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Northumbrian Water - Water Resources Management Plan 2024

Environmental Report - Appendix H

April 2024

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Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	08/08/22	R P	T K	Ja F	First draft for client comment
B	03/10/22	S S	C S	I S	Draft for consultation
C	17/04/24	A H	T S	Ja F	Final for Issue, added text with scope-out of option

Document reference: 100104977-RP-BOT-BNGNCAP-Rev C

Information class: Standard

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Contents

1 Introduction

1.1 Overview

This annex supports the SEA Environmental Report that accompanies the Northumbrian Water's (NW) Water Resource Management Plan (WRMP) 2024 submission to regulators. The annex presents the findings of the Natural Capital Approach (NCA) and Biodiversity Net Gain (BNG) assessments applied to the NW WRMP24 options.

1.2 Northumbrian Water WRMP24 options

The outputs of the initial options identified 5 options for additional water supplies in the NW region. These options are shown in Table 1.1. A further option was added for the final WRMP24 submission - Supplying Teesside Industrial Water, which is also summarised in the Table.

Table 1.1: Northumbrian Water WRMP24 options

Option name	Description overview
BOT-TRA-001	Transfer (10 Ml/d) from Warkworth WTW to Spring Hill Service Reservoir Transfer length approximately 56.7 km. Tunnelling (micro-tunnelling/horizontal directional drilling) highly likely to be required as the route crosses one railway, three major roads (A1068, A1 (twice)), six minor roads (B1340, B6347, B1341, B6349, B6353, B6525), 15 named rivers (River Coquet, Grange Burn, River Aln, Kittycarter Burn, Switcherdean Burn, Waren Burn, Chuckbridge Burn, Warenton Dean, Belford Burn, Middleton Burn, Kettle Burn, County Burn, Fenwick Burn, South Low, Allerdeanmill Burn), and numerous drainage channels.

BOT-TRA-002	Transfer (2 Ml/d) from Hedgeley Service Reservoir to New Scots Quarry Service Reservoir, with chemical dosing located at Hedgeley SR
	Transfer length approximately 13.7 km. Tunnelling (micro-tunnelling/horizontal directional drilling) potentially required as the route crosses one minor road (B6346), four rivers (River Breamish, Roddam Burn, Lilburn Bank, Wooler Water), and four drainage channels. The route follows the A697 road for a considerable length as elevation constraints result in this being the best route
	Option also requires reinforcement of existing network to support increased flow rates. The impact of this will be determined through network modelling which will be carried out in Phase 3
	The results of network modelling have identified multiple changes to the existing network:
	• Twinning of existing crossing to provide resilience.
	  ○ Railway crossing nr. Warkworth WTW
	  ○ A1 at Alnwick
	  ○ River Aln west of Alnwick
	• Pipe reinforcement (laying new pipe next to existing pipe and using both)
	  ○ Section NW of Alnwick
	  ○ From A697/B6354 junction to River Till crossing (west)
	  ○ River Till crossing (east) to Ford PS
	• Pipe replacement between Milfield and A697/B6354 junction

BOT-TRA-004	Transfer (10 Ml/d) from Wooler to Murton WTW Makes use of existing pipes from Wooler to Milfield. Pipe replacement required from Milfield to A697/B6354 junction. Pipe reinforcement required between A697/B6354 junction and River Till crossing (West), and between River Till crossing (east) and Ford PS. New pipeline from Ford to Murton WTW

Option name	Description overview
	Transfer length approximately 9.66 km. Tunnelling (micro-tunnelling/horizontal directional drilling) potentially required as the route crosses one minor road (B6354), two named rivers (Dean Burn, Allerdeanmill Burn), and one drainage channel
BOT-ABS-002	Abstraction (10 Ml/d DO) from a new borehole in Duddo, transfer in new pipeline to Felkington Mains, transfer using existing pipelines to discharge to Murton WTW New transfer pipeline length approximately 2.1 km. Tunnelling (micro-tunnelling/horizontal directional drilling) unlikely to be required as route follows the road B6354 Pipe replacement will be required between Thornton and Murton.
BOT-ABS-007	Recommission/refurbishment of a disconnected borehole (10 Ml/d DO) in Fowberry. Transfer from Fowberry to new Wooler WTW through existing mains. No network reinforcement required. Only new pipe is the connection between the mains and the WTW, approximate length of 320m Environmental mitigation: use of existing infrastructure with no need for network reinforcement. Use of new Wooler WTW (currently under construction)
Supplying Teesside Industrial Water	This option involves bringing the existing but currently unused Low Worsall RWPS on the Tees back into use, installing Eel Regs compliant eel screens at Low Worsall RPWS and increasing abstraction licences at Low Worsall RWPS back up to 2016 levels and at Blackwell RWPS back up to historic (pre-2016) levels. In order to supply the increased raw water demand, the Blackwell licence is proposed to be increased to pre 2016 volumes (58,075 Ml/yr, 159 Ml/d) along with installing eel screens (assume Hydrolox eel exclusion screens) at Low Worsall and increasing the licence to 2016 volumes (150Ml/d peak, 85Ml/d annual average). **Notes – (1)** The NCA assessment for the Supplying Teesside Industrial Water option, included in the Best Value Plan, has been scoped-out as the proposed works will be undertaken within existing hardstanding and therefore is not anticipated to impact natural capital stocks. **(2)** The BNG assessment for the Supplying Teesside Industrial Water option, included in the Best Value Plan, has been scoped-out as the proposed works will be undertaken within existing hardstanding and therefore is unlikely to impact upon any existing habitats.

2 Methodology

2.1 Natural Capital Assessment Methodology

2.1.1 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 Guidelines[1] (WRPG) and consider broader government policy objectives. The WRPG recommends 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 Resources North (WReN) regional plan 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 companies WRMPs.

To ensure that a Natural Capital Approach is incorporated in a consistent way across the WReN 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 Guideline (WRPG): 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

2.1.2 Principles to the WReN 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 NW WRMP24 SEA was undertaken in the context of these plans and falls within the Water Resources North (WReN) regional plan. In line with the EA guidance on Environment and Society in Decision-making[2] the WReN 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)

[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 the most 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 WReN 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

2.2.1 Zone of influence for option level assessment

The zone of influence (ZoI) for each option is defined as the area of receiving (i.e., a watercourse receiving a discharge) or providing (i.e., an aquifer where abstraction will occur) environment with the potential to be altered or changed as a result of the option.

This can include the operational catchment for a surface water abstraction or an aquifer for a groundwater abstraction in addition to the footprint of the option.

2.2.2 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 NECR285[3] to generate a Natural Capital account of the stocks within the Northumbrian region. The list of stocks considered within the accounts and the methodology for mapping them are shown in Section 4 of this appendix. 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 Northumbrian region.

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

2.3.1 Natural Capital Assessment

A natural capital assessment has been undertaken on the options in accordance with the Water Resources Planning Guideline[4] (WRPG) and Enabling a Natural Capital Approach[5] (ENCA) 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.

In August 2021, ENCA updated its guidance. Therefore, the NCA were updated in line with the values used to quantify the provision of ecosystem services.

The August 2021 ENCA guidance (GOV.UK, 2021) includes updated values within the Asset Databook and Service Databook. Within the Service Databook, the carbon reduction tab now includes BEIS (2022) carbon values - a set of values produced by the government to be used in policy appraisal and evaluation, reflecting the latest evidence. 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 (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 Metric[6].

[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] GOV.UK. 2021. Enabling a Natural Capital Approach guidance. Available online at: <https://www.gov.uk/government/publications/enabling-a-natural-capital-approach-enca-guidance/enabling-a-natural-capital-approach-guidance> [Accessed April 2022].

[6] Natural England, 2021. Available at: ARCHIVE SITE for the Biodiversity Metric 2.0 and the Biodiversity Metric 3.0 (nepubprod.appspot.com) [Accessed: May 2022]

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
- Water Regulation
- Biodiversity and Habitats
- Air pollutant removal
- Recreation & amenity value
- Food production

Both natural capital assessment strategies, as outlined in the WRPG 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, all of the seven ecosystem services listed 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.

2.4.1 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) [7] [5]

Land use type	C Seq rate (tCO2e/ha/yr)
Woodland - (deciduous)	4.97
Woodland – (coniferous)	12.66
Arable Land	0.107
Pastoral land	0.397
Peatland - Undamaged	4.11
Peatland - Overgrazed	-0.1
Peatland - Rotationally burnt	-3.66
Peatland - Extracted	-4.87
Grassland	0.397
Heathland	0.7
Shrub	0.7
Saltmarsh	5.188
Urban	0
Green Urban	0.397

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 (Table 2.2).

Table 2.2: BEIS updated short-term traded sector carbon values for policy appraisal, £/tCO2e (£2020)

Year	Low series	Central series	High series
2020	120	241	361
2021	122	245	367
2022	124	248	373
2023	126	252	378
2024	128	256	384
2025	130	260	390
2026	132	264	396
2027	134	268	402
2028	136	272	408
2029	138	276	414
2030	140	280	420
2031	142	285	427
2032	144	289	433
2033	147	293	440
2034	149	298	447
2035	151	302	453

[7] 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.

Year	Low series	Central series	High series
2036	155	307	460
2037	156	312	467
2038	158	316	474
2039	161	321	482
2040	163	326	489
2041	165	331	496
2042	168	336	504
2043	170	341	511
2044	173	346	519
2045	176	351	527
2046	178	356	535
2047	181	362	543
2048	184	367	551
2049	186	373	559
2050	189	378	568

2.4.2 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 Plan[8]. The capacity of habitats to achieve this was quantified, and then a monetary value assigned based on the damage-costs avoided from flooding or replacement costs due to their capacity to regulate flood waters. The capacity for a given natural capital asset to provide a flood regulation service will depend on two factors:

- 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, 2018[9]. 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

[8] 25 Year Environment Plan - GOV.UK (www.gov.uk)

[9] 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.

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 / m^3. 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 costs.[5]

2.4.3 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 NEVO[10] tool. The tool defines the resulting changes for the following water quality variables:

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

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.

2.4.4 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 will be used to compare the positive and negative effect of each option

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

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[2] that recommends not including monetisation of water regulation benefits in decision making.

2.4.5 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, 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. [5]

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 methodology[11]. 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.

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

2.4.6 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

[11] Jones L., Vieno M., Morton Dan et al. (2019) Developing Estimates For The Valuation Of Air Pollution Removal In Ecosystem Accounts. Final Report For Office Of National Statistics - NERC Open Research Archive.

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 Tool[12] (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.

2.4.7 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 ecosystems[5].

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 Bateman[13].

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 WReN 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.

[12] ORVal, Land, Environment Economics and Policy Institute. University of Exeter. Available online at: <https://www.exeter.ac.uk/research/leep/research/orval/> [Accessed April 2022]

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

The results of the NCA and BNG assessments will be incorporated into WReN 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 six 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 NW WRMP24 have been presented in Section 3 below.

2.6 Biodiversity Net Gain Assessment Methodology

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[2] 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 metric 3.0 which can be used to calculate BNG change through land use of each option. 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. Demand management options have not been assigned a biodiversity net gain and any impacts have been incorporated within the SEA assessment.

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.

Updates to the methodology for mapping natural capital stocks and therefore subsequent NCA and BNG assessments was agreed on the 28t June 2022, to account for the primary habitats that occur in the same location as, and were represented in the existing assessment by, active floodplain. The update to the methodology adheres to the same principles and approach for the NCA and BNG assessments, using previously identified datasets where possible, and supplementing the method with a new land use/land cover (LULC) dataset to identify any habitats that are currently represented as active floodplain that cannot be identified using the previously identified datasets. The update has ensured that primary habitat that was previously represented by active floodplain within the natural capital mapping, specifically pasture and arable land which have been categorised as lower priority in the development of the baseline map, have been fully accounted in the options-level assessments.

The update to the assessment methodology is outlined below:

- The area of active floodplain identified in the NCA / BNG assessment for each option was identified and selected using the same environmental datasets previously identified within section 2.2.3 above.
- Where areas of active floodplain were overlapping with habitats mapped by the previously identified datasets, those areas were updated with those habitat areas identified by those datasets.

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- Where areas of active floodplain did not overlap with the previously identified environmental datasets, habitats were identified using the Corine Land Cover (CLC) dataset from 2018[14].
- The CLC dataset is considered appropriate for the assessment, as the CLC products are based on the analysis of satellite imagery by national teams of participating countries - the EEA member and cooperating countries - following a standard methodology and nomenclature and include 44 classes of habitat.
- The habitats identified by both the previously identified environmental datasets and the CLC dataset were converted to the corresponding category of natural capital stock, with the full list of natural capital stocks set out in Appendix A.
- The NCA and BNG assessments were updated with the new areas of natural capital stocks identified.
- The NCA assessments are expected to indicate a larger area than the total area within the option boundary, given that areas of both active floodplain and areas of co-existing habitat will be identified. However, any risk of double counting has been avoided as active floodplain is not included within the ecosystem services assessment and works in synergy with the co-existing primary habitats.
- The BNG assessment includes the areas of new stocks identified as part of the update. The update has resulted in the total area located within the option boundary to be included in the BNG 3.0 Metric[15], as the existing calculations do not currently include areas of active floodplain as a habitat.

The update to the methodology ensures that impacts upon primary habitat, specifically pasture and arable land, are not underrepresented and provides a more holistic view of the potential impacts to the provision of ecosystem services.

2.6.1 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[16]. 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:

For Natural Capital Assessments (NCAs):

- The costs for constructing, operating, and maintaining the options was not considered within the assessments.

[14] UK CEH Environmental Information Data Centre. CORINE Land Cover Map datasets for the UK, Jersey and Guernsey. Available online at: <https://catalogue.ceh.ac.uk/documents/2fad7f16-6585-438a-9fe3-a7d68ff642f9>

[15] Natural England. ARCHIVE SITE for the Biodiversity Metric 2.0 and the Biodiversity Metric 3.0. Available online at: <http://publications.naturalengland.org.uk/publication/5850908674228224>

[16] Environment Act 2021 (legislation.gov.uk)

- 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. 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.

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3 NCA and BNG assessment outputs

The NCA and BNG outputs for the options are summarised in Table 3.1.

Note:

- Carbon sequestration is scoped out when the option does not cause the temporary and/or permanent loss of associated stocks.
- Natural hazard management is scoped out when the option does not cause the temporary and/or permanent loss of associated stocks within an active floodplain.
- Air pollutant removal is scoped out when the option does not cause the temporary and/or permanent loss of associated stocks within an AQMA or urban area.
- Recreation & amenity value is scoped out when the option does not cause the permanent loss of greenspace.

Food production is scoped out when the option does not cause the permanent loss of arable and pastoral land. and Table 3.4. Mitigation has only been considered when outlined in the options 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.

  Note: Only those options having stocks with predicted temporary and permanent impacts are listed.

Table 3.2 summarises the predicted impacts to the provision of ecosystem services screened in for detailed assessment.

Note:

- Carbon sequestration is scoped out when the option does not cause the temporary and/or permanent loss of associated stocks.
- Natural hazard management is scoped out when the option does not cause the temporary and/or permanent loss of associated stocks within an active floodplain.
- Air pollutant removal is scoped out when the option does not cause the temporary and/or permanent loss of associated stocks within an AQMA or urban area.
- Recreation & amenity value is scoped out when the option does not cause the permanent loss of greenspace.
- Food production is scoped out when the option does not cause the permanent loss of arable and pastoral land. 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 reprovision or additional habitat creation unless outlined in the options description.

All 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

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- Ancient woodland *this habitat is presumed irreplaceable once lost and therefore should be avoided
- Woodland priority habitat
- Orchards and top fruit *this habitat are presumed irreplaceable once lost and therefore should be avoided
- Lowland fens
- Hay meadows
- Dwarf-shrub heath
- Broadleaved, mixed and yew woodland
- Coniferous woodland
- Urban woodland
- Saltmarsh

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)
BOT-TRA-001				
Arable	110.43	0.00	102.41	-8.02
Pastures	29.94	0.00	25.53	-4.41
Broadleaved, mixed & Yew Woodland	0.13	0.00	0.13	0.00
Woodland Priority Habitat	0.14	0.00	0.14	0.00
Coniferous Woodland	0.21	0.00	0.21	0.00
Ancient Woodland	0.00	0.00	0.00	0.00
Active floodplain	3.38	3.38	2.49	-0.89
Rivers (length)	0.19	0.19	0.19	0.00
Ponds & linear features	0.03	0.03	0.03	0.00
BOT-TRA-002				
Arable	52.26	0.00	51.24	-1.02
Pastures	31.01	0.00	21.41	-9.60
Broadleaved, Mixed and Yew Woodland	0.35	0.00	0.34	-0.01
Woodland Priority Habitat	1.11	0.00	1.09	-0.02
Coniferous Woodland	3.38	0.00	3.31	-0.06
Ancient Woodland	0.06	0.00	0.00	-0.06
Greenspace	0.04	0.00	0.04	0.00
Active Flood Plain	6.82	6.82	5.13	-1.69
Rivers (length)	0.09	0.09	0.09	0.00
Ponds & linear features	0.15	0.15	0.15	0.00
BOT-TRA-004				
Arable	30.71	0.00	30.12	-0.59
Pastures	4.35	0.00	4.35	0.00
Broadleaved, Mixed and Yew Woodland	0.06	0.00	0.06	0.00
Woodland Priority Habitat	0.19	0.00	0.19	0.00
Coniferous Woodland	0.06	0.00	0.06	0.00
Ancient Woodland	0.06	0.00	0.00	-0.06
Greenspace	0.04	0.00	0.04	0.00
Active Flood Plain	1.53	1.53	1.53	0.00
Rivers (length)	0.00	0.00	0.00	0.00
Ponds & linear features	0.01	0.01	0.01	0.00
BOT-ABS-002				
Lowland Fens	0.15	0.00	0.15	0.00
Arable	7.52	0.00	7.46	-0.06
Pastures	1.07	0.00	1.07	0.00

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Orchards and Top Fruit	0.02	0.00	0.00	-0.02
Broadleaved, Mixed and Yew Woodland	0.10	0.00	0.10	0.00
Greenspace	0.01	0.00	0.01	0.00
BOT-ABS-007				
Arable	0.79	0.00	0.79	0.00
Active Flood Plain	0.36	0.36	0.36	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)
BOT-TRA-001					
Carbon storage	£10,322.58	£0.00	-£10,322.58	£8,978.22	-£1,344.36
Natural hazard management	£42.44	£0.00	-£42.44	£31.78	-£10.66
Food production	£1,603,200.00	£1,600,000.00	-£3,200.00	£1,600,000.00	-£3,200.00
Total	£1,613,565.02	£1,600,000.00	-£13,565.02	£1,609,010.00	-£4,555.02
BOT-TRA-002					
Carbon storage	£25,426.89	£0.00	-£25,426.89	£18,936.02	-£6,490.88
Natural hazard management	£32.49	£0.00	-£433.37	£315.14	-£118.22
Food production	£408,500.00	£407,600.00	-£900.00	£407,600.00	-£900.00
Total	£434,360.26	£407,600.00	-£26,760.26	£426,851.16	-£7,509.10
BOT-TRA-004					
Carbon storage	£2,732.12	£0.00	-£2,732.12	£2,415.56	-£316.57
Natural hazard management	£32.48	£0.00	-£32.49	£20.67	-£11.82
Food production	£248,300.00	£247,900.00	-£400.00	£247,900.00	-£400.00
Total	£251,064.61	£247,900.00	-£3,164.61	£250,336.23	-£728.38
BOT-ABS-002					
Carbon storage	£652.98	£0.00	-£652.98	£601.95	-£51.03
Natural hazard management	£9.29	£0.00	-£9.29	£6.96	-£2.32
Food production	£113,700.00	£113,400.00	-£300.00	£113,400.00	-£300.00
Total	£114,362.27	£113,400.00	-£962.27	£114,008.91	-£353.35
BOT-ABS-007					
Carbon storage	£31.35	£0.00	-£31.35	£31.35	£0.00
Total	£31.35	£0.00	-£31.35	£31.35	£0.00

Note:

- Carbon sequestration is scoped out when the option does not cause the temporary and/or permanent loss of associated stocks.
- Natural hazard management is scoped out when the option does not cause the temporary and/or permanent loss of associated stocks within an active floodplain.
- Air pollutant removal is scoped out when the option does not cause the temporary and/or permanent loss of associated stocks within an AQMA or urban area.
- Recreation & amenity value is scoped out when the option does not cause the permanent loss of greenspace.
- Food production is scoped out when the option does not cause the permanent loss of arable and pastoral land.

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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				
BOT-TRA-001 BOT-TRA-002 BOT-TRA-004 BOT-ABS-002	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.
Water flow regulation				
BOT-TRA-001 BOT-TRA-002 BOT-TRA-004	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

Note: there were no predicted impacts on water purification or water flow regulation for option BOT-ABS-007.

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
BOT-TRA-001	344.42	287.52	-56.9	-16.52%
BOT-TRA-002	259.56	182.02	-77.54	-29.87%
BOT-TRA-004	82.06	74.04	-8.02	-9.77%
BOT-ABS-002	22.80	21.01	-1.79	-7.84%
BOT-ABS-007	0.85	0.82	-0.06	-3.50%

The unmitigated BNG outputs have been informed using the predicted impacts on natural capital stocks listed in Table 3.1.

3.1 Summary of the NCA and BNG assessments

3.1.1 NCA and ecosystem services

All the options are likely to generate the loss of natural capital stocks during construction. However, habitat expected to be reinstated/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. There is some change anticipated in water flow regulation.

All the options were all scoped out for air pollutant removal, as none of the options' contributing stocks were located within a built-up area or Air Quality Management Area (AQMA).

All the options present an opportunity to improve the existing habitats through post construction remediation and replacement of low value habitats with higher value habitats. Options cross several Natural England habitats, Network Enhancement Zones, meaning they are suitable for the planting of new high value habitats.

3.1.2 BNG

All options are expected to cause the loss of BNG units due to habitat clearance associated with construction.

4 Natural capital stocks and mapping methodology

4.1 Natural capital stocks and mapping methodology

Table 4.1: Sources for the mapping methodology of natural capital stocks

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
Mountain, Moor and Heath	Blanket bog	Area of blanket bog mapped using Natural England's Priority Habitat Inventory.
	Dwarf shrub heath	Mapped using Natural England's Priority Habitat Inventory ('fragmented heath', 'lowland heathland' and 'upland heathland')
	Inland rock, scree and pavement (AML*)	Area of inland rock and limestone pavement above the moorland line, mapped using CEH's LCM2015 ('inland rock'), Natural England's Priority Habitats Inventory ('limestone pavement') and the Rural Payment Agency (RPA)'s Moorland Line dataset.
	Lakes and Reservoirs	Area of lakes and reservoirs above the moorland line, mapped using CEH's UK Lakes dataset, CEH's Inventory of UK reservoirs dataset and RPA's Moorland Line dataset.
	Mountain heath and willow scrub	Area of mountain heath and willow scrub mapped using Natural England's Priority Habitat Inventory.
	Rivers (AML)	Length of rivers mapped using EA's WFD river waterbodies dataset and RPA's Moorland Line dataset.

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

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

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

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