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# **Anglian Water WRMP24 Environmental Report**

Sub-Report C: Natural Capital Assessment  
(NCA) and Biodiversity Net Gain (BNG)

August 2024

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# Anglian Water WRMP24 Environmental Report

Sub-Report C: Natural Capital Assessment  
(NCA) and Biodiversity Net Gain (BNG)

August 2024

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## Table of Acronyms

BEIS	Business, Energy and Industrial Strategy
BNG	Biodiversity Net Gain
BU	Biodiversity Units
BVP	Best Value Plan
DEFRA	Department for Environment, Food & Rural Affairs
EA	Environment Agency
ENCA	Enabling a Natural Capital Approach
LNRS	Local Nature Recovery Strategies
LPA	Local Planning Authority
NCA	NCA's Natural Capital Assessments
NEVO	Natural Environment Valuation Online
NFM	Natural Flood Management
NSIP	Nationally Significant Infrastructure Projects
ORVal	Outdoor Recreation valuation Tool
SEA	Strategic Environmental Assessment
SRO	Strategic Resource Options
WINEP	Water Industry National Environment Programme
WRC	Water Recycling Centre
WRE	Water Resources East
WRMP24	Water Resources Management Plan 2024
WTW	Water Treatment Works
ZoI	Zone of influence

# Executive summary

All water companies in England and Wales including Anglian Water must prepare and maintain a Water Resources Management Plan 2024 (WRMP24). This sets out how to achieve a secure supply of water for customers and for a protected and enhanced environment. Under legislation a plan must be produced at least every five years and reviewed annually.

In developing their WRMP24, Anglian Water have undertaken Natural Capital Assessments (NCA) and Biodiversity Net Gain (BNG) assessments. The NCA and BNG assessments, in parallel with a Strategic Environmental Assessment (SEA), ensures that an integrated approach to environmental assessment has been followed.

Anglian Water has assessed potential implications of its WRMP24 on the risk of detrimental natural capital or biodiversity net gain effects, both individually and in combination as a plan-as-a-whole.

The WRMP24 Best Value Plan (Plan B) includes 50 supply-side options, five WINEP options and an aspirational demand management strategy. 32 of these supply-side options were scoped-in for NCA and BNG assessment. The 18 scoped-out options consist of additional work on made ground and require no new land take, therefore making these assessment types redundant. The five remaining options, defined as Water Industry National Environment Programme (WINEP) options, were not assessed due to the early stage of option development, with location and proposals for these options undefined at the time of assessment.

## Natural Capital Assessments

A NCA has been undertaken for the supply-side options in accordance with the Environment Agency's Water Resource Planning Guidelines (the 'Guidelines') and Enabling a Natural Capital Approach (ENCA)<sup>1</sup> (2020 version) requirements. ENCA is recommended for use by HM Treasury's Green Book: appraisal and evaluation in central government (2020) and represents supplementary guidance to the Green Book.

The results of the NCA indicate that the Plan B options will cause the temporary and permanent loss of natural capital stocks, however the plan will deliver over 900 hectares of reservoir habitat, primarily through the delivery of two Strategic Resource Options (SROs)<sup>2</sup>.

Construction impacts include the release of CO<sub>2</sub> due to habitat clearance, loss of natural hazard regulation, a reduction in food production services, a reduction in recreational and amenity services, and a reduction in water purification services.

Plan B presents an opportunity to improve the existing habitats through post construction remediation and replacement of low value habitats with higher value habitats. Plan B's options cross several Natural England habitats and Network Enhancement Zones that are suitable for planting new high value habitats. The natural capital and ecosystem service benefits that will be delivered with each option will contribute to the wider environmental benefits that will be delivered through the WRMP24. An example of these benefits would include returning water to the natural environment through the environmental destination, which is outlined in greater detail in the main Environmental Report.

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<sup>1</sup> Defra 2020. Guidance, Enabling a Natural Capital Approach (ENCA). Available at: <https://www.gov.uk/guidance/enabling-a-natural-capital-approach-enca>

<sup>2</sup> The SROs referenced are referring to the two reservoirs being progressed.



## Biodiversity Net Gain

The BNG requirements as outlined in the Guidelines recommends that each WRMP should provide a BNG Report. The option assessments used the most-up-to-date guidance available at the time, Biodiversity Metric 3.0, to undertake these assessments.

Anglian Water will have a Voluntary AMP8 Natural Capital Performance Commitment to achieve a minimum of 10% Biodiversity Net Gain (BNG) against measured losses of biodiversity on Anglian Water-owned land. It will apply to habitats measured by area (ha) and length (km), covering hedgerows and lines of trees that are affected by construction and nature conservation land management. This commitment will go beyond the statutory BNG commitment due to become mandatory in November 2023.

The measures for delivering BNG for each option will be developed at project-level, adhering to the latest BNG guidance, and aligned within the context of the wider portfolio of options. To achieve this, Anglian Water are developing a BNG Strategy which will enable strategic and effective delivery of projects across the business. This goes beyond future public water supply options (like those included in this plan) to also include the operation and maintenance of existing Anglian Water sites, which includes assets related to both drinking water and wastewater.

The BNG Strategy will:

- Identify opportunities to avoid and minimise impacts on existing habitats through further refinement of option design,
- Identify opportunities to create and enhance habitats, both on-site where the losses have occurred and off-site,
- Link these opportunities with national and local strategic priorities for conserving and enhancing biodiversity.

The BNG Strategy will highlight a series of strategic areas, with high potential for biodiversity creation and enhancement, guiding the delivery of BNG across the region.

These strategic areas will be targeted and proposals created, to ensure the best outcomes can be achieved for biodiversity and the wider environment.

This strategy will be used as a foundation when developing the options within the WRMP24 and will ensure that Anglian Water achieves a minimum of 10% net gain across its whole plan. The underlying principles of the forthcoming BNG Strategy have been set out within this report as a preliminary BNG Roadmap, illustrating how the BNG Strategy will be applied to the delivery of the WRMP24 options.

# 1 Introduction

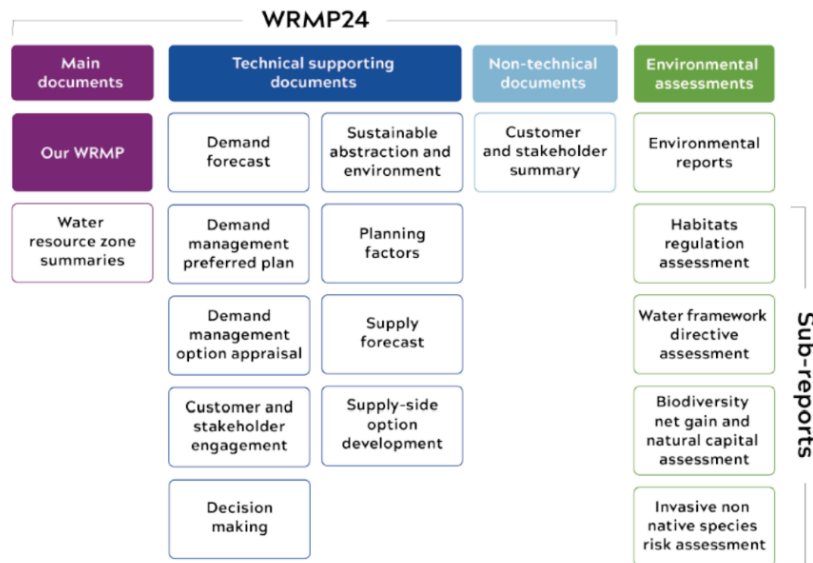
## 1.1 Water Resource Management Planning

- 1.1.1.1 Anglian Water is the largest water and wastewater company in England and Wales by geographically, covering 20% of the land.
- 1.1.1.2 As a water company Anglian Water has a statutory obligation to produce a Water Resources Management Plan (WRMP) every five years. The WRMP sets out how a sustainable and secure supply of clean drinking water will be provided to its customers over a minimum 25 year planning period, whilst showing how its long-term vision for the environment will be achieved. Wider societal benefits, such as tourism, are also considered and balanced against the plan being affordable to create a 'best value' plan.
- 1.1.1.3 In the development of a WRMP, companies in England and Wales must follow the Environment Agency / Ofwat Water Resources Planning Guideline (WRPG)<sup>3</sup>, consider broader government policy objectives and adhere to the relevant legislation. Anglian Water's plan-making for WRMP24 has undertaken all six environmental assessments that were highlighted in the WRPG. The broad scope of the SEA process has been used as a framework to integrate the findings of the other environmental assessments to avoid duplication and inconsistency across the specific requirements of each assessment:
- Habitats Regulations Assessment (HRA)
  - Water Framework Directive (WFD) assessment
  - Natural Capital Assessment via Ecosystem Services (NCA)
  - Biodiversity Net Gain (BNG) assessment
  - Invasive Non-Native Species (INNS) risk assessment
- 1.1.1.4 The development of a WRMP is a complex process involving the analysis of different types of information and data, the application of modelling and decision-making, and interacting, as required, with the six environmental assessments above. To read more about the plan-making process, please visit the suite of WRMP24 reports for more information on each aspect (Figure 1.1).
- 1.1.1.5 This report sits within the suite of Environmental assessment documents that accompany the WRMP24. The assessment process undertaken to generate it feeds into the plan-making process as part of the Anglian Water's best value planning (BVP) approach, discussed below.

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<sup>3</sup> Environment Agency, Natural Resources Wales, Office for Water Services (2023). Water resources planning guideline. Available at: <https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline>

**Figure 1.1: The WRMP24 reports**



Source: Anglian Water

## 1.2 Anglian Water’s WRMP24 Challenge

- 1.2.1.1 Anglian Water’s geographic area is divided into 28 Water Resource Zones (WRZs) including the Hartlepool area and the South Humber Bank which is a non-potable WRZ that sits within the Central Lincolnshire WRZ. It should be noted that Hartlepool is not covered further in this environmental assessment report as only demand management options (e.g., smart meters, leakage reduction) are required to maintain its supply demand balance through the WRMP24 period. Assessment of demand management is reported in Chapter 5 of the WRMP24 Environmental Report.
- 1.2.1.2 The East of England is one of the driest regions in the UK, receiving only two thirds of the national average rainfall each year, (approximately 600mm), with high evaporation losses<sup>4</sup>. Water supply is under pressure from multiple challenges. The supply and demand forecast upon which the WRMP24 is based must account for all these challenges, including population growth, climate change, sustainability reductions (i.e., licence capping, environmental destination and ambition) and the need to increase resilience of water supplies to severe drought.<sup>5</sup>
- 1.2.1.3 The WRPG sets out the requirements for developing the WRMP24. Some components of the forecasts of supply and demand are not fixed in the guideline and need to be optimised as part of the best value planning (BVP) process. There are five key policy decisions that the plan-making process must take, and which influence the WRMP24 environmental outcomes (the assessment of which are presented in the WRMP24 Environmental Report, within Chapters 5 and 6). The policy decisions are:
- Level of demand management
  - Timing of Licence capping
  - Timing of 1 in 500 year drought resilience
  - Level of environmental destination

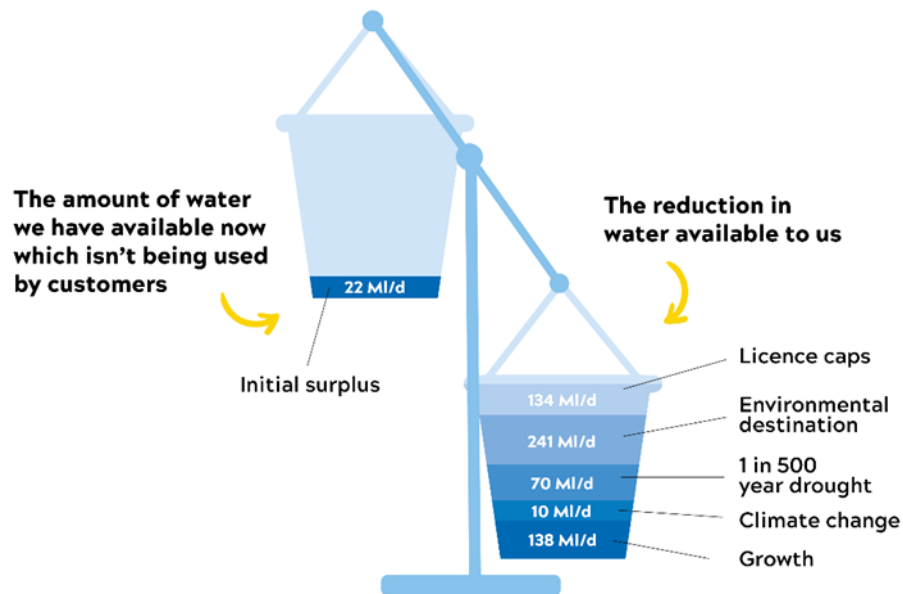
<sup>4</sup> Anglian Water Official Website (accessed 04.07.22): <https://www.anglianwater.co.uk/about-us/media/fast-facts/#:~:text=We%20operate%20in%20the%20driest,grow%20by%20another%20175%2C000%20homes.>

<sup>5</sup> Anglian Water Official Website (accessed 04.07.22): <https://www.anglianwater.co.uk/about-us/our-strategies-and-plans/water-resources-management-plan/>

- Level of environmental ambition (timing and profile of environmental destination)

1.2.1.4 The combined effects of the challenges influence the change in the amount and timing of water available to Anglian Water to deliver secure public water supplies throughout the planning period (2025-2050). The combination of these challenges (Figure 2.2) indicates that WRMP24 must deliver well over 400Ml/d of new demand management and supply-side infrastructure through the planning period in order to deliver the statutorily required supply-demand balance.

**Figure 2.2: The impact of expected challenges for Anglian Water’s WRMP24**



Source: Anglian Water

### 1.3 Anglian Water’s WRMP24 Plan Making

- 1.3.1.1 Once the supply demand forecast has determined the scale of challenge to be met, the plan-making process identifies how demand management and new supply-side options can deliver a supply and demand balance for all water resource zones at all times throughout the planning period (2025-2050).
- 1.3.1.2 To begin with, demand management options are implemented. Demand management options reduce the amount of water used by customers or lost in the water network. Examples of demand management options include leakage reduction, smart metering and water efficiency.
- 1.3.1.3 The objective led approach of the SEA has been used to assess the WRMP24 demand management as it is well suited to assessment activities with a broad scale effect. However, the five other environmental assessments require specific geographic location to base the assessment upon. For further information on the assessment of demand management can be found in Chapters 5, 6 and 7 of the Environmental Report.
- 1.3.1.4 Following the implementation of demand management options, supply-side options are required to resolve the deficit within the planning period. Due to the numerous challenges Anglian Water face in the coming 25 years, especially in terms of sustainability reductions, they are required to deliver a programme of significant new supply infrastructure. Identifying proposed new supply-side options that pose limited, or no risk, to the environment – as may be the case in other parts of the country that are not water stressed - was not feasible.

- 1.3.1.5 Supply-side options produce new, additional water that can be put into the water network to supply customers. The types of supply-side options available to Anglian Water on their constrained list to deliver WRMP24 are:
- Aquifer storage and recovery
  - Backwash recovery
  - Conjunctive use
  - Desalination
  - Groundwater treatment
  - Reservoirs
  - Tankering
  - Transfers
  - Trading
  - Water reuse
  - Water treatment works
- 1.3.1.6 The environmental assessments applied to the WRMP24 have influenced the components of the constrained list and in some cases, they have contributed to the removal of potential supply-side options (for more information see the WRMP24 Supply-side options development technical support document).
- 1.3.1.7 In addition to the above, the six environmental assessments completed have produced environmental metrics which have formed part of the BVP framework, thus, being used throughout the decision-making process. To read more about the environmental assessment metrics, please visit Chapter 5 of the Environmental Report and the WRMP24's Decision making technical supporting document.
- 1.3.1.8 Whilst option level environmental assessments are essential for producing a constrained list and facilitating decision making, there must be a focus on the environmental consequences of the WRMP as a whole plan.
- 1.3.1.9 It is also important to recognise the strategic plan-level of the WRMP24 and that, following adoption of the WRMP24, individual supply-side options will be progressed at a project-level. This will require detailed design, engagement with key stakeholders, detailed environmental assessments, compliance with environmental laws and policies and gaining any required consents/licences before they could be built and operated.

## 1.4 NCA and BNG Introduction

- 1.4.1.1 This sub-report supports the Environmental Report that accompanies Anglian Water's Water Resource Management Plan 2024 (WRMP24) submission to regulators. As part of the environmental assessment process applied to WRMP24 plan-making, Mott MacDonald undertook NCAs and BNG assessments of the options on Anglian Water's constrained list of supply-side options. The rdWMP24 comprises four plans: Plan A (Least Cost), Plan B (Best Value Plan), Plan C (Least Cost Best Value Plan), and Plan D (Best for Environment).
- 1.4.1.2 This sub-report presents the findings of the NCA and BNG assessments undertaken for Plan B's options. NCA and BNG assessments can be found in NCA and BNG Assessment Results (Chapter 3) and the findings of the alternative plan assessment spreadsheets can be found in Appendix B. The alternative plans are also assumed to adopt the roadmap to achieve BNG and this is reflected in the Environmental Report plan summaries.

## 1.5 Anglian Water WRMP24 options

1.5.1.1 The WRMP24 Best Value Plan (Plan B) includes 50 supply-side options, five WINEP options and an aspirational demand management strategy. Of the 50 supply-side options, 32 are scoped in for NCA and BNG assessment, and these options are presented in Table 1.1 below. The five WINEP options are presented separately in Table 1.2 below, as these assessments could not be undertaken at this stage due to the early stage of option development, with locations and proposals undefined at the time of assessment. However, these options do provide opportunities for BNG enhancement at a later stage, particularly measures to improve habitat and riverine environments.

**Table 1.1 Anglian Water WRMP24 Plan B Options scoped-in for NCA and BNG**

Option ID	Option Description
CAM4	Ruthamford South to Cambridge Water potable transfer (50 MI/d)
LNC25	Lincolnshire East to Lincolnshire Central potable transfer (29 MI/d)
EXC3	Essex South to Essex Central potable transfer (10 MI/d)
FND22	Marham Abstraction (7.9 MI/d up to 2039, 12.3 MI/d after 2039)
LNE11	Lincolnshire East Groundwater (7.5 MI/d)
NAY1	Norwich and the Broads to Aylsham potable transfer (3 MI/d)
NBR6	Fenland to Norfolk Bradenham potable transfer (50 MI/d)
NEH3	Suffolk Thetford to Norfolk East Harling potable transfer (5 MI/d)
NHL4	Norfolk East Harling to Norfolk Harleston potable transfer (5 MI/d)
NTB10	Norfolk Bradenham to Norwich and the Broads potable transfer (20 MI/d)
SUE23	Suffolk East WTW Upgrade (1.7 MI/d)
SUE24	Suffolk Sudbury to East Suffolk potable transfer (10 MI/d)
SWC8	Cambridge Water to Suffolk West Cambs potable transfer (50 MI/d)
SWC13	Suffolk West & Cambs groundwater relocation (2.6 MI/d)
EXS19	Colchester Reuse direct to Ardleigh Reservoir (no additional treatment) (11.4MI/d up to 2039, 13.9MI/d after 2039)
SUT5	Norfolk Bradenham to Suffolk Thetford potable transfer (15 MI/d)
LNN1	Lincolnshire Central to Lincolnshire Retford and Gainsborough potable transfer (3 MI/d)
NED2	Norfolk Bradenham to Norfolk East Dereham potable transfer (10 MI/d)
NNC4	Norfolk East Dereham to North Norfolk Coast potable transfer (10 MI/d)
SHB9	South Humber Bank Non-potable desalination (60 MI/d)
FND29	Fens Reservoir 50 MCM (usable volume) (44.4 MI/d)
EXS10	Holland on Sea desalination (seawater) (26 MI/d)
LNB1	Ruthamford North to Bourne potable transfer (20 MI/d)
LNC16	Ruthamford North to Lincolnshire Central potable transfer (20 MI/d)
LNC28	Bulk trade agreement – River Trent (7 MI/d)
LNE6	Mablethorpe desalination Seawater (50 MI/d)
NTB17	Bacton desalination (seawater) (25 MI/d)
NWY1	Norwich and the Broads to Norfolk Wymondham potable transfer (5 MI/d)
RTN30	Lincolnshire Central to Ruthamford North potable transfer (75 MI/d)

**Table 1.2 Anglian Water WRMP24 Plan B WINEP Options**

Option ID	Option Description
Brett	River Support Scheme with 2 MI/d at Lavenham, 2 MI/d at either Semer or Raydon and 2 MI/d at Shelley.
Colne	River support from Great Yeldham (at current daily licenced quantity) plus River Restoration.
Gipping	An optimised combination of river restoration options #11, #12, and #13 (Reach #2 (Brantham Road (B1113), south of Great Blackenham, to the railway crossing west of Ipswich) and reach #3 (from the railway crossing west of Ipswich to the tidal limit).
Pant	River support from Hawkspur Green source.
Stiffkey	Houghton St Giles river support to Q90 RA flows at Warham All Saints (18 MI/d).

1.5.1.2

A total of 18 supply-side options were scoped-out of Plan B’s list of options outlined in Table 1.1. Table 1.3 below outlines the scoped-out options along with a description as to why options have been scoped-out.

**Table 1.3: Anglian Water WRMP24 Plan B Options scoped-out for NCA and BNG**

Option	Description
Backwash water recovery, Essex Central WTW (0.3 MI/d) (EXC7)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.
Backwash water recovery, Fenland WTW (0.2 MI/d) (FND26)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.
Lincolnshire Central WTW Upgrade (3.2 MI/d) (LNC30)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks
Lincolnshire East Surface Water (13 MI/d before 2039, 7.3 MI/d after 2039) (LNE12)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks
Lincolnshire Retford and Gainsborough WTW Upgrade (0.72 MI/d) (LNN3)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks
Ruthamford South Drought permit (2.07 MI/d) (RTS16)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks
Ruthamford South surface water enhancement (9.5 MI/d up to 2040, 6 MI/d after 2040) (RTS21)	Extension of Clapham WTW from 25MI/d to 36MI/d. This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.
Backwash water recovery, Suffolk East WTW (0.05MI/d) (SUT6)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.
Backwash water recovery, Essex Central WTW (0.3MI/d) (EXS7)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.
Backwash water recovery, Norfolk Bradenham WTW (0.2MI/d) (NBR9)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.
North Norfolk Coast WTW backwash water recovery (0.18MI/d) (NNC5)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks
North Norfolk Coast WTW backwash water recovery (0.2MI/d) (NNC6)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks
Backwash water recovery, Lincolnshire East WTW (1.3MI/d) (LNE3)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks



Option	Description
Backwash water recovery, Norfolk Aylsham WTW (0.75MI/d) (NAY4)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.
Backwash water recovery, Norfolk East Dereham WTW (0.1MI/d) (NED3)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks
Backwash water recovery, Norfolk Harleston WTW (0.2MI/d) (NHL7)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.
Backwash water recovery, Norfolk Aylsham WTW (0.1MI/d) (NAY5)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks
Backwash water recovery, Suffolk East WTW (0.17MI/d) (SUE25)	This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.



## 2 Methodology

### 2.1 Natural capital assessment methodology

#### Guidance

- 2.1.1.1 Water companies have a statutory obligation to produce a Water Resources Management Plan (WRMP), which sets out how a company intends to maintain the balance between supply and demand for water over a minimum 25-year period. In the development of a WRMP, companies must follow the Environment Agency (EA) Water Resource Planning Guidelines<sup>6</sup> (hereafter referred to as the 'Guidelines') and consider broader government policy objectives. The Guidelines indicates that companies must consider the environment and society when developing the WRMP, stating that NCA and BNG should be used to inform decision-making. The natural capital approach is similarly supported by the Government's ambition to deliver environmental net gain, as set out in the 25 Year Environment Plan and the UK Department for Environment, Food & Rural Affairs' (Defra's) Guiding Principles.
- 2.1.1.2 The WRMP24 should, therefore, provide a reliable NCA, which aligns with the Guidelines and the wider Water Resources East (WRE) approach undertaken at the regional scale.
- 2.1.1.3 The methodological approach to the NCA and BNG developed for Anglian Water's WRMP24 aligns with the method defined by WRE. This alignment was considered with the aim of delivering a consistent NCA and BNG methodology across the water companies developing options requiring such assessments across the WRE region. The NCA and BNG have been produced in line with best practice and guidance available at the time the assessments were undertaken, including:
- Defra (2020) Enabling a Natural Capital Approach
  - HM Treasury and government finance (2018) The Green Book: appraisal and evaluation in central government
  - Natural England (2021) The Biodiversity Metric 3.0 auditing and accounting for biodiversity (JP039)
  - Natural England (2020) NERR076 Natural Capital Indicators: for defining and measuring change in natural capital
  - Water Resources Planning Guidelines ('Guidelines') (version 4.2) (Environment Agency, Natural Resources Wales, Ofwat)
  - Environment Agency (2020) Water resources planning guideline supplementary guidance – Environment and society in decision-making
- 2.1.1.4 Since the assessments were undertaken, a number of the guidance documents listed above have been updated, including The Green Book<sup>7</sup> (2022), The Biodiversity Metric 4.0<sup>8</sup> (2023), and

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<sup>6</sup> Environment Agency, Natural Resources Wales, Office for Water Services 2022. Guidance, Water resources planning guideline. Available at: <https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline>

<sup>7</sup> HM Treasury and Government Finance Function 2022. Guidance, The Green Book: appraisal and evaluation in central government. Available at: <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

<sup>8</sup> Defra and Natural England 2023. The Biodiversity Metric 4.0 (JP039). Available at: <https://publications.naturalengland.org.uk/publication/6049804846366720>

the Guidelines<sup>9</sup> (2023). However, the guidance available at the time of the assessments has been discussed with the Environment Agency and Natural England and is considered appropriate to inform Anglian Water's WRMP24 decision-making process.

### Principles to the natural capital assessment

2.1.1.5 Regional water resource plans taking a long-term view of water planning are currently being prepared for each region. The Anglian Water WRMP24 SEA was undertaken in the context of these plans and falls within the WRE Regional Plan. In line with the EA supplementary guidance on Environment and society in decision-making<sup>10</sup>, the NCA methodology has been developed in accordance with the following principles:

- The assessment includes the valuation of natural capital assets and ecosystem services within the footprint of each option and their zone of influence.
- The assessment methodology uses relevant qualitative, quantitative and/or monetary valuation approaches for the NCA. The assessment of the option's impact on the ecosystem services metrics has been undertaken in a sequential manner with an initial qualitative assessment, followed by a quantitative analysis and finally a monetised assessment if enough confidence exists in the values.
- Not all ecosystem services can be monetised within the NCA however those that are have been assessed against a consistent methodology. The monetised ecosystem service metrics have been incorporated into the cost benefit ratio as a discreet input. This monetised value is a single figure defined by the maximum natural capital benefit. The cost of the option has not been considered within this assessment as it is captured elsewhere within the multi criteria assessment.
- Ecosystem services that are not monetised have been quantified and incorporated into the Regional Plan decision-making process within the SEA.
- The NCA has been undertaken using open-source data in accordance with the guidance for regional assessments and to ensure that the approach is consistent across the entire study area.
- The WRE NCA methodology aims to align WRMPs' natural capital and ecosystem services which have previously been undertaken using separate approaches. The intention is that the aligned methodology will enable joint investment in strategic and catchment-based options.
- The assessment criteria have been designed to enable the maximisation of the potential benefits from WRE's Regional Plan.

### Anglian Water WRMP24

2.1.1.6 All options scoped on the constrained list have been assessed in accordance with the principles identified above and the NCA methodology set out below.

## 2.2 Stage 1: Defining the natural capital baseline

### Zone of influence for option level assessment

2.2.1.1 The zone of influence (Zol) for each option is defined as the area likely to be altered or changed as a result of the option, resulting in a potential change to the environmental benefits that are currently being provided. To assess the likely temporary impacts from construction within the

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<sup>9</sup> Environment Agency, Natural Resources Wales, Office for Water Services 2023. Guidance, Water resources planning guideline. Available at: <https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline>

<sup>10</sup> Environment Agency 2020. Water resources planning guideline supplementary guidance – Environment and society in decision-making.

ZoI, it has been assumed that below ground infrastructure will require a working width of approximately 10m from the option footprint to facilitate construction, while above ground infrastructure will require a working width of approximately 5m from the option footprint. It is assumed that the natural capital stocks located within the option footprint for above ground infrastructure will be permanently lost as a result of option construction.

### Developing a natural capital baseline

- 2.2.1.2 As part of the NCA of the feasible options within the WRMP, a natural capital baseline has been developed for the entire operational area. This baseline has been developed using open-source data as described in the National Natural Capital Atlas NECR285<sup>11</sup> to generate a natural capital account of the stocks within the Anglian Water region. The list of stocks considered within the accounts and the methodology for mapping them are shown in Appendix A. The methodology used to map natural capital utilises the same breakdown of stocks as the National Natural Capital Atlas where possible. However, the list has been supplemented with additional abiotic stocks and key habitats that are vital to the Anglian Water region such as chalk streams and rivers.
- 2.2.1.3 The natural capital baseline has been used to report the total quantity of each stock within the ZoI for each option.

## 2.3 Stage 2: Option level natural capital assessment

### Natural capital assessment

- 2.3.1.1 A NCA has been undertaken on the supply-side options in accordance with the 'Guidelines' and Enabling a Natural Capital Approach (ENCA)<sup>12</sup> (2020 version) requirements. ENCA is recommended for use by HM Treasury's Green Book: appraisal and evaluation in central government (2020) and represents supplementary guidance to the Green Book.
- 2.3.1.2 The 2020 ENCA guidance includes values within the Asset Databook and Service Databook. Within the Service Databook, the carbon reduction tab includes the Department of Business, Energy and Industrial Strategy (BEIS) (2021) carbon values – a set of values produced by the government to be used in policy appraisal and evaluation. The climate regulation section of the assessment has been updated in line with this.
- 2.3.1.3 The impact of the options on the natural capital stocks was reported for each option quantitatively. This impact was reported for construction and post construction to give an estimation of the impact of the options' whole lifecycle. The results of the stocks assessment were reported in total losses and gains within each option's zone of influence.
- 2.3.1.4 The results of the change in natural capital stocks informed the assessment against the eight ecosystem services metrics listed below using the Natural England logic chains, set out in Figure 2.1.: The cost / benefit assessment was informed by the option type, option description and any embedded mitigation. The outputs of the NCA were compared to the pre-construction provision of impacted services to assess the impact of the options. Five ecosystem services were monetised (subject to the scoping process set out below), and the results of the

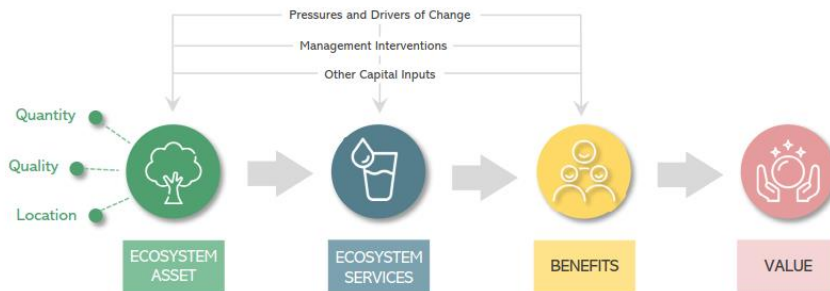
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<sup>11</sup> Natural England 2020. National Natural Capital Atlas: Mapping Indicators. Available at: <https://publications.naturalengland.org.uk/publication/4578000601612288>

<sup>12</sup> Defra 2020. Guidance, Enabling a Natural Capital Approach (ENCA). Available at: <https://www.gov.uk/guidance/enabling-a-natural-capital-approach-enca>

assessment reported as a discreet monetary figure, water purification and water regulation were assessed qualitatively, and biodiversity has been assessed via the Biodiversity 3.0 Metric<sup>13</sup>.

**Figure 2.1: Ecosystem Services valuation logic chain**



Source: Natural England

2.3.1.5 The eight metrics<sup>14</sup> used to assess the impact on natural capital include:

- Carbon sequestration (climate regulation)
- Natural hazard regulation
- Water purification
- Water regulation
- Biodiversity and habitats
- Air pollutant removal
- Recreation & amenity value
- Food production

2.3.1.6 Both natural capital assessment strategies, as outlined in the Guidelines and ENCA guidance, discuss taking a proportionate approach to the assessment. It is therefore important to accommodate this when integrating a natural capital approach within the option development and assessment. A natural capital approach has the potential to inform concept design and aid decision making, by quantifying the relative benefits and disbenefits of the options to aid the initial assessment of the identified strategic solutions.

## 2.4 Ecosystem services methodology

2.4.1.1 During the initial phase of the NCA, the seven ecosystem services listed (excluding Biodiversity and Habitat, assessed by the BNG 3.0 Metric) were reviewed and included or not included in the scope due to the geographical or socio-economic context of the option and its zone of influence. Specific guidance on the scoping process for individual metrics is provided below.

2.4.1.2 The NCA and resulting monetised figures are based on a 2021 price year. The SRO options, Lincolnshire Reservoir 50MCM (usable volume) (169MI/d) (RTN17) and Fens Reservoir 50MCM (usable volume) (44.4MI/d) (FND29), have undergone master planning stages in preparedness

<sup>13</sup> Natural England 2021. ,ARCHIVE SITE for the Biodiversity Metric 2.0, 3.0, 3.1 and the beta test version of the Small Sites Metric 2021. Available at: [https://nepubprod.appspot.com/publication/5850908674228224?\\_sm\\_au\\_=\\_iVVPNqtWD1q4R02FB4M2vK7T FvCft](https://nepubprod.appspot.com/publication/5850908674228224?_sm_au_=_iVVPNqtWD1q4R02FB4M2vK7T FvCft)

<sup>14</sup> The Environment Agency's supplementary guidance on Environment and society in decision-making identifies the following five services to be considered as minimum when developing an assessment: climate regulation, natural hazard regulation, water purification, water regulation, and biodiversity and habitats.

for RAPID Gate 2, and as such are more detailed options. The assessments for these options include the main reservoir, service reservoirs and transfers. The prices used to assess these options were subsequently uplifted to 2022 prices as part of the SRO assessment process. These updated versions of the assessments have been included in the environmental assessment of Plan B.

### Carbon sequestration (climate regulation)

2.4.1.3 The climate regulation metric focuses on carbon sequestration which can be defined as the capture and secure storage of carbon that would otherwise be emitted to, or remain, in the atmosphere. The carbon sequestration NCA will be in addition to construction carbon and operational carbon calculations and provide a holistic assessment of option carbon emissions.

2.4.1.4 The assessment was determined by land management within each option Zol which influence the carbon store for prolonged periods of time and result in changes to net emissions. The estimate of the carbon stocks for each option footprint was based on the area of broad land use types according to literature and research. The estimated carbon stocks for broad habitat types are listed below and the sequestration rates are shown in Table 2.1.

**Table 2.1 Carbon sequestration rates for broad habitat types (JBA Consulting)<sup>15 10</sup>**

Land use type	C Seq rate (tCO <sub>2</sub> e/ha/yr)
Woodland – (deciduous)	4.97
Woodland – (coniferous)	12.66
Arable Land	0.107
Pastoral Land	0.397
Peatland – Undamaged	4.11
Peatland – Overgrazed	-0.1
Peatland – Rotationally burnt	-3.66
Peatland – Extracted	-4.87
Grassland	0.397
Heathland	0.7
Shrub	0.7
Saltmarsh	5.188
Urban	0
Green Urban	0.397

2.4.1.5 The carbon sequestration rates were converted to monetary values using standard methods and the UK Department of BEIS Interim Non-Traded Carbon Values 2021 which sets out a revised approach to valuing greenhouse gas emissions in policy appraisal, following a cross-government review during 2020 and 2021. The 2021 high series value of £367 was used throughout the NCAs. These values are set out in Table 2.2 below, with the £367 value highlighted in bold. The NCA is based on a 2021 price year, however it should be noted that the SRO options Lincolnshire Reservoir 50MCM (usable volume) (169MI/d) (RTN17) and Fens Reservoir 50MCM (usable volume) (44.4MI/d) (FND29) have used updated BEIS values for 2022 to reflect the values used in the corresponding Gate 2 Regulators’ Alliance for Progressing Infrastructure Development (RAPID) submission for these strategic resource options.

<sup>15</sup> Alonso, I., Weston, k., Gregg, r. & Morecroft, M. 2012. Carbon storage by habitat - Review of the evidence of the impacts of management decisions and condition on carbon stores and sources. Natural England Research Reports, Number NERR043.

**Table 2.2: BEIS updated short-term traded sector carbon values for policy appraisal, £/tCO<sub>2</sub>e (£2020)<sup>16</sup>**

Year	Low series	Central series	High series
2020	120	241	361
2021	122	245	<b>367*</b>
2022	124	248	373
2023	126	252	378
2024	128	256	384
2025	130	260	390
2026	132	264	396
2027	134	268	402
2028	136	272	408
2029	138	276	414
2030	140	280	420

### Natural hazard regulation

- 2.4.1.6 Different habitat types have intrinsic flood risk management values by intercepting, storing, and slowing water flows. This is known as natural flood management (NFM) and is listed as a policy within the 25-Year Environment Plan<sup>17</sup>. The capacity of habitats to achieve this was quantified, and then a monetary value assigned based on the damage-costs avoided from flooding or replacement costs due to their capacity to regulate flood waters. The capacity for a given natural capital asset to provide a flood regulation service will depend on two factors:
- Its capacity to slow overland flows
  - Whether the asset is located in an area of flood risk.
- 2.4.1.7 This ecosystem service also applies in urban areas, where vegetation can reduce surface water flooding from heavy rainfall, with benefits to sewerage capacity. Coastal flood risk, which has been predicted to increase with future climate change, is reduced by coastal margin habitats such as saltmarsh.
- 2.4.1.8 Options have been assessed on their ability to positively or negatively impact flood risk through the comparison of pre & post construction natural capital stocks and the catchment in which it is located. The assessment is restricted to catchment areas which drain to downstream communities impacted by flooding. These communities are identified using the Environment Agency’s Indicative Flood Map, which overlays areas at risk of fluvial flooding and the National Receptor Database.
- 2.4.1.9 Reduced flood damage to downstream or coastal settlements as a result of reduced magnitude / frequency of flood / storm events; and / or lower sewer capacity or water storage costs have been valued in line with the “valuing flood regulation services of existing forest cover to inform natural capital accounts” methodology set out by Broadmeadow et al. 2018<sup>18</sup>. This assessment was developed to provide indicative national estimates of water regulation services of woodland to inform natural capital accounts. This is based on modelling to estimate the potential volume

<sup>16</sup> Department for Business, Energy and Industrial Strategy 2021. Valuing greenhouse gas emissions in policy appraisal. Available at: <https://www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal>

<sup>17</sup> Defra 2018. A Green Future: Our 25 Year Plan to Improve the Environment. Available at: <https://www.gov.uk/government/publications/25-year-environment-plan>

<sup>18</sup> Broadmeadow, S., Thomas, H., Nisbet, T. and Valatin, G., 2018. Valuing flood regulation services of existing forest cover to inform natural capital accounts. Forest Research.



of flood water avoided by woodland ecosystems in flood risk catchment. The methodology adopts a replacement-cost (rather than damage cost) approach to valuing the flood regulation service of woodland by applying annualised average capital and operating costs of flood reservoir storage that would be required in the absence of the ecosystem service.

- 2.4.1.10 Central estimate of the average annual costs of reservoir floodwater storage is £0.42 / m<sup>3</sup>. The range is from £0.10 to £1.19 /m<sup>3</sup> per year. The central estimate was used to derive an annual average estimate for the flood regulation service of woodland in Great Britain, which was then uplifted to a 2021 price year. These “replacement costs” can be considered a lower bound of the benefit if it can be assumed that such expenditure would be deemed value for money by the flooding authorities within flood risk catchments in terms of avoided flood damage costs<sup>12</sup>.

### Water purification

- 2.4.1.11 Based on their ecological functioning, different habitat types have varying capacities for absorbing pollutants from a given water source. This service is dependent on the location of the natural capital asset and the nature of the surrounding area. If a natural capital asset has a high capacity to remove pollutants but is not close to a water source, the service will not be provided. Due to this, valuation of the static water purification services of different natural capital assets as part of the NCA was not considered appropriate. A common value for different habitat types could not be applied due to extensive variation in local factors which determine the provisioning of this service.

- 2.4.1.12 To account for the provision of this service within the NCA the impact of an option associated with the provision or removal of woodland and semi-natural grassland was assessed qualitatively and with consideration of the Natural Environment Valuation Online (NEVO)<sup>19</sup> tool. The tool defines the resulting changes for the following water quality variables:

- Dissolved oxygen concentration
- Nitrogen concentration (including organic nitrogen, nitrate, nitrogen dioxide, ammonium)
- Phosphorous concentration (including organic and mineral phosphorous)
- Pesticide concentration (for eighteen different pesticide types)

- 2.4.1.13 This approach follows the methodology that if an area of woodland were to be lost, the resultant impacts on water quality can be quantified within the option's Zol. Any negative changes to the natural capital stocks in theory, reflects the loss of this service within each option's Zol.

- 2.4.1.14 The results of this assessment have informed the SEA assessment and been incorporated within the environmental metrics.

### Water regulation

- 2.4.1.15 Water flow regulation is a key ecosystem service that can be directly impacted by both changes in land use and the implementation of supply options. Land uses such as agriculture are direct consumers of the water supply, while forests are known to promote higher rates of evapotranspiration and infiltration, which can affect local hydrologic cycles and change the amount of available water. The same natural capital stocks that provide the water supply, such as freshwater lakes and rivers, can also provide other services such as recreation and amenity, especially when near residential and urban communities. In addition to land use changes, water resource options both impact and benefit from water flow regulation.

- 2.4.1.16 Supply-side options benefit by abstracting and providing water supply to customers, but they can also have varying effects on existing natural capital stocks, which in turn can affect the

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<sup>19</sup> Luizzo, L., Day, B., Binner, A., Owen, N., Bateman, I., Smith, G., Collings, P., Haddrell, L., Fezzi, C., 2019. Natural Environment Valuation Online Tool - Chapter 6a: Water Quantity & Quality Model

amount of available water. A qualitative assessment has been used to compare the positive and negative effect of each option on water flow regulation. Water regulation has only been considered qualitatively to avoid the potential double accounting of benefits with capacity-based and financial assessments, and to align with Environment Agency supplementary guidance<sup>10</sup> that recommends not including monetisation of water regulation benefits in decision making.

2.4.1.17 The key set out in Table 2.3 below is used to demonstrate the scale of effect caused by the option on the water regulation ecosystem service.

**Table 2.3: Scale of effect key on water regulation ecosystem service**

Colour	Scale of Effect	Description
+++	Major Positive	The option would result in a major improvement to the provision of water flow regulation.
++	Moderate Positive	The option would result in a moderate improvement to the provision of water flow regulation.
+	Minor Positive	The option would result in a minor improvement to the provision of water flow regulation.
0	Neutral	The option would not result in any effects on the provision of water flow regulation.
-	Minor Negative	The option would result in a minor decrease to the provision of water flow regulation.
--	Moderate Negative	The option would result in a moderate decrease to the provision of water flow regulation.
---	Major Negative	The option would result in a major decrease to the provision of water flow regulation.
?	Uncertain	From the level of information available, the effect that the option would have on the provision of water flow regulation is uncertain.

### Air pollutant removal

2.4.1.18 Air pollution presents a major risk to human health, resulting in premature deaths and reduced quality of life. By removing air pollution, habitats help to lessen these impacts on health and wellbeing. The provisioning of the service is positively related to several key aspects:

- The surrounding area of the natural capital assets with regards to background pollution, especially particulate pollutant.
- The quantity and type of natural capital asset, where woodland is the major service provider.
- The density of population potentially benefiting from reduced exposure. Because pollutants are transported, beneficiaries may be downwind of the ecosystem<sup>12</sup>.
- Each option has been scoped against the provision of air pollutant removal according to the location of the option. Air pollutant removal was only considered within built-up areas or when the ZOI includes Air Quality Management Areas. The impact of the option was assessed according to changes in natural capital stocks.

2.4.1.19 The value provided by natural capital assets was taken from the UK government’s air quality economic assessment methodology<sup>20</sup>. The assessment embeds these values (based on the damage cost approach, i.e., damage to health avoided from reductions in air pollution) and estimates the present value automatically based on the quantitative estimates provided.

<sup>20</sup> Jones L., Vieno M., Morton Dan et al. 2019. Developing Estimates For The Valuation Of Air Pollution Removal In Ecosystem Accounts. Final Report For Office Of National Statistics - NERC Open Research Archive.



- 2.4.1.20 Indicative average values for air pollution removal were calculated for different habitat types, using aggregate UK values published in February 2019. These estimates have been uplifted for 2021 and are set out in Table 2.4.
- 2.4.1.21 The value of each habitat was combined with the changes expected in natural capital stocks to provide a value for the change in service provision. The final impact was reported as a single value that was incorporated within the NCA metric.

**Table 2.4 Air pollutant value by habitat type (£2021)**

Habitat group	Value (£ per hectare per year)
Urban woodland	915
Rural woodland	291
Urban grassland	177
Enclosed farmland	17
Coastal margins	31

### Recreation & amenity

- 2.4.1.22 The recreational value of green spaces can be significant. This value reflects both the natural setting and the facilities on offer at the site and often has a strong non-market element. It varies with the type and quality of habitat, location, local population density and the availability of substitute recreational opportunities. Recreational values can be beneficially affected by enhancements in green spaces, or adversely affected by new developments or infrastructure. The wider tourism and outdoor leisure sector are also dependent upon nature to varying degrees.
- 2.4.1.23 This metric depends on the extent to which the natural capital stocks the option provides will enhance the opportunity for recreation.
- 2.4.1.24 The key parameter needed to estimate in this category is the number of additional or enhanced recreational visits created as a result of the option. This has been estimated using the Outdoor Recreation valuation Tool<sup>21</sup> (ORVal). ORVal is referenced in HM Treasury Green Book and consists of a random utility / travel cost model of recreational demand for all sites in England and Wales, generating probabilistic predictions of visitor numbers for any publicly accessible outdoor recreation park, path, or beach. It takes account of scarcity of sites and substitution possibilities, as well as travel distances to sites and their attributes. This model is useful for initial baseline assessment, accounting, and multiple sites. This should be seen as an estimation in the absence of site-specific data on visitor numbers.
- 2.4.1.25 The change in natural capital stocks and the creation or removal of greenspace has been entered into ORVal according to the NCA. The change in visitors and estimated change in value has been reported for each option using the ORVal online tool.

### Food production

- 2.4.1.26 Food, in its various forms, is produced by a range of ecosystems. In some cases, the food for human consumption is provided directly as a benefit of the provisioning service (for example, wild fruit and fish). More often the provisioning service is a raw material (for example, wheat and other crops) that is harvested and processed by humans to produce an added-value product (for example, bread). The boundary between what is provided by natural capital and the contribution

<sup>21</sup> ORVal, Land, Environment Economics and Policy Institute. University of Exeter. Available at: <https://www.exeter.ac.uk/research/leep/research/orval/>

of other forms of capital is often a grey area. For example, crops require agricultural management; livestock depends upon grassland ecosystems<sup>12</sup>.

- 2.4.1.27 Food production has been calculated using the NEVO agricultural model, which is a structural model of agricultural land use and production for Great Britain estimated using Farm Business Survey (2005 – 2011) and June Agricultural Census data. The agricultural land use component in NEVO builds upon the approach developed by Fezzi et al. 2019<sup>22</sup>.
- 2.4.1.28 NEVO has been used to assess the impact of the creation or removal of agricultural land for each option. The change in value of food provision for the footprint of each option has been calculated using this online tool and reported within the NCA metric.

### Price uplifts

- 2.4.1.29 The monetary values used to calculate the quantitative impact on ecosystem services were adjusted using GDP deflators<sup>23</sup> to a consistent price reporting year of 2021. As stated previously, it has been assumed that the BEIS price projections used to value the change in carbon sequestration potential have already been adjusted for inflation, and therefore price projections have not been adjusted.

## 2.5 Biodiversity net gain assessment methodology

- 2.5.1.1 The BNG requirement as outlined in the Guidelines recommends that each WRMP should provide a BNG. The option assessments used the most-up-to-date guidance available at the time to undertake the assessment, which was the Biodiversity Metric 3.0, and to inform the regional plans, this was launched in July 2021 by Defra and Natural England.
- 2.5.1.2 The Metric 3.0 presents significant improvements for measuring and accounting for habitat losses and gains. Firstly, it encourages users to apply the Avoidance and Minimisation stage of the Mitigation Hierarchy to especially avoid and reduce clearance of 'very high' and 'high' distinctiveness habitats. The Metric then incorporates incentives for creating and enhancing both the right type and location of habitats of strategic value for local conservation priorities to help establish or improve ecological networks through rural and urban landscapes. By linking to current and future habitat plans and strategies, including the future Local Nature Recovery Strategies (LNRS), the Metric 3.0 incentivises habitat creation and enhancement in locations of locally strategic value for nature conservation. It also 'rewards' landowners who create or enhance wildlife-rich habitats in advance of development, allowing them to generate more biodiversity units (BUs) from their land. Habitat condition assessment approaches have also been significantly updated and simplified for Metric 3.0 and some key changes made.
- 2.5.1.3 Option assessments have been updated in line with Metric 3.0 for the purposes of reporting. When the update to the metric, Defra's Biodiversity Metric 3.1<sup>24</sup> was released in April 2022, the majority of Anglian Waters' biodiversity net gain assessments had already been completed to feed metrics into WRMP24 modelling deadlines, leaving insufficient time to accommodate the new guidance. Since the update in 2022, the metric has been updated again by Defra's Biodiversity Metric 4.0<sup>8</sup>, released in March 2023. However, the metric available at the time of the assessments has been discussed with the Natural England and is considered appropriate to inform Anglian Water's WRMP24 decision-making process.

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<sup>22</sup> Fezzi, C., Bateman, I., Hadley, D. & Harwood, A. 2019. Natural Environment Valuation Online Tool - Chapter 1: Agriculture Model

<sup>23</sup> HM Treasury 2021. GDP deflators at market prices, and money GDP March 2021 (Budget). Available at: <https://www.gov.uk/government/statistics/gdp-deflators-at-market-prices-and-money-gdp-march-2021-budget>

<sup>24</sup> Biodiversity Metric 3.1: ARCHIVE SITE for the Biodiversity Metric 2.0, 3.0, 3.1 and the beta test version of the Small Sites Metric ([naturalengland.org.uk](http://naturalengland.org.uk))

- 2.5.1.4 The Defra Biodiversity Metric 3.0 is the recommended approach for the assessments. As proposed in the Environment Act 2021<sup>25</sup>, BNG must be measured using the Statutory Biodiversity Metric published by the Secretary of State in accordance with the Statutory Metric User Guide. The Metric essentially underpins the Environment Act's provisions for a minimum 10% BNG, in numerical terms, in England, subject to any necessary adjustments for application to Nationally Significant Infrastructure Projects (NSIPs) in late 2025. The Metric, when used as a tool in the design and long-term management plans for BNG, is to be based on sound ecological principles. The Act (Section 103, clause 40A) further specifies the requirement of biodiversity reports to include quantitative data relating to biodiversity<sup>25</sup>, and is to be aligned with guidance on mandatory BNG published by Natural England; the BNG Good Practice Principles and the British Standard on BNG<sup>26</sup> (BS8683).
- 2.5.1.5 Biodiversity net gain or net loss must be considered at both the option-level and for WRMP24 as a whole. Each option should look to achieve the minimum 10% BNG and exceed that minimum, which should be included in the option cost. Ecological mitigation should be considered in parallel for each option and should also be included in the option cost. The Environment Agency supplementary guidance<sup>27</sup> states that if there would be a significant additional cost for an option to get significant extra benefit, this could be included as a separate option for consideration.
- 2.5.1.6 A biodiversity baseline of each option has been estimated from open-source spatial data sets of habitats inventories (see Table A.1) alongside a series assumptions (Chapter 2.7 below). The natural capital account has been used to identify the biodiversity value of the footprint of each option prior to construction. The post construction land use including agreed mitigation has been used to calculate the post development biodiversity score of the predicted biodiversity unit outcomes from the development.
- 2.5.1.7 As this assessment has been carried out using only open-source data, a precautionary approach has been applied, presuming that where not specifically known, habitats will be assigned the moderate habitat score. This is recommended as a suitable methodology for this stage of the WRMP option development, absent habitat survey data.

## 2.6 Opportunities

- 2.6.1.1 Opportunities for the options to enhance natural capital and biodiversity were considered following the NCA and BNG assessments, utilising the data and results to inform on the most appropriate potential opportunities for enhancements and wider benefits.
- 2.6.1.2 The BNG assessments will be revisited as option design is further developed, and detailed mitigation and enhancement opportunities will be developed further to achieve the 10% BNG required to deliver the options. Where possible, the options will aim to apply the mitigation hierarchy for avoidance and reduction of habitat loss, especially to avoid impacting upon irreplaceable habitats. Following that, the options will aim to not only reinstate lost habitat, but provide a greater or more diverse habitat than is lost, resulting in an overall net gain in biodiversity, aligning with the regulatory requirements for BNG (at the time of the project consenting), the Metric trading rules, and the mandatory requirement within the Environment Act 2021. Opportunities for achieving BNG will be informed by specific BNG requirements in Local Plans, in Local Nature Recovery Strategies, and in other local strategic nature conservation priorities to align with the respective requirements of the local planning authorities (LPAs).

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<sup>25</sup> Environment Act 2021. [legislation.gov.uk](https://www.legislation.gov.uk). Available at: <https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted>

<sup>26</sup> British Standard on BNG: BS 8683 Process for designing and implementing Biodiversity Net Gain | BSI ([bsigroup.com](https://www.bsigroup.com))

<sup>27</sup> Defra, Guidance (2023). Available at: [Green Book supplementary guidance: climate change and environmental valuation - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/118442/green-book-supplementary-guidance-climate-change-and-environmental-valuation-2023.pdf)

Further detail, including an overarching Biodiversity Net Gain Roadmap, is set in Chapter 4.4 below.

## 2.7 Stage 3: Reporting of results

2.7.1.1 The changes in natural capital stocks have been reported for each option with the results of the ecosystem services scoping and detailed assessment, summarised in Appendix B. The monetised ecosystem services metrics have been aggregated into a single metric that has been used to inform decision-making. The impacts of each option against the individual ecosystem services metrics have been reported to allow for further analysis and optimisation. The results for each option have been summarised in a proforma that will demonstrate the results of the assessment and the justification behind the assessment.

2.7.1.2 The results of the NCA and BNG assessments have been incorporated into Anglian Water's decision-making process through the conversion of the results into metrics as described below:

- **Ecosystem Service (£) metric:** derived from the NCA, a single discreet monetised value reported in £/year generated by combining the outputs of each of the five monetised ecosystem services to provide a single cost / benefit figure.
- **Biodiversity Net Gain metric:** Two metrics were developed, which when combined provided an overall value for the estimated *BNG Total Terrestrial units required to deliver 10% BNG*. This estimate is based on the units required to achieve a 10% biodiversity net gain for each option according to the Biodiversity Metric, using the indicative BNG assessment. The two metrics were:
  - **Unmitigated loss of habitat units**, a value generated where the strategic design of supply-side options indicated a loss of terrestrial habitat units compared to the baseline; resulting in a combined value of the total terrestrial habitat units for all selected options in a portfolio
  - **Estimated Net Gain in terrestrial habitat units over baseline after delivery**, an estimation – based on 10% of the baseline terrestrial habitat units – of the additional habitat units that would be required to deliver 10% net gain for all selected options in a portfolio
- The NCA and Biodiversity metrics have informed the selection of options for the Anglian Water WRMP24. The results of the NCA and BNG assessments for the options identified in Plan B have been presented in Section 3. Following updates to the Guidelines in 2023, Anglian Water has estimated the cost per habitat unit to derive the wider costs associated with delivering 10% BNG as part of the WRMP24 and presents these cost estimates in the WRMP24 Decision Making Technical Supporting document. The estimated change in habitat units resulting from each option have been presented in this report, while the estimated costs of delivering 10% BNG have been estimated separately to inform the decision-making process.

## 2.8 Assumptions and Limitations

2.8.1.1 The methodology for the NCA has been developed in line with Defra's ENCA guidance, as set out in Chapter 2.4, above. The methodology for calculating biodiversity net gain has been developed using Defra and Natural England's Biodiversity metric, as set out in Chapter 2.5 of this report. The assumptions set out below in relation to these assessments have been developed to align with the stated guidance as far as possible and are considered to be reasonable and proportionate given the level of construction and design detail available at the time of reporting. Separate assumptions have been provided for the Biodiversity Net Gain Roadmap set out in Chapter 4.4, which are specific to that methodology. The following assumptions have been used within the NCA and BNG assessments in this report:

#### 2.8.1.2 For NCAs:

- The costs for constructing, operating, and maintaining the options was not considered within the assessments.
- Natural capital stocks identified within the areas allocated for above ground infrastructure have been assumed to be completely lost as a result of the option construction.
- Natural capital stocks presumed temporarily lost are expected to be reinstated/compensated.

#### 2.8.1.3 For BNG Assessments:

- No enhancement of habitat post construction was considered, apart from where this has been explicitly included in the option description/design, for example as part of the SRO Gate 2 designs. BNG habitat units were calculated by the Biodiversity Metric of the pre-construction land use according to the habitats estimated to be present within each option's zone of influence derived from open-source data. The post construction land use, including agreed mitigation, was used to estimate the post-development biodiversity habitat units.
- The desk-based assessment was carried out using open-source data. As such, a precautionary approach was applied, presuming that where not specifically known, habitats were assigned as moderate quality. Habitat identification will need to be refined with habitat survey data at later stages of design to refine the accuracy of the BNG calculations for each option.
- The desk-based assessment was carried out using open-source data. The baseline map does not include the location of hedgerows. Therefore, hedgerow units have not been included at this stage. Industry best practice, including the use of directional drilling where possible, is assumed to mitigate and avoid the majority of temporary adverse effects on identified watercourses. Habitat identification will need to be refined with habitat survey data at later stages of design to refine the accuracy of the BNG calculations for each option.
- The duration of disturbance and timeline for habitat creation has not been included in the assessment. Durations of disturbance, including proposals for creating habitats in advance of disturbance, will need to be refined with greater design detail at later stages to refine the accuracy of the BNG calculations for each option.
- Habitats are assumed to have a low/no strategic significance for the baseline and post development due to the limitation of the open data used to capture this information.
- There is no inclusion of the riparian zone (within 10m of the watercourse) in the watercourse BNG assessments.
- The open-source data used for watercourse assessments does not include canals, ditches, culverts and primary habitat hence there is a likelihood of underestimation of watercourse net losses, as the majority of watercourses have been categorised within the Biodiversity Metric as 'Other Rivers and Streams'.

## 3 NCA and BNG Assessment Results

- 3.1.1.1 The NCA and BNG outputs for the scoped-in options of Plan B are summarised in Appendix B. The results should be read in conjunction with the full list of Plan B options that have been scoped-in and scoped-out for assessment are presented in Table 1.1 and Table 1.2, respectively. Mitigation has only been considered when outlined in the option description, or where standard mitigation must be applied.
- 3.1.1.2 A summary of the tables provided in Appendix B, as well as the general content of each table is set out below:
- Table Table B. 1 shows the predicted impacts on natural capital during and post construction.
  - Table B.2 summarises the predicted monetised impacts to the provision of ecosystem services scoped in for detailed assessment.
  - Table B. 3 summarises the predicted qualitative impacts to the provision of water purification for the options scoped-in for assessment.
  - Table B.4 shows the unmitigated BNG outputs for the options which have been informed using the predicted permanent impacts on natural capital in Table Table B. 1.
  - **Note:** At this stage the BNG only takes account of reinstatement, not re-provision or additional habitat creation unless outlined in the option's description.
- 3.1.1.3 Some stocks reported in Table Table B. 1 (Appendix B) are expected to be permanently lost. All woodland and high-level stocks are expected to be reinstated onsite or offsite through re-planting schemes. These natural capital stocks include:
- Coastal and floodplain grazing marsh
  - Ancient woodland \*this habitat is presumed irreplaceable once lost and therefore should be avoided
  - Orchards and top fruit \*this habitat are presumed irreplaceable once lost and therefore should be avoided
  - Lowland fens
  - Hay meadows
  - Broadleaved, mixed and yew woodland
  - Coniferous woodland
  - Woodland priority habitat
  - Urban woodland
  - Greenspace
- 3.1.1.4 The overall effect of WRMP24 on NCA and BNG from the supply-side options assessed in this chapter is presented in Chapter 4.



## 4 Overall WRMP24 NCA and BNG Findings

### 4.1 Introduction

4.1.1.1 The final stage of the NCA and BNG assessments is the assessment of the overarching Plan B findings to inform Anglian Water's WRMP24 programme appraisal, this has been undertaken by producing a cumulative effects assessment of the plan.

4.1.1.2 This Section provides a summary of the outputs of the cumulative effects assessment for both the NCA and BNG finding for Plan B's options, set out in Table 1.1.

### 4.2 Methodology

4.2.1.1 The cumulative effects assessment for the options within Plan B considers the intra-plan effects of the NCAs as a whole and estimates the habitat units that would be required to deliver a 10% BNG in ways that meet the Biodiversity Metric's trading rules. For the NCA, the stocks that are likely to be temporarily and permanently impacted by the options in Plan B have been totalled to present an overall change in stocks resulting from the plan (Table 4.1). The resulting impacts on ecosystem services from each option assessment were similarly totalled to present the overall change in service provision (Table 4.2 and 4.3), and therefore the methodologies, including the assumptions and limitations, set out in Chapter 2, underpin the cumulative effects calculations.

4.2.1.2 The cumulative effects assessment for estimating BNG aligns with recent Defra guidance proposed as part of the consultation on BNG regulations and implementation<sup>28</sup>. For phased developments, the guidance requires an overarching strategy and supporting information for how BNG will be delivered across the whole site on a phase-by-phase basis, which will include a requirement for biodiversity net gain plans to be approved prior to the commencement of each phase<sup>29</sup>. The cumulative effects assessment identifies the likely impacts on biodiversity across the phased delivery of Plan B and estimates the quantity of BUs that would need to be delivered to achieve the 10% BNG. Where possible, the design of Plan B will be further refined and developed to not only reinstate lost habitat, but also provide a greater or more diverse habitat than is lost, to ensure an overall net gain that aligns with regulatory requirements for BNG (at the time of the project consenting) as set out in the Environment Act 2021. The latter could be achieved by identifying local sites of ecological interest and proposing measures which enhance these features, in collaboration with LPAs.

4.2.1.3 The methodology outlined above was replicated in undertaking the cumulative effects assessment for Plan A, B, C and D, which are presented in Anglian Water's WRMP24 Environmental Report.

### 4.3 Cumulative effects assessment results

#### Natural Capital & Ecosystem Services Assessment

4.3.1.1 The natural capital stocks that are likely to be temporarily and permanently impacted by Plan B as a whole have been presented in Table 4.1 below. Plan B is likely to generate both a gain and

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<sup>28</sup> Defra 2022. Consultation on Biodiversity Net Gain Regulations and Implementation. Available at: [https://consult.defra.gov.uk/defra-net-gain-consultation-team/consultation-on-biodiversity-net-gain-regulations/supporting\\_documents/Consultation%20on%20Biodiversity%20Net%20Gain%20Regulations%20and%20Implementation\\_January2022.pdf](https://consult.defra.gov.uk/defra-net-gain-consultation-team/consultation-on-biodiversity-net-gain-regulations/supporting_documents/Consultation%20on%20Biodiversity%20Net%20Gain%20Regulations%20and%20Implementation_January2022.pdf)

<sup>29</sup> Defra 2023. Consultation outcome, Government response and summary of responses. Available at: <https://www.gov.uk/government/consultations/consultation-on-biodiversity-net-gain-regulations-and-implementation/outcome/government-response-and-summary-of-responses>

loss of natural capital stocks during construction. Those habitats that are temporarily lost and that are expected to be reinstated and/or compensated to pre-construction conditions following best practice techniques will likely have no permanent impact to the provision of ecosystem services.

- 4.3.1.2 The various types of woodland habitat, including broadleaved, mixed, yew, priority woodland, coniferous, and urban woodland, have a significant maturity time with an approximate delay of 30 years. This delay is considered within the potential future provision of this stock through the ecosystem services assessment. This delay in maturity time is partially accounted by the tree mortality rate presumed after woodland areas are replanted.
- 4.3.1.3 Construction impacts include the release of CO2 due to habitat clearance, loss of natural hazard regulation, a reduction in food production services, a reduction in recreational and amenity services, and a reduction in water purification services. Like the option-level assessments, the carbon sequestration rates were converted to monetary values using standard methods and the BEIS interim non-traded carbon values. It is important to note that the 2022 carbon values were used for the cumulative effects assessment, set out in Table 4.2 and Table 4.3. There is some change anticipated in water flow regulation, as shown in Table 4.3, however the overall change is expected to bring additional water flow regulation to the environment due to the addition of two reservoirs.
- 4.3.1.4 Plan B presents an opportunity to improve the existing habitats through post construction remediation and replacement of low value habitats with higher value habitats. Plan B's options cross several Natural England habitats and Network Enhancement Zones and is therefore suitable for the planting of new high value habitats.

**Table 4.1: Predicted unmitigated temporary and permanent unmitigated impacts on natural capital stocks for Plan B**

Natural capital stock	Stocks within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Active Flood Plain	199.52	148.31	59.00	-43.52
Ancient Woodland	0.28	0	0.09	-0.19
Arable	3477.44	227.78	2855.01	-622.43
Beach	2.26	0.00	2.26	0.00
Broadleaved, Mixed and Yew Woodland	3.04	0.03	3.01	-0.03
Coastal floodplain grazing marsh	29.81	6.10	27.15	-2.66
Coniferous Woodland	6.22	0.00	6.15	-0.07
Greenspace	1.94	0.00	1.94	0.00
Hay Meadows	1.41	0.00	1.41	0.00
Lakes and Standing Waters	6.22	2.29	2.80	-3.42



Natural capital stock	Stocks within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Lowland Fens	0.91	0.00	0.91	0.00
Modified Waters (Reservoirs)	0.11	0.11	917.86	917.75
Mudflats	0.03	0.00	0.03	0.00
Orchards and Top Fruit	0.25	0.00	0.00	-0.25
Other Semi-Natural Grasslands	4.43	0.00	7.09	2.66
Pastoral	666.23	1.12	217.06	-449.17
Ponds and linear features	25.31	18.07	18.07	-7.24
Rivers (length)	20.49	14.66	17.85	-2.64
Saltmarsh	0.10	0.00	0.10	0.00
Sand Dunes	1.98	0.00	1.98	0.00
Shallow Subtidal Sediment	3.04	0.00	3.04	0.00
Urban Semi Natural Habitat	0.09	0.00	0.09	0.00
Urban Woodland	0.13	0.00	0.13	0.00
Woodland Priority Habitat	17.19	0.29	14.81	-2.38

**Table 4.2: Monetised assessment of the unmitigated predicted permanent impacts of Plan B's options on the provision of ecosystem services**

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Carbon storage	£301,225.67	£9,691.55	-£291,534.12	£191,338.05	-£109,887.62
Natural hazard regulation	£2,570.03	£32.20	-£2,537.83	£1,726.64	-£843.10
Air Pollutant Removal	£2,445.67	£0.00	-£2445.67	£2,183.45	-£262.21
Recreation & amenity value*	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£11,122,691.80	£10,565,344.34	-£552,975.23	£10,565,344.34	-£557,347.47
Total	£11,428,933.17	£10,575,068.09	-£849,492.85	£10,760,592.48	-£668,340.40

\*Recreation & amenity service scoped-out as no Plan B options result in the permanent loss of greenspace. See ecosystem service scoping methodology set out in Section 2.4 for further detail.

**Table 4.3: Qualitative assessment of the unmitigated predicted impacts of Plan B's options on the provision of water purification and water regulation**

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
<b>Water purification</b>				
Plan B	<p>Scoped in as the option causes the temporary and permanent loss of associated stocks. Some stock is expected to be replaced/compensated through inset re-planting schemes. However broadleaved/ coniferous/ priority/ urban woodland have significant maturity time with a delay of 30 years. As a result, the potential provision of these stocks will be reduced. Ancient Woodland is a high value natural capital stock that cannot be replaced or replicated once lost, therefore, future provision of stock presumed permanently lost.</p>	<p>The provision of services will be lost during construction.</p>	<p>The future provision of the ecosystem service provided by the stock will likely be reduced.</p>	<p>The provision of water purification provided by the stock will likely be reduced due to the option. Future provision of ecosystem services provided by Ancient Woodland will be permanently lost as it is a high value natural capital stock that cannot be replaced or replicated once lost.</p>
<b>Water regulation</b>				
Plan B	<p>The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The loss of stocks will increase negative impacts to the ecosystem service.</p>	<p>The provision of water flow regulation services of contributing stocks will be lost during construction. However, the addition of a reservoir will bring additional water flow regulation to the environment.</p>	<p>The loss of contributing stocks has the potential to impede water flow on site. The addition of a reservoir will regulate flows, control water movement and maintain water supplies in dry periods, enabling a resilient supply of water to consumers, however the loss of existing stocks will require a further WFD assessment at the project level and suitable measures will be proposed at this stage. As such, the impact of the</p>	<p>?</p>

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
			option on water flow regulation cannot be assessed at this stage.	

**Biodiversity net gain**

4.3.1.5 Plan B achieves a predicted onsite increase of approximately 7% in habitat units above the baseline however indicates a permanent loss approximately 170ha of habitat area due to construction of above ground infrastructure. Plan B achieves a predicted decrease of approximately 13% in river units below the baseline, despite the predicted positive effects of the reservoir schemes included within the plan. Definitive rules on the function of BNG in the consenting of individual infrastructure projects contained in the WRMP are not yet available; as such, we have assumed this requirement will apply for the whole of the WRMP24 planning period (2025-2050). To ensure the delivery of biodiversity net gain, we have developed a BNG Roadmap (outlined in Chapter 4.4 below), setting out the additional off-site habitat units and river units required to meet and exceed the minimum 10% BNG (based on the Environment Act) that is being implemented for planning permissions from November 2023. It should be noted that this requirement will similarly apply to options within Plan B that may be subject to separate consenting processes, such as the SROs. Plan B’s predicted increase of approximately 7% in habitat units above the baseline on-site is largely driven by the habitat areas created by the delivery of Lincolnshire Reservoir 50MCM (usable volume) (169MI/d) (RTN17) . It is noted that ancient woodland has been excluded from BNG calculations as this habitat is classed as irreplaceable once lost and which would have been negatively impacted by the options. Subtidal habitats have similarly not been included within the calculations, however, would not have been negatively impacted by the options.

4.3.1.6 Note that the BNG assessments to support the SRO Gate 2 reporting for both Lincolnshire Reservoir 50MCM (usable volume) (169MI/d) (RTN17) and Fens Reservoir 50MCM (usable volume) (44.4MI/d) (FND29) were undertaken using different assumptions to the approach outlined in Section 2.5, for example in assigning strategic significance to specific habitats. However, the individual Biodiversity Metric calculations have been combined for Plan B and included in the totals presented in Table 4.4 below.

**Table 4.4 Summary of the unmitigated Biodiversity Metric 3.0 estimates for Plan B**

	Estimate on-site baseline (biodiversity units)	Estimated on-site post intervention (biodiversity units)	Total estimated net unit change (biodiversity units)	Total estimated percentage change	Estimated BNG biodiversity unit requirement to achieve BNG
Habitats	10,758.08	11,496.67	738.59	6.87%	337.22
Rivers	245.28	213.60	-31.68	-12.88%	55.96

4.3.1.7 The predicted increase of approximately 7% in habitat units above the baseline and the predicted decrease of approximately 13% in river units below the baseline reported within Table 4.4 above reflects the cumulative change in habitat and river units on-site across all Plan B options to understand the likely impacts and overall performance of the plan without detailed mitigation or enhancement measures. However, this does not reflect the overall aim of the plan which is to achieve a minimum of 10% net gain.

- 4.3.1.8 The proposed Defra guidance<sup>28</sup> suggests that the BNG strategy will need to consider how to achieve the BNG objective across the whole site and to demonstrate how this will be delivered on a phase-by-phase basis. The Defra guidance sets out key elements to be considered when developing the BNG strategy, including:
- The key principles that will be followed to ensure BNG commitments are achieved through subsequent detailed design.
  - How BNG delivery will be tracked on a phase-by-phase basis, including the target percentage gains to be delivered at each stage. For most phased developments, the guidance intent is to state that biodiversity gains should be ‘frontloaded’ into earlier stages. This will help to avoid the risk of net losses being caused by later stages being delayed or cancelled.
  - The approach to be taken in the event that subsequent phases do not proceed or fail to achieve their BNG targets.
  - That the pre-development biodiversity value for the whole site will be agreed as part of the framework plan and used as the basis for agreeing the detailed proposals.
  - A mechanism to link the framework plan to subsequent applications pursuant to the approved development.
- 4.3.1.9 The guidance recognises that phased developments delivered across multiple stages, will require flexibility to accommodate changes over time, particularly where development is delivered over a long period.
- 4.3.1.10 Anglian Water will have a Voluntary AMP8 Natural Capital Performance Commitment to achieve a minimum of 10% Biodiversity Net Gain (BNG) against measured losses of biodiversity on Anglian Water-owned land. It will apply to habitats measured by area (ha) and length (km), covering hedgerows and lines of trees that are affected by construction and nature conservation land management. This commitment will go beyond the statutory BNG commitment due to become mandatory in November 2023.
- 4.3.1.11 The measures for delivering BNG for each option will be developed at project-level, adhering to the latest BNG guidance, and aligned within the context of the wider portfolio of options. To achieve this, Anglian Water are developing a BNG Strategy which will enable strategic and effective delivery of projects across the business. This goes beyond future public water supply options (like those included in this plan) to also include the operation and maintenance of existing Anglian Water sites, which includes assets related to both drinking water and wastewater.
- 4.3.1.12 The BNG Strategy will:
- Identify opportunities to avoid and minimise impacts on existing habitats through further refinement of option design,
  - Identify opportunities to create and enhance habitats, both on-site where the losses have occurred and off-site,
  - Link these opportunities with national and local strategic priorities for conserving and enhancing biodiversity.
- 4.3.1.13 The BNG Strategy will highlight a series of strategic areas, with high potential for biodiversity creation and enhancement, guiding the delivery of BNG across the region.
- 4.3.1.14 These strategic areas will be targeted and proposals created, to ensure the best outcomes can be achieved for biodiversity and the wider environment.
- 4.3.1.15 This strategy will be used as a foundation when developing the options within the WRMP24 and will ensure that Anglian Water achieves a minimum of 10% net gain across its whole plan. The

underlying principles of the forthcoming BNG Strategy have been set out in Chapter 4.4 below as a preliminary BNG Roadmap, illustrating how the BNG Strategy will be applied to the delivery of the WRMP24 options.

## 4.4 Opportunities

### Plan B Roadmap to achieve Biodiversity Net Gain

- 4.4.1.1 As a first step toward achieving BNG, an assessment was undertaken to estimate change in habitat units for each option and then for all options together (see Chapter 3, Appendix B and Chapter 4.3 above).
- 4.4.1.2 There were limitations to the assessment, including the exact type and condition of habitats on site, the construction programme for the options, and which options are under mandatory BNG. While the limitations reflect the early stages of Plan B, the assessment provides the information to develop this Roadmap.
- 4.4.1.3 This Roadmap sets out key steps for Plan B to achieve BNG in ways that contribute toward strategic conservation priorities and generate wider environmental benefits including carbon sequestration and climate resilience. It also provides high-level modelling of the habitat creation required for BNG to inform planning and programming for the delivery of BNG.
- 4.4.1.4 This Roadmap is comprised of:
- Integrating the Biodiversity Net Gain Good Practice Principles
  - Designing wildlife-rich, carbon-rich and climate resilient habitats
  - Planning for habitat creation requirements for BNG

### Integrating the Biodiversity Net Gain Good Practice Principles

- 4.4.1.5 The 'Biodiversity Net Gain: Good Practice Principles for Development'<sup>30</sup> are the cornerstone for development to achieve BNG. There are ten principles (referred to as the 'BNG Principles') and these are applied all together as one approach.
- 4.4.1.6 The BNG assessment (see Chapter 3, Appendix B and Chapter 4.3 above) embeds the BNG Principles, and the first stage of this Roadmap is to continue to integrate the BNG Principles within the design and implementation of Plan B. In particular, core project documentation shall reference both the BNG target and the BNG Principles, and BNG reports shall describe implementation of the BNG Principles to-date with any barriers or constraints faced and the best resolution that could be implemented.
- 4.4.1.7 While all BNG Principles are applied as one approach, those that are particularly important for Plan B are:
- Apply the Mitigation hierarchy - Identifying irreplaceable, Very High Distinctiveness and High Distinctiveness habitats on or nearby the options shall be undertaken as soon as possible, for example by targeted site-surveys using the information collated for this BNG assessment. Avoiding negative impacts on these habitats shall be prioritised and considered upfront and early within the programme.
  - Contribute towards nature conservation - BNG shall be designed in ways that contribute towards local nature conservation priorities, such as those in LPA's Local Plans and Local Nature Recovery Strategies. This especially regards any core BNG Delivery Sites, for which the location of these sites and the created and/or enhanced habitats on the sites shall aim to generate strategically important outcomes for nature conservation, see Box 1 below.

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<sup>30</sup> [Biodiversity-Net-Gain-Principles.pdf \(cieem.net\)](#)

- Optimise sustainability - BNG shall be designed in ways that achieve the net gain outcomes as well as wider environmental benefits. For Plan B, this especially regards links between BNG and climate change (please see the following Section on designing wildlife-rich, carbon-rich and climate resilient habitats) and, by utilising the NCA and BNG assessments, adopting a Nature-based solution approach, see Box 1 below.

#### Box 1: Core BNG Delivery Sites for Plan B

It is understood that the establishment of core BNG Delivery Sites for Plan B is being considered. The number of sites, their location, and the habitat creation/enhancement measures on these sites shall be planned on the basis of:

- Taking a Nature-based solution approach by considering the wider landscape and catchment area, and how the location and design of BNG Delivery Sites can be a 'solution' that meets Anglian Water's requirements. For example, so that BNG Delivery Sites help to regulate water flow and improve water quality within the catchment.
- Meeting specific BNG requirements of the selected options. For example, the type and number of habitat units that are required to meet the trading rules of the Biodiversity Metric and being within appropriate distances of the options.
- Planning for BNG delivery beyond Plan B, especially by developing an overarching biodiversity plan for each site with iterative metric calculations showing how habitat units will be generated as habitats establish and develop through natural successional processes.
- Designing habitat creation and enhancement that are ecologically and environmentally appropriate for each site, with built-in climate resilience measures, especially to protect newly establishing habitats from drought during the summer and excess water during the winter.
- Locating the site where habitat creation and enhancement to achieve BNG for the options also aim to generate strategically important outcomes for nature conservation including bigger, better and more joined-up networks of habitats and ecological stepping stones.

### Designing wildlife-rich, carbon-rich and climate resilient habitats

#### Wildlife-rich BNG habitats

- 4.4.1.8 Designs to create and enhance wildlife-rich habitats for BNG on Plan B shall be based on sound ecological principles and shall be feasible and ecologically appropriate for the site and surrounds. This includes designing BNG habitats that are of a sufficient size for their intended ecological function, such as stepping stones, and can thrive given environmental conditions on-site such as soil types and drainage.
- 4.4.1.9 To support this, the BNG design deliverables for Plan B shall include a Biodiversity Metric calculation together with an accompanying landscape design (and associated design outputs e.g., planting schedules) and long-term BNG management and monitoring plans. There shall also be dedicated BNG handovers from design to construction and from construction to operation.

#### Increasing carbon sequestration

- 4.4.1.10 It is widely acknowledged that society faces a joint climate and biodiversity crisis, whereby tackling one cannot be successful without tackling the other. Under mandatory BNG, there is a change in habitats when (by following the mitigation hierarchy) some habitats are cleared for a development and other habitats are created or enhanced to achieve BNG outcomes. As

habitats sequester carbon and act as carbon sinks in the landscape, BNG will affect carbon sequestration and the presence of carbon sinks.

- 4.4.1.11 For Plan B, change in carbon sequestration rates of habitats under BNG shall be assessed utilising a practical and pragmatic approach. The carbon assessment shall inform BNG designs, with the aim that BNG has an overall neutral impact on carbon sequestration rates as a minimum and, where possible, increases carbon sequestration, over the duration of BNG.

#### **Being resilient to climate change**

- 4.4.1.12 Mandatory BNG is for a minimum of 30 years. Over this time, extreme weather events will increase in frequency and severity, and there will be a change in climate conditions to warmer, wetter winters and to hotter, drier summers. It is critical that climate resilience measures are integrated into the design and long-term management and monitoring plan for BNG.
- 4.4.1.13 Climate projection data shall be obtained for BNG sites in order to assess climate risks to the proposed BNG habitats, and then integrate climate resilience measures into BNG designs. The aims shall be to boost long-term resilience of the BNG-habitats and then for the resilient BNG habitats to boost resilience of nearby assets and the surrounding landscape.

#### **Planning for habitat creation requirements for BNG**

- 4.4.1.14 The BNG assessment (see Chapter 3, Appendix B and Chapter 4.3 above) estimates change in habitat units for each option and then for all options together at this early stage of Plan B. Building on this assessment and using the Biodiversity Metric, modelling was undertaken to estimate the type and amount (in hectares and km) of off-site habitat creation that could be required to achieve BNG. The aims were three-fold: to identify the key focus for avoiding and reducing clearance especially of high distinctiveness habitats; to enable planning, budgeting and programming of any off-site BNG requirements; and, to inform the location and design of any core BNG delivery sites.
- 4.4.1.15 The modelling was undertaken for all options in one Biodiversity Metric calculation, specifically to demonstrate how the minimum 10% increase in habitat units could be achieved by meeting the metric's trading rules. It should be noted that the modelling has been presented to demonstrate a route by which to achieve the minimum 10% net gain, but this modelling will need to be iteratively refined throughout the option development and delivery process, as habitat survey data becomes available at later stages of design, and as additional opportunities for delivering biodiversity net gain across the strategy are identified. The following assumptions were made to inform the modelling:
- Off-site BNG delivery would commence in the same year as habitat loss on-site for the options (with the Metric's advance/delay function set to zero years).
  - For area-based habitats:
    - Off-site baselines would be modified grassland in poor condition of low strategic significance.
    - Off-site BNG delivery would be within the same LPA as the associated options.
    - The modelling was based on habitat creation to a target condition of moderate.
  - For rivers
    - Off-site baselines would be 'other rivers and streams' in poor condition.
    - River BNG would be achieved by enhancing the watercourse condition to good.
    - Off-site BNG delivery would be in the same catchment as the associated options.
- 4.4.1.16 To note that this modelling only represents a high-level estimate of the off-site BNG delivery requirements.



### Area-based habitats

- 4.4.1.17 For all options, the assessment showed a predicted onsite increase of approximately 7% in habitat units above the baseline, and an estimated requirement of 338 habitat units to achieve the minimum 10% BNG.
- 4.4.1.18 Some of these units could result from enhancing retained habitats on site. Opportunities to enhance the distinctiveness and condition of retained habitats as part of BNG delivery shall be reviewed in the context of what will be feasible and realistic for the 30-year duration of BNG and given on-site operational requirements.
- 4.4.1.19 A target condition of moderate was assumed for on-site habitat creation. Other units to achieve BNG could result from maximising the target condition if feasible and realistic for the 30-year duration of BNG given on-site operational requirements.
- 4.4.1.20 If off-site BNG delivery for the 338 habitat units is required, the selection of high distinctiveness habitats was necessary for the modelling to meet the metric’s trading rules.
- 4.4.1.21 From the modelling, an estimated total off-site baseline of 996 hectares with the approximate ratios of habitat creation shown in Table 4.5 would be required to achieve the minimum 10% BNG in ways that meet the Biodiversity Metric’s trading rules. This represents the approximate total area of off-site BNG delivery for all options. In practice, off-site BNG delivery could be achieved in key sites nearby the selected options. From this modelling, there was an estimated gain of 663 habitat units that resulted in an overall estimated 13.02% BNG for Plan B that met the Metric’s trading rules.

**Table 4.5: Estimated off-site BNG delivery requirements for area-based habitats**

Broad Habitat Type	Estimated area (ha) required
Grassland – Lowland Calcareous Grassland	300
Grassland – Floodplain Wetland Mosaic	300
Grassland – Traditional Orchards	50
Woodland and Forest – Lowland Mixed Deciduous Woodland	300
Lakes	16
Intertidal sediment	30
<b>TOTAL</b>	<b>996</b>

### Rivers

- 4.4.1.22 The assessment estimated an approximate 32 river units would be required to achieve BNG of ‘other river and streams’ which is a high distinctiveness habitat. If off-site BNG delivery is required, the modelled showed that approximately 20km of enhancements of ‘other rivers and streams’ from poor to good condition would be required. This could generate an estimated 60 river units that would achieve an overall 11.34% of river net gain for the Plan B in ways that meet the metric’s trading rules. It is noted that the river BNG assessment is likely an under-estimation because of the limitations of the data available for this assessment.
- 4.4.1.23 It is to be noted that this is a high-level BNG roadmap which will require further iterations upon finalisation of Plan B.

### Mitigation and Enhancement Opportunities

- 4.4.1.24 To deliver BNG against the principles set out in the BNG Roadmap above, opportunities will be considered to ensure that the natural environment is left in a better condition than pre-construction conditions for Plan B. This will be achieved by one or both of the following:



- **Mitigation:** Opportunities to avoid and minimise the net loss of biodiversity asset(s) and/or natural capital stock(s) (ecosystem service).
- **Enhancements:** Opportunities that, once introduced and established, would result in a net gain to a biodiversity asset and/or natural capital stock(s) (ecosystem service).

4.4.1.25 Any habitats that are created or enhanced to achieve BNG are required to be secured for a minimum of 30 years, through management, maintenance, and monitoring. The natural capital map which is based on the methodology described in the NECR28 (see Chapter 2) should be utilised, where possible, to assist in identifying opportunities to improve habitats and natural capital.

4.4.1.26 A summary of the potential mitigation and enhancement opportunities for each sub-component type of Plan B are outlined in Table 4.6. Further explanation into the potential enhancement measures is provided below the table.

**Table 4.6 Summary of potential mitigation and enhancement opportunities**

Option element	Mitigation opportunity	Enhancement opportunity
All option elements	Option layouts to be amended to avoid the permanent loss of high value natural capital assets that once lost, cannot be easily reinstated. Assets include ancient woodland and traditional orchards.	Creation of higher value habitat within grassland, arable and pasture natural capital assets onsite to achieve an increase in biodiversity units (BU) and work towards a 10% uplift in BNG.
	Options to identify area for the creation and/or reinstatement of high value natural capital assets, including: <ul style="list-style-type: none"> <li>● Coastal and floodplain grazing marsh</li> <li>● Lowland fens</li> <li>● Lowland raised bog</li> <li>● Reedbeds</li> <li>● Blanket bog</li> <li>● Hay meadows</li> <li>● Dwarf shrub heath</li> <li>● Broadleaved, mixed and yew woodland</li> <li>● Coniferous woodland</li> <li>● Blue space</li> <li>● Greenspace</li> </ul>	Habitat creation work within the adjacent priority habitats. Options fall within or are in the vicinity of habitat network zones <sup>31</sup> : <ul style="list-style-type: none"> <li>● Habitat restoration-creation</li> <li>● Restorable habitat</li> <li>● Fragmentation action zone</li> <li>● Network enhancement zones 1 and 2</li> <li>● Expansion zone</li> </ul> These areas identify specific locations for a range of actions to help improve the ecological resilience for each of the habitats/habitat networks. The options should look to identify habitat network zones and priority habitats within the near vicinity and look to improve/create/restore habitats which would help to work towards increasing BU and work towards a 10% uplift in BNG.
	Construction practices to be considered to reduce the amount of clearance required for, especially in areas that include high value natural capital assets (see above for list).	Increase the quality/quantity of freshwater assets, including lakes, ponds located in designated SSSIs, pending detailed assessment of local conditions and available space.
	Directional drilling to be used where possible to avoid loss of high value natural capital assets (see above for list).	Options to identify suitable areas offsite for the creation, enhancement and/or restoration in order to develop off-site net gains, working towards achieving a 10% uplift in BNG.

<sup>31</sup> Edwards J, Knight M, Taylor S & Crosher I. E (May 2020) 'Habitat Networks Maps, User Guidance v.2', Natural England

Option element	Mitigation opportunity	Enhancement opportunity
	Not applicable	Identify areas of local peatland restoration.
Option elements located along canals	Not applicable	Possibly create man-made floating wetland islands, enabling plants and microbes to form and attract wildlife both above and below the water's surface and create biochemical and physical processes to improve things such as water quality.
Wastewater treatment works, abstraction and treatment works, and other option elements that contain above ground infrastructure	Not applicable	Seeding of grassland within footprints of the above ground infrastructure, where possible.

4.4.1.27 Overall habitat creation and enhancement possibilities to support achieving a 10% BNG include:

- On-site: Improve the existing habitats on-site through post construction remediation and replacement of low BNG value habitats with higher BNG value habitats
- Off-site: Purchase suitable areas of off-site land within the local area and/or at a regional scale to offset BNG by improving the existing habitats within the off-site land and/or by replacing existing low-value habitats with higher BNG value habitats off-site.
- On-site and off-site: Improve existing habitats and/or replacement of low BNG value habitats with higher BNG value habitats as part of the catchment management options.

4.4.1.28 It is important that, where possible, Anglian Water will begin engaging with local non-government organisation and planning authorities who may potentially be able to carry out BNG both on-site and off-site. Early engagement may help provide further insight on local opportunities for enhancement, how this can be achieved, local priorities and limiting factors. Furthermore, Anglian Water will consider engaging with local conservation projects to carry out BNG on-site.

4.4.1.29 Under the mandatory net gain scheme, as a last resort when on-site and local off-site provision of habitat cannot deliver the BNG required, developers can achieve BNG via a new statutory biodiversity credits scheme. However, the BNG Roadmap outlined above will help Anglian Water achieve the mandatory 10% BNG.

# 5 Conclusions

## 5.1 Overall Conclusion

5.1.1.1 The NCA, BNG and ecosystem services outputs of Plan B identified the following:

- **Natural Capital & Ecosystem Services Assessment:** Plan B options will cause the temporary and permanent loss of natural capital stocks. Plan B is likely to permanently impact approximately 0.19ha of Ancient & Semi-Natural Woodland which is an irreplaceable habitat. Plan B is also likely to impact a small area of orchards and top fruit stocks (0.25ha), as well as pasture and arable stocks, coastal floodplain grazing marsh, lakes and standing waters, ponds, rivers, coniferous woodland, and broadleaved, mixed and yew woodland. Plan B will deliver over 900 hectares of reservoir habitat, primarily through the delivery of the two SROs. Anglian Water should seek to avoid and reduce the level of impact of the proposed development on these irreplaceable habitats, through well planned construction techniques of the buried pipelines.
- Plan B presents opportunities to improve the existing habitats along the route through post construction remediation and the replacement of low value habitats with higher value habitats. The potential permanent loss of ancient woodland, orchards and top fruit, active flood plain, rivers, woodland priority habitat, arable and pastoral habitat could result in the permanent loss of several ecosystem services that the stock provides in synergy, including carbon sequestration, natural hazard regulation, air pollution removal, recreation & amenity value, and food production. The potential permanent loss of arable and pastoral stock could result in the permanent loss of food production.
- **Biodiversity net gain:** Plan B is likely to result in a gain of 13.02% habitat BNG and 11.34% river BNG due to the mitigation, enhancement and creation of 'like-for-like' and 'like-for-better' habitats detailed in the BNG Roadmap. Plan B indicates a permanent loss of approximately 170ha of habitat area due to construction of above ground infrastructure. Mitigation and enhancement opportunities across the selected supply options have been suggested within Section 4.4, which can work in tandem to ensure a net gain in biodiversity and introduce an overall environmental net gain.

## 5.2 Next Steps

5.2.1.1 The opportunities identified in the NCA and BNG assessments for Plan B have the potential to contribute to government ambitions for environmental net gain. This could take the form of habitat compensation, creation and/or species relocation schemes. Any options would need to be taken forward based on a comprehensive understanding on the interaction between natural systems and between natural systems and social uses of land. The natural capital and ecosystem service benefits that will be delivered with each option will contribute to the wider environmental benefits that will be delivered through the WRMP24. An example of these benefits would include returning water to the natural environment through the environmental destination, which is outlined in greater detail in the Environmental Report.

5.2.1.2 Plan B, through the BNG Roadmap, could consider some opportunities to create and improve habitat on-site and off-site through local schemes, nature recovery networks and wildlife corridors in order to achieve and exceed 10% BNG and increase the provision of ecosystem services, therefore aiding in developing more resilient options for the future provision of water for the Anglian WRMP24.

# A. Natural Capital Stocks and Mapping Methodology

## A.1 Natural capital stocks and mapping methodology

Broad Natural Group	Subgroup	Mapping Methodology
Freshwater	Active flood plain	Areas at high or medium risks within the Environment Agency (EA)'s Risk of Flooding from Rivers and Sea dataset.
	Blanket Bog	Area of blanket bog mapped using Natural England's Priority Habitat Inventory.
	Chalk Rivers*	Mapped using the EA chalk rivers dataset and mapping intersections with OS watercourse polygons
	Coastal and floodplain grazing marsh	Area of coastal floodplain and grazing marsh mapped using Natural England's Priority Habitat Inventory
	Lakes and standing waters	Area of lakes and reservoirs mapped using the Centre for Ecology and Hydrology (CEH)'s UK Lakes Portal dataset.
	Lowland Fens	Area of lowland fens mapped using Natural England's Priority Habitat Inventory.
	Lowland raised bog	Area of lowland raised bog mapped using Natural England's Priority Habitat Inventory
	Modified waters e.g., reservoirs	Area of reservoirs mapped by selecting Ordnance Survey (OS) surface water polygons (Vector Map District) that coincide with CEH's Inventory of UK reservoirs (points).
	Other semi-natural habitats	Area of other semi-natural habitat mapped using Natural England's Priority Habitat Inventory (including upland and lowland grasslands, heathland, and saltmarsh).
	Ponds and ditches	Mapped by selecting surface water bodies (from OS Vector Map District) that do not intersect rivers, are smaller than 2ha in size.
Mountain, Moor and Heath	Reedbeds	Area of reedbed habitat mapped using NE's Priority Habitat Inventory
	Rivers	Length of rivers mapped using EA's Water Framework Directive (WFD) river water bodies dataset (cycle 1, to include coastal streams
	Blanket bog	Area of blanket bog mapped using Natural England's Priority Habitat Inventory.
	Dwarf shrub heath	Mapped using Natural England's Priority Habitat Inventory ('fragmented heath', 'lowland heathland' and 'upland heathland')
	Inland rock, scree and pavement (AML*)	Area of inland rock and limestone pavement above the moorland line, mapped using CEH's LCM2015 ('inland rock'), Natural England's Priority Habitats Inventory ('limestone pavement') and the Rural Payment Agency (RPA)'s Moorland Line dataset.
	Lakes and Reservoirs	Area of lakes and reservoirs above the moorland line, mapped using CEH's UK Lakes dataset, CEH's Inventory of UK reservoirs dataset and RPA's Moorland Line dataset.
	Mountain heath and willow scrub	Area of mountain heath and willow scrub mapped using Natural England's Priority Habitat Inventory.
	Rivers (AML)	Length of rivers mapped using EA's WFD river water bodies dataset and RPA's Moorland Line dataset.
	Semi-natural grassland (AML*)	Area of semi-natural grassland above the moorland line, mapped using Natural England's Priority Habitat Inventory and RPA's moorland line dataset.

Broad Natural Group	Subgroup	Mapping Methodology
	Upland flushes fens and swamps	Area of upland flushes, fens and swamps, mapped using Natural England's Priority Habitat Inventory.
	Wood pasture (AML*)	Area of wood pasture above the moorland line, mapped using Natural England's provisional Wood-Pasture and Parkland BAP Priority Habitat Inventory and RPA's Moorland line dataset.
	Woodland (AML*)	Area of woodland above the moorland line, mapped using FC's National Forest Inventory and RPA's moorland line dataset.
Urban	Blue space	Mapped by intersecting OS Vector Map District Surface Water with the Office for National Statistic (ONS)'s Built-Up areas dataset.
	Green space - not semi-natural	Area of urban green space (not semi-natural), mapped using the OS Open Greenspace Layer.
	Open mosaic habitats	Area of open mosaic habitats on previously developed land, mapped using Natural England's draft Open Mosaic Habitat dataset
	Woodland, scrub, and hedge	While urban scrub and hedge are difficult to map at a national scale, the area of urban woodland is mapped here by intersecting FC's National Forest Inventory with ONS Built-Up Areas.
	Semi-natural habitats	Mapped by intersecting Natural England's Priority Habitat Inventory habitats (excluding woodland, good quality semi-improved grassland and traditional orchards) with ONS Built-Up Areas.
	Farmland	Arable and rotational leys
Horticulture		Area of arable and rotational leys, and horticulture individually, this map shows the area of arable, and horticulture combined. Mapped using CEH's Land Cover Map 2015 (LCM2015).
Improved grassland		Area of improved grassland mapped using CEH's LCM2015.
Orchards and top fruit		Area of orchards and top fruit mapped using Natural England's Priority Habitat Inventory ('traditional orchards')
Woodland	Ancient Woodland	Mapped using Natural England's Ancient Woodland dataset.
	Broadleaved, mixed and yew woodland	Mapped using FC's National Forest Inventory.
	Coniferous woodland	Area of coniferous woodland mapped using FC's National Forest Inventory
	Woodland priority habitats	Mapped using Natural England's Priority Habitat Inventory ('deciduous woodland').
Grasslands	Hay meadows	Area of hay meadow mapped using Natural England's Priority Habitat Inventory ('upland meadow' and 'lowland meadow').
	Other semi-natural grasslands	Area of other semi-natural grassland, mapped using Natural England's Priority Habitat Inventory ('upland calcareous', 'lowland calcareous', 'lowland dry acid', 'good quality semi-improved', 'grass moorland' and 'purple moor grass and rush pasture').
Coastal	Beach	Area of beach mapped using OS Vector Map District ('foreshore'). Note that this dataset includes areas of intertidal sediment as well as beaches.
	Coastal lagoons	Area of coastal lagoons mapped using Natural England's Priority Habitat Inventory ('saline lagoons').

Broad Natural Group	Subgroup	Mapping Methodology
	Mudflats	Area of intertidal mudflats mapped using the EMODnet (Natural England) Intertidal Mudflats dataset.
	Salt marsh	Area of saltmarsh mapped using EA's Saltmarsh Extent dataset.
	Sand dunes	Area of sand dunes mapped using Natural England's Priority Habitat Inventory ('coastal dunes')
	Sea Cliff	Area of sea cliff habitat mapped using Natural England's Priority Habitat Inventory ('maritime cliff and slopes').
	Shingle	Area of shingle mapped using Natural England's Priority Habitat Inventory ('coastal vegetated shingle').
Marine	Intertidal rock	Area of intertidal rock mapped using Natural England's Open Marine Evidence Base (EUNIS code A1).
	Maerl beds	Area of maerl beds mapped using Natural England's Open Marine Evidence Base (EUNIS code A5.51).
	Reefs	Area of potential reefs mapped using JNCC's Potential Appendix 1 Reefs
	Sea grass beds	Area of seagrass beds mapped using Natural England's Open Marine Evidence Base (EUNIS code A2.61)
	Shallow subtidal sediment	Area of shallow subtidal sediment mapped using JNCC's UK Sea Map 2018 (biozone = shallow circalittoral or infralittoral and substrate = sediment, sand, or mud).
	Shelf subtidal sediment	Area of shelf subtidal sediment mapped using JNCC's UK Sea Map 2018 (biozone = deep circalittoral and substrate = sediment, sand, or mud).
	Subtidal rock	Area of subtidal rock mapped using JNCC's UK Sea Map 2018 (substrate = rock).
Soils	Nutrient Status of Soil	Mean estimates of total nitrogen concentration in topsoil (0-15cm depth) - % dry weight of soil, mapped using data produced from Natural England and CEH's 'Mapping Natural Capital' project (2016).
	Soil Carbon/Organic Matter	Mean estimates of carbon density in topsoil (0-15cm depth) – tonnes per hectare, mapped using data produced from Natural England and CEH's 'Mapping Natural Capital' project (2016)
	Soil Biota	Mean estimates of total abundance of invertebrates in topsoil (0-8 cm depth), mapped using data produced from Natural England and CEH's 'Mapping Natural Capital' project (2016)
Indicators of condition	Natural Aquifer Function	Area of groundwater catchment with 'good' quantitative status for WFD 2016, mapped using EA's WFD data and groundwater catchment boundaries (C2).
	Naturalness of Flow Regime	The WFD hydrological regime classification describe the naturalness of river flows. This map shows the length of river with 'high' WFD hydrological status in 2016, mapped using EA's WFD data and river water bodies (C2)
	Lack of Physical Modifications of Water Bodies	Lack of physical modification of rivers, mapped using EA's Reasons for Not Achieving Good Status data (SWMI = 'physical modification'), 2013-2016.
	Presence and Frequency of Pollinator Food Plants	Mean estimates of number of nectar plant species for bees per 2x2m plot, mapped using data produced from Natural England and CEH's 'Mapping Natural Capital' project (2016)
	Chemical status of water bodies	River chemical status for WFD 2016, mapped using EA's WFD data and river water bodies (C2)

\* The list of natural capital stocks as described in NERC285 have been supplemented with additional abiotic stocks and key habitats that are vital to the Anglian region.

## B. NCA and BNG Assessment Results

B.1.1.1 A summary of what is included within each table is as follows:

- Table Table B. 1 shows the predicted impacts on natural capital during and post construction.
- Table B.2 summarises the predicted monetised impacts to the provision of ecosystem services scoped in for detailed assessment.
- Table B. 3 summarises the predicted qualitative impacts to the provision of water purification for the options scoped-in for assessment.
- Table B.4 shows the unmitigated BNG outputs for the options which have been informed using the predicted permanent impacts on natural capital in Table Table B. 1.
- **Note:** At this stage the BNG only takes account of reinstatement, not re-provision or additional habitat creation unless outlined in the option’s description.

**Table B. 1 Predicted impacts on natural capital stocks**

Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Ruthamford South to Cambridge Water potable transfer (50 MI/d) (CAM4)				
Arable	32.15	0.00	32.15	0.00
Pastoral	2.64	0.00	2.64	0.00
Orchards and Top Fruit	0.02	0.00	0.00	-0.02
Other Semi-Natural Grassland	0.26	0.00	0.26	0.00
Broadleaved, Mixed and Yew Woodland	0.13	0.00	0.13	0.00
Coniferous Woodland	0.002	0.00	0.002	0.00
Woodland Priority Habitat	0.41	0.00	0.41	0.00
Active Flood Plain	3.77	3.77	3.77	0.00
Rivers (length)	0.48	0.48	0.48	0.00
Pond & Linear Features	<0.01	<0.01	<0.01	0.00
Lincolnshire East to Lincolnshire Central potable transfer (29 MI/d) (LNC25)				
Arable	84.41	59.97	59.97	-24.44
Broadleaved, Mixed and Yew Woodland	0.06	0.00	0.06	0.00
Active Flood Plain	5.54	3.91	3.91	-1.63
Rivers (length)	0.10	0.10	0.10	0.00
Ponds and linear features	0.52	0.26	0.26	-0.26
Essex Central to Essex South potable transfer (10MI/d) (EXS3)				
Arable	11.27	0.00	11.27	0.00
Pastoral	2.40	0.00	2.40	0.00



Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Broadleaved, Mixed and Yew Woodland	0.40	0.00	0.40	0.00
Woodland Priority Habitat	0.66	0.00	0.66	0.00
Coniferous Woodland	0.39	0.00	0.39	0.00
Ancient Woodland	0.07	0.00	0.00	-0.07
Active Flood Plain	0.19	0.19	0.19	0.00
Rivers (length)	0.07	0.07	0.07	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
Lakes and Standing Waters	<0.01	<0.01	<0.01	0.00
<b>Marham abstraction relocation (FND22)</b>				
Coastal and Floodplain Grazing Marsh	0.22	0.00	0.22	0.00
Lowland Fens	0.01	0.00	0.01	0.00
Arable	12.73	0.00	12.73	0.00
Pastoral	0.77	0.00	0.77	0.00
Other semi-natural grassland	0.10	0.00	0.10	0.00
Coniferous Woodland	<0.01	0.00	<0.01	0.00
Active Flood Plain	10.44	10.44	10.44	0.00
Rivers (length)	0.46	0.46	0.46	0.00
Ponds and linear features	0.48	0.48	0.48	0.00
<b>Lincolnshire East Groundwater enhancement (LNE11)</b>				
Arable	0.40	0.00	0.00	-0.40
<b>Norwich and the Broads to Aylsham potable transfer (3 MI/d) (NAY1)</b>				
Coastal and Floodplain Grazing Marsh	0.68	0.00	0.68	0.00
Arable	23.95	0.00	23.95	0.00
Pastoral	4.95	0.00	4.95	0.00
Broadleaved, Mixed and Yew Woodland	0.07	0.00	0.07	0.00
Woodland Priority Habitat	0.76	0.00	0.76	0.00
Greenspace	0.12	0.00	0.12	0.00
Urban Semi-Natural Habitat	<0.01	0.00	<0.01	0.00
Active Flood Plain	1.02	1.02	1.02	0.00
Rivers (length)	0.03	0.03	0.03	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
<b>Fenland to Norfolk Bradenham potable transfer (50 MI/d) (NBR6)</b>				

<b>Natural capital stock</b>	<b>Stocks present within option Zol pre-construction (Ha)</b>	<b>Stocks present within option Zol during construction (Ha)</b>	<b>Stocks present within option Zol post construction (Ha)</b>	<b>Change (Ha)</b>
Coastal and Floodplain Grazing Marsh	0.73	0.00	0.73	0.00
Lowland Fens	0.33	0.00	0.33	0.00
Arable	59.08	0.00	59.08	0.00
Pastoral	1.47	0.00	1.47	0.00
Broadleaved, Mixed and Yew Woodland	0.26	0.00	0.26	0.00
Woodland Priority Habitat	3.35	0.00	3.35	0.00
Coniferous Woodland	0.31	0.00	0.31	0.00
Active Flood Plain	3.18	3.18	3.18	0.00
Rivers (length)	0.37	0.37	0.37	0.00
Ponds and linear features	0.03	0.03	0.03	0.00
<b>Suffolk Thetford to Norfolk East Harling potable transfer (5 MI/d) (NEH3)</b>				
Lowland Fens	0.11	0.00	0.11	0.00
Arable	20.05	0.00	20.05	0.00
Pastoral	4.53	0.00	4.53	0.00
Other semi-natural grassland	0.06	0.00	0.06	0.00
Broadleaved, Mixed and Yew Woodland	0.67	0.00	0.67	0.00
Woodland Priority Habitat	0.50	0.00	0.50	0.00
Coniferous Woodland	1.86	0.00	1.86	0.00
Active Flood Plain	0.29	0.29	0.29	0.00
Rivers (length)	0.06	0.06	0.06	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
<b>Norfolk East Harling to Norfolk Harleston potable transfer (5 MI/d) (NHL4)</b>				
Arable	44.66	0.00	44.66	0.00
Pastoral	3.05	0.00	3.05	0.00
Hay Meadows	0.01	0.00	0.01	0.00
Broadleaved, Mixed and Yew Woodland	0.01	0.00	0.01	0.00
Woodland Priority Habitat	0.17	0.00	0.17	0.00
Coniferous Woodland	0.01	0.00	0.01	0.00
Active Flood Plain	3.78	3.78	3.78	0.00
Rivers (length)	0.43	0.43	0.43	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
<b>Norfolk Bradenham to Norwich and the Broads potable transfer (20 MI/d) (NTB10)</b>				
Coastal and Floodplain Grazing Marsh	0.66	0.00	0.66	0.00

Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Lowland Fens	0.01	0.00	0.01	0.00
Arable	102.83	0.00	102.83	0.00
Pastoral	8.19	0.00	8.19	0.00
Other Semi-Natural Grassland	0.08	0.00	0.08	0.00
Broadleaved, Mixed and Yew Woodland	0.56	0.00	0.56	0.00
Woodland Priority Habitat	3.02	0.00	3.02	0.00
Coniferous Woodland	2.00	0.00	2.00	0.00
Ancient Woodland	0.19	0.00	0.09	-0.10
Greenspace	0.06	0.00	0.06	0.00
Active Flood Plain	0.54	0.54	0.54	0.00
Rivers (length)	0.55	0.55	0.55	0.00
Ponds and linear features	0.36	0.36	0.36	0.00
Suffolk East groundwater enhancement (SUE23)				
Coastal and Floodplain Grazing Marsh	0.13	0.00	0.00	-0.13
Pastures	1.01	0.00	0.00	-1.01
Active Flood Plain	0.10	0.00	0.00	-0.10
Suffolk Sudbury to East Suffolk potable transfer (5 MI/d) (SUE24)				
Arable	10.26	0.00	10.26	0.00
Broadleaved, Mixed and Yew Woodland	0.05	0.00	0.05	0.00
Woodland Priority Habitat	0.05	0.00	0.05	0.00
Greenspace	0.01	0.00	0.01	0.00
Cambridge Water to Cambs and West Suffolk (50 MI/d) (SWC8)				
Coastal and Floodplain Grazing Marsh	0.32	0.00	0.32	0.00
Arable	82.35	0.00	82.35	0.00
Pastoral	12.20	0.00	12.20	0.00
Broadleaved, Mixed and Yew Woodland	0.01	0.00	0.01	0.00
Woodland Priority Habitat	0.27	0.00	0.27	0.00
Coniferous Woodland	0.30	0.00	0.30	0.00
Ancient Woodland	0.01	0.00	0.00	-0.01
Greenspace	0.39	0.00	0.39	0.00
Active Flood Plain	9.37	9.37	9.37	0.00
Rivers (length)	0.64	0.64	0.64	0.00
Ponds and linear features	0.08	0.08	0.08	0.00
Suffolk West & Cambs groundwater relocation (SWC13)				

Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Arable	10.27	0.00	10.27	0.00
Pastoral	0.20	0.00	0.20	0.00
Active Flood Plain	0.20	0.20	0.20	0.00
Rivers (length)	0.10	0.10	0.10	0.00
EXS19 (Colchester Reuse direct to Ardleigh Reservoir (no additional treatment) (11.4MI/d up to 2039, 13.9MI/d after 2039))				
Coastal and Floodplain Grazing Marsh	1.27	0.00	1.27	0.00
Arable	3.35	0.00	3.35	0.00
Pastoral	9.73	0.00	7.05	-2.68
Broadleaved, Mixed and Yew Woodland	0.04	0.00	0.04	0.00
Woodland Priority Habitat	0.18	0.00	0.18	0.00
Active Flood Plain	1.37	1.08	1.08	-0.29
Rivers (length)	0.02	0.02	0.02	0.00
Modified Waters (Reservoirs)	0.11	0.11	0.11	0.00
Mudflats	0.03	0.00	0.03	0.00
SUT5 (Norfolk Bradenham to Suffolk Thetford potable transfer (15 MI/d))				
Coastal and Floodplain Grazing Marsh	0.85	0.00	0.85	0.00
Arable	54.71	0.00	54.71	0.00
Pastoral	4.58	0.00	4.58	0.00
Other Semi Natural Grassland	1.10	0.00	1.10	0.00
Broadleaved, Mixed and Yew Woodland	0.17	0.00	0.17	0.00
Woodland Priority Habitat	0.20	0.00	0.20	0.00
Coniferous Woodland	0.15	0.00	0.15	0.00
Active Flood Plain	2.38	2.38	2.38	0.00
Rivers (length)	0.32	0.32	0.32	0.00
Ponds and linear features	0.08	0.08	0.08	0.00
LNN1 (Lincolnshire Central to Lincolnshire Retford and Gainsborough potable transfer (3MI/d))				
Arable	38.64	0.00	38.64	0.00
Pastoral	0.38	0.00	0.38	0.00
Woodland Priority Habitat	1.15	0.00	1.15	0.00
Ancient Woodland	0.01	0.00	0.00	-0.01
Greenspace	<0.01	<0.01	<0.01	0.00
Rivers (length)	0.10	0.10	0.10	0.00
Ponds and linear features	0.03	0.03	0.03	0.00

Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
<b>NED2 (Norfolk Bradenham to Norfolk East Dereham potable transfer (10 MI/d))</b>				
Arable	17.31	0.00	17.31	0.00
Pastoral	0.36	0.00	0.36	0.00
Greenspace	0.07	0.00	0.07	0.00
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Woodland Priority Habitat	0.06	0.00	0.06	0.00
Active Flood Plain	0.53	0.53	0.53	0.00
Rivers (length)	0.07	0.07	0.07	0.00
Ponds and linear features	<0.01	<0.01	<0.01	0.00
<b>NNC4 (Norfolk East Dereham to North Norfolk Coast potable transfer (10 MI/d))</b>				
Coastal and Floodplain Grazing Marsh	1.46	0.00	1.46	0.00
Lowland Fens	0.44	0.00	0.44	0.00
Arable	29.49	0.00	29.49	0.00
Pastoral	8.55	0.00	8.55	0.00
Hay Meadows	0.29	0.00	0.29	0.00
Other Semi-Natural Grasslands	0.76	0.00	0.76	0.00
Broadleaved, Mixed and Yew Woodland	0.20	0.00	0.20	0.00
Woodland Priority Habitat	0.32	0.00	0.32	0.00
Greenspace	0.07	0.00	0.07	0.00
Active Flood Plain	0.08	0.08	0.08	0.00
Rivers (length)	0.23	0.23	0.23	0.23
Ponds and linear features	0.01	0.01	0.01	0.00
<b>SHB9 (South Humber Bank Non-potable desalination (60 MI/d))</b>				
Coastal and Floodplain Grazing Marsh	1.34	0.00	1.34	0.00
Arable	0.72	0.00	0.72	0.00
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Woodland Priority Habitat	0.25	0.00	0.25	0.00
Active Flood Plain	50.75	30.00	30.00	-20.75
Lakes and Standing Waters	0.02	0.02	0.02	0.00
Rivers (length)	0.05	0.05	0.05	0.00
Ponds and linear features	0.58	0.58	0.58	0.00
Beach	1.13	0.00	1.13	0.00

Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Saltmarsh	0.05	0.00	0.05	0.00
Sand Dunes	0.99	0.00	0.99	0.00
Shallow Subtidal Sediment	1.52	0.00	1.52	0.00
<b>FND29 ( Fens Reservoir 50 MCM (useable volume) (44.4 MI/d))</b>				
Coastal and Floodplain Grazing Marsh	13.03	6.10	11.09	-1.97
Lowland fens	0.01	0.00	0.01	0.00
Arable	1070.47	28.37	1014.18	-56.29
Pastoral	520.87	00.00	123.52	-397.35
Orchards and top fruit	0.16	0.00	0.00	-0.16
Other Semi-Natural Grassland	0.00	00.00	1.10	1.10
Greenspace	0.16	0.02	0.16	0.00
Coniferous Woodland	0.26	0.00	0.19	-0.07
Active floodplain	4.05	1.25	4.05	0.00
Lakes and Standing Waters	5.90	1.97	2.48	-3.42
Rivers (length)	4.36	2.77	3.33	-1.03
Modified Waters (Reservoirs)	0.00	0.00	438.02	438.02
Ponds and linear features	11.09	3.85	7.07	-4.02
<b>EXS10 (Holland on Sea desalination (seawater) (26 MI/d))</b>				
Coastal and Floodplain Grazing Marsh	2.20	0.00	2.20	0.00
Arable	63.97	58.17	58.17	-5.80
Pastoral	6.66	0.00	6.66	0.00
Other Semi-Natural Grassland	0.33	0.00	0.33	0.00
Woodland Priority Habitat	0.01	0.00	0.01	0.00
Greenspace	0.08	0.00	0.08	0.00
Active Flood Plain	3.55	3.55	3.55	0.00
Rivers (length)	0.63	0.63	0.63	0.00
Ponds and linear features	0.08	0.06	0.06	-0.02
<b>LNB1 (Ruthamford North to Bourne potable transfer (20 MI/d))</b>				
Arable	17.80	0.00	17.80	0.00
Pastoral	0.11	0.00	0.11	0.00
Broadleaved, Mixed and Yew Woodland	0.01	0.00	0.01	0.00
Woodland Priority Habitat	0.14	0.00	0.14	0.00
Coniferous Woodland	0.01	0.00	0.01	0.00

Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Active Flood Plain	8.38	8.38	8.38	0.00
Lakes and Standing Waters	0.01	0.01	0.01	0.00
Rivers (length)	0.47	0.47	0.47	0.00
Ponds and linear features	0.14	0.14	0.14	0.00
LNC16 (Ruthamford North to Lincolnshire Central potable transfer (20 MI/d))				
Arable	124.20	0.00	124.20	0.00
Pastoral	2.62	0.00	2.62	0.00
Broadleaved, Mixed and Yew Woodland	0.01	0.00	0.01	0.00
Woodland Priority Habitat	0.14	0.00	0.14	0.00
Coniferous Woodland	0.01	0.00	0.01	0.00
Active Flood Plain	9.48	9.48	9.48	0.00
Lakes and Standing Waters	0.01	0.01	0.01	0.00
Rivers (length)	0.58	0.58	0.58	0.00
Ponds and linear features	0.30	0.30	0.30	0.00
LNC28 (Bulk trade agreement – River Trent (7 MI/d))				
Coastal and Floodplain Grazing Marsh	2.21	0.00	2.21	0.00
Arable	27.24	0.00	27.24	0.00
Pastoral	0.25	0.00	0.25	0.00
Active Flood Plain	17.76	17.76	17.76	0.00
Rivers (length)	0.25	0.25	0.25	0.00
Ponds and linear features	0.08	0.08	0.08	0.00
LNE6 (Mablethorpe desalination Seawater (50 MI/d))				
Coastal and Floodplain Grazing Marsh	1.34	0.00	1.34	0.00
Arable	0.72	0.00	0.72	0.00
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Woodland Priority Habitat	0.25	0.00	0.25	0.00
Active Flood Plain	50.75	30.00	30.00	-20.75
Lakes and Standing Waters	0.02	0.02	0.02	0.00
Rivers (length)	0.05	0.05	0.05	0.00
Ponds and linear features	0.58	0.58	0.58	0.00
Beach	1.13	0.00	1.13	0.00
Saltmarsh	0.05	0.00	0.05	0.00



Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Sand Dunes	0.99	0.00	0.99	0.00
Shallow Subtidal Sediment	1.52	0.00	1.52	0.00
NTB17 (Bacton desalination (seawater) (25 MI/d))				
Coastal and Floodplain Grazing Marsh	0.26	0.00	0.26	0.00
Arable	61.73	54.45	54.45	-7.28
Pastoral	1.42	0.00	1.42	0.00
Broadleaved, Mixed and Yew Woodland	0.07	0.00	0.07	0.00
Woodland Priority Habitat	1.06	0.00	1.06	0.00
Coniferous Woodland	0.21	0.00	0.21	0.00
Greenspace	0.21	0.00	0.21	0.00
Urban Semi Natural Habitat	0.09	0.00	0.09	0.00
Urban Woodland	0.13	0.00	0.13	0.00
Active Flood Plain	1.24	1.24	1.24	0.00
Rivers (length)	0.27	0.27	0.27	0.00
Ponds and linear features	0.05	0.05	0.05	0.00
NWY1 (Norwich and the Broads to Norfolk Wymondham potable transfer (5 MI/d))				
Coastal and Floodplain Grazing Marsh	0.61	0.00	0.61	0.00
Lowland Fens	<0.01	<0.01	<0.01	0.00
Arable	21.77	0.00	21.77	0.00
Pastoral	1.02	0.00	1.02	0.00
Orchards and Top Fruit	0.07	0.00	0.00	-0.07
Other Semi-Natural Grassland	0.50	0.00	0.50	0.00
Broadleaved, Mixed and Yew Woodland	<0.01	<0.01	<0.01	0.00
Woodland Priority Habitat	0.01	0.00	0.01	0.00
Greenspace	0.07	0.00	0.07	0.00
Active Flood Plain	0.46	0.46	0.46	0.00
Rivers (length)	0.12	0.12	0.12	0.00
Ponds and linear features	0.01	0.00	0.01	0.00
RTN30 (Lincolnshire Central to Ruthamford North potable transfer (75 MI/d))*				
Coastal and Floodplain Grazing Marsh	1.07	0.00	1.07	0.00
Arable	20.35	0.00	20.35	0.00
Pastoral	0.40	0.00	0.40	0.00

Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Broadleaved, Mixed and Yew Woodland	<0.01	0.00	<0.01	0.00
Woodland Priority Habitat	<0.01	0.00	<0.01	0.00
Active Flood Plain	3.53	3.53	3.53	0.00
Rivers (length)	0.27	0.27	0.27	0.00
Ponds and linear features	0.04	0.04	0.04	0.00
RTS24 (Ruthamford North to Ruthamford North potable transfer)				
Coastal and Floodplain Grazing Marsh	0.23	0.00	0.23	0.00
Arable	55.58	0.00	55.58	0.00
Pastoral	5.53	0.00	5.53	0.00
Broadleaved, Mixed and Yew Woodland	0.02	0.00	0.02	0.00
Woodland Priority Habitat	0.04	0.00	0.04	0.00
Coniferous Woodland	0.02	0.00	0.02	0.00
Active Flood Plain	1.29	1.29	1.29	0.00
Rivers (length)	0.24	0.24	0.24	0.00
Ponds and linear features	0.06	0.06	0.06	0.00
RTN17 (Lincolnshire Reservoir 50MCM (usable volume) (169MI/d))				
Coastal floodplain grazing marsh	1.2	0	0.61	-0.59
Arable	1346.59	26.82	818.37	-528.21
Pastures	50.05	1.12	1.92	-48.13
Other semi-natural grassland	0	0	1.56	1.56
Broadleaved, mixed and yew woodland	0.19	0.03	0.16	-0.02
Woodland priority habitat	4.09	0.29	1.71	-2.37
Greenspace	0.35	0.31	0.35	0
Active floodplain	5.1	0.21	5.1	0
Lakes and standing water	0.26	0.26	0.26	0
Rivers (length)	8.88	4.64	7.27	-1.6
Ponds and linear features	10.67	5.66	7.73	-2.94
Modified waters (reservoirs)	0	0	479.73	479.73
RTC3 (Ruthamford South to Ruthamford Central potable transfer (20 MI/d))				
Arable	28.39	0.00	28.39	0.00
Pastoral	12.29	0.00	12.29	0.00
Hay Meadows	1.11	0.00	1.11	0.00

Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Other Semi-Natural Grassland	1.24	0.00	1.24	0.00
Broadleaved, Mixed and Yew Woodland	0.02	0.00	0.02	0.00
Woodland Priority Habitat	0.10	0.00	0.10	0.00
Coniferous Woodland	0.69	0.00	0.69	0.00
Greenspace	0.35	0.00	0.35	0.00
Active Flood Plain	0.40	0.40	0.40	0.00
Rivers (length)	0.29	0.29	0.29	0.00
Ponds and linear features	<0.01	<0.01	<0.01	0.00
<b>LNC28 (Bulk trade agreement – River Trent (7 MI/d))</b>				
Coastal and Floodplain Grazing Marsh	2.21	0.00	2.21	0.00
Arable	27.24	0.00	27.24	0.00
Pastoral	0.25	0.00	0.25	0.00
Active Flood Plain	17.76	17.76	17.76	0.00
Rivers (length)	0.25	0.25	0.25	0.00
Ponds and linear features	0.08	0.08	0.08	0.00
<b>SHB9 (South Humber Bank Non-potable desalination (60 MI/d))</b>				
Coastal and Floodplain Grazing Marsh	1.34	0.00	1.34	0.00
Arable	0.72	0.00	0.72	0.00
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Woodland Priority Habitat	0.25	0.00	0.25	0.00
Active Flood Plain	50.75	30.00	30.00	-20.75
Lakes and Standing Waters	0.02	0.02	0.02	0.00
Rivers (length)	0.05	0.05	0.05	0.00
Ponds and linear features	0.58	0.58	0.58	0.00
Beach	1.13	0.00	1.13	0.00
Saltmarsh	0.05	0.00	0.05	0.00
Sand Dunes	0.99	0.00	0.99	0.00
Shallow Subtidal Sediment	1.52	0.00	1.52	0.00
<b>SUE24 (Suffolk Sudbury to East Suffolk potable transfer (10 MI/d))</b>				
Arable	10.26	0.00	10.26	0.00
Broadleaved, Mixed and Yew Woodland	0.05	0.00	0.05	0.00
Woodland Priority Habitat	0.05	0.00	0.05	0.00

Natural capital stock	Stocks present within option Zol pre-construction (Ha)	Stocks present within option Zol during construction (Ha)	Stocks present within option Zol post construction (Ha)	Change (Ha)
Greenspace	0.01	0.00	0.01	0.00
LNE11 (Lincolnshire East Groundwater (7.5 MI/d))				
Arable	0.40	0.00	0.00	-0.40
NAY1 (Norwich and the Broads to Aylsham potable transfer (3 MI/d))				
Coastal and Floodplain Grazing Marsh	0.68	0.00	0.68	0.00
Arable	23.95	0.00	23.95	0.00
Pastoral	4.95	0.00	4.95	0.00
Broadleaved, Mixed and Yew Woodland	0.07	0.00	0.07	0.00
Woodland Priority Habitat	0.76	0.00	0.76	0.00
Greenspace	0.12	0.00	0.12	0.00
Urban Semi-Natural Habitat	<0.01	0.00	<0.01	0.00
Active Flood Plain	1.02	1.02	1.02	0.00
Rivers (length)	0.03	0.03	0.03	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
Suffolk West & Cambs groundwater relocation (2.6MI/d) (SWC13)				
Arable	10.27	0.00	10.27	0.00
Pastoral	0.20	0.00	0.20	0.00
Active Flood Plain	0.20	0.20	0.20	0.00
Rivers (length)	0.10	0.10	0.10	0.00

## B.2 Monetised assessment of the unmitigated predicted permanent - impacts on the provision of ecosystem services.

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
<b>CAM4 (Ruthamford South to Cambridge Water potable transfer (50 MI/d))</b>					
Carbon storage	£2,648.27	£0.00	-£2,648.27	£2,434.46	-£249.81
Natural hazard regulation	£52.25	£0.00	-£52.25	£39.19	-£13.06
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£2,736.53</b>	<b>£0.00</b>	<b>-£2,736.53</b>	<b>£2,473.65</b>	<b>-£262.87</b>

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
<b>LNC25 (Lincolnshire East to Lincolnshire Central potable transfer (29 MI/d))</b>					
Carbon storage	£3,424.14	£2,354.96	-£1,069.17	£2,437.04	-£987.09
Natural hazard regulation	£5.75	£0.00	-£5.75	£4.31	-£1.44
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£567,734.26	£558,212.51	-£9,521.75	£558,212.51	-£9,521.75
Total	£571,164.14	£560,567.47	-£10,596.67	£560,653.86	-£10,510.28
<b>EXC3 (Essex South to Essex Central potable transfer (10 MI/d))</b>					
Carbon storage	£4,646.77	£0.00	-£4,646.77	£3,592.55	-£1,054.22
Natural hazard regulation	£144.85	£0.00	-£144.85	£103.87	-£40.98
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£4,791.62	£0.00	-£4,791.62	£3,696.42	-£1,095.20
<b>FND22 (Marham Abstraction (7.9MI/d up to 2039, 12.3MI/d after 2039))</b>					
Carbon storage	£626.38	£0.00	-£626.38	£626.13	-£0.25
Natural hazard management	£0.02	£0.00	-£0.02	£0.02	-£0.01
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£626.40	£0.00	-£626.40	£626.4	-£0.26
<b>LNE11 (Lincolnshire East Groundwater (7.5 MI/d))</b>					
Carbon storage	£15.71	£0.00	-£15.71	£0.00	-£15.71
Natural hazard management	Scoped out	Scoped out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£126,812.38	£126,487.77	-£324.61	£126,487.77	-£324.61
Total	£126,828.09	£126,487.77	-£340.31	£126,487.77	-£340.31
<b>NAY1 (Norwich and the Broads to Aylsham potable transfer (3 MI/d))</b>					
Carbon storage	£3,167.57	£0.00	-£3,167.57	£2,791.43	-£376.14

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Natural hazard management	£79.07	£0.00	-£79.07	£59.30	-£19.77
Air Pollutant Removal	£640.07	£0.00	-£640.07	£579.96	-£60.10
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£3,886.71</b>	<b>£0.00</b>	<b>-£3,886.71</b>	<b>£3,430.70</b>	<b>-£456.01</b>
<b>NBR6 (Fenland to Norfolk Bradenham potable transfer (50 MI/d))</b>					
Carbon storage	£10,533.51	£0.00	-£10,533.51	£8,533.55	-£1,999.96
Natural hazard regulation	£375.08	£0.00	-£375.08	£281.31	-£93.77
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£10,908.59</b>	<b>£0.00</b>	<b>-£10,908.59</b>	<b>£8,814.86</b>	<b>-£2,093.73</b>
<b>NEH3 (Suffolk Thetford to Norfolk East Harling potable transfer (5 MI/d))</b>					
Carbon storage	£12,232.14	£0.00	-£12,232.14	£9,538.13	-£2,694.01
Natural hazard regulation	£290.46	£0.00	-£290.46	£217.84	-£72.61
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£12,522.60</b>	<b>£0.00</b>	<b>-£12,522.60</b>	<b>£9,755.97</b>	<b>-£2,766.62</b>
<b>NHL4 (Norfolk East Harling to Norfolk Harleston potable transfer (5 MI/d))</b>					
Carbon storage	£2,582.64	£0.00	-£2,582.64	£2,486.77	-£95.87
Natural hazard regulation	£18.86	£0.00	-£18.86	£14.14	-£4.71
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£2,601.50</b>	<b>£0.00</b>	<b>-£2,601.50</b>	<b>£2,500.92</b>	<b>-£100.58</b>
<b>NTB10 (Norfolk Bradenham to Norwich and the Broads potable transfer (20 MI/d))</b>					

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Carbon storage	£21,420.95	£0.00	-£21,420.95	£17,120.54	-£4,300.41
Natural hazard regulation	£553.35	£0.00	-£553.35	£401.56	-£151.79
Air Pollutant Removal	£1,089.26	£0.00	-£1,089.26	£979.03	-£110.23
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£21,974.30</b>	<b>£0.00</b>	<b>-£21,974.30</b>	<b>£17,522.10</b>	<b>-£4,452.20</b>
<b>SUE23 (Suffolk East WTW Upgrade (1.7MI/d))</b>					
Carbon storage	£147.26	£0.00	-£147.26	£0.00	-£147.26
Natural hazard management	Scoped out	Scoped out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£121,943.30	£121,077.69	-£865.61	£121,077.69	-£865.61
<b>Total</b>	<b>£122,090.57</b>	<b>£121,077.69</b>	<b>-£1,012.88</b>	<b>£121,077.69</b>	<b>-£1,021.88</b>
<b>SUE24 (Suffolk Sudbury to East Suffolk potable transfer (10 MI/d))</b>					
Carbon storage	£585.30	£0.00	-£585.30	£585.70	-£45.60
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£585.30</b>	<b>£0.00</b>	<b>-£585.30</b>	<b>£585.70</b>	<b>-£45.60</b>
<b>SWC8 (Cambridge to Suffolk West Cambs potable transfer (50MI/d))</b>					
Carbon storage	£6,960.57	£0.00	-£6,960.57	£6,455.73	-£504.84
Natural hazard regulation	£57.79	£0.00	-£57.79	£42.42	-£15.37
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£7,018.35</b>	<b>£0.00</b>	<b>-£7,018.35</b>	<b>£6,498.15</b>	<b>-£520.20</b>



Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
<b>Suffolk West &amp; Cambs groundwater relocation (2.6MI/d) (SWC13)</b>					
Carbon storage	£432.43	£0.00	-£432.43	£432.43	£0.00
Natural hazard management	£0.00	£0.00	£0.00	£0.00	£0.00
Air Pollutant Removal	£171.10	£0.00	-£171.10	£171.10	£0.00
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£603.53	£0.00	-£603.53	£603.53	£0.00
<b>EXS19 (Colchester Reuse direct to Ardleigh Reservoir (no additional treatment) (11.4MI/d up to 2039, 13.9MI/d after 2039))</b>					
Carbon storage	£1,877.52	£0.00	-£1,877.52	£1,404.97	-£472.55
Natural hazard regulation	£17.52	£0.00	-£17.52	£12.94	-£4.31
Air Pollutant Removal	£439.18	£0.00	-£439.18	£375.48	-£63.70
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£179,500.00	£178,300.00	-£1,200.00	£178,300.00	-£1,200.00
Total	£181,394.78	£178,300.00	-£3,094.78	£179,717.91	-£1,676.87
<b>SUT5 (Norfolk Bradenham to Suffolk Thetford potable transfer (15 MI/d))</b>					
Carbon storage	£4,352.56	£0.00	-£4,352.56	£4,008.48	-£344.08
Natural hazard management	£50.11	£0.00	-£50.11	£37.58	-£12.53
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£4,402.67	£0.00	-£4,402.67	£4,046.06	-£365.61
<b>LNN1 (Lincolnshire Central to Lincolnshire Retford and Gainsborough potable transfer (3MI/d))</b>					
Carbon storage	£3,681.50	£0.00	-£3,681.50	£3,144.26	-£537.24
Natural hazard regulation	£110.81	£0.00	-£110.81	£82.58	-£28.23
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
<b>Total</b>	£3,792.31	£0.00	-£3,792.31	£3,226.83	-£565.48
<b>NED2 (Norfolk Bradenham to Norfolk East Dereham potable transfer (10 MI/d))</b>					
Carbon storage	£890.48	£0.00	-£890.48	£851.01	-£39.46
Natural hazard regulation	£8.30	£0.00	-£8.30	£6.22	-£2.07
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	£898.77	£0.00	-£898.77	£857.24	-£41.53
<b>NNC4 (Norfolk East Dereham to North Norfolk Coast potable transfer (10 MI/d))</b>					
Carbon storage	£3,511.45	£0.00	-£3,511.45	£3,272.82	-£283.63
Natural hazard regulation	£50.17	£0.00	-£50.17	£37.62	-£12.54
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	£3,561.62	£0.00	-£3,561.62	£3,310.45	-£251.17
<b>SHB9 (South Humber Bank Non-potable desalination (60 MI/d))</b>					
Carbon storage	£634.19	£0.00	-£634.19	£506.51	-£127.68
Natural hazard regulation	£26.84	£0.00	-£26.84	£20.13	-£6.71
Air Pollutant Removal	£53.03	£0.00	-£53.03	£38.94	-£14.09
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	£661.03	£0.00	-£661.03	£526.64	-£134.39
<b>FND29 ( Fens Reservoir 50 MCM (useable volume) (44.4 MI/d))</b>					
Carbon storage	£122,322.00	£1,132.00	-£121,190.00	£60,768.00	-£61,552.00
Natural hazard regulation	£26.00	£0.00	-£26.00	£14.00	-£11.00
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out

<b>Ecosystem services</b>	<b>Baseline value (£/year)</b>	<b>Estimated value post construction (£/year)</b>	<b>Temporary impact from construction (£/year)</b>	<b>Total future value (£/year)</b>	<b>Overall change in value (£/year)</b>
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£3,273,700.00	£3,070,200.00	-£203,500.00	£3,070,200.00	-£203,500.00
<b>Total</b>	<b>£3,396,048.00</b>	<b>£3,071,332.00</b>	<b>-£324,716.00</b>	<b>£3,130,982.00</b>	<b>-£265,063.00</b>
<b>EXS10 (Holland on Sea desalination (seawater) (26 MI/d))</b>					
Carbon storage	£3,548.71	£2,284.28	-£1,264.44	£3,316.39	-£232.32
Natural hazard regulation	£0.96	£0.00	-£0.96	£0.72	-£0.24
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£132,114.26	£129,842.03	£2,100.00	£129,842.03	-£2,272.24
<b>Total</b>	<b>£135,663.93</b>	<b>£132,126.30</b>	<b>-£3,365.39</b>	<b>£133,159.14</b>	<b>-£2,504.80</b>
<b>LNB1 (Ruthamford North to Bourne potable transfer (20 MI/d))</b>					
Carbon storage	£1,032.83	£0.00	-£1,032.83	£953.37	-£79.46
Natural hazard regulation	£15.13	£0.00	-£15.13	£11.35	-£3.78
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£1,047.96</b>	<b>£0.00</b>	<b>-£1,047.96</b>	<b>£964.72</b>	<b>-£83.24</b>
<b>LNC16 (Ruthamford North to Lincolnshire Central potable transfer (20 MI/d))</b>					
Carbon storage	£5,579.00	£0.00	-£5,579.00	£5,498.99	-£80.02
Natural hazard regulation	£15.34	£0.00	-£15.34	£11.50	-£3.83
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£5,594.34</b>	<b>£0.00</b>	<b>-£5,594.34</b>	<b>£5,510.49</b>	<b>-£83.56</b>
<b>LNC28 (Bulk trade agreement – River Trent (7 MI/d))</b>					
Carbon storage	£1,106.26	£0.00	-£1,106.26	£1,106.26	£0.00

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Natural hazard regulation	£0.00	£0.00	£0.00	£0.00	£0.00
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£1,106.26</b>	<b>£0.00</b>	<b>-£1,106.26</b>	<b>£1,106.26</b>	<b>£0.00</b>
<b>LNE6 (Mablethorpe desalination Seawater (50 MI/d))</b>					
Carbon storage	£634.19	£0.00	-£634.19	£506.51	-£127.68
Natural hazard regulation	£26.84	£0.00	-£26.84	£20.13	-£6.71
Air Pollutant Removal	£53.03	£0.00	-£53.03	£38.94	-£14.09
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£661.03</b>	<b>£0.00</b>	<b>-£661.03</b>	<b>£526.64</b>	<b>-£134.39</b>
<b>NTB17 (Bacton desalination (seawater) (25 MI/d))</b>					
Carbon storage	£5,918.01	£2,138.20	-£3,779.82	£4,813.65	-£1,104.36
Natural hazard regulation	£140.91	£0.00	-£140.91	£105.69	-£35.23
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£51,287.60	£47,392.34	-£3,895.26	£47,392.34	-£3,895.26
<b>Total</b>	<b>£57,346.53</b>	<b>£49,530.54</b>	<b>-£7,815.99</b>	<b>£52,311.68</b>	<b>-£5,034.85</b>
<b>NWY1 (Norwich and the Broads to Norfolk Wymondham potable transfer (5 MI/d))</b>					
Carbon storage	£1,092.21	£3.75	-£1,088.45	£1,088.28	£3.93
Natural hazard Management	£0.83	£0.20	-£0.63	£0.62	-£0.21
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£1,093.03</b>	<b>£3.95</b>	<b>-£1,089.08</b>	<b>£1,088.90</b>	<b>-£4.13</b>

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
<b>RTN30 (Lincolnshire Central to Ruthamford North potable transfer (75 MI/d))</b>					
Carbon storage	£864.77	£0.00	-£864.77	£862.95	-£1.82
Natural hazard regulation	£0.38	£0.00	-£0.38	£0.29	-£0.10
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£865.16</b>	<b>£0.00</b>	<b>-£865.16</b>	<b>£863.24</b>	<b>-£1.92</b>
<b>RTS24 (Ruthamford North to Ruthamford North potable transfer)</b>					
Carbon storage	£3,172.16	£0.00	-£3,172.16	£3,126.12	-£46.04
Natural hazard management	£6.81	£0.00	-£6.81	£5.11	-£1.70
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
<b>Total</b>	<b>£3,178.97</b>	<b>£0.00</b>	<b>-£3,178.97</b>	<b>£3,131.22</b>	<b>-£47.74</b>
<b>RTN17 (Lincolnshire Reservoir 50MCM (usable volume) (169MI/d))</b>					
Carbon storage	£69,696	£2,077	-£67,619	£36,229	-£33,468
Natural hazard regulation	£418	£32	-£386	£138	-£281
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£6,669,600	£6,333,832	-£335,768	£6,333,832	-£335,768
<b>Total</b>	<b>£6,739,714</b>	<b>£6,335,941</b>	<b>-£403,687</b>	<b>£6,370,199</b>	<b>-£369,431</b>
<b>RTC3 (Ruthamford South to Ruthamford Central potable transfer (20 MI/d))</b>					
Carbon storage	£6,680.13	£0.00	-£6,680.13	£5,822.24	-£857.88
Natural hazard regulation	£77.60	£0.00	-£77.60	£58.20	-£19.40
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Total	£6,757.73	£0.00	-£6,757.73	£5,880.45	-£877.28

### B. 3 Qualitative assessment of the unmitigated predicted impacts on the provision of water purification and water regulation

Option ID	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
<b>Water purification</b>				
<ul style="list-style-type: none"> <li>● CAM4</li> <li>● LNC25</li> <li>● FND22</li> <li>● NAY1</li> <li>● NBR6</li> <li>● NEH3</li> <li>● NHL4</li> <li>● SUE23</li> <li>● SUE24</li> <li>● EXS19</li> <li>● SUT5</li> <li>● NED2</li> <li>● NNC4</li> <li>● SHB9</li> <li>● FND29</li> <li>● EXS10</li> <li>● LNB1</li> <li>● LNC16</li> <li>● LNC28</li> <li>● LNE6</li> <li>● NTB17</li> <li>● NWY1</li> <li>● RTN30</li> <li>● RTS24</li> <li>● RTN17</li> <li>● RTC3</li> </ul>	The stocks both temporarily and permanently lost likely provide a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced	The provision of water purification provided by the associated stocks will likely be reduced due to the option.
<ul style="list-style-type: none"> <li>● EXC3</li> <li>● NTB10</li> <li>● SWC8</li> <li>● LNN1</li> </ul>	The stocks both temporary and permanently lost likely provide a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and the proximity of the	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced.	The provision of water purification provided by the associated stocks will likely be reduced due to the option. Ancient Woodland is a high value natural capital stock that cannot be replaced or replicated once lost, therefore, future provision of stock

Option ID	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
	asset to a water source.			presumed permanently lost.
<b>Water regulation*</b>				
<ul style="list-style-type: none"> <li>● CAM4</li> <li>● EXC3</li> <li>● FND22</li> <li>● NAY1</li> <li>● NBR6</li> <li>● NEH3</li> <li>● NHL4</li> <li>● NTB10</li> <li>● SWC8</li> <li>● SWC13</li> <li>● EXS19</li> <li>● SUT5</li> <li>● LNN1</li> <li>● NED2</li> <li>● NNC4</li> <li>● LNB1</li> <li>● LNC16</li> <li>● LNC28</li> <li>● NTB17</li> <li>● NWY1</li> <li>● RTN30</li> <li>● RTS24</li> <li>● RTC3</li> </ul>	The stocks both temporarily and permanently lost provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The preservation of stocks will reduce negative impacts to the ecosystem service.	The provision of services will be retained during construction.	The future provision of the ecosystem service provided by the associated stocks will likely remain.	0
<ul style="list-style-type: none"> <li>● SHB9</li> <li>● EXS10</li> <li>● LNE6</li> </ul>	The stocks both temporarily and permanently lost provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The preservation of stocks will reduce negative impacts to the ecosystem service.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the associated stocks will likely reduce slightly.	-
<ul style="list-style-type: none"> <li>● LNC25</li> </ul>	The stocks both temporarily and permanently lost provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The preservation of stocks will reduce negative	The provision of water flow regulation services of contributing stocks will be lost during construction. However, the addition of a reservoir will bring additional water flow regulation to the environment.	The loss of contributing stocks has the potential to impede water flow on site.	--



Option ID	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
<ul style="list-style-type: none"> <li>● FND29</li> <li>● RTN17</li> </ul>	<p>impacts to the ecosystem service.</p> <p>The stocks both temporarily and permanently lost provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The loss of stocks will increase negative impacts to the ecosystem service.</p>	<p>The provision of water flow regulation services of contributing stocks will be lost during construction. However, the addition of a reservoir will bring additional water flow regulation to the environment.</p>	<p>The loss of contributing stocks has the potential to impede water flow on site. The addition of a reservoir will regulate flows, control water movement and maintain water supplies in dry periods, enabling a resilient supply of water to consumers, however the loss of existing stocks will require a further WFD assessment at the project level and suitable measures will be proposed at this stage. As such, the impact of the option on water flow regulation cannot be assessed at this stage.</p>	<p>?</p>

### B.4 Summary of the unmitigated Biodiversity Metric outputs

Option	On-site habitat baseline (biodiversity units)	On-site habitats post intervention (biodiversity units)	Total habitat net unit change (biodiversity units)	Total percentage change	On-site rivers baseline (biodiversity units)	On-site rivers post intervention (biodiversity units)	Total rivers net unit change (biodiversity units)	Total percentage change
CAM4 (Ruthamford South to Cambridge Water potable transfer (50 MI/d))	84.19	73.07	-11.13	-13.22%	5.76	5.76	0.00	0.00%
EXC3 (Essex South to Essex Central potable transfer (10 MI/d))	44.90	33.40	-11.50	-25.61%	0.84	0.84	0.00	0.00%
EXS10 (Holland on Sea desalination (seawater) (26 MI/d))	186.02	154.51	-31.51	-16.94%	7.56	7.56	0.00	0.00%
EXS19 (Colchester Reuse direct to Ardeigh Reservoir (no additional treatment) (11.4MI/d up to 2039, 13.9MI/d after 2039))	64.34	35.77	-28.57	-44.40%	2.58	2.58	0.00	0.00%
FND22 (Marham Abstraction (7.9MI/d up to 2039, 12.3MI/d after 2039))	36.38	32.13	-4.25	-11.69%	5.52	5.52	0.00	0.00%
FND29 (Fens Reservoir 50 MCM)	5243.56	5191.88	-51.68	-0.99%	190.76	131.86	-58.91	-30.88%

Option	On-site habitat baseline (biodiversity units)	On-site habitats post intervention (biodiversity units)	Total habitat net unit change (biodiversity units)	Total percentage change	On-site rivers baseline (biodiversity units)	On-site rivers post intervention (biodiversity units)	Total rivers net unit change (biodiversity units)	Total percentage change
(useable volume) (44.4 MI/d))								
LNB1 (Ruthamford North to Bourne potable transfer (20 MI/d))	39.08	36.21	-2.87	-7.34%	5.64	5.64	0.00	0.00%
LNC16 (Ruthamford North to Lincolnshire Central potable transfer (20 MI/d))	263.20	251.55	-11.65	-4.43%	6.96	6.96	0.00	0.00%
LNC25 (Lincolnshire East to Lincolnshire Central potable transfer (29 MI/d))	173.46	118.10	-55.36	-31.91%	1.20	1.20	0.00	0.00%
LNC28 (Bulk trade agreement – River Trent (7 MI/d))	82.64	60.21	-22.43	-27.14%	3.00	3.00	0.00	0.00%
LNE11 (Lincolnshire East Groundwater (7.5 MI/d))	0.80	0.00	-0.80	-100%	0.00	0.00	0.00	0.00%
LNE6 (Mablethorpe desalination Seawater (50 MI/d))	36.72	10.06	-26.66	-72.59%	3.12	3.12	0.00	0.00%
LNN1 (Lincolnshire Central to Lincolnshire Retford and Gainsborough)	92.84	77.59	-15.25	-16.43%	1.20	1.20	0.00	0.00%

Option	On-site habitat baseline (biodiversity units)	On-site habitats post intervention (biodiversity units)	Total habitat net unit change (biodiversity units)	Total percentage change	On-site rivers baseline (biodiversity units)	On-site rivers post intervention (biodiversity units)	Total rivers net unit change (biodiversity units)	Total percentage change
potable transfer (3MI/d)								
NAY1 (Norwich and the Broads to Aylsham potable transfer (3 MI/d))	86.11	67.08	-19.04	-22.11%	5.76	5.76	0.00	0.00%
NBR6 (Fenland to Norfolk Bradenham potable transfer (50 MI/d))	181.84	132.55	-49.29	-27.10%	4.44	4.44	0.00	0.00%
NED2 (Norfolk Bradenham to Norfolk East Dereham potable transfer (10 MI/d))	37.30	35.12	-2.18	-5.85%	0.84	0.84	0.00	0.00%
NEH3 (Suffolk Thetford to Norfolk East Harling potable transfer (5 MI/d))	79.14	62.83	-16.31	-20.61%	0.72	0.72	0.00	0.00%
NHL4 (Norfolk East Harling to Norfolk Harleston potable transfer (5 MI/d))	103.92	97.29	-6.63	-6.38%	0.00	0.00	0.00	0.00%
NNC4 (Norfolk East Dereham to North Norfolk Coast potable transfer (10 MI/d))	137.30	106.08	-31.22	-22.74%	2.76	2.76	0.00	0.00%
NTB10 (Norfolk Bradenham to Norwich and the	266.17	241.24	-57.93	-19.36%	6.65	6.65	0.00	0.00%

Option	On-site habitat baseline (biodiversity units)	On-site habitats post intervention (biodiversity units)	Total habitat net unit change (biodiversity units)	Total percentage change	On-site rivers baseline (biodiversity units)	On-site rivers post intervention (biodiversity units)	Total rivers net unit change (biodiversity units)	Total percentage change
Broads potable transfer (20 MI/d))								
NTB17 (Bacton desalination (seawater) (25 MI/d))	149.26	114.80	-34.46	-23.09%	3.24	3.24	0.00	0.00%
NWY1 (Norwich and the Broads to Norfolk Wymondham potable transfer (5 MI/d))	62.28	48.75	-13.53	-21.73%	1.44	1.44	1.44	0.00%
RTC3 (Ruthamford South to Ruthamford Central potable transfer (20 MI/d))	144.10	121.00	-23.10	-16.03%	3.48	3.48	0.00	0.00%
RTN17 (Lincolnshire Reservoir 50MCM (usable volume) (169MI/d))	3141.46	3846.40	704.94	22.44%	256.67	195.03	-61.54	-23.99%
RTN30 (Lincolnshire Central to Ruthamford North potable transfer (75 MI/d))	55.50	43.96	-11.54	-20.79%	3.24	3.24	0.00	0.00%
RTS24 (Ruthamford North to Ruthamford North potable transfer)	137.24	127.74	-9.50	-6.92%	2.88	2.88	0.00	0.00%

Option	On-site habitat baseline (biodiversity units)	On-site habitats post intervention (biodiversity units)	Total habitat net unit change (biodiversity units)	Total percentage change	On-site rivers baseline (biodiversity units)	On-site rivers post intervention (biodiversity units)	Total rivers net unit change (biodiversity units)	Total percentage change
SHB9 (South Humber Bank Non-potable desalination (60 MI/d))	36.72	10.06	-26.66	-72.59%	3.12	3.12	0.00	0.00%
SUE23 (Suffolk East WTW Upgrade (1.7MI/d))	5.60	0.00	-5.60	-100%	0.00	0.00	0.00	0.00%
SUE24 (Suffolk Sudbury to East Suffolk potable transfer (10 MI/d))	21.56	20.13	-1.43	-6.61%	0.00	0.00	0.00	0.00%
SUT5 (Norfolk Bradenham to Suffolk Thetford (15 MI/d Norfolk Bradenham to Suffolk Thetford potable transfer (15 MI/d))	156.14	128.78	-27.36	-17.52%	3.84	3.84	0.00	0.00%
(SWC13) Suffolk West & Cambs groundwater relocation (2.6MI/d)	21.34	20.51	-0.83	-3.87%	1.20	1.20	0.00	0.00%
SWC8 (Cambridge to Suffolk West Cambs potable transfer (50MI/d))	224.06	204.93	-19.13	-8.54%	7.68	7.68	0.00	0.00%

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