813	Laleham Identify piece meal bank work for removal.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37861	Lateral zoning to concentrate boats within a central channel	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37862	Limit number of mooring permits available	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37896	Lower weir at Abbey Chase.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37828	LTS – Teddington weir, new 2 stage fish pass proposed with hydropower scheme	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37824	LTS Molesey weir – fish pass to replace fish trap finishes 2014	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37897	Narrow over-wide channels	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37845	Narrow over-wide channels, Penton Hook pit	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37844	Narrow over-wide channels, Sunbury lock and weir	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	41200	Payment for Ecosystem Services projects targeting Oxfordshire Ray	1. To control or manage rural diffuse pollution 2. Manage, contain and treat runoff 3. Contain contaminated or polluted water from farms	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37805	Penton Hook marina create 2.5 ha BAP habitat.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37886	Penton Hook. Install fish shelters and predator refuge in Penton Hook Pit	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	41178	PR14 catchment management scheme SEW	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Improve arable and grassland soil management	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	41177	PR14 catchment management scheme TW	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Improve arable and grassland soil management	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	41201	PR14 catchment management scheme-AW	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Improve arable and grassland soil management	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	41175	Product substitution-AW, SEW and TW	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Improve arable and grassland soil management	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37885	Reconnect and restore historic aquatic habitats, Create compensation habitats	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37846	Reconnect and restore historic aquatic habitats, Penton Hook pit	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37847	Reconnect and restore historic aquatic habitats. Covered by WTh_Low_001897	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37848	Recreate a sinuous river channel (re-meandering), Abbey River	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37849	Recreate a sinuous river channel (re-meandering), Hurst Park	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37903	Recreation of gravel bars and riffles.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37829	Redevelopment of Marina may have possible habitat enhancement	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	41176	Reduce diffuse pesticide pollution by EA/NE engaging with farmers	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Improve arable and grassland soil management	Would support overall improvements offered by the scheme through reducing water quality impacts along the River Thames.
	37812	Reduce the wash by having signs to reduce boat speed – Waterways	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37851	Removal of hard engineering structures (e.g. naturalisation)	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37888	Removal of hard engineering structures/ bank rehabilitation/reprofiling.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37816	Remove Abbey Chase weir on Abbey River and install stoplogs which can be removed over time	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37904	Replace hard defence with soft engineering	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.

WFD water body	Action ID	Title	Measure Aim	Relevance
	37853	Replace hard defence with soft engineering, Sunbury lock and weir	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37806	Restoration of backwaters at Truss's island.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37804	Restore backwater at Riverbank residential development, Staines.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37839	River bed raising or lowering.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37811	Selective opening up of right bank at Laleham. Create beach areas	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37822	Sunbury depot island create reed bed to create BAP habitat	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37880	Sunbury lock and weir. Create fish and wildlife channel through Sunbury Lock Island.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37901	Surbiton (Seething wells) intake. Install fish screen	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	36930	Thames (Egham to Teddington)	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37823	Walton 2 intake – screening on intake to prevent fish entrapment	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.
	37882	Wetland and reed bed creation at Penton Hook pit.	Mitigation Measure	Would support in improving overall ecological resilience of the River Thames.

Table 5.12 Wider area measures from water body extended summary, provided by EA

WFD water body	CPS Action ID	Title	Measure Aim	Relevance
Childrey Brook and Norbrook at Common Barn	40979	Ock NFM/WFD Project	1. To control or manage rural diffuse pollution 2. Improve land management practices 3. Manage fields and boundaries to reduce runoff, sediment and nutrient losses	Would support overall improvements offered by the scheme through reducing water quality impacts along the respective water bodies.
Sandford Brook (Source to Ock)				
Cow Common Brook and Portobello Ditch				
Ginge Brook and Mill Brook				
Ock and tributaries (Land Brook confluence to Thames)				
Thames (Evenlode to Thame)				

Table 5.13 Relevant measures in Thames River Basin Management Plan (2015)[11]

Operational Catchment	Measure Proposed
Ock	Engage landowners to adjust land management through land use models to reduce flood risk, diffuse pollution, considering the effect of sewage treatment work (STW) improvements. Take an upstream to downstream approach and protect and build out from the freshwater, standing water and wetland 'hot-spot' locations.
	Extend downstream existing river 'hot-spot' sections, create water quality buffers around key freshwater and wetland sites, implement measures for species of conservation concern and install clean water ponds and wetlands across the catchment.
South Chilterns	None

[11] Environment Agency, 2015, Part 1 Thames river basin district, River basin management plan. [online] Available at: Thames_RBD_Part_1_river_basin_management_plan.pdf (publishing.service.gov.uk) [Accessed 04/02/2021]

Maidenhead to Sunbury	Engagement and training of community volunteers in river restoration, invasive species management and putting Mitigation Measures in place.
	Small-scale habitat projects with consideration for cross catchment mutual gains involving volunteers to re-naturalise a river corridor and improve water quality, habitat, biodiversity and flood resilience by removing hard banking and planting with marginal native macrophytes, and installing a small-scale SuDS reed bed on a priority surface water body.
	High media level promoting of the Lower Thames, for catchment-wide engagement of people and business.
	Citizen science and accredited training for community volunteers in the catchment area.
	Strategic review of barriers to fish, and back waters and scope implementation of new design fish passages at priority weirs (for example, Salthill stream and Roundmoor Ditch). This would improve fish populations and habitat for refuge.

5.2 Outcomes of the Level 1 – basic screening assessment

5.39 This section assesses where the proposed scheme design may impact the WFD water bodies within the assessment area. It screens in those water bodies that will need further assessment and screens out those that will not be impacted (and therefore where there is no risk of non-compliance with WFD).

5.40 The updated (in Gate 2) ACWG template Level 1 screening findings have been recorded in Appendix A, notably:

- Worksheet 1 – "List relevant water bodies"
- Worksheet 2 – "Level 1 activities"

5.41 Worksheet 3 "Level 1 summary" is auto generated to summarise those water bodies to be carried forward to the Level 2 assessment.

5.42 As the ACWG template does not have specific sections for documenting the reasoning behind the selection of water bodies or activities, relevant description is set out below.

5.43 The following section on scheme assessment reviews the construction aspects of SESRO first and then describes how the proposed mitigation will be constructed as part of the overall scheme. Following on from this, scheme elements that have the potential to be impacted will be assessed. Finally, the operational aspects of the proposed scheme will be reviewed.

5.2.1 Scheme assessment

5.2.1.1 Design principles

5.44 The diverted watercourses would all have improved morphological form and functioning when compared to the existing situation as much of the length of the current watercourses has been historically straightened. The new morphological template that would be constructed would have be expected to have a greater habitat heterogeneity (i.e. better hydromorphological condition) leading to an improved ecological value. The WWD would have two channels, the diverted Cow Common Brook (part of the Cow Common Brook and Portobello ditch WFD water body) and improvements (by way of channel restoration) to the East Hanney Ditch (part of the Childrey Brook and Norbrook at Common Barn WFD water body). These two watercourses would not be connected physically but together would form a mosaic of habitats as the water rises and spreads out across the newly created floodplain which would form part of the floodplain compensation area. Gravels would be added to the new channels, where appropriate, to help form new riffle features. All the mitigation for the 'wetland' ditches would also be constructed at this stage. Wood added in each of these wetland ditches would support their overall functioning.

5.2.1.2 Construction

5.45 The proposed works for SESRO involves a 8-year construction programme and then an additional 2 years to fill, between 2029 and 2038 (Table 5.14). As part of the initial site mobilisation the environmental mitigation works would be undertaken. This includes the following activities:

- Environmental mitigation works
- Site clearance and perimeter fencing
- Replacement flood storage area
- Settlement ponds and site drainage

5.46 As part of the environmental mitigation works the main watercourses across the site will be diverted to form both the WWD and EWD. This would occur in the early part of the programme. The new watercourses would be constructed in the dry, as much as possible, to keep the existing habitat functioning while the new channels are constructed off-line away from the existing habitat. A high-level programme for this operation is shown in Table 5.14. Flow would be directed into the WWD and EWD once the channel construction is fully complete. This would be undertaken by connecting the new watercourses at the upstream ends to the existing flowing channels and then installing clay plugs at the upstream limits of the existing channels to divert the flows fully. Once the old channels are drained down, a clay plug would be installed at the downstream limit. It is envisaged, that following excavation of the watercourse additional mitigation could be undertaken upon them to increase the rate of recovery. This could include both selective marginal planting as well as macro-invertebrate translocation as well as any rare/notable species if discovered, a future date, on site. Fish surveys and translocation would also be necessary after the channels have been fully plugged. Translocation would be undertaken after the flow is changed between the watercourses. These additional steps wouldaid recovery of these water bodies and help them move towards 'Good' ecological status at a quicker rate than if they were not undertaken. Once all the additional mitigation has been completed the existing channels would be filled in with appropriate material and compacted.

5.47 It is envisaged that within two growing seasons the macrophytes and macroinvertebrate communities could evolve to a better status than the existing water bodies. As a result, it is envisaged that if construction is undertaken through 2029, and into early 2030, than by Autumn 2031 the habitats would be expected to be at a status that is improved over the baseline condition when compared to existing watercourse habitats within the scheme footprint. The habitats would also be expected tomove towards good status.

Table 5.14 SESRO Preliminary programme

Construction Activities	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Site Mobilisation	→	→	→	→						
Environmental mitigation works	→	→								
Procurement of long lead times	→	→	→	→	→					
Reservoir	→	→	→	→	→	→	→	→		
Embankment			→	→	→	→	→	→		
Tunnel				→	→					
Commissioning activities								→	→	→

5.2.1.3 Scheme elements

There are several scheme elements that may have an impact on the WFD water bodies within the vicinity of the proposed scheme. A description of the proposed scheme can be found in Section 2 and in more detail in the 2022 SESRO CDR (Technical Annex A). The location of all the scheme elements is displayed on Figure 5.1 to

5.48 Figure 5.12 with the potential impacts of these elements on water bodies shown as either a point or a line. For each of the WFD Water bodies screened in, the scheme elements that potentially impact that water body, the description of their potential effects, and the potential impacts are listed in Table 5.15 below. For each scheme element, the options which they relate to are also stated. The scheme elements are named the same in the table as on the figures where possible to keep it as clear as possible. One exception to this is "reservoir footprint" which is used in the table but encompasses all the elements in the figures located within the perimeter access track as they have the same potential impact. Statistics that detail river length lost and gained and the overall change is illustrated in Table 5.16. This does not include ditches which are covered separately in the SESRO BNG assessment (B6 Biodiversity Net Gain Assessment).

5.49 The WRSE WFD assessment is undertaken using a standard list of construction and operation activities, as specified in the WRSE (2020) ACWG methodology.[12] These have been linked to the scheme elements in Table 5.15 where relevant and are documented as part of the ACWG methodology. However, there are several construction and operation activities in the standard list that are not relevant to the works in this proposed scheme and so are not in Table 5.15, these are listed below.

- Construction of below ground structures (shaft/retaining wall) with associated dewatering, within 500m of a sensitive groundwater feature;
- Presence of new underground structure (tunnel/shaft/retaining wall) within 500m of a sensitive groundwater feature;
- Construction of new cutting with external dewatering with no sensitive groundwater feature within 500m;
- Construction of new cutting with external dewatering within 500m of a sensitive groundwater feature;
- Removal of significant in channel watercourse structure (such as impassable weir);
- Removal of existing culverts or other in channel watercourse structure;
- High volume discharge of water with a quality element of higher WFD status than the receiving water body;
- High volume discharge of water with a quality element of a lower WFD status than the receiving water body;

[12] WRSE, 2020, All Company Working Group Water Framework Directive: Consistent framework for undertaking no deterioration assessments, Mott MacDonald 2020.

- Low volume discharge of water with a quality element of the same or higher WFD status than the receiving water body;
- Low volume discharge of water with a quality element of a lower WFD status than the receiving water body;
- Low volume discharge of water with a quality element of the same WFD status as the receiving water body;
- New WTW discharge to watercourse;
- New discharge of highly saline water to a coastal or transitional water body;
- New discharge of highly saline water to a surface water body or groundwater;
- Cessation of existing discharge to a watercourse;
- Construction of a new abstraction borehole headworks and associated infrastructure;
- Refurbishment of existing boreholes;
- Drilling new abstraction boreholes;
- Maintenance and use of abstraction borehole infrastructure;
- Daylighting of existing culverts;
- Maintenance and use of coastal intakes;
- Use of existing ground and surface water abstraction licences, within licence conditions and recent abstraction patterns;
- Use of existing surface water and groundwater abstraction licences, within existing licence conditions but outside of the recent actual rates;
- Emergency or drought use of existing surface water or groundwater abstraction outside of licence conditions;
- New or increased groundwater abstraction;
- Increase in surface water and groundwater abstraction licences;
- New coastal or transitional water body abstraction licence;
- Reduction of coastal or transitional water body abstraction licence;
- Increase of coastal or transitional water body abstraction licence;
- Trenching and laying of pipelines involving watercourse crossings;
- Trenching and laying of pipelines involving large watercourse crossings with in-channel modifications;
- Removal/decommissioning of existing pipeline (no watercourse crossings);
- Removal/decommissioning of existing pipeline (involving watercourse crossings);
- New above ground pipelines (crossing watercourse);
- New above ground pipelines (not crossing watercourse);

- Modification of an existing storage reservoir;
- Modification of an existing service reservoir adjacent in close proximity to watercourse;
- Presence of new reservoir or modified existing service reservoir in close proximity to watercourse;
- Modification of an existing service reservoir not in close proximity to watercourse;
- Presence of new reservoir or modified existing service reservoir not in close proximity to watercourse;
- New or continuation of contractual agreement between companies to continue providing transfer with no change to abstraction licence associated;
- Contractual agreement between companies to continue providing transfer with decrease in abstraction licence associated;
- Contractual agreement between companies to continue providing transfer with increase in abstraction licence associated;
- Catchment management schemes;
- Modification of an existing WTW or pumping station relating to treated water;
- Construction of a new WTW or pumping station relating to treated water;
- Maintenance and use of pumping stations and WTW;
- Removal of existing WTW and associated discharge;
- Construction or modification of a desalination plant; and,
- Maintenance and use of desalination plant.

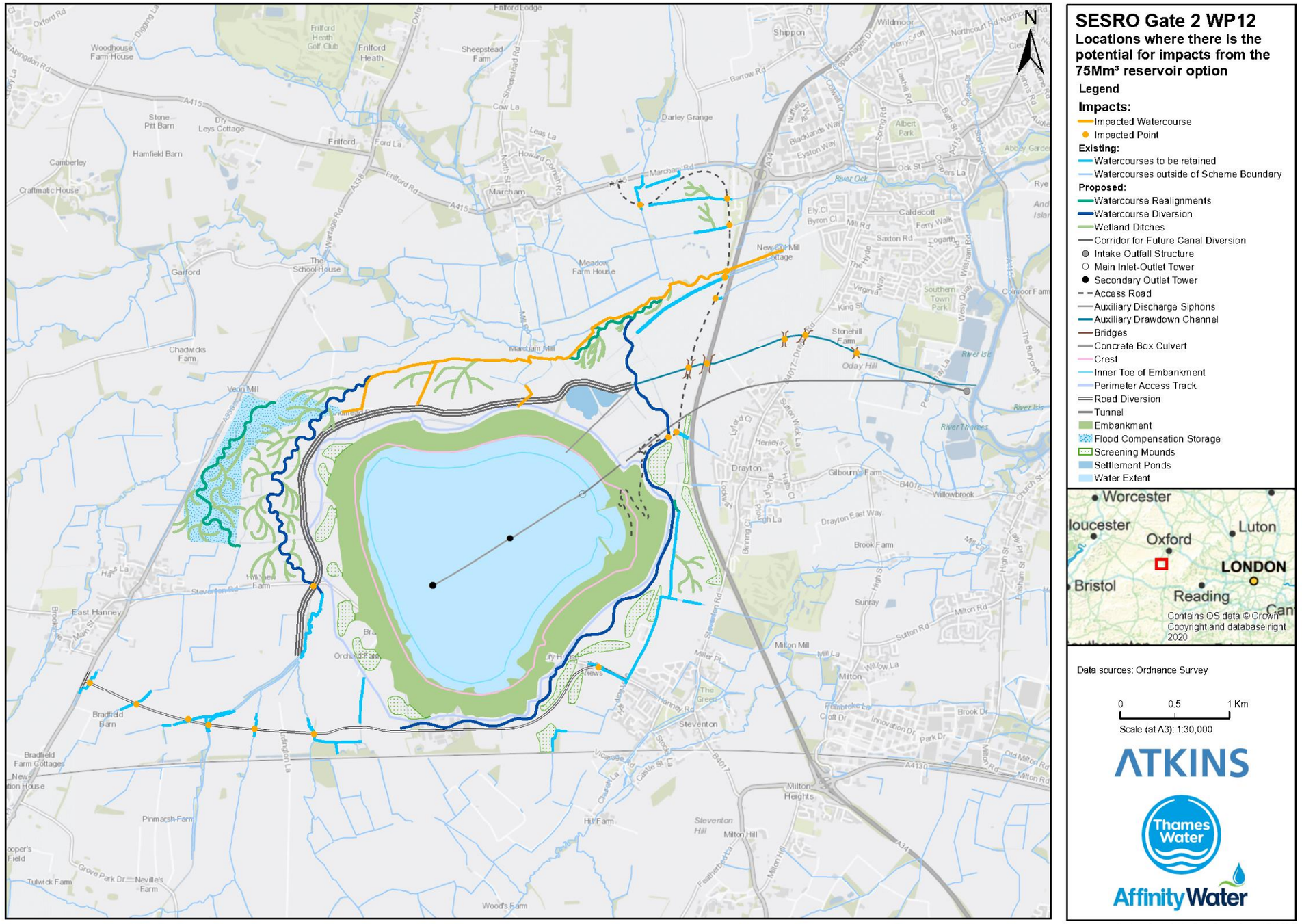


Figure 5.1 Locations where there is the potential for impacts from the 75 Mm^3 option

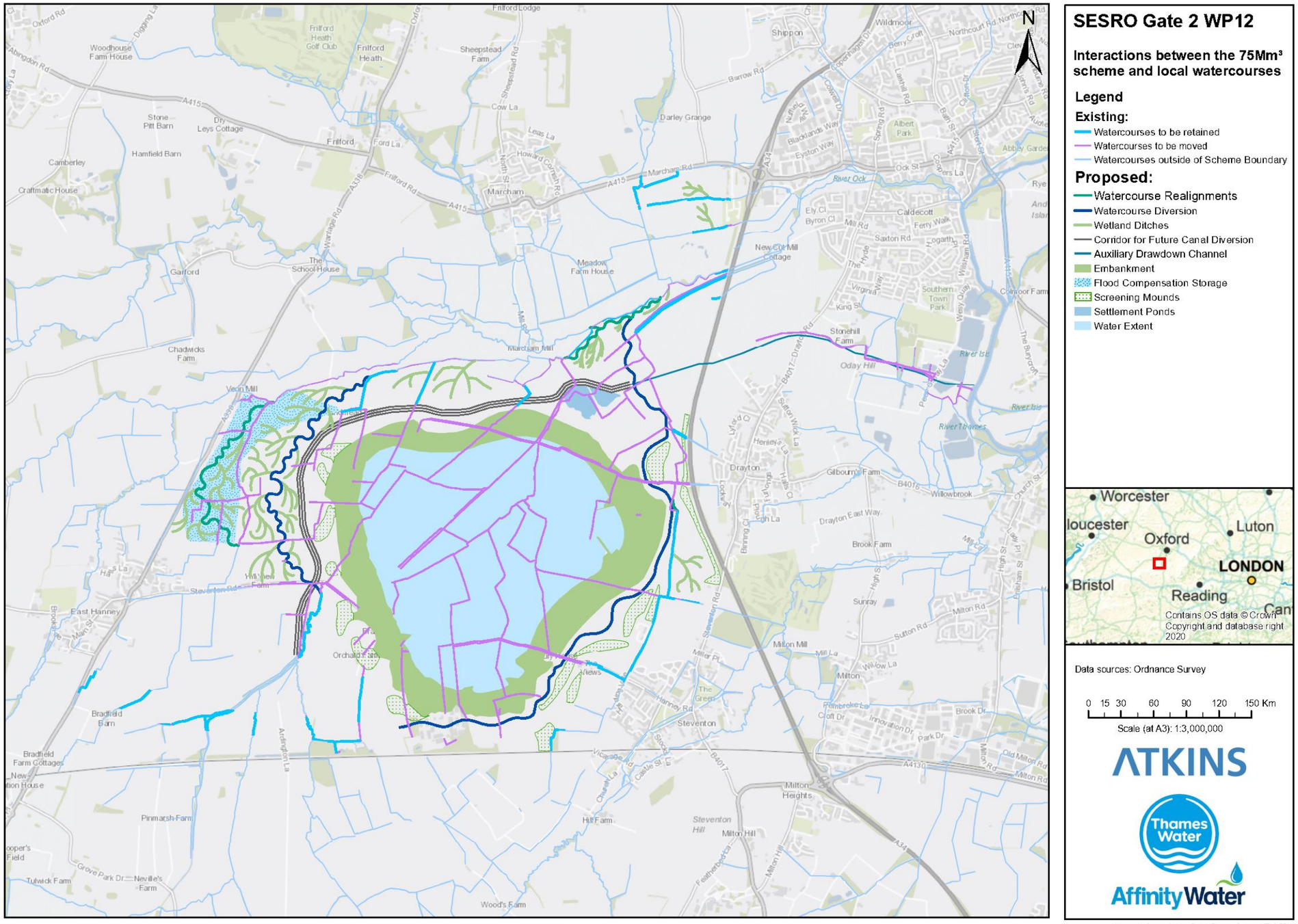
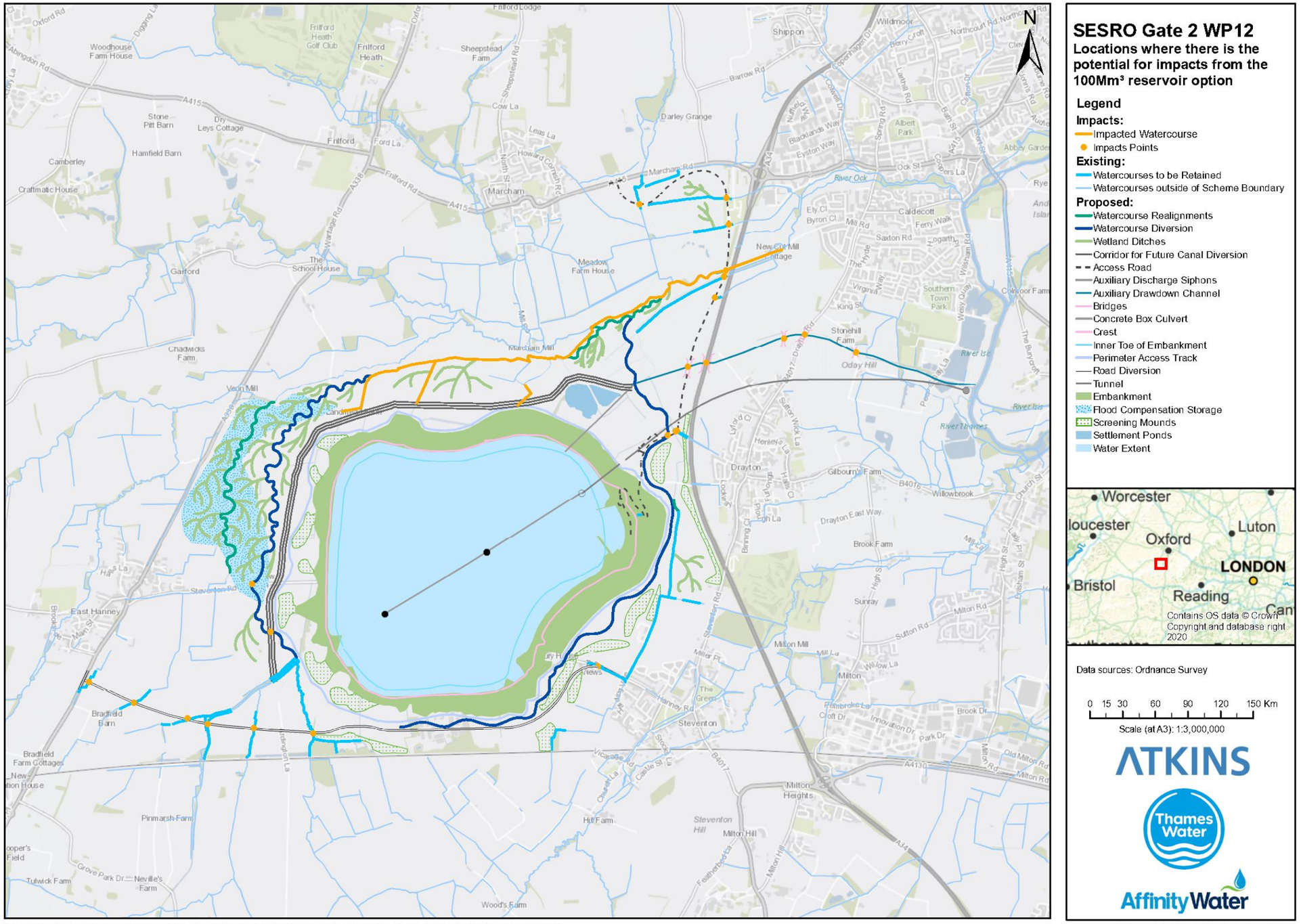


Figure 5.2 Interactions between the 75 Mm³ option and local watercourses



SESRO Gate 2 WP12

Locations where there is the potential for impacts from the 100Mm³ reservoir option

Legend

Impacts:
- Impacted Watercourse
- Impacts Points

Existing:
- Watercourses to be Retained
- Watercourses outside of Scheme Boundary

Proposed:
- Watercourse Realignments
- Watercourse Diversion
- Wetland Ditches
- Corridor for Future Canal Diversion
- Access Road
- Auxiliary Discharge Siphons
- Auxiliary Drawdown Channel
- Bridges
- Concrete Box Culvert
- Crest
- Inner Toe of Embankment
- Perimeter Access Track
- Road Diversion
- Tunnel
- Embankment
- Flood Compensation Storage
- Screening Mounds
- Settlement Ponds
- Water Extent

Woodcote Grove, Ashley Road, Epsom, Surrey, KT18 5BW
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Figure 5.3 Locations where there is the potential for impacts from the 100 Mm³ option

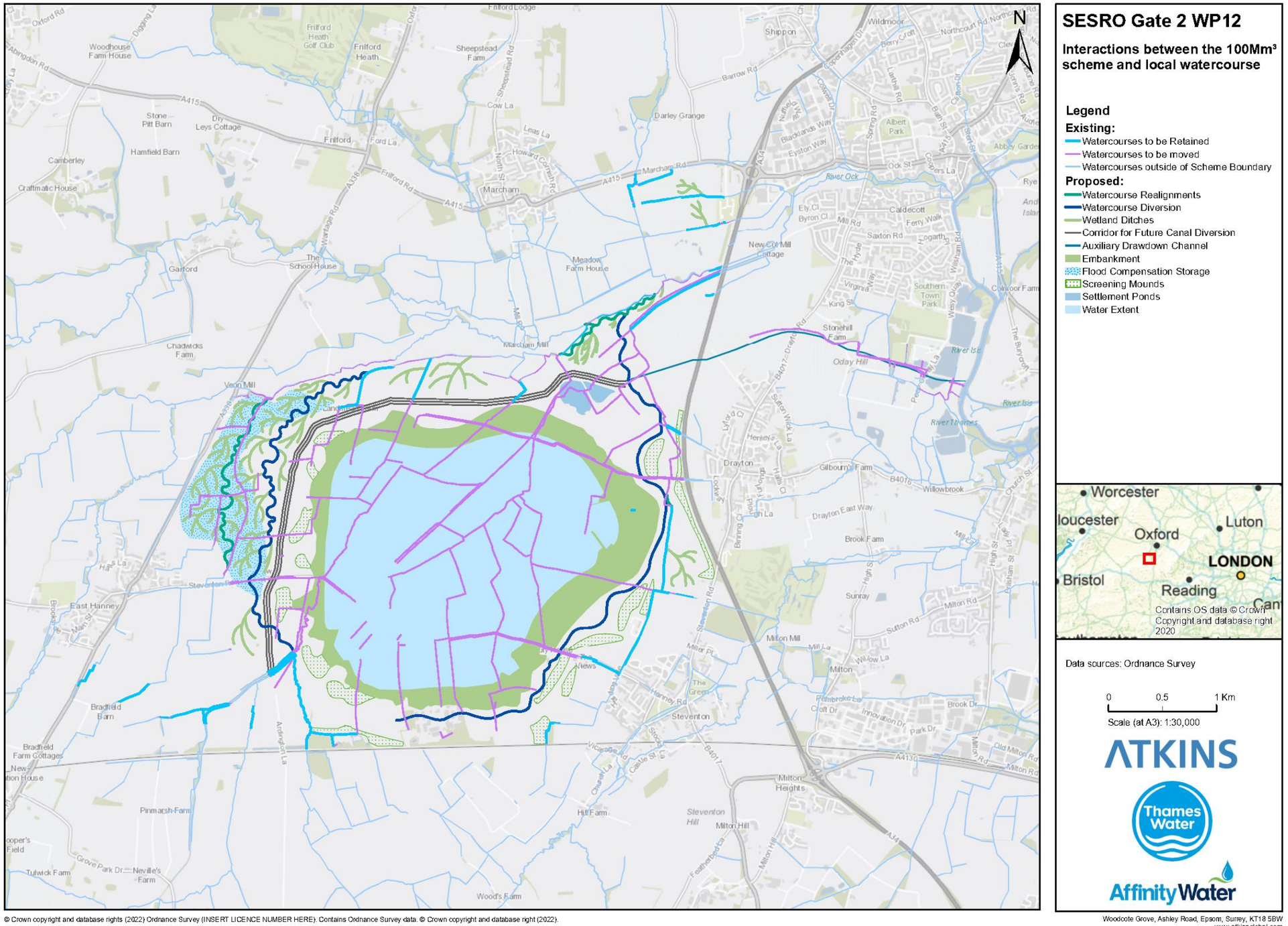
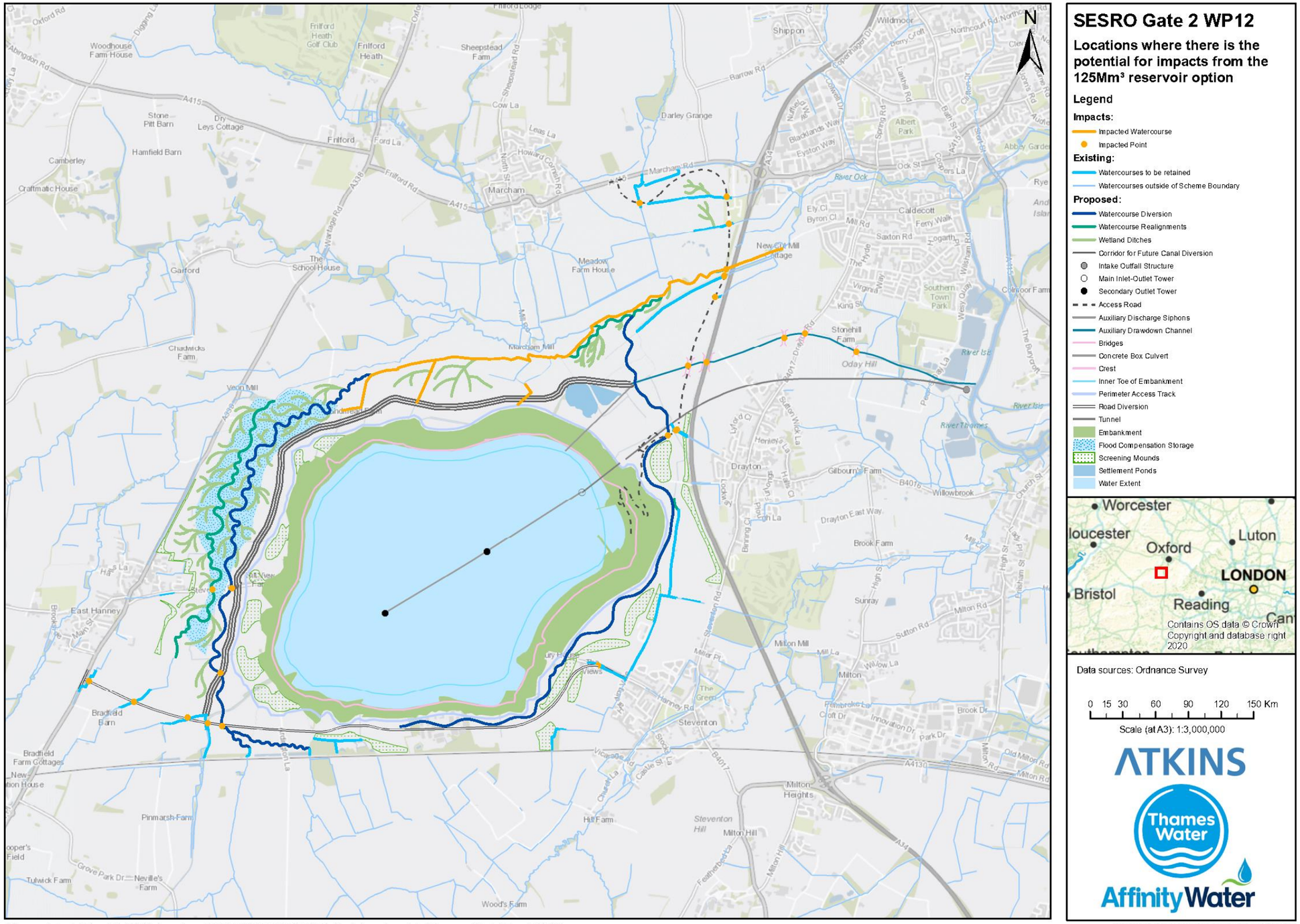


Figure 5.4 Interactions between the 100 Mm³ option and local watercourses



SESRO Gate 2 WP12

Locations where there is the potential for impacts from the 125Mm³ reservoir option

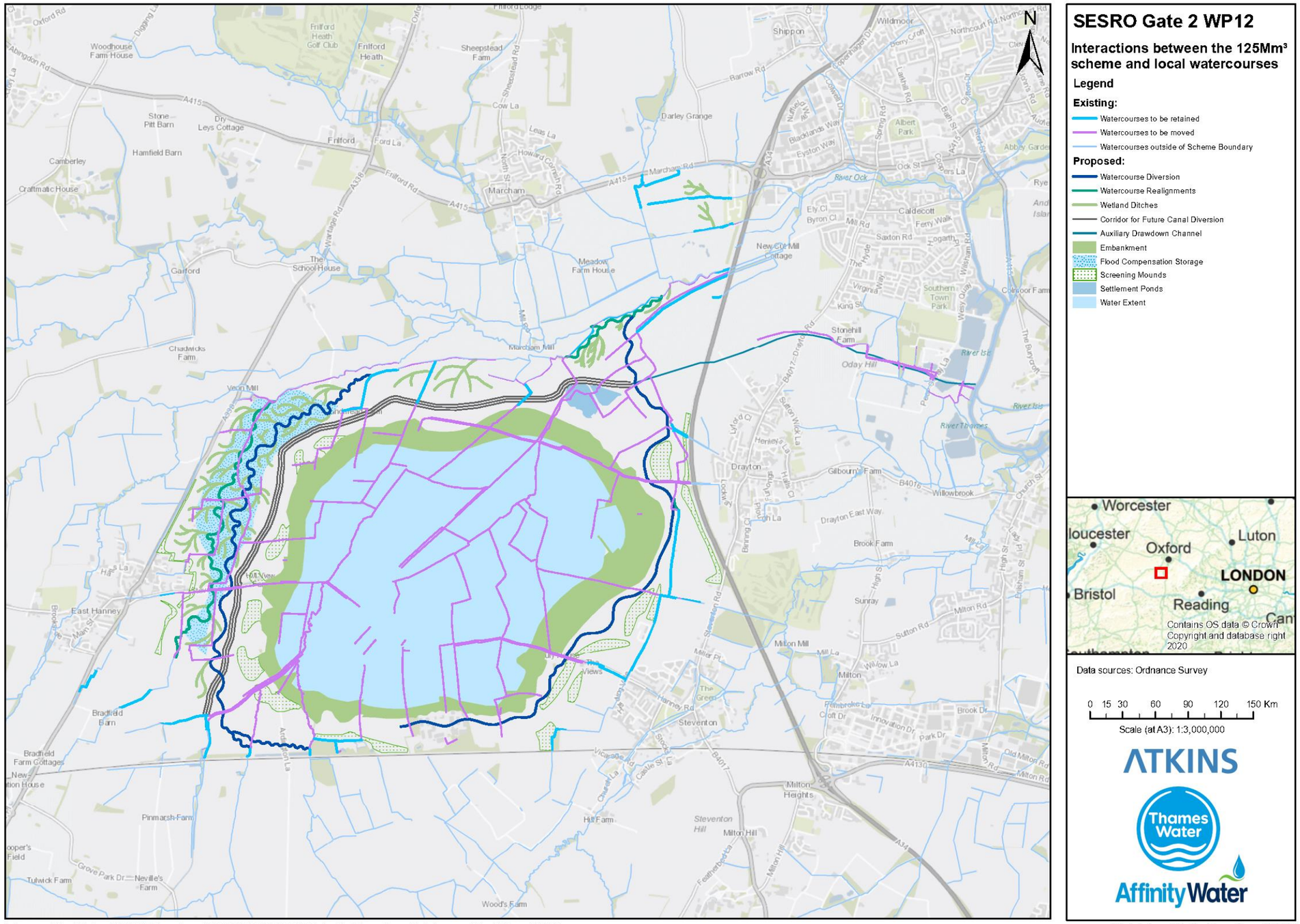
Legend

Impacts:
- Impacted Watercourse
- Impacted Point

Existing:
- Watercourses to be retained
- Watercourses outside of Scheme Boundary

Proposed:
- Watercourse Diversion
- Watercourse Realignments
- Wetland Ditches
- Corridor for Future Canal Diversion
- Intake Outfall Structure
- Main Inlet-Outlet Tower
- Secondary Outlet Tower
- Access Road
- Auxiliary Discharge Siphons
- Auxiliary Drawdown Channel
- Bridges
- Concrete Box Culvert
- Crest
- Inner Toe of Embankment
- Perimeter Access Track
- Road Diversion
- Tunnel
- Embankment
- Flood Compensation Storage
- Screening Mounds
- Settlement Ponds
- Water Extent

Figure 5.5 Locations where there is the potential for impacts from the 125 Mm³ option



SESRO Gate 2 WP12

Interactions between the 125Mm³ scheme and local watercourses

Legend

Existing:

- Watercourses to be retained
- Watercourses to be moved
- Watercourses outside of Scheme Boundary

Proposed:

- Watercourse Diversion
- Watercourse Realignments
- Wetland Ditches
- Corridor for Future Canal Diversion
- Auxiliary Drawdown Channel
- Embankment
- Flood Compensation Storage
- Screening Mounds
- Settlement Ponds
- Water Extent

Figure 5.6 Interactions between the 125 Mm³ option and local watercourses

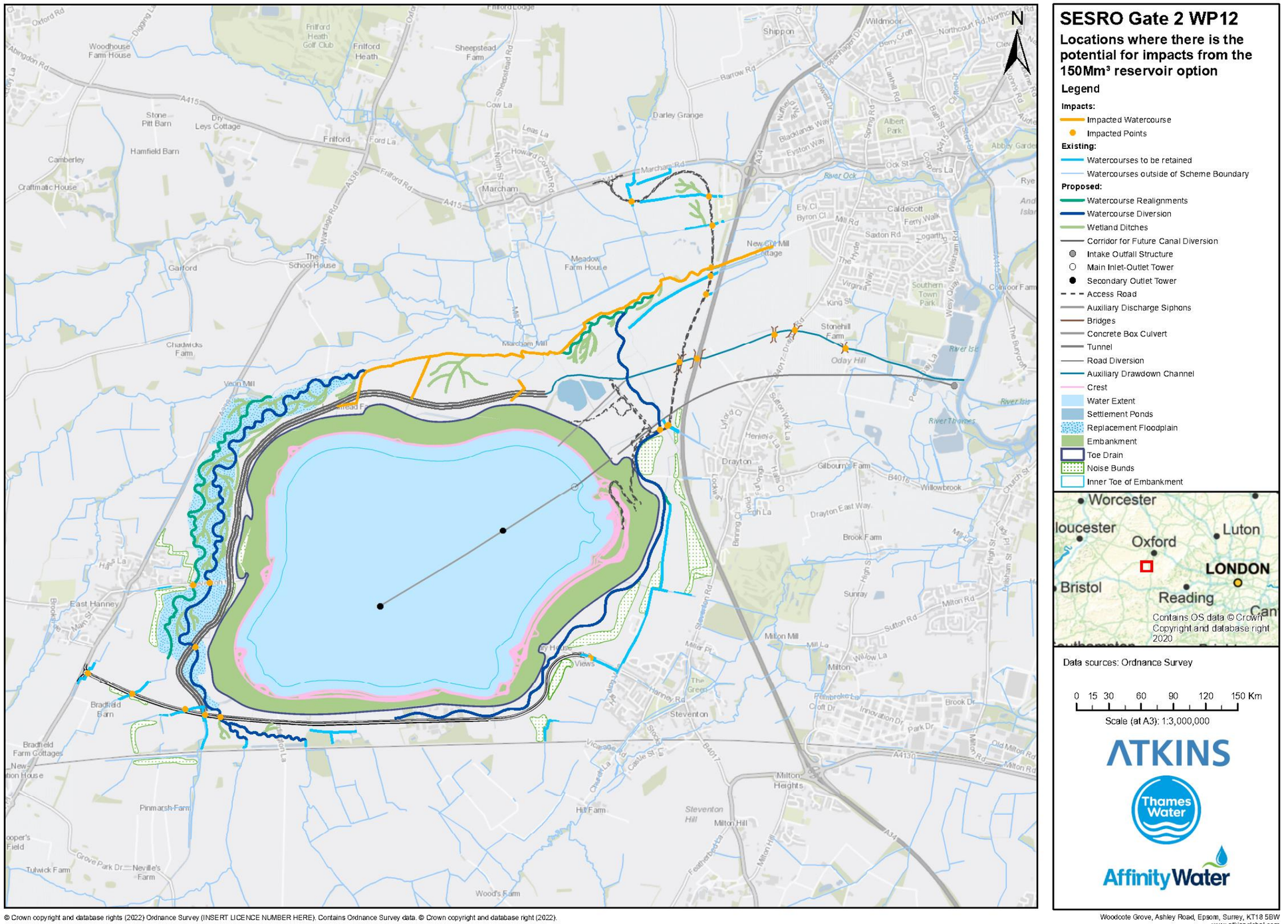


Figure 5.7 Locations where there is the potential for impacts from the 150 Mm³ option

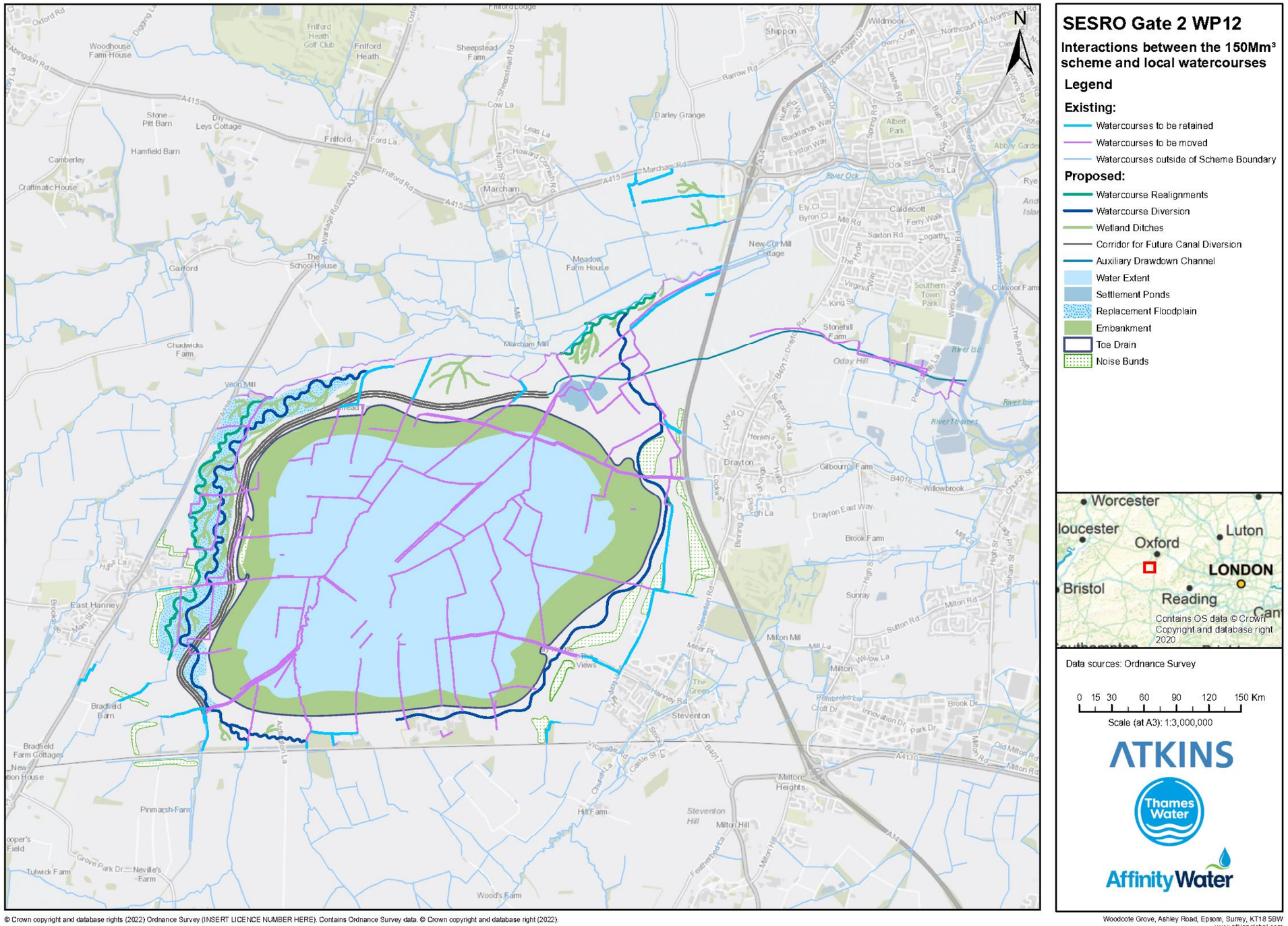


Figure 5.8 Interactions between the 150 Mm³ option and local watercourses

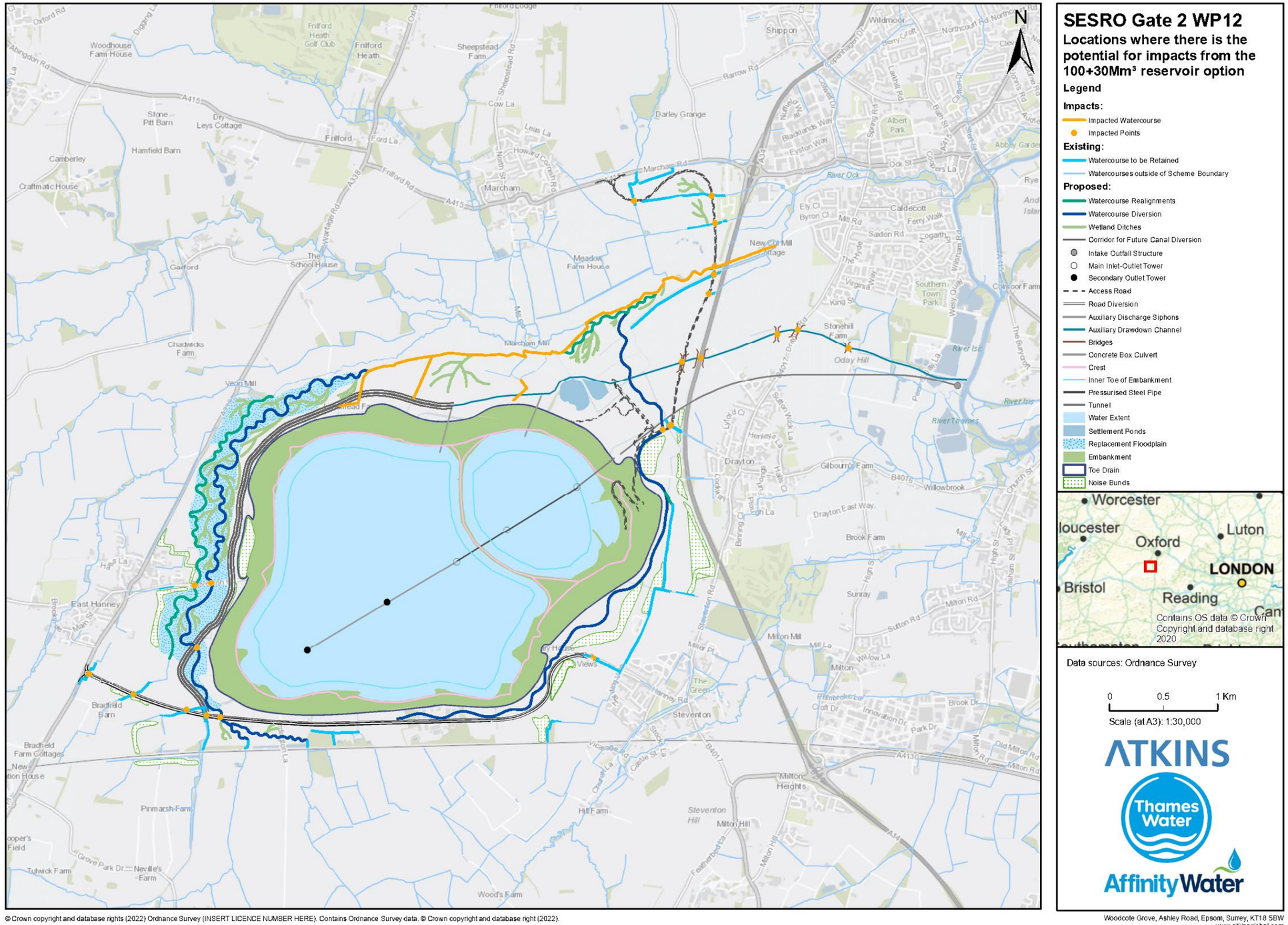


Figure 5.9 Locations where there is the potential for impacts from the 100+30 Mm³ option

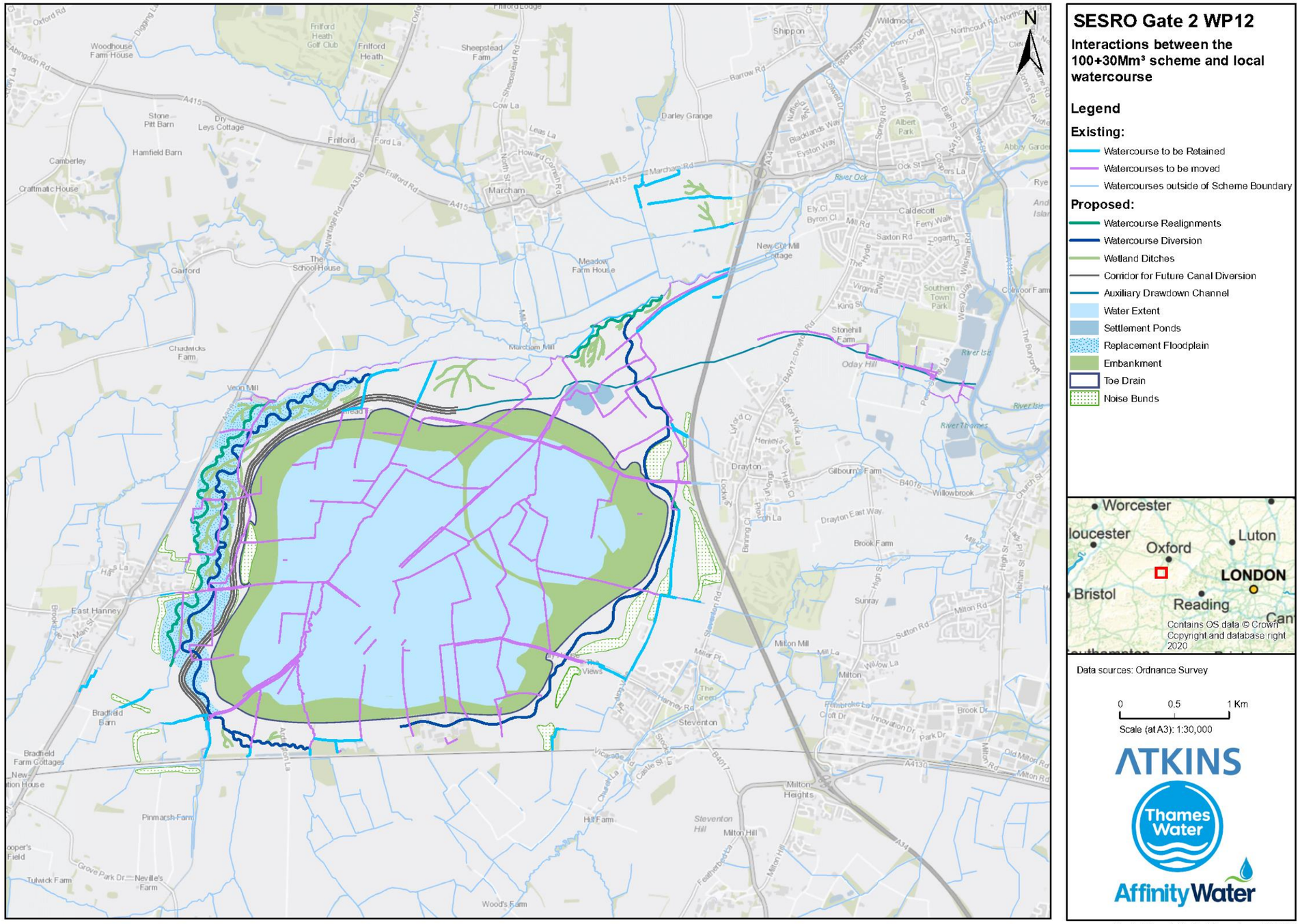


Figure 5.10 Interactions between the 100+30 Mm³ option and local watercourses

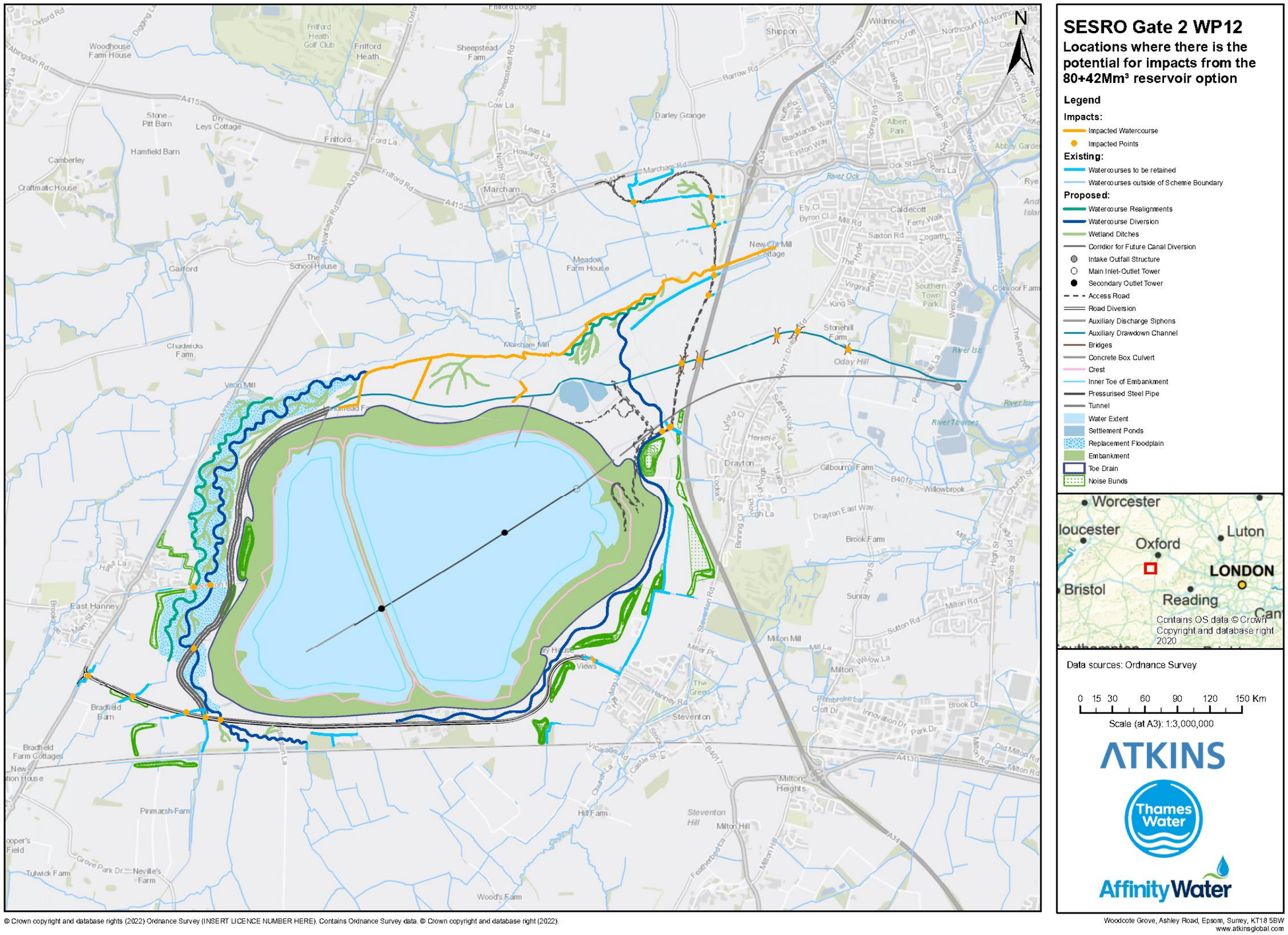


Figure 5.11 Locations where there is the potential for impacts from the 80+42 Mm3 option

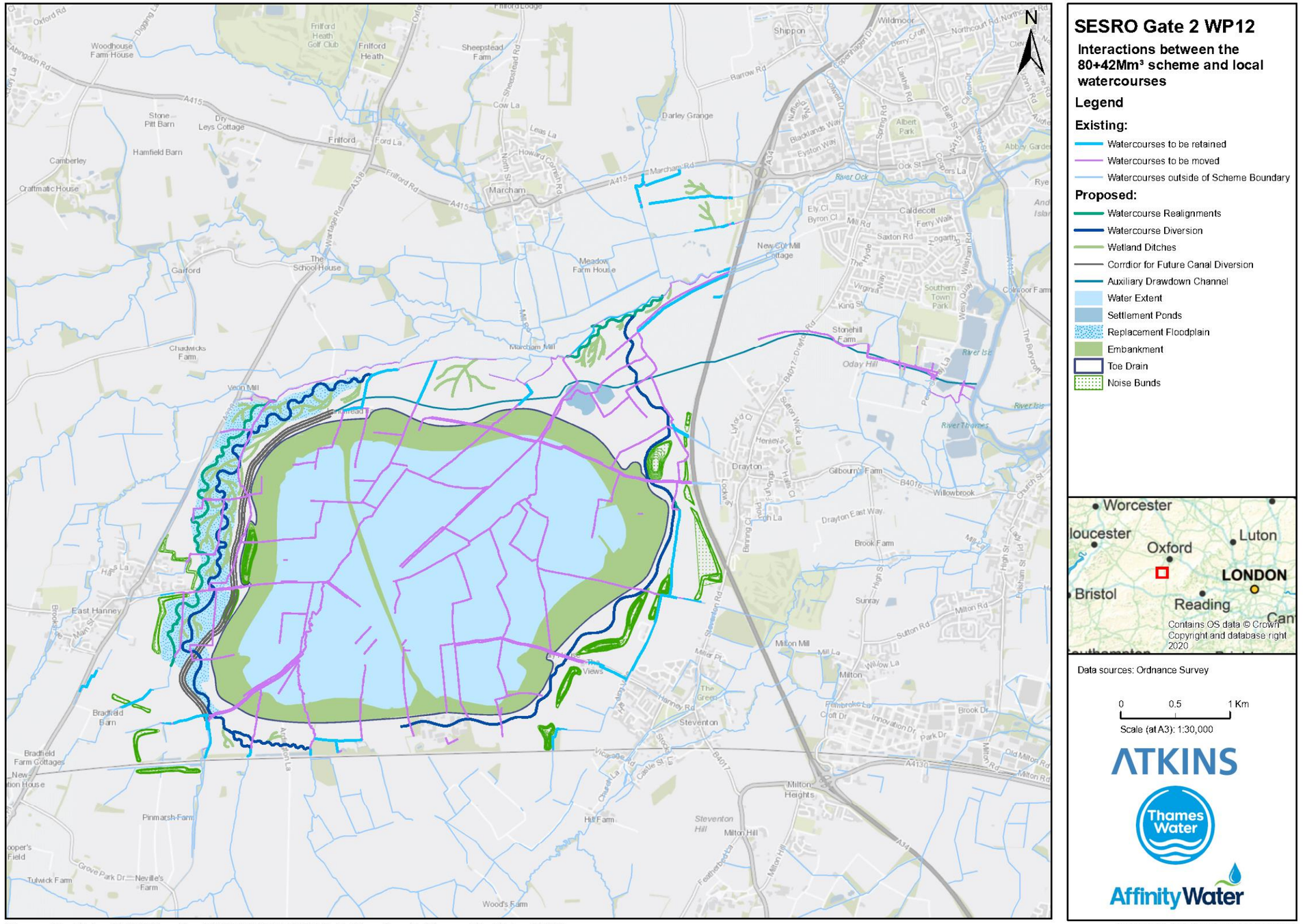


Figure 5.12 Interactions between the 80+42 Mm³ option and local watercourses

Table 5.15 Potential implications for the WFD water bodies of the scheme elements

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
Cow Common Brook and Portobello ditch	Construction/repair of new tunnels and conduits (Construction) Construction and presence of below ground structures (shaft/retaining wall) with associated dewatering, with no sensitive groundwater feature within 500 m (Construction and Operation)	Tunnel	All	The proposed tunnel route crosses the Main River Mere Dyke and the Eastern Watercourse Diversion in all six options.	There are two potential options of method used for a tunnel crossing a watercourse. As it is not yet known what method is most likely, both are considered. One option is to bore under the channel. This should have minimal impact on the watercourse but might not always be feasible. This is the current preferred option. The other option is to cut a section into the channel, lay the tunnel down and then reinstate the channel on top. This wouldl have temporary impacts but should not have permanent impacts, providing the channel is reinstated to a good enough standard, either like for like or creating an improvement in morphology and habitat.
	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment and Presence of new culvert, in headwaters or on drainage ditches (Operation)	Road Diversion	All	For all options the proposed road diversion crosses watercourses. The 75, 100 and 125 Mm³ options would cross seven watercourses including Cow Common Brook which is both a Main River and a WFD water body; Portobello Ditch which is a main river; the Eastern Watercourse Diversion; and four ordinary watercourses. The 150, 80+42 and 100+30 Mm³ options would crosssix watercourses including Cow Common Brook which is both a Main River and a WFD water body; Portobello Ditch which is a main river and four ordinary watercourses.	The potential impact of the crossings would depend on the type of structure used. A single, clear span bridge would have a lower impact than a box culvert. A Main River and/or WFD assessed watercourse would require a single-span bridge. A box culvert may be considered on smaller watercourses and ditches if the culvert is appropriately designed and mitigated. A box culvert may disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone. A clear span bridge would: shade the channel and riparian zone reducing

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
					photosynthetic ability. Depending on the restriction of each situation it can also impact on the morphology and hydrological regime, though less than with a culvert.
	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment (Operation)[13]	Canal diversion	All	The proposed canal diversion route has a varying number of crossings for the different options. All options include a crossing over the realigned Cow Common Brook which is a Main River and WFD water body (and forms part of the new WWD) and the original section of the Cow Common Brook. All but the 75, 125 and 100 Mm^3 option cross the Main River Landmead Ditch.	As much of the canal diversion shown in the design is only proposed to be left for potential future development, there would be limited direct impacts from leaving the space available. Only the crossing over the realigned Cow Common Brook would require a culvert and thus would require mitigation. Future design of the canal would need to consider WFD impacts.
	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment (Operation)[14]	Auxiliary Drawdown Channel	All	The proposed route for the Auxiliary Drawdown Channel on all reservoir options include one crossing over the Eastern Watercourse Diversion. All other watercourses would be diverted to join this watercourse by the crossing point.	The EWD would be diverted underneath the Auxiliary Drawdown Channel via a culvert. This would include a short loss in open channel but has the benefit of continuing the original flow path of these watercourses into the River Ock. Local mitigation would be required at the culvert to ensure it is still passable to fish.
	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment and Presence of new culvert, in headwaters or on drainage ditches (Operation)	Access Road	All	The proposed access road route crosses eight watercourses. All routes cross the River Ock, the Eastern Watercourse Diversion and the Auxiliary Drawdown Channel.	The potential impact of the crossings would depend on the type of structure used. A single-span bridge would have a lower impact than a box culvert. A Main River and/or WFD assessed watercourse would require a single-span bridge. A box culvert may be considered on smaller watercourses and ditches if the culvert is appropriately designed and mitigated.

[13] This category has been used in this case to cover the crossing of two watercourses.
[14] This category has been used in this case to cover the crossing of two watercourses.

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
					A box culvert would: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone. A clear span bridge would: shade the channel and riparian zone reducing photosynthetic ability. Depending on the restriction of each situation it can also impact on the morphology and hydrological regime, though less than with a culvert.
	Construction of new reservoir (in line/next to watercourse – within 500 m) (Construction) Presence of new reservoir or modified existing storage reservoir (Operation) Construction of reservoir (set back from watercourse) (Construction) [15] Creation of significant areas of riparian habitats (Construction) Minor habitat creation (Construction) Channel realignment with natural bed substrate and good riparian connections (Operation)	Reservoir footprint	All	75 Mm^3 Option: moving approximately 47 km of watercourse. 100+30 Mm^3 Option: moving approximately 58 km of watercourse. * 125 Mm^3 Option: moving approximately 58 km of watercourse. * 150 Mm^3 Option: moving approximately 58 km of watercourse. * 80+42 Mm^3 Option: moving approximately 58 km of watercourse. * 100 Mm^3 Option: moving approximately 53 km of watercourse. * *some of the realigned watercourse may also be in Childrey Brook and Norbrook at Common Barn water body. The river statistics for each option are shown in Table 5.16.	A large section of the main Cow Common Brook wouldbe diverted into the WWD. The channel would present a morphological improvement to the baseline over its realigned length. Following construction and diversion of water into the new WWD and the EWD, ecological recovery would be enhanced through planting and translocation of macro-invertebrates. Fish surveys and translocation would also be undertaken at the same time as the channels are plugged. Translocation would be undertaken after the flow is changed between the watercourses. These activities would shorten recovery time towards good status. The morphological template that would be constructed would already have a greater habitat heterogeneity (i.e. better hydromorphological condition) than a large proportion of the existing channels within the site footprint.

[15] This WRSE category has been used to represent loss of length or area of water bodies in absence of the right category being available. This is the case each time it is used in this assessment. Therefore, the actual impact we wish to describe is NOT set back from watercourse but the watercourse or water body itself.

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
					Preliminary modelling results using SAGIS (for more information see B1 Environmental Assessment Report (aquatic)) has suggested that as a result of the scheme footprint there could be reduced flow in the new WWD. However, this does not take into account any potential localised changes in the baseflow as localised changes in any groundwater could emerge elsewhere. This would need to be assessed further in subsequent project stages. In addition, it does not factor in how the WWD would be designed which would lead to benefits in the way water flows through this area maximising ecological enhancement.
	Transfer of water via a river, canal or aqueduct (Operation) Creation of significant areas of riparian habitats (Construction) Minor habitat creation (Construction) Channel realignment with natural bed substrate and good riparian connections (Operation)		All	Reduction in flow in the Main River Cow Common Brook and numerous ditches downstream of the proposed reservoir due to much of the water body catchment being within the reservoir footprint.	Preliminary modelling results using SAGIS (for more information see B1 Environmental Assessment Report (aquatic)) has suggested that as a result of the scheme footprint there could be reduced flow in the new WWD. However, this does not take into account any potential localised changes in the baseflow as localised changes in any groundwater could emerge elsewhere. This would need to be assessed further in in subsequent project stages. The new WWD would have a morphological improvement to the baseline over its whole realigned length so the impact from the reduction in flow would be mitigated for within the new design.
	Construction of reservoir (set back from watercourse) (Construction) Minor habitat creation (Construction)	Settlement Ponds	All	Diversion of approximately 1.2 km of watercourse for all options.	The settlement ponds would also provide some new still water habitat which would encourage new species to the area, different to those in the nearby watercourses. The length of any watercourse under the footprint

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
					would be mitigated for as part of the overall package of mitigation which includes diversions of both the WWD and the EWD.
	Construction of reservoir (set back from watercourse) (Construction)	Contractors site compound	All	Loss of approximately 0.8 km of watercourse for all options.	The length of any watercourse under the footprint wouldbe mitigated for as part of the overall package of mitigation which includes both the WWD and the EWD.
	Construction or modification of a new pumping station and/or intake from raw water (river or coastal waters)	Pumping station	All	New pumping station	No permanent effect anticipated.
	Construction of reservoir (set back from watercourse) (Construction)	Eastern and Western Watercourse Diversions	All	Diversion of approximately 3.5–5.5 km of watercourse for all options.	The watercourses under the footprint of the reservoir would be mitigated for by diversions which are incorporated into the WWD and the EWD. The morphological template that would be constructed would already have a greater habitat heterogeneity (i.e. better hydromorphological condition) than a large proportion of the existing channels within the site footprint leading to an improved ecological value.
Ock and Tributaries (Land Brook confluence to Thames)	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment and Presence of new culvert, in headwaters or on drainage ditches (Operation)	Access Road	All	All options include a crossing of the River Ock, which is a Main River and ditch MD7.	The potential impact of the crossings would depend on the type of structure used. A single-span bridge would have a lower impact than a box culvert. A Main River and/or WFD assessed watercourse would require a single-span bridge. A box culvert may be considered on smaller watercourses and ditches if the culvert is appropriately designed and mitigated. A box culvert would: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
					watercourse during construction; and reduce the extent of the riparian zone. A clear span bridge would: shade the channel and riparian zone reducing photosynthetic ability. Depending on the restriction of each situation it can also impact on the morphology and hydrological regime, though less than with a culvert.
	Transfer of water via a river, canal or aqueduct (Operation)	Western Watercourse Diversion	All	There could be an increase in flow in a short section of the Landmead Ditch form the confluence of the Western Watercourse Diversion, to its former confluence with the original Cow Common Brook.	The current channel has a capacity lower than could be required with this increase in flow by virtue of the WWD. However, preliminary SAGIS modelling suggests that there would overall be a lower flow in the WWD so this could balance out. Should capacity be exceeded, it would be more likely that localised flooding would happen onto the floodplain more often and for longer periods of time. This could have a positive or negative effect, depending on the floodplain habitat already available and land ownership. Mitigation could include local modifications to this reach should an impact be determined following further analysis. This would need to be assessed in subsequent project stages.
	Transfer of water via a river, canal or aqueduct (Operation)	Reservoir Footprint	All	There would be a slightly reduced flow in the River Ock downstream of the confluence with the Cow Common Brook due to a reduction in flow in the WWD because much of the catchment is within the reservoir footprint.	Preliminary modelling results using SAGIS (for more information see B1 Environmental Assessment Report (aquatic)) has suggested that as a result of the scheme footprint there could be reduced flow in the new WWD. However, the impact of this reduces with distance downstream and is further reduced after the confluence with the River Ock. It also does not take into account any potential localised changes in the

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
					baseflow as localised changes in any groundwater could emerge elsewhere. The level of the hydrological/hydrogeological changes are currently uncertain, it would need to be looked at in more detail and quantified as part of subsequent project stages.
Sandford Brook (Source to Ock)	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment and Presence of new culvert, in headwaters or on drainage ditches (Operation)	Access road	All	The proposed access road route for all options crosses the watercourse Sandford Brook (a Main River) twice and ditch SB1.	The potential impact of the crossings would depend on the type of structure used. A single-span bridge would have a lower impact than a box culvert. A Main River and/or WFD assessed watercourse would require a single-span bridge. A box culvert may be considered on smaller watercourses and ditches if the culvert is appropriately designed and mitigated. A box culvert would: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone. A clear span bridge would: shade the channel and riparian zone reducing photosynthetic ability. Depending on the restriction of each situation it can also impact on the morphology and hydrological regime, though less than with a culvert.
Thames (Evenlode to Thame)	Construction/repair of new tunnels and conduits (Construction) Construction and presence of below ground structures (shaft/retaining wall) with associated dewatering, with no sensitive groundwater	Tunnel	All	The proposed tunnel crosses the Oday Ditches under all options. These ditches all flow westwards and join the River Thames directly.	There are two potential options of method used for a tunnel crossing a watercourse. As it is not yet known what method is most likely, both are considered. One option is to bore under the channel. This should have minimal

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
	feature within 500m (Construction and Operation)				impact on the watercourse but might not always be feasible. The other option is to cut a section into the channel, lay the tunnel down and then reinstate the channel on top. This would have temporary impacts but should not have permanent impacts, providing the channel is reinstated to a good enough standard, either like for like or creating an improvement in morphology and habitat.
	Construction of reservoir (set back from watercourse) (Construction) Creation of significant areas of riparian habitats (Construction) Minor habitat creation (Construction) Channel realignment with artificial banks/base	Auxiliary Drawdown Channel	All	Loss of approximately 2 km of watercourse for all options.	The small ordinary watercourses would be lost at this location as they would be directly under the proposed footprint of the Auxiliary Drawdown Channel. The primary impact wouldbe the loss of riparian zone, planform, floodplain, sediment continuity and aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to loss of abundance and species. The construction of the new Auxiliary Drawdown Channel gives the opportunity to create a new channel with the creation of some still water[16] and riparian habitat. However, due to the use of this channel for navigation, with locks to be added, some of the bank and bed may be artificial. The loss of the small watercourses would be mitigated for through the creation of a greater length of watercourses across the whole proposed scheme in all options.

[16] It is assumed at this stage that the Auxiliary Drawdown Channel would be a non-flowing water body which is in continuity with the River Thames. It would form part of the Berks and Wilts Canal if this is pursued at a later stage and would be constructed up to the reservoir footprint as part of the proposed scheme.

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
	Construction of a new outfall structure to a watercourse, coastal waters, transitional waters or reservoir (Construction) Maintenance and use of river, coastal or transitional water outfall (Operation) Construction or modification of a new pumping station and/or intake from raw water (river or coastal waters) (Construction) Maintenance and use of river intakes (Operation) Trenching and laying of pipelines within the interfluves of a catchment (no watercourse crossings) (Construction) Maintenance of pipelines (Operation) Draining of pipelines for maintenance (Operation)	Intake and outfall structure	All	New intake and outfall structure probably on the bank of the River Thames. Exact details of structure unknown. May require some bank protection.	New structure on the bank of the River Thames would result in the loss of some riparian habitat and potentially marginal habitat. If bank protection were required there would be a localised impact on the geomorphology of the channel but it would be negligible at a water body scale and could eb mitigated for elsewhere within the site.
	High volume discharge of water with a quality element of the same WFD status as the receiving water body (Operation) New or increased surface water abstraction (Operation) Transfer of water via a river, canal or aqueduct (Operation)	Reservoir water intake and outfall	All	Change in volumes of water for all options. Water taken from river during higher flows to fill reservoir and put into the Thames during lower flows.	Changes in depth along the River Thames as a result of the triggered releases from SESRO have been simulated in the 1D Infoworks model. Depths are based on cross sectional averages and show an increase of ~25 cm during the SESRO release period within the first 10 km downstream and ~15 cm a further 30 km downstream (for more information see B1 Environmental Assessment Report (aquatic)). This is within the normal operational range of 25–30 cm. Overall, the water quality modelling immediately downstream of the SESRO discharge has shown to improve as a result of the discharge of water from SESRO (for more information see B1 Environmental Assessment Report (aquatic)). The only slight decline was a local change

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
					in ammonia levels but that has not changed any water quality elements from a WFD perspective and thus is considered compliant. Changes in water flow and levels in the Thames could have an impact on marginal zones and floodplain habitat as it could reduce the regularity and longevity of habitats being exposed and inundated, respectively. This may reduce the biodiversity of the marginal, riparian and floodplain habitats as well as having impacts to fish habitat and migration. If these impacts are realised then they could be mitigated against. There are some potentials for benefits during low flows as it could reduce the vulnerability of habitats to low flow conditions. At this stage, it is not certain what the level of impact would be, both positive and negative. This is being report in the B1 Environmental Assessment Report and would be assessed further in subsequent project stages.
Childrey Brook and Norbrook at Common Barn	Construction of new reservoir (in line/next to watercourse – within 500 m) Presence of new reservoir or modified existing storage reservoir (Operation) Construction of reservoir (set back from watercourse) (Construction) Creation of significant areas of riparian habitats (Construction) Minor habitat creation (Construction) Channel realignment with natural bed substrate and good riparian connections (Operation)	Reservoir footprint	125 Mm^3 150 Mm^3 80+42 Mm^3 100+30 Mm^3	Diversions of watercourses in all but 100 Mm^3 and 75 Mm^3 options.	The morphological form and functioning of the East Hanney Ditch would be improved in all options thus any impacts would be mitigated against.

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment and Presence of new culvert, in headwaters or on drainage ditches (Operation)	Road Diversion	All	The proposed road diversion route crosses East Hanney Ditch, an ordinary watercourse at this point, in all options.	The potential impact of the crossings would depend on the type of structure used. A single-span bridge would have a lower impact than a box culvert. A Main River and/or WFD assessed watercourse would require a single-span bridge. A box culvert may be considered on smaller watercourses and ditches if the culvert is appropriately designed and mitigated. There is general presumption against culverts from a WFD perspective. A box culvert could: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone. A clear span bridge could: shade the channel and riparian zone reducing photosynthetic ability. Depending on the restriction of each situation it can also impact on the morphology and hydrological regime, though less than with a culvert.
	Construction of reservoir (set back from watercourse) (Construction)	Western Watercourse Diversion	All	Diversions of watercourses for all options.	The watercourses under the footprint of the scheme or through localised changes would be mitigated for through the creation of a greater length of watercourse in all cases through diversions incorporated in the EWD and the WWD. All the watercourses would be improved through the morphological form and functioning which would ultimately lead to improved ecology, over a time period of 2–2.5 years.
Thames Wallingford to Caversham		Reservoir water intake and outfall	All	Change in volumes of water for all options. Water taken from river	Changes in depth along the River Thames as a result of the triggered

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
Thames (Reading to Cookham)	Transfer of water via a river, canal or aqueduct (Operation)			during higher flows to fill reservoir and returned into the River Thames during lower flows.	releases from SESRO have been simulated in the 1D Infoworks model. Depths are based on cross sectional averages and show an increase of ~25 cm during the SESRO release period within the first 10 km downstream and ~15 cm a further 30 km downstream (for more information see B1 Environmental Assessment Report (aquatic)). Overall, the water quality modelling immediately downstream of the SESRO discharge has shown to improve as a result of the discharge of water from SESRO. The only slight decline was a local change in ammonia levels but that has not changed any water quality elements from a WFD perspective and thus is considered compliant (for more information see B1 Environmental Assessment Report (aquatic)). Changes in water flow and levels in the Thames could have an impact on marginal zones and floodplain habitat as it could reduce the regularity and longevity of habitats being exposed and inundated, respectively. This may reduce the biodiversity of the marginal, riparian and floodplain habitats as well as having impacts to fish habitat and migration. If these impacts are realised, then they could be mitigated against. There is some potential for benefits during low flows as it could reduce the vulnerability of habitats to low flow conditions. At this stage, it is not certain what the level of impact would be, both positive and negative. This is being report in the B1 Environmental
Thames (Cookham to Egham)					
Thames (Egham to Teddington					

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
					Assessment Report and would be assessed further in subsequent project stages.

Table 5.16 River statistics across each option (measurements in km)

	75 Mm³	100 Mm³	125 Mm³	150 Mm³	100 + 30 Mm³	84 + 24 Mm³
Baseline	16.43	16.43	15.59	14.14	16.43	16.43
Lost	13.76	13.76	13.01	9.34	13.76	14.05
Retained	2.68	2.68	2.59	4.79	2.68	2.39
Enhanced	16.54	16.14	13.74	12.94	16.54	16.54
Total	19.22	18.82	16.33	17.73	19.22	18.93
Change (length) – gain	**2.79**	**2.39**	**0.74**	**3.59**	**2.79**	**2.50**
Change (%) – gain	**19.63%**	**17.64%**	**8.19%**	**27.02%**	**19.63%**	**18.41%**

5.2.1.4 Operation

5.50 Following construction and diversion of water into the new WWD and the EWD, ecological recovery would be enhanced through planting and translocation of macro-invertebrates. These activities would shorten recovery time towards good status. The morphological template that would be constructed would already have a greater habitat heterogeneity (i.e. better hydromorphological condition) than a large proportion of the existing channels within the site footprint. Therefore, the time required for the habitat to evolve to a status that is at least equivalent to the baseline channel condition, and then moving past that towards a better status, would be optimised.

5.51 It is envisaged that within two growing seasons the macrophytes and macroinvertebrate communities could evolve to a better status relative to the existing water bodies. One of the key constraining factors of the existing water bodies is the fact that they have been heavily modified, largely through straightening (for more information see B1 Environmental Assessment Report (aquatic)). Along with the fact that these water bodies have a low stream power means that natural recovery to a good status would take a very long time assuming that no further management interventions are undertaken. As a result, it is envisaged that if construction of the morphologically enhanced, diverted channels, is undertaken through 2029 and into early 2030 than by Autumn 2031 the habitats would be at a status that at least matches the existing watercourse habitats within the scheme footprint. The improved hydromorphological structure would then facilitate further ecological improvements thereafter. Montioring and any maintenance of these watercourses could be undertaken during the remainder of the reservoir construction period as necessary.

5.52 The fact that the reservoir would sit on around 50% of the Cow Common Brook and Portobello Ditch catchment means that there would be a significant land use change

in the lower part of the catchment. The agriculture and rural land management that had been identified for as a RNAG could be significantly reduced raising the possibility of a reduction in nutrient levels and potential improvements to water quality. This is likely to be less significant on East Hanney Ditch but still possible due to the improvement works on the East Hanney Ditch and changes in the vicinity of the western embankment. This is discussed further in chapter 6.3.8. The river and wetland mosaic around the WWD would yield continued improvements to the ecological status and has the potential to lead to some additional improvements in water quality.

5.2.2 In-combination

5.53 There has been a significant change in the proposed watercourse alignments in Gate 2 following further design work. The updated design shows the East Hanney Ditch joining Childrey Brook at the same location as it currently does. However, Cow Common Brook instead of joining East Hanney Ditch (as it did in Gate 1) flows further around to join Landmead Ditch which is on the same watercourse that it currently joins only around 1–1.5 km upstream. The change reduces the extent of flow changes within the overall system particularly removing the potential for additional flow to go into the Childrey Brook. One of the remaining uncertainties for the Cow Common Brook and Portobello Ditch water body is how the local hydrology would change as a result of the footprint of the reservoir since a significant portion of the contributing catchment would now feed directly into the River Thames instead of the River Ock catchment. A preliminary assessment of this element is reviewed in Chapter 6.3.8. The impacts of this would need to be further assessed in the consenting process to yield greater certainty around the impacts.

5.2.3 Level 1 – basic screening conclusions

5.54 The Level 1 – basic screening of the ACWG assessment has identified five surface water bodies which have an activity impact score greater than 1 (see section 3.4.1 for scoring justifications including use of professional judgement) for all six options: Ock and tributaries (Land Brook confluence to Thames) (GB106039023430); Cow Common Brook and Portobello Ditch (GB106039023360); Childrey Brook and Norbrook at Common Barn (GB106039023380); Sandford Brook (Source to Ock) (GB106039023410); Thames (Evenlode to Thame) (GB106039030334). These water bodies would therefore be taken through to Level 2.

5.55 For the following five water bodies, it was determined that the Scheme would either have no permanent impact or had an impact score of 1 (see section 3.4.1 for scoring justifications including use of professional judgement) for all six options: Ginge Brook and Mill Brook (GB106039023660); Thames Wallingford to Caversham (GB106039030331); Thames (Reading to Cookham) (GB106039023233); Thames (Cookham to Eghahm) (GB106039023231); and Thames (Egham to Teddington) (GB106039023232). These water bodies therefore do not require further assessment as part of Level 2. Although the four Thames water bodies scored 1 in the Level 1 ACWG assessment, this is a product of the ACWG assessment process, and they

cannot be credibly screened out with existing information. They would therefore still be taken forward to subsequent project stages. Ginge Brook and Mill Brook (GB106039023660) water body is screened out, but should any changes made in the proposed scheme in the future that would change this potential impact it would need to be re-examined. This also applies to any water bodies in the vicinity of the scheme.

5.56 It is assumed that good practice measures are adhered to during construction of the reservoir and the associated works. Works would be undertaken in line with the requirements set out within relevant PPGs and GPPs (GPP1 General Guide to Prevention of Pollution;[17] GPP5 Works and maintenance in or near water;[18] GPP21 pollution incident response planning;[19] PPG6 working at construction and demolition sites;[20] GPP3 use and design of oil separators in surface water drainage systems;[21] and GPP5 Maintenance of structures over water.[18] With these mitigations in place all construction activities associated with the options are likely to be temporary and therefore would not require further assessment as part of the WFD compliance assessment process.

[17] NRW/NIEA/SEPA, 2020, Understanding your environmental responsibilities – good environmental practices GPP 1. A basic introduction to pollution prevention, with signposts to other PPGs and publications.
[18] NRW/NIEA/SEPA, 2018, Works and maintenance in or near water: GPP 5.
[19] NRW/NIEA/SEPA, 2017, Pollution incident response planning: GPP 21.
[20] EA/NIEA/SEPA, 2012, Working at construction and demolition sites: PPG 6.
[21] NRW/NIEA/SEPA, 2022, Use and design of oil separators in surface water drainage systems: GPP 3.

6. Level 2 – Detailed screening

6.1 Introduction

6.1 This section provides the outcome from the Gate 2 ACWG Level 2 – detailed screening assessment, and is based on the design information available at the time of writing. The assessment would be undertaken again in subsequent project stages and based on updated design and baseline information as appropriate. The outcomes of the impact assessment presented in this section are, therefore, preliminary and subject to change.

6.2 This section will outline the potential impacts associated with the assigned activities as outlined in the ACWG Level 2 – detailed screening assessment methodology.

6.3 Extensive site visits have not been undertaken for this Gate 2 assessment, therefore, the Technical Supporting Document B1, Environmental Appraisal Report (aquatic) for each of the options should be read in tandem to this assessment to understand the physical environment, water quality and aquatic ecology information and assessments that underpin the WFD compliance assessment.

6.4 Due to access constraints, the only site visit was undertaken on 8th and 9th November 2021 and was restricted to public footpaths. As a result, the locations along the channels potentially impacted by the scheme which could be visited were limited to where they could be accessed from public footpaths. This means that although some of the details of the channels are still unknown, there is now some information on the geomorphology and the habitats available in these watercourses at a water body scale to add to the baseline information obtained through desk-based review (see B1 Environmental Assessment Report (aquatic)).

6.2 Confidence

6.5 As part of the ACWG methodology, a confidence level must be applied to the data and design details. As the data for WFD classifications and objectives are still in draft form (dRBMP3), and limited modelling or monitoring data is yet available for the sites, the confidence is set to Low. Due to the stage in the design process, Gate 2, there are still significant design assumptions associated with all options. Therefore, design confidence has also been set to Low.

6.3 Surface water findings

6.6 This section provides a summary of the site baseline for the catchment containing the ten WFD water bodies. The baseline for each of the WFD water bodies (in terms of WFD status) has been provided in Chapter 5. The Gate 2 Technical Annex B1 Environmental Assessment Report (aquatic) provides the supporting physical environment, water quality and aquatic ecology information and assessments that underpin the WFD compliance assessment.

6.3.1 General description of the River Ock water environment

6.7 The site is in a lowland landscape primarily used for arable agriculture with some pasture and two large solar panel farms. The topography of the landscape is flat with subtle variation associated with catchment boundaries. There are various water courses of differing size and form within the boundary of the project. The position of these watercourses is shown previously in Figure 4.4. There are also several Main Rivers, which are described further below. The geology of the area within the footprint of the reservoir is Ampthill Clay Formation and Kimmeridge Clay Formation (undifferentiated) – Mudstone.

6.3.2 Cow Common Brook and Portobello Ditch

6.8 The Cow Common Brook (Table 6.1) flows through the centre of the site and is estimated from aerial imagery and Google Street View to be approximately 1.5 m wide and is 4.9 km long before flowing into the River Ock on the boundary of the scheme. For all of its course the river runs through arable land. The planform is predominantly straight as a result of substantial artificial geomorphic modification and has been since at least 1900 (National Library of Scotland, 2022). Only a section of approximately 600 m downstream of Hanney Road has been straightened since that time. Upstream of Hanney Road the planform has retained some sinuosity and so has the potential to be in reasonable morphological condition; the rest of the channel is likely to have limited geomorphic or ecological value on account of its apparently limited morphological and flow diversity and also displays more sparse riparian vegetation cover. The channel would be realigned and would form part of the WWD.

6.9 There are also ten ditches (CCB1-CCB10) that flow into the Cow Common Brook. These are all artificial manmade drainage ditches, forming field boundaries, with a straight planform. In total the length of Cow Common Brook and associated tributaries within the indicative location of SESRO is 15.8 km. These would all be realigned and would form part of the WWD.

6.10 Portobello Ditch, a tributary of the Cow Common Brook, is also a Main River and has also been straightened, with limited diversity. The heavily modified channel has steep banks indicating historic deepening. Overall, the channel it is also likely to provide limited aquatic value. This would be realigned and would form part of the WWD at which point the channel would be improved in terms of habitat diversity and morphology.

Table 6.1 Photos taken at locations along Cow Common Brook and Portobello Ditch during site visits on 8 and 9 November 2021

Site photos – Cow Common Brook	
Photo 1 – NGR SU 43335 92149	
Photo 2 – NGR SU 43525 92405	
Photo 3 – NGR SU 45279 94030	
Photo 4 – NGR SU 45287 94564	

Site photos – Portobello Ditch	
Photo 1 – NGR SU 43092 91633	
Photo 2 – NGR SU 42697 91941	

6.3.3 East Hanney Ditch

6.11 East Hanney Ditch (Table 6.2) is a tributary of the Childrey Brook and runs from the railway line to the south of the indicative scheme boundary to the confluence with Childrey Brook for a total length of 4.7 km, 3.7 km of which is within the indicative location of SESRO. For its entire course the ditch lacks any sinuosity and is likely to have been artificially created for agricultural drainage. For most of the ditch it maintains a thin strip of mature riparian vegetation down each bank. There are an additional seven manmade agricultural drainage ditches that flow into the East Hanney Ditch) for a total length of 4.2 km. East Hanney Ditch forms a large part of the Childrey Brook and Nor Brook at Common Barn water body and would be a part of the new WWD.

Table 6.2 Photos taken at locations on East Hanney Ditch within the scheme boundary during site visits on 8 and 9 November 2021

Site photos	
Photo 1 – NGR SU 42174 92168	
Photo 2- NGR SU 42389 92479	

6.3.4 Childrey Brook and River Ock

6.12 The River Ock (Table 6.3) is a tributary of the River Thames, with the confluence located in Abingdon, Oxfordshire, downstream of the study area. Childrey Brook (Table 6.3) joins the River Ock just upstream of Marcham Mill to the north of the main site. The sections of Childrey Brook and the River Ock within the indicative location of SESRO have retained much of their sinuosity, though the section of the Ock between Marcham Mill and the A34 have been straightened since the 1888–1913 OS map (National Library of Scotland, 2022). The section of the Ock either side of the A34 appears to have been straightened to power New Cut Mill sometime prior to the late 1800s. The Ock and Childrey Brook may, therefore, provide appreciable geomorphic and ecological value. The River Ock is approximately 10 m wide and Childrey Brook approximately 5 m wide.

Table 6.3 Photos taken at locations on Childrey Brook and the River Ock during site visits on 8 and 9 November 2021

Site photos	
Photo 1 – NGR SU 44829 95441 on Childrey Brook	
Photo 2 – NGR SU 44703 95709 on the River Ock	

6.3.5 Other notable ditches

6.13 The Mere Dyke (Table 6.4) is a Main River that forms the lower part of a system of drainage ditches draining into the River Ock and wouldl form part of the new WWD. All of the channels in the system are straightened and probably partially artificial, including the section that is Main River. Therefore, they are likely to provide limited aquatic value. Landmead Ditch (Table 6.4) and the Oday Ditches have a similarly straightened planform and are likely to be in a similarly poor condition. The same applies to Sandford Brook and Marcham Brook in the area in the indicative location

of SESRO, though they have a more natural and sinuous planform upstream of the A415.

Table 6.4 Photos taken at locations on other notable ditches within the scheme boundary during site visits on 8 and 9 November 2021

Site photos	
Photo 1 – NGR SU 46425 93907 on Mere Dyke	
Photo 2 – NGR SU 44065 94735 on Landmead Ditch	
Photo 3 – NGR SU 48630 95343 on Oday Ditches	

6.3.6 General description of the River Thames water environment

6.14 The River Thames at the location near to the site, has retained some of its sinuosity although the river is maintained for navigation, so the channel is comparatively heavily managed from a level perspective. There are reasonable widths of riparian and marginal zones of the river. Typical photos are shown in Table 6.5. In this area, the channel is approximately 50–60 m wide. Just downstream of the proposed intake/outfall structure site the River Thames splits for a short distance some of the water going down Culham Cut on which there is a lock used to navigate past weirs on the main Thames. These weirs help retain water levels for navigation which also impacts on the geomorphology of the Thames upstream, ponding the river more than would be natural. The location around these weirs is an important local feature known as Sutton Pools.

Table 6.5 Photos taken at locations on River Thames during site visit on 9 November 2021

Site photos	
Photo 1 – Typical reach photo	
Photo 2 – Typical reach photo	

6.3.7 Designated Sites

6.15 There are no statutory or non-statutory designated sites within the site area, although the whole local area is a nitrate vulnerable zone, a drinking water safeguard zone (surface water) and most of the area east of the A34 is a Drinking Water Protected Area (Surface Water). The site is in the impact zone for three different Sites of Special Scientific Interest (SSSIs), all of which are impacted by water levels in the adjacent watercourses. These are Barrow Farm Fen SSSI which is upstream of the site on Sandford Brook, Frilford Heath Ponds and Fens SSSI which is upstream on Marcham Brook, and Culham Brake SSSI which is adjacent to the River Thames.

6.3.8 SESRO water quality modelling

6.3.8.1 Overview

6.16 Further detail on water quality modelling presented in this section is provided in Technical Annex B1, Environmental Appraisal Report (aquatic) and its appendices.

6.3.8.2 River Thames

6.17 WFD compliance was assessed by linking water quality models for the reservoir with an Infoworks model of the River Thames. Inputs of algae to the river were derived from the PROTECH reservoir model run by Centre of Ecology and Hydrology (CEH), temperature inputs were based on Computational Fluid Dynamics (CFD) reservoir modelling and inputs of other chemicals were output from the Intermediate Reservoir Water Quality model, developed by Atkins. All these models take the time series inflows and outflows, to and from SESRO, from the Pywr water resources model and were run for modelling periods representing moderately dry, drought and extreme drought conditions (derived from stochastic hydrology time series). SESRO has been modelled in Pywr with a storage of 150 Mm^3 which has a maximum discharge to the River Thames at Culham of 321 Ml/d. The simulated discharge was reduced by 2% before it is input to the River Thames to account for potential losses along the river itself. The timing of the releases from SESRO were determined by Pywr and are triggered at Drought Event Level 1 (DEL1). This occurs when either London reservoir storage as represented in the Pywr model falls below Level 1 of the Lower Thames Control Diagram (LTCD), or flows on the River Thames at Teddington fall below 3,000 Ml/d, as a 10-day rolling average.

6.18 Changes in depth along the River Thames as a result of the triggered releases from SESRO have been simulated in the 1D Infoworks model. Depths are based on cross sectional averages and show an increase of ~25 cm during the SESRO release period within the first 10 km downstream and ~15 cm a further 30 km downstream. This is in context of a level controlled system and does not necessarily take account of local operating procedures, thus needs validation during subsequent project stages.

6.19 Changes in water quality in the River Thames that result from SESRO within the modelling system are the result of a number of key processes: 1) differences in water quality between reservoir and river, 2) changes in dilution downstream of the inputs

from SESRO, and 3) changes in within river processes that result from changes in river velocity and temperature. Differences in water quality and reservoir are, in turn, the result of, 1) mixing and storage on water input from the Thames, 2) processes that reduce concentration within the reservoir by settling and degradation, 3) the timing of inputs to the reservoir in relation to concentrations at the intake, 4) and biological processes in the reservoir that increase chemical concentrations, e.g. algal growth.

6.20 It is also important to note that the hydrological conditions from these model runs are atypical and, therefore, likely to result in greater differences between the pre and post SESRO conditions in relation to WFD status than would occur in the long term over more average condition.

6.21 Overall, the water quality immediately downstream of the SESRO discharge has shown to improve as a result of the discharge of water from SESRO. The only slight decline was a local change in ammonia levels but that has not changed any water quality elements from a WFD perspective and thus is considered compliant as the WFD status remains 'High'.

6.3.8.3 River Ock and tributaries

6.22 An existing SAGIS-SIMCAT model (as used by the Environment Agency for PR19) was modified to assess water quality impacts of the changes to the river channels and their catchment that would result from the development of SESRO (150 Mm^3 design option). The key changes were the replacement of part of the Cow Common Brook catchment with the open water area of the reservoir, along with the reservoir embankment, and the routing of the existing Cow Common Brook into a new river channel to the west of the reservoir, plus a new channel to the east that would receive part of the flow that currently drains into the Cow Common Brook.

6.23 Comparison of modelled river water quality was made before and after the development of SESRO at the bottom of the Childrey Brook, immediately upstream of the confluence between the River Ock and the River Thames, and between the bottom end of the existing Cow Common Brook and bottom end of the new diverted Cow Common Brook (western diversion). Despite small reductions in river flow at all three locations due to the loss of water to the reservoir, impacts on water quality were small.

6.24 Water quality in the River Ock upstream of the confluence with the River Thames showed no changes or a slight improvement in water quality for the modelled chemicals (Ammonia, BOD, Orthophosphate, Dissolved Oxygen, Nitrate). An improvement for all chemicals was also shown, comparing the bottom end of the new and old Cow Common Brook. The bottom end of the Childrey Brook, however, showed a slight increase in ammonia and phosphate because some of the flow that currently drains into the brook would be diverted by the new western diversion to join the River Ock further downstream via the Landmead Ditch. This reduces dilution of upstream point source inputs (including Wantage swage works) resulting of this change over a short section of channel. The Landmead Ditch itself is considered to

benefit in terms of future flows. For all chemicals, however, the change is relatively small (less than 10%) and there is no change in WFD class.

6.4 Outcomes of the Level 2 – detailed screening assessment

6.4.1 Overview

6.25 This section provides the outcome from the ACWG Level 2 assessment. The ACWG template Level 2 assessment comprises the following worksheets completed by Atkins (Appendix A):

- Worksheet 4 "Assign Level2 WB Impacts" – these are the specific activities to be assessed per water body. For consistency, these have been selected as those reported in worksheet "2. Level 1 activities" and set out in Section 4.
- Worksheet 5 "Level 2 assessment template" – a copy of this template has been set out for each of the water bodies carried forward to the Level 2 assessment and these are renamed as the water body ID code.
- A third worksheet "6. Level 2 summary" is auto-generated by the template to summarise the per water body level 2 assessments.

6.26 Using the information presented in the spreadsheets, a narrative description of the WFD compliance assessment for each grouping is provided below. In particular, the narrative provides information on the confidence in the assessment – the data confidence and the design certainty. Where the assessment reports the potential for WFD objective non-compliance, additional mitigation actions that may reduce this potential and lead to WFD compliance is indicated in the narrative summary. The level of assessment is suitable for this stage of the RAPID process. The assessments undertaken to date will be used to support the full WFD assessment which would be required at the respective planning stage. At this stage, the full WFD screening, scoping and impact assessment would be undertaken.

6.4.2 Summary of Findings

6.27 Table 6.6 illustrates how the water bodies would be impacted following a Level 2 assessment. There are two water bodies that have a maximum score of 3 prior to mitigation in at least some of the options, namely:

- Childrey Brook and Norbrook at Common Barn (GB106039023380) (150, 30+100, 80+42 Mm^3); and
- Cow Common Brook and Portobello Ditch (GB106039023360) (all options).

6.28 A score of 3 means that 'Impacts when taken on their own have the potential to lead to a significant effect and permanent deterioration of WFD status. Potential for high impact on preventing target WFD objectives from being achieved.' For Childrey Brook and Norbrook at Common Barn water body and Cow Common Brook and Portobello Ditch water bodies they are both at risk of failing WFD objective 1, prior

to any additional mitigation which is 'to prevent deterioration of any WFD element of any water body – in line with Regulation 13(2)a and 13(5)a.'

6.29 The reason for this risk for Cow Common Brook and Portobello Ditch (GB106039023360) is primarily a loss of physical habitat, which is a relatively large proportion of the overall catchment size of the current RBMP2 WFD water body shape and size. However, in Gate 2, mitigation has been developed to divert the Cow Common Brook around the footprint of the reservoir, improving the hydromorphological, ecological and water quality of the channel. This would mitigate for the direct loss of channel length and habitat. Hydrological and water quality modelling also suggests that there is a small reduction in flow (less than 1% of the Q_{mean} flow at Sutton Courtenay) which has a localised knock-on impact on the water quality. This impact is judged to be insufficient to trigger a concern for WFD deterioration (change in ammonia and orthophosphate are both less than 10% -7% for ammonia and 9% for orthophosphate- with no change in predicted WFD class) and becomes imperceptible on the River Ock around Abingdon with impacts being diluted accordingly as a result of increased flow contribution from other tributaries. The score post mitigation is therefore still a 1, though this means that it would now be compliant with WFD.

6.30 Childrey Brook and Norbrook at Common Barn (GB106039023380) water body yields a score of 3 for three of the options, all which have the largest reservoir footprint (150 Mm^3, 30+100 Mm^3, and 80+42 Mm^3). This largest reservoir footprint sits on part of the Childrey Brook and Norbrook at Common Barn catchment, reducing the water input from the catchment to East Hanney Ditch. It also requires the diversion of East Hanney Ditch to accommodate the Western Watercourse Diversion, which further reduces the volume of water inputting from the catchment. It is these impacts from the footprint that gives the water body a score of 3 pre-mitigation. Mitigation has been proposed as part of Gate 2 to realign and improve the hydromorphological, ecological and water quality of East Hanney Ditch as well as creating additional wetland habitat. This should compensate for channels affected by the reservoir footprint, bringing the score down to 1.

6.31 The options that have smaller reservoir footprints have more space for the Western Watercourse Diversion and thus there is minimal direct impact on East Hanney Ditch, although there is still a reduction in water input from the catchment to East Hanney Ditch. The smaller options therefore have a score of 2. The same mitigation brings the score down to 1. In all options latest hydrological and water quality modelling suggests (B1 Environmental Assessment Report (aquatic)) the reduction of flow is small and thus while the knock-on impacts to water quality is noticeable (change in ammonia and orthophosphate are both less than 10% (7% for ammonia and 9% for orthophosphate) with no change in predicted WFD class) this diminishes with distance and becomes imperceptible on the River Ock around Abingdon with impacts being diluted accordingly as a result of increased flow contribution from other tributaries. The post mitigation score of 1 means that the water body would be compliant with WFD.

6.32 For the River Thames (Evenlode to Thame) WFD water body (GB106039030334), preliminary hydrological and water quality modelling (B1 Environmental Assessment Report (aquatic)) suggests that changes in depth along the River Thames as a result of the triggered releases from SESRO, that are based on cross sectional averages, show an increase of ~25 cm during the SESRO release period within the first 10 km downstream and ~15 cm a further 30 km downstream. This is within the normal operational range of 25–30 cm, but more work is required to assess the interaction with weir level management and the opportunity to optimise velocity and level with navigation and environmental requirements. Overall, the water quality modelling has shown that the water quality immediately downstream of the SESRO discharge would improve as a result of the discharge of water from SESRO. The only slight decline was a local change in ammonia levels (although concentrations continue to remain well within High WFD status) but that has not changed any water quality elements from a WFD perspective.

6.33 Changes in water flow and levels in the Thames could have an impact on marginal zones and floodplain habitat as it could reduce the regularity and longevity of habitats being exposed and inundated, respectively. This may reduce the biodiversity of the marginal, riparian and floodplain habitats as well as having impacts to fish habitat and migration. If these impacts are realised, then they could be mitigated against. There is some potential for benefits during low flows as it could reduce the vulnerability of habitats to low flow conditions. At this stage, it is not certain what the level of impact would be, both positive and negative. This is being reported in the B1 Environmental Assessment Report and would be assessed further in subsequent project stages. Mitigation reduces the impacts on this water body from a 2 to a 1 and therefore signifies that the water body is likely to be compliant with WFD.

6.34 The Ock and Tributaries (Land Brook confluence to Thames) WFD water body was given a score of 2 prior to mitigation. This is due to a new crossing over the River Ock and a change in the volume of water entering the water body from upstream catchments due to the reservoir footprint. Mitigation for this takes the form of a clear span bridge over the river and the diversion of a stretch of the River Ock. The diversion should improve the hydromorphological and ecological quality of the channel and improve its resilience to change in water volumes entering the channel. Preliminary modelling results using SAGIS (for more information see B1 Environmental Assessment Report (aquatic)) has suggested that as a result of the scheme footprint there could be reduced flow in the new WWD and a slight reduction in water quality. However, the impact of this reduces with distance downstream and is further reduced after the confluence with the River Ock. It also does not take into account any potential localised changes in the baseflow as localised changes in any groundwater could emerge elsewhere. The level of the hydrological/hydrogeological and water quality changes are currently uncertain, it would need to be looked at in more detail and quantified in subsequent project stages. However, it cannot yet be certain the reduction in water input from the reduced catchment size can be fully mitigated against, so the score post mitigation is 1. This means that the water body is compliant with WFD.

6.35 Sandford Brook (Source to Ock) was also given a score of 2 prior to mitigation. This is due to new culvert crossings over channels in the catchment. Mitigation for this will take the form of embedded mitigation in future stages of the design, ensuring that the culverts have a natural bed and are sized for ecological, hydrological and morphological reasons, rather than just hydraulic ones. Post mitigation it is assessed as having a score of 1 andhas therefore been deemed as compliant with all three WFD objectives assessed against.

6.36 The following WFD water bodies were screened out of the Level 2 assessment. However, until further assessments of the hydrological and water quality models and potential impacts on the River Thames and River Ock catchments, and associated tributaries are completed, they cannot be fully discounted and so would be assessed again during subsequent project stages:

- Thames Wallingford to Caversham – GB106039030331;
- Thames (Reading to Cookham) – GB106039023233;
- Thames (Cookham to Egham) – GB106039023231; and,
- Thames (Egham to Teddington) – GB106039023232

6.37 The latest proposed scheme concept shows no impact on Ginge Brook and Mill Brook (GB106039023660) and thus it has been screened out from further assessment unless changes to the scheme during subsequent project stages require reassessment.

6.38 Field based validation is needed for all water bodies witin the indicative scheme boundary and impacts would need tore-evaluated in future.

Table 6.6 WFD water bodies screened into the next phase of the assessment (see descriptions for Level 2 scores in Table 5.2)

WFD Water body name	Level 2 Maximum score (pre-mitigation)	Level 2 Maximum score (post-mitigation)	WFD compliant against assessed WFD objective (Section 3.1)	Potential non-compliant issue
Childrey Brook and Norbrook at Common Barn (GB106039023380)	3 (150, 30+100 & 80+42 Mm^3) 2 (75, 100 & 125 Mm^3)	1 (150, 30+100 & 80+42 Mm^3) 1 (75, 100 &125 Mm^3)	Yes (Medium confidence)	n/a
Sandford Brook (source to Ock) (GB106039023410)	2 (All options)	1 (All options)	Yes (High confidence)	n/a

Cow Common Brook and Portobello Ditch (GB106039023360)	3 (All options)	1 (All options)	Yes (Medium confidence)	n/a
Ock and tributaries (Land Brook confluence to Thames) (GB106039023430)	2 (All options)	0 (All options)	Yes (Medium confidence)	n/a
Thames (Evenlode to Thame) (GB106039030334)	2 (All options)	1 (All options)	Yes (High confidence)	n/a

7. Conclusions and recommendations

7.1 Summary

7.1 The assessments undertaken in the Gate 2 process have identified those water bodies that need to be screened into future assessment phases of work on SESRO. Five water bodies were screened in through the ACWG process and a further four on the River Thames have been pulled through to further assessment as impacts cannot be ruled out at this stage. According to the ACWG Level 1 assessment, these are:

- Childrey Brook and Norbrook at Common Barn – GB106039023380;
- Sandford Brook (source to Ock) – GB106039023410;
- Cow Common Brook and Portobello Ditch – GB106039023360;
- Ock and tributaries (Land Brook confluence to Thames) – GB106039023430; and,
- Thames (Evenlode to Thames) – GB106039030334.

7.2 The following WFD water bodies were screened out of the ACWG Level 2 assessment, however, until further assessments into the hydrological impacts on the River Thames are completed, they cannot be fully discounted and so would be assessed again in subsequent project stages:

- Thames Wallingford to Caversham – GB106039030331;
- Thames (Reading to Cookham) – GB106039023233;
- Thames (Cookham to Egham) – GB106039023231; and,
- Thames (Egham to Teddington) – GB106039023232.

7.3 The ACWG Level 1 assessment is in keeping with historic modelling work undertaken by Thames Water which highlights that the greatest zone of influence of the SESRO scheme within the River Thames is between Culham and the River Thame. It is also in keeping with Atkins Gate 1 proportional assessment work for water quality and ecology.[22]

7.4 Despite the findings of the ACWG Level 1 assessment, based on a precautionary principle, it is recommended that the downstream-most River Thames WFD water bodies are retained until further assessment work on hydrodynamics and water quality in the River Thames is completed and can be reviewed further in subsequent project stages.

7.5 Out of these WFD water bodies, the ACWG Level 2 assessment concluded that with the proposed mitigation all WFD water bodies have the potential to be compliant

[22] Atkins, 2021b, SESRO Gate 1 Environmental Assessment Report (EAR).

and therefore should not require derogations in line with Regulation 13(2)a and 13(5)a.

7.6 The details of further environmental mitigation, that would be completed in later stages of the project, would help to confirm these assessments and give more detail on the level of impact. This is especially the case with impact of the change of volumes of flow and water quality from the diverted watercourses on Cow Common Brook and Portobello Ditch, Childrey Brook and Norbrook at Common Barn, and Ock and tributaries (Land Brook confluence to Thames). Whilst current modelling suggest some reduction in flows and water quality in the Childrey Brook (change in ammonia and orthophosphate are both less than 10% (7% for ammonia and 9% for orthophosphate) with no change in predicted WFD class), other water quality benefits were observed in the Cow Common Brook and River Ock. Further hydrodynamic and water quality modelling is proposed in subsequent project stages for the River Ock to explore this further.

7.7 The assessments undertaken in Gate 2 have also helped to refine the concept designs further particularly in relation to the watercourse diversions and mitigation. The level of modelling and is assessment is suitable for this stage of the assessment process with further studies necessary as the scheme progresses.

7.8 From a WFD Compliance Assessment perspective, further work on various proposed scheme elements associated with the concept designs would increase confidence on the likely impacts that the proposed scheme would have on the water environment. Gate 2 work has demonstrated that the length of watercourse under the footprint of the proposed scheme and ancillary infrastructure can be mitigated for in all options.

7.9 Site access was limited to walkovers by public rights of way and thus more detailed surveys would be required to assess the overall quality of the habitat, and any species, lost. Figures for mitigation can be revised once this information is gathered.

7.10 In future phases of the scheme it is recommended that work focus on the key areas detailed below.

7.2 Recommendations

7.2.1 Proposed scheme footprint (and connecting watercourses)

7.11 Watercourse and ditch re-alignments around the proposed scheme footprint need further assessment to determine the quality of the baseline habitat (with respect to flow, water quality and ecological communities) impacted and then mitigation (quality and quantity) re-assessed in light of the findings.

7.12 Connections between watercourses and ditches with other proposed scheme elements need to be assessed further to determine the most appropriate connections, notably:

- Diversion of Cow Common Brook and Portobello Ditch (the WWD) particularly in relation to its form, location, interrelationship with East Hanney Ditch and

Childrey Brook, crossing around the diverted road and potential crossing of the proposed area for the canal;

- The form of crossings proposed for the new Access Road, the Auxiliary Drawdown Channel and the Road Diversion over any watercourses, both current and proposed (i.e. clear span bridge or box culvert).

7.13 Flow considerations in Landmead Ditch and the River Ock would need to be assessed with regard to changes in flow as a result of the diversion of Cow Common Brook and Portobello Ditch (WWD). This change means that these watercourses would connect to Landmead Ditch further upstream than is currently the case. Landmead Ditch would receive a benefit whilst a short reach of the Childrey Brook would not.

7.14 Preliminary modelling results using SAGIS (for more information see Technical Annex B1 Environmental Assessment Report (aquatic)) has suggested that as a result of the scheme footprint there could be some reduced flow in the Cow Common Brook (the new WWD) along with an improvement in water quality. There is also a reduction in flow in the Childrey Brook along but some local reduction in water quality for phosphate and ammonia. Slight benefits in water quality are predicted for the River Ock. Changes to flow and water quality would need to be looked at in more detail and quantified as part of subsequent project stages. A hydrodynamic model is being developed for the River Ock to assist with this assessment. Monitoring of the baseline conditions as well as an investigation into groundwater/surface water interaction is recommended as part of this assessment.

7.15 Indicative location of SESRO extensions – work would be required on the various watercourses listed above as a result of the diversion of Cow Common Brook and Portobello Ditch. In addition, the Tunnel and Direct Supply Pipeline would have direct interfaces with a range of channels and the interfaces would need to be considered more fully.

7.16 It is recommended that a baseline assessment of the impacted channels be undertaken in subsequent project stages to establish a fuller picture of the current conditions across the whole site. This would include hydrological, geomorphological, water quality and aquatic ecology surveys from which the mitigation and compensation plan for the project would be refined to off-set, and mitigate for, any impacts identified. Any changes would need to a revision of the current proposed river statistics illustrated in Table 7.1 River statistics (measurements in km) across each optionTable 7.1.

Table 7.1 River statistics (measurements in km) across each option

	75 Mm^3	100 Mm^3	125 Mm^3	150 Mm^3	100 + 30 Mm^3	84 + 24 Mm^3
Baseline	16.43	16.43	15.59	14.14	16.43	16.43
Lost	13.76	13.76	13.01	9.34	13.76	14.05

	75 Mm^3	100 Mm^3	125 Mm^3	150 Mm^3	100 + 30 Mm^3	84 + 24 Mm^3
Retained	2.68	2.68	2.59	4.79	2.68	2.39
Enhanced	16.54	16.14	13.74	12.94	16.54	16.54
Total	19.22	18.82	16.33	17.73	19.22	18.93
Change (length) – gain	2.79	2.39	0.74	3.59	2.79	2.50
Change (%) – gain	19.63%	17.64%	8.19%	27.02%	19.63%	18.41%

7.2.2 Abstraction from and discharge into the River Thames

7.17 The impacts of the abstraction from and discharge into the River Thames needs to be considered further in relation to potential opportunities and impacts of these changes on the flow regime and water quality on the downstream water bodies and what impacts and benefits that this may have. Initial assessments suggest that changes in depth along the River Thames as a result of the triggered releases from SESRO, that are based on cross sectional averages, show an increase of ~25 cm during the SESRO release period at a location approximately 10 km downstream, and ~15 cm a further 30 km downstream. This is within the normal operational range for the weirs within this reach which is between 25 and 30 cm and does not take account of any local level management practices. The modelling that has been undertaken to date is initial modelling, suitable for the current stage of the assessment and this would be refined and updated as part of the consenting process. Specifically, Further work would be required to assess the interaction with weir level management and the opportunity to optimise velocity and level with navigation and environmental requirements.

7.18 Overall, the water quality modelling immediately downstream of the SESRO discharge has shown to improve as a result of the discharge of water from SESRO. This work would need to be refined following further detailed hydrodynamic modelling of the fluvial River Thames, local assessments to changes to flow, level and velocity at Culham, Clifton and Day's Lock, and algal assessment work.

7.19 Impacts of the abstraction and discharge regime would need to assess the impacts on the performance of existing and potentially planned fish/eel passes on the Thames as well as the weir streams in general that may be impacted by changes in the flow conditions.

7.20 At the planning stage, a cumulative assessment should be completed to determine potential cumulative effects of this SRO in combination with other developments

within the study area. Additionally, an in-combination assessment should be completed at the planning stage to determine the in-combination effects from multiple SROs which have the potential to impact the River Thames.

7.2.3 Mitigation and Biodiversity Net Gain (BNG)

7.21 Noting that BNG is not a requirement for WFD compliance, Gate 2 work has shown that mitigation for the loss in length of watercourses and ditches can be achieved across the site (B6 Biodiversity Net Gain Assessment). This aligns with Thames Water's commitment to a 10% BNG for all engineering projects in their Biodiversity policy (POL037).[23] For the rivers and ditches part of the metric it is important that this impact is assessed and updated, and any mitigation requirements integrated into the proposed scheme's design going forward. BNG would need to be assessed using DEFRA's revised BNG metric of which version 3.1 which was released in May 2022.

[23] Thames Water Utilities Limited, 2022, Biodiversity Net Gain policy (POL037), biodiversity-policy.pdf (thameswater.co.uk), Accessed May 2022.

Appendix A Completed ACWG Spreadsheets

Affinity Water

Taking care of your water

Thames Water