



South East Strategic Reservoir Option (SESRO)

Technical Supporting Document B6
Biodiversity Net Gain Report

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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Executive Summary

All water supply companies in the UK have a statutory duty to consult upon and produce a Water Resources Management Plan (WRMP) every 5 years. The next plan, which will be issued in draft for consultation in November 2022, provides a strategic forecast of the companies expected requirements and proposed investment to ensure a secure and resilient water supply to their customers from 2025 to 2100.

The South East Strategic Reservoir Option (SESRO) is being jointly promoted and developed by Thames Water and Affinity Water under The Regulators' Alliance for Progressing Infrastructure Development (RAPID) Strategic Reservoir Option (SRO) programme. The SESRO SRO includes six size options that are included in the Thames Water WRMP24 Constrained List of Options. The purpose of this report is to present the indicative calculations of the loss and gains in biodiversity units as a result of the Development and establish the biodiversity units required to achieve a minimum 10% net gain in biodiversity value as a result of the Development. This assessment is an early calculation to inform the RAPID process and is, therefore, high level at this stage. The calculations are based on partial site walkover information, aerial imagery and other desk study information. It should also be noted that the mitigation hierarchy has been applied to these calculations to ensure habitat loss is avoided or minimised wherever possible. The application of mitigation measures will be applied prior to the provision of any required habitat compensation.

In summary, analysis of the Biodiversity Net Gain (BNG) calculations highlighted that all Reservoir options exceed the required 10% net gain in biodiversity. Through the creation of the reservoir, wildlife ponds, wetland mosaic with wet woodland and species rich grasslands the 150 Mm³ option for SESRO could achieve an overall net gain in biodiversity of 33.09% for habitats. For the alternative reservoir options the scheme could achieve an overall net gain in biodiversity of between 37.16% (125 Mm³ option) and 51.64% (75 Mm³ option).

Under the current proposals for the alternative reservoir options, between 34.25 ha (75 Mm³ option) and 45.39 ha (150 Mm³, 80+42 Mm³ and 30+100 Mm³ options) of lowland mixed deciduous woodland would be lost as a result of the Development. In comparison, only between 17 ha and 18 ha of lowland mixed deciduous woodland will be retained *in situ*. This equates to a loss of lowland mixed deciduous woodland habitat units of between 708.98 and 939.57 which have not been accounted for within the metric. The metric tool requires habitats of high distinctiveness, such as lowland mixed deciduous woodland, to be replaced with the same habitat or a habitat of higher distinctiveness. Updates to the design will be undertaken through the RAPID Gated process and where possible additional areas of lowland mixed deciduous woodland to be retained will be identified. In addition, further survey work will be undertaken to accurately classify the baseline habitats and some of the woodland areas categorised as lowland mixed deciduous woodland are likely to be reclassified as a different woodland type with a lower distinctiveness score.

Under the current proposals, all SESRO options will not achieve ≥10% BNG for linear features such as hedgerows and tree lines. The 150 Mm³ option has identified a loss of 21.91% and the alternative options have identified a loss of between 10.68% (75 Mm³ option) and 23.95% (80+42 Mm³ option). Further modifications to the masterplan design will likely identify additional areas of hedgerow and

other linear features which can be retained or enhanced and further opportunities for habitat creation are considered likely. If necessary, the loss in linear features may be mitigated for through habitat creation outside the indicative scheme boundary.

An ancient crack willow (*Salix fragilis*) tree is located within the scheme boundary where the proposed reservoir will be constructed. Retention of this tree is therefore not possible. As ancient trees are considered irreplaceable habitat, mitigation for the loss of this tree is not possible. However, it is recommended that a bespoke compensation strategy is developed which will require the retention of the tree as deadwood elsewhere on site. The compensation strategy will also require a significant amount of tree planting and retention of soils on site will also be considered.

SESRO could achieve $\geq 10\%$ BNG for rivers and streams for all six reservoir options ranging from 14.85% (84+42 Mm³ option) to 34.84% (75 Mm³ option) BNG through the creation of wetland ditches and the realignment of rivers to meandering planforms. This would be a significant improvement from the network of agriculturally modified watercourses currently on site to provide aquatic biodiversity benefits to a range of species and local residents.

Acronyms and Abbreviations

CEMP	Construction Environmental Management Plan
DWI	Drinking Water Inspectorate
HPI	Habitat of Principal Importance
LNR	Local Nature Reserve
LPA	Local Planning Authority
MAGIC	Multi-Agency Geographical Information for the Countryside
NCA	National Character Area
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
OfWat	Office of Water Services
RAPID	Regulators' Alliance for Progressing Infrastructure Development
SESRO	South East Strategic Reservoir Option
SRO	Strategic Resource Option
SSSI	Site of Special Scientific Interest
UK Hab	UK Habitat Classification
WRMP	Water Resources Management Plan
WRPG	Water Resources Planning Guidance (Environment Agency, 2020)
WRSE	Water Resources South East
WRZ	Water Resource Zone

1. Introduction

1.1 Water Resource Planning Process

- 1.1 All water supply companies in the UK have a statutory duty to consult upon and produce a Water Resources Management Plan (WRMP) every 5 years. The next plan, which will be issued in draft for consultation in November 2022, provides a strategic forecast of the companies expected requirements and proposed investment to ensure a secure and resilient water supply to their customers from 2025 to 2100. The investment requirements (i.e. new solutions for water supply) are derived from a thorough appraisal of alternative options and the selection of a preferred set of solutions (programme) in accordance with the Environment Agency's Water Resources Planning Guidance¹.
- 1.2 The WRMP process is supported by a non-statutory regional water resources resilience plan, which is produced for each region of the UK and provides the strategic regional context for the WRMP. Thames Water and Affinity Water are both part of the Water Resources South East Group (WRSE), along with South East Water, Southern Water, Sutton and East Surrey Water and Portsmouth Water.
- 1.3 The WRSE group published their emerging draft regional plan in January 2022, with an updated Draft Regional Resilience Plan in late summer 2022. The partner companies' Draft WRMPs are aligned with this regional strategy.
- 1.4 The WRMPs include a set of solutions that they plan to implement to meet their customers' future water supply needs. A number of these solutions involve strategically important and large-scale new developments, many of which need development by multiple partners for wider regional benefit beyond one company's supply boundaries. These types of schemes are lengthy and complex to consent and develop and may be required within the next 15–20 years. For this reason, a number of the strategic solutions need further investigation and feasibility studies completed for them, in order to ensure uncertainties associated with them are better understood and that they are ready to consent and develop within the required timescales from the identified in the WRMP. The South East Strategic Resource Option (SESRO) (also known as the Abingdon Reservoir) is one such option. The associated feasibility studies are completed under the Regulators' Alliance for Progressing Infrastructure Development (RAPID) gated process.
- 1.5 RAPID, a joint team made up of the three water regulators: Office of Water Services (Ofwat), the Environment Agency and the Drinking Water Inspectorate (DWI), was set up to support and oversee this work. RAPID has introduced a new regulatory process which sets out the activities that need to be completed to progress through the gated process. This process allows comparison of the solutions at regular

¹ GOV.UK and Environment Agency. (2022). *Water Resources Planning Guideline*. [Online] Available at: <https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline> (Accessed April 2022).

intervals, and has clear checkpoints, or ‘gates’, to assess progress and determine which solutions should be taken forward for further assessment.

1.6 Each scheme passes through a series of governance ‘gates’, enabling key information to be presented and an assessment made on whether the scheme should continue for further feasibility assessment. The gates set out by Ofwat RAPID are as follows:

- Gate 1 – Initial feasibility, design and multi-solution decision making (July 2021);
- Gate 2 – Detailed feasibility, design and multi-solution decision making (April 2022 to October/November/2022);
- Gate 3 – Finalised feasibility, pre-planning investigations and planning applications (summer 2023, tbc); and
- Gate 4 – Planning applications, procurement strategy and land purchase (summer 2024, tbc).

1.7 This BNG report has been prepared for the SESRO Gate 2 submission.

1.2 Purpose of the Report

1.8 The purpose of this report is to present the calculations of the loss and gains in biodiversity units as a result of SESRO and establish the biodiversity units required to achieve a minimum 10% net gain in biodiversity value as a result of SESRO. The report also describes the methodology employed and presents the results of the assessment.

1.9 Given that SESRO is still undergoing design iterations, and liable to change, this should be interpreted as a high-level preliminary assessment until the exact details regarding have been finalised. Consistent collaboration, throughout the life cycle of SESRO, within the design, landscape and ecology teams will ensure that an accurate calculation of habitats to be lost are made, allowing for an accurate assessment of what needs to be done to achieve net gain for SESRO.

1.10 A separate Habitat and Landscape Management Plan will be produced at a future stage in the scheme’s evolution, setting out how habitats will be created/enhanced (as per this report) and how they will be managed and monitored in the long term, in order to achieve the target condition for the habitats.

1.3 Policy Context

1.11 The National Planning Policy Framework (NPPF)² and accompanying National Planning Policy Guidance (NPPG)³ set out the Government’s economic, environmental and social planning policies for England. The NPPF and NPPG identify that developments in England should deliver a net gain for biodiversity. The NPPF,

² Gov.UK (2021). *National Planning Policy Framework – Publications – GOV.UK*. [Online] Available at <https://www.gov.uk/government/publications/national-planning-policy-framework--2>. [Accessed May 2022].

³ Gov.UK (2021). *National Planning Policy Guidance – GOV.UK*. [Online] Available at <https://www.gov.uk/government/collections/planning-practice-guidance>. [Accessed May 2022].

published in July 2021, states (paragraph 174) that: “*Planning Policies and decisions should contribute to and enhance the natural and local environment by... minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.*” The NPPG for the Natural Environment, updated in July 2019, states (paragraph 020) that: “*Net gain in planning describes an approach to development that leaves the natural environment in a measurably better state than it was beforehand.*”

- 1.12 The Vale of White Horse Local Plan was adopted in 2016. Policy 45 states a “*net gain in Green Infrastructure, including biodiversity, will be sought either through on-site provision or off-site contributions and the targeted use of other funding sources*”⁴.
- 1.13 The Oxfordshire Minerals and Waste Local Plan Core Strategy (2015) aims to demonstrate that they will not have an unacceptable adverse impact on the local environment including from noise, dust, air quality, surface or ground contamination amongst others. Minerals and waste development should also conserve and, where possible, deliver a net gain in biodiversity. The highest level of protection will be given to sites and species of international nature conservation importance such as SACs and European Protected Species. Development that would be likely to adversely affect these sites and species will not be permitted.
- 1.14 A key element of policy is that changes in biodiversity should be measurable. As a result, Biodiversity Metric tools have been developed that allow losses and gains in biodiversity to be measured in an objective and repeatable manner. This report uses the Department for Environment, Food and Rural Affairs (Defra) Biodiversity Metric 3.0 Calculation Tool^{5,6} to estimate the loss and gains in biodiversity as a result of SESRO. The Defra Metric is an industry standard method for assessing BNG and version 3.0 of the Metric was the most up to date version at the beginning of the Gate 2 period.

1.4 Assessment Area

- 1.15 This assessment primarily considers the areas within the indicative scheme boundary for the 150Mm³ reservoir option, the largest planning boundary of the six options, as shown in Appendix A Figure A.1. The impacted area is approximately 1754.34ha and is located between the villages of Drayton to the east and East Hanney to the west, south of the River Ock and north of the Great Western mainline.
- 1.16 High level biodiversity net gain calculations have also been undertaken for the five alternative reservoir options.
- 125 Mm³ – impacted area is approximately 1706.54ha, construction of the reservoir will take approximately 9 years to complete.

⁴ Vale of White Horse (2016). *Vale of White Horse Local Plan*.

⁵ Natural England (2021). *The Biodiversity Metric 3.0: Auditing and Accounting for Biodiversity - Technical Supplement*. Natural England.

⁶ Natural England (2021). *The Biodiversity Metric 3.0: Auditing and Accounting for Biodiversity – User Guide*. Natural England.

- 100 Mm³– impacted area is approximately 1598.60ha, construction of the reservoir will take approximately 9 years to complete.
- 75 Mm³– impacted area is approximately 1528ha, construction of the reservoir will take approximately 8 years to complete.
- 30 + 100 Mm³– impacted area is approximately 1754.11ha, construction of the reservoir will take approximately 8 years to complete following a two-phased approach.
- 42 + 80 Mm³– impacted area is approximately 1754.11ha, construction of the reservoir will take approximately 8 years to complete, following a two-phased approach.

1.17 The indicative location for SESRO is within a lowland landscape primarily used for arable agriculture with some pasture, woodlands, hedgerows, ponds and two large solar panel farms. There are 68.5km of watercourses within the boundary of the project, primarily the Cow Common Brook and Portobello Ditch that run through the centre of the indicative scheme boundary for all six reservoir size options. The area also contains a dense network of land drainage ditches that run along field boundaries. For the purposes of this report, both terrestrial and aquatic habitats have been considered.

1.18 Due the size, scale and potential impact of SESRO, it is assumed at this stage and for the purposes of this high-level biodiversity net gain assessment, that the majority of habitats will be lost and there will be little in the way of opportunity for habitat retention and enhancement. Where habitat retention is feasible, this will likely be located around the perimeter of the site.

1.19 SESRO provides the opportunity to dramatically improve the value of the landscape for biodiversity (and other ecosystem services such as carbon sequestration, flood alleviation, recreation and water resources) by replacing agricultural fields segmented by straightened, overly deep rivers and ditches with diverse watercourses integrated into a mosaic of wet woodland, floodplain meadow and open water habitats.

1.4.1 Survey Data

1.20 The baseline habitat data was compiled through both field surveys and analysis of desktop data including aerial images. At the time of field survey, the site could only be accessed from public rights of way (PRoW) so a full assessment, including a habitat condition assessment and river condition assessment, could not be conducted. Assumptions have therefore had to be made about some of the habitats present on site and their condition. Conditions for each habitat have been made consistent across the Scheme, where an accurate assessment could not be undertaken.

1.21 For the Rivers and Streams metric, culverts and watercourse or riparian encroachment weightings have not been included in the baseline assessment as they could not be assessed consistently on site. There are, however, likely instances of watercourse encroachment in the indicative scheme outline, particularly culverts

under tracks and roads. These would reduce the number of River Biodiversity Units (RBUs) lost to the scheme which would result in less habitat loss to mitigate for. However, there are also factors that would incur encroachment weightings in the future baseline (e.g. culverts) that are not included in the assessment for consistency with the baseline. The lengths of watercourse with encroachment are likely similar between baseline and future baseline so are unlikely to have a large impact on BNG results.

1.4.2 Defra Biodiversity Metric

1.22 The Biodiversity Metric 3.0 published by Defra, was selected as the appropriate tool for the BNG assessment at the time of writing as it has been subject to extensive testing and is widely recognised and used.

1.23 The metric splits the assessment into three sections:

1. Habitat Area metric - for habitats measured by area (ha) such as woodland, ponds, grassland, wetland etc.
2. Hedgerow metric - for hedgerows and lines of trees measured by length (km).
3. River and Streams metric – for watercourses measured by length (km) such as rivers, streams, ditches, canals and culverts.

1.24 The metric uses habitat categories as a proxy for biodiversity. The generated biodiversity unit scores are then proxies for the relative biodiversity worth for the state of a place. The metric and its outputs should therefore be interpreted, alongside ecological expertise and common sense, as an element of the evidence that informs plans and decisions.

1.25 The biodiversity unit scores are a forecast until SESRO is implemented, the habitats have established, and the target condition has been achieved. Monitoring will be required to confirm the habitats are developing along the right trajectory or whether remedial action is required. Details of the monitoring requirements will be provided in the future Habitat and Landscape Management Plan.

1.26 A key principle of the BNG assessment is the application of the mitigation hierarchy. The mitigation hierarchy will ensure habitat loss is avoided or minimised wherever possible. The application of mitigation measures will be applied prior to the provision of any required habitat compensation.

2. Solution design, options and sub-options

2.1 Solution description

- 2.1 The South East Strategic Reservoir Option (SESRO) is an 'off-line', fully bunded raw water storage reservoir in the upper catchment of the River Thames.
- 2.2 Water would be abstracted from the River Thames during periods of high flow and stored in a reservoir, to be released back into the River Thames when there is a need to augment the flows in the River Thames. Water released from SESRO could be re-abstracted by existing or new infrastructure further downstream to supply customers of Thames Water and Affinity Water.
- 2.3 SESRO also incorporates the future flexibility to abstract water direct from the reservoir, treat it on site and then transfer potable water either to the south to serve Southern Water⁷ or else to support TW's Swindon and Oxfordshire supply zone⁸. These elements will continue to be explored as the scheme develops and the timing and magnitude of each is confirmed in the final WRMPs.

2.2 Options considered

- 2.4 SESRO is one of various raw water storage reservoirs that have been considered for WRMP24 by Thames Water. Alternative options have been passed through an appraisal process⁹ and feasible options costed and assessed as part of WRMP24. Analysis completed as part of the options appraisal for WRMP24 confirms that alternative sites for storage reservoirs are available in the Thames Valley, but none considered as suitable as SESRO. Building upon the options appraisal work that was originally undertaken for WRMP09 and has been updated for each subsequent strategic plan to ensure accuracy, the leading alternative sites have been analysed and costed (and made available for selection as feasible options) as part of option selection for WRMP24. Further 'back-checking' of the analysis and screening out of alternative sites has ensured that the list of options is correct and robust. This is all reported in the updated Reservoir Feasibility Report that will be published for consultation by Thames Water as part of WRMP24.
- 2.5 Several size variants of the SESRO scheme have been included in the Thames Water WRMP24 Constrained List of options and submitted as options to WRSE, as follows:
- 150 Mm³ capacity reservoir;
 - 125 Mm³ capacity reservoir;
 - 100 Mm³ capacity reservoir;
 - 75 Mm³ capacity reservoir;
 - 30+100 Mm³ capacity phased reservoir; and

⁷ Thames to Southern Transfer, another SRO project, jointly funded by Thames Water and Southern Water

⁸ The additional transfers and associated water treatment facilities are not included within the SESRO core scheme, although a provision of land allocation within the scheme is identified for such future use

⁹ Thames Water WRMP24, Reservoir Feasibility Report Update.

- 80+42 Mm³ capacity phased reservoir.

2.3 Option configuration and operation

- 2.6 The combined river intake / outfall Structure would be located on the western bank of the River Thames upstream of Culham. Abstracted water would pass through a tunnel and pumping station and jetted into the reservoir at the base of an inlet tower.
- 2.7 Water being discharged back into the river would pass through an outlet tower and the same tunnel before flowing over a stepped gravity weir at the outfall, which would maximise aeration whilst avoiding scour to the River Thames.
- 2.8 The current conceptual design provisionally allows for the inclusion of the outfall for the Severn to Thames Transfer (STT) SRO project within the SESRO outfall, providing a more efficient combined solution should both schemes be implemented.
- 2.9 The intake for the reservoir would operate under strict conditions imposed by the Environment Agency's future environmental permit for the scheme. This would be sought as part of the scheme's consenting strategy:
- The abstraction into SESRO shall be controlled by a Minimum Residual Flow (MRF) that must be retained in the River Thames at Culham of 1,450MI/d;
 - The maximum pumping capacity at the intake shall not exceed 1,200 MI/d;
 - The maximum 24-hour abstraction shall be < 1,000 MI/d (and < 150,000 MI/yr);
 - Abstraction will increase progressively at a rate of no more than 300 MI/d; and
 - Water would be discharged at a maximum rate of 600 MI/d, with typical release rate between ~165 MI/d and ~320 MI/d depending on the size of the reservoir.
- 2.10 The need for water to be released from the reservoir would be triggered by conditions in the lower River Thames, governed by the Lower Thames Operating Agreement¹⁰. It is expected that the release would primarily be triggered during periods of low flow.

2.4 Key assets required

- 2.11 The key components or assets required to deliver the scheme are as follows:
- Provision of a fully bunded raw water storage reservoir in Oxfordshire, 5km south-west of Abingdon.
 - Pumping station at the toe of the embankment (on the north-east side of the reservoir) including both inflow pumps and outflow energy-recovery turbines.
 - Conveyance tunnel to transfer flows via the pumping station to and from the intake / outfall structure on the River Thames near Culham.
 - Auxiliary drawdown channel (ADC) linking the reservoir siphons to the River Thames, to allow drawdown of the reservoir in emergency scenarios. This could also form a

¹⁰ Further information may be found in Supporting Document G: Planning and Consents Strategy

navigable channel and as plans progress for the SESRO scheme, there is an opportunity to engage with the promoter of any rehabilitation of the Wilts & Berks Canal for an ADC to form part of their scheme.

- Main access road into the site (from A415, Marcham Road) and diversion of the existing East Hanney to Steventon Road.
- Temporary rail siding to facilitate delivery of certain construction materials by freight train.
- Public access, parking and recreation facilities, public education facilities, landscaping and creation of aquatic / grassland habitats.
- Local stream channel diversion to both the east and the west of the reservoir and construction of compensatory floodplain.

2.12 To provide a first illustration of how the engineering requirements of the scheme may be integrated with the expected environmental mitigation and with possible recreational uses of the site, an indicative landscape and environment led Master Plan for the largest SESRO option has been developed for Gate 2 (see Figure 2.1). This vision will be subject to change and refinement if SESRO progresses through scheme promotion, through future consultation, environmental assessment and associated design iterations, but provides an initial overview of how the largest SESRO option could be conceptualised. We considered this level of detail appropriate for the SESRO Gate 2 submission, which may exceed that available or presented for other SROs, due to the maturity of the scheme (it has been considered in many previous strategic plans and subject to various previous public consultations) and the level of public interest in the scheme, as demonstrated by the consultation on the WRSE emerging regional plan and the SESRO Gate 1 submission (see Section 9 of the Gate 2 Report). As noted in paragraph 2.4 previously, the 150 Mm³ option, as the largest option for the proposed site, has formed the basis of the design work completed for Gate 2. Although all options were considered feasible and available, this largest scheme contains the most constraints and issues to resolve and hence was considered a better 'starting point' for the Gate 2 design process and for the development of the indicative Gate 2 Master Plan.

2.13 This indicative Gate 2 Master Plan has been informed by the design principles and vision for the scheme and driven by the initial desk-based environmental assessments that have been completed (see Section 6.1 of the Gate 2 Report) and by initial community feedback. These are demonstrated in Table 2.1 below.

2.14 We aim to develop this indicative Gate 2 Master Plan once the size and / or phasing of the preferred scheme is confirmed by WRMP24 and as we progress more local, community engagement on the specific design and use of SESRO.

Table 2.1: Summary of key aspects of the Indicative Gate 2 Master Plan

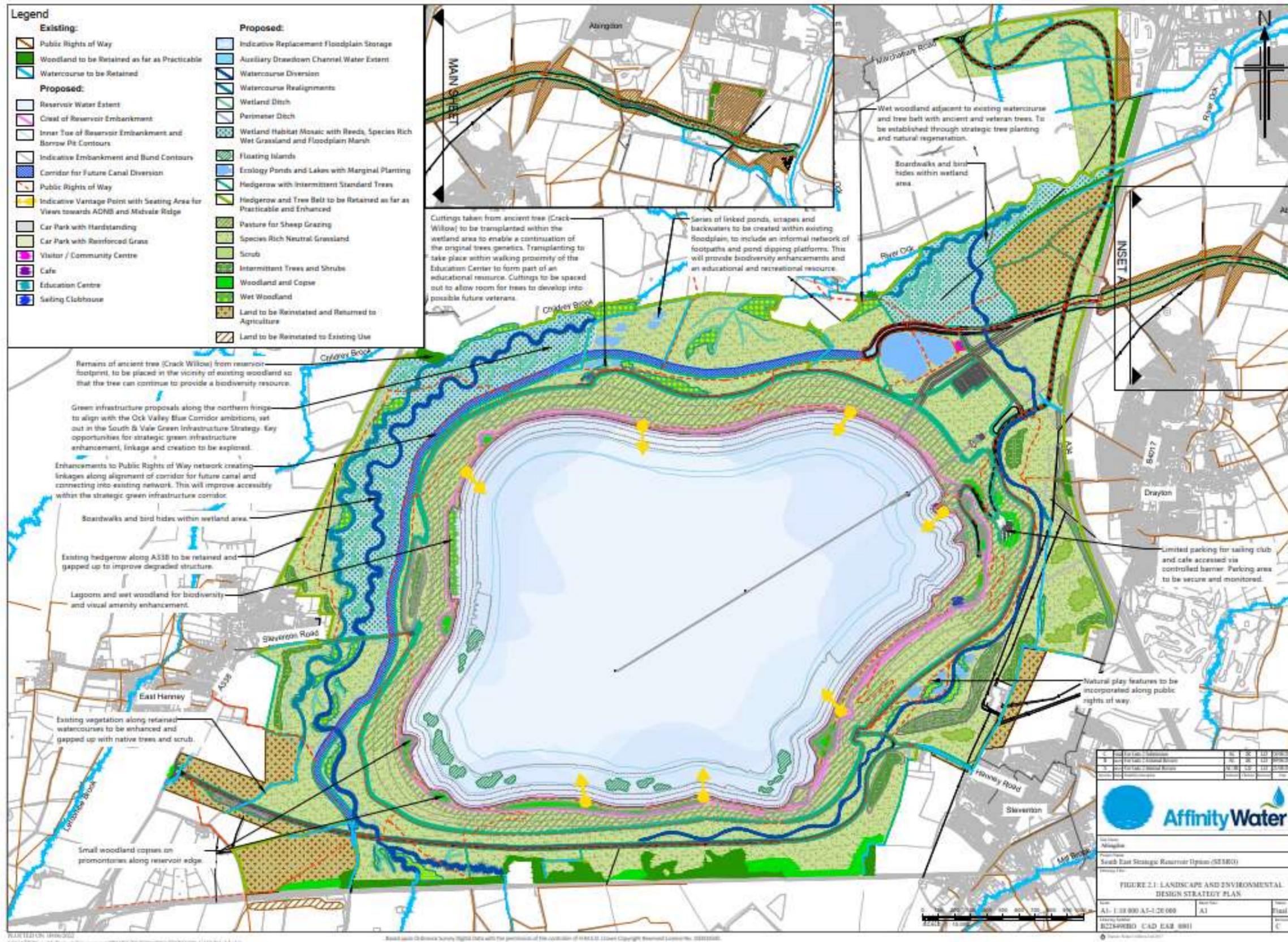
Design Philosophy	Indicative Gate 2 Master Plan 'response'
Provide value to local communities	<p>Provide recreational and access opportunities for local communities. Small scale water-based recreation, under controlled conditions (such as via a sailing club or similar), could be provided in the north-east corner, co-located with the main access routes into and out of the site. This corner, furthest from the local villages, would be a much busier part of the site, dedicated to the more intensive recreational uses.</p> <p>The access and recreational concept for the site is intended to be modest, at this early stage, and to maximise environmental benefit and to minimise disturbance and disruption to the closest villages. The wetland focused western part of the site, adjacent to East Hanney would be designed to be a quieter, less disturbed part of the site, to maximise the environmental benefit. Some local access and parking would be provided on this western side for the benefit of East Hanney. Visitor footfall to the south-east corner of the site, around Steventon, would also be discouraged to minimise disturbance. However, the indicative master plan has been currently developed to allow local access from both villages to the circular footpath and cycle path networks, along with limited local parking.</p>
Manage visitors to the site to minimise local disruption and maximise environmental benefit	<p>'Zoning' of the site into different areas, to implement the habitat creation and mosaic of biodiversity net gain required and also to help manage the flow of visitors into and around the site and to help protect the more sensitive areas. Access into and out of the site is configured to minimise disruption to local traffic networks, as far as possible, making best use of the adjacent trunk main and A-road network. This enables the main access road to come into the site from the north, directing the majority of visitors and operational traffic to the north-east corner of the site, furthest from the existing villages of East Hanney and Steventon. A modest visitor 'hub' could be provided at this location, adjacent to the main parking areas, with a small café on the embankment crest overlooking the views of the Ridgeway towards the south.</p>
Focus on the aquatic environment	<p>The management of water on site, either drainage, stream diversion or floodplain compensation is designed to make best use of the existing topography of the site. This enables the lower lying western areas to be dedicated as a conservation and biodiversity led sector, providing extensive wetland habitat creation. A small education centre is envisaged to the north of this sector, providing educational opportunities for the local school communities. We have suggested the possibility of integrating this wetland creation, with conservation led features along the west and south-west sides of the main reservoir, including lagoons and small floating platforms for wildfowl.</p>
Enable access for all	<p>The network of footpaths and cycle paths across the site is intended to provide enhanced integration with the existing Public Rights of Way network and provide access to all across the site and link up with all surrounding routes and villages. The new paths across the site could include a crest path around the reservoir, various circular routes around the embankment and multiple access points up to the crest. The footpaths around the quieter western sector are designed to integrate into the wetland areas.</p>

2.15 The design development undertaken for Gate 2 aligns to the design principles set out by the All Company Working Group Gate 2 methodology on design¹¹, with further details provided in Supporting Document A1: Concept Design Report. This methodology provides a guiding framework for the design of the SROs to ensure consistency and best-practice.

¹¹ All Company Working Group (ACWG) Design Principles, Process and Gate 2 Interim Guidance, December 2021, Fereday Pollard

Figure 2.1: SESRO 150Mm3 option, Indicative Gate 2 Master Plan

note, the details of this plan are subject to change through future community engagement and consultation, further environmental assessment and associated design development; it will be adjusted, as required, once the size of the preferred scheme is confirmed by WRMP24



2.5 Interactions with existing assets and other SROs

2.16 There are significant potential physical interactions between SESRO and other SROs and local water supply schemes, which may need to be integrated together in the final scheme design, depending on the final timing between schemes. These include:

- **Severn to Thames Transfer (STT) SRO:** to minimise construction disruption and to provide greater refill resilience if SESRO is linked to the Thames to Southern Transfer (T2ST) SRO. Further information on the Deployable Output benefit of combining the schemes is provided in Section 4.2 of the Gate 2 Report. In the WRSE draft Regional plan and draft WRMPs preferred plans, the STT is required by 2050 for the more extreme future scenarios (situations 1 and 4).
- **Thames to Southern Transfer (T2ST) SRO:** to minimise the impacts of the transfer on London's Deployable Output and maximise the resilience of the transfer. In the WRSE draft Regional plan and draft WRMPs preferred plans, this is required by 2040 for the more extreme future scenarios (situations 1, 4 and 7).
- **Thames to Affinity Transfer (T2AT) SRO:** The resources from SESRO could provide supplies to the Thames to Affinity Transfer (T2AT), required by 2040 in the WRSE draft Regional plan and draft WRMPs preferred plans, hence they would need to be integrated in terms of utilisation and control. However, there is no physical interaction between the schemes at the reservoir site.
- **Supply to Thames Water's Swindon and Oxford (SWOX) water resources zone.** In the WRSE draft Regional plan and draft WRMPs preferred plans, this would be utilised for up to 48 MI/d after 2050 for the more extreme future scenarios (situations 1, 4, 5 and 7).
- **Potential integration with Farmoor Reservoir:** to help manage potential future reductions in abstraction during low flow periods and deliver environmental benefits to the Oxford watercourses, which forms part of Thames Water's medium and high scenario Environmental Destinations¹².

These interactions and the implications for SESRO are summarised in

2.17 Table 2.2 below. The exact integration of these different aspects has not yet been decided and will not be until the exact timing between them is finalised in the Final WRMP. However, it is probable that some of the aspects noted above may need to be integrated into the DCO for either SESRO or the STT, in order to deliver the schemes in the most cost efficient and the least environmentally and socially disruptive way.

¹² In the draft WRMP the reductions at Farmoor are within the Medium scenario (15MI/d reduction in Deployable Output by 2050) and High scenario (35MI/d reduction in Deployable Output by 2050).

Table 2.2: Interactions of SESRO with other SROs and with other local supplies and sources

Interaction	Implication for SESRO
STT	<p>The route of the STT pipeline passes close to the SESRO site. The two schemes could be joined via a connecting valve chamber west of the A34 crossing, linking the STT pipeline and the SESRO intake pumping station. This means that either scheme could be delivered first, depending on the outcome of the WRMP process. The lower section of the STT pipeline follows the approximate route of the SESRO ADC and discharges to the River Thames at the same location as SESRO. The concept design currently allows for the lower sections of the STT pipeline to be constructed at the same time as the ADC, located in the towpath of the canal. This would minimise construction disruption, avoid the need for multiple road crossings and reduce the land area required for the two schemes. A single outfall structure could accommodate the discharge from both schemes. If STT precedes SESRO, then this configuration will need to be revised, but the current approach reflects the timing of the schemes within the draft WRMP.</p>
T2ST	<p>The proposed site for the water treatment works for the T2ST is currently located on the SESRO site, adjacent to the intake pumping station. The site for this works would either need to be safeguarded within the SESRO site design, to enable future construction when required under separate consent by a third party, or else included within the SESRO scheme, depending on scheme timing. The initial sections of treated water main to Southern Water would pass to the east of the SESRO embankment, before crossing the Great West Railway. It is expected that the initial section of this treated water main would need to be constructed as part of the SESRO scheme, to avoid destroying new habitat that would be created as part of the SESRO scheme. The SESRO indicative Gate 2 Master Plan has been developed to ensure such a pipeline route is available through the site, into which the T2ST SRO could then connect, as required.</p>
SWOX Supply and Farmoor	<p>The proposed site for the water treatment works for the local SWOX supply is currently located on the SESRO site, adjacent to the intake pumping station. The site for this works would either need to be safeguarded within the SESRO site design, to enable future construction when required under separate consent by a third party, or else included within the SESRO scheme, depending on scheme timing. The initial sections of treated / raw water main(s) to SWOX and Farmoor would pass to the north, crossing the River Ock floodplain. The SESRO indicative Gate 2 Master Plan has been developed to ensure a route for these main(s) is available. The optimised option for meeting the SWOX supply and the abstraction reduction at Farmoor Reservoir has yet to be developed. This will be a key aspect of the scheme development in the next phase.</p>

2.6 Scalability

- 2.18 The SESRO options enable a degree of scalability and future phasing, but this is within the constraints of the main option chosen. For each of the single phase options, once built, these would not enable easy future expansion and no such facility is currently built into the concept design. The two phased options are available, which would enable the assets, and hence the available deployable output, to be phased if that is the best value solution. The phased options do tend to be more expensive (see Section 8.1 of the Gate 2 Report) as they involve more earthworks, overall, for the volume of storage created, and would need to be developed in multiple construction phases thereby extending the time of the construction phase impacts.
- 2.19 The integration with other schemes would enable scalability in the future. For example, the STT connection could be enabled for future use but not commissioned immediately, which would enable future integration with transfers from the Severn to maximise the potentially available additional DO (see Section 4.2.1 of the Gate 2 Report). Equally, the SWOX supply or the Thames to Southern Transfer WTWs could be developed in a modular fashion, depending on future need for the water. This would enable the supply of water to those subsidiary uses to be scaled if required, to help manage future uncertainty. The design of these aspects of the scheme will be developed during the next design phase, depending on the outcome of the WRMP24 process.

3. Methodology

3.1 Site Baseline - UK Habitat Classification and Condition Assessment

- 3.1 A UK Habitat Classification (UKHab) survey was undertaken in January 2022, to classify all habitats and record their condition to inform the baseline biodiversity unit calculations (Appendix A). The UKHab survey was undertaken using both field surveys (from PRow only) and analysis of aerial images and Ordnance Survey (OS) maps.
- 3.2 A UKHab survey can be undertaken at any time of year, however, the optimal time is between April and September when deciduous and annual plants are identifiable. The UKHab survey undertaken for SESRO was undertaken at a sub-optimal time of year (January) for identifying some plant species. However, this is not considered to be a considerable constraint to the survey results as the survey was high-level and most of the habitats could not be accessed anyway so certain assumptions had to be made (see 2.3).
- 3.3 For those habitats which could not be assessed due to access restrictions, appropriate assumptions have been made regarding their condition. These assumptions are in line with the Biodiversity Metric 3.0 Technical Supplement. A precautionary approach was taken to determining the habitat condition score, if a definite pass or fail could not be assigned for a particular habitat condition criteria, then it was assumed the habitat would have passed. In addition, high or moderate condition was assumed unless the habitat was of low distinctiveness, such as crop land, for which poor condition was either assumed or automatically required by the metric tool.
- 3.4 Areas of woodland which could not be accessed and assessed thoroughly were categorised as lowland mixed deciduous woodland and the condition was estimated to be good. This is a precautionary approach as lowland mixed deciduous woodland is a habitat with high distinctiveness which is known to be present within the indicative location for SESRO and surrounding habitats.
- 3.5 The Habitat Area habitat condition assessments are precautionary, often categorising a habitat as a 'higher' condition score than they are likely to be on site.
- 3.6 A walkover of watercourses was undertaken in November 2021, to qualitatively assess the condition of rivers and ditches on site using the principles of the MoRPh¹³ and ditch condition surveys that are required for a BNG assessment. Full MoRPh and ditch condition surveys could not, however, be undertaken due to the limited site access. Watercourses that were visited during the walkover are shown in Appendix A. Condition was, therefore, assessed using site observations and open-source data as detailed in Section 3.5.3
- 3.7 This report has been produced in accordance with the methodology set out in the following BNG guidance documents:

¹³ Modular River Survey (2022). [Online] Available at: <https://modularriversurvey.org/>.

- Biodiversity Metric 3.0 – Technical Supplement⁵.
- Biodiversity Metric 3.0 – User Guide⁶.

3.2 Future Site Baseline

3.2.1 Largest Reservoir Option

3.8 The future site baseline was developed following a series of multi-disciplinary workshops and meetings. An illustrative masterplan of the site was then created for the largest option (150 Mm³) by the landscape architects in CAD which was subsequently recreated in GIS to allow measurements of each habitat created/retained or enhanced to be made (Appendix B). These measurements were then inserted into the habitat creation tab of the BNG metric tool. The key changes from Gate 1 were further definition of the reservoir embankments, site access and amenities, watercourse realignments and creation of wetland areas that informed the definition of the future site baseline.

3.2.2 Alternative Reservoir Options

3.9 A landscape masterplan was not created for each of the alternative reservoir options. Therefore, in order to calculate the future baseline habitat areas for the alternative options, certain high-level assumptions have been made. Firstly, the area within the indicative scheme boundary for each alternative option was measured in GIS to give a total future baseline habitat area. The size of each reservoir and associated embankment were also measured as these areas were already presented at Gate 1. To calculate the area of remaining habitat to be created for each option, the reservoir area and embankment area was subtracted from the total baseline area. The areas of habitat creation calculated for the 150 Mm³ options were then scaled down or up depending on the size of each indicative scheme boundary (Table 3.1).

Table 3.1: Methodology for calculating the future baseline habitat areas for the alternative reservoir options

Reservoir Option	Indicative Scheme Boundary (ha)	Reservoir Area (ha)	Embankment Area (ha)	Total Area Minus Reservoir and Embankment (ha)	% Change in Habitat Area
150Mm³	1754.34	662.17	229.08	862.75	N/A
125Mm³	1706.54	581.5	212.73	912.31	+5.74
100Mm³	1598.60	495.24	196.41	906.95	+5.12
75Mm³	1528	391.91	224.4	911.69	+5.67
30 + 100Mm³	1754.11	650.28	240.8	862.92	+0.02
80 + 42Mm³	1754.11	648.19	242.86	862.95	+0.02

3.10 For the watercourses, new watercourse realignments and wetland ditches were defined for each alternative reservoir option as an update from Gate 1. The details for the six different design options are outlined in Water Framework Directive Compliance Assessment 2022 (Technical Annex B5). As a brief summary these include the following watercourse scheme components:

- **Western Watercourse Diversion:** Diversion of Cow Common Brook to the west of the new reservoir.
- **Eastern Watercourse Diversion:** Diversion of Mere Dyke and associated ditches to the east of the new reservoir.
- **River realignments:** Realignments of existing watercourses (Landmead Ditch, Portobello Ditch, River Ock, Mere Dyke) to feed into the watercourse diversions and/or provide habitat improvements by remeandering the channel.
- **Auxiliary Drawdown Channel:** Drawdown channel from the reservoir to the River Thames that will function as a canal.
- **Toe drain and outflow:** Ditch around the outside of the embankment to capture run off and the toe drain outflow via existing the Cow Common Brook channel to River Ock.
- **Wetland ditches:** new ditches across the scheme to act as pockets of wetland habitat, particularly in the flood compensation area to the west of the scheme.

3.3 Ancient Woodland and Trees

3.11 The Woodland Trust Ancient Tree Inventory and the Multi-Agency Geographic Information for the Countryside (MAGIC) websites were accessed to identify the location of these habitat types within indicative location for SESRO^{14,15}.

3.4 Habitat Metrics

3.12 Biodiversity Metric 3.0 provides a value measured in units for a site pre-intervention ('baseline value') and post-intervention ('future baseline'), allowing the difference (positive or negative) to be measured as a net loss or net gain. The calculation is based on the size of a parcel of habitat and its quality. For each habitat parcel, a biodiversity value is generated based on four factors as detailed below:

- **Area/length:** the area in hectares that the habitat occupies or the length of hedgerow or watercourse.

¹⁴ Woodland Trust (Undated). Ancient Tree Inventory. [Online] Available at: <https://ati.woodlandtrust.org.uk/> (Accessed March 2022).

¹⁵ Defra (Undated). Multi-Agency Geographical Information for the Countryside. [Online] Available at: <https://magic.defra.gov.uk/MagicMap.aspx>. (Accessed March 2022).

- **Distinctiveness:** the relative scarcity of the habitat and its importance for nature conservation. This is scored between 0 (very low distinctiveness) and 8 (very high distinctiveness).
- **Condition:** a measure of the quality of a habitat. This is scored between 1 (poor condition or N/A) and 3 (good condition).
- **Strategic significance:** gives extra value to habitats that are located in optimal locations to meet biodiversity and other environmental objectives. This can include areas identified as suitable for protected species compensation. This is scored between 1 (low strategic significance) and 1.15 (high strategic significance).
- **Extent of encroachment (Rivers and Streams metric only):** includes watercourse and riparian encroachment to reflect the amount of development that enters the watercourse (e.g. culverts, weirs, engineered bank protection) or the riparian zone 10 m either side of the river bank, respectively.

3.13 Where habitat creation or enhancement is proposed to compensate for loss of biodiversity value, multipliers are used to reflect the time it will take for the required condition of the target habitat to be achieved and the difficulty of creating the target habitat in the first place. Whilst these are called multipliers, the effect they have on the number of biodiversity units that proposed new or enhanced habitats will deliver is to reduce them. This reflects uncertainties around the effectiveness of habitat creation and enhancement.

3.14 To calculate the change in biodiversity unit value, firstly the baseline (or pre-intervention) 'biodiversity unit' value of each habitat parcel was calculated. Next, using the proposed design, the biodiversity unit value for the habitats that were expected to be retained, plus the values for any enhanced or newly created habitats, were calculated. The change in biodiversity was worked out by subtracting SESRO's baseline biodiversity unit value from the sum of post-intervention values for retained, created and enhanced parcels of the same habitat type. This gave the final biodiversity unit value from which net gain or loss for SESRO was assessed.

3.5 Biodiversity Value

3.5.1 Habitat Parcels

Habitat Area and Hedgerows Metric

3.15 To ensure the habitats corresponded with the UK Habitat Classification User Manual¹⁶. Jacobs conducted a high-level habitat survey in January 2022. Where access was available from PRoW, the extent, type, value and condition of each habitat was recorded during the surveys, and these factors are described in Sections 3.5.2 and 3.5.3. Where access was not available, aerial imagery, OS maps and professional judgement were used to determine the habitat classification and condition assessment.

3.16 Where there was change in habitat condition across a habitat type, the surveyor

¹⁶ UK Habitat Classification Working Group (2018). UK Habitat Classification User Manual.

divided the habitat up into parcels of each habitat type. Each parcel was recorded on the map and calculated separately using the metric. Habitat types were only separated into parcels either when they were not geographically connected and there was difference in condition, or where there was a change in condition in a single location.

Rivers and Streams Metric

3.17 All watercourses in the baseline were mapped using 1:1250,000 OS Master Map. All watercourses within the indicative scheme boundary were included in the baseline. Watercourses on the boundary of the indicative scheme outline (e.g. sections of Landmead Ditch and the River Ock) were only included in the assessment if impacted by the scheme or mitigation plans.

3.18 Watercourses were split into reaches based on their watercourse type, condition and designation (see map in 5.14 Appendix A for map and naming convention).

3.5.2 Habitat Distinctiveness

Habitat Area Metric and Hedgerow Metric

3.19 Habitat distinctiveness is a preassigned score based on the type of habitat present. The UK Habitat Classification survey undertaken by Jacobs recorded the habitat types and a review of the Section 41: Habitats of Principle Importance (HPI) in England was then carried out to confirm the category for each habitat. Detailed tables for the habitat distinctiveness score for each habitat are provided in the Technical Supplement (Natural England, 2021) and summarised in Table 3.2.

Table 3.2: Distinctiveness categories used for Area Habitats (adapted from Biodiversity Metric 3.0- User Guide)

Category	Scores	Description	Suggested Action
Very High	8	Priority habitats as defined in Section 41 of the Natural Environment and Rural Communities (NERC) Act that are highly threatened, internationally scarce and require conservation action.	Bespoke compensation likely to be required
High	6	Priority habitats as defined in Section 41 of the NERC Act requiring conservation action.	Same habitat required
Medium	4	Semi-natural habitats not classed as a Priority Habitat but with significant wildlife benefit	Same broad habitat or a higher distinctiveness habitat required
Low	2	Habitat of low biodiversity value.	Same distinctiveness or better habitat required

Category	Scores	Description	Suggested Action
Very Low	0	Little or no biodiversity value e.g. hard standing	Compensation Not Required

Rivers and Streams Metric

3.20 Watercourse type classification (i.e. river or ditch) determines the distinctiveness category (Table 3.3). Defra’s Biodiversity Metric 3.0 User Guide⁶ defines ditches as a “Artificially created, linear water-conveyancing features that are less than 5 m wide and likely to retain water for more than 4 months of the year. Their hydraulic function is primarily for land drainage, and although partially or fully connected to a river system, they would not have been present without human intervention” (Box 3-1, pg. 22) but also notes that “some heavily engineered ditches may actually be part of the river system (usually part of the headwater system). If there is uncertainty, consult historic maps, LIDAR data and riverine specialists.” (Paragraph 8.29, pg. 77). While the Metric does not explicitly define rivers, rivers are determined in this assessment as those watercourses categorised as rivers by statutory datasets (e.g. WFD, Environment Agency’s Main River database) or those which appear natural based on their course.

Table 3.3: Distinctiveness categories used in the Rivers and Streams metric (adapted from Biodiversity Metric 3.0-User Guide)

Category	Scores	Description
Very High	8	Priority River Habitat
High	6	Other Rivers and Streams
Medium	4	Ditches and Canals
Low	2	Culverts

3.21 Watercourse type was determined on site where site access was possible but where watercourses were not accessible, watercourse type was determined using the criteria in Figure 3.1. The criteria to determine watercourse type included the consultation of open-source historic maps and LIDAR data as proposed in the User Guide⁶ but also by using watercourse designations (e.g. Priority River Habitats, WFD water body or Main River). This method has been agreed with Graham Scholey (Environment Agency BNG lead) in an email exchange on 7th March 2022.

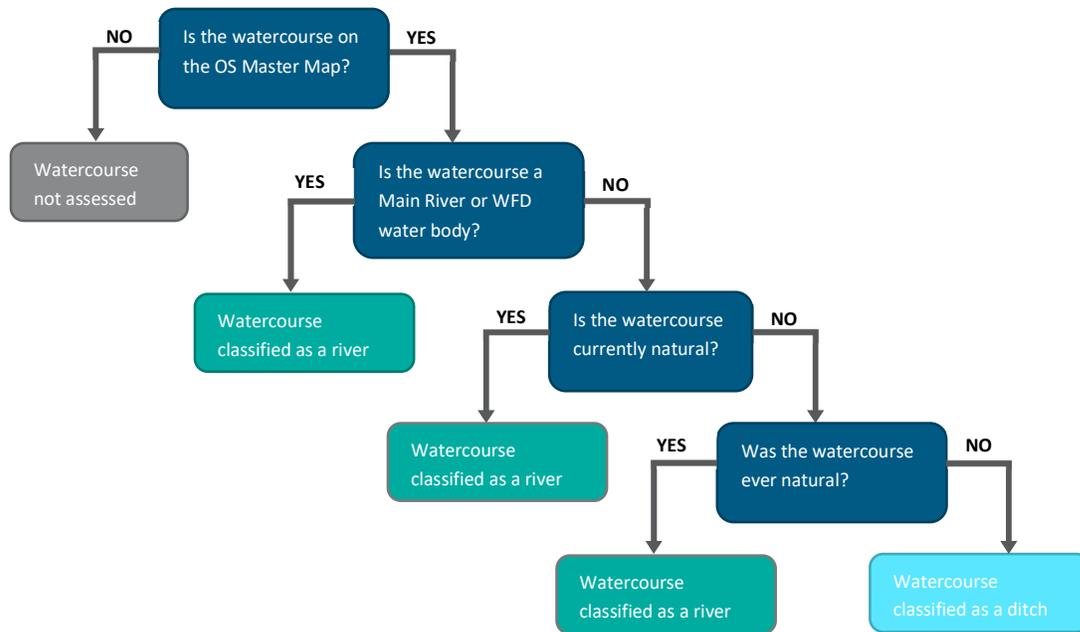


Figure 3.1: Flow chart to classify watercourses as rivers or ditches

- 3.22 Watercourses with no designation and with an artificial course were considered ditches. However, if there is evidence that a ditch once followed the course of a natural river it may be classified as a river according to the User Guide⁶. Whether a watercourse is currently natural was determined by assessing the planform of the watercourse and observations made from satellite imagery and, when available, aerial photography. To determine whether a watercourse was ever natural, LIDAR¹⁷, historical maps¹⁸ and surface water flood maps¹⁹ were consulted.
- 3.23 Rivers would be considered Priority River Habitats (Very High Distinctiveness) if they were on the Priority River Map²⁰ but there are none within the indicative scheme outline. It should be noted that the watercourse called the Old Canal is a disused canal but is approximately 15 m wide so is classified as a canal rather than a ditch. The final map of baseline watercourse types is in 5.14 Appendix A Appendix A.

¹⁷ Environment Agency (2022). *National LIDAR Programme*. [Online] Available at: <https://data.gov.uk/dataset/f0db0249-f17b-4036-9e65-309148c97ce4/national-lidar-programme> [Accessed 19th March 2022]

¹⁸ Ordnance Survey Published in 1883 and 1899. [Online] Available at: <https://maps.nls.uk/> [Accessed 19th March 2022]

¹⁹ Environment Agency (2021). *Risk of Flooding from Rivers and Sea (RoFRS)*. [Online] Available at: <https://data.gov.uk/dataset/bad20199-6d39-4aad-8564-26a46778fd94/risk-of-flooding-from-rivers-and-sea> [Accessed 19th March 2022]

²⁰ Natural England (2021) Priority River Habitat – Rivers [online]. Available from: Priority River Habitat - Rivers - data.gov.uk

3.5.3 Habitat Condition

- 3.24 Habitat condition is a score based on the quality of the habitat, judged against the perceived ecological optimum state for that particular habitat. The process of assessing habitat condition considers how many of the key physical characteristics and typical species of a particular habitat type are present in a habitat patch. This is determined by condition criteria. Table TS1-1 in the Technical Supplement (Natural England, 2021A) lists the habitat condition sheets that are available and indicates which sheet should be used for each Area Habitat Type.
- 3.25 Some habitats have a preassigned condition score, and no assessment is required. These tend to be habitats that are intensively managed (croplands) or artificial (develop/sealed surface, artificial unvegetated/unsealed surface) and have a narrow biodiversity niche.
- 3.26 Habitat condition is divided into one of three categories for the Habitat Area metric (Good, Moderate and Poor), and one of five categories for the Rivers and Streams metric (Good, Fairly Good, Moderate, Fairly Poor and Poor). These main categories will be used but the Habitat Area metric and calculation tool does allow for half scores, if for example, it is not possible to separate two main categories.
- 3.27 Identifying habitat condition requires some ecological knowledge in most circumstances and quantitative information was collected (where access allowed) to explain how each habitat meets the condition criteria as set out in the Technical Supplement. One condition assessment proforma was completed for each habitat parcel that could be assessed. Each habitat parcel was assessed against each condition assessment criterion for each indicator of condition, recording a result of 'pass' or 'fail'. Some condition proformas employ 'essential' criteria. These are criteria which must be passed for the habitat parcel to achieve a particular condition. These scores are then summed and compared to the overall score thresholds for the habitat group and an overall assessment of condition is reached²¹.
- 3.28 For the Rivers and Streams metric, the river condition assessment is undertaken using MoRPh surveys¹³ and ditch condition assessment surveys. While these surveys are required for a BNG assessment, they could not be undertaken due to the site access limitations. Therefore, condition scores have been estimated based on the sections of watercourse that were observable on site using the principles of the MoRPh and ditch condition surveys. In sections that were not accessible, it is assumed that rivers were of 'moderate' condition and ditches were of 'poor' condition. These conditions are assigned based on the other watercourses observed during the site visit and from satellite imagery. The final map of baseline watercourse condition is in 1.1Appendix A. For future SESRO BNG assessments, the site will need to be revisited with fewer access restrictions to ensure the appropriate condition has been assigned based on actual MoRPh surveys and ditch condition surveys.

²¹ Natural England (2021A). *The Biodiversity Metric 3.0: Auditing and Accounting for Biodiversity - Technical Supplement*. Natural England.

3.5.4 Strategic Significance

- 3.29 Strategic significance is a score based on whether the location of the development and/or off-site work has been identified locally as significant for nature.
- 3.30 A review of the Oxfordshire Biodiversity Action Plan²² and the Vale of White Horse Local Plan²³ was carried out to identify strategically significant ecological networks.
- 3.31 In addition, a review of Natural England’s Habitat Network Maps²⁴ was carried out. The habitat network maps are intended to be used to help identify areas for future habitat creation and restoration at a landscape scale but need to be considered alongside other local datasets and knowledge. The maps are based on two components:
- ‘Existing Habitat’: primary habitats, associated habitats, areas suitable for habitat creation/restoration, and restorable habitat areas.
 - ‘Network Enhancement & Expansion’: network zones that identify areas for improvement to improve habitat networks, join up areas of existing habitat, increase connectivity and reduce habitat fragmentation.
- 3.32 For the Rivers and Streams metric, strategic significance is assumed to be ‘low’ for all watercourses as they are not listed within local plans, catchment plans or priority habitats. This is with the exception of watercourses that are included within the length of the WFD water body channel which are assumed to be ‘high’ as they have targets to improve their current poor ecological status by 2027 and the Sandford Brook and the River Ock are in Thames River Basin Management Plan.

3.6 Risk Multipliers- Habitat Creation and Enhancement

3.6.1 Time to Target Condition

- 3.33 ‘Time to target condition’ is a standard score based on how long the habitat type takes to establish and achieve its targeted condition. The time period used is the length of time (in years) between the intervention and the point in time the habitat reaches the pre-agreed target quality (i.e. distinctiveness, condition, area). This length of time will vary between habitat types, between change scenarios (e.g. creation typically takes longer than enhancement) and habitat management regime. Detailed tables for the time to target condition for each habitat is provided in the Technical Supplement (Natural England., 2021A) and summarised in Table 3.4.

²² Oxford City Council (2014). *Biodiversity Action Plan 2015 – 2020*.

²³ Vale of White Horse (2016). *Vale of White Horse Local Plan*.

²⁴ Edwards, J., Knight, M., Taylor, S. and Crosher, I.E. (2020). *Habitat Networks Maps: User Guide V2. Natural England*.

Table 3.4: Time to target condition: multipliers for different time periods (adapted from Biodiversity Metric 3.0 – User Guide)

Time (years)	Multiplier	Time (year)	Multiplier
0	1.000	15	0.586
1	0.965	20	0.490
2	0.931	25	0.410
5	0.837	30	0.343
10	0.700	>32	0.320

3.6.2 Difficulty of Creation or Restoring a Habitat

3.34 Habitat creation carries an associated risk based on the difficulty and uncertainty of successfully creating, restoring or enhancing a habitat. A multiplier is therefore applied to recognise the difficulty of creating different habitats (Table 3.5). Where uncertainties have been identified further work will be required to help give confidence that the habitat creation or restoration will be successful.

Table 3.5: Difficulty category multipliers (taken from Biodiversity Metric 3.0 – User Guide)

Difficulty Categories	Category Multiplier
Very High	0.1
High	0.33
Medium	0.67
Low	1

3.6.3 Off-site Risk

3.35 An off-site risk multiplier is also applied, based on the location where the habitat creation or enhancement is undertaken. The off-site multiplier is applied for habitat areas, to compensation parcels outside of the relevant Local Planning Authority (LPA) or National Character Area (NCA), and to watercourses outside of the WFD waterbody, as demonstrated in Table 3.6.

Table 3.6: Off-site risk multipliers (taken from Biodiversity Metric 3.0 – User Guide)

Habitat Area Category	Rivers and Streams Category	Score
Compensation inside LPA or NCA of impact site	Within waterbody	1.0
Compensation outside of LPA or NCA of impact site but in neighbouring Local Character Area (LCA) or NCA	Outside waterbody	0.75
Compensation outside LPA or NCA of impact site and beyond neighbouring LPA or NCA.	Outside catchment	0.5

4. Results

4.1 150 Mm³ Reservoir Option

4.1 All biodiversity unit calculations for SESRO are based upon the indicative scheme boundary, including the permanent habitat loss for the scheme and the Landscape and Environmental Design Strategy Plan (Appendix C). The results should be read in conjunction with the Baseline Habitat Plans (Appendix A) which highlight the high-level baseline habitat currently present on site and the Landscape and Environmental Design Strategy Plan which shows the habitats to be created.

4.2 As previously stated, the results of this assessment are based on the findings of high-level field surveys, analysis of OS maps and aerial images and an illustrative Environmental Management Plan. It should also be noted that due to this initial high-level assessment, certain assumptions regarding the habitat types and condition assessments for the habitats had to be made. A precautionary approach was taken when determining the habitat condition score, for example high or moderate condition was assumed unless the habitat was of low distinctiveness. Habitats of low distinctiveness were given a condition score of poor. Areas of woodland which could not be accessed and assessed thoroughly were categorised as lowland mixed deciduous woodland and the condition was estimated to be good.

4.3 The indicative scheme boundary represents a total of 1754.34 ha, equating to 4923.57 habitat units. Linear features consisting of lines of trees, native hedgerow and native hedgerow with trees located within the Development area equate to a total of 99.9 km, equating to 440.24 hedgerow units. As a result of SESRO, the majority of these habitats and linear features within the assessment area will be lost and new habitats created to compensate for the significant losses to biodiversity (see Section 4.1 for further detail).

4.4 The strategic significance for all habitats has been assessed based on the location within a Conservation Target Area. Excluding lowland mixed deciduous woodland, and linear features, the strategic significance for all habitats has been assessed as 'low'. This is because the habitats identified during the field survey and desk study are not listed on The Vale of White Horse District Council or Oxfordshire Biodiversity Action Plan (BAP). The site as a whole, nor the habitats contained within it, fall within the nature conservation target areas of The Vale of White Horse District Council. Lowland mixed deciduous woodland has been assessed as having 'high' strategic significance as the woodland to the south of the site is located within 'The Cutting' Local Wildlife Site which is also known to have badgers (*Meles meles*) and great crested newts (*Triturus cristatus*) present. Both of these species are protected under UK law.

4.1.2 Habitat Area Metrics

4.1.2.1 Habitat loss

4.5 The total area of habitats lost is 1734.24 ha, equating to 4546.87 habitat units.

- 4.6 An area of 35.74 ha provides no habitat units including buildings, roads and surfaced paths. With regards to the habitat metric, this type of habitat presents no/ negligible ecological value. The remainder of the assessment area (1698.5 ha) is comprised of Low to High distinctiveness habitats of Poor to Good condition. It should also be noted that approximately 90% of the baseline habitats to be lost consist of crop land or solar farms which have a low or very low distinctiveness. In some areas, solar farms comprise high value habitats, comprising a mosaic of habitats of varying distinctiveness and condition. However, the solar farms which could be assessed during the field survey were situated on historical agricultural land which is poor condition and low distinctiveness.
- 4.7 The most significant impact of the development will be the loss of lowland mixed deciduous woodland. The site contains 62.39 ha of this woodland type which has a condition assessment of good and is of high distinctiveness. Only 17 ha of lowland mixed deciduous woodland will be retained on site, primarily around the perimeter of the site. This will lead to a loss of 45.39 ha of this habitat.
- 4.8 The condition assessment scores and the habitats to be lost are detailed in Table 4.1 below.

Table 4.1: Habitats to be lost

Habitat (UKHab)	Distinctiveness	Condition	Area Loss (ha)	Habitat Unit Loss
c1c Cereal crops	Low	N/A-Agricultural	1381.87	2763.74
c1c114 Cereal crops: Solar farm	Low	N/A-Agricultural	146.24	292.48
g3c Other neutral grassland	Medium	Poor	72.23	288.92
g4 Modified grassland	Low	Moderate	40	160
h3h Mixed scrub	Medium	Moderate	7.54	60.32
r1b Ponds (non-priority habitat)	Medium	Moderate	2.9	23.2
s1d Other inland rock and scree	Medium	Moderate	1.18	9.44
w1f Lowland mixed deciduous woodland	High	Good	45.39	939.57
w1e Other woodland, mixed	Medium	Moderate	1.15	9.20
u1b5 Buildings	Very low	N/A-Other	25.34	0

Habitat (UKHab)	Distinctiveness	Condition	Area Loss (ha)	Habitat Unit Loss
u1c Artificial unvegetated surface	Very low	N/A-Other	0.8	0
u1e Built linear features	Very low	N/A-Other	9.6	0

4.1.2.2 Retained and Enhanced Habitats

4.9 Areas within three habitat parcels will be retained as part of the Development, totalling an area of 20.1 ha equating to 376.70 habitat units. Under the current proposals, none of the retained habitats will be enhanced. Additional biodiversity units can be obtained by enhancing retained habitats so this should be explored further at Gate 3 once the full UK Habs assessment has been completed. The habitats to be retained within the development boundary is outlined in Table 4.2.

Table 4.2: Retained habitats

Habitat (UKHab)	Distinctiveness	Condition	Area Retained (ha)	Area Enhanced (ha)	Habitat Units
w1f Lowland mixed deciduous woodland	High	Good	17	0	351.90
w1e Other woodland; mixed	Medium	Moderate	1.2	0	9.6
Ponds (Non-priority habitat)	Medium	Moderate	1.9	0	15.20

4.1.2.3 Habitat Creation

4.10 The illustrative masterplan depicts that the total area of habitats to be created is 1680.31 ha, equating to 6176.21 habitat units. The built extent arising from the Development will encompass approximately 41.26 ha. This extent will have no biodiversity value and so offers limited opportunity for habitat creation.

4.11 Habitat created will aim to blend in with the existing landscape and be tailored to suit the physical and hydrological site conditions. Habitat created will be of significantly better quality for biodiversity than the previous predominantly arable landscape. The strategy for achieving the desired condition of the habitats to be created will be detailed within the future Habitat and Landscape Management Plan.

4.12 The reservoir itself will be 662.17 ha, which accounts for a significantly large proportion of the development area. The main aspect of the condition assessment of reservoirs involves assigning a naturalness class to the four elements of lake functioning; physical, hydrological, chemical and biological. The design of the

reservoir will include widespread modification of the shoreline with more than 2/3 of the shoreline reinforced. There will also be little opportunity for marginal vegetation to establish except within several small areas along the western shoreline. The reservoir will also be subject to water level fluctuations during times of drawdown and inflow. All of these design features offer little in the way of 'naturalisation' and as such the condition assessment for the proposed reservoir will be 'poor'. The reservoir design does include the provision of floating islands which will be beneficial for wildlife.

- 4.13 The main focus of the habitat creation will be to establish a wetland habitat mosaic located to the west of the reservoir (127.6 ha). The wetland area will be a mosaic of wet woodland, neutral grassland, reedbeds, floodplain wetland mosaic and wet ditches and rivers. The goal will be to create a biodiverse wetland nature reserve, providing habitat for numerous species of flora and fauna notably breeding birds, invertebrates and riparian mammals. The condition score provided for these habitats has been discussed with scheme engineers and landscape architects who have identified which of the condition criteria each habitat will be able to achieve.
- 4.14 A significant proportion of the habitat units gained (4350 units) will be from the creation of species-rich neutral grassland. Neutral grassland will be planted within the wetland habitat mosaic to the west of the reservoir but also on the reservoir embankments and within other grassland areas of the site. The grasslands on the reservoir embankments will be sheep-grazed in order to keep the sward short for security purposes. Other grassland areas will be allowed to grow tall which will encourage use by invertebrate, mammal, amphibian, reptile and bird species. The species-rich grassland will also offer an aesthetic value to the site.
- 4.15 A series of non-priority habitat ponds (10.6 ha) will be created to the north-west, north-east and to the east of the reservoir. Not only do ponds provide a unique biodiversity resource, rich in flora and fauna, but they also provide an important resource for recreation and education and are visually appealing within the landscape. The condition of the ponds has been determined as moderate based on the understanding that the ponds will be of good water quality, not be artificially stocked with fish, will not have non-native species of plant and animal and pond levels will be able to fluctuate naturally (amongst other criteria).
- 4.16 An area of cropland (80.36 ha) will be reinstated in the south-western corner of the site. Although this habitat is of low distinctiveness and offers little in the way of biodiversity net gain, soils of high value have been identified on site and should be retained where possible.
- 4.17 The habitats to be created within the scheme boundary is outlined within Table 4.3 below and illustrated on the Landscape and Environmental Design Strategy Plan (Appendix C).

Table 4.3: Habitats to be created

Habitat (UKhab)	Distinctiveness	Condition	Area Created (ha)	Habitat Unit Gain
c1c Cereal crops	Low	N/A-Agricultural	80.36	112.55
g3c Other neutral grassland	Medium	Good	18.21	111.05
g3c Other neutral grassland	Medium	Good	229.08	1396.97
h3h Mixed scrub	Medium	Moderate	6.45	31.34
r1b Ponds (non-priority habitat)	Medium	Moderate	10.6	55.30
w1d Wet woodland	High	Moderate	21.54	73.65
w1e Other woodland, mixed	Medium	Moderate	15	38.38
r1108 Reservoir	Medium	Poor	662.17	1242.73
u1b Developed land sealed surface	Very low	N/A-Other	41.26	
Floodplain wetland mosaic (western wetland mosaic)	Medium	Good	122.6	246.72
f2e Reedbeds (western wetland mosaic)	High	Moderate	5	22.73
g3c Other neutral grassland (western wetland mosaic)	Medium	Good	466.04	2842

The areas of habitat creation mentioned above are shown on the Landscape and Environmental Design Strategy Plan (Appendix C).

4.1.3 Hedgerow Metrics

4.1.3.1 Hedgerow Loss

4.18 The total length of hedgerow, hedgerow with trees and lines of trees to be lost is 83.9 km, equating to a loss of 376.24 hedgerow units.

4.19 This comprised three hedgerow types of Low to Medium distinctiveness all of which were classified as being in 'moderate' condition. The hedgerows to be lost are detailed in Table 4.4 below.

Table 4.4: Hedgerow to be lost

Habitat (UKHab)	Distinctiveness	Condition	Length Lost (km)	Hedgerow Unit Lost
h2 Native hedgerow	Low	Moderate	49.72	198.88
h2 Native hedgerow with trees	Medium	Moderate	10.16	81.28
w1g6 Line of trees	Low	Moderate	24.02	96.08

4.1.3.2 Retained and Enhanced Hedgerows

4.20 The current masterplan design has highlighted 16 km of ‘linear feature’ to be retained and enhanced within the indicative scheme boundary. It has therefore been assumed 4 km of native hedgerow will be enhanced and 4 km of native hedgerow will be retained. The same assumption has been made for tree lines. The 16 km of linear habitat to be retained and enhanced will equate to a gain of 32 hedgerow units. The hedgerows to be retained and enhanced within the development boundary is outlined in Table 4.5.

4.21 Hedgerows and tree lines which have been categorised as having a ‘moderate’ condition assessment for the baseline habitat will be enhanced to ‘good’ condition, where possible. This will be achieved through ‘gapping up’ of sections of hedgerow where plants have become sparse or there are gaps. This will also help to maintain existing connectivity across the site. Additional hedgerow plants will be planted to create a greater species richness and to create a wider feature.

Table 4.5: Retained and enhanced hedgerows

Habitat (UKHab)	Distinctiveness	Condition	Length Retained (km)	Length Enhanced (km)	Hedgerow Unit
h2 Native hedgerow	Low	Moderate	4	4	16
w1g6 Line of trees	Low	Moderate	4	4	16

4.1.3.3 Hedgerow Creation

4.22 Native hedgerows with trees of ‘good’ condition are to be created within the development boundary, covering a total length of 42.2 km, equating to 270.32 hedgerow units. The strategy for achieving the desired condition of the hedgerows to be created will be detailed within the future Habitat and Landscape Management Plan. Where possible, the hedgerows to be created will be ‘species-rich’ but for the purposes of this precautionary and high-level assessment, the hedgerows have been categorised as ‘native’ only. Hedgerows and tree lines will be planted in long,

continuous lines where possible, often adjacent to other linear features such as roads, access tracks and the proposed canal. These hedgerows will be planted to help maintain habitat connectivity across the site. This will ensure wildlife continue to be able to commute through the landscape and do not become isolated from important foraging or breeding grounds.

- 4.23 The areas of hedgerow creation mentioned above are shown on the Landscape and Environmental Design Strategy Plan (Appendix C).

4.1.4 Habitat Trading Summary

- 4.24 Lowland mixed deciduous woodland includes woodland growing on the full range of soil conditions, from very acid to base-rich, and takes in most semi-natural woodland in southern and eastern England. The woodlands include ancient woodlands and tend to be small, less than 20 ha. The total area of this woodland has declined through clearance, over grazing and replanting with non-native species, by about 30–40% over the last 50 years²⁵. Lowland mixed deciduous woodland has therefore been given a high distinctiveness rating in the Biodiversity Metric 3.0.

- 4.25 Under the current proposals for the scheme, 45.39 ha of lowland mixed deciduous woodland will be lost and only 17 ha will be retained. This equates to a loss of 939.57 units of habitat which have not been accounted for within the metric. As the metric Trading Summary states that habitats of high distinctiveness must be replaced with the same habitat type (taking into account the risk multiplier), only planting of lowland mixed deciduous woodland would rectify this issue. As there is no space within the site to create 939.57 units of this woodland type, the habitat may need to be created off-site or habitat units bought to compensate for the loss.

- 4.26 It also needs to be taken into account that all areas of lowland mixed deciduous woodland identified on site may actually be a different type of woodland once a full site survey has been undertaken. Should the woodlands on site actually be a habitat of lower distinctiveness or condition, the amount of habitat creation required is likely to be reduced.

4.1.5 Ancient Trees

- 4.27 The search of the Ancient Woodland Inventory identified no Ancient Woodland blocks located within the scheme boundary or directly adjacent. The search of the Ancient Tree Inventory highlighted the presence of one ancient tree within the scheme boundary and 14 veteran trees, one ancient tree and one notable tree along the River Ock to the north of the site (see Appendix D for location of Ancient Trees). Under the current proposals for the Scheme, the trees along the River Ock will not be impacted and a suitable works exclusion zone will be installed around these trees to

²⁵ JNCC (2008). *UK Biodiversity Action Plan Priority Habitat Descriptions: Lowland Mixed Deciduous Woodland*. [Online] Available at: <https://data.jncc.gov.uk/data/2829ce47-1ca5-41e7-bc1a-871c1cc0b3ae/UKBAP-BAPHabitats-30-LowlandMixedDecWood.pdf>. (Accessed April 2022).

ensure their survival. The ancient tree located within the centre of the Scheme will be lost.

- 4.28 The tree located within the centre of the indicative location for SESRO is an ancient crack willow (*Salix fragilis*) which has been pollarded. The tree is located within a tree belt adjacent to a public footpath.

4.2 Alternative Reservoir Options

- 4.29 The biodiversity unit calculations for the SESRO alternative reservoir options are based upon the indicative scheme boundaries and a scaled down version of the Landscape and Environmental Design Strategy Plan for the 150 Mm³ option (Appendix C). A Landscape and Environmental Design Strategy Plan has not been created for each of the alternative options.

- 4.30 The results of the assessment should be read in conjunction with the Baseline Habitat Plans (Appendix A) which highlight the high-level baseline habitat currently present on site.

- 4.31 The alternative options indicative scheme boundaries represent a total of between 1528 ha (75 Mm³ option) and 1754.11 ha (80+42 and 30+100 Mm³ options), equating to between 4253.42 and 4922.65 baseline habitat units. The linear features as discussed for the 150 Mm³ option equate to a total of between 90.5 Km (75 Mm³ option) and 99.9 Km (80+42 and 30+100 Mm³ options), equating to between 402.64 and 440.24 baseline hedgerow units. As a result of SESRO the majority of these habitat and linear features within the assessment areas will be lost and new habitats created to avoid significant losses to biodiversity.

4.2.2 Habitat Area Metrics

Habitat Loss

- 4.32 For the alternative reservoir options, the total area of habitat lost is between 1506 ha (75 Mm³ option) and 1734.01 ha (80+42 and 30+100 Mm³ options), equating to between 3854.74 and 4545.95 habitat units (See Table 4.6 for full results).

- 4.33 As the alternative reservoir options significantly overlap with the largest reservoir option (150 Mm³), the types and conditions of habitats to be lost are largely the same.

Retained and Enhanced Habitats

- 4.34 As per the largest reservoir option (150 Mm³), areas within three habitat parcels will be retained as part of the development proposals for the alternative reservoir options. Between 20.10 ha (80+42 and 30+100 Mm³ options) and 21.26 ha (75 Mm³ and 125 Mm³ options) equating to 375.80 and 398.08 units. (See Table 4.7 for full results).

Habitat Creation

- 4.35 In order to calculate the future baseline habitat areas for the alternative options, certain high-level assumptions have been made. Refer to Section 3.2.2 for the methodology for calculating the areas of habitat creation for the alternative reservoir options based on the Landscape and Environmental Design Strategy Plan for the 150 Mm³ option.
- 4.36 The amount of habitat to be created ranges between 1450 ha (75 Mm³ option) and 1680.25 ha (80+42 option) which equates to 6051.11 and 6488.20 habitat units. (See Table 4.8 for full results). It should also be taken into account that there will be a significant delay before starting habitat creation due to the length of time it will take to build the reservoir. All alternative reservoir options excluding the 125 Mm³ option, has an estimated 8 years delay before the start of habitat creation. The 125 Mm³ option has a delay of 9 years.
- 4.37 As the habitats to be created for the alternative reservoir options are based on the Landscape and Environmental Design Strategy Plan for the 150 Mm³ reservoir option, the description of the habitats is as per paragraphs 4.13 to 4.17.

4.2.3 Hedgerow Metrics

Hedgerow Loss

- 4.38 The total length of hedgerow to be lost for the alternative reservoir options ranges between 73.58 Km (75 Mm³ option) and 83.58 Km (80+42 and 30+100 Mm³ options) which equates to 334.96 and 374.96 hedgerow baseline units. (See Table 4.9 for full results).
- 4.39 This comprised three hedgerow types of Low to Medium distinctiveness all of which were classified as being in 'moderate' condition.

Retained and Enhanced Hedgerows

- 4.40 For all alternative reservoir options, lengths of native hedgerow and lengths of lines of trees will be retained and enhanced. For the purposes of this assessment the lengths of retention and enhancement are the same for both habitat types. The total length of native hedgerow and lines of trees to be retained and enhanced ranges between 4.08 Km (80+42 and 30+100 Mm³ options) and 4.23 Km (75 Mm³ and 125 Mm³ options). (See Table 4.10 for full results).
- 4.41 Hedgerows and tree lines which have been categorised as having a 'moderate' condition assessment for the baseline habitat will be enhanced to 'good' condition, where possible. This will be achieved through 'gapping up' of sections of hedgerow where plants have become sparse or there are gaps. This will also help to maintain existing connectivity across the site. Additional hedgerow plants will be planted to create a greater species richness and to create a wider feature.

Hedgerow Creation

4.42 Native hedgerows with trees of 'good' condition are to be created within the development boundary, covering a total length of 42.2Km (all options), equating to between 270.32 (all other options) and 280.12 (125 Mm³ option only) hedgerow units (see Table 4.11 for full results). The difference in hedgerow units calculated is a result in the number of years delay before starting habitat creation. All alternative reservoir options excluding the 125 Mm³ option, has an estimated 8 years delay before the start of hedgerow planting. The 125 Mm³ option has a delay of 9 years. Where feasible the hedgerows planted will be species-rich but for the purposes of this precautionary and high-level assessment, the hedgerows have been classified as 'native' only.

4.2.4 Habitat Trading Summary

4.43 Under the current proposals for the alternative reservoir options, between 34.25 ha (75 Mm³ option) and 45.39 ha (80+42 and 30+100 Mm³ options) of lowland mixed deciduous woodland will be lost as a result of the Development. In comparison, only between 17 ha and 18 ha of will be retained *in situ*. This equates to a loss of lowland mixed deciduous woodland habitat units of between 708.98 and 939.57 which have not been accounted for within the metric. As the metric trading summary states that habitats of high distinctiveness must be replaced with the same habitat type (taking into account the risk multiplier), only planting of lowland mixed deciduous woodland would rectify this issue. The habitat may need to be created off-site or habitat units bought to compensate for the loss.

Table 4.6: Habitats to be lost – alternative reservoir options

Habitat (UKHab)	Distinctiveness	Condition	125Mm ³ Option		100Mm ³ Option		75Mm ³ Option		42+80Mm ³ Option		30+100Mm ³ Option	
			Area Loss (ha)	Habitat Unit Loss	Area Loss (ha)	Habitat Unit Loss	Area Loss (ha)	Habitat Unit Loss	Area Loss (ha)	Habitat Unit Loss	Area Loss (ha)	Habitat Unit Loss
c1c Cereal crops	Low	N/A-Agricultural	1347.05	2694.1	1246.32	2492.64	1179.08	2358.16	1381.87	2763.74	1381.87	2763.74
c1c114 Solar farm	Low	N/A-Agricultural	146.24	292.48	146.24	292.48	146.24	292.48	146.24	292.48	146.24	292.48
g3c Other neutral grassland	Medium	Poor	72	288	72	288	72	288	72	288	72	288
g4 Modified grassland	Low	Moderate	30.58	122.32	29.58	118.32	29.58	118.32	40.00	160	40	160
h3h Mixed scrub	Medium	Moderate	7.36	58.88	7.36	58.88	7.36	58.88	7.54	60.32	7.54	60.32
r1b Ponds (non-priority habitat)	Medium	Moderate	2.53	20.24	2.70	21.60	1.47	11.76	2.9	23.20	2.9	23.20
s1d Other inland rock and scree	Medium	Moderate	1.18	9.44	1.18	9.44	1.18	9.44	1.18	9.44	1.18	9.44

Habitat (UKHab)	Distinctiveness	Condition	125Mm ³ Option		100Mm ³ Option		75Mm ³ Option		42+80Mm ³ Option		30+100Mm ³ Option	
			Area Loss (ha)	Habitat Unit Loss	Area Loss (ha)	Habitat Unit Loss	Area Loss (ha)	Habitat Unit Loss	Area Loss (ha)	Habitat Unit Loss	Area Loss (ha)	Habitat Unit Loss
w1f Lowland mixed deciduous woodland	High	Good	41.82	865.67	37.05	766.94	34.25	708.98	45.39	939.57	45.39	939.57
w1e Other woodland, mixed	Medium	Moderate	1.09	8.72	0.35	2.80	1.09	8.72	1.15	9.20	1.15	9.20
u1b5 Buildings	Very low	N/A-Other	25.34	0.0	25.27	0.00	25.17	0.0	25.34	0.0	25.34	0.0
u1c Artificial unvegetated surface	Very low	N/A-Other	0.80	0.00	0.80	0.00	0.80	0.0	0.80	0.0	0.8	0.0
u1e Built linear features	Very low	N/A-Other	9.29	0.0	8.62	0.00	8.52	0.0	9.6	0.0	9.6	0.0

Table 4.7: Retained habitats – alternative reservoir options

Habitat (UKHab)	Distinctiveness	Condition	125Mm ³ Option		100Mm ³ Option		75Mm ³ Option		42+80Mm ³ Option		30+100Mm ³ Option	
			Area retained (ha)	Habitat Units	Area retained (ha)	Habitat Units	Area retained (ha)	Habitat Units	Area retained (ha)	Habitat Units	Area retained (ha)	Habitat Units
w1f Lowland mixed deciduous woodland	High	Good	18.00	372.60	17.87	369.91	18	372.60	17	351.90	17	351.90
w1e Other woodland; mixed	Medium	Moderate	1.26	10.08	2.0	10.08	1.26	10.08	1.2	9.6	1.2	9.6
Ponds (Non-priority habitat)	Medium	Moderate	2.00	16.00	1.26	16.00	2	16.00	1.9	15.20	1.9	15.20

Table 4.8: Habitats to be created – alternative reservoir options

Habitat (UKHab)	Distinctiveness	Condition	125Mm ³ Option		100Mm ³ Option		75Mm ³ Option		42+80Mm ³ Option		30+100Mm ³ Option	
			Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain
c1c Cereal crops	Low	N/A-Agricultural	84.98	119.02	84.47	122.60	84.92	123.25	80.38	116.66	80.38	116.66
g3c Other neutral grassland	Medium	Good	19.26	117.45	19.14	120.95	19.24	121.58	18.21	115.08	18.21	128.06
g3c Other neutral grassland	Medium	Good	212.73	1297.27	196.41	1241.18	224.4	1418.06	242.86	1534.72	240.80	1521.70
h3h Mixed scrub	Medium	Moderate	6.82	33.13	6.78	34.13	6.82	34.33	6.45	32.47	6.45	32.47
r1b Ponds (non-priority habitat)	Medium	Moderate	11.21	58.48	11.14	60.22	11.20	60.55	10.60	57.31	10.60	63.77
w1d Wet woodland	High	Moderate	22.78	77.89	22.64	80.22	22.76	80.64	21.54	76.32	21.54	84.93

Habitat (UKHab)	Distinctiveness	Condition	125Mm ³ Option		100Mm ³ Option		75Mm ³ Option		42+80Mm ³ Option		30+100Mm ³ Option	
			Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain
w1e Other woodland, mixed	Medium	Moderate	15.86	40.58	15.77	40.35	15.85	40.55	15.00	38.38	15.00	38.38
r1108 Reservoir	Medium	Poor	581.5	1091.33	495.24	963.16	391.81	762.00	648.19	1260.62	650.28	1264.68
u1b Developed land sealed surface	Very low	N/A-Other	43.63	0.00	43.37	0.00	43.6	0.00	41.27	0.00	41.27	0.00
Floodplain wetland mosaic (western wetland mosaic)	Medium	Good	129.64	260.89	128.88	268.76	129.55	270.16	122.62	284.55	122.62	255.71
f2e Reedbeds (western wetland mosaic)	High	Moderate	5.29	24.05	5.26	24.78	5.28	24.88	5.00	23.56	5.00	23.56

Habitat (UKHab)	Distinctiveness	Condition	125Mm ³ Option		100Mm ³ Option		75Mm ³ Option		42+80Mm ³ Option		30+100Mm ³ Option	
			Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain	Area created (ha)	Habitat Unit Gain
g3c Other neutral grassland (western wetland mosaic)	Medium	Good	492.79	3005.12	490	3096.48	492.46	3112.03	466.13	2945.64	466.13	3277.92
Modified grassland	Low	Poor	2.11	2.96	2.10	3.05	2.11	3.06	2.00	2.90	2.00	2.90

4.2.5 Hedgerow Metrics

Table 4.9: Hedgerow to be lost – alternative reservoir options

Habitat (UKHab)	Distinctiveness	Condition	125Mm ³ Option		100Mm ³ Option		75Mm ³ Option		42+80Mm ³ Option		30+100Mm ³ Option	
			Length Lost (km)	Hedgerow Units Lost	Length Lost (km)	Hedgerow Units Lost	Length Lost (km)	Hedgerow Units Lost	Length Lost (km)	Hedgerow Units Lost	Length Lost (km)	Hedgerow Units Lost
h2 Native hedgerow	Low	Moderate	48.21	192.84	43.07	172.28	41.82	167.28	49.56	198.24	49.56	198.24
h2 Native hedgerow with trees	Medium	Moderate	10.16	81.28	10.16	81.28	10.16	81.28	10.16	81.28	10.16	81.28
w1g6 Line of trees	Low	Moderate	23.01	92.04	22.30	89.20	21.60	86.40	23.86	95.44	23.86	95.44
Totals			81.38	366.16	75.53	342.76	73.58	334.96	83.58	374.96	83.58	374.96

Table 4.10: Hedgerow to be retained and enhanced – alternative reservoir options

Habitat (UKHab)	Distinctiveness	Condition	125Mm ³ Option		100Mm ³ Option		75Mm ³ Option		42+80Mm ³ Option		30+100Mm ³ Option	
			Length Retained (km)	Length Enhanced (km)	Length Retained (km)	Length Enhanced (km)	Length Retained (km)	Length Enhanced (km)	Length Retained (km)	Length Enhanced (km)	Length Retained (km)	Length Enhanced (km)
h2 Native hedgerow	Low	Moderate	4.23	4.23	4.20	4.20	4.23	4.23	4.08	4.08	4.08	4.08
w1g6 Line of trees	Low	Moderate	4.23	4.23	4.20	4.20	4.23	4.23	4.08	4.08	4.08	4.08

Table 4.11: Hedgerow to be created – alternative reservoir options

Habitat (UKHab)	Distinctiveness	Condition	125Mm ³ Option		100Mm ³ Option		75Mm ³ Option		42+80Mm ³ Option		30+100Mm ³ Option	
			Length Created (km)	Hedgerow Units Created	Length Created (km)	Hedgerow Units Created	Length Created (km)	Hedgerow Units Created	Length Created (km)	Hedgerow Units Created	Length Created (km)	Hedgerow Units Created
h2 Native hedgerow with trees	High	Good	42.20	270.32	42.20	280.12	42.20	280.12	42.20	280.12	42.20	280.12

4.3 River Metrics

4.3.1 Watercourse Loss

4.44 Watercourses at baseline and the length lost is detailed in Table 4.12. Of the 68.50km of watercourse within the 150 Mm³ baseline, 57.60 km is lost to SESRO. The majority of the watercourses lost are ditches with over 84% of ditches (43.84 km) within the indicative scheme outline lost to the scheme. The majority of ditches were identified on site or assumed to be 'poor' condition. Over 83% (13.76 km) of rivers are also lost to the Development, most of which had been artificially modified to some extent achieving a 'moderate' condition, but some of which exhibited natural planform and diverse habitats, achieving a 'fairly good' condition.

4.45 The amount of watercourse length lost is approximately 57 km for the 150 Mm³, 125 Mm³, 30+100 Mm³ and 80+42 Mm³ reservoir size options as the footprint for all does not differ dramatically. Only the 100 Mm³ and 75 Mm³ options have less watercourse length lost as the size of the footprint reduces at 52.89 km and 46.79 km length lost, respectively. Results are reported separately for rivers, ditches and canals due to the BNG trading rules.

Table 4.12: Watercourses to be lost. *Reach is WFD water body. ** River Basin Units (RBUs) are zero despite a length lost being recorded as the length of enhancements in the watercourse (see Table 4.13 for details) are greater than the length lost.

Ref	Reach name	River type	Baseline condition	150 Mm ³				125 Mm ³				100 Mm ³			
				Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)	Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)	Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)
1	Cow Common Brook	River	Moderate	1.05	12.60	0.99	0.00**	1.05	12.60	0.99	0.00	1.05	12.60	0.99	1.56
2	Cow Common Brook*	River	Fairly good	0.99	17.08	0.99	0.00**	0.99	17.08	0.99	0.00	0.99	17.08	0.99	2.24
3	Cow Common Brook*	River	Moderate	2.86	39.47	2.86	0.00**	2.86	39.47	2.86	0.00	2.86	39.47	2.86	5.11
4	All poor ditches/canals	Ditch/ Canal	Poor	49.81	199.24	42.27	168.56	49.72	198.88	42.27	168.64	46.30	185.20	39.19	156.32
5	Hanney Ditch	Ditch	Fairly poor	1.57	9.42	0.88	0.00**	1.15	6.90	0.81	0.00	0.34	2.04	0.00	0.00
6	Hanney Ditch	River	Moderate	2.09	25.08	2.09	0.00**	2.09	25.08	2.09	0.00	1.86	22.32	1.86	0.00
7	Landmead Ditch	River	Fairly poor	0.73	6.57	0.00	0.00	0.73	6.57	0.00	0.00	0.73	6.57	0.00	0.00
8	Landmead Ditch*	River	Moderate	0.39	5.38	0.06	0.00**	0.39	5.38	0.06	0.00	0.39	5.38	0.06	0.00
9	Mere Dyke West	River	Moderate	2.04	24.48	2.04	24.48	2.04	24.48	2.04	24.48	2.04	24.48	2.04	24.48
10	Mere Dyke	River	Moderate	2.58	30.96	2.54	0.00**	2.58	30.96	2.54	0.00	2.58	30.96	2.54	0.00
11	Oday Ditch (OD4)	Ditch	Moderate	0.69	5.52	0.69	5.52	0.69	5.52	0.69	5.52	0.69	5.52	0.69	5.52
12	Oday Ditches	River	Moderate	0.25	3.00	0.25	3.00	0.25	3.00	0.25	3.00	0.25	3.00	0.25	3.00
13	Oday Ditches*	River	Moderate	0.34	4.69	0.34	4.69	0.34	4.69	0.34	4.69	0.34	4.69	0.34	4.69
14	Orchard Farm Ditch	River	Moderate	0.35	4.20	0.35	4.20	0.35	4.20	0.35	4.20	0.35	4.20	0.35	4.20
15	Portobello Ditch*	River	Fairly good	0.69	11.90	0.60	7.59	0.69	11.90	0.60	7.42	0.23	3.97	0.23	3.97
16	Portobello Ditch*	River	Moderate	0.46	6.35	0.46	4.69	0.46	6.35	0.46	4.55	0.31	4.28	0.31	4.28
17	River Ock*	River	Moderate	0.85	11.73	0.13	0.00**	0.85	11.73	0.13	0.00	0.85	11.73	0.13	0.00
18	Sandford Brook*	River	Moderate	0.76	10.49	0.06	0.69	0.76	10.49	0.06	0.69	0.76	10.49	0.06	0.69

Ref	Reach name	River type	Baseline condition	150 Mm ³				125 Mm ³				100 Mm ³			
				Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)	Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)	Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)
Total river				16.43	213.98	13.76	49.34	16.43	213.98	13.76	49.03	15.59	201.21	13.01	54.22
Total ditch				52.07	214.18	43.84	174.08	51.56	211.30	43.77	174.16	47.33	192.76	39.88	161.84
Total watercourse				68.50	428.16	57.60	223.42	67.99	425.28	57.53	223.19	62.92	393.97	52.89	216.06

Table 4.13 (continued): Watercourses to be lost. *Reach is WFD water body. ** River Basin Units (RBUs) are zero despite a length lost being recorded as the length of enhancements in the watercourse (see Table 4.13 for details) are greater than the length lost.

Ref	Reach name	River type	Baseline condition	75 Mm ³				30+100 Mm ³				80+42 Mm ³			
				Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)	Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)	Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)
1	Cow Common Brook	River	Moderate	0.28	3.36	0.02	0.00	1.05	12.60	0.99	0.00	1.05	12.60	0.99	0.00
2	Cow Common Brook*	River	Fairly good	0.97	16.73	0.14	0.00	0.99	17.08	0.99	0.00	0.99	17.08	0.99	0.00
3	Cow Common Brook*	River	Moderate	2.86	39.47	2.86	0.00	2.86	39.47	2.86	0.00	2.86	39.47	2.86	0.00
4	All poor ditches/canals	Ditch/ Canal	Poor	44.72	178.88	36.76	146.60	49.81	199.24	42.27	168.56	49.81	199.24	42.27	168.56
5	Hanney Ditch	Ditch	Fairly poor	0.34	2.04	0.00	0.00	1.57	9.42	0.88	0.00	1.57	9.42	0.88	0.00
6	Hanney Ditch	River	Moderate	1.51	18.12	1.51	0.00	2.09	25.08	2.09	0.00	2.09	25.08	2.09	0.00
7	Landmead Ditch	River	Fairly poor	0.73	6.57	0.00	0.00	0.73	6.57	0.00	0.00	0.73	6.57	0.29	2.61
8	Landmead Ditch*	River	Moderate	0.39	5.38	0.05	0.00	0.39	5.38	0.06	0.00	0.39	5.38	0.06	0.00
9	Mere Dyke West	River	Moderate	2.04	24.48	2.04	24.48	2.04	24.48	2.04	24.48	2.04	24.48	2.04	24.48
10	Mere Dyke	River	Moderate	2.58	30.96	1.58	0.00	2.58	30.96	2.54	0.00	2.58	30.96	2.54	0.00
11	Oday Ditch (OD4)	Ditch	Moderate	0.69	5.52	0.69	5.52	0.69	5.52	0.69	5.52	0.69	5.52	0.69	5.52
12	Oday Ditches	River	Moderate	0.25	3.00	0.25	3.00	0.25	3.00	0.25	3.00	0.25	3.00	0.25	3.00
13	Oday Ditches*	River	Moderate	0.34	4.69	0.34	4.69	0.34	4.69	0.34	4.69	0.34	4.69	0.34	4.69

Ref	Reach name	River type	Baseline condition	75 Mm ³				30+100 Mm ³				80+42 Mm ³			
				Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)	Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)	Baseline (km)	Baseline (RBUs)	Lost (km)	Lost (RBU)
14	Orchard Farm Ditch	River	Moderate	0.35	4.20	0.35	4.20	0.35	4.20	0.35	4.20	0.35	4.20	0.35	4.20
15	Portobello Ditch*	River	Fairly good	0.23	3.97	0.00	0.17	0.69	11.90	0.60	7.59	0.69	11.90	0.60	7.59
16	Portobello Ditch*	River	Moderate	0.00	0.00	0.00	0.00	0.46	6.35	0.46	4.69	0.46	6.35	0.46	4.69
17	River Ock*	River	Moderate	0.85	11.73	0.13	0.00	0.85	11.73	0.13	0.00	0.85	11.73	0.13	0.00
18	Sandford Brook*	River	Moderate	0.76	10.49	0.07	0.83	0.76	10.49	0.06	0.69	0.76	10.49	0.06	0.69
Total river				14.14	183.15	9.34	37.37	16.43	213.98	13.76	49.34	16.43	213.98	14.05	51.95
Total ditch				45.75	186.44	37.45	152.12	52.07	214.18	43.84	174.08	52.07	214.18	43.84	174.08
Total watercourse				59.89	369.59	46.79	189.49	68.50	428.16	57.60	223.42	68.50	428.16	57.89	226.03

4.3.2 Enhanced Rivers

- 4.46 Watercourse enhancements are detailed in Table 4.14. All watercourse diversions and realignments including the Western Diversion (Cow Common Brook and Portobello Ditch), Eastern Diversion (Mere Dyke), Hanney Ditch, Landmead Ditch, Mere Dyke Ditch and River Ock have been included as watercourse enhancements. It is assumed that river condition will improve to 'fairly good', a conservative and likely to be achievable condition, with the exception of Portobello Ditch which will improve from 'fairly good' to 'good' condition. This is because the watercourse diversions and realignments will be designed to support increased biodiversity so will likely deliver an improved condition score. Ditch condition is assumed to improve from 'poor' to 'moderate'. While the ditches will be enhanced with biodiversity in mind it may be less possible to achieve 'good' condition due to the artificial nature and current 'poor' status of the ditches. These assumptions are based on expert judgement but should be re-evaluated as further details of the watercourse mitigation become available further in the Gated process. The enhancement of the Cow Common Brook due to the Western Diversion is distributed proportionally across the reaches of the Cow Common Brook which are lost to the scheme.
- 4.47 For the 150 Mm³, 100+30 Mm³ and 80+42 Mm³ reservoir size options, 16.54 km of river is enhanced, more than is lost to SESRO through the introduction of a meandering planform in the Western and Eastern Diversions and realignments. This results in the delivery of 222.37 RBUs. Only 1.20 km of existing ditch is enhanced, resulting in the delivery of 8.58 RBUs. For the smaller reservoir size options, less length of river is enhanced but still results in more RBUs than lost to SESRO for each option.

4.3.3 River Creation

- 4.48 Watercourse creation is detailed in Table 4.15. No new rivers are created as part of the mitigation. The greatest creation of watercourse habitat is the creation of wetland ditches that will be shallow ditches part of a low-lying wetland habitat mosaic. For the 150 Mm³, 100+30 Mm³ and 80+42 Mm³ reservoir size options, approximately 13 km of wetland ditches in the indicative scheme outline will be designed with ecological benefits in mind, so it is assumed that they will be of 'moderate' rather than the 'poor' condition assigned to ditches in the baseline. The new wetland ditches deliver approximately 87 RBUs. In the smaller reservoir size options, the length of wetland ditches increases as there is more space within the indicative scheme outline to 16.92 km for the 125 Mm³, 19.77 km for the 100 Mm³ and 18.67 km for the 75 Mm³ options. Only the ditches are included in this watercourse assessment, the wetland habitat surrounding them is included in the Habitat Area Metrics.
- 4.49 An open toe drain is also proposed around the toe of the reservoir embankment that can be designed to achieve 'moderate' condition. It will be 12.28 km long for the 150 Mm³, 100+30 Mm³ and 80+42 Mm³ reservoir size options, and reduce in size as the reservoir size options decrease. The outflow of this toe drain to the River Ock will flow along the existing Cow Common Brook channel. However, this channel will no

longer function as a river, so is 'lost' to SESRO and a ditch 'created' in the Metric instead.

- 4.50 The Auxiliary Drawdown Channel (ADC) is being included as canal creation as it is being designed with a lock and for recreational boating. It is assumed that there will be sufficient flow to create a 'moderate' condition habitat. The ADC is longest for the 125 Mm³ option at 6.21 km and shortest for the 80+42 Mm³ option at 3.49 km due to the different siphon locations for the different options that would provide flow to the ADC.

4.3.4 Habitat Trading

- 4.51 Due to the trading rules in Biodiversity Metric 3.0, watercourse types can only be replaced with the same watercourse type (e.g. rivers replaced with rivers, and ditches with ditches). Whilst the ≥10% net gain does not have to be met for individual watercourse types, there can be no net loss in River Biodiversity Units (RBUs) within watercourse types.

- 4.52 The results show that under the 150 Mm³ option, the largest reservoir footprint, 49.34 RBUs from rivers and 174.08 RBUs from ditches are lost to the scheme (Figure 3.12). Through the watercourse mitigation plan a total of 255.98 river RBUs are delivered (this includes the watercourses retained, enhanced and created), producing an extra **+42.00 river RBUs** compared to the 213.98 river RBUs present at baseline. 214.86 ditch RBUs are also delivered, **+0.68 ditch RBUs** compared to the 214.18 ditch RBUs present at baseline. **For all reservoir size options, the river and ditch RBUs delivered through SESRO are greater than those lost. This meets the Biodiversity Metric 3.0 trading rules for the Rivers and Streams metric.**

Table 4.14: Watercourses to be enhanced. *Reach is WFD water body

Ref	Scheme component	Reach name	Enhanced river type	Enhanced condition	150 Mm ³		125 Mm ³		100 Mm ³		75 Mm ³		30+100 Mm ³		80+42 Mm ³	
					Enhanced (km)	Enhanced (RBUs)	Enhanced (km)	Enhanced (RBUs)	Enhanced (km)	Enhanced (RBUs)	Enhanced (km)	Enhanced (RBUs)	Enhanced (km)	Enhanced (RBUs)	Enhanced (km)	Enhanced (RBUs)
1	Western Diversion	Cow Common Brook	River - River	Moderate - Fairly good	1.32	17.09	1.23	16.25	0.86	11.93	0.03	0.42	1.32	17.09	1.32	17.09
2		Cow Common Brook*	River - River	Fairly good - Good	1.32	23.47	1.23	22.31	0.86	16.69	0.15	2.91	1.32	23.47	1.32	23.47
3		Cow Common Brook*	River - River	Moderate - Fairly good	3.80	55.74	3.55	53.05	2.49	39.72	3.24	49.71	3.80	55.74	3.80	55.74
4	Realignment	All poor ditches (Mere Dyke Ditch)	Ditch - Ditch	Poor - Moderate	0.13	0.82	0.11	0.70	0.11	0.70	0.11	0.70	0.13	0.82	0.13	0.82
5	Realignment	Hanney Ditch	Ditch - Ditch	Poor - Moderate	1.07	7.76	0.98	7.10	-	-	-	-	1.07	7.76	1.07	7.76
6	Realignment	Hanney Ditch	River - River	Moderate - Fairly good	2.52	33.02	2.53	33.11	2.23	29.26	2.22	27.59	2.52	33.02	2.52	33.02
8	Realignment	Landmead Ditch*	River - River	Moderate - Fairly good	0.50	7.41	0.50	7.41	0.50	7.41	0.50	7.41	0.50	7.41	0.50	7.41
10	Eastern Diversion	Mere Dyke	River - River	Moderate - Fairly good	5.99	67.70	5.99	67.70	5.99	67.70	5.99	67.70	5.99	67.70	5.99	67.70
15	Realignment	Portobello Ditch*	River - River	Fairly good - Good	0.16	3.10	0.17	3.30	-	-	-	-	0.16	3.10	0.16	3.10
16	Realignment	Portobello Ditch*	River - River	Moderate - Fairly good	0.12	1.91	0.13	2.07	-	-	-	-	0.12	1.91	0.12	1.91
17	Realignment	River Ock*	River - River	Moderate - Fairly good	0.81	12.92	0.81	12.92	0.81	12.92	0.81	12.92	0.81	12.92	0.81	12.92
Total enhanced river					16.54	222.37	16.14	218.12	13.74	185.63	12.94	168.66	16.54	222.37	16.54	222.37

Ref	Scheme component	Reach name	Enhanced river type	Enhanced condition	150 Mm ³		125 Mm ³		100 Mm ³		75 Mm ³		30+100 Mm ³		80+42 Mm ³	
					Enhanced (km)	Enhanced (RBUs)	Enhanced (km)	Enhanced (RBUs)	Enhanced (km)	Enhanced (RBUs)	Enhanced (km)	Enhanced (RBUs)	Enhanced (km)	Enhanced (RBUs)	Enhanced (km)	Enhanced (RBUs)
Total enhanced ditch					1.20	8.58	1.09	7.80	0.11	0.70	0.11	0.70	1.20	8.58	1.20	8.58
Total enhanced watercourse					17.74	230.94	17.23	225.92	13.85	186.33	13.05	169.36	17.74	230.95	17.74	230.95

Table 4.15: Watercourses to be created. *Reach is WFD water body

Ref	Scheme component	Created river type	Created condition	150 Mm ³		125 Mm ³		100 Mm ³		75 Mm ³		30+100 Mm ³		80+42 Mm ³	
				Created (km)	Created (RBUs)	Created (km)	Created (RBUs)	Created (km)	Created (RBUs)	Created (km)	Created (RBUs)	Created (km)	Created (RBUs)	Created (km)	Created (RBUs)
1	Auxiliary Drawdown Channel	Canal	Moderate	4.12	27.58	6.21	41.57	5.41	36.22	5.12	34.28	4.67	31.26	3.49	23.36
2	Wetland ditches	Ditch	Moderate	13.11	87.77	16.92	113.27	19.77	132.35	18.67	124.99	13.14	87.97	13.14	87.97
3	Toe drain	Ditch	Moderate	12.28	82.21	11.86	79.40	10.99	73.57	10.44	69.89	12.28	82.21	12.28	82.21
4	Cow Common Brook toe drain outflow*	Ditch	Moderate	0.26	2.00	0.26	2.00	0.26	2.00	0.26	2.00	0.26	2.00	0.26	2.00
Total created ditch				25.65	171.98	29.04	194.67	31.02	207.93	29.37	196.88	25.68	172.18	25.68	172.18
Total created canals				4.12	27.58	6.21	41.57	5.41	36.22	5.12	34.28	4.67	31.26	3.49	23.36
Total created watercourses				29.77	199.56	35.25	236.25	36.43	244.15	34.49	231.16	30.35	203.44	29.17	195.54

4.4 Summary of Results

4.53 A summary of the assessment results is presented in Table 4.16, based on the outputs of the Defra Biodiversity Metric 3.0 calculation, as reported in Sections 4.1–4.3.

Table 4.16: Summary of assessment results for the reservoir options

Reservoir Option	Biodiversity Units	Onsite Baseline	Onsite Post Development (including retention, enhancement and creation)	Total Net Unit Change	Total % Change
150 Mm³	Habitat Units	4923.57	6552.91	1629.34	33.09%
	Hedgerow Units	440.24	343.79	-96.45	-21.91%
	River Units	428.16	498.41	70.26	16.41%
125 Mm³	Habitat Units	4758.53	6526.84	1768.31	37.16%
	Hedgerow Units	433.84	348.02	-85.82	-19.78%
	River Units	425.28	527.62	102.34	24.06%
100 Mm³	Habitat Units	4447.08	6451.88	2004.79	45.08%
	Hedgerow Units	409.96	357.63	-52.33	-12.76%
	River Units	393.97	493.01	99.04	25.14%
75 Mm³	Habitat Units	4253.42	6449.79	2196.37	51.64%
	Hedgerow Units	402.64	359.65	-42.99	-10.68%
	River Units	369.59	498.37	128.78	34.84%
100+30 Mm³	Habitat Units	4922.65	7187.43	2264.78	46.01%
	Hedgerow Units	440.24	355.42	-84.82	-19.27%
	River Units	428.16	502.30	74.14	17.32%
80+42 Mm³	Habitat Units	4922.65	6864.90	1942.25	39.46%
	Hedgerow Units	440.24	334.80	-105.44	-23.95%
	River Units	428.16	491.79	63.63	14.86%

5. Discussion/ Conclusion

5.1 BNG Objective and Analysis

- 5.1 The objective of SESRO is to achieve a minimum 10% net gain in biodiversity value.
- 5.2 As set out in Table 4.16 the baseline habitat units for the 150 Mm³ reservoir option are 4923.57, and an additional 6552.91 biodiversity habitat units may be provided equating to a net gain in biodiversity of 33.09%. For the alternative reservoir options the baseline habitat units range from 4253.42 to 4922.65, with an additional 6449.79 to 7187.43 biodiversity habitat units being provided equating to a net gain in biodiversity of between 37.16% and 51.64%. As much of the baseline habitats will be lost to SESRO, this significant net gain in biodiversity for all options indicates that the replacement habitats and future landscape surrounding SESRO will be far more beneficial to biodiversity than the current landscape. This is because the habitats to be created, such as the ponds and wetland habitat mosaic will provide habitat for a range of species from invertebrates and amphibians to riparian mammals and breeding and wintering birds. The species rich grassland habitats will attract birds and invertebrates and the woodland habitats will develop into highly biodiverse areas.
- 5.3 As set out in Table 4.16 the baseline hedgerow units are 440.24, and as a result of SESRO, 376.24 hedgerow units will be lost equating to a net loss in hedgerow biodiversity of 21.91%. For the alternative reservoir options the baseline hedgerow units range from 402.64 to 440.24, and as a result of SESRO between 334.96 and 374.96 units will be lost. this equates to a net loss in hedgerow biodiversity of between -10.68% and -23.95%. In order to satisfy the habitat trading rules associated with biodiversity net gain calculations, this loss cannot be offset by the significant gains made within the habitat units and the same broad habitat type will need to be replaced. Consequently, off-site compensation for the loss of these hedgerow units will be sought, and at a minimum, an additional 143 hedgerow units will need to be gained to achieve a ≥10% net gain for the 150 Mm³ option. This should be undertaken within a location where hedgerows will improve ecological connectivity in landscapes nearby to the scheme impact. The current metric does not take account for any potential advanced planting of hedgerow and tree lines which is likely to occur in order to maintain connectivity across the site during construction. Opportunities for advanced planting will be discussed during further iterations of SESRO's masterplan.
- 5.4 Analysis of the metric calculations highlighted all Reservoir options exceed the required 10% net gain in habitats. The 75 Mm³ Reservoir option provides the greatest gain in biodiversity units of 51.64% and the least loss in hedgerow units -10.68%. This is likely to be because the 75Mm³ Reservoir option is the smallest of the six options but still has a relatively large indicative scheme boundary where habitats of high biodiversity value can be created. The 150 Mm³ reservoir option provides the least gain in habitat units of 33.09% but the 80+42 Mm³ reservoir option has the greatest loss of hedgerow units of -23.95%.

- 5.5 It should be noted that the habitat area and hedgerow length baseline calculations are based on data where significant assumptions relating to habitat type and condition have been made as a result of limited land access. It is recommended that future work includes a full UKHab survey and condition assessment be conducted for all habitats within the indicative scheme boundary. This will significantly improve the accuracy of the data and conclusions drawn from the calculations. In addition, the future baseline calculations for the alternative Reservoir options are all based on a scaled down version of the Masterplan which was developed for the 150 Mm³ reservoir option only. Should any of the alternative Reservoir options be taken forward to Gate 3, a full Masterplan will be required specific to each design option. Again, this will significantly improve the accuracy of the calculations made.
- 5.6 As set out in Table 4.16, the baseline river biodiversity units for the 150 Mm³ reservoir are 428.16, and an additional 70.26 river biodiversity units will be provided equating to a net gain in biodiversity of +16.41%. Biodiversity net gain for all options ranges from +14.85% (80+42 Mm³) to +34.84% (75 Mm³). The proposed mitigation for all reservoir options meets the river habitat trading rules with no net loss of river or ditch river biodiversity units. The more naturalised planform and enhanced connectivity of the river channel to wetland floodplain habitats will significantly improve the quality and natural functioning of the river compared to the artificial conditions present currently.
- 5.7 Once a Reservoir option has been chosen and the design for the scheme has been finalised, a Habitat and Landscape Management Plan will be produced. This document will set out the actions and responsibilities required for the creation, reinstatement and enhancements as described in this report, including management and monitoring.

5.2 Irreplaceable Habitats

- 5.8 Irreplaceable habitat is habitat that, once lost, cannot be recreated elsewhere, within a reasonable timeframe. Examples of such habitat are ancient woodland, active peat and limestone pavements. These types of habitats are often located within statutory designated sites, but it cannot be assumed that all have been designated or included in any local mapping exercise or inventory. Evidence, expert opinion and local knowledge are all needed to identify irreplaceable habitats.
- 5.9 The Biodiversity Metric 3.0 does not apply to irreplaceable habitats such as ancient woodland and the losses cannot be offset to achieve BNG. The guidelines advise that such habitats should be retained on site and impacts avoided. Should any irreplaceable habitats be impacted, the project cannot claim that the project as a whole has achieved BNG.
- 5.10 Compensation for irreplaceable habitats cannot be provided on a 'like for like' basis that reduces the impact on those habitats to neutral. The compensation will need to be designed in recognition of the nature and extent of the loss or damage, to make a contribution to biodiversity that is considered proportionate. Bespoke compensation which may include habitat creation, enhancement or restoration will need to be

agreed with the statutory nature conservation body²⁶.

- 5.11 Mitigation will involve the provision of a significant number of trees, most likely off-site. Mitigation for the loss of one ancient tree is likely to involve the translocation of woodland soils, seedbank and vegetative fragments. This will not replace the habitat lost but can retain some of the local genetic material stock of ancient plants, soil biota and other attributes.
- 5.12 As the project will result in the loss of one ancient tree, which is categorised as irreplaceable habitat, the scheme cannot achieve BNG at the 'project level'. However, the project will generate meaningful gains for other biodiversity features such as neutral grassland, wet woodland and wetland areas.

5.3 Biodiversity Net Gain Conclusions

- 5.13 For the 150 Mm³ option, the creation of 6552.91 habitat units and 498.41 river units on site will ensure that SESRO provides a significant biodiversity net gain for biodiversity leaving the natural environment in a measurably better state than it was beforehand. However, additional lengths of hedgerow linear features need to be created, retained or enhanced on site or off-site in order for SESRO to reach the ≥10% net gain target for hedgerows.
- 5.14 In addition, the trading rule for the loss of lowland mixed deciduous woodland, a habitat with high distinctiveness, has not been appropriately accounted for within the metric. This is because, for the 150 Mm³ Reservoir option, 939.57 units of lowland mixed deciduous woodland need to be created as 45.39 ha will be lost and not compensated for. Further iterations of the Scheme design and more detailed field work to be undertaken with the aim of rectifying these issues, where possible.

²⁶ Baker, J., Hoskins, R. and Butterworth, T. (2019). *Biodiversity Net Gain: Good Practice Principles for Development. A Practical Guide*. CIRIA.

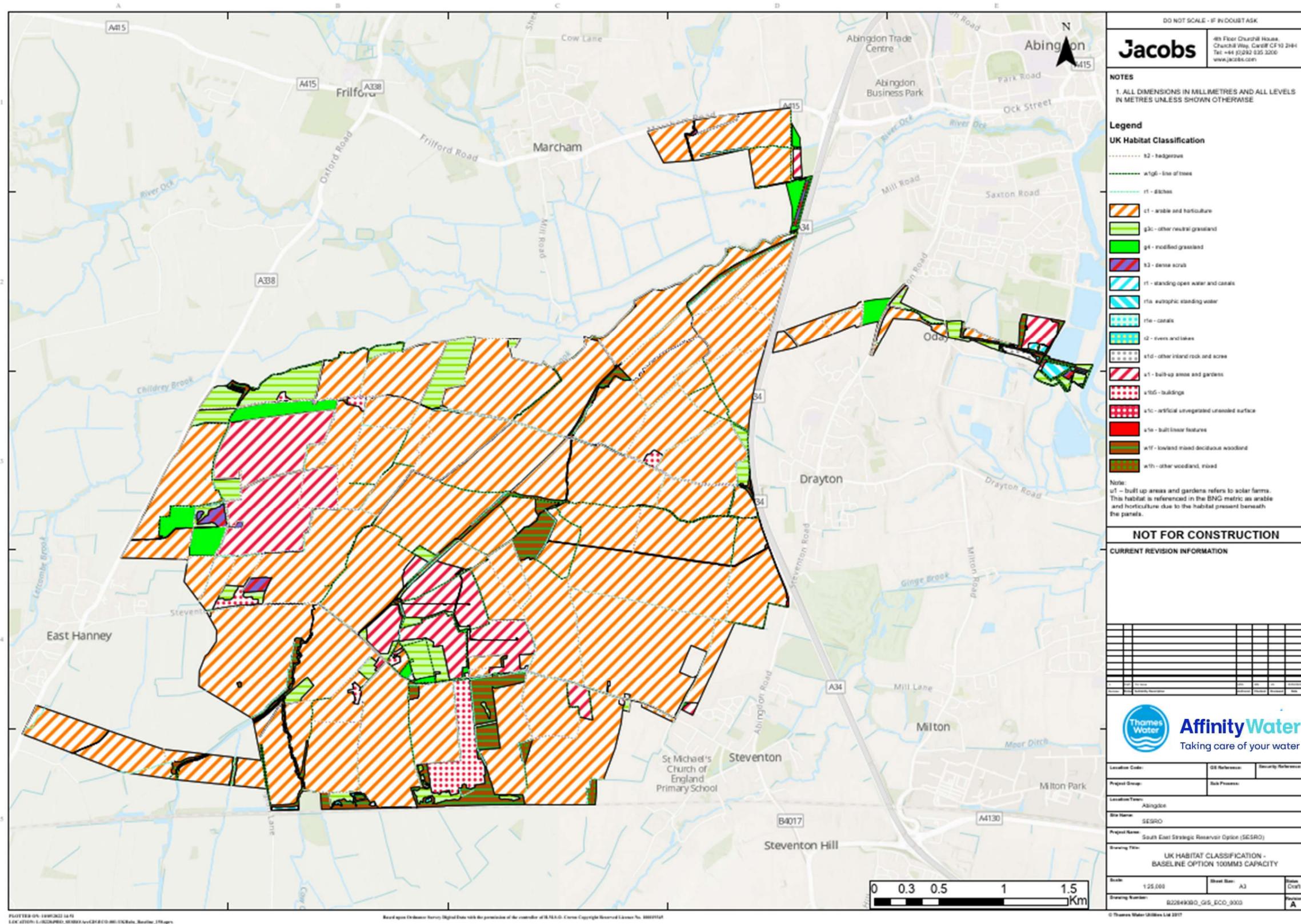


Figure A.3: UK Habitat Classification Baseline Plan – 100Mm³ Reservoir Option

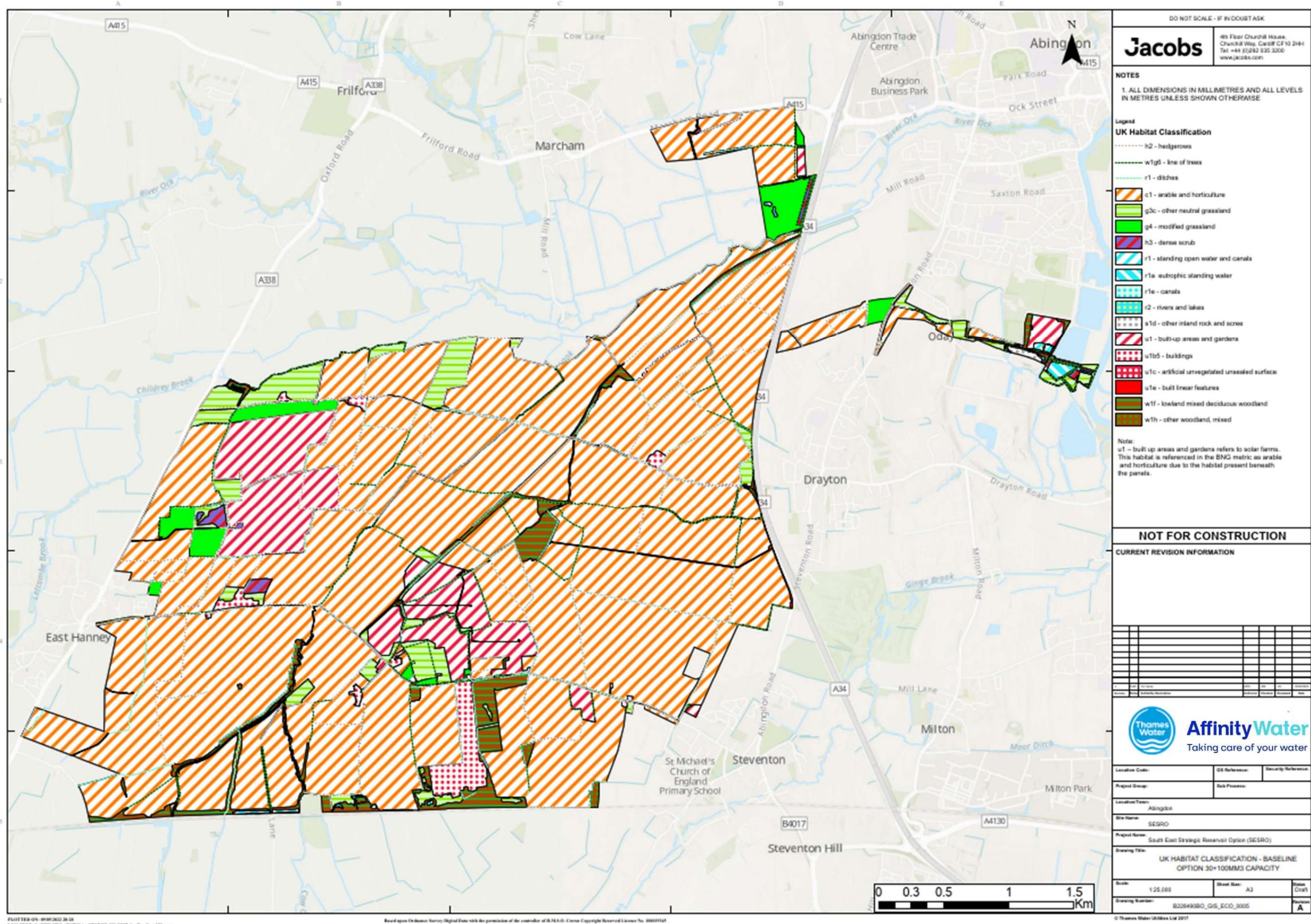
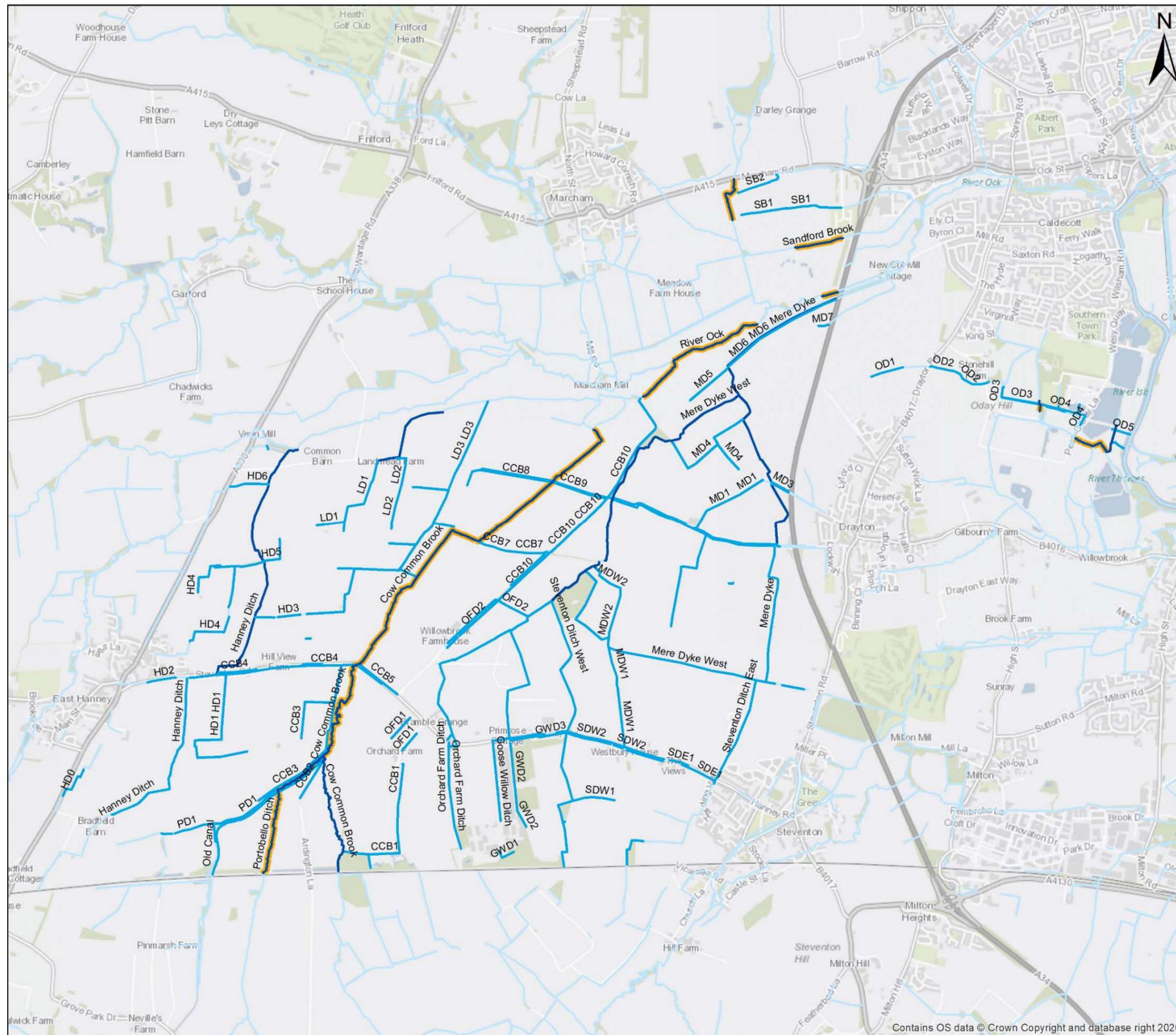


Figure A.5: UK Habitat Classification Baseline Plan – 30 + 100Mm³ Reservoir Option



SESRO Gate 2 WP12

Biodiversity Net Gain baseline river type

Legend

- All watercourses
- WFD water body

Baseline river type

- River
- Ditch

Data sources: Ordnance Survey Master Map

0 5 10 20 30 40 50 Km

Scale (at A3): 1:956,250

ATKINS

Thames Water

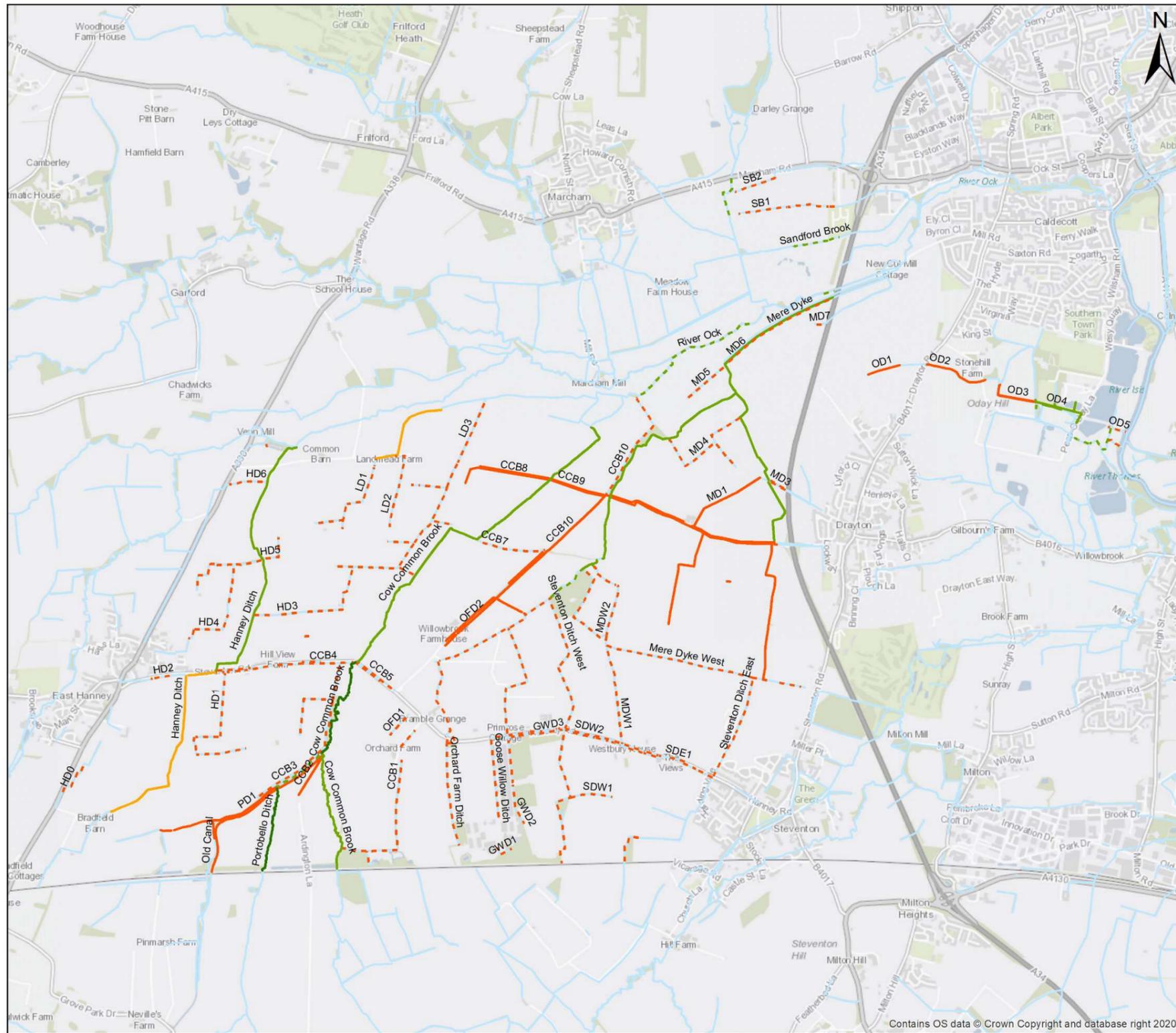
AffinityWater
Taking care of your water

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Note: Each watercourse is assigned a unique identifier. Where available this is the name of the watercourse but where not available a code is assigned based on the watercourse into which the unnamed watercourse flows (e.g. an unnamed watercourse flowing into the Cow Common Brook is called CCB1).

Figure A.7: Baseline watercourse types and naming convention

Appendix B Baseline River Condition Scores



SESRO Gate 2 WP12

Biodiversity Net Gain baseline river condition

Legend

- All watercourses
- Fairly good (visited during walkover)
- Moderate (visited during walkover)
- Moderate
- Fairly poor (visited during walkover)
- Poor (visited during walkover)
- Poor

Data sources: Ordnance Survey Master Map

0 5 10 20 30 40 50 Km

Scale (at A3): 1:956,250

ATKINS

Thames Water

AffinityWater

Taking care of your water

Note: Each watercourse is assigned a unique identifier. Where available this is the name of the watercourse but where not available a code is assigned based on the watercourse into which the unnamed watercourse flows (e.g. an unnamed watercourse flowing into the Cow Common Brook is called CCB1).

Figure B.1: Map of baseline river condition scores

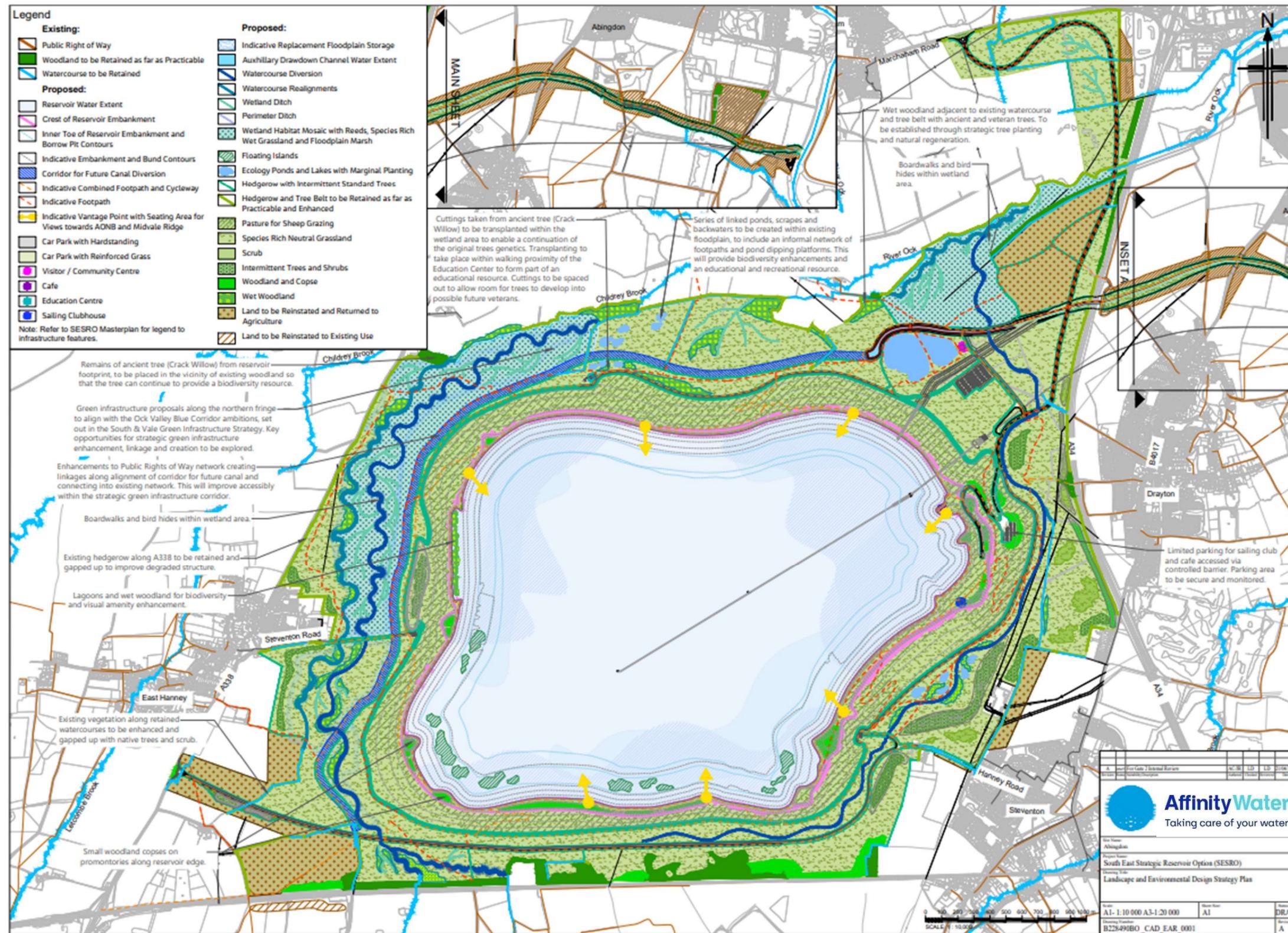
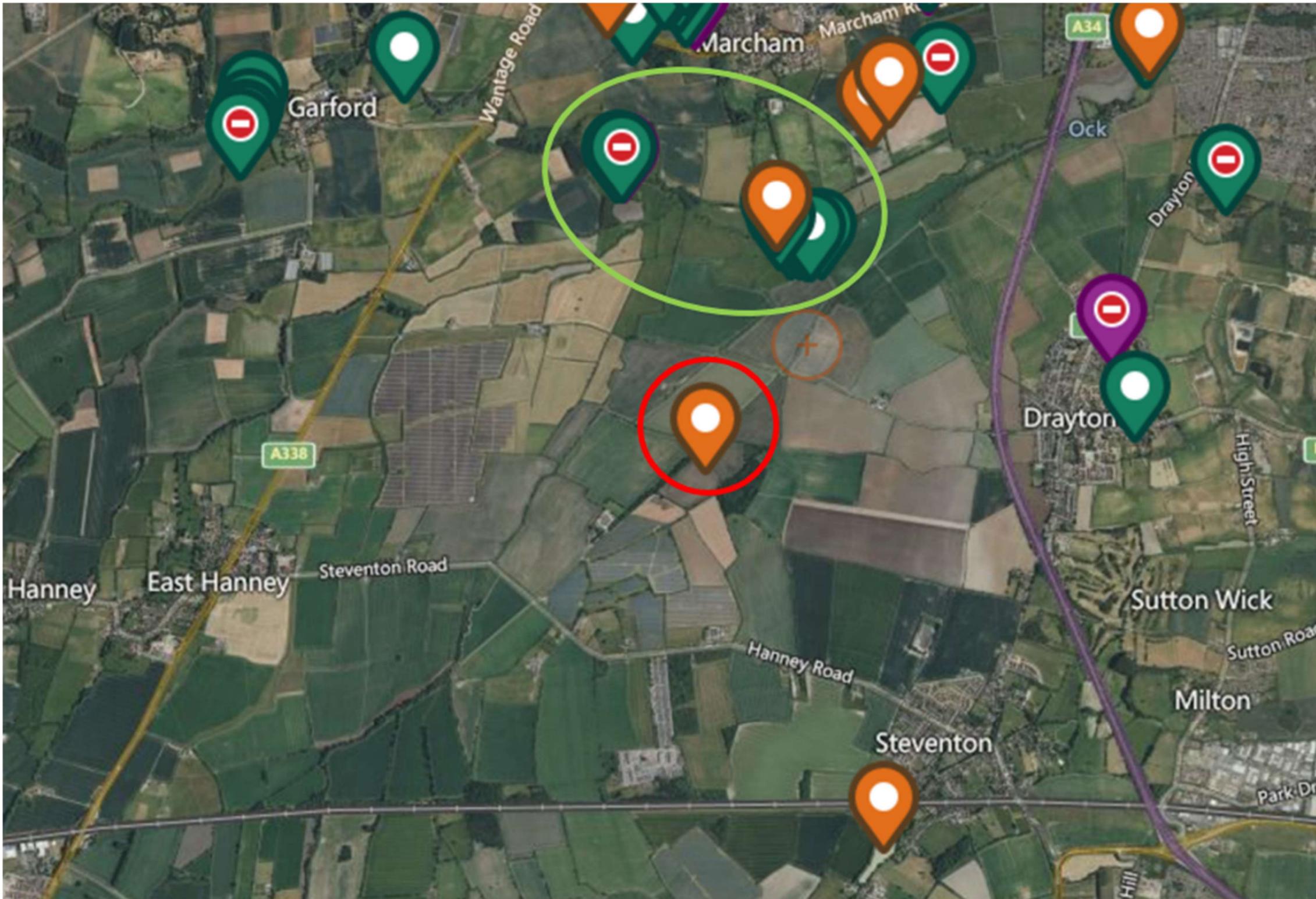


Figure C.1 Landscape and Environmental Design Strategy Plan



*Tree highlighted with a red circle will be lost as a result of the development

**Trees highlighted with a green circle will be retained and protected

Figure D.1: Ancient Tree Location Plan

Affinity Water

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