Cambridge Water

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HABITATS REGULATIONS ASSESSMENT

Draft Water Resources Management Plan 2024

Information to support an assessment under Regulation 63 of the *Conservation of Habitats and Species Regulations 2017*

Cambridge Water

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Front Cover Image:
Linton Water tower, Rivey Hill, Cambridge Water

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EXECUTIVE SUMMARY

Water companies in England and Wales have a statutory requirement to prepare a Water Resources Management Plan (WRMP) every five years. The purpose of these WRMPs is to set out a strategy for a particular supply area over a 25-year period (statutory minimum) to maintain a supply-demand balance. This statutory requirement is defined under the Water Act 2003. This Habitats Regulations Assessment (HRA) accompanies the Cambridge Water draft WRMP24.

A water company must ensure its final WRMP meets the requirements of the Habitats Regulations before implementation. The requirement for a HRA is established through Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. This directive, known as the Habitats Directive, is transposed into national legislation by the Conservation of Habitats and Species Regulations 2017; commonly referred to as the Habitats Regulations. Under Regulations 63, any plan or project which is likely to have a significant effect on a European site (either alone or in-combination with other plans or projects) and is not directly connected with, or necessary for the management of the site, must be subject to a HRA to determine the implications for the site in view of its conservation objectives. Under UK Government policy, wetland sites designated under the international Ramsar Convention 1971 should also be subject to HRA, and are also referred to as 'European sites' in this context.

The HRA needs to consider whether there are any likely significant effects (LSE) arising from construction or implementation activities and/or operation of any of the options considered in the WRMP24. Ricardo was commissioned by Cambridge Water to undertake a HRA of a 'feasible' list of options in its WRMP24. By considering HRA from the outset, the intention has been to seek to avoid options being included in the WRMP24 that would lead to adverse effects on European sites.

This HRA report documents the HRA Stage 1 Screening for the 'feasible' list of options in the WRMP24 and the HRA Stage 2 Appropriate Assessment for the options included in the preferred programme of the WRMP24 (where sufficient option information has been made available). This report provides the legislative background, consultation process, Plan overview, methodology for the HRA and the results of the Stage 1 Screening assessment process. Tables with the HRA Stage 1 assessments for each scheme are given in the Appendix. Colour coding has been assigned to represent the outcome of the assessment of each option, where 'green' is no LSE and 'amber' is LSE cannot be ruled out and where further assessment/information regarding the scheme will be required as part of a Stage 2 Appropriate Assessment if that option were to be included in the preferred programme of the WRMP24.

The preferred programme includes demand management measures targeted at leakage reduction, water efficiency measures and fitting of enhanced meter technology and underpinned by fitting of universal smart meter technology. For demand-side measures that are likely to require some form of physical intervention or amendment to infrastructure (e.g. pipe repair), some instances of effect pathways might be conceivable but it is not possible to predict or identify specific locations where such measures might be applied and so effects on specific European sites cannot be identified. However, it is very likely that adverse and/or significant effects could be avoidable at a scheme level; Therefore, from an HRA perspective, the options are 'screened in' (as an effect pathway is conceivable) but as a meaningful appropriate assessment is not possible, the assessment is necessarily deferred to the project level.

The preferred programme includes ten supply-side options which have been assessed, of which two were assessed as having no LSE (i.e. 'green'), and eight were assessed as having LSE (i.e. 'amber'). Stage 2 Appropriate Assessments have been carried out for the following sites affected by the options; Ouse Washes SAC, SPA and Ramsar, Fenland SAC and Eversden and Wimpole SAC. With mitigation measures in place, no adverse effects on site integrity during construction and/or operation are anticipated.

1. INTRODUCTION

1.1 BACKGROUND AND PURPOSE OF REPORT

The Water Act 2003 requires that all water companies in England and Wales prepare and maintain Water Resources Management Plans (WRMPs). These plans set out how public water supply (PWS) will be maintained over a minimum of 25 years in a way that is economically, socially and environmentally sustainable. The WRMPs must be revised every five years.

Cambridge Water is preparing its next Water Resources Management Plan 2024 (WRMP 2024) which sets out how the balance between water supply and demand, and security of supply, will be maintained over a minimum of 25 years in a way that is economically, socially and environmentally sustainable. WRMPs are reviewed on a rolling five-year basis, with Cambridge Water's most recent being published in December 2019. The draft WRMP24 sets out Cambridge Water's feasible options, both demand management and supply-side options.

Cambridge Water forms part of the Water Resources East (WRE)[1] regional group which is one of five regional water resources groups in England and Wales working under the National Framework for Water Resources (the 'National Framework')[2]. Each regional group brings together the water companies operating in that region with key water users, stakeholders and environmental regulators including the Environment Agency. This enables greater co-ordination and alignment of water resources planning for WRMP and regional plan development. The other water companies that form WRE alongside Cambridge Water are Affinity Water, Anglian Water, Essex & Suffolk Water and Severn Trent Water.

In addition, Cambridge Water is part of South Staffs Water. South Staffs Water is one of five water companies[3] that make up the Water Resource West (WRW) regional group. As such, there is also the requirement for the Cambridge Water WRMP to align with that of South Staffs Water and the WRW regional plan.

A water company must ensure its final WRMP meets the requirements of the Habitats Regulations before implementation. The requirement for a Habitats Regulations Assessment (HRA) is established through Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, hereby referred to as the 'Habitats Directive', in Articles 6(3) and 6(4). The Habitats Directive is transposed into national legislation by the Conservation of Habitats and Species Regulations 2017 (as amended)[4], commonly referred to as the Habitats Regulations.

Regulations 63 and 64 transposed the provisions of Articles 6(3) and 6(4) of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') as they related to plans or projects in England and Wales.

Regulation 63 states that if a plan or project is "*(a) is likely to have a significant effect on a European site*[5] *or a European offshore marine site*[6] *(either alone or in-combination with other plans or projects); and (b) is not directly connected with or necessary to the management of the site*" then the competent authority must

[1] https://wre.org.uk/

[2] https://www.gov.uk/government/publications/meeting-our-future-water-needs-a-national-framework-for-water-resources

[3] Along with Severn Trent Water, United Utilities Water, Dŵr Cymru Welsh Water and Hafren Dyfrdwy

[4] The 2017 Regulations have been amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 to reflect the UK's exit from the EU, although these largely carried forward the provisions and terminology of the 2017 Regulations and do not fundamentally alter their interpretation. This report therefore primarily refers to the 2017 Regulations and (where appropriate for clarity) the relevant provisions of the Habitats Directive.

[5] As noted, the 2019 amendment to the Habitats Regulations largely carried forward the provisions and terminology of the 2017 Regulations, and so the term 'European site' is currently retained and for all practical purposes the definition is essentially unchanged. European sites are therefore: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agreed the site as a 'Site of Community Importance' (SCI) (if this was before 31 Jan 2020); any classified Special Protection Area (SPA); and any candidate SAC (cSAC). However, the term is also commonly used when referring to potential SPAs (pSPAs), to which the provisions of Article 4(4) of Directive 2009/147/EC (the 'new wild birds directive') are applied; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied a matter of Government policy (NPPF para. 181; TAN5 para. 5.1.3) when considering development proposals that may affect them. "European site" is therefore used in this document in its broadest sense, as an umbrella term for all of the above designated sites. Note, it is likely that this term will be supplanted at some point in the future although an appropriate UK-wide alternative has not yet been agreed (e.g. the NPPF in England has adopted the term 'Habitats sites' to refer collectively to those sites defined by Regulation 8; the *Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019* does not offer a direct alternative to "European site" but uses the term 'National Site Network' in place of 'Natura 2000').

[6] 'European offshore marine sites' are defined by Regulation 18 of The Conservation of Offshore Marine Habitats and Species Regulations 2017; these regulations cover waters (and hence sites) over 12 nautical miles from the coast.

"…*make an appropriate assessment of the implications for the site in view of that site's conservation objectives*" before the giving consent or authorisation. The plan or project can only be given effect if it can be concluded (following an 'appropriate assessment') that it "…*will not adversely affect the integrity*" of a site, unless the provisions of Regulation 64 are met.

This assessment process is known as Habitats Regulations Assessment (HRA)[7]. An HRA determines whether there will be any 'likely significant effects' (LSE) on any European site as a result of a plan's implementation (either on its own or 'in-combination' with other plans or projects)[8] and, if so, whether there will be any 'adverse effects on site integrity'[9].

1.2 CONSULTATION

Natural England and the Environment Agency were consulted on the proposed HRA methodology in April 2022. Natural England and the Environment Agency were also consulted on the SEA Scoping Report in April 2022. Further consultation will be undertaken with both stakeholders as necessary between the draft and final plan and this section will be updated accordingly.

1.3 STRUCTURE OF THE REPORT

The report is divided into the following sections:

Section 1: Introduction

Section 2: Methodology

Section 3: Cambridge Water's draft WRMP24

Section 4: HRA Stage 1 Screening

Section 5: Stage 2 Appropriate Assessment: Ouse Washes SAC

Section 6: Stage 2 Appropriate Assessment: Ouse Washes SPA and Ramsar

Section 7: Stage 2 Appropriate Assessment: Fenland SAC

Section 8: Stage 2 Appropriate Assessment: Eversden and Wimpole Woods SAC

Section 9: Strategic in-combination assessment

Section 10: Draft HRA conclusions

[7] The term 'Appropriate Assessment' has been historically used to describe the process of assessment; however, the process is more typically referred to as 'Habitats Regulations Assessment' (HRA), with the term 'Appropriate Assessment' limited to a specific stage within the process.
[8] Also referred to as the 'test of significance'.
[9] Also referred to as the 'integrity test'.

2. METHODOLOGY

2.1 CONTEXT AND STAGES OF THE HRA PROCESS

The responsibility for undertaking the HRA lies with Cambridge Water as the plan making authority.

The HRA determines whether there will be any 'likely significant effects' (LSE) on any European site as a result of a plan's implementation (either on its own or 'in-combination' with other plans or projects)[10] and, if so, whether there will be any 'adverse effects on site integrity'[11].

Guidance recognises four key steps in the HRA process as follows:

1. Stage 1 Screening – the identification of Likely Significant Effects (LSEs) of a plan or project on a European designated site either alone or in-combination. The test is a trigger for further assessment, and therefore the bar is set low i.e., is there a risk or possibility of an adverse effect. At this stage mitigation measures should not be taken into account, in accordance with the People over Wind (Court of Justice of the European Union (ECJ) Case C-323/17); this reinforces the idea of screening as a 'low bar' and makes 'appropriate assessments' more common.
2. Stage 2 Appropriate Assessment and the 'integrity test' – which involves closer examination of the project or plan and 'screened in' European designated sites to determine whether those sites will be subject to 'adverse effects on integrity'. The scope of such assessments is not set, and some may not be particularly detailed, especially where standard mitigation measures are available which are known to be effective. The level of assessment must be sufficient to ensure that there is no 'reasonable scientific doubt' that adverse effects on site integrity will not occur.
3. Stage 3 – Alternative Solutions – where adverse effects or uncertainty remain after the inclusion of mitigation in Stage 2, alternative ways where alternative solutions that meet the plan objectives are identified and consideration of their effects are given in comparison to those in the plan. A plan or project which has adverse effects on the integrity of a European site cannot be permitted if alternative solutions are available, except where the criteria for imperative reasons of overriding public interest are met (IROPI, see Stage 4).
4. Stage 4 Imperative Reasons of Overriding Public Interest – where there are no alternatives that have no or lesser effects on European sites, and the IROPI criteria are met, compensatory measures are developed and secured.

The stages as described above, are used to ensure compliance with the Habitats Regulations and so principally reflect the stepwise legislative tests applied to the final, submitted project or plan; **there is no statutory requirement for HRA (or its specific stages) to be completed for draft plans or similar developmental stages**.

Consequently there is flexibility for the HRA process to be run in a manner that provides maximum benefit for plan-development and sound decision-making, whilst still ultimately meeting the legislative tests.

In practice, HRAs of WRMPs usually have two functional components: they informally guide each water company as it considers which water resource options will be included in the published plan; and subsequently provide a formal assessment of the published WRMP against Regulation 63. A degree of separation between these functions is therefore sometimes necessary, and the rigid application of the stages to the emerging or interim stages of strategic plans[12] is not always appropriate, reducing the clarity and usefulness of the HRA as a plan-shaping process for both plan-makers and consultees. For WRMPs this is especially true for the assessment of the emerging feasible options and the application of the 'People over Wind' (PoW)[13] case.

Therefore, whilst the principles of HRA have been applied to the emerging WRMP and the feasible options, **the specific tests associated with Regulation 63 are applied to the preferred programme of options only**. The overarching HRA *process* for the WRMP has therefore included the following key steps:

[10] Also referred to as the 'test of significance'.
[11] Also referred to as the 'integrity test'.
[12] Particularly those (such as WRMPs) where the guideline HRA stages do not map easily on to the agreed or statutory stages in the plan development process.
[13] *People Over Wind and Sweetman v Coillte Teoranta* (C-323/17)

An initial **'risk review' of the supply-side**[14] **feasible options**, to assist Cambridge Water's selection of the preferred programme options (i.e. 'HRA as a process'). The review of the feasible options applied the normal principles and practices associated with 'HRA screening' but also took account of the deliverability of the options including potential mitigation opportunities[15].

2.2 GUIDANCE

The HRA has been undertaken in accordance with the key guidance document UKWIR (2021). *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans*. UK Water Industry Research Limited, London.

Other relevant guidance and case-practice has been considered, as summarised below:

- Defra (2021). Policy paper: Changes to the Habitats Regulations 2017 [online].
- UK Government (2019). Appropriate assessment: Guidance on the use of Habitats Regulations Assessment [online].
- Tyldesley, D. & Chapman, C. (2021). The Habitats Regulations Assessment Handbook [online]. DTA Publications Limited.
- UK Government (2021). Water resources planning guideline [online].
- Natural England (2020). Guidance on how to use Natural England's Conservation Advice Packages in Environmental Assessments. Natural England, Peterborough.
- European Commission (2018). Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. European Union, 1-86.
- Defra (2012). The Habitats and Wild Birds Directives in England and its seas: Core guidance for developers, regulators & land/marine managers [online].
- PINS Note 05/2018: Consideration of avoidance and reduction measures in Habitats Regulations Assessment: People over Wind, Peter Sweetman v Coillte Teoranta. [withdrawn].
- SNH (2019). SNH Guidance Note: The handling of mitigation in Habitats Regulations Appraisal – the People Over Wind CJEU judgement [online].

2.3 APPROACH TO HRA STAGE 1 SCREENING

The objective of the HRA is to establish firstly whether any of the measures included in the draft WRMP24 are likely to have a significant effect on European sites (alone or in-combination with other supply schemes in the plan, or with other plans and projects).

For each of the preferred options in the draft WRMP24 the assessment has considered whether there are any LSEs arising from construction and/or operation of the option (either alone or in-combination) on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), as well as internationally-designated Ramsar sites:

- SPAs are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC; 'Birds Directive') for the protection of **wild birds and their habitats** (including particularly rare and vulnerable species listed in Annex 1 of the Birds Directive, and migratory species).

[14] Demand-side options designed to reduce treated water use (such as metering, provision of water butts or leakage reduction options) are not systematically reviewed at this stage as they are invariably generic and geographically unspecified activities or groups of actions that cannot negatively affect any European sites (or be meaningfully assessed at the strategy level). Since they will form part of the adopted WRMP they are formally subject to Regulation 63 as part of the final HRA, but this is typically a simple screening exercise or 'down-the-line' deferral, depending on the nature of the option.

[15] Applying a PoW-compliant 'screening' assessment to the feasible options would have little value for plan-development since mitigation opportunities, including effective and well-established measures for marginal effects, would be ignored. All options with 'likely significant effects' would therefore be treated equally, with no distinction between options that would (from an HRA perspective) be easily achievable in practice and those that would be extremely challenging or impossible. The review of the feasible options is not therefore intended to be, or replicate, a formal and fully compliant 'HRA screening' or be a 'draft HRA' or similar. It takes a broad view of the 'HRA-related risk' associated with an option that captures both the risk to Cambridge Water and the delivery of the WRMP within the statutory timescales (for example, the data collection required to definitively demonstrate that an option is acceptable might not be achievable in the time available for delivery of the WRMP) and the risks of the option to European site integrity (i.e. where adverse effects would appear to be an unavoidable outcome of the option as presented). The terminology intentionally reflects a typical RAG risk assessment to provide clarity for Cambridge Water and to avoid the perception of premature assessment conclusions.

- SACs are designated under the Habitats Directive (92/43/EEC) and target particular **habitats** (Annex 1) **and/or species** (Annex II) identified as being of European importance.
- The Government also expects, as a matter of policy, potential SPAs (pSPAs), possible/proposed SACs (pSACs), compensation habitat and Ramsar sites to be included within the assessment.
- Ramsar sites support **internationally important wetland habitats** and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

For ease of reference throughout the HRA process, these designations will be collectively referred to as "European sites", despite Ramsar designations being made at the international level.

The HRA Stage 1 Screening process will identify whether each option (either alone or in-combination with other plans or projects) is likely to have significant effects on European designated sites. The purpose of the screening stage is to determine whether any part of the plan is likely to have a significant effect on any European site (including areas of compensation habitat, areas of functional land, and the ability for abstractions to occur for the management of designated wetland sites). This is judged in terms of the implications of the plan for a site's conservation objectives, which relate to its 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated[16], and Ramsar criterion). Significantly, HRA is based on a rigorous application of the precautionary principle. Where uncertainty or doubt remains, an impact should be assumed, triggering the requirement for Appropriate Assessment of that scheme or plan.

The screening stage also has to conclude whether any in-combination effects would result from the various schemes within the plan itself, or from implementation of the plan in-combination with other plans and projects, and whether these would adversely affect the integrity of a European site.

2.3.1 Identifying European sites

The initial list of European sites for screening has been derived by adopting a distance-based threshold of 10km from each option component, plus exceptional, longer impact pathways. The use of a '10km threshold plus exceptional pathways' approach is based on precedent set for previous HRAs of plans through consultation with statutory consultees and the Impact Risk Zone (IRZ) mapping provided by Natural England for screening of impacts to designated sites in England. It is based on the premise that most significant effects on qualifying species and habitats will occur within a maximum 10km radius of the source of impact, except where there are exceptional pathways such as major downstream or coastal dispersion effects, or larger foraging and dispersal distances for mobile species (e.g., bats, migratory fish).

In addition, the HRA Stage 1 Screening has identified any habitat outside the designated site that also supports the qualifying species populations that use the European site in question. This off-site 'functionally linked land' (or sea) is particularly relevant to mobile qualifying species (e.g., birds, bats, invertebrates, fish, otters). The precautionary principle applies equally to functionally linked land, so where there is insufficient information to ascertain that there would be no LSE, an Appropriate Assessment will be required. However, this does not mean that every possible parcel of land within reach of the European site's qualifying populations must have been surveyed. The 'Boggis' case[17] establishes that there must be at least credible evidence that there could be a functional link between the location of option effects and the European site.

2.3.2 Sources of information

Data on the European sites and their interest features has been collected from the Joint Nature Conservation Committee (JNCC) and Natural England websites. These data include information on the attributes of the European sites that contribute to and define their integrity, current conservation status and the specific sensitivities of the site, notably the site boundaries and the boundaries of the component SSSIs; the conservation objectives; the condition , vulnerabilities and sensitivities of the sites and their interest features; the current pressures and threats for the sites; and the approximate locations of the interest features within each site (if reported); and designated or non-designated 'functional habitats' (if identified).

The following sources of published information were used:

- Site citations.
- Site Register Entries.

[16] Annexes are contained within the relevant EC Directive.
[17] Boggis and Another v Natural England: Court of Appeal, 20 Oct 2009

- Standard Data Form (SPA/SAC) or Information Sheet (Ramsar site).
- Conservation Objectives and Supplementary Advice on Conservation Objectives (for SPAs/SACs[18]).
- Site Improvement Plans (SIPs).
- Regulation 33 information for European Marine Sites or Conservation Advice for Marine Protected Areas[19].
- Environment Agency Review of Consents information.
- SSSI Impact Risk Zones (in England), which apply equally to European sites.
- Site condition assessment has been integrated with SSSI assessments through Common Standards Monitoring (CSM) and marine condition assessments (for SAC marine features only).
- Definitions of Favourable Conservation Status (where available for species/habitat).
- Favourable Condition Tables are set out for every SSSI that underpins a European site and can often be applicable to the European site's qualifying features.
- Article 12 (SPA) and Article 17 (SAC) status reports.

2.3.3 Thresholds

The UKWIR (2021) guidance[20] includes accepted 'zones of influence' for certain impacts, as repeated in **Table 2.1**, however the best and latest information should always be used to inform an assessment. Where possible, robust universal assumptions regarding the sensitivities of European site interest features will also be specified and applied at screening, for example:

- most breeding passerines will not be water-resource dependent.
- for groundwater sources and groundwater fed habitats, the Environment Agency consider that significant effects as a result of ground water abstractions are unlikely on European sites over 5km from the abstraction[21].
- wide-ranging marine / marine dependent species associated with marine sites that are not directly connected to the hydrological zone of influence are not typically considered to be both sensitive and exposed to the effects of the options (except in certain relatively unique circumstances, such as some desalination schemes).

Sites over 10km from the options that are not hydrologically linked and which do not support wide-ranging mobile species are considered sufficiently remote such that any environmental changes will be effectively nil, and so there will be 'no effects' on sites beyond this distance (and so no possibility of 'in-combination' effects).

Table 2.1 Potential Impacts of Plan Options[22] (Source: UKWIR, 2021)

Broad categories of potential impacts on European Sites, with examples	Examples of activities responsible for impacts *(example distance considerations in italics)*
Physical loss: • Removal • Smothering	Development of infrastructure associated with option, e.g., new or temporary pipelines, transport infrastructure, temporary weirs. Indirect effects from a reduction in flows e.g., drying out of water-margin habitat. *Physical loss is likely to be significant where the boundary of the option extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated, or where natural processes link the option to the site, such as through hydrological connectivity downstream of an option, long shore drift along the coast, or the option impacts the linking habitat).*

[18] The conservation objectives for Ramsar sites are taken to be the same as for the corresponding SACs / SPAs (where sites overlap); SSSI Favourable Condition Tables will be used for those features not covered by SAC/SPA designations.

[19] Natural England & the Countryside Council for Wales' advice given under Regulation 33(2)(a) of the Conservation (Natural Habitats, &c.) Regulations 1994, as amended.

[20] UKWIR (2021) Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans.

[21] National EA guidance: Habitats Directive Stage 2 Review: Water Resources Authorisations – Practical Advice for Agency Water Resources Staff

[22] Note that the distances given in this table are illustrative only and should be defined for each Plan option on a case by case basis.

Broad categories of potential impacts on European Sites, with examples	Examples of activities responsible for impacts *(example distance considerations in italics)*
Physical damage: • Sedimentation/silting • Prevention of natural processes • Habitat degradation • Erosion • Fragmentation • Severance/barrier effect • Edge effects	Construction activity leading to permanent and/or temporary damage of available habitat, sedimentation/siltation, fragmentation, etc. *Physical damage is likely to be significant where the boundary of the option extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat that supports species for which a European site is designated, or where natural processes link the option to the site, such as through hydrological connectivity downstream of an option or sediment drift along the coast.*
Non-physical disturbance: • Noise • Visual presence • Human presence • Light pollution	Noise from temporary construction or temporary pumping activities. *Taking into consideration the noise level generated from general building activity (c. 122dB(A)) and considering the lowest noise level identified in appropriate guidance as likely to cause disturbance to estuarine bird species, it is concluded that noise impacts could be significant up to 1km from the boundary of the European Site*[23,24] Noise from vehicular traffic during operation of an option. *Noise from construction traffic is only likely to be significant where the transport route to and from the option is within 3-5km of the boundary of the European site*[25]*.* Plant and personnel involved in in operation of the option. *These effects (noise, visual/human presence) are only likely to be significant where the boundary of the option extends within or is adjacent to the boundary of the European Site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).* Options that might include artificial lighting, e.g., for security around a temporary pumping station. *Effects from light pollution*[26] *are more likely to be significant where the boundary of the option is within 500m of the boundary of the European site.*
Water table/availability: • Drying • Flooding/stormwater • Changes to surface water levels and flows • Changes in groundwater levels and flows • Changes to coastal water movement	Changes to water levels and flows due to increased water abstraction, reduced storage or reduced flow releases from reservoirs to river systems. Potential for changes to habitat availability, for example reductions in wetted width of rivers leading to desiccation of macrophyte beds. *These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the option and the European site, and sometimes whether the option is up or down stream from the European site.*
Toxic contamination: • Water pollution • Soil contamination • Air Pollution	Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems. *These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the option and the European site, and sometimes whether the option is up or down stream from the European site.*

[23] Environment Agency (2013) Bird Disturbance from Flood and Coastal Risk Management Construction Activities. Overarching Interpretive Summary Report. Prepared by Cascade Consulting and Institute of Estuarine and Coastal Studies.
[24] Cutts N, Hemingway K and Spencer J (2013) The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects. Produced by the Institute of Estuarine and Coastal Studies (IECS). Version 3.2.
[25] British Standards Institute (BSI) (2009) BS5228 - Noise and Vibration Control on Construction and Open Sites. BSI, London.
[26] Institute of Lighting Professionals (2020) Guidance Notes for the Reduction of Obtrusive Light GN01/20.

Broad categories of potential impacts on European Sites, with examples	Examples of activities responsible for impacts *(example distance considerations in italics)*
	Air emissions associated with plant and vehicular traffic during construction and operation of options. *The effect of dust is only likely to be significant where site is within or in close proximity to the boundary of the European site*[27,28]*. Without mitigation, dust and dirt from the construction site may be transported onto the public road network and then deposited/spread by vehicles on roads up to 500m from large sites, 200m from medium sites, and 50m from small sites as measured from the site exit.* *Effects of road traffic emissions from the transport route to be taken by the project traffic are only likely to be significant where the protected site falls within 200 metres of the edge of a road affected*[29]*.*
Non-toxic contamination: • Nutrient enrichment (e.g., of soils and water) • Algal blooms • Changes in salinity • Changes in thermal regime • Changes in turbidity • Changes in sedimentation/silting	Changes to water salinity, nutrient levels, turbidity, thermal regime due to increased water abstraction, discharges, storage, or reduced compensation flow releases to river systems. *These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the option and the European site, and sometimes whether the option is up or down stream from the European site.*
Biological disturbance: • Direct mortality • Changes to habitat availability • Out-competition by non-native species • Selective extraction of species • Introduction of disease • Rapid population fluctuations • Natural succession	Killing or injury due to construction activity. *Likely to be a risk where the boundary of the option extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).* Creation of new pathway for spread of non-native invasive species. *This effect is only likely to be significant where the option is situated within the European site or an upstream tributary of the European site, but also for inter-catchment water transfers.*

2.4 APPROACH TO STAGE 2 APPROPRIATE ASSESSMENTS

The 'appropriate assessments' are an extension of the assessment processes undertaken at the screening stage, with significant effects (or areas of uncertainty) examined to determine whether there will be any adverse effects on the integrity of any European sites taking into account the conservation objectives. The presentation of the assessments depends on the nature of the options and European sites that might be exposed to effects. In this case the assessments are 'European site led' (i.e. each assessment section relates to a specific European site), rather than being 'option by option'; this tends to simplify the 'in-combination' assessment and minimises repetition of information relating to the interest features / sensitivities (etc.) of the sites).

Shared evidence applicable to multiple sites or features (for example, in relation to birds and construction noise) are provided in **APPENDIX A** and **APPENDIX B t**o reduce repetition.

The appropriate assessments are 'appropriate' to the nature of the WRMP as a strategic plan, the option under consideration, and the scale and likelihood of any effects; for example, exhaustive examination of feature sensitivities and possible effect pathways is not undertaken for options that would have previously been 'screened out with mitigation' if there is a high degree of confidence in the mitigation measures. The assessments include inter-option 'in-combination' assessments.

[27] Highways Agency (2003) Design Manual for Roads and Bridges (DMRB), Volume 11.
[28] Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction v1.1.
[29] NE Internal Guidance – Approach to Advising Competent Authorities on Road Traffic Emissions and HRAs V1.4 Final - June 2018

2.5 REVIEW OF POTENTIAL IN-COMBINATION EFFECTS

HRA requires that the effects of other projects, plans or programmes be considered for effects on European sites 'in-combination' with the WRMP. There is limited guidance on the precise scope of 'in-combination' assessments for strategies, particularly with respect to the levels within the planning hierarchy at which 'in-combination' effects should be considered, although guidance is provided by the All Company Working Group.

Broadly, it is considered that the Cambridge Water draft WRMP24 could have the following in-combination effects:

- Within-plan effects, i.e. separate options within the WRMP affecting the same European site(s); these are addressed as part of the option assessment process outlined above.
- Between-plan abstraction effects, i.e. effects with other abstractions, in association with or driven by other plans (for example, other water company WRMPs);
- Other between-plan effects, i.e. 'in-combination' with non-abstraction activities promoted by other plans – for example, with flood risk management plans.
- Between-project effects, i.e. effects of a specific option with other specific projects and developments.

In undertaking the 'in-combination' assessment it is important to note the following:

- The WRMP development process explicitly accounts for land-use plans, growth forecasts and population projections when determining future treatment and water management requirements.
- The detailed examination of non-water company consents for 'in-combination' effects can only be undertaken by the Environment Agency (or Natural Resources Wales) through their permitting procedures.
- Likely water resource demands of known major projects are also taken into account during the development of the WRMPs, unless otherwise noted.

Therefore:

- It is considered that (for the HRA) potential 'in-combination' effects in respect of water-resource demands associated with known plans or projects will not occur since these demands are explicitly considered when developing the WRMP and its associated and related plans (including the SROs). The main exception to this is other water company WRMPs, which are developed concurrently.
- With regard to other strategic plans, the list of plans included within the SEA of the Cambridge Water draft WRMP24 is used as the basis for a high-level 'in-combination' assessment. The SEA is used to provide information on the themes, policies and objectives of the 'in-combination' plans, with the plans themselves examined in more detail as necessary. Plans are obtained from the SEA datasets or internet sources where possible.
- With regard to projects:
    - The WRMP development process explicitly accounts for the water-resource demands of known major projects (e.g. power station decommissioning; large-scale housing development) during its development, and so these 'in-combination' effects are not considered in detail.
    - Potential 'in-combination' effects between individual options and Nationally Significant Infrastructure Projects (NSIPs) identified by The Planning Inspectorate, and other known major projects, are assessed.
    - It is not possible to produce a definitive list of minor existing or anticipated planning applications within the zone of influence of each proposed option to review possible local 'in-combination' effects.

In accordance with the legislation, the following approach will be adopted for the in-combination assessment:

- STEP 1 – Does the Scheme have no discernible effect, whatsoever, on the European site? If not, then there's no need for in-combination assessment, as logic dictates it can't have in-combination effects.
- STEP 2 - Does the Scheme, alone, have an adverse effect on the European site? If so, then there's no need for in-combination assessment as consent cannot be given unless the HRA Stages 3 and 4 derogation tests are met, in which case all residual effects of the scheme acting alone will be compensated for.

- STEP 3 – Does this Scheme have a discernible effect, but one which is not 'significant' in the context of the Habitats Regulations (i.e. adverse effect on site integrity) alone? If so, then an in-combination assessment is required.
- STEP 4 – Identify the other Plans/Projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in-combination with effects of your Project. It is normal practice to agree this list of potential in-combination Plans/Projects with the Competent Authority before doing the assessment.
- STEP 5 – Assess these other Plans/Projects in-combination with this Project.

2.6 KEY CHALLENGES AND ASSUMPTIONS

The fundamental nature of the WRMP (a long-term strategic plan with specific projects) presents a number of distinct challenges for a 'strategic' or plan-level HRA and it is therefore important to understand how the WRMP is developed, its objectives, and hence how it might consequently affect European sites.

2.6.1 Uncertainty and plan-level mitigation

HRAs of plans and strategies typically have to deal with a degree of uncertainty; very often, it is not possible to provide a detailed assessment of the effects of a proposal as many aspects simply cannot be fully defined at the strategy-level in the planning hierarchy. This is particularly true for options that will only be required over longer-term planning horizons, which are inevitably less defined than options that are required in the near term.

Where the available information is fundamentally insufficient to complete a meaningful appropriate assessment, then case-practice (both for WRMPs and strategic plans in general) suggests some assessment may be deferred 'down the line' to a lower planning tier provided that certain criteria are met.

This is usually only appropriate where there is sufficient certainty that the proposal can (with the implementation of established scheme-level measures that are known to be effective) avoid adverse effects on the integrity of European sites; and/or if appropriate investigation schemes are identified to resolve the uncertainty and commitments are made within the plan to not pursue an option if adverse effects are identified through these investigations.

Case-practice in WRMP HRAs[30] suggests it may be acceptable to include preferred programme options with residual uncertainties provided that:

- there is sufficient flexibility within the terms of the WRMP to ensure adverse effects can be avoided at the project level (e.g. the plan does not dictate specific pipeline routes or yields that cannot be deviated from); and/or
- the option is not required within the first five years of the plan period, so allowing time for additional investigations to be completed; and
- the uncertainty that this creates is mitigated at the plan-level by the inclusion of alternative options which:
    - will meet the required demand / deficit should the preferred programme option prove to have an unavoidable risk of adverse effects on the European sites in question; **and**
    - will not themselves have any adverse effect on any European sites.

Note, this is not intended to provide a mechanism for the inclusion of options where there appears to be no reasonable way of avoiding adverse effects. It should be noted that this flexibility is perhaps desirable in any case, since it is possible that a 'no adverse effect' option might be subsequently proven to have adverse effects when brought to the design stage. This approach allows for the WRMP to be compliant with the Habitats Regulations since certainty over outcomes for the plan as a whole is provided.

However, it is important to note that some uncertainties will remain (particularly with regard to 'in-combination' effects) and for some options it will only be possible to fully assess any potential effects at the pre-project planning stage when certain specific details are known; for example: construction techniques; site specific survey information; the precise timing of implementation; or the status of other projects that may operate 'in-

[30] For example, in relation to UU's WRMP14.

combination'. In addition, it may be several years before an option is employed, during which time other factors may alter the baseline or the likely effects of the option.

2.6.2 WRMP development parameters and relevance to HRA

The modelling underpinning the WRMP development and option selection process incorporates several assumptions that influence the scope of the HRA:

- The WRMP development process takes account of the existing consents regime, and any known (or reasonably anticipated) amendments that are likely to be required (e.g. following WINEP investigations or similar) since there has to be a starting point / basis for the assessment (i.e. the modelling / optioneering process cannot start with the assumption that no current consents are reliable). Any required licence amendments are factored into the supply-deficit calculations, and the Environment Agency will have confirmed that these are valid for the planning period when the WRMP modelling is undertaken. The existing consents regime (taking into account any required sustainability reductions) is therefore 'the baseline'[31] and, by extension the HRA of the WRMP necessarily focuses on the additional effects introduced by the WRMP options and does not (and cannot) reassess or reconfirm the existing consents regime.
- In some instances, when considering water that may be available from existing sources, consultees have indicated that consideration of 'recent actual' abstraction is more appropriate than the currently licenced maximum, particularly for waterbodies that are considered 'over-licensed'; it is understood that these licences have been identified to Cambridge Water during the plan-development process and factored into the supply-demand balance calculations.
- The modelling takes account of predicted local and regional growth when identifying risk areas and potential solutions, based (*inter alia*) on Local Plans and population growth models. 'In-combination' effects with respect to land-use plans and specific options are therefore inherently considered and accounted for as part of the WRMP option development process (i.e. an option that does not account for local growth is not a solution) and this can be relied on by the HRA. Likewise, the modelling accounts for climate change.
- Unless otherwise stated by the Environment Agency during the options development process, it is assumed that the relevant Catchment Abstraction Management Strategy (CAMS) documents are correct and reliable, and that there is 'water available' where this is confirmed by the CAMS.

2.6.3 In-combination effects with SROs

With regard to schemes involving multiple water companies (particularly some SROs) the assessment will necessarily focus on those European sites directly exposed to the activities proposed and managed by Cambridge Water, rather than sites that will only be affected by those scheme elements proposed and managed by other water companies; i.e. when undertaking the 'in-combination' assessment of a scheme that appears in multiple plans the effects from source/donor will be considered distinct from supply/beneficiary.

For example, the source/donor plan will only consider the implications of the abstraction, etc on relevant European sites and waterbodies within its catchment (and downstream catchments where relevant), and the supply/beneficiary plan would consider any implications on European sites / water bodies from the application of the supplied water within its catchment(s)[32]. This approach is intended to ensure unnecessary duplication is avoided, and pragmatism will be applied to address indirect, downstream effects and effects on functional habitat.

The Fens Reservoir Strategic Resource Option is being proposed in the Anglian Water region to support supply to both Anglian Water and Cambridge Water customers. At Gate 1, the initial concept for the reservoir evolved from Anglian Water's WRMP19 solution, involving a 50,000Ml reservoir with an abstraction from the River Ely-Ouse at Denver. Additional abstractions from the River Bedford-Ouse at Earith, Middle Level Drain at St Germans and the Ouse Washes have been assessed, which combined would increase the available deployable output (DO) sufficiently to support a regional-scale scheme. The location of the reservoir is to be

[31] It is recognised that, occasionally, the sustainability reductions agreed through the RoC process have been subsequently shown to be insufficient to address the effects of PWS abstraction on some sites; it is assumed that these will be identified to the water companies as part of the WRMP development process.
[32] Note: for the Severn Thames transfer we would expect the in-combination assessment of impacts on the Severn to feature in both WRW and WRSEs plans. This is due to the complex interaction of releases and abstractions particular to this scheme.

confirmed but is likely to be in the Fens, either to the east or west of the Ouse Washes to ensure proximity to the water sources, and within Anglian Water's catchment. As such, within this WRMP24, Cambridge Water are assessing the supplied water (i.e. they are the beneficiary only) from the scheme and transfer pipeline.

3. CAMBRIDGE WATER'S DRAFT WRMP24

3.1 INTRODUCTION

This section provides an overview of the water resources management planning process, the Cambridge Water supply system and the draft WRMP24. For further detail, reference should be made to the overarching plan.

Water resources management planning is undertaken by all water companies in England and Wales in order to ensure reliable, resilient water supplies over the long-term planning horizon. The process includes forecasting how much water will be available and how much water customers will need over the planning period (assessing supply and demand). If a potential deficit is identified in the supply demand balance, the WRMP will determine how best to close the gap.

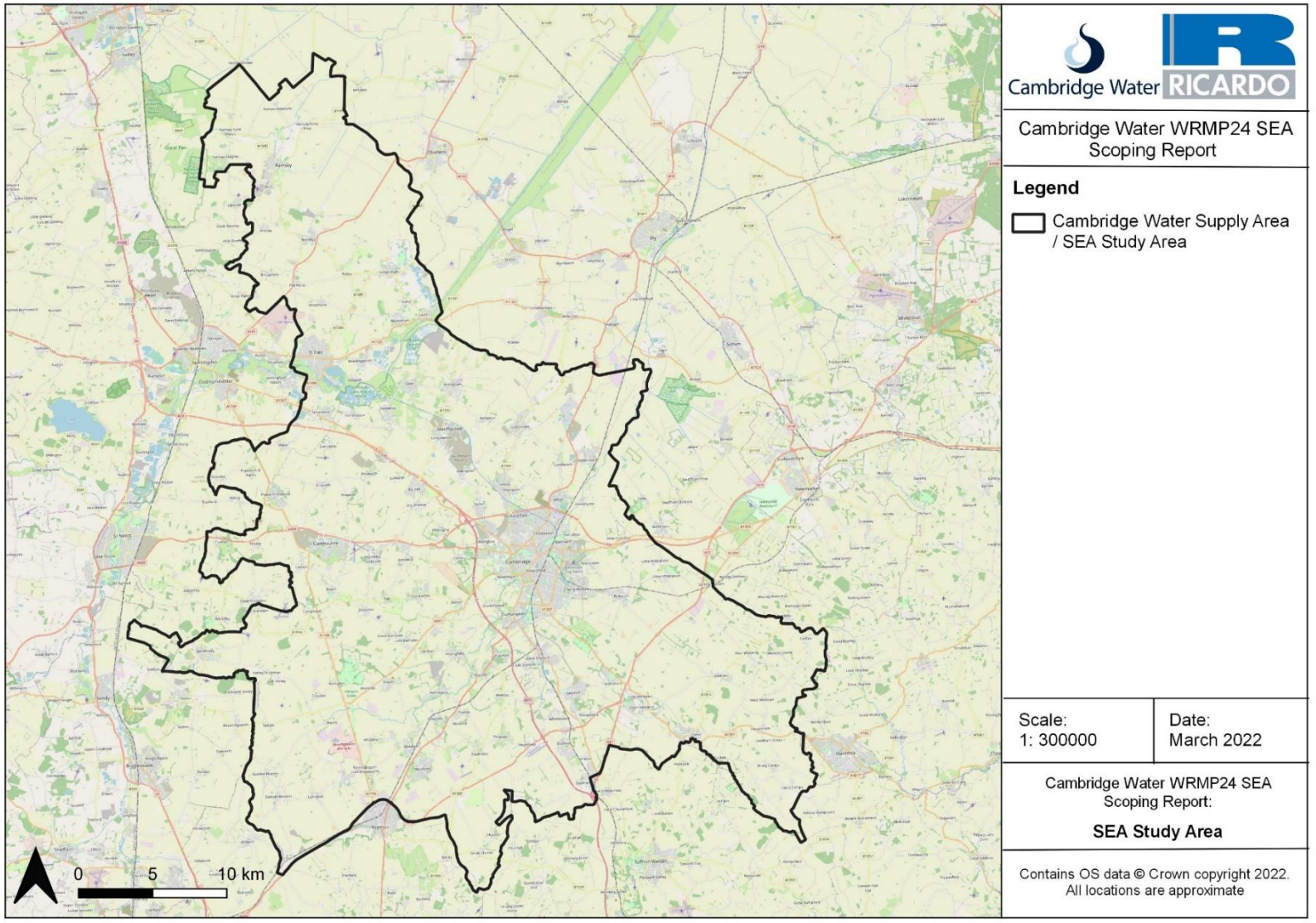
Water companies in England and Wales have a statutory requirement to prepare a WRMP every five years and this has been described above in **Section 1**. Cambridge Water's draft WRMP24 consultation programme commenced in April 2022 and will continue as the WRMP24 continues to be developed. The final WRMP24 will be published for formal public consultation in autumn 2023.

Cambridge Water has identified feasible options from an unconstrained list containing a much greater breadth of options which are being investigated further. The feasible list is a set of options that Cambridge Water considers suitable to be included in the options programme appraisal process to determine the preferred mix of solutions for meeting any potential future supply deficits.

The feasible options have been assessed to understand the costs, the benefits to the supply-demand balance, the effect on carbon emissions and the environmental and social effects (through the SEA, HRA and WFD assessments). The options have been compared through a comprehensive options appraisal process to determine the 'best value' programme of options to maintain a supply-demand balance over the planning period, and therefore identify the 'preferred programme'. Cambridge Water provides high quality water to approximately 351,000 customers over an area of 1,173 km^2 which includes Cambridge city and extends to Ramsey and St Ives in the north, Balsham in the east, Gamlingay in the west and Melbourn in the south. Water is supplied through 2,300 km of water mains fed by ground water abstraction from underground aquifers. In total, 97% of the water available for supply by Cambridge Water comes from boreholes drilled into the chalk strata to the south and east of Cambridge, and from a single wellfield in the Thetford area. The remaining 3% comes from a greensand source to the west of the area which can supply the more local area and surrounding villages. Water supplies are both pumped directly into supply following treatment or are distributed through a system of service reservoirs with sufficient capacity to manage short term peaks in demand.

For water resource planning purposes, Cambridge Water's supply area is managed under one Water Resource Zone (WRZ) (**Figure 3.1**). For the HRA, the assessment area includes the Cambridge Water supply area and the wider surrounding area, where there are either existing or proposed sources of water for the company (such as the groundwater sources in the Thetford area) and European sites with pathways for impact at greater distances (see **Section 4**).

Figure 3.1 Cambridge Water supply area



There are several future key challenges faced by Cambridge Water in providing reliable and secure water supplies to its customers. These include considerable projected housing growth and increasing population in some areas, the potential effects of climate change, and water availability challenges in the east of England due to the chalk stream issues.

As a result of these various pressures, actions are likely to be required by Cambridge Water to maintain sustainable and secure water supplies to customers. These actions could include measures to reduce the demand for water and/or develop additional water supply availability. A wide range of demand and supply measures will be considered initially, which will then be narrowed down to a smaller number of options for more detailed evaluation.

In developing its draft WRMP24, Cambridge Water has examined the future forecast water supply/demand balance and determined how any deficit between forecast demand and reliable water supply availability should be addressed. In developing the plan, a large number of alternative options were identified and assessed to understand their costs, their benefits to the supply-demand balance, their effect on carbon emissions and their environmental and social effects (through the SEA process and associated HRA and WFD assessments). The options were subsequently compared through a comprehensive programme appraisal process to determine the 'best value' programme of options to maintain the supply-demand balance over the planning period. Decisions on the best value programme took account of a range of factors, such as the implications for water customer bills, the resilience to future risks and uncertainties, deliverability considerations and the environmental and social effects of the programme (both adverse and beneficial effects), as informed by the SEA. **Figure 3.2**, summarises the overall approach to the evolution of the draft WRMP24: from the initial "unconstrained" list of options through to the consideration of alternative programmes and the development of the draft WRMP24.

A total of 21 options (3 demand side and 18 supply side) were assessed as part of the feasible options list. The demand management options are shown in **Table 3.1** and the supply side options in **Table 3.2**.

Table 3.1 Feasible options: demand management options

Option	Activity
9% reduction in NHH demand	Fitting of Enhanced Meter Technology over AMP8 and AMP9 to all NHH
50% leakage reduction by 2050	Proactive trunk mains leakage reduction
	Advanced pressure optimisation
	Customer supply pipe repair or replacement (without smart networks)
	Distribution Mains/Comms pipe replacement
	Customer supply pipe repair or replacement (with smart networks)
	DMA MOT (with smart networks)
	DMA ALC plus (with smart networks)
	DMA MOT (without smart networks)
	DMA ALC plus (without smart networks)
110 l/h/d by 2050	Water labelling no minimum standards
	Household water efficiency programme (partnering approach, home visit)
	Housing associations - targeted programme
	Innovative tariffs
	Targeting properties for efficiency audits (without smart metering)
	Water neutrality (without smart metering)
	Community Water Efficiency Scheme (without smart metering)

Underpinning these options is the company's programme of universal metering it is proposing to undertake between 2025 and 2035, which will provide invaluable information to support changes to customer behaviour as well as aiding with the targeting and delivery of leakage reductions.

Figure 3.2 Alignment of SEA, HRA, Water Framework Directive (WFD) and Natural Capital Assessments (NCA) to inform plan development

Table 3.2 Feasible options: supply side options

Cambridge Water Option ID	Option name	Description
CW-01A	Combined Ouse gravel sources Fenstanton and St Ives (01A)	This option is to recommission the unused groundwater abstraction source (gravels) at Fenstanton BH, through the creation of 2 new BH's (25m deep) with pumps and an associated building on site to allow for an average DO of 0.44Ml/d DYAA. The raw water is to be transferred along a 1km 150mm new pipeline to St.Ives for treatment (the treatment process must consider metaldehyde risks at the site) and then distribution of the potable water to the CAM network via a 100m of 450mm pipeline to connect from the outlet of the treatment works to network. This option is exclusive to option CW24-01B as it uses the same source.
CW-01B	Combined Ouse gravel sources Fenstanton and St Ives (01B)	This option requires the same assets as CW24-01A however the source water includes augmentation of the river Ouse to allow for increased abstraction at Fenstanton compared to CW24-01A
CW-37Ai	Northstowe greywater reuse or similar growth large storage	Site-scale greywater reuse scheme incorporated into large scale development.
CW-37Aii	Northstowe greywater reuse or similar growth small storage	Site-scale greywater reuse scheme incorporated into small scale development.
CW-38A	Site-scale rainwater harvesting (Northstowe or similar growth)	Site-scale rainwater harvesting scheme incorporated into large scale development.
CW-38B	Northstowe rainwater harvest or similar growth small storage	Site-scale rainwater harvesting scheme incorporated into small scale development.
CW-57	River Cam abstraction & treatment works	River Cambridge abstraction & treatment works.
CW-71	Anglian Water (AWS) Milton Wastewater Treatment Works (WWTW) effluent discharge reuse	Milton WWTW Effluent re-use surface water abstraction post effluent discharge.
CW-73A	Fens Reservoir internal potable water transfer - Chatteris	Construction of a major new surface water reservoir in South Fenland, to be shared between CW and Anglian Water (AWS). Location to be chosen from four alternatives; for this option it is assumed to lie just north of Chatteris.

Cambridge Water Option ID	Option name	Description
CW-75Ai and ii	AWS potable transfer through CAM area 5Mld (variant Aii includes contribution to AWS strategic main)	This option is to provide one or more cross-connections at suitable location(s) between the new AWS main (from Grafham WTW to their new strategic reservoir that is currently under construction at Rede (adjacent to an existing reservoir) as part of their AMP7 SPA pipelines programme) and the existing CAM network, such that a notional 5Ml/d (for this sub-option) may be imported from AWS.
CW-7Aiii	AWS potable transfer through CAM area 5Mld with main cost and 0.3ha blending plant	Cross-connection from Anglian Water (AWS) new strategic pipeline to Cambridge network north of Longstanton with a supply of 5Ml/d, inclusive of AWS main cost and a blending plant.
CW-75Bi and ii	AWS potable transfer through CAM area 10Ml/d (variant Bii includes contribution to AWS strategic main)	This option is to provide one or more cross-connections at suitable location(s) between the new AWS main (from Grafham WTW to their new strategic reservoir that is currently under construction at Rede (adjacent to an existing reservoir) as part of their AMP7 SPA pipelines programme) and the existing CW network, such that a notional 10Ml/d (for this sub-option) may be imported from AWS.
CW-75Biii	AWS potable transfer through CAM area 5Mld with main cost and 0.4ha blending plant	Cross-connection from AWS new strategic pipeline to Cambridge network north of Longstanton with a supply of 10Ml/d, inclusive of AWS main cost and a blending plant.
CW-75Ci and ii	AWS potable transfer through CAM area 15Mld (variant Cii and includes contribution to AWS strategic main)	This option is to provide one or more cross-connections at suitable location(s) between the new AWS main (from Grafham WTW to their new strategic reservoir that is currently under construction at Rede (adjacent to an existing reservoir) as part of their AMP7 SPA pipelines programme) and the existing CW network, such that a notional 15Ml/d (for this sub-option) may be imported from AWS.
CW-75Ciii	AWS potable transfer through CAM area 5Mld with main cost and 0.5ha blending plant	Cross-connection from AWS new strategic pipeline to Cambridge network north of Longstanton with a supply of 15Ml/d, inclusive of AWS main cost and a blending plant.

4. HRA STAGE 1 SCREENING

4.1 POTENTIAL LIKELY SIGNIFICANT EFFECTS OF DRAFT WRMP24 FEASIBLE OPTIONS

The approach to HRA screening is described above in **Section 2** above. The Cambridge Water supply area and the European sites within proximity to this area are shown on **Figure 4.1**.

The HRA screening of demand management options for the draft WRMP24 is provided in **Section 4.1.1** and for potential water supply options in **Section 4.1.2**. Where uncertainty has been identified, this uncertainty indicates that a confident conclusion of no LSE is not yet possible. Where uncertainty remains, a Stage 2 HRA (AA) would be required to either confirm no adverse effect related to a scheme or to confirm an adverse effect and any appropriate mitigation measures. The draft WRMP24 does not include any options that were identified as 'uncertain' in respect of LSE on any European site.

4.1.1 Demand management options

The demand side options are summarised in **Table 3.1**, and essentially comprise the following generic option types:

- Physical amendments to the network:
  - District Metered Area (DMA) optimisation (reducing the size of DMAs through network interventions to improve the detection of smaller leaks);
  - Flow regulators (installation of flow restrictors and pressure reducing valves);
  - In-pipe repairs and lining technologies (typically non-invasive);
  - Mains rehabilitation/renewal/replacement (typically invasive);
  - Permanent network sensors (installation of acoustic loggers within assets);
  - Pressure management (reduces leakages);
  - Enhanced metering of households (smart meters);
  - Upgrade existing household meters to smart meters;
  - Upstream tile optimisation (installation of larger meters 'upstream' in the supply network to improve monitoring of network losses).
- Water efficiency support:
  - Free water efficiency audits for households;
  - Free water efficiency devices (internal or external) for households;
  - Government intervention (water labelling, standards);
  - Non-household water efficiency programmes;
  - Rainwater harvesting and water reuse (new builds).

Of these, the 'water efficiency support' options cannot have significant effects due to the nature of the option (based on established guidance for similar policies and proposals in strategic planning documents that do not promote development[33]).

The remaining demand-side options are likely to require some form of physical intervention or amendment to the network. The works required for the vast majority of these options will be very minor (e.g. meter

[33] e.g. Tyldesley, D. & Chapman, C. (2021). The Habitats Regulations Assessment Handbook [online]. DTA Publications Limited. Available at: https://www.dtapublications.co.uk/handbook/.

installation) with virtually no risk of significant effects on European sites. In some instances effect pathways might be conceivable (for example, a hypothetical leaking pipe might be located in or near a European site) but it is not possible to predict or identify specific locations where such measures might be applied and so effects on specific European sites cannot be identified.

Non-specific residual risks such as these can almost always be avoided with established scheme-level mitigation measures and it is very unlikely that significant or significant and adverse effects as the result of a particular demand-side measure would be unavoidable at the scheme level; however, these options are carried forward to the 'appropriate assessment' stage for procedural reasons and to avoid potential conflict with the 'People over Wind' case.

4.1.2 Supply-side options

A summary of the initial **'risk review' of the supply-side**[34] **feasible options**, to assist Cambridge Water's selection of constrained options (i.e. 'HRA as a process') is provided in **Table 4.1**. Further screening details are provided in **APPENDIX C**.

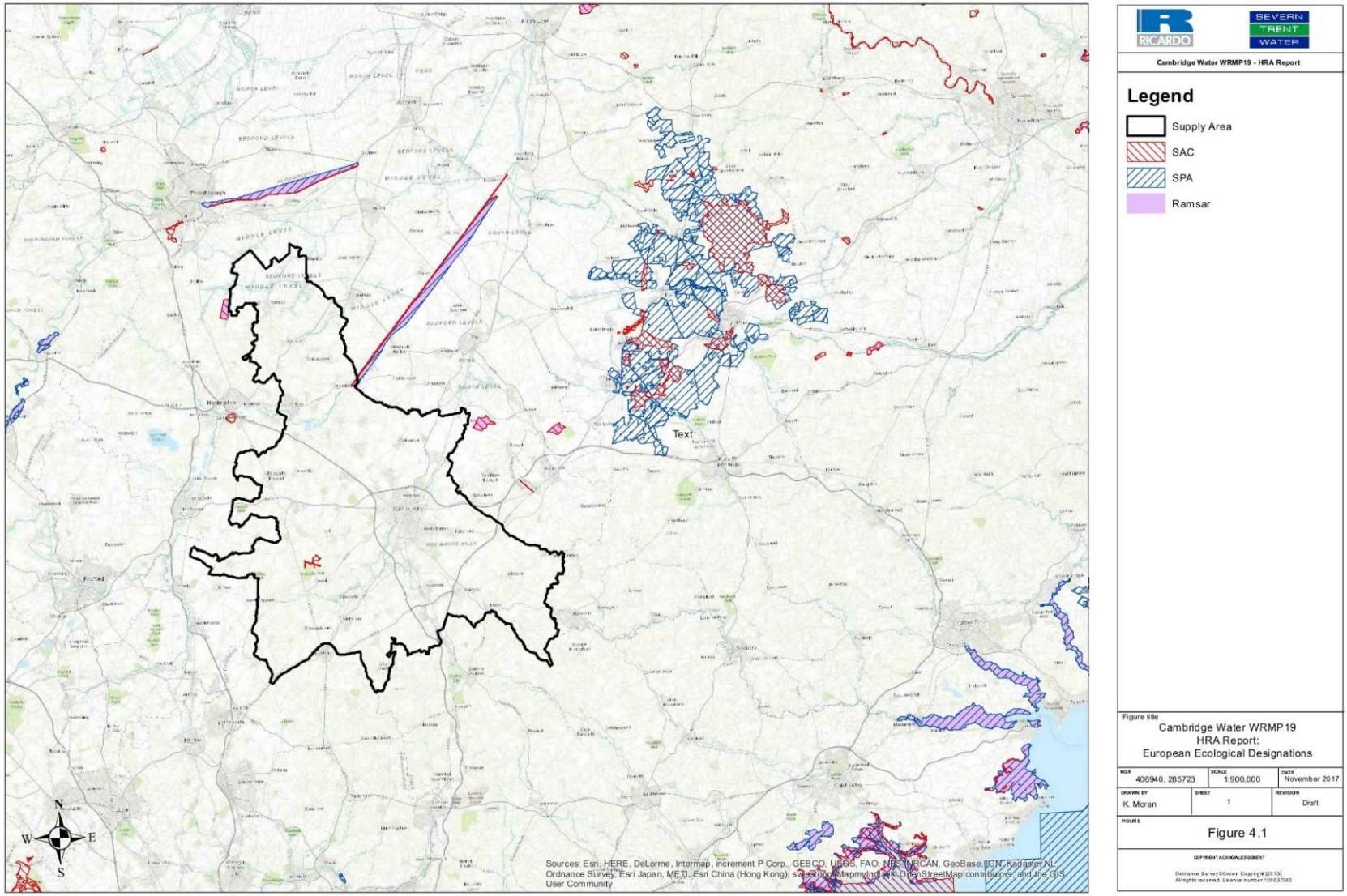
Table 4.1 Screening 'risk review' of supply-side feasible options for impacts on European sites

Option No.	Option Name	HRA Outcome	Comments
CW24-01A	Combined Ouse gravel sources Fenstanton and St Ives (01A)	LSEs identified – construction and operation	The Ouse Washes SAC/SPA and Ramsar is located downstream at approximately 8.85km. Construction works in proximity to the River Great Ouse could give rise to site-derived pollutants (principally oils and other contaminants) and sediment entering the watercourse. Additional abstraction during operation of the boreholes may affect water availability downstream (uncertain). As such, a Stage 2 Appropriate Assessment will be required if this option is selected within the preferred programme.
CW24-01B	Combined Ouse gravel sources Fenstanton and St Ives (01B)		
CW24-37Ai	Northstowe greywater reuse or similar growth large storage	No LSEs anticipated	There are no European sites within 10km of the scheme components, or impact pathways over a greater distance.
CW24-37Aii	Northstowe greywater reuse or similar growth small storage		
CW24-38A	Site-scale rainwater harvesting (Northstowe or similar growth)		
CW24-38B	Northstowe rainwater harvest or similar growth small storage		
CW24-57	River Cam abstraction & treatment works	LSEs identified – construction only	Fenland SAC includes spined loach *Cobitis taenia* as a qualifying feature. Spined loach may be present within the River Cam of which the confluence is located ~700m from Fenland SAC. Site-derived pollutants (principally oils and other contaminants) and sediment from construction activities may enter the watercourse and affect off-site supporting habitat. No new abstraction licence is required for the option, and the abstraction of water will be managed through the Hands Off Flow arrangement. As such, no LSEs during operation are anticipated.

[34] Demand-side options designed to reduce treated water use (such as metering, provision of water butts or leakage reduction options) are not systematically reviewed at this stage as they are invariably generic and geographically unspecified activities or groups of actions that cannot negatively affect any European sites (or be meaningfully assessed at the strategy level). Since they will form part of the adopted WRMP they are formally subject to Regulation 63 as part of the final HRA, but this is typically a simple screening exercise or 'down-the-line' deferral, depending on the nature of the option.

Option No.	Option Name	HRA Outcome	Comments
CW24-71	AWS Milton WWTW effluent discharge reuse	No LSEs anticipated	There are no European sites within 10km of the scheme components, or impact pathways over a greater distance. The ultimate downstream receptor is The Wash and North Norfolk Coast SAC. None of the qualifying features are migratory fish species, where use of functionally linked habitat within the River Cam could have been an issue. Similarly, freshwater input is not identified in the SACO as a key attribute/target. The Wash SPA and Ramsar, are considered sufficiently distant such that the River Cam does not provide functionally linked habitat for any of the qualifying features.
CW24-73A	Fens Reservoir internal potable water transfer Chatteris	LSEs identified – construction only	The Ouse Washes SAC, SPA and Ramsar is located downstream of the option components, construction of which could lead to site-derived pollutants and sediments entering the watercourse and causing deterioration to supporting habitat. Eversden and Wimpole Woods SAC is located within 7km from option 73A and construction could lead to loss/ damage to supporting habitat for barbastelle bats or habitat fragmentation. Option 73A does not include an abstraction of water, or increase in water abstraction only the transfer of the potable water from the new Fens reservoir (being assessed separately) therefore no operational LSEs are anticipated.
CW24-75Ai, Aii, Aiii	AWS potable transfer through CAM area 5Mld (Aii variant includes contribution to AWS strategic main, and Aiii variant includes a blending plant)	LSEs identified – construction only	The Ouse Washes SAC, SPA and Ramsar is located downstream of the option components, construction of which could lead to site-derived pollutants and sediments entering the watercourse and causing deterioration to supporting habitat. The availability of surplus water has been identified by Anglian Water. The option does not require an abstraction licence, or change to abstraction licence, therefore no operational LSEs are anticipated.
CW24-75Bi, Bii, Biii	AWS potable transfer through CAM area 10Mld (Bii variant includes contribution to AWS strategic main, and Biii variant includes a blending plant)		
CW24-75Ci, Cii, Ciii	AWS potable transfer through CAM area 15Mld (Cii variant includes contribution to AWS strategic main, and Ciii variant includes a blending plant)		

Figure 4.1 European sites within the study area



4.2 HRA STAGE 1 SCREENING CONCLUSIONS FOR PREFERRED PROGRAMME OPTIONS

This section sets out the supply side and demand side options within the preferred plan and presents the Stage 1 screening conclusions for these options. It highlights the sites and options where screening has concluded that significant effects are either likely or uncertain and are therefore taken forward to an appropriate assessment stage:

4.2.1 Demand side options

No further assessment has been carried out on the demand side options given the conclusions of the review undertaken during the feasible options stage, see **Section 4.1.1**.

4.2.2 Supply-side options

The initial 'alone' screening assessments have been completed for each preferred option and are proportionate to immediacy of the option being required. In summary, the assessment aims to identify those European site features that are potentially vulnerable to a particular option – i.e. which have features that are both exposed and sensitive to the likely outcomes, taking into account the baseline for the site including the conservation objectives. Features that are both exposed and sensitive to an environmental change are assumed to be subject to 'likely significant effects' unless there is a clear over-riding reason why significant effects cannot occur.

The options included within the preferred plan, along with their first year of use, are listed below.

- CW24-01A: Combined Ouse gravel sources -Fenstanton and St Ives - 2030
- CW24-01B: Combined Ouse gravel sources - Fenstanton and St Ives - 2030
- CW24-37Aii: Small site-scale greywater reuse (Northstowe) - 2035
- CW24-38B: Small site-scale rainwater harvesting (Northstowe or similar growth) - 2035
- CW24-57: River Cam abstraction & treatment works - 2040
- CW24-71: Milton Wastewater Treatment Works (WWTW) Effluent re-use surface water abstraction post effluent discharge - 2035
- CW24-73A: Fens Reservoir internal potable water transfer – Chatteris - 2035
- CW24-75Aiii: AWS potable transfer through CAM area 5Mld with main cost and blending plant – 2035
- CW24-75Biii: AWS potable transfer through CAM area 10Mld with main cost and blending plant – 2030
- CW24-75Ciii: AWS potable transfer through CAM area 15Mld with main cost and blending plant – 2030

The full HRA Stage 1 Screening is provided in **Table 4.2** for those preferred plan options required before 2050.

Table 4.2 Preferred programme: supply side options screening of 'Likely Significant Effects' (LSE)

Option No.	Name	Description	European site	Approximate distance and direction from option	Screening Summary
CW24-01A	Combined Ouse gravel sources Fenstanton and St Ives	This option is to recommission the unused groundwater abstraction source (gravels) at Fenstanton BH, through the creation of 2 new BH's (25m deep) with pumps and an associated building on site to allow for an average DO of 0.44Ml/d DYAA. The raw water is to be transferred along a 1km 150mm new pipeline to St.Ives for treatment (the treatment process must consider metaldehyde risks at the site) and then distribution of the potable water to the CW network via a 100m of 450mm pipeline to connect from the outlet of the treatment works to network.	Portholme SAC	6.5km, west	No pathways for construction or operation related effects (distance and no hydrological connectivity).
			Ouse Washes SAC / SPA / Ramsar	8.85km, north-east	**Construction**: Option 01A will require the construction of a new pipeline in proximity to the River Great Ouse (180m) which may result in surface and groundwater pollution incident and sedimentation which may affect qualifying feature of the Ouse Washes SAC (spined loach) and the waterbird assemblage associated with the SPA and Ramsar sites. LSE cannot be ruled out at this stage and further assessment will be required. **Operation**: Option 01A is based on the available abstraction licence at Fenstanton BH despite the boreholes not being in used since 1999. Water abstraction will be required during operation in proximity to the River Great Ouse which is hydrologically connected to the Ouse Washes SAC/SPA/Ramsar (downstream of option 01A). As a result, abstraction of ground water may have an impact on the water level within the River Great Ouse. Therefore LSE cannot be ruled out at this stage and further assessment will be required.
CW24-01B	Combined Ouse gravel sources Fenstanton and St Ives	This option requires the same assets as 01A however the source water includes augmentation of the River Ouse to allow for increased abstraction at Fenstanton compared to 01A.	Portholme SAC	6.5km, west	No pathways for construction or operation related effects (distance and no hydrological connectivity).
			Ouse Washes SAC / SPA / Ramsar	8.85km, north-east	**Construction**: Option 01B will require the construction of a new pipeline in proximity to the River Great Ouse (180m) which may result in surface and groundwater pollution incident and sedimentation which may affect qualifying feature of the Ouse Washes SAC (spined loach) and the waterbird assemblage associated with the SPA and

Option No.	Name	Description	European site	Approximate distance and direction from option	Screening Summary
					Ramsar sites. LSE cannot be ruled out at this stage and further assessment will be required. **Operation**: Option 01B is based on the available abstraction licence at Fenstanton BH despite the boreholes not being in used since 1999. Water abstraction will be required during operation in proximity to the River Great Ouse which is hydrologically connected to the Ouse Washes SAC/SPA/Ramsar (downstream of option 01B). As a result, abstraction of ground water may have an impact on the water level within the River Great Ouse. Therefore LSE cannot be ruled out at this stage and further assessment will be required.
CW24-37Aii	Northstowe greywater reuse or similar growth small storage	Site-scale greywater reuse scheme incorporated into small scale development	No European sites within 10km of the option.	-	No pathways for construction or operation related effects (distance and no hydrological connectivity).
CW24-38B	Northstowe rainwater harvest or similar growth small storage	Site-scale rainwater harvesting scheme incorporated into small scale development	No European sites within 10km of the option.	-	No pathways for construction or operation related effects (distance and no hydrological connectivity).
CW24-57	River Cam abstraction and treatment works	River Cam abstraction & treatment works	Fenland SAC	7.9km, north-east	**Construction:** The SAC is located along Burwell Lode and Wicken Lode tributaries of Reach Lode which flows into the River Cam, downstream of option 57. Construction of option 57 may impact supporting habitat for spined loach if present within the River Cam through surface pollution incidents, sedimentation or introduction of INNS. LSE cannot be ruled out at this stage and further assessment will be required for spined loach. **Operation:** Option 57 will require additional abstraction on the River Cam to provide additional raw water to be stored in an embankment reservoir. This stretch of the River Cam is currently supplemented by effluent discharge

Option No.	Name	Description	European site	Approximate distance and direction from option	Screening Summary
					from Milton WWTW. Option 57 is based on the available abstraction of the River Cam, allowing 22.2Ml/d to be abstracted during 120 days of the year. No new licence abstraction is required and abstraction of water will be managed through the Hands off Flow. No LSE are anticipated from operation of option 57.
			Devils Dyke SAC	10km, east	No pathways for construction or operation related effects (distance and no hydrological connectivity).
			Wicken Fen Ramsar	7.9km, north-east	**Construction:** The Ramsar is located along Burwell Lode and Wicken Lode tributaries of Reach Lode which flows into the River Cam, downstream of option 57. due to the distance between option 57 and Fenland SAC and Wicken Fen Ramsar, and due to the lack of hydrological connectivity, no LSE are anticipated from option 57 upon the habitat qualifying features (peat fens) nor upon fen violet *Viola persicifolia*. **Operation:** Option 57 will require additional abstraction on the River Cam to provide additional raw water to be stored in an embankment reservoir. This stretch of the River Cam is currently supplemented by effluent discharge from Milton WWTW. Option 57 is based on the available abstraction of the River Cam, allowing 22.2Ml/d to be abstracted during 120 days of the year. No new licence abstraction is required and abstraction of water will be managed through the Hands off Flow. No LSE are anticipated from operation of option 57.
CW24-71	AWS Milton WWTW effluent discharge reuse	Milton Wastewater Treatment Works (WWTW) Effluent re-use surface water abstraction post effluent discharge	The Wash and North Norfolk Coast SAC	Downstream receptor (c.66km)	The ultimate downstream receptor is The Wash and North Norfolk Coast SAC, however none of the qualifying features are migratory fish species, where use of functionally linked habitat within the River Cam could have been an issue. Similarly, The Wash SPA and Ramsar, are considered sufficiently distant such
			The Wash SPA and Ramsar	Downstream receptor (c.66km)	

Option No.	Name	Description	European site	Approximate distance and direction from option	Screening Summary
					that the River Cam does not provide functionally linked habitat for any of the qualifying features.
CW24-73A	Fens Reservoir internal potable water transfer Chatteris	Construction of a major new surface water reservoir in South Fenland (Chatteris), to be shared between Cambridge Water and Anglian Water (AWS). This option only assesses a high lift pump and pumped pipeline transfer of potable water to Madingley reservoir, with an offtake to Bluntisham reservoir, with additional storage included at these two locations.	Ouse Washes SAC / SPA / Ramsar	2.8km, east	**Construction:** Ouse Washes SAC/SPA/Ramsar is located along the Old Bedford River and the New Bedford River, which are artificial, partial diversion of the waters of the River Great Ouse. The construction of the pipeline associated with option 73A will require crossing the River Great Ouse, approximately 6km upstream of the designated site and crossing various ditches connected to the Ouse Washes SPA/SAC/Ramsar. Construction works may result in surface and groundwater pollution incident and sedimentation which may affect qualifying feature of the Ouse Washes SAC (spined loach) and the waterbird assemblage associated with the SPA and Ramsar sites. Construction of option 73A may also result in loss or damage of supporting habitat if present within the footprint of the project, in particular the section drained to the north. LSE cannot be ruled out at this stage and further assessment will be required. **Operation:** Option 73A does not include abstractions of water as this is a potable water source from a new reservoir. Therefore, no LSE are anticipated from operation of option 73A.
			Eversden and Wimpole Woods SAC	7.2km, south-west	**Construction:** As barbastelle bats can travel over 7km for foraging, construction works may result in the loss or damage to supporting habitat and habitat fragmentation. Therefore, LSE cannot be ruled out at this stage and further assessment will be required. **Operation:** Option 73A does not include abstractions of water as this is a potable water source from a new reservoir.

Option No.	Name	Description	European site	Approximate distance and direction from option	Screening Summary
					Therefore, no LSE are anticipated from operation of option 73A.
CW24-75Aiii	AWS potable transfer through CAM area 5Ml/d with main cost and blending plant	Cross-connection from AWS new strategic pipeline to Cambridge network north of Longstanton with a supply of 5Ml/d, inclusive of AWS main cost and a blending plant.	Ouse Washes SAC / SPA / Ramsar	6.8km north	**Construction:** Ouse Washes SAC/SPA/Ramsar is located along the Old Bedford River and the New Bedford River, which are artificial, partial diversion of the waters of the River Great Ouse. The construction of the 750m pipeline associated with option 75A/B/C will require crossing Swavesey Drain, a small tributary of the River Great Ouse (approximately 4.8km upstream of the confluence) which joins the river approximately 4.9km upstream of the Ouse Wash SAC/SPA/Ramsar. The location of the blending plant is also in close proximity to two drains (c.70m). A review of sites surveyed for the WeBS and NBN Atlas data suggests that the site for the blending plant is not offsite functionally linked habitat. Few species are recorded within 2km or are in very low numbers. Due to the distance between the option and the designated sites, construction works are not anticipated to have an impact on the qualifying features through noise, visual disturbance or air pollution. However, construction works may result in surface and groundwater pollution incident, sedimentation which may affect qualifying feature of the Ouse Washes SAC (spined loach) and the waterbird assemblage associated with the SPA and Ramsar sites. **Operation:** Options 75A/B/C are third party potable water transfer options which include a cross-connection from Anglian Water's new strategic pipeline to Cambridge network with a supply of 5-15Ml/d. The availability of surplus water has been identified by Anglian Water. The option does not require an abstraction licence, or change to abstraction licence. Therefore, no LSE are anticipated.
CW24-75Biii	AWS potable transfer through CAM area 10Ml/d with main cost and blending plant	Cross-connection from Anglian Water (AWS) new strategic pipeline to Cambridge network north of Longstanton with a supply of 10Ml/d, inclusive of AWS main cost and a blending plant.			
CW24-75Ciii	AWS potable transfer through CAM area 15Ml/d with main cost and blending plant	Cross-connection from Anglian Water (AWS) new strategic pipeline to Cambridge network north of Longstanton with a supply of 15Ml/d, inclusive of AWS main cost and a blending plant.			

4.3 SCREENING CONCLUSIONS

The screening has concluded that significant effects are either likely or uncertain for the following sites and options; these are therefore taken forward to an appropriate assessment stage (**Table 4.3**).

Table 4.3 Summary of supply-side options and sites requiring Stage 2 Appropriate Assessment

European site	Options	Alone or in-combination with other WRMP options?
Ouse Washes SAC / SPA / Ramsar	CW24-01A	Yes – alone (construction and operation)
	CW24-01B	Yes – alone (construction and operation)
	CW24-73A	Yes – alone (construction)
	CW24-75Aiii	Yes – alone (construction)
	CW24-75Biii	Yes – alone (construction)
	CW24-75Ciii	Yes – alone (construction)
Fenland SAC	CW24-57	Yes – alone (construction)
Eversden and Wimpole Woods SAC	CW24-73A	Yes – alone (construction)

5. STAGE 2 APPROPRIATE ASSESSMENT: OUSE WASHES SAC

5.1 INTRODUCTION

The following options have been screened in as potentially impacting the Ouse Washes SAC:

- CW24-01A: Combined Ouse gravel sources -Fenstanton and St Ives – **construction and operation.**
- CW24-01B: Combined Ouse gravel sources -Fenstanton and St Ives – **construction and operation.**
- CW24-73A: Fens Reservoir potable transfer – Chatteris – **construction only.**
- CW24-75Aiii, Biii, Ciii: AWS potable transfer through CAM area 5, 10, 15Ml/d with main cost and blending plant – **construction only**.

Theoretical pathways for effects exist through:

- Potential construction-related impacts on off-site supporting habitat that will rely on project-level mitigation (and so cannot be 'screened out').
- Biological disturbance through the introduction of invasive non-native species.
- Permanent change in habitats as a result of drying from increased abstraction.

The Ouse Washes SAC is designated for the following features, however on the basis of the above pathways, only those qualifying features in bold have been taken through to the appropriate assessment:

- **S1149 Spined loach *Cobitis taenia.***

5.2 SITE SUMMARY

5.2.1 Site description

The Ouse Washes SAC is a wetland comprising seasonally flooded washlands which are agriculturally managed in a traditional manner. The associated dykes and rivers hold a great variety of aquatic plants; the pondweeds *Potamogeton* spp. are particularly well represented. The associated aquatic fauna is similarly diverse and includes spined loach. The Counter Drain, with its clear water and abundant aquatic plants, is particularly important, and a healthy population of spined loach is known to occur. It also provides breeding and winter habitats for important assemblages of wetland bird species, particularly wildfowl and waders.

Ouse Washes SAC encompasses one Site of Special Scientific Interest (SSSI) and is encapsulated within the Fens National Character Area (NCA).

5.2.2 Qualifying features screened into Stage 2 Appropriate Assessment: baseline

5.2.2.1 Spined loach

The Ouse Washes SAC represent spined loach populations within the River Ouse catchment. The Counter Drain, with its clear water and abundant macrophytes, is particularly important, and a healthy population of spined loach is known to occur.

As per the Supplementary Advice document[35] the spined loach is one of the UK's smallest freshwater fish, usually reaching no more than 14 centimetres in length. Its name is derived from the two small spines present under each eye. It is a bottom-living fish that has a restricted microhabitat associated with a specialised feeding mechanism. They use a complex branchial or gill apparatus to filter-feed in fine but well oxygenated sediments. Optimal habitat is typically standing or slow-moving open water with a patchy cover of submerged (and possibly emergent) plants which are important for spawning during summer, and a sandy or silty substrate into which juvenile fish tend to bury themselves when inactive.

The fish has limited means of dispersal, so UK populations are largely genetically isolated from each other.

[35] Natural England (2015) European Site Conservation Objectives: Supplementary advice on conserving and resorting site features. Ouse Washes SAC. Site code: UK0013011.

The Ouse Washes SAC represents spined loach populations within the River Ouse catchment. The Counter Drain, with its clear water and abundant macrophytes, is a particularly important part of the site where a healthy population of spined loach is known to occur.

5.2.3 Condition, threats and pressures

The Ouse Washes SAC is legally underpinned by one SSSI: Ouse Washes SSSI. There are 21 units associated with the site including 'lowland neutral grassland' all assessed as being in 'unfavourable – no change' condition, 'improved grassland' assessed in 'favourable' condition and 'rivers and streams' assessed as being in 'unfavourable – no change' and 'favourable' condition. The SSSI citation states '…*It is of particular note for the large numbers of wildfowl and waders which it supports, for the large area of unimproved neutral grassland communities which it holds and for the richness of the aquatic fauna and flora within the associated watercourse. The capacity of the site to hold wintering and breeding waterfowl and waders is of international significance*'[36]. Ouse Washes SSSI is considered to be 15.73% 'favourable', 3.56% 'unfavourable – recovering' and 80.71% 'unfavourable – no change'.

No pressures / threats have been identified within the Ouse Washes SAC Site Improvement Plan with regards to spined loach.

5.3 ASSESSMENT OF EFFECTS

An assessment of effects against the relevant SACO attributes and targets is provided in **Table 5.1**.

Spined loach is considered highly specialised for life on and in sandy bottoms and eggs are found nearly exclusively in the densest vegetation available with a potential tendency toward the shallower areas with low current velocity[37]. If suitable spawning habitat is lacking, the eggs are more exposed to predation or flushing, leading in general to a higher mortality rate. It is understood that mortality rate during very early development is critical for recruitment[38], such absence of suitable spawning habitat may seriously affect population growth.

While they tend to favour shallow water, natural drought or over-abstraction can be devastating, owing to the increased vulnerability to predation. Similarly, land-use changes and developments can increase siltation and reduce flow, creating unsuitable conditions for spined loach.

5.4 UNCERTAINTIES

There is limited understanding of the distribution of the qualifying features within the River Great Ouse catchment, passability of existing weirs, and therefore extent of offsite functionally linked habitat. Baseline surveys of the affected reaches (habitat and barriers) should be undertaken to support the project-level HRAs. There is also limited information regarding water abstraction requirement associated with options CW24-01A and CW24-01B.

There is uncertainty as to the operation of options CW24-01A and CW24-01B which would require water abstraction from a borehole which has not been operated since 1999 (noting that no new licence to be required). A hydrological model of the River Great Ouse watercourse is not available within which to model the impacts of the changes/additional abstractions and confirm likely changes to flows at a variety of points on the hydrograph.

[36] Natural England's Designated Site View – Ouse Washes SSSI. SSSI detail (naturalengland.org.uk) Accessed in November 2022.
[37] Bohlen J., 2003. Spawning habitat in the spined loach, Cobitis taenis (Cypriniformes: Cobitidae). Ichthyological research 50: 98-101.
[38] Kamler E (1992) Early life history of fishes: an energetic approach. Chapman & Hall, London.

Table 5.1 Information to inform an assessment of adverse effects on the Ouse Washes SAC: spined loach

Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
CONSTRUCTION PHASE				
Supporting habitat: structure/ function – Biotope mosaic Supporting habitat: structure/ function – sediment regime Supporting habitat: structure/ function – water quality (nutrient) Supporting habitat: structure/function – Integrity of off-site habitats	Maintain the characteristic physical form of the river channels which provide supporting habitat for spined loach. Maintain in-channel substrate character of at least 20% sand and no more than 40% silt. Maintain the nutrient regime of the river channels at or below the following levels; an annual mean of 0.1mgl-1 total phosphorous. Biological Water Quality in ditches target equivalent to Class 'b' in the biological module of the General Quality Assessment scheme (GQA). Dissolved oxygen, ammonia, BOD equivalent quality to Chemical GQA Class 'C'. Mean cover of filamentous macro-algae and Enteromorpha not more than 10%. Maintain any supporting habitats beyond the SAC boundary upon which the SAC spined loach population may depend.	**Options 01A and 01B** Both options are to recommission the unused groundwater abstraction source at Fenstanton BH, requiring the construction of new infrastructure, including a 1.2km pipeline within 200m of the River Great Ouse, between Fentsanton BH and St Ives WTW to transfer raw water. As the option is located upstream of the SAC, the River Great Ouse may be used as functionally linked habitat for the spined loach population associated with the SAC. No works within the River Great Ouse will be required, however any works within proximity to the watercourse could result in incidental surface run offs and release in fine sediments resulting in sedimentation of the riverbed which could impact the integrity of off-site habitats and therefore the spined loach population. Literature for the species suggests that the bottom-dwelling habit, 'nesting'/burrowing and territorial behaviours, and poor swimming ability limits the distances over which the species will range[39], and therefore confines the population extent. The release of fine sediments may result in temporary and minor increases in nutrient load to the river during construction. The species may be exposed to site-derived pollutants (principally oils and other contaminants) and sediment entering the tributaries of/and River Great Ouse, hence affecting potential off-site supporting habitats. Additional fine sediments could settle on macrophyte beds and coarse substrates downstream of the River Great Sow changing habitat suitability or smothering the plants, which could result in a reduction in the availability of suitable refuge areas for spined loach.	*Water quality* • Adherence to EA Pollution Prevention Guidelines (now archived) and NRW, SEPA's Guidance on Pollution Prevention including Works and Maintenance in or near Water (2017). *Nutrient pollution* • Implementation of a buffer strip to minimise the release of fine particles to the watercourse. *General* • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. • The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works.	No adverse effects on conservation objectives or site integrity
		Option 73A The option requires the construction of a major new surface water reservoir and associated infrastructures including a pipeline to transfer potable water to Madingley Reservoir which will cross the River Great Ouse, upstream of the SAC. As the option is located upstream of the SAC, the River Great Ouse may be used as functionally linked habitat for the spined loach population associated with the SAC. Any works within proximity to the watercourse could result in incidental surface run offs and release in fine sediments resulting in sedimentation of the riverbed which could impact the integrity of off-site habitats and therefore the spined loach population. The release of fine sediments may result in temporary and minor increases in nutrient load to the river during construction. Construction of the pipeline may require excavation within the River Great Ouse and could result in direct damages and loss of functionally linked habitats for the spined loach population, sedimentation of supporting features, killing and injuring individuals. As above regarding site-derived pollution and sediments.	*Loss of functionally linked habitat* • Design the pipeline crossing to avoid direct impacts to the watercourse and loss of functionally linked habitat by using horizontal directional drilling (HDD) under the River Great Ouse. *Damages* • Restrict work between April and July to avoid impacts to spawning fish. *Water quality* • Adherence to EA Pollution Prevention Guidelines (now archived) and NRW, SEPA's Guidance on Pollution Prevention including Works and Maintenance in or near Water (2017). *Nutrient pollution* • Implementation of a buffer strip to minimise the release of fine particles to the watercourse. *General* • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. • The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works.	No adverse effects on conservation objectives or site integrity
		Options 75Aiii, 75Biii and 75Ciii The construction of the 750m pipeline associated with option 75A/B/C will require crossing Swavesey Drain, a small tributary of the River Great Ouse (approximately 4.8km upstream of the confluence) which joins the river approximately 4.9km upstream of the Ouse Wash SAC/SPA/Ramsar. The location of the blending plant is also within 70m of the drain. Any works within proximity to the watercourse could result in incidental surface run offs and release in fine sediments resulting in sedimentation of the riverbed which could impact the integrity of off-site habitats and therefore the spined loach population. The release of fine sediments may result in temporary and minor increases in nutrient load to the river during construction. As above regarding site-derived pollution and sediments.		No adverse effects on conservation objectives or site integrity

[39] Culling M.A and Côté I.M. (2006) *Genetics and ecology of spined loach in England: implications for conservation management* Science Report: SC000026/SR. Report for the Environment Agency,

Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
		In-combination effects of Options 01A, 01B, 73A, 75Aiii, 75Biii and 75Ciii All options are required to be operational by either 2030 or 2035 and therefore construction programmes are likely to overlap leading to potential increased opportunities for effects on the same watercourse.	*General* • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. • The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works. • Coordinate construction programmes and ensure suitable communication strategy between workforces. • Install pipelines for maximum capacity to avoid repeat disturbance of area.	No adverse effects on conservation objectives or site integrity
Supporting habitat: structure/ function – invasive non-native species	Maintain the mean cover of aggressive non-native plant at least than 1%. Maintain the mean total combined cover of all non-native species and introduced species at less than 30%.	**Options 01A, 01B, 73A, 75Aiii, 75Biii and 75Ciii** Options will require construction works within proximity to the River Great Ouse and may result in the spread or introduction of invasive non-native species. Construction activities have the potential to cause or facilitate the spread of invasive non-native species. Invasive plant species can colonise new areas of land from seeds contained in the parent plant or the soil, or from fragments of living root or stem. Such reproductive materials can be inadvertently transferred to enabling works areas from outside of the scheme boundary if they adhere to vehicles, machinery, tools or clothing. they can also be inadvertently transferred in waste. Once present, invasive species can spread rapidly and out-compete the native vegetation that characterises the notable non-designated habitat. Habitat loss and fragmentation can also encourage the colonisation of invasive species by providing a pathway of suitable environmental conditions for invasive species to move closer to areas currently free from these species, this could affect the conservation status of the qualifying habitat. Standard best practice mitigation measures are considered to be available to prevent the introduction of aquatic or riparian invasive species to the SAC or supporting habitats. Taking into account the proposed mitigation no adverse effects on site integrity are anticipated due to invasive species.	*Damages* • Complete a pre-works invasive non-native species survey and develop a mitigation strategy if species identified. *General* • Implement standard biosecurity measures (Check, Clean, Dry). *General* • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. • The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works. • Consider phasing construction to allow time to deal with the presence and/or risk of spread of INNS.	No adverse effects on conservation objectives or site integrity
OPERATION PHASE				
Supporting habitat: structure/ function – Biotope mosaic	Maintain the characteristic physical form of the river channels which provide supporting habitat for spined loach.	**Options 01A and 01B** No new abstraction licence will be required however, these options will recommission Fenstanton BH which has not been in used since 1999 and abstraction within the River Great Ouse will be required. Water abstraction may result in a reduction of water flow, changes to flow velocity which could have an impact upon the physical characteristic of the watercourse which provide supporting habitat, in particular sandy bottoms and vegetation required for spawning activities. The WFD assessment has assessed the impacts to flow in GB105033047921 - Ouse (Roxton to Earith). The cumulative impact of both Option CW2401A and CW2401B has been assessed on this water body. The flow reduction as a result of the two options in this water body is only expected to be minor (2.9% of Q95 flows). This hydrological change is insufficient to act as a pathway to impact the aquatic ecology and water quality in this water body. However, a better understanding of the groundwater and surface water interaction should be undertaken to support a project level HRA.	• Hydrological modelling should be undertaken to fully assess the impacts of water abstraction for a project-level HRA, and amendments to volumes or abstraction timings made where necessary. • Baseline surveys of the reach to be impacted, should also be undertaken to determine potential for offsite functionally linked habitat.	No adverse effects on conservation objectives or site integrity
Supporting habitat: structure/ function – Flow regime	Maintain a flow regime which is characteristic of the river channels.	**Options 01A and 01B** No new abstraction licence will be required however, these options will recommission Fenstanton BH which has not been in used since 1999 and abstraction within the River Great Ouse will be required. Water abstraction may result in a reduction of water flow, changes to flow velocity and subsequent consequences on the sediments present in the river bottom which could affect the distribution of spined loach and its spawning activity, altering the recruitment processes.	• Hydrological modelling should be undertaken to fully assess the impacts of water abstraction for a project-level HRA, and amendments to volumes or abstraction timings made where necessary. • Baseline surveys of the reach to be impacted, should also be undertaken to	No adverse effects on conservation objectives or site integrity

Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
		WFD assessment has concluded that the operation of the options cumulatively, will not lead to a deterioration in WFD status (and therefore also alone).	determine potential for offsite functionally linked habitat.	
Supporting habitat: structure/ function – sediment regime	Maintain in-channel substrate character of at least 20% sand and no more than 40% silt.	**Options 01A and 01B** No new abstraction licence will be required however, these options will recommission Fenstanton BH which has not been in used since 1999 and abstraction within the River Great Ouse will be required. Water abstraction may result in a reduction of water flow, changes to flow velocity and subsequent consequences on the sediments present in the river bottom which could affect the distribution of spined loach and its spawning activity, altering the recruitment processes. WFD assessment has concluded that the operation of the options cumulatively, will not lead to a deterioration in WFD status (and therefore also alone).	• Hydrological modelling should be undertaken to fully assess the impacts of water abstraction for a project-level HRA, and amendments to volumes or abstraction timings made where necessary. • Baseline surveys of the reach to be impacted, should also be undertaken to determine potential for offsite functionally linked habitat.	No adverse effects on conservation objectives or site integrity

6. STAGE 2 APPROPRIATE ASSESSMENT: OUSE WASHES SPA AND RAMSAR

6.1 INTRODUCTION

The following options have been screened in as potentially impacting the Ouse Washes SPA and Ramsar:

- CW24-01A: Combined Ouse gravel sources -Fenstanton and St Ives – **construction and operation.**
- CW24-01B: Combined Ouse gravel sources -Fenstanton and St Ives – **construction and operation.**
- CW24-73A: Fens Reservoir potable transfer – Chatteris – **construction only.**
- CW24-75Aiii, Biii, Ciii: AWS potable transfer through CAM area 5, 10, 15Ml/d with main cost and blending plant – **construction only**.

Theoretical pathways for effects exist through:

- Potential construction-related impacts on off-site supporting habitat that will rely on project-level mitigation (and so cannot be 'screened out').
- Biological disturbance through the introduction of invasive non-native species.
- Potential disturbance-related impacts on off-site supporting habitat, in relation to the waterbird assemblage.
- Permanent change in habitats as a result of drying from increased abstraction.

The Ouse Washes SPA is designated for the following features, however on the basis of the above pathways, only those qualifying features in bold have been taken through to the appropriate assessment:

- **Ruff *Philomachus pugnax* (breeding).**
- **Bewick's swan *Cygnus columbianus bewickii* (non-breeding)**
- **Whooper swans *Cygnus cygnus* (non-breeding)**
- **Hen harrier *Circus cyaneus* (non-breeding)**
- **Qualifying assemblage of breeding population of five migratory species (gadwall *Anas strepera*, mallard *A. platyrhynchus*, garganey *A. querquedula*, shoveler *A. clypeata* and black-tailed godwit *Limosa limosa*).**
- **Qualifying assemblage of wintering waterfowl population (cormorant *Phalacroconax carbo*, mute swan *Cygnus olor*, wigeon *Arias penelope*, gadwall, teal *A. crecca*, pintail *Anas acuta*, shoveler, pochard *Aythya ferina*, tufted duck *Aythya fuligula* and coot *Fulica atra*).**
- **Qualifying assemblage of summer breeding migratory waders of lowland wet grassland (oystercatcher *Haematopus ostralegus*, redshank *Tringa totanus*, snipe *Gallinago gallinago*, ruff, lapwing *Vanellus vanellus*, and blacktailed godwit).**

The Ouse Washes Ramsar is designated for the following features, however on the basis of the above pathways, only those qualifying features in bold have been taken through to the appropriate assessment:

- Extensive areas of seasonally-flooding washland.
- Several nationally scarce plants, including small water pepper *Polygonum minus*, whorled water-milfoil *Myriophyllum verticillatum*, greater water parsnip *Sium latifolium*, river water-dropwort *Oenanthe fluviatilis*, fringed water-lily *Nymphoides peltata*, long-stalked pondweed *Potamogeton praelongus*, hair-like pondweed *Potamogeton trichoides*, grass-wrack pondweed *Potamogeton compressus*, tasteless water-pepper *Polygonum mite* and marsh dock *Rumex palustris*.
- **Qualifying assemblage of wintering waterfowl population (Bewick's swan, Whooper swan, wigeon, gadwall, teal, pintail and shoveler).**

6.2 SITE SUMMARY

6.2.1 Site description

The Ouse Washes SPA and Ramsar is a wetland comprising seasonally flooded washlands which are agriculturally managed in a traditional manner. The associated dykes and rivers hold a great variety of aquatic plants; the pondweeds *Potamogeton* spp. are particularly well represented. The associated aquatic fauna is similarly diverse and includes spined loach. The Counter Drain, with its clear water and abundant aquatic plants, is particularly important, and a healthy population of spined loach is known to occur. It also provides breeding and winter habitats for important assemblages of wetland bird species, particularly wildfowl and waders.

Ouse Washes SPA and Ramsar encompasses one SSSI and is encapsulated within the Fens NCA.

6.2.2 Qualifying features screened into Stage 2 Appropriate Assessment: baseline

6.2.2.1 Ruff

Ruff are present within the SPA and Ramsar during the breeding season. The SPA citation states that an average of 57 individuals had been recorded lekking 'in recent years', but Royal Society for the Protection of Birds (RSPB) and Wildfowl and Wetland Trust (WWT) breeding bird counts suggest that breeding numbers were lower (mean of 6 during the 10 years immediately prior to notification). No confirmed breeding attempts have been made at the Ouse Washes since 1999. Although lekking still occurs nearby, there have only been four confirmed breeding records in the country between 2006 and 2015 (Holling *et al*. 2015). While the habitat at the Ouse Washes may well no longer be suitable, research into ruff migration has shown that there is another likely cause for the decline of breeding ruff in Britain unrelated to habitat suitability of the breeding sites (there has recently been a large increase in the population breeding in Siberia and a corresponding decrease in the population breeding in western Europe). Although the recent research suggests that ruff are able to make large changes to their migration routes and breeding sites within a relatively short space of time (the likely change in migration route documented by Rakhimberdiev *et al*. (2011) and Verkuil *et a*l. (2012) involved tens of thousands of individuals within two decades) breeding ruff are unlikely to return to Britain in such numbers as before unless there is restoration of good quality wet grassland that can be used for feeding by migrating ruff in the Netherlands.

6.2.2.2 Bewick's swan

Bewick's swans are present at the SPA and Ramsar during the non-breeding season. The site supported 4980 individuals at notification, 29% of the north-west European wintering population. The peak 5 year mean from 2013/14 – 2017/18 was 1897. Both the north-west European population and numbers occurring within Britain have declined substantially during the last 20 years (Holt *et al*. 2015, Rees & Beekman 2010, Worden *et al*. 2006), and the majority of British SPAs show short-, medium- and long-term Wetland Bird Survey (WeBS) alerts for Bewick's swan (Holt et al. 2015). The declines are thought to be at least in part due to milder winters causing fewer birds to travel as far west as in previous years (Rees and Beekman 2010). Other influences on population dynamics have been identified in the African Eurasian Waterbird Agreement (AEWA) Single Species Action Plan (Nagy *et al*. 2012), including climate change, disease, illegal/accidental shooting and a diminished food resource and human disturbance on overwintering sites. While deeper and more persistent winter flooding may affect and inhibit foraging opportunities, evidence suggests that Bewick's swans have always roosted on the Ouse Washes but foraged mainly on the surrounding agricultural land (Rees *et al*. 1997). Numbers of Bewick's swans on the Ouse Washes have actually held up well in comparison with the national and international trends (Nagy *et al*. 2012).

6.2.2.3 Whooper swan

Whooper swans are present at the SPA and Ramsar during the non-breeding season. The site supported 590 individuals at SPA notification, 3% of the British population. The peak 5 year mean from 2013/14 – 2017/18 was 6840. The national trend is similar. Like Bewick's swans, whooper swans tend to feed on nearby agricultural land during the day and roost on the washes at night; the location depends on the depth of floodwater and will change through the season.

6.2.2.4 Hen harrier

Hen harriers are present at the SPA and Ramsar during the non-breeding season. The five-year average noted in the 1992 SPA citation was 12 individuals (1982 – 1987). Hen harriers are noted during WeBS counts by the

RSPB and WWT, and during the most recent period (from 2013/14 to 2017/18), 1 bird was resident two years out of five. There is no national trend available for wintering hen harriers with which to compare the change in numbers at the Ouse Washes, although Dobson *et al*. (2012) found the wintering population of hen harriers in Britain to be closely allied to the breeding population; the breeding population in the UK is about the same as it was in the 1980s, although the most recent surveys show a decline since 2004 (Wotton *et al*. 2018). Without further investigation it is difficult to judge how much the change in numbers at the Ouse Washes is due to site effects. The displacement of small mammals and few places to perch or roost during deep floods may be causing hen harriers to move elsewhere. A confidential study of wintering hen harriers found roosting opportunities at the Ouse Washes to be plentiful during the winter of 2011/12 (Dobson & Carrington-Cotton 2012), but this was a year with relatively low water levels

6.2.2.5 Waterbird assemblage of breeding waders and wildfowl associated with lowland damp grassland

During the breeding season (April to August included), the SPA and Ramsar support a nationally important breeding population including gadwall, mallard, garganey, shoveler, black-tailed godwit, oystercatcher, redshank, snipe and lapwing.

Gadwall

The site supported 111 breeding pairs at the time of SPA notification, 20% of the British population. The mean population count in the period 2010-14 was 120 pairs. UK breeding numbers have been increasing rapidly recently (Woodward et al 2018).

Mallard

The site supported 850 breeding pairs at the time of SPA notification, 2% of the British population. The mean population count in the period 2010-14 was 381 pairs. Breeding numbers in the UK have risen since notification, although they have been stable since 2000 (Woodward et al 2018).

Garganey

The site supported 14 breeding pairs at the time of notification, 20% of the British population. The mean population count in the period 2010-14 was 8 pairs. UK breeding numbers have increased slightly in the last 25 years (Holling and the Rare Breeding Birds Panel, 2017).

Shoveler

The site supported 155 breeding pairs at the time of notification, representing 12% of the British population. The mean population count in the period 2010-14 was 121 pairs. Breeding numbers in the UK have been stable since notification (Holling and the Rare Breeding Birds Panel 2017, JNCC SPA Species Account). Duck species will nest along the whole length of the protected site. The northern end of the site tends to be less affected by flooding within the breeding season, and the vegetation changes that have resulted from that, and will often support a greater density of nests.

Black-tailed godwit

The site supported 26 breeding pairs at the time of notification in 1996, representing 44% of the British population. The population on the Ouse Washes has decreased as the nearby population on the Nene Washes has increased. No nesting has occurred on the Ouse Washes itself since 2013, but the 'lifeboat sites', areas of habitat suitable for breeding waders that have been created adjacent to the boundary of the Ouse Washes close to Manea and the WWT reserve at Welney, have supported a small number of breeding pairs since then. Numbers have been as low as two pairs, but there has been breeding success in the form of fledged chicks, and numbers of breeding pairs are starting to rise. In 2018 there were eight breeding pairs.

6.2.2.6 Waterbird assemblage – wintering population

From the period July to April each year, the SPA regularly supports a waterbird assemblage where peak counts of more than 20,000 waterbirds are achieved. The average peak count for numbers of wintering waterfowl in the period 2009/10 – 2013/14 was 79839 (Holt et al. 2015), more than the number given in the SPA citation (60950) which is the five-year average from 1986/87 to 1990/91. WeBS trends are not currently available for waterbird assemblage numbers countrywide; an approximation has been made by summing the peak waterfowl numbers from the 50 UK sites with the highest number of waterfowl since winter of 1990/91, taken from the Wildfowl and Wader Counts and the Wetland Bird Surveys produced by the BTO, which suggests that over the same period there has been a small increase in numbers nationally.

6.2.3 Condition, threats and pressures

The Ouse Washes SPA and Ramsar is legally underpinned by one SSSI: Ouse Washes SSSI. There are 21 units associated with the site including 'lowland neutral grassland' all assessed as being in 'unfavourable – no change' condition, 'improved grassland' assessed in 'favourable' condition and 'rivers and streams' assessed as being in 'unfavourable – no change' and 'favourable' condition. The SSSI citation states '…*It is of particular note for the large numbers of wildfowl and waders which it supports, for the large area of unimproved neutral grassland communities which it holds and for the richness of the aquatic fauna and flora within the associated watercourse. The capacity of the site to hold wintering and breeding waterfowl and waders is of international significance*'[40]. Ouse Washes SSSI is considered to be 15.73% 'favourable', 3.56% 'unfavourable – recovering' and 80.71% 'unfavourable – no change'.

The following are pressures / threats with the outlined measures required to improve the condition of the feature which are listed within the Ouse Washes SPA Site Improvement Plan[41]:

- Inappropriate water levels: A050(NB) Wigeon, A056(B) Shoveler, A119(B) Spotted Crake, A151(B) Ruff, A156a(B) Black-tailed Godwit – Habitat creation to offset historical decline of wintering and breeding birds and other strategies to alleviate flooding
- Water pollution: A037(NB) Bewick's Swan, A038(NB) Whooper Swan, A050(NB) Wigeon, A051(B) Gadwall, A051(NB) Gadwall, A052(NB) Eurasian teal, A053(B) Mallard, A054(NB) Pintail, A055(B) Garganey, A056(B) Shoveler, A056(NB) Shoveler, A059(NB) Common pochard, A082(NB) Hen Harrier, A119(B) Spotted Crake, A151(B) Ruff, A151(NB) Ruff, A156a(B) Black-tailed Godwit, A156a(NB) Black-tailed Godwit, Breeding bird assemblage, Waterbird assemblage – Implementation of Diffuse Water Pollution plan to tackle inappropriate levels of nutrients from flooding

6.3 ASSESSMENT OF EFFECTS

An assessment of effects against the relevant SACO attributes and targets is provided in **Table 6.1**.

6.3.1.1 Ruff (breeding)

Breeding ruff are present within the SPA between April and June. The species require wet grassland with a short but variable sward of fine grasses and herbaceous species with a mean height of 5cm and shallow floods covering 15-20% of the area at the beginning of April, and groundwater table within 20cm of the surface over 50% of the area between April and June. Changes in water quality and inadequate quantities can therefore adversely affect the availability and suitability of breeding, rearing, feeding and roosting habitats, and is likely to have an impact on the ruff population.

6.3.1.2 Bewick's swan and whooper swan (non-breeding)

During the winter months the habitats within the Washes should be a combination of shallow water (no more than 30cm deep) and short wet grassland. Deeper water should be confined to scrapes, hollows, pools and ditches, with areas of water greater than 10ha present across the site. Swans also feed on arable fields overwinter and therefore may be impacted by construction works taking place within arable lands. Loss/damage to feeding habitat, changes in water quality and inadequate water quantities can therefore adversely affect the availability and suitability of feeding and roosting habitats, and is likely to have an impact on the Bewick's swan and whooper swan overwinter population.

6.3.1.3 Hen harrier (non-breeding)

The availability of an abundant food supply (prey including mammals, birds) is important for successful breeding, adult fitness, survival and the overall sustainability of the population of hen harrier. Construction works may have an impact on the presence of food resources and could damage foraging habitats utilised by the qualifying feature. Loss/damage to feeding habitat, changes in water quality and inadequate water quantities can therefore adversely affect the availability and suitability of feeding and roosting habitats, and is likely to have an impact on the hen harrier overwinter population.

[40] Natural England's Designated Site View – Ouse Washes SSSI. SSSI detail (naturalengland.org.uk) Accessed in November 2022.

[41] Natural England. (2014). *Site Improvement Plan Ouse Washes.* Improvement Programme for England's Natura 2000 Sites. Planning for the Future.

6.3.1.4 Waterbird assemblage of breeding waders and wildfowl associated with lowland damp grassland

The waterbird assemblage includes species that rely upon water-dependant habitats: gadwall, mallard, garganey, shoveler, black-tailed godwit, oystercatcher, redshank, snipe and lapwing. Breeding habitats include:

- Gadwall: water-filled scrapes (for feeding), field drains and swamps.
- Mallard: water with abundant invertebrate life (for feeding), tall vegetation nearby (for nesting).
- Garganey: shallow pools (for feeding), tall grass in close vicinity of feeding areas (for nesting).
- Shoveler: water with shallow margins and plenty of macrophytes (for feeding), tall grass (for nesting).
- Black-tailed godwit: wet grassland with a short but variable sward of fine grasses and herbaceous species with a mean height of 5cm and shallow floods covering 15-20% of the area at the beginning of April, and groundwater table within 20cm of the surface over 50% of the area between April and June.

Loss/damage to feeding habitat, changes in water quality and inadequate water quantities can therefore adversely affect the availability and suitability of feeding and roosting habitats, and is likely to have an impact on the breeding population.

6.4 UNCERTAINTIES

There is limited understanding of the distribution of the qualifying features and offsite functionally linked habitat in the catchment. Data search assessment and baseline surveys of the affected water-dependant habitats and supporting habitats should be undertaken to support the project-level HRAs. There is also limited information regarding water abstraction requirement associated with options CW24-01A and CW24-01B.

There is uncertainty as to the operation of options CW24-01A and CW24-01B which would require water abstraction from a borehole which has not been operated since 1999 (noting that no new licence to be required). A hydrological model of the River Great Ouse watercourse is not available within which to model the impacts of the changes/additional abstractions and confirm likely changes to flows at a variety of points on the hydrograph.

Table 6.1 Information to inform an assessment of adverse effects on the Ouse Washes SPA and Ramsar

Qualifying Feature	Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
CONSTRUCTION PHASE					
All qualifying features	Supporting habitat (both within and outside the site): function/ supporting process – Water quality/ quantity for all species and assemblages	Where the supporting habitats of the SPA feature are dependent on surface water, restore water quality and quantity to a standard which provides the necessary conditions to support the feature. Soluble reactive phosphorus < 0.1 mg/l annual mean.	**Options 01A and 01B** Both options are to recommission the unused groundwater abstraction source at Fenstanton BH, requiring the construction of new infrastructure, including a 1.2km pipeline within 200m of the River Great Ouse, between Fentsanton BH and St Ives WTW to transfer raw water. As the option is located upstream of the SPA/Ramsar, construction works may result in the release of sediments to the watercourse. This may result in temporary and minor increases in nutrient load to the river during construction.	*Water quality* • Adherence to EA Pollution Prevention Guidelines (now archived) and NRW, SEPA's Guidance on Pollution Prevention including Works and Maintenance in or near Water (2017). *Nutrient pollution* • Implementation of a buffer strip to minimise the release of fine particles to the watercourse. *General* • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works.	No adverse effects on conservation objectives or site integrity
			Options 75Aiii, 75Biii and 75Ciii The construction of the 750m pipeline associated with option 75A/B/C will require crossing Swavesey Drain, a small tributary of the River Great Ouse (approximately 4.8km upstream of the confluence) which joins the river approximately 4.9km upstream of the Ouse Wash SAC/SPA/Ramsar. The blending plant is also located within 70m of the drain. Any works within proximity to the watercourse could result in incidental surface run offs and release in fine sediments resulting in sedimentation of the riverbed which could impact the integrity of off-site habitats and therefore the spined loach population. The release of fine sediments may result in temporary and minor increases in nutrient load to the river during construction.		No adverse effects on conservation objectives or site integrity
			Option 73A The option requires the construction of a major new surface water reservoir and associated infrastructures including a pipeline to transfer potable water to Madingley Reservoir which will cross the River Great Ouse, upstream of the SPA/Ramsar. Any works within proximity to the watercourse could result in incidental surface run offs and release in sediments which could lead to a temporary increase in nutrient load to the river during construction.	*Loss of functionally linked habitat* • Design the pipeline crossing to avoid direct impacts to the watercourse by using HDD under the River Great Ouse. *Water quality* • Adherence to EA Pollution Prevention Guidelines (now archived) and NRW, SEPA's Guidance on Pollution Prevention including Works and Maintenance in or near Water (2017). *Nutrient pollution* • Implementation of a buffer strip and/or silt traps to minimise the release of fine particles to the watercourse. *General* • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works.	No adverse effects on conservation objectives or site integrity
			In-combination effects of Options 01A, 01B, 73A, 75Aiii, 75Biii and 75Ciii All options are required to be operational by either 2030 or 2035 and therefore construction programmes are likely to overlap leading to potential increased opportunities for effects on the same watercourse.	*General* • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. • The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works. • Coordinate construction programmes and ensure suitable communication strategy between workforces. Install pipelines for maximum capacity to avoid repeat disturbance of area.	No adverse effects on conservation objectives or site integrity
A037 Bewick's swan (NB)	Supporting habitat (both within and outside the site):	Ensure the frequency, duration and/or intensity of disturbance within close	**Options 01A and 01B**	None required.	No adverse effects on conservation

Qualifying Feature	Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
A038 Whooper Swan (NB) A050 Eurasian Wigeon (NB) A037 Eurasian Teal (NB) A054 Northern pintail (NB) A056 Northern shoveler (NB) A082 Hen harrier (NB) Waterbird Assemblage	disturbance - Disturbance caused by human activity	proximity of moulting, loafing, foraging and roosting areas doesn't reach levels which significantly affect the SPA features.	These projects are located 8.85km from the SPA/Ramsar, therefore construction works is not anticipated to have an impact through disturbance on supporting habitats within the site. Habitats surrounding these options include predominantly arable fields, residential estate (and gardens), grazing pasture and several open waterbodies within 500m of the work footprint (Marsh Lane Gravel Pits[42] and Fenstanton GP[43] both WeBS sites). A review of the WeBS data at Marsh Lane Gravel Pits and Fenstanton GP identified the presence of wintering wigeon, teal, pintail and shoveler over the five-years period 2015/16 to 2019/20 Wintering population of Bewick's swan and whooper swan can be associated with arable fields used for feeding purposes. Wigeon, teal, pintail and shoveler tend to stay within proximity to open waterbodies, utilising grassland field typically within 50m and waterbodies for feeding and roosting activities. Hen harrier may utilised farmland for feeding purposes. During construction, workforce personnel will be carrying out activities adjacent to potential offsite functional habitats. Study (Rees *et al*., 2005) shows that whooper swan developed first alert behaviour within 300m of human activity on the ground[44] (approximately 200m for vehicles). As per IECS 2009 report[45],, noise below 50dB is considered to have 'no effect' upon bird behaviour. Up to 70dB, effect is considered moderate, inducing scanning behaviour, reduced feeding and movement. As per IECS 2009 report all waterbirds' species would fly away when subject to third party disturbance up to 50m. Over 50m, all species show behavioural changes, and most species move to another area close by. Minimal effect is noted above 300m. Natural England's internal guidance also suggest that Stage 2 Appropriate Assessments are required where there is a change in baseline noise levels by 3dB. Due to the presence of existing human disturbance associated with the residential estate and farm activity, due to the scale of the project and due to the distance between the options and the SPA/Ramsar, no adverse effect upon the non-breeding bird assemblage is anticipated.		objectives or site integrity
			Option 73A The option requires the construction of a major new surface water reservoir and associated infrastructures including two 18km pipelines. Habitats surrounding these options include predominantly arable fields, grazing pasture and several open waterbodies within 500m of the work footprint. During construction, workforce personnel will be carrying out activities adjacent to potential offsite functional habitats and may result in disturbance through noise and visual presence. Study (Rees *et al*., 2005) shows that whooper swan developed first alert behaviour within 300m of human activity on the ground[46] (approximately 200m for vehicles). As per IECS 2009	• To avoid disturbance during non-breeding season, open trenches within arable fields where stubble is present should avoid taking place overwinter (September to April inclusive). • Ambient construction noise levels should be restricted to below 70dB within 200m of suitable overwinter habitat for Bewick's swan and whooper swan. Where possible, sudden irregular noise above 50dB should be avoided. • Pre-construction checks to assess the presence of the target species within 300m of the work footprint if the works are planned over winter (late September to late November and mid-February to mid-April). The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works.	No adverse effects on conservation objectives or site integrity

[42] Marsh Land Gravel Pits WeBS data: https://app.bto.org/webs-reporting/numbers.jsp?locid=LOC659166 – accessed in November 2022.
[43] Fenstanton GP WeBS data https://app.bto.org/webs-reporting/numbers.jsp?locid=LOC648174 – accessed in November 2022.
[44] Rees E.C, Bruce J.H & White G.T, 2005. *Factors affecting the behavioural responses of whooper swans (Cygnus c. cygnus) to various human activities*. Biological Conservation, 121, 00. 369-382.
[45] Cutts, N., A. Phelps, and D. Burdon. 2009. "*Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance, Report to Humber INCA*." ZBB710-F-2009. Institute of Estuarine and Coastal Studies University of Hull.
[46] Rees E.C, Bruce J.H & White G.T, 2005. *Factors affecting the behavioural responses of whooper swans (Cygnus c. cygnus) to various human activities*. Biological Conservation, 121, 00. 369-382.

Qualifying Feature	Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
			report[47],, noise below 50dB is considered to have 'no effect' upon bird behaviour. Up to 70dB, effect is considered moderate, inducing scanning behaviour, reduced feeding and movement. As per IECS 2009 report all waterbirds' species would fly away when subject to third party disturbance up to 50m. Over 50m, all species show behavioural changes, and most species move to another area close by. Minimal effect is noted above 300m. Natural England's internal guidance also suggest that Stage 2 Appropriate Assessments are required where there is a change in baseline noise levels by 3dB.		
A051 Gadwall (B) A053 Mallard (B) A055 Garganey (B) A056 Northern shoveler (B) A151 Ruff (B) A156a Black-tailed godwit (B) Breeding Bird assemblage	Supporting habitat (both within and outside the site): disturbance - Disturbance caused by human activity	Ensure the frequency, duration and/or intensity of disturbance in the vicinity of nesting and foraging areas doesn't reach levels which significantly affect the SPA features.	**Options 01A, 01B and 73A** Habitats surrounding these options include predominantly arable fields and several open waterbodies within 500m of the work footprint. A review of the WeBS data at Marsh Lane Gravel Pits, Fenstanton GP and Ouse Fen and Pits identified the presence of garganey (July peak), gadwall, mallard, wigeon, ruff and shoveler over the five-years period 2015/16 to 2019/20 (no breeding information). During construction, workforce personnel will be carrying out activities adjacent to potential offsite functional habitats and may result in disturbance through noise and visual presence. Details regarding impacts from noise and visual disturbance are provided in row above.	*Noise and visual disturbance* • Avoid breeding bird period (March-August inclusive) unless it can be demonstrated that there are no breeding sites within proximity of the construction corridors, or there is sufficient evidence to demonstrate that noise and visual disturbance will not occur.	No adverse effects on conservation objectives or site integrity
A037 Bewick's swan (NB) A038 Whooper Swan (NB)	Supporting habitat: function/supporting process – Food availability within supporting habitat	Maintain the availability of cereal grains, rape, potatoes and sugar beet, where these sources are locally important to feeding flocks. Maintain abundance and diversity of aquatic macrophytes and grass fields.	**Options 01A, 01B and 73A** Construction of these options will require open trenches within arable field which may be used by Bewick's swan and whooper swan when feeding. Construction works may result in temporary loss of supporting foraging habitat.	• To avoid disturbance during non-breeding season, open trenches within arable fields where stubble is present should avoid taking place during migration months (late September to late November and mid-February to mid-April). • Pre-construction checks to assess the presence of Bewick's swan and whooper swan within 300m of the work footprint, if the works are planned over winter (late September to late November and mid-February to mid-April).	No adverse effects on conservation objectives or site integrity
A050 Eurasian Wigeon (NB)	Supporting habitat: function/supporting process – Food availability within supporting habitat	Maintain high cover/abundance of suitable grassland for feeding (short, fine grasses with herbaceous species)	**Options 01A, 01B and 73A** Construction of these options will require open trenches within open grassland which may be used by wigeon for feeding. Construction works may result in temporary loss of supporting foraging habitat.	• Pre-construction checks to assess the presence of Bewick's swan and whooper swan within 300m of the work footprint, if the works are planned over winter (late September to late November and mid-February to mid-April).	No adverse effects on conservation objectives or site integrity
Waterbird assemblage	Supporting habitat (both within and outside the site): structure/function - Quality of supporting non-breeding habitat	Restore the structure, function and availability of the following habitats which support the main component species of the assemblage feature for all stages (moulting, roosting, loafing, feeding) of the non-breeding period. Habitats likely to be important for the waterbird assemblage are: offsite arable land, shallow waterbodies, waterbodies larger than 10 ha and short sward wet grassland	**Options 01A, 01B and 73A** Construction of these options will require open trenches within varied habitats including arable fields and open grassland. Construction works may result in temporary loss of supporting foraging habitat.	• Minimise work footprint and implement a phasing programme to avoid large scale impact to waterbird assemblage. • Reinstate habitats on completion of the works. • Adherence to EA Pollution Prevention Guidelines (now archived) and NRW, SEPA's Guidance on Pollution Prevention including Works and Maintenance in or near Water (2017). • Implementation of a buffer strip and/or silt traps to minimise the release of fine particles to the watercourse. • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works.	No adverse effects on conservation objectives or site integrity
OPERATION PHASE					
Northern shoveler (B)	Supporting habitat (both within and outside the site):	Restore water control with floods covering no more than 30% of the site	**Options 01A and 01B**	• Hydrological modelling should be undertaken to fully assess the impacts of water abstraction for a project-level HRA, and	No adverse effects on conservation

[47] Cutts, N., A. Phelps, and D. Burdon. 2009. "*Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance, Report to Humber INCA*." ZBB710-F-2009. Institute of Estuarine and Coastal Studies University of Hull.

Qualifying Feature	Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
Gadwall (B) Garganey (B) Mallard (B) Black-tailed godwit (B) Ruff (B) All breeding waders and wildfowl as part of the breeding assemblages:	function/supporting process – hydrology/flow	by the beginning of April, gradually reducing over the summer months without further flooding. Maintain water levels in ditches, with high summer retention levels achieved in March and continuing through the summer. Restore the water levels in scrapes and natural depressions so that they are between 0.2 and 0.3 m depth at the beginning of the breeding season (1st April) over at least 50% of the area, which gradually reduces over the following two months. Maintain high water tables, within 20 cm of the surface over at least 50% of the site, providing surface water and damp field conditions between April and June, with 20-30% of the area soggy or flooded overall.	No new abstraction licence will be required however, these options will recommission Fenstanton BH which has not been in used since 1999 and abstraction within the River Great Ouse will be required. Water abstraction may result in a reduction of water flow which could have impact on vegetation composition within the watercourses, groundwater table and water-dependant habitats which support the bird assemblage associated with the SPA and Ramsar. The WFD assessment has assessed the impacts to flow in GB105033047921 -Ouse (Roxton to Earith). The cumulative impact of both Option CW2401A and CW2401B has been assessed on this water body. The flow reduction as a result of the two options in this water body is only expected to be minor (2.9% of Q95 flows). This hydrological change is insufficient to act as a pathway to impact the aquatic ecology and water quality in this water body. However, a better understanding5 of the groundwater and surface water interaction should be undertaken to support a project level HRA.	amendments to volumes or abstraction timings made where necessary. Baseline surveys of the reach and water-dependant habitats to be impacted, may be required to determine potential for offsite functionally linked habitat.	objectives or site integrity

B: Breeding; NB: Non-Breeding

7. STAGE 2 APPROPRIATE ASSESSMENT: FENLAND SAC

7.1 INTRODUCTION

The following option has been screened in as potentially impacting the Fenland SAC:

- CW24-57: River Cam abstraction and treatment works – **Construction only**

Theoretical pathways for effects exist through:

- potential construction-related impacts on off-site supporting habitat that will rely on project-level mitigation (and so cannot be 'screened out').
- biological disturbance through the introduction of invasive non-native species.

The Fenland SAC is designated for the following features, however on the basis of the above pathways, only those qualifying features in bold have been taken through to the appropriate assessment:

- H6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- H7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
- **S1149 Spined loach *Cobitis taenia***
- S1166 Great crested newt *Triturus cristatus*

7.2 SITE SUMMARY

7.2.1 Site description

The individual sites within Fenland SAC each hold areas of calcareous fens, with a long and well-documented history of regular management. There is a full range from species-poor great fen-sedge *Cladium mariscus*-dominated fen to species-rich fen with a lower proportion of great fen-sedge and containing such species as black bog-rush *Schoenus nigricans*, tormentil *Potentilla erecta* and meadow thistle *Cirsium dissectum*. There are good transitions to the tall herb-rich East Anglian type of purple moor-grass *Molinia caerulea* – meadow thistle fen-meadow and rush pastures, all set within a mosaic of reedbeds and wet pasture.

The SAC encompasses three SSSI and is encapsulated within the Fens National Character Area (NCA) and East Anglian Chalk NCA.

7.2.2 Qualifying features screened into Stage 2 Appropriate Assessment: baseline

S1149 Spined loach *Cobitis taenia*

As per the Supplementary Advice document[48] the spined loach is a small bottom-living fish that has a restricted microhabitat associated with a specialised feeding mechanism. Optimal habitat is patchy cover of submerged (and possibly emergent) macrophytes, which are important for spawning, and a sandy (also silty) substrate, into which juvenile fish tend to bury themselves. In the UK, spined loach appears to be restricted to just five east-flowing river systems in eastern England – the Rivers Trent, Welland, Witham, Nene and Great Ouse, with their associated waterways[49]. Within these catchments it appears to occur patchily in a variety of waterbodies, including small streams, large rivers and both large and small drainage ditches. With limited means of dispersal, the UK populations are largely genetically isolated from each other.

Spined loach surveys have been carried out in Wicken Lode and Monk's Lode, two tributaries of the River Cam, and most recently the density of the species was found to be about the same in both water courses. Both water courses have good water quality and good communities of aquatic macrophytes. No surveys have been carried out in the infield drains within Wicken Fen, but it is possible that the species might also be present in these at low numbers as has been found at other sites in the fens.

Barriers to spined loach movement can include weirs, dams or waterfalls, a length of highly modified channel lacking suitable refuges, poor water quality within a reach, lack of specific habitats or habitat changes resulting

[48] Natural England (2019) European Site Conservation Objectives: Supplementary advice on conserving and resorting site features. Fenland SAC. Site code: UK0014782.

[49] Perrow M and Jowitt A., 2000. On the trail of the spined loach: Developing a conservation plan for a poorly known species. British Wildlife 11(6):390-397

from management. A few weirs and culvert[50] have been identified along the River Cam which may reduce the connectivity for spined loach between the SAC and the River Cam.

A review of the Environment Agency fish data[51] identified the presence of spined loach within the River Cam upstream of the Fenland SAC and downstream of the option 57 (grid reference TL5002264244 in 2016 and TL5107265753 in 2012), therefore it can be concluded that the River Cam provides suitable supporting habitat for spined loach.

7.2.3 Condition, threats and pressures

Fenland SAC is legally underpinned by three SSSI:

- Chippenham Fen and Snailwell Poor's Fen SSSI (grid reference TL 648 694). This SSSI is not notified for the presence of spined loach. There are 15 Units present within the site, but no ditches are included as a Unit.
- Wicken Fen SSSI (grid reference TL 554 701). This SSSI is not notified for the presence of spined loach but the species is known to be present within some of the ditches of the SSSI. There are five Units present within the site, and ditches (unit 5) were last assessed in 2010 as favourable condition.
- Woodwalton Fen SSSI (grid reference TL 229 844). This SSSI is not notified for the presence of spined loach. There are five units present within the site, and ditches (unit 5) were last assessed in 2010 as 'unfavourable – no change'.

No pressures / threats have been identified within the Fenland SAC Site Improvement Plan (SIP) with regards to spined loach.

7.3 ASSESSMENT OF EFFECTS

An assessment of effects against the relevant SACO attributes and targets is provided in **Table 7.1.**

Spined loach is associated with a restricted microhabitat with a preference for sandy riverbed over silt and mud [52]. This preference may be linked to food resources, better egg survival and oxygen levels within the substrate. The optimal habitat is therefore likely to include a combination of sand with patchy, dense macrophytes for refuges. Therefore a change in flow velocity, sediment and presence in filamentous algae is likely to have an impact on the spined loach population.

7.4 UNCERTAINTIES

There is limited understanding of the distribution of the qualifying features within the River Cam catchment, passability of existing weirs, and therefore extent of offsite functionally linked habitat. Baseline surveys of the affected reaches (habitat and barriers) should be undertaken to support the project-level HRAs.

[50] River Obstacles: https://river-obstacles-theriverstrust.hub.arcgis.com/pages/results-map - Accessed in November 2022.

[51] Department for Environment Food & Rural Affairs, Environment Agency – Ecology & Fish Data Explorer: https://environment.data.gov.uk/ecology/explorer/ - Accessed in November 2022.

[52] English Nature, unknown publication year. The habitat and management requirements of spined loach Cobitis taenia. No 244, English Nature Research Reports.

Table 7.1 Information to inform an assessment of adverse effects on Fenland SAC: spined loach

Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
CONSTRUCTION PHASE				
Supporting habitat: structure/function – Integrity of off-site habitats	Maintain any supporting habitats beyond the SAC boundary upon which the SAC spined loach population may depend.	Construction of option 57 will require construction works within proximity to the River Cam where spined loach have been identified. As the option is located upstream of the SAC, the River Cam may be used as functionally linked habitat for the spined loach population associated with the SAC. No works within the River Cam will be required, however any works within proximity to the watercourse could result in incidental surface run offs and release in fine sediments resulting in sedimentation of the riverbed which could impact the integrity of off-site habitats and therefore the spined loach population. Literature for the species suggests that the bottom-dwelling habit, 'nesting'/burrowing and territorial behaviours, and poor swimming ability limits the distances over which the species will range[53], and therefore confines the population extent. The release of fine sediments may result in temporary and minor increases in nutrient load to the river during construction. The species may be exposed to site-derived pollutants (principally oils and other contaminants) and sediment entering the tributaries of/and River Cam, hence affecting potential off-site supporting habitats. Additional fine sediments could settle on macrophyte beds and coarse substrates downstream of the River Cam changing habitat suitability or smothering the plants, which could result in a reduction in the availability of suitable refuge areas for spined loach	*Water quality* • Adherence to EA Pollution Prevention Guidelines (now archived) and NRW, SEPA's Guidance on Pollution Prevention including Works and Maintenance in or near Water (2017). *Nutrient pollution* • Implementation of a buffer strip to minimise the release of fine particles to the watercourse. *General* • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. • The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works.	No adverse effects on conservation objectives or site integrity
Supporting habitat: structure/function – water quality (nutrients)	Maintain the natural nutrient regime of the river/watercourse, with any anthropogenic enrichment above natural/background concentrations limited to levels at which adverse effects on the feature are unlikely. Water quality should be equivalent to class 'B' in the Biological module of the General Quality Assessment scheme and equivalent to class 'C' in the chemical module. Soluble reactive phosphorus should have an annual mean of no more than 0.1mg L-1.			
Supporting processes (on which the feature and/or its supporting habitat relies) – water quantity/quality	Where the feature or its supporting habitat is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature. Water quality should be equivalent to class 'B' in the Biological module of the General Quality Assessment scheme and equivalent to class 'C' in the chemical module. Soluble reactive phosphorus should have an annual mean of no more than 0.1 mg L-1			
Supporting habitat: structure/function – Invasive non-native species	Mean cover of each very aggressive non-native plant not exceeding 1%. Mean total combined cover of all non-native species and introduced species less than 30%. Populations of invasive non-native species should be monitored, and controlled if there is any evidence for effects on spined loach populations	Construction of option 57 will require construction works within proximity to the River Cam and may result in the spread or introduction of invasive non-native species. Construction activities have the potential to cause or facilitate the spread of invasive non-native species. Invasive plant species can colonise new areas of land from seeds contained in the parent plant or the soil, or from fragments of living root or stem. Such reproductive materials can be inadvertently transferred to enabling works areas from outside of the scheme boundary if they adhere to vehicles, machinery, tools or clothing. they can also be inadvertently transferred in waste. Once present, invasive species can spread rapidly and out-compete the native vegetation that characterises the notable non-designated habitat. Habitat loss and fragmentation can also encourage the colonisation of invasive species by providing a pathway of suitable environmental conditions for invasive species to move closer to areas currently free from these species, this could affect the conservation status of the qualifying habitat. Standard best practice mitigation measures are considered to be available to prevent the introduction of aquatic or riparian invasive species to the SAC or supporting habitats. Taking into account the proposed mitigation no adverse effects on site integrity are anticipated due to invasive species.	*Damages* • Complete a pre-works invasive non-native species survey and develop a mitigation strategy if species identified. *General* • Implement standard biosecurity measures (Check, Clean, Dry). *General* • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works.	No adverse effects on conservation objectives or site integrity

[53] Culling M.A and Côté I.M. (2006) *Genetics and ecology of spined loach in England: implications for conservation management* Science Report: SC000026/SR. Report for the Environment Agency,

8. STAGE 2 APPROPRIATE ASSESSMENT: EVERSDEN AND WIMPOLE WOODS SAC

8.1 INTRODUCTION

The following option has been screened in as potentially impacting the Eversden and Wimpole Woods SAC:

- CW24-73A: Fens Reservoir potable transfer – Chatteris – **Construction only**.

Theoretical pathways for effects exist through:

- Potential construction-related impacts on off-site supporting habitat that will rely on project-level mitigation (and so cannot be 'screened out').
- Potential disturbance-related impacts on off-site supporting habitat, in relation to the barbastelle population.

The Everden and Wimpole Woods SAC is designated for the following feature, which on the basis of the above pathways, has been taken through to the appropriate assessment:

- **S1308 Barbastelle *Barbastella barbastellus*.**

8.2 SITE SUMMARY

8.2.1 Site description

The site comprises a mixture of ancient coppice woodland (Eversden Wood) and high forest woods likely to be of more recent origin (Wimpole Woods). A colony of barbastelle is associated with the trees in Wimpole Woods. These trees are used as a summer maternity roost where the female bats gather to give birth and rear their young. Most of the roost sites are within tree crevices. The bats also use the site as a foraging area. Some of the woodland is also used as a flight path when bats forage outside the site.

The SAC encompasses one SSSI and is encapsulated within the Bedfordshire and Cambridgeshire Claylands NCA.

8.2.2 Qualifying features screened into Stage 2 Appropriate Assessment: baseline

S1308 Barbastelle *Barbastella barbastellus*

As per the Supplementary Advice document[54] the barbastelle is a medium-sized species of bat by British standards, weighing between 6-13 grams. Barbastelle ecology is relatively poorly-known although more information has become available since this SAC was designated. It is a northern temperate species, occurring in upland sites in southern Europe. In the UK it is found in a variety of habitats where suitable roosting and foraging is found. The species forages in mixed habitats, including over water. Barbastelles appear to select cracks and crevices in wood for breeding, mostly in old or damaged trees, but cracks and crevices in the timbers of old buildings may also be used. Maternity colonies may move between suitable crevices within a small area, such as a piece of woodland or a complex of buildings. Caves and underground structures may be used for hibernation. The species is very sensitive to disturbance, together with the loss of roost-sites and food resources.

The barbastelle is one of the UK's rarest mammals. In recent years this species has been found to be more widespread across southern England and south Wales than previously recognised. The Eversden and Wimpole Woods SAC is one of the few sites to be protected by SAC designation for barbastelle bats. A colony of barbastelle is associated with the cracks and crevices of trees within Wimpole Woods. These trees are used as a summer maternity roost (i.e. between April and September) where the female bats gather to give birth and rear their young. Baby bats are usually born in July, sometimes even in early August; females usually produce a single baby, but occasionally twins. Juvenile bats can fly at about 3 weeks, and by 6 weeks can forage for themselves. Research indicates that juveniles follow the adults into their established foraging areas.

[54] Natural England (2018) European Site Conservation Objectives: Supplementary advice on conserving and resorting site features. Eversden and Wimpole Woods SAC. Site code: UK0030331.

The limited radio-tracking studies that have been carried out[55];[56] showed that bats travelled as far as 11km in a night to forage.

8.2.3 Condition, threats and pressures

Eversden and Wimpole Woods SAC is legally underpinned by one SSSI:

- Eversden and Wimpole Woods SAC SSSI (grid reference TL 342 527). This SSSI is notified for its important ancient semi-natural woodland and the presence of nationally important summer maternity roost for the barbastelle bat. There are two units present within the site which were last assessed in 2010 as 'unfavourable – recovering' and 'favourable' condition.

The following are pressures / threats with the outlined measures required to improve the condition of the feature which are listed within the Eversden and Wimpole Woods SAC Site Improvement Plan[57]:

- Offsite habitat availability management – investigate the use the bats make of the surrounding countryside currently so that providing additional habitat can be targeted appropriately.

8.3 ASSESSMENT OF EFFECTS

An assessment of effects against the relevant SACO attributes and targets is provided in **Table 8.1.**

Barbastelle bats rely on wider habitats for foraging during maternity season. They also rely on dark, unlit and well-connected flight-lines (hedgerows, waterways, blocks of scrub, wooded rides and tracks) to commute between roosting and feeding areas. Flight-lines therefore extend beyond the designated site boundary into the wider local landscape. Study shows that '*from Google Earth, it can be seen that the flight lines and foraging areas are very limited and are very vulnerable and as such could have a significant effect on the breeding viability of this very rare species'* (Damant & Vine, 2006) and that '*absolutely any woodland loss within a radius of 10-15km could be of great significance for the viability of the population of Barbastelles at Wimpole'*.

The removal of mature trees, hedgerows, scrub habitat as well as construction works within proximity to woodland edge, watercourses, ditches and tracks is therefore likely to have an impact on commuting and foraging bats and may have an impact on the barbastelle population associated with the SAC.

8.4 UNCERTAINTIES

There is limited understanding of the distribution of the qualifying features outside the boundaries of Eversden and Wimpole Woods SAC and how they use the wider environs to forage and commute. Data from Cambridgeshire and Peterborough Environmental Records Centre should be assessed and baseline surveys conducted to support the project-level HRAs.

[55] Damant, S. & Vine, C. 2006. *The Barbastelle at Wimpole*. Nature in Cambridgeshire, 48 60-64

[56] Vine, C. 2002. *A. study of Barbastelle bats at Wimpole, Cambridgeshire, July 2000 to August 2002*. Report to Natural England. Available from Natural England on request or directly from the National Trust

[57] Natural England. (2015). *Site Improvement Plan* Eversden and Wimpole Woods. Improvement Programme for England's Natura 2000 Sites. Planning for the Future.

Table 8.1 Information to inform an assessment of adverse effects on Eversden and Wimpole Woods SAC: barbastelle bats

Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
CONSTRUCTION PHASE				
Supporting habitat: structure/function – Supporting off-site habitat (flight-lines and foraging areas)	Maintain the presence, structure and quality of any linear landscape features which function as flight-lines between the SAC and surrounding foraging areas used by Barbastelles Maintain core areas of feeding habitat outside of the SAC boundary that are critical to Barbastelle bats during their breeding period.	Option 73A requires the construction of a major new surface water reservoir and associated infrastructures including two 18km pipelines. Construction may result in the loss of foraging habitat, roosting features and commuting flight-lines (hedgerows, waterways, blocks of scrub, wooded rides and tracks) if habitats to the north of the SAC are used by barbastelle for foraging purpose and may result in habitat fragmentation and disturbance to bats through noise, light spilling or vibration. Barbastelles may forage up to 5-7km from their maternity roosts, though some individuals in less favourable habitat may forage further to reach suitable feeding grounds (Greenaway, 2001). Barbastelles prefer pastoral landscapes with deciduous woodland, wet meadows and water bodies, though they will feed in more open areas i.e. orchards, suburban parks.	• Bat surveys would be required to understand the distribution of the barbastelle population. *Loss of functionally linked habitat* • Design the scheme to avoid direct impacts to linear features (hedgerows), woodland, watercourses and mature trees by re-routing and/or using HDD. *Light pollution* • Night-time working should be avoided during construction and/or a construction lighting design should be developed and implemented to avoid light spill within habitat of higher value. • Adherence to EA Pollution Prevention Guidelines (now archived) and NRW, SEPA's Guidance on Pollution Prevention including Works and Maintenance in or near Water (2017). <u>*General*</u> • A Construction Management Plan will be drawn up to detail all exclusion and protection measures. The above mitigation measures will be monitored and enforced by an on-site Environmental Clerk of Works.	No adverse effects on conservation objectives or site integrity.

9. STRATEGIC IN-COMBINATION ASSESSMENT

This section sets out:

- between-option 'in-combination' effects.
- in-combination effects with other Cambridge Water plans i.e. the Cambridge Water Drought Plan.
- between-company in-combination effects i.e. with other water company WRMPs and Drought Plans.
- in-combination effects with other plans and programme including major and minor projects and other strategic plans and water resource demand.

The in-combination assessment between options within the preferred programme has been completed within the Stage 2 Appropriate Assessments in the preceding sections. It was concluded that the operation of options 01A and 01B would not adversely effect the Ouse Washes SAC, SPA and Ramsar. Similarly, where multiple construction projects are ongoing, best practice measures and the implementation of Construction Environmental Management Plans should ensure limited overlapping of effects. Where pipeline crossings are required, it is recommended that these are sized appropriately for the final variant size, to avoid re-disturbing sites within 5 years.

The period encompassed by Cambridge Water's Drought Plan extends to 2027, meanwhile the earliest year of implementation for supply options included in the draft WRMP24 preferred programme is 2030. As such, the options between plans will not overlap and there is sufficient time to reassess any drought plan options which may be retained in the next iteration post-2027. .

The Water Resources East draft Regional Plan HRA assessment identified the European sites that are impacted by options within any of the water company draft WRMP24 within the Water Resources East regional group. There were several options identified in the draft Regional Plan that impact the Ouse Washes SAC, SPA and Ramsar:

- Transfer of potable water between Bexwell SR (Fenland RZ) and Cherry Hinton SR (Cambridge Water asset) (CAM7).
- Cambs and West Suffolk to Fenland potable transfer (BCTTW125).
- Fens Reservoir Strategic Resource Option (SRO): Earth embanked reservoir with a storage capacity 50 million cubic metres, located in the fens.

These options could act in-combination with the following Cambridge Water draft WRMP24 options:

- CW24-01A: Combined Ouse gravel sources -Fenstanton and St Ives – **construction and operation.**
- CW24-01B: Combined Ouse gravel sources -Fenstanton and St Ives – **construction and operation.**
- CW24-73A: Fens Reservoir potable transfer – Chatteris – **construction only.**
- CW24-75Aiii, Biii, Ciii: AWS potable transfer through CAM area 5, 10, 15Ml/d with main cost and blending plant – **construction only**.

No Appropriate Assessment work is available for CAM7 or BCTTW125 in the draft WRE plan, and therefore further work may be required ahead of the final WRMP submission to understand the potential in-combination effects.

Where construction impacts are identified, it is anticipated that the Construction Environmental Management Plans (CEMPs) can adequately address any in-combination effects. The Fens Reservoir SRO concluded adverse effects on its own, and therefore this will require investigation separately.

During operation, there is the potential for in-combination effects from CW24-01A, CW24-01B and the Fens Reservoir SRO. There is uncertainty as to the level of impact on groundwater and resultant surface water flows from the rehabilitation of the borehole (not used since 1999) for CW23-01A and B. The Fens Reservoir SRO requires abstraction from the River Delph and Bedford Ouse at Earith. Adverse effects during operation from the Fens Reservoir SRO alone could not be ruled out. Further investigation is therefore needed for this option. The potential for in-combination effects between these options will be discussed as part of the regional plan work.

In relation to 'in-combination' effects of water resource demand with other plans or projects, the WRMP explicitly accounts for growth forecasts when calculating future water demand (and hence areas with potential deficits). This means that 'in-combination' water-resource effects with growth promoted by other plans or projects are considered and accounted for during the WRMP development process and its deficit calculations.

Potential 'in-combination' effects in respect of water-resource demands due to other plans or projects are therefore unlikely since these demands are explicitly modelled when determining deficit zones and hence developing Feasible Options. As a result (in respect of water resources) the WRMP is not likely to make non-significant effects in other plans significant (indeed, other plans are arguably the 'source' of any potential effects in respect of water demand, with the WRMP having to manage potential effects that are not generated by the WRMP itself).

Obviously local plans are not all consistent with regard to planned growth and this arguably introduces some uncertainty. However, with regard to water resources and planning uncertainty it is important to note the following:

The WRMP safeguards against uncertainty in option yield and timing through 'Target Headroom'; this is an allowance provided in the planning process (i.e. designed-in spare capacity) that ensures that any supply-demand deficit will still be met if there is an underperforming demand management measure or growth exceeds predicted levels. It is therefore extremely unlikely that additional demand or a poorly-performing option would 'suddenly' result in a deficit that might affect a European site; and (in any case);

The WRMP is revised on a five-yearly cycle, which allows any changes in demand forecasts (e.g. as new plans come forward) to be accounted for, and for timely intervention should a measure not be performing as expected. Delivery is also formally reviewed on an annual basis.

It is therefore considered that the WRMP options will not have significant 'in-combination' effects with local plans in respect of water resources.

10. DRAFT HRA CONCLUSIONS

10.1 OVERVIEW

Water company WRMPs are subject to the provisions of the *Conservation of Habitats and Species Regulations 2017.* Cambridge Water has a statutory duty to prepare a WRMP and is therefore the Competent Authority for the HRA of that plan. This draft HRA report accompanies the draft WRMP24 that has been published for consultation, and summarises the current assessment of Cambridge Water's preferred plan of options against the requirements of the Habitats Regulations. It also documents the iterative HRA process that has been applied through the development of the draft WRMP24.

For each option (or group of options, as appropriate), the assessment comprises:

- a 'screening' of European sites within the study area to identify those sites and features where there will self-evidently be 'no effect', 'no likely significant effects', or positive effects due to the option[58], and those where significant effects are likely or uncertain; and
- an 'appropriate assessment' of any European sites where significant effects cannot be excluded (this may include 'down-the-line' deferral of some options in accordance with established HRA practice, where appropriate).

The conservation objectives are taken into account at the screening and appropriate assessment stages as necessary.

Cambridge Water has identified ten supply-side options within its preferred programme, which have been screened for LSEs, and where necessary, Stage 2 Appropriate Assessments completed.

10.2 STAGE 1 SCREENING: PREFERRED PROGRAMME

The screening has concluded that significant effects are either likely or uncertain for the following sites and options (note, this includes options that may rely on mitigation measures to prevent significant effects occurring); these are therefore taken forward to an appropriate assessment stage.

Table 10.1 Summary of supply-side options and sites requiring Stage 2 Appropriate Assessment'

European site	Options	Alone or in-combination with other WRMP options?
Portholme SAC	CW24-01A: Combined Ouse gravel sources -Fenstanton and St Ives	No LSE
	CW24-01B: Combined Ouse gravel sources - Fenstanton and St Ives	No LSE
Ouse Washes SAC / SPA / Ramsar	CW24-01A: Combined Ouse gravel sources -Fenstanton and St Ives	Yes – alone (construction and operation)
	CW24-38B: Small site-scale rainwater harvesting (Northstowe or similar growth)	Yes – alone (construction and operation)
	CW24-73A: Fens Reservoir internal potable water transfer – Chatteris	Yes – alone (construction)
	CW24-75Aiii, Biii and Ciii AWS potable transfer through CAM area 5-15Mld (these variants include contribution to AWS strategic main and a blending plant)	Yes – alone (construction)
Fenland SAC	CW24-57: River Cam abstraction & treatment works	Yes – alone (construction)
Eversden and Wimpole Woods SAC	CW24-73A: Fens Reservoir internal potable water transfer – Chatteris	Yes – alone (construction)
Devils Dyke SAC	CW24-57: River Cam abstraction & treatment works	No LSE
Wicken Fen Ramsar	CW24-57: River Cam abstraction & treatment works	No LSE

[58] Note, for options with 'no effects' or positive effects there is no possibility of 'in-combination' effects.

European site	Options	Alone or in-combination with other WRMP options?
The Wash and North Norfolk Coast SAC	CW24-71: Milton WWTW Effluent re-use surface water abstraction post effluent discharge	No LSE
The Wash SPA and Ramsar	CW24-71: Milton WWTW Effluent re-use surface water abstraction post effluent discharge	No LSE

10.3 STAGE 2 APPROPRIATE ASSESSMENTS: PREFERRED PROGRAMME

Stage 2 Appropriate Assessments were undertaken for those European sites that may be significantly affected by WRMP options (or where there was uncertainty at the screening stage), alone or in-combination, where they are within the preferred programme, or an alternative programme.

With regard to **demand-side measures**, the only realistic mechanism for a negative effect would be through any construction required (for example, the leakage reduction programme may require repair of a pipe in or near an SAC), but this cannot be meaningfully assessed at the strategic level since information on the location of specific intervention requirements (e.g. leaks; households requesting meters) is not available without specific investigations, which would form part of the option package, and there is consequently no information on the scale (etc.) of any construction required. Therefore, from an HRA perspective, the options are 'screened in' (as an effect pathway is conceivable) but as a meaningful appropriate assessment is not possible, the assessment is necessarily deferred to the project level.

The results of the assessments of the **supply-side options** show that there are likely sufficient standard and best practice mitigation measures that can be implemented during construction to avoid adverse effects, however without further detailed information regarding each option there are some uncertainties. Further hydrological assessment and surveys to confirm presence and use of offsite functionally linked habitat will be required for a number of options ahead of project-level HRAs. Mitigation measures may be required to avoid adverse effects.

Further work on in-combination effects with other water company plans, is required between draft and final WRMP submission.

APPENDICES

APPENDIX A EFFECT PATHWAY ASSUMPTIONS

Table 2.1 within the main report (from UKWIR 2021) and the following paragraphs outline some of the general assumptions that are typically (and reliably) applied to plan-level assessments where effect pathways are imaginable but not quantifiable at the plan level. These are applied cautiously, recognising that there is always a risk of atypical scenarios, but have been proved to be generally robust across a wide range of scenarios.

In addition:

WATER RESOURCE SENSITIVE FEATURES

The Environment Agency has previously published advice on qualifying species and habitats that it considers to be water-resource dependent (National Environment Agency guidance: Habitats Directive Stage 2 Review: Water Resources Authorisations – Practical Advice for Agency Water Resources Staff). This is not reproduced here, but as a general rule most species are not considered water resource dependent with the exception of wildfowl and waders associated with estuarine and wetland sites. Wide-ranging marine / marine dependent species associated with marine sites that are not directly connected to the hydrological zone of influence are not typically considered to be both sensitive and exposed to the effects of the options (except in certain relatively unique circumstances, such as some desalination schemes).

ESTUARINE BIRDS AND FRESHWATER FLOWS

Several studies have suggested that the number and densities of wintering waterbirds around estuarine freshwater channels are consistently greater than across associated mudflats, and that several bird species show significant preferences for freshwater flow areas over mudflats (e.g. Ravenscroft et al. (1997), Ravenscroft (1998, 1999), Ravenscroft & Beardall (2002) & Ravenscroft & Emes (2004)), although other studies have indicated that deeply incised channels associated with large volume inflows are less attractive to birds (Ravenscroft & Beardall, 2002).

There are a number of possible mechanisms for this. Correlations between freshwater flow and particle size (e.g. Ravenscroft & Emes (2004)), and substrate particle size distribution and invertebrate distribution have been recognised (e.g. Goss-Custard et al. (1991), Colwell and Landrum (1993), Yates et al. (1993)). Freshwater flow, salinity and invertebrate distribution have also been correlated (Kelly (2001)).

These physical relationships between invertebrate distributions and freshwater flows are important since there are numerous studies detailing relationships between overwintering waterbirds and the densities or distributions of their invertebrate prey (e.g. Goss-Custard et al. (1991), Colwell (1993), Colwell and Landrum (1993), Yates et al. (1993), Dierschke et al. (1999), Ravenscroft et al. (2002, 2004). Associations between bird densities and particle size (Granadeiro et al. 2004) have also been recognised.

Possible relationships between birds and freshwater flows were investigated in detail through a series of studies in The Swale SPA/Ramsar and the Medway Estuary and Marshes SPA/Ramsar (RPS 2004a, 2004b, 2004c, 2005a; Humpheryes & Kellett 2003). These studies found few consistent patterns, however; for example:

- Whilst the general relationship of birds and creek corridors (rather than channels) was usually replicated between watercourses and embayments, the species assemblage was variable between creeks and years, suggesting that creek-specific variables may be less important for determining the community composition than environmental or community processes operating in the wider estuary or beyond. Most species (67%) displayed no, or a negative, association with creeks (70% when feeding behaviour only was considered).
- Latitudinal relationships between creeks and invertebrates were inconsistent, with only a slight tendency for invertebrate biomass to be higher within the creek corridor than the channel or surrounding mudflats.
- Significant decreases in invertebrate abundance and biomass down longitudinal gradients (potentially related to greater exposure to tidal processes) were recorded, although bird numbers showed the opposite (i.e. greater numbers towards the sea), perhaps reflecting greater foraging accessibility due to interstitial water, or less disturbance.

Furthermore, no significant differences in the usage of creeks by birds were recorded between freshwater creeks and those that were predominantly saline.

A broad consensus position appears to be that it is not freshwater flow volumes per se that are critical to the bird / intertidal channel relationship, rather the presence of some flows within channels to maintain morphology, and that bird distributions are often influenced instead by estuary-wide factors (e.g. changes in disturbance levels, reductions in bird populations altering estuary usage, proximity of roost sites), local factors (e.g. the role of creek morphology or substrate penetrability) and small-scale interactions (e.g. inter and intra-specific bird relationships, or prey availability associated with behavioural or physiological responses to intertidal exposure).

BAT SPECIES AND FUNCTIONAL LAND

Bat species associated with UK SACs are not considered 'water resource sensitive' and so (in the absence of substantial habitat changes caused by operational aspects (e.g. draining of a wetland or replacement of extensive foraging habitat with a reservoir; or introduction of light etc. sources that may disrupt commuting or seasonal movements), their exposure to the outcomes of the WRMP will be limited to incidental effects from construction. In most instances potential effects will not be specifically identifiable or quantifiable (as the locations of works are not necessarily defined, and field surveys would not typically be undertaken at plan level).

UK bat species do not typically travel substantial distances (i.e. tens of kilometres) when foraging and the Bat Conservation Trust has therefore identified Core Sustenance Zones (CSZs) – defined as "*the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the roost*" – for UK bat species; the CSZs for all UK species have a radius of 4km or less, with the exception of the CSZ for barbastelle (6km). This can be cautiously applied to bat SACs, although it is recognised that many roosts used by SAC bat populations will not be within the boundaries of the SAC. In general, therefore, unavoidable adverse effects would not be expected unless significant permanent land-take within those zones is likely; virtually all other potential effects are avoidable with normal good practice in planning and design, and with established mitigation measures that are known to be effective – although these inevitably cannot be defined above the project level.

BIRDS AND CONSTRUCTION NOISE / VISUAL DISTURBANCE

The **exposure** of any birds using the reservoir to **noise and visual disturbance** associated with the development will depend on several factors, including:

- the sound power level of the machinery;
- the principal habitats and locations used by the birds species (and hence the distance from the source of any disturbance);
- attenuating factors (such as screening by topography, buildings or vegetation);
- the seasonal timing of the works;
- background noise levels in this area[59].

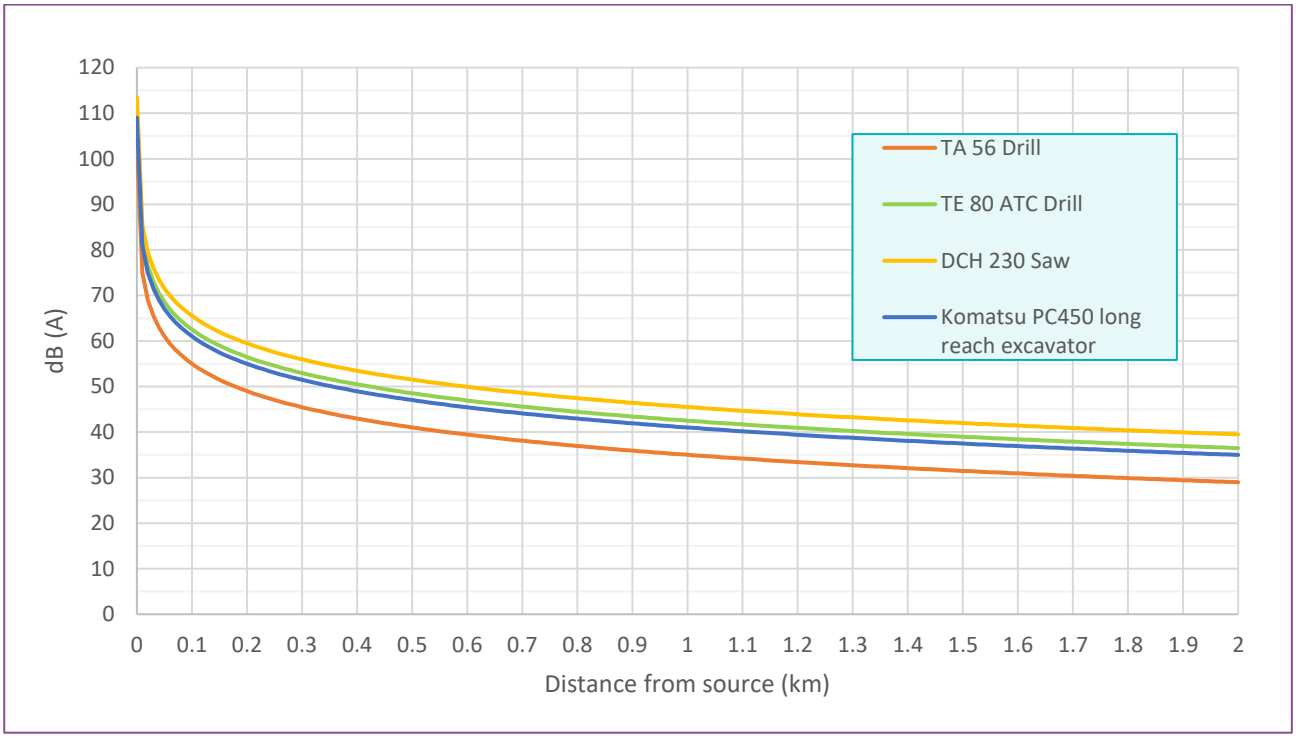
The sensitivity of the interest features will depend on their behavioural characteristics, their general tolerance / habituation to existing or new activities at a site, and the extent to which avoidance behaviours are achievable. This may also vary during the year (for example, most bird species will be more sensitive when nesting as avoidance behaviours are more constrained).

With regard to noise, a typical long-reach excavator has sound power level of ~109 dB(A); drills and saws have sound power level between 103 dB(A) and 114 dB(A). Without any barriers, the noise level of the loudest equipment used would attenuate to around 55dB(A) within 300m, and to 50 dB(A)[60] within 600m due to distance alone (see Figure A.1).

[59] Noise levels do not operate additively, so the dB levels in an area are not the sum of the component sources.

[60] As a guide, 60dB(A) is approximately equivalent to a conversation; 50dB(A) is approximately equivalent to the level associated with a quiet suburb or light traffic (which is unlikely to be reached except at night in this area).

Figure A.1 Approximate attenuation of equipment noise with no barriers



With regard to visual disturbance, sensitivity may be broadly correlated with size, with larger species typically having greater 'flush distances' (the distances at which birds typically move when approached by people). Laursen et al. (2005) determined that the mean flush distance for shelduck was 225 m; 319 m for brent geese; but only 70 m for dunlin (a much smaller species).

Cutts et al. (2009)[61] provide a useful review of available data on bird disturbance. It makes particular reference to noise and disturbance investigations studies undertaken during sea defence works, which included piling works. These studies identified disturbance levels for various activities associated with construction, based on observations of bird responses.

The study also records the following observations from other construction schemes on the Humber:

- Piling activity on the landward side of the sea wall at Pyewipe (southern shore), associated with construction of a pumping station, had no disturbance effect on birds in January, February and March; the numbers and distributions of birds were similar during periods with and without piling. Disturbance only occurred when construction was moved to the seaward-side of the sea wall in April.
- Six years of bird monitoring associated with the construction of the Humber International Terminal (HIT) concluded that most disturbance only caused birds to move over a small area, and that the HIT development did not have a significant effect on usage of the area by birds.

The work has been consolidated as part of the TIDE toolbox, a result of the INTERREG IVB-Project "Tidal River Development" TIDE, which aims at the integrated management of estuaries by providing information on estuarine functioning, but also provides resources to support estuarine managers by providing experience, recommendations and tools for use in their work. The waterbird disturbance and mitigation toolkit is available at: TIDE toolbox - TIDE tools (tide-toolbox.eu)

[61] Cutts N., Phelps A. & Burdon D. (2009) *Construction and waterfowl: defining sensitivity, response, impacts and guidance*. Report to Humber INCA by the Institute of Estuarine and Coastal Studies, University of Hull

In general, therefore, effects from noise and visual disturbance during construction typically have a limited range and duration, are reversible, and do not result in long-term adjustments in bird behaviours (such that they might constitute an adverse effect).

APPENDIX B STANDARD MITIGATION AND AVOIDANCE MEASURES

OVERVIEW

The 'avoidance measures' that may be applied to the options are detailed below, and are grouped as follows:

- General Measures (established construction best-practice, etc.) which will be applied to all options;
- Option-specific Measures (established and reliable measures identified to avoid specific potential effects on European sites, such as in relation to mobile species from the sites).

These measures will be applied unless project-level HRAs or project-specific environmental studies demonstrate that they are not required (i.e. the anticipated effect will not occur), not appropriate, or that alternative or additional measures are necessary or more appropriate.

Note that these measures are not exhaustive or exclusive and must be reviewed at the project stage, taking into account any changes in best-practice as well as scheme-specific survey information or studies.

GENERAL MEASURES AND PRINCIPLES

Scheme Design and Planning

All options will be subject to project-level environmental assessment as they are brought forward, which will include assessments of their potential to affect European sites during their construction or operation. These assessments will consider or identify (inter alia):

- opportunities for avoiding potential effects on European sites through design (e.g. alternative pipeline routes; micro siting; etc);
- construction measures that need to be incorporated into scheme design and/or planning to avoid or mitigate potential effects - for example, ensuring that sufficient working area is available for pollution prevention measures to be installed, such as sediment traps;
- operational designs required to ensure no adverse effects occur (e.g. screening, additional treatment, etc.) – although note that these measures can only be identified through detailed investigation schemes and agreed through the project-level HRA process.

Pollution Prevention

The habitats of European sites are most likely to be affected indirectly, through site-derived pollutants, rather than through direct encroachment. There is a substantial body of general construction good-practice which is likely to be applicable to all of the proposed options and can be relied on (at this level) to prevent significant or adverse effects on a European site occurring as a result of construction site-derived pollutants. The following guidance documents detail the industry best-practices in construction that are likely to be relevant to the proposed schemes:

- Environment Agency Pollution Prevention Guidance Notes[62], including:
  - PPG1: General guide to the prevention of pollution (May 2001);
  - PPG5: Works and maintenance in or near water (October 2007);
  - PPG6: Pollution prevention guidance for working at construction and demolition sites (April 2010);
  - PPG21: Pollution incident response planning (March 2009);
  - PPG22: Dealing with spillages on highways (June 2002);

[62] Note, the Environment Agency Pollution Prevention Guidance Notes have been withdrawn by the Government, although the principles within them are sound and form a reasonable basis for pollution prevention measures.

- Environment Agency (2001) Preventing pollution from major pipelines [online]. Available at www.environment-agency.gov.uk/static/documents/Business/pipes.pdf. [Accessed 1 March 2011];
- Venables R. et al. (2000) Environmental Handbook for Building and Civil Engineering Projects. 2nd Edition. Construction Industry Research and Information Association (CIRIA), London.

The best-practice procedures and measures detailed in these documents will be followed for all construction works derived from the WRMP as a minimum standard, unless scheme-specific investigations identify additional measures and/or more appropriate non-standard approaches for dealing with potential site-derived pollutants.

GENERAL MEASURES FOR SPECIES

Most species-specific avoidance or mitigation measures can only be determined at the scheme level, following scheme-specific surveys, and 'best-practice' mitigation for a species will vary according to a range of factors that cannot be determined at the strategic (DP) level. In addition, some general 'best-practice' measures may not be relevant or appropriate to the interest features of the European sites concerned (for example, clearing vegetation over winter is usually advocated to avoid impacts on nesting birds; however, this is unlikely to be necessary to avoid effects on some SPA species (such as overwintering estuarine birds) and the winter removal of vegetation might actually have a negative effect on these species through disturbance). However, the following general measures will be followed to minimise the potential for impacts on species that are European site interest features unless project level environmental studies or HRA indicate that they are not required or not appropriate, or that alternative or additional measures are more appropriate/necessary:

- Scheme design will aim to minimise the environmental effects by 'designing to avoid' potential habitat features that may be used by species that are European site interest features when outside the site boundary (e.g. linear features such as hedges or stream corridors; large areas of scrub or woodland; mature trees; etc.) through scheme-specific routing studies.
- The works programme and requirements for each option will be determined at the earliest opportunity to allow investigation schemes, surveys and mitigation to be appropriately scheduled and to provide sufficient time for consultations with NRW/NE.
- Night-time working, or working around dusk/dawn, should be avoided to reduce the likelihood of negative effects on nocturnal species.
- Any lighting required (either temporary or permanent) will be designed with an ecologist to ensure that potential 'displacement' effects on nocturnal animals, particularly SAC bat species, are avoided.
- All compounds/pipe stores etc. will be sited, fenced or otherwise arranged to prevent vulnerable SAC species (notably otters) from accessing them.
- All materials will be stored away from commuting routes/foraging areas that may be used by species that are European site interest features.
- All excavations will have ramps or battered ends to prevent species becoming trapped.
- Pipe-caps must be installed overnight to prevent species entering and becoming trapped in any laid pipe-work.

APPENDIX C HRA STAGE 1 SCREENING

WRMP24 Ref	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSEs identified?	Operational Commentary	Operation LSEs identified?
CW24-01A	Combined Ouse gravel sources Fenstanton and St Ives (01A)	This option is to recommission the unused groundwater abstraction source (gravels) at Fenstanton BH, through the creation of 2 new BH's (25m deep) with pumps and an associated building on site to allow for an average DO of 0.44Ml/d DYAA. The raw water is to be transferred along a 1km 150mm new pipeline to St.Ives for treatment (the treatment process must consider metaldehyde risks at the site) and then distribution of the potable water to the CW network via a 100m of 450mm pipeline to connect from the outlet of the treatment works to network. This option is exclusive to option CW24-01B as it uses the same source.	Ouse Washes SAC Ouse Washes SPA Ouse Washes Ramsar Portholme SAC	8.85km, north-east 8.85km, north-east 8.85km, north-east 6.5km, west	Portholme SAC is located 6.5km, along the River Great Ouse, upstream of Option 01B therefore no LSE are anticipated from construction works upon the qualifying features of the SAC (H6510 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officin*alis). Ouse Washes SAC/SPA/Ramsar is located along the Old Bedford River and the New Bedford River, which are artificial, partial diversion of the waters of the River Great Ouse. The designated sites are located 8.85km downstream of option 01B. Due to the distance between the option and the designated sites, construction works are not anticipated to have an impact on the qualifying features through noise, visual disturbance or air pollution. However, construction works which include a new pipeline in proximity to the River Great Ouse (180m) may result in surface and groundwater pollution incident, sedimentation which may affect qualifying feature of the Ouse Washes SAC (spined loach) and the waterbird assemblage associated with the SPA and Ramsar sites. LSE cannot be ruled out at this stage and further assessment will be required.	LSEs identified, mitigation measures during construction required	Option 01A is based on the available abstraction licence at Fenstanton BH despite the boreholes not being in used since 1999. Water abstraction will be required during operation in proximity to the River Great Ouse which is hydrologically connected to the Ouse Washes SAC/SPA/Ramsar (downstream of option 01A) and Portholme SAC (upstream of option 01A). As a result, abstraction of ground water may have an impact on the water level within the River Great Ouse. Therefore LSE cannot be ruled out at this stage and further assessment will be required.	LSEs identified, uncertainty over impact of groundwater abstraction
CW24-01B	Combined Ouse gravel sources Fenstanton and St Ives (01B)	This option requires the same assets as 01A however the source water includes augmentation of the River Ouse to allow for increased abstraction at Fenstanton compared to 01A. The option is to recommission the unused groundwater abstraction source (gravels) at Fenstanton BH, through the creation of 2 new BH's (25m deep) with pumps and an associated building on site to allow for an average DO of 2Ml/d DYAA. The raw water is to be transferred along a 1km 150mm new pipeline to St.Ives for treatment (the treatment process must consider metaldehyde risks at the site) and then distribution of the potable water to the CW network via a 100m of 450mm pipeline to connect from the outlet of the treatment works to network. This option is exclusive to option CW24-01A as it uses the same source.	Ouse Washes SAC Ouse Washes SPA Ouse Washes Ramsar Portholme SAC	8.85km, north-east 8.85km, north-east 8.85km, north-east 6.5km, west	Portholme SAC is located 6.5km, along the River Great Ouse, upstream of Option 01B therefore no LSE are anticipated from construction works upon the qualifying features of the SAC (H6510 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officin*alis). Ouse Washes SAC/SPA/Ramsar is located along the Old Bedford River and the New Bedford River, which are artificial, partial diversion of the waters of the River Great Ouse. The designated sites are located 8.85km downstream of option 01B. Due to the distance between the option and the designated sites, construction works are not anticipated to have an impact on the qualifying features through noise, visual disturbance or air pollution. However, construction works which include a new pipeline in proximity to the River Great Ouse (180m) may result in surface and groundwater pollution incident, sedimentation which may affect qualifying feature of the Ouse Washes SAC (spined loach) and the waterbird assemblage associated with the SPA and Ramsar sites. LSE cannot be ruled out at this stage and further assessment will be required.	LSEs identified, mitigation measures during construction required	Option 01B is based on the available abstraction licence at Fenstanton BH despite the boreholes not being in used since 1999. Water abstraction will be required during operation in proximity to the River Great Ouse which is hydrologically connected to the Ouse Washes SAC/SPA/Ramsar (downstream of option 01B) and Portholme SAC (upstream of option 01B). As a result, abstraction of ground water may have an impact on the water level within the River Great Ouse. Therefore LSE cannot be ruled out at this stage and further assessment will be required.	LSEs identified, uncertainty over impact of groundwater abstraction
CW24-37Ai	Northstowe greywater reuse or similar growth large storage	Site-scale greywater reuse scheme incorporated into large scale development	No European sites within 10km of the option.	-	There are no European sites within 10km of the scheme components, or impact pathways over a greater distance.	No LSEs anticipated	There are no European designated sites within 10km of the scheme components, or impact pathways over a greater distance.	No LSEs anticipated
CW24-37Aii	Northstowe greywater reuse or similar growth small storage	Site-scale greywater reuse scheme incorporated into small scale development	No European sites within 10km of the option.	-	There are no European sites within 10km of the scheme components, or impact pathways over a greater distance.	No LSEs anticipated	There are no European designated sites within 10km of the scheme components, or impact pathways over a greater distance.	No LSEs anticipated
CW24-38A	Site-scale rainwater harvesting (Northstowe	Site-scale rainwater harvesting scheme incorporated into large scale development	No European sites within 10km of the option.	-	There are no European sites within 10km of the scheme components, or impact pathways over a greater distance.	No LSEs anticipated	There are no European designated sites within 10km of the scheme components, or impact pathways over a greater distance.	No LSEs anticipated

WRMP24 Ref	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSEs identified?	Operational Commentary	Operation LSEs identified?
	or similar growth)							
CW24-38B	Northstowe rainwater harvest or similar growth small storage	Site-scale rainwater harvesting scheme incorporated into small scale development	No European sites within 10km of the option.	-	There are no European sites within 10km of the scheme components, or impact pathways over a greater distance.	No LSEs anticipated	There are no European designated sites within 10km of the scheme components, or impact pathways over a greater distance.	No LSEs anticipated
CW24-57	River Cam abstraction and treatment works	River Cambridge abstraction & treatment works	Fenland SAC Devils Dyke SAC Wicken Fen Ramsar	7.9km, north-east 10km, east 7.9km, north-east	Due to the distance and the lack of hydrological connectivity between option 57 and Devils Dyke SAC, no LSE are anticipated from construction works. Fenland SAC and Wicken Fen Ramsar share the same boundary, both designated sites are located along Burwell Lode and Wicken Lode tributaries of Reach Lode which flows into the River Cam, downstream of option 57, approximately 7.9km away. Therefore due to the distance between option 57 and Fenland SAC and Wicken Fen Ramsar, and due to the lack of hydrological connectivity, no LSE are anticipated from option 57 upon the habitat qualifying features (peat fens, H6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*), and H7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*) nor upon S1166 Great crested newt *Triturus cristatus* or fen violet *Viola persicifolia*. Spined loach may be present within the River Cam of which the confluence is located ~700m from Fenland SAC and therefore construction work may impact supporting habitat for spined loach if present within the River Cam through surface pollution incidents, sedimentation or introduction of INNS. LSE cannot be ruled out at this stage and further assessment will be required for spined loach.	LSEs identified, mitigation measures during construction required	Due to the distance and the lack of hydrological connectivity between option 57 and Devils Dyke SAC, no LSE are anticipated from construction works. Option 57 will require additional abstraction on the River Cam to provide additional raw water to be stored in an embankment reservoir. This stretch of the River Cam is currently supplemented by effluent discharge from Milton WWTW. Option 57 is based on the available abstraction of the River Cam, allowing 22.2Ml/d to be abstracted during 120 days of the year. Fenland SAC and Wicken Fen Ramsar share the same boundary, both designated sites are located along Burwell Lode and Wicken Lode tributaries of Reach Lode which flows into the River Cam, downstream of option 57, approximately 7.9km away. No new licence abstraction is required and abstraction of water will be managed through the Hands off Flow. No LSE are anticipated from operation of option 57.	No LSEs anticipated
CW24-71	AWS Milton WWTW effluent discharge reuse	Milton Wastewater Treatment Works (WWTW) Effluent re-use surface water abstraction post effluent discharge	No European sites within 10km of the option The Wash and North Norfolk Coast SAC The Wash SPA and Ramsar	 Downstream receptor (c.66km) Downstream receptor (c.66km)	There are no European sites within 10km of the scheme components. The ultimate downstream receptor is The Wash and North Norfolk Coast SAC, however none of the qualifying features are migratory fish species, where use of functionally linked habitat within the River Cam could have been an issue. Similarly, The Wash SPA and Ramsar, are considered sufficiently distant such that the River Cam does not provide functionally linked habitat for any of the qualifying features.	No LSEs anticipated	There are no European sites within 10km of the scheme components, or impact pathways over a greater distance. The ultimate downstream receptor is The Wash and North Norfolk Coast SAC, however none of the qualifying features are migratory fish species, where use of functionally linked habitat within the River Cam could have been an issue. Similarly, The Wash SPA and Ramsar, are considered sufficiently distant such that the River Cam does not provide functionally linked habitat for any of the qualifying features.	No LSEs anticipated

WRMP24 Ref	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSEs identified?	Operational Commentary	Operation LSEs identified?
CW24-73A	Fens Reservoir internal potable water transfer Chatteris	Construction of a major new surface water reservoir in South Fenland (Chatteris), to be shared between Cambridge Water and Anglian Water (AWS). This option only assesses a high lift pump and pumped pipeline transfer of potable water to Madingley reservoir, with an offtake to Bluntisham reservoir, with additional storage included at these two locations.	Ouse Washes SPA Ouse Washes SAC Eversden and Wimpole Woods SAC Ouse Washes SAC	2.8km, east 2.8km, east 7.2km, south-west 2.8km, east	Due to the distance and the lack of hydrological connectivity between option 73A and Eversden and Whimpole Woods SAC, no LSE are anticipated from construction works through air pollution, human disturbance or water pollution. However as barbastelle bats can travel over 7km for foraging, LSE cannot be ruled out as construction works may result in loss, damage to supporting habitat and habitat fragmentation. Ouse Washes SAC/SPA/Ramsar is located along the Old Bedford River and the New Bedford River, which are artificial, partial diversion of the waters of the River Great Ouse. The construction of the pipeline associated with option 73A will require crossing the River Great Ouse, approximately 6km upstream of the designated site and crossing various ditches connected to the Ouse Washes SPA/SAC/Ramsar. Due to the distance between the option and the designated sites, construction works are not anticipated to have an impact on the qualifying features through noise, visual disturbance or air pollution. However, construction works may result in surface and groundwater pollution incident, sedimentation which may affect qualifying feature of the Ouse Washes SAC (spined loach) and the waterbird assemblage associated with the SPA and Ramsar sites. Construction of option 73A may also result in loss or damage of supporting habitat if present within the footprint of the project, in particular the section drained to the north. LSE cannot be ruled out at this stage and further assessment will be required.	LSEs identified, mitigation measures during construction required	Option 73A does not include an abstraction of water, or increase in water abstraction - it is just a transfer of the potable water source from the new Fens reservoir. Therefore, no LSE are anticipated from operation of option 73A.	No LSEs anticipated
CW24-75Ai, ii and iii	AWS potable transfer through CAM area 5Mld	This option is to provide one or more cross-connections at suitable location(s) between the new AWS main (from Grafham WTW to their new strategic reservoir that is currently under construction at Rede (adjacent to an existing reservoir) as part of their AMP7 SPA pipelines programme) and the existing CW network, such that a notional 5Ml/d (for this sub-option) may be imported from AWS (with Aii variant including contribution to AWS strategic main and Aiii a blending plant).	Ouse Wash SAC, SPA & Ramsar	6.8km, north	Ouse Washes SAC/SPA/Ramsar is located along the Old Bedford River and the New Bedford River, which are artificial, partial diversion of the waters of the River Great Ouse. The construction of the 750m pipeline associated with option 75A will require crossing Swavesey Drain, a small tributary of the River Great Ouse (approximately 4.8km upstream of the confluence) which joins the river approximately 4.9km upstream of the Ouse Wash SAC/SPA/Ramsar. The blending plant required for variant Aiii is within 70m of the drain. A review of sites surveyed for the WeBS and NBN Atlas data suggests that the site for the blending plant is not offsite functionally linked habitat. Few species are recorded within 2km or are in in very low numbers. Due to the distance between the option and the designated sites, construction works are not anticipated to have an impact on the qualifying features through noise, visual disturbance or air pollution. However, construction works may result in surface and groundwater pollution incident, sedimentation which may affect qualifying feature of the Ouse Washes SAC (spined loach) and the waterbird assemblage associated with the SPA and Ramsar sites.	LSEs identified, mitigation measures during construction required	Option 75A is a third party potable water transfer which includes a cross-connection from Anglian Water's new strategic pipeline to the Cambridge network with a supply of 5Ml/d. The availability of surplus water has been identified by Anglian Water. The option does not require an abstraction licence, or change to abstraction licence. Therefore, no LSE are anticipated from option 75A.	No LSEs anticipated

WRMP24 Ref	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSEs identified?	Operational Commentary	Operation LSEs identified?
CW24-75Bi, ii and iii	AWS potable transfer through CAM area 10Mld	This option is to provide one or more cross-connections at suitable location(s) between the new AWS main (from Grafham WTW to their new strategic reservoir that is currently under construction at Rede (adjacent to an existing reservoir) as part of their AMP7 SPA pipelines programme) and the existing CW network, such that a notional 10Ml/d (for this sub-option) may be imported from AWS (with Bii variant including contribution to AWS strategic main and Biii a blending plant).	Ouse Wash SAC, SPA & Ramsar	6.8km, north	Ouse Washes SAC/SPA/Ramsar is located along the Old Bedford River and the New Bedford River, which are artificial, partial diversion of the waters of the River Great Ouse. The construction of the 750m pipeline associated with option 75B will require crossing Swavesey Drain, a small tributary of the River Great Ouse (approximately 4.8km upstream of the confluence) which joins the river approximately 4.9km upstream of the Ouse Wash SAC/SPA/Ramsar. The blending plant required for variant Biii is within 70m of the drain. A review of sites surveyed for the WeBS and NBN Atlas data suggests that the site for the blending plant is not offsite functionally linked habitat. Few species are recorded within 2km or are in in very low numbers. Due to the distance between the option and the designated sites, construction works are not anticipated to have an impact on the qualifying features through noise, visual disturbance or air pollution. However, construction works may result in surface and groundwater pollution incident, sedimentation which may affect qualifying feature of the Ouse Washes SAC (spined loach) and the waterbird assemblage associated with the SPA and Ramsar sites.	LSEs identified, mitigation measures during construction required	Option 75B is a third party potable water transfer which include a cross-connection from Anglian Water's new strategic pipeline to Cambridge network with a supply of 10Ml/d. The availability of surplus water has been identified by Anglian Water. The option does not require an abstraction licence, or change to abstraction licence. Therefore, no LSE are anticipated from option 75B.	No LSEs anticipated
CW24-75Ci, ii and iii	AWS potable transfer through CAM area 15Mld	This option is to provide one or more cross-connections at suitable location(s) between the new AWS main (from Grafham WTW to their new strategic reservoir that is currently under construction at Rede (adjacent to an existing reservoir) as part of their AMP7 SPA pipelines programme) and the existing CW network, such that a notional 15Ml/d (for this sub-option) may be imported from AWS (with Cii variant including contribution to AWS strategic main and Ciii a blending plant).	Ouse Wash SAC, SPA & Ramsar	6.8km, north	Ouse Washes SAC/SPA/Ramsar is located along the Old Bedford River and the New Bedford River, which are artificial, partial diversion of the waters of the River Great Ouse. The construction of the 750m pipeline associated with option 75A will require crossing Swavesey Drain, a small tributary of the River Great Ouse (approximately 4.8km upstream of the confluence) which joins the river approximately 4.9km upstream of the Ouse Wash SAC/SPA/Ramsar. The blending plant required for variant Ciii is within 70m of the drain. A review of sites surveyed for the WeBS and NBN Atlas data suggests that the site for the blending plant is not offsite functionally linked habitat. Few species are recorded within 2km or are in in very low numbers. Due to the distance between the option and the designated sites, construction works are not anticipated to have an impact on the qualifying features through noise, visual disturbance or air pollution. However, construction works may result in surface and groundwater pollution incident, sedimentation which may affect qualifying feature of the Ouse Washes SAC (spined loach) and the waterbird assemblage associated with the SPA and Ramsar sites.	LSEs identified, mitigation measures during construction required	Option 75C is a third party potable water transfer which include a cross-connection from Anglian Water's new strategic pipeline to Cambridge network with a supply of 15Ml/d. The availability of surplus water has been identified by Anglian Water. The option does not require an abstraction licence, or change to abstraction licence. Therefore, no LSE are anticipated from option 75C.	No LSEs anticipated

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