



Anglian Water Draft WRMP24

Biodiversity Net Gain (BNG) and Natural Capital
Assessments (NCA)

November 2022

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Assessments (NCA)

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Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	27/09/22	AN	HD	JF	First Draft
B	09/11/22	AN	HD	-	Updated with SRO findings

Document reference: 1004210650-021-L0-WRMP-MML-RP-EN-0539 |

Information class: Standard

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1 Introduction

1.1 Overview

This sub-report supports the Environment Assessment Report (EAR) that accompanies the Anglian Waters Water Resource Management Plan (WRMP) 2024 submission to regulators. At the first stage of optioneering, Mott MacDonald screened all of Anglian Waters constrained list via Natural Capital and Biodiversity Net Gain (BNG) assessments. This report presents the findings of the Natural Capital Approach (NCA) and BNG assessments undertaken for the Anglian Water WRMP24 Best Value Plan (BVP) options.

1.2 Anglian Water WRMP24 options

The Anglian Water WRMP24 BVP includes 31 supply-side options, including the associated Strategic Resource Options (SROs) and their associated transfers. The scoped in BVP options and associated option descriptions are presented in Table 1.1 below.

Table 1.1 Anglian Water WRMP24 BVP Options

Option ID	Description
CAM4	Ruthamford South to Cambridge Water potable transfer (50 MI/d)
LNC25	Lincolnshire East to Lincolnshire Central potable transfer (29 MI/d)
EXC15	Cambs & West Suffolk to Essex Central potable transfer (10 MI/d)
EXS18	Cambs & West Suffolk to Essex Central potable transfer (10 MI/d)
NAY1	Norwich and the Broads to Aylsham potable transfer (3 MI/d)
NBR6	Fenland to Norfolk Bradenham potable transfer (50 MI/d)
NEH5	Suffolk Thetford to Norfolk East Harling potable transfer (15 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)
SWC8	Cambridge Water to Cambs and West Suffolk (50 MI/d)
EXS19	Colchester WRC direct to Ardleigh Reservoir (no additional treatment)
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)
FND21	Strategic Resource Option (SRO): Earth embanked reservoir with a storage capacity 50 million cubic metres, located in the fens. Abstraction will be from the River Great Ouse.
SUT5	Norfolk Bradenham to Suffolk Thetford (15 MI/d)
RTC3	Ruthamford South to Ruthamford Central potable transfer (20 MI/d)
LNB1	Ruthamford North to Bourne potable transfer (20 MI/d)
NWY2	Norwich and the Broads to Norfolk Wymondham potable transfer (15 MI/d)
RTN13	Ruthamford North to Ruthamford North potable transfer (100 MI/d)
RTS11	Ruthamford North to Ruthamford North potable transfer (50 MI/d)
FND16	Ruthamford South to Fenland potable transfer (20 MI/d)
RTN17	Strategic Resource Option (SRO): Earth embanked winter storage reservoir located in the south Lincolnshire area. Abstraction will be from the River Trent, with a transfer via the River Witham
SUE5	Felixstowe desalination (seawater) 25 MI/d
LNC10	Extension /new reservoir at Hall - conjunctive with new treatment
EXS10	Holland on Sea desalination (seawater) 25 MI/d.

Option ID	Description
NTB20	Desalination (seawater) plant in the Caister area (25 MI/d)
LNE6	Mablethorpe desalination Seawater (63 MI/d)

A total of 4 options were scoped out of the BVP list of options outlined in Table 1.1. Table 1.2 below outlines the scoped-out options along with a summary for being scoped out.

Table 1.2: Anglian Water WRMP24 scoped out BVP Options

Option ID	Description
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.
SUE23	Modification of Raydon WTW to reduce the minimum treatment capacity from 8MI/d to 2MI/d. This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.
LNE12	Increasing the utilisation of existing surface water licence at Covenham Reservoir. This option consists of additional work on made ground, and as such not anticipated to impact natural capital stocks.
SUI1	Transfer using existing pipeline but reversing the flow. No additional works needed, therefore it has not been considered further.

2 Methodology

2.1 Natural Capital Assessment Methodology

Guidance

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 Guidelines¹ ('Guidelines') and consider broader government policy objectives. The Guidelines recommend that companies must consider the environment and society when developing the WRMP, stating that natural capital assessments and biodiversity net gain 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 Defra's Guiding Principles.

The Water Resource East (WRE) should therefore provide a reliable Natural Capital Assessment (NCA) that is suitable to the regional scale but provides a framework to be built upon within the individual water company WRMP's.

To ensure that a Natural Capital Approach is incorporated in a consistent way across the WRE Regional Plan, this method statement outlines a recommended approach to the regional NCA, the quantification of impacts and the valuation of benefits and impacts. The NCA and BNG have been produced in line with best practise 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'): Working version for WRMP24 (version 4.2) (Environment Agency, Natural Resources Wales, Ofwat)
- Environment Agency (2020) Water resources planning guideline supplementary guidance – Environment and society in decision-making

Principles to the WRE Natural Capital approach

Regional water resource plans taking a long-term view of water planning to 2100 are currently being prepared for each region. The Anglian Water WRMP24 SEA was undertaken in the context of these plans and falls within the Water Resources East (WRE) regional plan. In line with the EA guidance on Environment and Society in Decision-making² the WRE regional plan NCA methodology has been developed in accordance with the following principles:

¹ Environment Agency, Natural Resources Wales, Office for Water Services (2022). Water resources planning guideline. Available at: [Water resources planning guideline - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/108444/water-resources-planning-guideline.pdf)

² Environment Agency (2020) Water resources planning guideline supplementary guidance – Environment and society in decision-making.

- The assessment will include the valuation of natural capital assets and ecosystem services within the footprint of each option and their zone of influence (see Section 2.2)
- The assessment methodology uses relevant qualitative, quantitative and/or monetary valuation approaches for the NCA. The assessment of the option's impact on the natural capital metrics will be 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 will be assessed against a consistent methodology. The monetised natural capital metrics will be incorporated into the cost benefit ratio as a discreet input. This monetised value will be a single figure defined by the maximum natural capital benefit. The cost of the option will not be considered within this assessment as it is captured elsewhere within the multi criteria assessment.
- Ecosystem services that are not monetised will be quantified and incorporated into the regional plan decision-making process within the SEA assessment.
- The NCA will be 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. It is hoped that the united 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 the regional plan.

2.2 Stage 1: Defining the Natural Capital Baseline

Zone of influence for option level assessment

The zone of influence (ZoI) for each option is defined as the area of receiving or providing environment with the potential to be altered or changed as a result of the option.

Developing a natural capital baseline

As part of the NCA of the feasible options within the regional plan a natural capital baseline will be developed for the study area. This baseline will be developed using open-source data as described in NECR285³ 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.

The Natural Capital baseline will report the total quantity of each stock within the study area, and where suitable, an indication of natural capital condition. Monetary valuation of the Natural Capital baseline will not be included within the Regional Natural Capital Baseline due to the availability of data.

³ Natural England, (2020) National Natural Capital Atlas: Mapping Indicators

2.3 Stage 2: Option Level Natural Capital Assessment

Natural Capital Assessment

A natural capital assessment has been undertaken on the options in accordance with the Water Resources Planning Guidelines⁴ ('Guidelines') and Enabling a Natural Capital Approach (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 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) (2018) 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.

The impact of the options on the Natural Capital stocks and indicators of condition was reported for each option quantitatively. This impact was reported for during construction and post construction to give an estimation of the impact of the options' whole lifecycle. The results of the stock assessment were reported in total losses and gains within each option's zone of influence.

The results of the change in natural capital stocks informed the assessment against the six natural capital metrics (ecosystem services) 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 screening process set out below), and the results of the 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 Metric⁵.

Figure 2.1 Ecosystem Services valuation logic chain



The metrics used to assess the impact on natural capital include:

- Carbon Sequestration (Climate Regulation)
- Natural Hazard Management
- Water Purification

⁴ GOV.UK. 2020. Water resources planning guideline. [online] Available at: <<https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline>> [Accessed March 2022].

⁵ Natural England, 2021. Available at: [ARCHIVE SITE for the Biodiversity Metric 2.0 and the Biodiversity Metric 3.0 \(nepubprod.appspot.com\)](https://www.naturalengland.org.uk/About-us/Our-work/Policy-and-strategy/Biodiversity-Metric-2.0-and-Biodiversity-Metric-3.0) [Accessed: May 2022]

- Water Regulation
- Biodiversity and Habitats
- Air Pollutant Removal
- Recreation & amenity value
- Food production

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 options. A natural capital approach has the potential to inform concept design and aid decision making, by quantifying the relative cost benefits and disbenefits of the options to aid the initial assessment of the identified strategic solutions.

2.4 Ecosystem Services Screening

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 scoped in or out due to the geographical or socio-economic context of the option and its zone of influence. Specific guidance on the screening process for individual metrics is provided below.

The Fens Reservoir and South Lincolnshire Reservoir SROs are options that have undergone master planning stages in preparedness for RAPID Gate 2, and as such are more detailed options. As such, their assessment includes both the main reservoir, service reservoirs and transfers. The latest assessments of these options underwent a price uplift in order to convert the guidance values attained in 2018 to 2022 prices, to reflect the current economy. As such, these updated versions of the assessments were included in environmental assessment of the Best Value Plan.

Carbon Sequestration (Climate Regulation)

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.

The assessment was determined by land management within each option ZoI 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) ^{6 7}

Land use type	C Seq rate (t/CO ₂ e/ha/yr)
Woodland - (deciduous)	4.97
Woodland – (coniferous)	12.66
Arable Land	0.107
Pastoral land	0.397

⁶ 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.

⁷ The Environment Agency, (2020) Water resources planning guideline supplementary guidance – Environment and society in decision-making.

Land use type	C Seq rate (t/CO ₂ e/ha/yr)
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

The carbon sequestration rates were converted to monetary values using standard methods and the Department for Business, Energy and Industrial Strategy (BEIS) Interim Non-Traded Carbon Values 2018. These values are set out in Table 2.2 below. Please note, that RTN17 and FND21 have used updated BEIS values (2022) to reflect the values used in their Gate 2 Rapid Submission.

Table 2.2: BEIS updated short-term traded sector carbon values for policy appraisal, £/tCO₂e (2018)⁸.

Year	Low series	Central series	High series
2018	2.33	12.76	25.51
2019	0.00	13.15	26.30
2020	0.00	13.84	27.69
2021	4.04	20.54	37.04
2022	8.08	27.24	46.40
2023	12.12	33.94	55.75
2024	16.17	40.64	65.11
2025	20.21	47.33	74.46
2026	24.25	54.03	83.82
2027	28.29	60.73	93.17
2028	32.33	67.43	102.53
2029	36.37	74.13	111.88
2030	40.41	80.83	121.24

Natural Hazard Regulation

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 Plan⁹. The capacity of habitats to achieve this was quantified,

⁸ Department for Business, Energy and Industrial Strategy. 2019. Updated short-term traded carbon values. Available from:

[Updated short-term traded carbon values used for UK public policy appraisal: 2018 \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/824442/Updated-short-term-traded-carbon-values-used-for-UK-public-policy-appraisal-2018.pdf)

⁹ Defra. 2018. 25 year Environment Plan. Available from:
[25 Year Environment Plan - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/25-year-environment-plan)

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:

- It's capacity to slow overland flows
- Whether the asset is located in an area of flood risk.

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.

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.

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, 2018¹⁰. 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 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.

Central estimate of the average annual costs of reservoir floodwater storage is £0.42 / m³. The range is from £0.10 to £1.19 / m³ per 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 costs¹¹.

Water Purification

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.

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) tool. The tool defines the resulting changes for the following water quality variables:

¹⁰ 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.

¹¹ Luizzo, L., (2019) Natural Environment Valuation Online Tool - Chapter 6a: Water Quantity & Quality Model

- 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)

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 zone of influence. Any negative changes to the natural capital stocks in theory, reflects the loss of this service within each option's zone of influence.

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

Water Regulation

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. Options benefit by abstracting and providing water supply to customers, but supply options can also have varying effects on existing natural capital stocks, which in turn can affect the 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 that recommends not including monetisation of water regulation benefits in decision making.

Air Pollutant Removal

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.

Each option will be screened against the provision of air pollutant removal according to the location of the option. Air pollutant removal was only be considered within build up areas or when the zone of influence includes Air Quality Management Areas. The impact of the option was assessed according to changes in natural capital stocks.

The value provided by natural capital assets was taken from the UK government's air quality economic assessment methodology¹². 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.

¹²Jones 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.

Indicative average values for air pollution removal in 2015 for different habitats air pollutant removal calculated from aggregate UK values published in February 2019 as shown in Table 2.3.

The value of each habitat will be combined with the changes expected in natural capital stocks to provide a value for the change in service provision. The final impact will be reported as a single value that will be incorporated within the NCA metric.

Table 2.3 Air pollutant value by habitat type

Habitat group	Value (£ per hectare per year)
Urban Woodland	771
Rural Woodland	245
Urban grassland	149
Enclosed farmland	14
Coastal margins	26

Recreation & Amenity

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 is also dependent upon nature to varying degrees.

This metric depends on the extent to which the natural capital stocks the option provides will enhance the opportunity for recreation.

The key parameter needed to estimate in this category is the number of additional or enhanced recreational visits created because of the option. This has been estimated using the Outdoor Recreation Valuation Tool¹³ (ORVal). ORVal is Referenced in HM Treasury Green Book. Random utility / travel cost model of recreational demand for all sites in England and Wales and generates 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 is useful for baseline initial assessment, accounting, and multiple sites. This should be seen as an estimation in the absence of site-specific data on visitor numbers.

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 will be reported for each option using the ORVal online tool.

Food Production

Food in its various forms is produced by a range of ecosystems in some cases, the food for human consumption is effectively the same as the ecosystem service (for example, wild fruit, capture fishing). More often the provisioning service is a raw material (for example, crops) that is harvested and processed by humans and produced capital into added value processed food (for example, bread). The boundary between what is provided by natural capital and the

contribution of other forms of capital is often a grey area. For example, crops require agricultural management; livestock depends upon grassland ecosystems¹⁴.

Food production has been calculated using the NEVO agricultural model, this 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 and Bateman¹⁵.

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.

2.5 Stage 3: Reporting of results

The changes in natural capital stocks have been reported for each option with the results of the ecosystem services screening and detailed assessment. The natural capital metrics will be aggregated into a single metric that will be considered within the WRE investment model. The impacts of each option against the individual natural capital metrics will also be reported to allow for further analysis and optimisation. The results for each option will be summarised in proforma that will demonstrate the results of the assessment and for the justification behind the assessment.

The results of the NCA and BNG assessments will be incorporated into WRE decision making process through the conversion of the results into metrics as described below:

- **Natural Capital metric:** A single discreet monetised value reported in £/year generated by combining the outputs of each of the five monetised natural capital metrics to provide a single cost / benefit figure.
- **Biodiversity Net Gain metric:** A single score for each option showing the percentage change in biodiversity net gain units for each option according to the metric.

The results of the NCA and BNG assessments for the feasible options identified in the Anglian Water WRMP24 have been presented in Section 3 below.

2.6 Biodiversity Net Gain Assessment Methodology

The BNG requirement as outlined in the Guidelines recommend that each WRMPs should look to provide a BNG. The option assessments used the most-up-to-date guidance available at the time to undertake the assessment, the Biodiversity 2.0 Metric, and to inform the regional plans. In July 2021, Defra and Natural England launched The Biodiversity 3.0 Metric. The 3.0 Metric presents significant improvements for measuring and accounting for habitat losses and gains. It encourages users to create and enhance habitats where they are most needed 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 3.0 Metric incentivises habitat creation and enhancement where most needed. It also 'rewards' landowners who undertake work early, creating or enhancing habitats in advance, allowing them to generate more biodiversity units from their land. Condition assessment approaches have also been significantly updated and simplified for 3.0 Metric and some key changes made. Option assessments have been updated in line with 3.0 Metric for the purposes of reporting. At the time of writing, the Defra BNG 3.1 Metric is the latest and as such

¹⁴ ORVal, Land, Environment Economics and Policy Institute. University of Exeter. Available from: <https://www.exeter.ac.uk/research/leep/research/orval/>

¹⁵ Fezzi, C., Bateman, I., Hadley, D. & Harwood, A. 2019. Natural Environment Valuation Online Tool - Chapter 1: Agriculture Model

recommended approach to net gain assessments by Natural England. However, when 3.1 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 little time to accommodate the new guidance. We will discuss the need to update these assessments with regulators – to match the latest available guidance – as part of our next iteration of the plan making process.

The Defra BNG 3.0 Metric is the recommended approach to net gain assessments. The government anticipates the 3.0 Metric (and subsequent revisions) to become the industry standard for biodiversity assessments for on-land and intertidal development types in England. As proposed in the Environment Act 2021¹⁶ in November 2021, biodiversity net gain must be measured using a recognised biodiversity metric. The Metric essentially underpins the Environment Bill's provisions for mandatory biodiversity net gain in England, subject to any necessary adjustments for application to major infrastructure projects. The Act further specifies the requirement of biodiversity reports to include specified quantitative data relating to biodiversity, and as such any tool for which evaluation is predominantly qualitative is not recommended.

Biodiversity net gain or net loss must be considered at both the option and programme level and a biodiversity optimised programme suggested. Each option should look to maximise biodiversity net gain and any required mitigation should be included in the option cost. The Environment Agency supplementary guidance 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.

A biodiversity baseline has been developed from spatial data sets of habitats inventories (see Table A.1) and assessed in line with the Defra BNG 3.0 Metric. 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 construction biodiversity score.

As this assessment has been carried out using only open-source data a precautionary approach will be applied, presuming that where not specifically known, habitats will be assigned the moderate habitat score. This is recommended as a suitable methodology for the scale of the WRMP Methodology updates.

Opportunities

The potential opportunities for the options to enhance NC and BNG were considered following the NCA and BNG assessments, utilising the data and results to inform on the most appropriate potential opportunities for enhancement of the options and wider benefits.

The BNG assessments can be revisited, and mitigation or enhancement opportunities developed further to achieve the 10% BNG required within the options. Additionally, where possible, the options could aim to not only reinstate lost habitat, but also provide a greater or more diverse habitat than is lost, to achieve overall Biodiversity Net Gain in line with regulatory requirements for BNG (at the time of the project consenting) as stated as a mandatory requirement within the Environment Act 2021. The latter could be achieved by identifying local sites of ecological interest and proposing measures which enhance these features.

2.7 Assumptions and Limitations

The following assumptions have been used within the assessments in this technical note:

¹⁶ Environment Act 2021. [legislation.gov.uk](https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted). Available at:
<https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted>

For Natural Capital Assessments (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.

For Biodiversity Net Gain (BNG) Assessments:

- No enhancement of biodiversity 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 assigned to the pre-construction land use according to the habitats present within each option boundary. The post construction land use, including agreed mitigation, was used to calculate the post construction biodiversity score.
- 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 the maximum habitat score. Habitat identification will need to be refined with habitat survey data at later gates 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.

3 NCA and BNG Assessment Results

The NCA and BNG outputs for the options are summarised in Table 3.1, Table 3.2, Table 3.3 and Table 3.4. Mitigation has only been considered when outlined in the option description, or where standard mitigation must be applied.

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

- Table 3.1 shows the predicted impacts on natural capital during and post construction.
- Table 3.2 summarises the predicted impacts to the provision of ecosystem services screened in for detailed assessment.
- Table 3.3 summarises the predicted impacts to the provision of water purification for the options screened in for qualitative assessment.
- Table 3.4 shows the unmitigated BNG outputs for the options which have been informed using the predicted permanent impacts on natural capital in Table 3.1.

Note: At this stage the BNG only takes account reinstatement, not re-provision or additional habitat creation unless outlined in the options description.

Some stocks reported in Table 3.1 are expected to be permanently lost. All woodland and high-level stocks are expected to be reinstated onsite or offsite through re-planting scheme. 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
- Blue space
- Greenspace

Table 3.1: Predicted impacts on natural capital stocks

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
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
Other Semi-Natural Grassland	1.24	0.00	1.24	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
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)	0.02	0.02	0.02	0.00
Ponds and linear features	0.0046	0.0046	0.0046	0.00
RTN17 (Strategic Resource Option (SRO): Earth embanked winter storage reservoir located in the south Lincolnshire area. Abstraction will be from the River Trent, with a transfer via the River Witham)				
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
NBR6 (Fenland to Norfolk Bradenham potable transfer (50 MI/d))				
Arable	59.88	0.00	58.99	0.00
Pastoral	3.16	0.00	3.16	0.00
Broadleaved, Mixed and Yew Woodland	0.0002	0.0002	0.0002	0.00
Woodland Priority Habitat	0.11	0.00	0.11	0.00
Coniferous Woodland	0.57	0.00	0.57	0.00
Ancient Woodland	0.11	0.00	0.00	-0.11
Active Flood Plain	2.19	2.19	2.19	0.00
Lakes and Standing Waters	0.05	0.05	0.05	0.00
Ponds and linear features	0.04	0.04	0.04	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
NB10 (Norfolk Bradenham to Norwich and the Broads potable transfer (20 MI/d))				
Coastal and Floodplain Grazing Marsh	0.39	0.00	0.39	0.00
Arable	46.31	0.00	46.31	0.00
Pastoral	3.37	0.00	3.37	0.00
Broadleaved, Mixed and Yew Woodland	0.14	0.00	0.14	0.00
Woodland Priority Habitat	0.41	0.00	0.41	0.00
Coniferous Woodland	0.40	0.00	0.40	0.00
Greenspace	0.04	0.00	0.04	0.00
Urban Semi Natural Habitat	0.07	0.00	0.07	0.00
Urban Woodland	0.27	0.00	0.27	0.00
Active Flood Plain	2.04	2.04	2.04	0.00
Rivers (length)	327	327	327	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
NWY2 (Norwich and the Broads to Norfolk Wymondham potable transfer (15 MI/d))				
Coastal and Floodplain Grazing Marsh	0.61	0.00	0.61	0.00
Lowland Fens	0.001	0.001	0.001	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	0.002	0.002	0.002	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)	0.01	0.01	0.01	0.00
Ponds and linear features	0.01	0.00	0.01	0.00
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

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Pastoral	4.95	0.00	4.95	0.00
Greenspace	0.12	0.00	0.12	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
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
NED2 (Norfolk Bradenham to Norfolk East Dereham potable transfer (10 MI/d))				
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)	0.01	0.01	0.01	0.00
Ponds and linear features	0.004	0.004	0.004	0.00
NNC4 (Norfolk East Dereham to North Norfolk Coast potable transfer (10 MI/d))				
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)	0.05	0.05	0.05	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
SUT5 (Norfolk Bradenham to Suffolk Thetford (15 MI/d))				

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
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
Active Flood Plain	2.38	2.38	2.38	0.00
Rivers (length)	0.04	0.04	0.04	0.00
Ponds and linear features	0.08	0.08	0.08	0.00
NHL4 (Norfolk East Harling to Norfolk Harleston potable transfer (5 MI/d))				
Arable	44.75	0.00	44.75	0.00
Pastoral	0.32	0.00	0.32	0.00
Broadleaved, Mixed and Yew Woodland	0.04	0.00	0.04	0.00
Woodland Priority Habitat	0.10	0.00	0.10	0.00
Active Flood Plain	0.61	0.61	0.61	0.00
Rivers (length)	0.01	0.01	0.01	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
NEH5 (Suffolk Thetford to Norfolk East Harling potable transfer (15 MI/d))				
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	0.05	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)	0.02	0.02	0.02	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
FND16 (Ruthamford South to Fenland potable transfer (20 MI/d))				

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Coastal and Floodplain Grazing Marsh	0.22	0.00	0.22	0.00
Arable	19.35	0.00	19.35	0.00
Pastoral	0.89	0.00	0.89	0.00
Other Semi-Natural Grassland	0.11	0.00	0.11	0.00
Broadleaved, Mixed and Yew Woodland	0.00035	0.00	0.00035	0.00
Woodland Priority Habitat	0.09	0.00	0.00	-0.09
Active Flood Plain	80.27	80.27	80.27	0.00
Lakes and Standing Waters	0.17	0.17	0.17	0.00
Rivers (length)	0.18	0.18	0.18	0.00
Ponds and linear features	1.16	1.16	1.16	0.00
RTN13 (Ruthamford North to Ruthamford North potable transfer (100 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
Active Flood Plain	3.53	3.53	3.53	0.00
Rivers (length)	273.36	273.36	273.36	0.00
Ponds and linear features	0.04	0.04	0.04	0.00
RTS11 (Ruthamford North to Ruthamford North potable transfer (50 MI/d))				
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)	239.63	239.63	239.63	0.00
Ponds and linear features	0.06	0.06	0.06	0.00
CAM4 (Ruthamford South to Cambridge Water potable transfer (50 MI/d))				

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Coastal and Floodplain Grazing Marsh	0.20	0.00	0.20	0.00
Arable	56.92	0.00	56.92	0.00
Pastoral	1.92	0.00	1.92	0.00
Orchards and Top Fruit	0.13	0.00	0.00	-0.13
Other Semi-Natural Grassland	0.39	0.00	0.39	0.00
Broadleaved, Mixed and Yew Woodland	0.35	0.00	0.35	0.00
Woodland Priority Habitat	0.28	0.00	0.28	0.00
Greenspace	0.06	0.00	0.06	0.00
Urban Woodland	0.26	0.00	0.26	0.00
Active Flood Plain	7.65	7.65	7.65	0.00
Rivers (length)	0.14	0.14	0.14	0.00
Ponds and linear features	0.06	0.06	0.06	0.00
SWC8 (Cambridge Water to Cambs and West Suffolk (50 MI/d)#)				
Arable	55.44	0.00	55.44	0.00
Pastoral	3.36	0.00	3.36	0.00
Broadleaved, Mixed and Yew Woodland	0.09	0.00	0.09	0.00
Woodland Priority Habitat	0.07	0.00	0.07	0.00
Active Flood Plain	1.91	1.91	1.91	0.00
Rivers (length)	0.03	0.03	0.03	0.00
Ponds and linear features	0.02	0.02	0.02	0.00
EXC15 (Cambs & West Suffolk to Essex Central potable transfer (10 MI/d))				
Arable	77.18	0.00	77.18	0.00
Pastoral	2.98	0.00	2.98	0.00
Broadleaved, Mixed and Yew Woodland	0.04	0.00	0.04	0.00
Woodland Priority Habitat	0.02	0.00	0.02	0.00
Greenspace	0.03	0.00	0.03	0.00
Active Flood Plain	2.02	2.02	2.02	0.00
Rivers (length)	425.35	425.35	425.35	0.00
Ponds and linear features	0.04	0.04	0.04	0.00
LNB1 (Ruthamford North to Bourne potable transfer (20 MI/d))				
Arable	17.80	0.00	17.80	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
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
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)	0.09	0.09	0.09	0.00
Ponds and linear features	0.14	0.14	0.14	0.00
EXS18 (Cams & West Suffolk to Essex Central potable transfer (10 MI/d))				
Coastal and Floodplain Grazing Marsh	0.40	0.00	0.40	0.00
Arable	23.92	0.00	23.92	0.00
Pastoral	5.35	0.00	5.35	0.00
Hay Meadows	0.14	0.00	0.14	0.00
Active Flood Plain	2.55	2.55	2.55	0.00
Rivers (length)	220.00	220.00	220.00	0.00
Ponds and linear features	0.02	0.02	0.02	0.00
EXS19 (Colchester WRC direct to Ardleigh Reservoir (no additional treatment))				
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
LNC25 (Lincolnshire East to Lincolnshire Central potable transfer (29 MI/d))				
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)	95.00	95.00	95.00	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Ponds and linear features	0.52	0.26	0.26	-0.26
FND21 (Strategic Resource Option (SRO): Earth embanked reservoir with a storage capacity 50 million cubic metres, located in the fens. Abstraction will be from the River Great Ouse)				
Coastal and Floodplain Grazing Marsh	13.03	6.1	11.09	-1.97
Lowland Fens	0.01	0	0.01	0
Arable	1070.47	28.37	1014.18	-56.29
Pastoral	520.87	0	123.52	-397.35
Orchards and top fruit	0.16	0	0	-0.16
Other Semi-Natural Grassland	0	0	1.1	1.1
Greenspace	0.16	0.02	0.16	0
Coniferous Woodland	0.26	0	0.19	-0.07
Active floodplain	4.05	1.25	4.05	0
Lakes and Standing Waters	5.9	1.97	2.48	-3.42
Rivers (length)	4.36	2.77	3.33	-1.03
Modified Waters (Reservoirs)	0	0	438.02	438.02
Ponds and linear features	11.09	3.85	7.07	-4.02
LNC10 (Extension /new reservoir at Hall - conjunctive with new treatment)				
Arable	15.69	0.00	3.31	-12.38
Active Flood Plain	1.96	1.96	0.20	-1.76
Modified Waters (Reservoirs)	0.00	0.00	14.14	14.14
Ponds and linear features	0.15	0.15	0.15	0.00
SUE5 (Felixstowe desalination (seawater) 25 Ml/d)				
Coastal and Floodplain Grazing Marsh	0.12	0.00	0.12	0.00
Arable	35.56	29.89	28.89	-5.67
Pastoral	3.21	0.00	3.21	0.00
Other Semi-Natural Grassland	1.19	0.00	1.19	0.00
Broadleaved, Mixed and Yew Woodland	0.06	0.00	0.06	0.00
Woodland Priority Habitat	1.42	0.00	1.42	0.00
Coniferous Woodland	0.34	0.00	0.34	0.00
Greenspace	2.23	0.00	2.23	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Active Flood Plain	12.58	11.33	11.33	-1.25
Rivers (length)	0.28	0.28	0.28	0.00
Ponds and linear features	0.11	0.11	0.11	0.00
Beach	0.08	0.00	0.08	0.00
Mudflats	0.86	0.00	0.86	0.00
Shallow Subtidal Sediment	11.62	0.00	11.62	0.00
EXS10 (Holland on Sea desalination (seawater) 25 MI/d)				
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)	0.13	0.13	0.13	0.00
Ponds and linear features	0.08	0.06	0.06	-0.02
NTB20 (Desalination (seawater) plant in the Caister area (25 MI/d))				
Coastal and Floodplain Grazing Marsh	1.91	0.00	1.91	0.00
Arable	52.82	0.00	48.38	-4.44
Pastoral	0.06	0.00	0.06	0.00
Other Semi-Natural Grassland	0.03	0.00	0.03	0.00
Broadleaved, Mixed and Yew Woodland	0.01	0.00	0.01	0.00
Woodland Priority Habitat	0.51	0.00	0.51	0.00
Greenspace	0.04	0.00	0.04	0.00
Urban Woodland	0.15	0.00	0.15	0.00
Active Flood Plain	5.93	3.17	3.17	-2.76
Rivers (length)	0.01	0.01	0.01	0.00
Ponds and linear features	0.23	0.14	0.14	-0.09
LNE6 (Mablethorpe desalination Seawater (63 MI/d))				

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
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

Table 3.2: Quantitative detailed 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)
RTC3 (Ruthamford South to Ruthamford Central potable transfer (20 MI/d))					
Carbon storage	£927.01	£0.00	-£927.01	£862.28	-£64.73
Natural hazard management	£71.72	£0.00	-£71.72	£53.79	-£17.93
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	£998.74	£0.00	-£998.74	£916.08	-£82.66
SUE5 (Felixstowe desalination (seawater) 25 MI/d)					

Carbon storage	£6,991.74	£1,173.75	-£5,817.98	£5,699.28	-£1,292.46
Natural hazard management	£161.25	£0.00	-£161.25	£120.94	-£40.31
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	£7,152.99	£1,173.75	-£5,979.24	£5,820.21	-£1,332.77
NBR6 (Fenland to Norfolk Bradenham potable transfer (50 MI/d))					
Carbon storage	£6529.63	£3.65	-£6525.98	£5615.83	-£913.80
Natural hazard management	£70.17	£0.18	-£69.99	£45.32	-£24.85
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	£1,043.67	£0.45	-£1,043.22	£949.87	-£93.80
NTB10 (Norfolk Bradenham to Norwich and the Broads potable transfer (20 MI/d))					
Carbon storage	£853.44	£0.00	-£853.44	£790.17	-£63.27
Natural hazard management	£108.09	£0.00	-£108.09	£81.07	-£27.02
Air Pollutant Removal	£1089.26	£0.00	-£1089.26	£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
Total	£2050.79	£0.00	-£2050.79	£185.27	-£200.52
NWY2 (Norwich and the Broads to Norfolk Wymondham potable transfer (15 MI/d))					
Carbon storage	£273.44	£0.28	-£273.16	£273.14	-£0.30
Natural hazard management	£0.76	£0.18	-£0.58	£0.57	-£0.19
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	£274.20	£0.47	-£273.74	£273.71	-£0.49
NAY1 (Norwich and the Broads to Aylsham potable transfer (3 MI/d))					
Carbon storage	£317.60	£0.00	-£317.60	£289.22	-£28.38
Natural hazard management	£73.08	£0.00	-£73.08	£54.81	-£18.27
Air Pollutant Removal	£537.93	£0.00	-£537.93	£487.41	-£50.52
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	£928.62	£0.00	-£928.62	£831.45	-£97.17
NED2 (Norfolk Bradenham to Norfolk East Dereham potable transfer (10 MI/d))					
Carbon storage	£211.94	£0.00	-£211.94	£208.97	-£2.98
Natural hazard management	£767.00	£0.00	-£7.67	£5.75	-£1.92
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	£219.61	£0.00	-£219.61	£214.72	-£4.89
NNC4 (Norfolk East Dereham to North Norfolk Coast potable transfer (10 MI/d))					
Carbon storage	£637.43	£0.00	-£637.43	£619.43	-£18.00
Natural hazard management	£46.37	£0.00	-£46.37	£34.77	-£11.59
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	£683.80	£0.00	-£683.80	£654.20	-£29.60
NHL4 (Norfolk East Harling to Norfolk Harleston potable transfer (5 MI/d))					

Carbon storage	£520.09	£0.00	-£520.09	£515.23	-£4.86
Natural hazard management	£12.53	£0.00	-£12.53	£9.40	-£3.13
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	£53,262.00	£0.00	-£532.62	£524.62	-£8.00
NEH5 (Suffolk Thetford to Norfolk East Harling potable transfer (15 MI/d))					
Carbon storage	£1,154.36	£0.00	-£1,154.36	£951.49	-£202.87
Natural hazard management	£268.02	£0.00	-£268.02	£201.02	-£67.01
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	£1,422.38	£0.00	-£1,422.38	£1,152.51	-£269.88
SUT5 (Norfolk Bradenham to Suffolk Thetford (15 MI/d))					
Carbon storage	£840.35	£0.00	-£840.35	£814.39	-£25.96
Natural hazard management	£46.32	£0.00	-£46.32	£34.74	-£11.58
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	£886.67	£0.00	-£886.67	£849.13	-£37.54
FND16 (Ruthamford South to Fenland potable transfer (20 MI/d))					
Carbon storage	£249.70	£0.00	-£249.70	£246.70	-£3.01
Natural hazard management	£7.75	£0.00	-£7.75	£5.81	-£1.94
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	£257.45	£0.00	-£257.45	£252.51	-£4.95
RTN13 (Ruthamford North to Ruthamford North potable transfer (100 MI/d))					
Carbon storage	£235.00	£0.00	-£235.00	£234.87	-£0.14
Natural hazard management	£0.35	£0.00	-£0.35	£0.27	-£0.09
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	£235.36	£0.00	-£235.36	£235.13	-£0.23
RTS11 (Ruthamford North to Ruthamford North potable transfer (50 MI/d))					
Carbon storage	£773.37	£0.00	-£773.37	£769.90	-£3.47
Natural hazard management	£6.29	£0.00	-£6.29	£4.72	-£1.57
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	£779.67	£0.00	-£779.67	£774.62	-£5.05
CAM4 (Ruthamford South to Cambridge Water potable transfer (50 MI/d))					
Carbon storage	£4,598.87	£0.00	-£4,598.87	£4,193.03	-£405.84
Natural hazard management	£78.85	£0.00	-£78.85	£59.14	-£19.71
Air Pollutant Removal	£1,151.69	£0.00	-£1,151.69	£1,062.99	-£88.70
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	£5,829.41	£0.00	-£5,829.41	£5,315.16	-£514.25
SWC8 (Cambridge Water to Cambs and West Suffolk (50 MI/d))					

Carbon storage	£723.30	£0.00	-£723.30	£717.42	-£5.88
Natural hazard management	£15.01	£0.00	-£15.01	£11.26	-£3.75
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	£738.31	£0.00	-£738.31	£728.67	-£9.64
EXC15 (Cams & West Suffolk to Essex Central potable transfer (10 MI/d))					
Carbon storage	£936.73	£0.00	-£936.73	£934.67	-£2.06
Natural hazard management	£5.32	£0.00	-£5.32	£3.99	-£1.33
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	£942.05	£0.00	-£942.05	£938.65	-£3.39
LNB1 (Ruthamford North to Bourne potable transfer (20 MI/d))					
Carbon storage	£222.16	£0.00	-£222.16	£216.62	-£5.54
Natural hazard management	£13.99	£0.00	-£13.99	£10.49	-£3.50
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	£236.15	£0.00	-£236.15	£227.11	-£9.04
EXS18 (Cams & West Suffolk to Essex Central potable transfer (10 MI/d))					
Carbon storage	£408.19	£0.00	-£408.19	£408.19	£0.00
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
Total	£408.19	£0.00	£408.19	-£408.19	£0.00
EXS19 (Colchester WRC direct to Ardleigh Reservoir (no additional treatment))					
Carbon storage	£3,996.61	£0.00	-£3,996.61	£2,942.24	-£1,054.37
Natural hazard management	£19.49	£0.00	-£19.49	£14.62	-4.87
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	£179,500.00	£178,300.00	-£1,200.00	£178,300.00	-£1,200.00
Total	£189,516.10	£178,300.00	-£5,126.10	£181,156.86	-£2,259.25
RTN17 (Strategic Resource Option (SRO): Earth embanked winter storage reservoir located in the south Lincolnshire area. Abstraction will be from the River Trent, with a transfer via the River Witham.)					
Carbon storage	£69,696	£2,077	-£67,619	£36,229	-£33,468
Natural hazard management	£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	-£335,682	£6,333,832	-£335,682
Total	£6,739,714	£6,335,941	-£403,687	£6,370,199	-£369,431
LNC25 (Lincolnshire East to Lincolnshire Central potable transfer (29 MI/d))					
Carbon storage	£936.17	£659.25	-£276.92	£665.44	-£270.73
Natural hazard management	£5.32	£0.00	-£5.32	£3.99	-£1.33
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	£524,700.00	£515,900.00	-£8,800.00	£515,900.00	-£9,072.06
Total	£525,641.49	£516,559.25	-£9,082.24	£516,569.43	-9,072.06

FND21 (Strategic Resource Option (SRO): Earth embanked reservoir with a storage capacity 50 million cubic metres, located in the fens. Abstraction will be from the River Great Ouse.)

Carbon storage	£122,322	£1,132	-£121,190	£60,768	-£61,552
Natural hazard management	£26	£0	-£26	£14	-£11
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	£3,273,700	£3,070,200	-£203,500	£3,070,200	-£203,500
Total	£3,396,048	£3,071,332	-£324,716	£3,130,982	-£265,063

EXS10 (Holland on Sea desalination (seawater) 25 MI/d)

Carbon storage	£4,949.25	£2,284.28	-£2,664.97	£4,716.93	-£232.32
Natural hazard management	£0.89	£0.00	-£0.89	£0.66	-£0.22
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	£122,100.00	£120,000.00	-£2,100.00	£1,200.00	-£2,100.00
Total	£127,050.14	£122,284.28	-£4,765.86	£124,717.60	-£2,332.54

NTB20 (Desalination (seawater) plant in the Caister area (25 MI/d))

Carbon storage	£3,321.99	£0.00	-£3,321.99	£2,842.12	-£479.87
Natural hazard management	£59.36	£0.00	-£59.36	£44.52	-£14.84
Air Pollutant Removal	£982.53	£0.00	-£982.53	£859.61	-£122.92
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£108,100.00	£105,700.00	-£2,400.00	£105,700.00	-£2,400.00
Total	£112,463.88	£105,700.00	-£6,763.88	£109,446.25	-£3,017.64

LNE6 (Mablethorpe desalination Seawater (63 MI/d))

Carbon storage	£634.19	£0.00	-£634.19	£506.51	-£127.68
Natural hazard management	£24.81	£0.00	-£24.81	£1861	-£6.20

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	£659.00	£0.00	-£659.00	£525.12	-£133.88

SUE23 (Modification of Raydon WTW to reduce the minimum treatment capacity from 8MI/d to 2MI/d)

Carbon storage	£27.18	£0.00	-£27.15	£0.00	-£27.15
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	£127,700.00	£111,900.00	-£800.00	£111,900.00	-£800.00
Total	£112,727.15	£111,900.00	-£827.15	£111,900.00	-£827.15

LNC10 (Extension /new reservoir at Hall - conjunctive with new treatment)

Carbon storage	£172.45	£0.00	-£172.45	£36.40	-£136.04
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	£157,400.00	£151,800.00	-£5,600.00	£151,800.00	-£5,600.00
Total	£157,572.45	£151,800.00	-£5,772.45	£151,836.00	-£5,736.04

Table 3.3: Qualitative assessment of the unmitigated predicted impacts on the provision of water purification and water flow regulation

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Water purification				
<ul style="list-style-type: none"> CAM4 LNC25 EXC15 EXS18 NAY1 NBR6 NEH5 NHL4 	The stock likely provides a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and 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 stock will likely be reduced due to the option.

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
<ul style="list-style-type: none"> NTB10 SWC8 EXS19 SUT5 NNC4 FND21 NED2 RTC3 LNB1 NWY2 RTN13 RTS11 FND16 RTN17 SUE5 LNC10 LNE6 	proximity of the asset to a water source.			
<ul style="list-style-type: none"> NBR6 	The stock likely provides 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 stock will likely be reduced due to the option. Future provision of ecosystem services provided by Ancient Woodland will be permanently lost as is a high value natural capital stock that cannot be replaced or replicated once lost.
Water flow regulation				
<ul style="list-style-type: none"> RTC3 SUE5 NBR6 NTB10 NWY2 NAY1 NED2 SUT5 NNC4 NHL4 NEH5 FND16 RTN13 RTS11 CAM4 SWC8 EXC15 LNB1 EXS18 EXS19 	The stocks 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 stock will likely remain.	0
<ul style="list-style-type: none"> DES-16 NTB20 	The stocks provide a regulation of water flow, both	The provision of services will be	The future provision of the ecosystem service provided by	-

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
	retaining water within the catchment and providing water to local communities. The preservation of stocks will reduce negative impacts to the ecosystem service.	lost during construction.	the stock will likely reduce slightly.	
<ul style="list-style-type: none"> EXS18 LNE6 	The stocks 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 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. 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 Level 2 WFD. As such, the impact of the option on water flow regulation cannot be assessed at this stage.	--
<ul style="list-style-type: none"> LNC10 RTN17 FND21 	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.	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. 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 Level 2 WFD. As such, the impact of the option on water flow regulation cannot be assessed at this stage.	+++

Table 3.4: Summary of the unmitigated BNG Metric outputs

Option	On-site Baseline (Ha)	On-Site Post Intervention (Ha)	Total Net Unit change (Ha)	Total Percentage Change
CAM4 (Ruthamford South to Cambridge Water potable transfer (50 MI/d))	139.12	122.05	-17.07	-12.27%
LNC25 (Lincolnshire East to Lincolnshire Central potable transfer (29 MI/d))	173.46	118.1	-55.36	-31.91%
EXC15 (Cambs & West Suffolk to Essex Central potable transfer (10 MI/d))	167.28	159.93	-7.35	-4.39%
EXS18 (Cambs & West Suffolk to Essex Central potable transfer (10 MI/d))	76.44	68.23	-8.21	-10.74%
NAY1 (Norwich and the Broads to Aylsham potable transfer (3 MI/d))	86.11	67.08	-19.04	-22.11%
NBR6 (Fenland to Norfolk Bradenham potable transfer (50 MI/d))	136.64	128.39	-8.55	-6.24%
NEH5 (Suffolk Thetford to Norfolk East Harling potable transfer (15 MI/d))	79.04	62.71	-16.32	-20.65%
NHL4 (Norfolk East Harling to Norfolk Harleston potable transfer (5 MI/d))	92.4	87.9	-4.5	-4.87%
SUT5 (Norfolk Bradenham to Suffolk Thetford (15 MI/d))	156.19	128.76	-27.43	-17.56%
SWC8 (Cambridge Water to Cambs and West Suffolk (50 MI/d))	126.04	119.33	-6.72	-5.33%
EXS19 (Colchester WRC direct to Ardleigh Reservoir (no additional treatment))	64.34	35.77	-28.57	-44.40%
NTB10 (Norfolk Bradenham to Norwich and the Broads potable transfer (20 MI/d))	122.07	105.57	-16.50	-13.52%
NNC4 (Norfolk East Dereham to North Norfolk Coast potable transfer (10 MI/d))	137.44	106.21	-31.23	-22.72%
FND21 (Strategic Resource Option (SRO): Earth embanked reservoir with a storage capacity 50 million cubic metres, located in the fens. Abstraction will be from the River Great Ouse)	5243.56	5191.88	-51.68	-0.99%
NED2 (Norfolk Bradenham to Norfolk East Dereham potable transfer (10 MI/d))	156.19	128.76	-27.43	-17.56%
RTC3 (Ruthamford South to Ruthamford Central potable transfer (20 MI/d))	144.13	121.02	-23.11	-16.03%

Option	On-site Baseline (Ha)	On-Site Post Intervention (Ha)	Total Net Unit change (Ha)	Total Percentage Change
LNB1 (Ruthamford North to Bourne potable transfer (20 MI/d))	39.08	36.21	-2.87	-7.34%
NWY2 (Norwich and the Broads to Norfolk Wymondham potable transfer (15 MI/d))	62.26	48.76	-13.51	-21.69%
RTN13 (Ruthamford North to Ruthamford North potable transfer (100 MI/d))	55.5	43.96	-11.54	-20.79%
RTS11 (Ruthamford North to Ruthamford North potable transfer (50 MI/d))	137.24	127.74	-9.5	-6.92%
FND16 (Ruthamford South to Fenland potable transfer (20 MI/d))	58.62	52.78	-5.84	-9.96%
RTN17 (Strategic Resource Option (SRO): Earth embanked winter storage reservoir located in the south Lincolnshire area. Abstraction will be from the River Trent, with a transfer via the River Witham)	3141.39	3846.59	705.20	22.45%
SUE5 (Felixstowe desalination (seawater) 25 MI/d)	139.32	87.09	-52.23	-37.49%
LNC10 (Extension /new reservoir at Hall - conjunctive with new treatment)	32.58	71.02	33.44	117.97%
NTB20 (Desalination (seawater) plant in the Caister area (25 MI/d))	144.36	102.93	-41.43	-28.70%
EXS10 (Holland on Sea desalination (seawater) 25 MI/d)	186.02	154.51	-31.51	-16.94%
LNE6 (Mablethorpe desalination Seawater (63 MI/d))	47.16	16.96	-30.20	-64.04%

4 Cumulative Effects Assessment

4.1 Introduction

The final stage in natural capital assessment is the cumulative effects assessment, including intra-plan effects, to inform Anglian Water's WRMP24 programme appraisal.

This section provides a summary of the outputs of the cumulative effects assessment for both the NCA and BNG of Anglian Water's WRMP24 BVP options.

4.2 Methodology

For NCA and BNG, the cumulative effects assessment only considers the BVP options and does not include an assessment of the alternative plans. The cumulative intra-plan effects assessment for the Best Value Plan considers the option assessments as a whole and the habitat units that would be required to be purchased in order to achieve a 10% net gain in BNG. This provides an estimate of the value of the potential mitigation or enhancement opportunities that will need to be developed further to achieve the 10% BNG required within the options. Additionally, where possible, the Best Value Plan could aim to not only reinstate lost habitat, but also provide a greater or more diverse habitat than is lost, to achieve overall Biodiversity Net Gain in line with regulatory requirements for BNG (at the time of the project consenting) as stated as a mandatory requirement within the Environment Act 2021¹⁷. The latter could be achieved by identifying local sites of ecological interest and proposing measures which enhance these features.

Cumulative Effects Assessment

Cumulative (Intra-plan) Effects Assessment

Table 4.1 below lists the stocks of natural capital that are likely to be temporarily and permanently impacted by the BVP. The BVP is likely to generate both a gain and loss of natural capital stocks during construction. Some of the lost habitat that is expected to be reinstated and/or compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services.

Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted.

Construction impacts include the release of CO₂ due to habitat clearance, loss of natural hazard management, a reduction in food production services, a reduction in recreational and amenity services, and a reduction in water purification. Like the option-level assessments, the carbon sequestration rates were converted to monetary values using standard methods and the Department for Business, Energy and Industrial Strategy (BEIS) Interim Non-Traded Carbon Values. Please note, the 2022 values were used for the cumulative effects assessment (Table 4.2 and Table 4.3). There is some change anticipated in water flow regulation (Table 4.3), however the change is expected to bring additional water flow regulation to the environment due to the addition of a reservoir.

The BVP presents an opportunity to improve the existing habitats through post construction remediation and replacement of low value habitats with higher value habitats. The option

¹⁷ [Environment Act 2021 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukpga/2021/12/section/12)

crosses several Natural England habitats, Network Enhancement Zones and is therefore suitable for the planting of new high value habitats.

Table 4.1 Predicted temporary and permanent impacts on natural capital stocks for the BVP

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present during construction (Ha)	Stocks present post construction (Ha)	Change (Ha)
Active Flood Plain	208.43	174.06	179.99	-28.44
Ancient Woodland	0.11	0	0	-0.11
Arable	3346.73	203.22	2707.6	-637.23
Beach	1.21	0	1.21	0
Broadleaved, Mixed and Yew Woodland	2.24255	0.0322	2.21255	-0.02
Coastal floodplain grazing marsh	27.18	6.1	24.65	-2.56
Coniferous Woodland	4.15	0	4.08	-0.07
Greenspace	3.67	0.33	3.67	0
Hay Meadows	1.54	0	1.54	0
Lakes and Standing Waters	6.41	2.48	2.99	-3.42
Lowland Fens	0.561	0.001	0.561	0
Modified Waters (Reservoirs)	0.11	0.11	932	931.89
Mudflats	0.89	0	0.89	0
Orchards and Top Fruit	0.36	0	0	-0.36
Other Semi-Natural Grasslands	5.71	0	8.37	2.66
Pastoral	654.25	1.12	206.09	-448.16
Ponds and linear features	25.1586	12.5286	17.8286	-7.33
Rivers (length)	1594.7	1588.87	1592.06	-2.63
Saltmarsh	0.05	0	0.05	0
Sand Dunes	0.99	0	0.99	0
Shallow Subtidal Sediment	13.14	0	13.14	0
Urban Semi Natural Habitat	0.07	0	0.07	0
Urban Woodland	0.68	0	0.68	0
Woodland Priority Habitat	9.67	0.29	6.75	-2.46

Table 4.2 Quantitative 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)
BVP					
Carbon storage	£251,077.35	£8,731.12	-£242,346.23	£151,092.06	-£99,985.29
Natural hazard management	£1,125.45	£28.55	-£1,096.90	£640.75	-£484.70
Air Pollutant Removal	£50,335.75	£2,924.02	-£47,411.74	£39,958.21	-£10,377.55
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£11,162,800.00	£10,587,632.00	-£560,082.00	£9,908,477.94	-£560,354.06
Total	£11,465,338.55	£10,599,315.69	-£850,936.87	£10,100,168.96	-£671,201.60

Table 4.3 Qualitative assessment of the unmitigated predicted impacts on the provision of water purification and water flow regulation for the BVP

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Water purification				
BVP	Scoped in as the option causes the temporary and permanent loss of associated stock. 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.	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 stock will likely be reduced due to the option. Future provision of ecosystem services provided by Ancient Woodland will be permanently lost as is a high value natural capital stock that cannot be replaced or replicated once lost.

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Water flow regulation				
BVP	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.	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. 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 Level 2 WFD. As such, the impact of the option on water flow regulation cannot be assessed at this stage.	+++

The Anglian Water BVP achieves the 10% BNG as a whole driven by the predicted positive effects of the reservoir schemes it includes. Definitive rules on the function of BNG in the consenting of individual infrastructure projects contained in the draft WRMP are not yet available; as such, despite the overall performance of the BVP, additional local habitat units may still need to be created to restore the loss of habitat units – and deliver 10% BNG – where the implementation of individual supply options indicates a loss of habitat units. The BVP's achievement of 10% BNG is associated with the natural capital created with the addition of the three reservoirs at Hall, South Lincolnshire and Fens. It is noted that Ancient Woodland has been excluded from BNG calculations as this habitat is classed as irreplaceable once lost, and subtidal habitats have also not been included within the calculations.

Table 4.4 Summary of the unmitigated BNG Metric outputs for the BVP

On-site Baseline (Ha)	On-Site Post Intervention (Ha)	Total Net Unit change (Ha)	Total Percentage Change
10314.77	11134.65	819.88	7.95%

4.3 Opportunities

Opportunities should be considered to ensure that the natural environment is left in a better condition than pre-construction conditions for the BVP. This should be achieved by one or both of the following:

- **Mitigation:** Opportunities to offset 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).

As a core principle, where possible, the BVP should aim to not only reinstate lost habitat, but also provide a greater or more diverse habitat than is lost, to achieve overall BNG. The latter could be achieved by identifying local sites of ecological interest and proposing measures. Any habitats that are created or enhanced to achieve BNG are required to be secured for 30 years, through management, maintenance, and monitoring. The natural capital map which is based on

the methodology described in the NECR285 (see Section 2) should be utilised, where possible, to assist in identifying opportunities to improve natural capital.

A summary of the potential NCA, BNG mitigation and enhancement measures for each sub-component type of the BVP are outlined in Table 4.5. Further explanation into the potential enhancement measures is provided within the sections below.

Table 4.5 Summary of potential net gain 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"> Coastal and floodplain grazing marsh Lowland fens Lowland raised bog Reedbeds Blanket bog Hay meadows Dwarf shrub heath Broadleaved, mixed and yew woodland Coniferous woodland Blue space Greenspace 	Habitat creation work within the adjacent priority habitats. Options fall within or are in the vicinity of habitat network zones ¹⁸ : <ul style="list-style-type: none"> Habitat restoration-creation Restorable habitat Fragmentation action zone Network enhancement zones 1 and 2 Expansion zone 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.
Option elements located along the canals		Identify areas of local peatland restoration
		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		Seeding of grassland within footprints of the above ground infrastructure, where possible.

¹⁸ 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
that contain above ground infrastructure		

BNG Unit Purchase

BNG can be achieved via a new statutory biodiversity credits scheme. Credits can be bought by developers as a last resort when onsite and local offsite provision of habitat cannot deliver the BNG required. The price of biodiversity credits will be set higher than prices for equivalent biodiversity gain on the market and are expected to be purchased through a national register for net gain delivery sites. Natural England is in the process of running pilot schemes to provide a practical insight into the implications of the scheme, which is expected to go live spring 2023.

Habitat creation possibilities, other than unit purchase, to support achieving a 10% BNG gain 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 decrease by improving the existing habitats within the off-site land and/or by replacing existing habitats with higher BNG value habitats.
- 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.

It is important that, where possible, the BVP starts to consider reaching out to local non-government organisation and planning authorities who may potentially be able to carry out BNG both onsite and offsite. Early engagement may help provide further insight on local opportunities for enhancement, how this can be achieved, local priorities and limiting factors

5 Conclusions

5.1 Overall Conclusion

The NCA, BNG and ecosystem services outputs of the BVP identified the following:

- **NC:** The BVP options will cause the temporary and permanent loss of natural capital stocks. The BVP is likely to permanently impact a small area of the edge of an Ancient & Semi-Natural Woodland (0.11ha). The BVP is also likely to impact a small area of orchards and top fruit stocks (0.36ha). Anglian Water should seek to avoid and reduce the level of impact of the proposed development on these irreversible habitats, through well planned construction techniques of the buried pipelines.
- **Ecosystem services:** The plan 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 management, 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.
- **BNG:** The draft Plan is likely to result in a gain of BNG habitat units due to the reinstatement of lost natural capital assets, but more significantly the addition of three reservoirs in the BVP. Mitigation and enhancement opportunities across the selected supply options have been suggested within Section 4, which can work in tandem to maintaining the gain of BNG and introducing environmental net gain.

5.2 Next Steps

The opportunities identified in the BNG/NC assessment for the BVP 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 BVP could consider some opportunities to create and improve habitat on-site and off-site through local schemes, NRNs and wildlife corridors in order to achieve a 10% net gain in BNG units and increase the provision of ecosystem services, therefore aiding in developing more resilient options for the future provision of water for Anglian WRMP24.

Appendix

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 waterbodies (from OS Vector Map District) that do not intersect rivers, are smaller than 2ha in size.
	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 waterbodies dataset (cycle 1, to include coastal streams
	Blanket bog	Area of blanket bog mapped using Natural England's Priority Habitat Inventory.
Mountain, Moor and Heath	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 waterbodies 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
Urban	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.
	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
	Arable and rotational leys	Area of arable and rotational leys, and horticulture individually, this map shows the area of arable, and horticulture combined. Mapped using UK Land Cover 2018 Sub Classes.
	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).
Farmland	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')
	Ancient Woodland	Mapped using Natural England's Ancient Woodland dataset.
	Broadleaved, mixed and yew woodland	Mapped using FC's National Forest Inventory.
Woodland	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').
	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
Marine	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').
	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).
	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.

