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A3-06 ENHANCEMENT CASE WN - WINEP WATER FRAMEWORK DIRECTIVE (WATER)

NES19



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1. INTRODUCTION

This business case sets out the enhancement investment required for us to meet our environmental obligations under the *Water Environment (Water Framework Directive) (England and Wales) Regulations 2017¹* (Water Framework Directive), as captured against the following four WINEP drivers:

- Water Resources Hydrological Regime (WRFlow)
- Water Resources Artificial and Heavily Modified Water Bodies (WRHWB)
- Groundwater Pressures (WFDGW)
- Water Framework Directive Physical Habitat and Fish Passage (PHYS_HAB)

The Water Resources Hydrological Regime (WRFlow) driver relates to actions to protect and improve the hydrological regime of water bodies to meet objectives as set out in accordance with the Water Framework Directive. The hydrological regime is a supporting element for a water body to achieve good ecological status. The impact of abstraction pressures on the hydrological regime can mean that the flow in a water body is not sufficient to be supporting good ecological status. This business case sets out the enhancement investment required to prevent our ground and surface water abstractions from reducing flow below the 'Environmental Flow Indicator' (EFI) at Recent Actual abstraction, or to mitigate the impact of this abstraction to prevent deterioration of flow at Full Licensed abstraction.

The Water Resources Artificial and Heavily Modified Water Bodies (WRHWB) driver relates to actions to achieve and maintain Good Ecological Potential of water bodies that are artificial or heavily modified. The objective is for Good Ecological Potential rather than Good Ecological Status as it is recognised that these water bodies are designed for a specific purpose or use and achieving Good Ecological Status would impact on that purpose or use. This business case sets out the enhancement investment required for us to achieve and protect the ecological potential of our artificial or heavily modified water bodies.

The Groundwater Pressures (WFDGW) driver relates to actions to protect and improve groundwater status. Groundwater sustains rivers and habitats like chalk streams and wetlands which provide biodiversity and broader environmental benefits. As a water company we need to manage the impacts of our drinking water abstractions on groundwater as they are vulnerable to harm and difficult to remediate. In our Northumbrian Water region, 7% of supplies are from groundwater, and in the Essex and Suffolk regions 9.08% of supplies are from groundwater with 2 water resource zones (Hartismere and Blythe) 100% reliant on groundwater. This business case sets out the enhancement investment required for us to protect and improve the WFD status of groundwaters we abstract from for drinking water supply, and their associated surface waterbodies.

¹ [The Water Environment \(Water Framework Directive\) \(England and Wales\) Regulations 2017 \(legislation.gov.uk\)](https://www.legislation.gov.uk)

The Water Framework Directive Physical Habitat and Fish Passage (PHYS_HAB) driver relates to actions to address impacts caused by assets owned or used by water companies that create physical modifications or ecological discontinuities to water courses. This includes assets (physical structures) which impede or prevent fish migration and have an impact on fish lifecycles. This business case sets out the enhancement investment required to address the physical or ecological deterioration of water courses as a result of our assets.

Meeting our WFD-related obligations through the four WINEP drivers in this case will require investment of £12.397m over AMP8, in 2022 prices. These costs are summarised in Table 1 below.

TABLE 1: SUMMARY OF COSTS TO ACHIEVE OUR WFD-RELATED OBLIGATIONS OVER AMP8

Driver	Total (£m)
WRFlow	6.571
WRHWB	3.226
WFDGW	0.312
PHYS_HAB	2.289
Total	12.397

2. NEED FOR ENHANCEMENT INVESTMENT

2.1. ALIGNMENT WITH STATUTORY PLANNING FRAMEWORKS

The Environment Agency (EA) and Natural England (NE) translate legislation and UK government priorities set out in the Water Industry Strategic Environmental Requirement (WISER). WISER describes the legal obligations, government targets and statutory (S or S+) requirements water companies must achieve during each 5 yearly price review. It also sets out the non-statutory (NS) (with or without government support) requirements a water company should consider provided there is customer support for this action. WISER therefore underpins the government's Strategic Policy Statement which specifies the government's priorities for the water industry and the framework and policy priorities within which Ofwat should operate.

The Water Industry National Environment Programme (WINEP) methodology enables water companies to develop, fund and implement sustainable solutions to address the problems. It does this by setting out the overarching process to design, develop, and deliver water company actions to protect and improve the environment.

Individual needs against WINEP drivers are assigned a driver code as shorthand to describe the driver and the need type. There are a range of driver codes which allow for the delivery of actions to meet the requirements of the Water Framework Directive, covering:

- Water Resources Hydrological Regime (WFD_WRFlow)
- Water Resources Artificial and Heavily Modified Water Bodies (WFD_WRHMWB)
- Groundwater Pressures (WFDGW)
- Water Framework Directive Physical Habitat and Fish Passage (WFD_PHYS_HAB)

ALL FOUR DRIVERS WITHIN THIS BUSINESS CASE ARE ASSOCIATED WITH THE PROTECTION AND ENHANCEMENT OF THE ENVIRONMENT TO MEET OUR OBLIGATIONS UNDER ENGLISH LEGISLATION THAT RELATES TO THE WATER FRAMEWORK DIRECTIVE, AS SUMMARISED IN SECTION 2.5.1. THE WINEP DRIVER CODES RELEVANT TO THE FOUR WFD-RELATED DRIVERS IN THIS BUSINESS CASE, AND THEIR ALIGNMENT TO OFWAT PR24 ENHANCEMENT CATEGORIES, ARE OUTLINED IN

Table 2 to Table 5 below.

THERE ARE FOUR SUFFIX CODES THAT CAN BE ADDED TO THE OVERALL DRIVER CODE TO INDICATE THE ACTION (SOLUTION) REQUIRED FOR THE NEED. FOR THE DRIVERS COVERED BY THIS BUSINESS CASE, THESE ARE IMP (IMPROVEMENT), INV (INVESTIGATE), ND (NO DETERIORATION) AND NDINV (NO DETERIORATION INVESTIGATION). SOME OF THESE DRIVER CODES, SHOWN IN

Table 2 to Table 5, are 'Statutory', meaning that action must be taken. Other codes are 'Statutory+' which means the options to address needs under these codes are subject to cost benefit assessment and will only be implemented if they are demonstrated to be cost beneficial. Our needs in AMP8 against 'Statutory+' driver codes are considered cost beneficial and are therefore statutory as demonstrated through our AMP7 investigations.

TABLE 2: STATUTORY WINEP DRIVER CODES RELEVANT TO THE WATER RESOURCES HYDROLOGICAL REGIME DRIVER NEEDS IN AMP8 – NOTE THAT ONLY DRIVERS RELATED TO AMP8 NEEDS ARE INCLUDED IN THE TABLE

Driver Code	Description	Statutory / Statutory+	Tier 1 Outcome	Required by dates	PR24 Data Tables Enhancement Category
WFD_INV_WRFflow	Investigation to determine impact of abstractions and appraisal of options for an effective solution to achieve good ecological status (surface water)	Statutory	Water company contribution to achieving water body objective status within a catchment OR Water company contribution to preventing deterioration from current status within a catchment	By 31 December 2026 to help inform PR29 planning	Investigations - survey, monitoring or simple modelling
WFD_NDINV_WRFflow	Investigation to determine the likelihood that future abstraction will cause deterioration in any element affecting the ecological status of a water body and identify effective solutions	Statutory		By 31 December 2026 to help inform PR29 planning	
WFD_ND_WRFflow	Action to protect / ensure no deterioration in status (surface water)	Statutory		By 31 March 2030 to be delivered in AMP8	Water Framework Directive
WFD_IMP_WRFflow	Action to improve ecological status (surface water)	Statutory+		By 31 March 2030 to be delivered in AMP8	Water Framework Directive

TABLE 3: STATUTORY WINEP DRIVER CODES RELEVANT TO THE WATER RESOURCES ARTIFICIAL AND HEAVILY MODIFIED WATER BODIES DRIVER NEEDS IN AMP8 – NOTE THAT ONLY DRIVERS RELATED TO AMP8 NEEDS ARE INCLUDED IN THE TABLE

Driver Code	Description	Statutory / Statutory+	Tier 1 Outcome	Required by dates	PR24 Data Tables Enhancement Category
WFD_INV_WRHMWB	Investigation and appraisal of options to determine the impact of abstraction and/or water storage infrastructure on achievement of good ecological potential in an Artificial or Heavily Modified Water Body (water resources use)	Statutory	Implement mitigation measures in a catchment to meet water framework directive objectives in designated WR A/HMWBs	By 31 December 2026 to help inform PR29 planning	Investigations - survey, monitoring or simple modelling
WFD_IMP_WRHMWB	Action to achieve good ecological potential	Statutory+		By 31 March 2030 to be delivered in AMP8	Eels/fish passes

TABLE 4: STATUTORY WINEP DRIVER CODES RELEVANT TO THE GROUNDWATER PRESSURES DRIVER NEEDS IN AMP8 – NOTE THAT ONLY DRIVERS RELATED TO AMP8 NEEDS ARE INCLUDED IN THE TABLE

Driver Code	Description	Statutory / Statutory+	Tier 1 Outcome	Required by dates	PR24 Data Tables Enhancement Category
WFDGW_INV	Groundwater good status investigation relating to water resource or water quality	Statutory	Water company's contribution to achieve good status, protected area, prevent deterioration and/or improvement	By 30 April 2027 to help inform PR29 planning	Investigations – survey, monitoring or simple modelling
WFDGW_ND	Groundwater prevent deterioration action relating to water resource or water quality	Statutory	objectives for groundwater quantity, quality and/or land contamination	By 31 March 2026 to help inform PR29 planning OR By 31 March 2030 to be delivered in AMP8	Water Framework Directive
WFDGW_IMP	Groundwater good status improvement action relating to water resource or water quality	Statutory+		By 31 March 2030 to be delivered in AMP8	

TABLE 5: STATUTORY WINEP DRIVER CODES RELEVANT TO THE WATER FRAMEWORK DIRECTIVE PHYSICAL HABITAT AND FISH PASSAGE DRIVER NEEDS IN AMP8 – NOTE THAT ONLY DRIVERS RELATED TO AMP8 NEEDS ARE INCLUDED IN THE TABLE

Driver Code	Description	Statutory / Statutory+	Tier 1 Outcome	Required by dates	PR24 Data Tables Enhancement Category
WFD_INV_PHYS HAB	Investigations to determine <ul style="list-style-type: none"> impacts from water company owned/utilised physical modification on fish passage or physical habitat, and impact on WFD water body status/potential objectives – for example, is the physical modification a reason for not achieving good status/potential? 	Statutory	Achieve water body objective status or prevent deterioration	By 30 April 2027 to help inform PR29 planning	Investigations – survey, monitoring or simple modelling
WFD_IMP_PHYS HAB	Actions to address barriers to passage of fish or impacted physical habitat in WFD failing waterbodies not designated artificial or heavily modified for water resource users	Statutory+		By 31 March 2030 to be delivered in AMP8	Eels/fish passes

2.2. OUR PROGRESS DURING AMP7

During AMP7, we have been working against each WINEP driver covered by this business case, particularly with regard to improving our understanding of impacts to the environment based on our drinking water abstractions. Progress against each driver during AMP7 is detailed further below.

2.2.1 Water Resources Hydrological Regime

Sustainability of our abstractions

During AMP7, we investigated the sustainability of our groundwater and some surface water abstractions in our Essex and Suffolk (ESW) regions. The surface water abstractions we focused on were those identified by the EA as potentially affecting WFD water bodies. Where our investigations (modelling) identified that groundwater or surface water abstractions are contributing to river flows being below the environmental flow indicator(s) (EFI) at Recent Actual abstraction, we completed an options appraisal. These identified options that would either increase flows to meet the EFI or mitigate the impact of the abstraction on the water body. The preferred options have been agreed with the EA and will be delivered during AMP8 under the WRFlow_IMP driver.

Abstraction licence reductions

In November 2021, the EA issued an information letter (EA112021) introducing its approach to capping licences to prevent WFD deterioration. In March 2022, the EA provided us with a list of licence reductions that it intended to apply to groundwater abstractions in our ESW region by March 2030 or at the time of licence renewals, whichever is sooner. This list of licence reductions was updated by the EA in January 2023, taking into consideration any relevant outcomes from our AMP7 WINEP investigations and changing definitions around the caps. We will deliver the licence reductions required during AMP8 under the WRFlow_ND driver.

2.2.2 Water Resources Artificial and Heavily Modified Water Bodies

Reservoir flow regime investigations

During AMP7 we carried out investigations for three of our reservoirs (Kielder, Fontburn and Waskerley) and at the Waskerley Catchwater to understand how the current flow regime from these sites impacts the downstream water bodies. These investigations confirmed that these reservoirs are impeding flow and sediment releases causing a deterioration in the geomorphological function of the rivers downstream. Recommendations from our investigation have informed our PR24 WINEP options development and led to the three implementation needs in our AMP8 programme to mitigate the identified impacts (see Section 2.6.2). The recommendation relating to the Fontburn Reservoir (to remove a weir upstream of the reservoir to improve fish passage) will be progressed within AMP7 due to the relative low cost of the action.

Protecting and enhancing the environment at Muck Fleet

During AMP7, strengthening works to improve the flood defence banks alongside the Muck Fleet between Filby Broad and Stokesby New Road, Norfolk, were carried out in 2019-2022 by the Water Management Alliance (WMA) in consultation with

the Trinity Broads Technical Group. The WMA are due to automate the Muck Fleet sluice by Stokesby New Road in 2023 as the final part of this project. We own and operate the Muck Fleet sluice to manage water levels for public water supply in the upstream Trinity Broads. Some bankside vegetation and in channel vegetation along the Muck Fleet was cleared as part of the WMA project. The EA have identified concerns with fish welfare in the Muck Fleet, related to the presence of the sluice, that will not be completely resolved via automation, leading to development of options to address this risk in AMP8 (see Section 2.6.2).

2.2.3 Groundwater Pressures

Improved Understanding of Saline Intrusion in the Sunderland Magnesian Limestone

During AMP7, we investigated the potential for saline intrusion at our groundwater sites abstracting from the Sunderland Magnesian Limestone in our Northumberland Region via a desktop study. Historically, there were a greater number of public water supply abstractions in this area however two were irrevocably lost to saline intrusion in the late twentieth century. Our investigation considered the conceptual likelihood of saline intrusion and included a review of historic groundwater data, to identify trends that might be of concern. The data review projected that concentrations of chloride and sodium will not exceed drinking water standards at any of our groundwater sources used for drinking water supply or monitoring now or within the next two river basin management plan (RBMP) cycles (12 years). This includes through increases in abstraction to fully licenced rates or through long-term temporal changes. The conceptual modelling identified two of our eight sources as being the most theoretically susceptible to saline intrusion and recommended further monitoring so that we may have greater confidence in their sustainability. Typically, this is carried out by monitoring groundwater between the abstraction point and the coast from an observation borehole. This allows for the identification of an incoming saline front before it compromises abstraction. For our two drinking water sources now recognised as theoretically susceptible to saline intrusion, one has an established observation borehole between it and the coast, and the other does not. This led to identifying our IMP need for AMP8 (see Section 2.6.3).

Improved Understanding of the Potential Impact on WFD Water Bodies

In the Darlington Magnesian Limestone

During AMP7, we benefited from insight into the interaction between the Darlington Magnesian Limestone and nearby surface water bodies thanks to an investigation by Anglian Water, operating as Hartlepool Water, who also abstract from the groundwater body. Their study utilised available models of the area and identified that our abstraction may impact the Skerne surface water body. As a result, the EA have requested that we build on this investigation in AMP8 with a focus on our own abstraction from the Darlington Magnesian Limestone, to confirm any impact on the Skerne surface water body. This has driven the need for an AMP8 INV need to confirm the impacts of our groundwater abstract on the Skerne surface water body and means to mitigate it (Section 2.6.3).

For Aldeburgh Well

Our AMP7 East Suffolk Chalk and Crag investigation and options appraisal identified that there was an unused groundwater abstraction licence at Aldeburgh Well. The EA has confirmed they will not accept the transfer of this licence to another local abstraction point (Coldfair Green and Leiston) and considered it extremely unlikely that this licence could be transferred further afield. We have therefore agreed to revoke this licence during AMP8 (Section 2.6.3).

2.2.4 Water Framework Directive Physical Habitat and Fish Passage

Fish passage schemes

During AMP7, we are delivering four fish passage schemes in our Northumbrian area: Burnhope Burn (Derwent Reservoir catchwater), two at Ireshope Burn (Burnhope Reservoir catchwater), and Harthope Burn (Burnhope Reservoir catchwater). Some assets in our Essex and Suffolk regions have been identified as still posing a barrier to fish passage and this has led to our AMP8 needs outlined in Section 2.6.4. In our Northumbrian region, uncertainty remains around if any our owned assets are preventing fish passage, and this has led to an AMP8 need for a region wide investigation to identify fish passage issues.

During AMP7 we have been engaging with the Essex Fish Migration Road Map², a multi-stakeholder group led by Essex Wildlife Trust and with the backing of the EA. The roadmap identifies barriers to fish migration within the Essex river system and we aim to align our future efforts for delivering fish passage schemes, including in AMP8, with the aims of this broader partnership.

Abstraction sustainability investigations

We have also undertaken abstraction sustainability investigations throughout our Essex and Suffolk regions (under the WFDGW and WFD_WRFflow drivers). These investigations include options appraisals where an impact of our abstractions on physical habitat has been confirmed, the outcomes of which have identified three needs that we aim to address during AMP8 at Glenfield Gates, Hoe Mill and Roman River (Section 2.6.4).

2.3. OUR ASSUMPTIONS FOR BASE SPEND IN AMP8

The assumptions we have made to allocate investment to base or enhancement are outlined in Table 6. We assume that continuing our now business-as-usual activities that deliver against needs from previous AMPs will be covered by base investment. This includes ongoing monitoring (water quality or other benefits) or land management. Our AMP8 efforts to continue to deliver against the WFD-related drivers covered in this business case that align with base expenditure are outlined in Section 2.4.

As our AMP8 WINEP needs within this business case (outlined in Section 2.6) align with our statutory obligations (outlined in Section 2.1), they fall to enhancement expenditure.

² [Essex Fish Migration Roadmap \(Essex Wildlife Trust\)](#)

TABLE 6: OUR ASSUMPTIONS AROUND BASE AND ENHANCEMENT INVESTMENT

Base	Enhancement
<ul style="list-style-type: none"> Ongoing water quality or environmental health monitoring following previous AMP enhancement investment Items funded at previous price reviews Business-as-usual activities that deliver against needs from previous AMP enhancement investment 	<ul style="list-style-type: none"> Needs aligned with statutory obligations Improving water supply resilience against impacts of climate change

We have not received investment funding from Ofwat to address our AMP8 WINEP needs in the past.

2.4. BASE EXPENDITURE FOR AMP8

Base investment required for each of the drivers in AMP8 is outlined below.

2.4.1 Water Resources Hydrological Regime

Base investment will cover abstraction licence amendment costs under the ND driver code, related to licences that are time limited or have a time limited clauses which we intend to renew during AMP8. There are six such licences: Little Glemham, Ball Lane, Holton & Halesworth, Walpole & Rockstone Lane, Langford Trench, and Waskerley Airshaft. We expect the EA will ask us to deliver the identified WINEP ND licence caps at the point of licence renewal.

2.4.2 Water Resources Artificial and Heavily Modified Water Bodies

There will be base expenditure at the Trinity Broads and Burgh Doles (close to Muckfleet) in AMP8. This covers habitat management, catchment working, invasive species actions (specifically relating to killer shrimp), water quality monitoring, surveys of flora and fauna, implementation of biosecurity measures, and liaison with local stakeholders. The work here aims to ensure that the sites provide good quality wetland habitat. A new 5-year management plan was approved in 2023.

2.4.3 Groundwater Pressures

The national EA data download, mentioned in Section 2.4.1, also identified several ND needs as potentially falling within the WINEP Groundwater driver in our Northumbrian region for enhancement, which have been agreed with the EA to be covered by business as usual (base expenditure) during AMP8. This includes the renewal of two groundwater abstraction licences, which are time limited and will require a decrease in abstraction volume from April 2030: Allenheads (from 0.033 MI/d to 0.023 MI/d) and Stonehaugh (from 0.041 MI/d to 0.025 MI/d), and the renegotiation of the Fowberry group licence which will require a decrease in abstraction volume (from 3.64 MI/d to 3.12 MI/d) from April 2027. We require the current levels of abstraction from all three licences to maintain our systems and meet customer demand. We will renew these groundwater abstraction licences so that we can continue to abstract at current levels. In addition, we will revoke two unused historical abstraction points in our Northumbrian region that we do not intend to use in the future at Seal and Routing Burn, and Halton Lea Gate.

2.4.4 Water Framework Directive Physical Habitat and Fish Passage

Our base expenditure in AMP8 will cover the ongoing maintenance of the fish passes installed during AMP6 and AMP7, including at the Langford Sluice on the Blackwater in Essex and at four sites in the Upper Wear in our Northumbrian area (Section 2.2.4). The Langford Sluice was delivered in AMP6 under the E1 driver, and the remaining schemes were delivered in AMP7 under WFD ND drivers. Any ecological monitoring required to confirm the effectiveness of the operation of these passes will also be included within AMP8 base expenditure.

2.5. NEED FOR ENHANCEMENT EXPENDITURE IN AMP8

Obligations under all four drivers within this business case are concerned with water company contributions to achieving or maintaining Good Ecological Status (GES) or meeting improvement objectives for surface water and groundwater bodies, as required by the Water Framework Directive³. The Water Framework Directive regulations set out environmental quality standards for the water environment that relate to all four drivers. Under the regulations, a river basin management plan (RBMP) must be prepared outlining the legally binding objectives for groundwater and surface waters, including estuaries and coastal waters, by setting targets for ecological status and chemical status for each water body. Under the Water Framework Directive regulations, we are responsible for contributing to meeting these objectives by putting in place actions to ensure that no river, lake or estuary is in poor or bad ecological status due to water company activities, and by to achieve good status where technically feasible and best value. This includes actions to protect and improve the hydrological regime of waterbodies (WFD_WRFlow), protect and achieve ecological potential of Heavily Modified Water Bodies designated for water resources uses (WFD_WRHMWB), prevent deterioration of groundwater quality, quantity and habitats (WFDGW), and address physical modification and ecological discontinuity causes by physical infrastructure that we own or utilise (WFD_PHYS HAB). Further details of our obligations under each of these four drivers are provided in the following sections.

2.5.1 Our obligations relating to Water Resources Hydrological Regime

The Hydrological Regime driver⁴ (WFD_WRFlow) requires us to take action to protect and improve the hydrological regime of water bodies to contribute to meeting objectives under the Water Framework Directive and RBMP.

The Water Framework Directive regulations acknowledge that surface waters' hydrological regime is an essential factor determining the creation, function and health of aquatic habitats and the protection of the ecology they support. Hydrological regime is therefore a supporting element for a water body to achieve Good Ecological Status (GES).

Abstraction pressures can impact the hydrological regime of water bodies, and as a water company we have a responsibility to manage our abstractions to prevent deterioration in WFD classification elements that make up ecological status/potential.

³ [The Water Environment \(Water Framework Directive\) \(England and Wales\) Regulations 2017 \(legislation.gov.uk\)](https://www.legislation.gov.uk)

⁴ PR24 WINEP driver guidance – Water Resources (hydrological regime) (Environment Agency, 2022)

We must ensure that under future planned rates of abstraction, the hydrological regime element in rivers, lakes and transitional water bodies will not deteriorate and that elements of groundwater quantitative status are not compromised.

To provide quantitative targets, the UK government has developed specific flow thresholds for rivers and lakes that are stipulated in the Water Framework Directive regulations and implemented by the EA as the 'Environmental Flow Indicator' (EFI)⁵. These are used to indicate where abstraction pressures may start to cause undesirable effects on river habitats and species. The EFI is set at a level considered supportive to the WFD's good ecological status. The EA uses the EFI as its default target to determine the extent of action required to address pressures caused by actual and potential abstractions. For freshwater flow to estuaries, a lower set of flow thresholds were adopted by the UK for the freshwater flow regime in transitional waters. The regulatory requirement is that waterbodies will meet the EFI at Recent Actual abstraction and will not contribute to 'deterioration' at Full Licensed abstraction.

In addition to our obligations under the Water Framework Directive, The Environment Act 2021 contains a section on abstraction that introduces two new provisions. The first removes the right to compensation when an abstraction licence is changed to protect the environment from damage rather than from serious damage. The second removes the right to compensation when an abstraction licence is changed to remove underutilised portions. Both changes will be effective from the 1st of January 2028, during AMP8. As a water company, we will then no longer be eligible for compensation due to changes to our abstraction licences.

The Water Framework Directive regulations require that water body status does not deteriorate so actions to achieve this do not have an economic exemption (i.e., are not subject to cost-beneficial tests) and the most cost-effective combination of actions should be identified. However, actions required to achieve water body WFD objectives must not be disproportionately expensive, and this will be assessed through the RBMPs.

2.5.2 Our obligations relating to Water Resources Artificial and Heavily Modified Water

Bodies

The Water Resources Artificial and Heavily Modified Water Bodies driver (WFD_WRHMWB)⁶ requires us to implement actions where needed to mitigate the impact of our abstractions in order to achieve and maintain Good Ecological Potential (GEP) for water bodies that are designated as artificial or heavily modified.

The Water Framework Directive regulations recognise that some water bodies are designed, modified or used for a specific purpose such as water storage for drinking water supply or power generation, and that achieving GES in these water bodies is not feasible. The regulations therefore sets objectives for these water bodies to achieve and maintain GEP rather than

⁵ PR24 WINEP driver guidance – Water Resources (hydrological regime) (Environment Agency, 2022)

⁶ PR24 WINEP driver guidance - Water Resources Artificial and Heavily Modified Water Bodies (Environment Agency, 2022)

GES. Therefore, as a water company that owns or uses artificial or heavily modified water bodies for the purpose of drinking water supply, we are obliged to implement measures to achieve and maintain GEP in order to comply with the objectives of the WFD.

2.5.3 Our obligations relating to Groundwater Pressures

The Groundwater Pressures (WFD_GW) driver⁷ requires us to contribute to achieving good status in groundwater bodies, meeting improvement objectives and/or preventing deterioration in groundwater quantity and quality.

This reflects obligations under the Water Framework Directive regulations, the *Environmental Permitting (England and Wales) Regulations 2016* (as amended⁸), the *Water Resources Act 1991*⁹, and the *Conservation of Habitats and Species Regulations 2017*¹⁰ to:

- prevent deterioration of groundwater quality, quantity and habitats;
- reverse upward trends in pollution;
- reduce the level of purification treatment required to produce drinking water (covered by the Drinking Water Protected Area driver¹¹);
- meet “prevent and limit” objectives of the Environmental Permitting Regulations (2016); and
- achieve good status in groundwater bodies.

As a water company, we are obliged to contribute to the achievement of the above where our assets are affecting, or being affected by, anthropogenic groundwater quality or quantity issues.

Undertaking actions under this driver also meets requirements under the government’s *25 Year Environment Plan (25YEP)*¹² to leave the environment in a better state than it is now, including protecting and improving groundwater. The 25YEP includes goals to ‘improve at least three quarters of our waters to be close to their natural state as soon as is practicable’ and for water bodies to be ‘reaching or exceeding objectives for rivers, lakes, coastal and groundwater that are specially protected, whether for biodiversity or drinking water as per our RBMPs over the next 25 years.

2.5.4 Our obligations relating to Physical Habitat and Fish Passage

The Water Framework Directive Physical Habitat and Fish Passage driver¹³ (WFD_PHYS HAB) requires actions to address impacts caused by assets owned or used by water companies that create physical modifications or ecological discontinuities

⁷ PR24 WINEP driver guidance – Groundwater (Environment Agency, 2022)

⁸ [Environmental Permitting \(England and Wales\) Regulations 2016 \(legislation.gov.uk\)](#)

⁹ [Water Resources Act 1991 \(legislation.gov.uk\)](#)

¹⁰ [Conservation of Habitats and Species Regulations 2017 \(legislation.gov.uk\)](#)

¹¹ This driver is included in our [Water - WINEP - Protected Areas and Biodiversity](#) business case

¹² [25 year environment plan \(www.gov.uk\)](#)

¹³ PR24 WINEP driver guidance – WFD Physical Habitat and Fish Passage (Environment Agency, 2022)

in water bodies, preventing them from achieving GES. This driver applies only to water bodies not designated as artificial or heavily modified for water resources purposes.

Built structures and physical modifications within our rivers, catchments and coastlines are the primary reasons England's waters have an ecological quality classed as less than good. This includes impoundments such as dams and weirs, river bank protection and channel modifications such as realignment, deepening and straightening. Potential impacts of these modifications include¹⁴:

- loss of habitat
- reduction in morphological diversity
- disruption of natural erosion and sedimentation processes
- reduced connection to floodplain or intertidal zone
- loss of upstream to downstream connectivity (for sediment, wildlife)

As part of our obligations under the Water Framework Directive regulations, we are required to address WFD biological quality element failures that relate to fish passage, fish entrainment and/or physical modifications or ecological discontinuities caused by structures and other physical infrastructure we own or utilise.

2.6. OUR AMP8 NEEDS

Below we outline our AMP8 needs under each driver. These needs have not been funded at previous price reviews. Enhancement investment into addressing these needs will not overlap with investment from other activities.

2.6.1 Water Resources Hydrological Regime

We have identified 24 needs against the Hydrological Regime (WRFlow) driver that we intend to deliver in AMP8. Our needs are outlined in Table 7, alongside their issue and root cause, and the Action ID that has been assigned to the need as part of our WINEP submission to the EA. Majority of our needs (20) are in our Essex and Suffolk regions, which primarily fall to IMP (13) and ND (6).

The AMP8 needs in our Northumbrian region under the INV_WRFlow and NDINV_WRFlow driver codes were identified by the EA in response to their concerns. We have one INV_WRFlow need (08NW104106) and three NDINV_WRFlow needs associated with determining whether our surface (08NW104124) and groundwater (08NW104115a and b) abstractions are having a detrimental impact on the WFD status of various water bodies.

In our Essex and Suffolk regions, our AMP7 investigations into the sustainability of our abstractions (Section 2.2.1) identified our AMP8 IMP_WRFlow needs to mitigate the impact of our abstractions on the hydrological regime of water bodies.

¹⁴ [Physical modifications: challenges for the water environment](#) (Environment Agency, 2021)

Additionally, our AMP7 investigations resulted in us and the EA jointly identifying our AMP8 ND_WRFlow needs (Section 2.2.1) to reduce the impact of our abstractions at Full Licence on flow or ecological status.

Our NDINV_WRFlow need to prevent deterioration of WFD Good status at River Coquet (08NW104124), is one of two AMP8 needs focused on improving the health and ecological function of the River Coquet. The second need is to minimise the detrimental impacts on fish passage and ecology caused by the Coquet semi-tidal weir (08NW104011), which is covered under the Biodiversity¹⁵ driver.

¹⁵ The Biodiversity driver is included in our [Water - WINEP - Protected Areas and Biodiversity](#) business case.

TABLE 7: DEFINING THE NEEDS FOR THE WATER RESOURCES HYDROLOGICAL REGIME DRIVER

	Risk / Issue	Root Cause	Need	WINEP Action ID
	WFD_INV_WRF_{low}			
Northumbria	1 EA have identified potential deterioration in WFD status at Skerne (Demon's Beck to Tees) surface water body, which may be associated with impacts from our groundwater abstraction from the Broken Scar boreholes (1/25/2/127).	Current rates of groundwater abstraction may be causing a decline in flow in the Skerne surface water body which could lead to deterioration in WFD status.	To determine whether groundwater abstraction could lead to deterioration in WFD status in the Skerne (Demon's Beck to Tees) water body and if so, to confirm a solution to mitigate the quantified impact.	08NW104106
	WFD_NDIV_WRF_{low}			
	2 North Low (from Berrington Burn to North Sea) surface water body is potentially at risk of deterioration in WFD status due to the impact of our groundwater abstractions in the Berwick area, at Murton, Thornton Mains and Bleakridge.	Rates of groundwater abstraction from various boreholes in the Berwick area may be causing a decline in river flow in the North Low (from Berrington Burn to North Sea) surface waterbody which could lead to a deterioration in WFD status.	To determine whether our groundwater abstractions in the Berwick area has the potential to cause a deterioration of the WFD status of North Low (from Berrington Burn to North Sea) water body and if there is, to confirm a solution to mitigate the quantified impact.	08NW104115b
	3 North Low (from Source to Berrington Burn) surface water body is potentially at risk of deterioration in WFD status due to impact of our groundwater abstractions in the Berwick area, at Murton, Thornton Mains and Bleakridge.	Rates of groundwater abstraction from various boreholes in the Berwick area may be causing a decline in flow in the North Low (from Source to Berrington Burn) surface water body which could lead to deterioration in WFD status.	To determine whether our groundwater abstractions in the Berwick area has the potential to cause a deterioration of the WFD status of North Low (from Source to Berrington Burn) water body and if so, to confirm a solution to mitigate the quantified impact.	08NW104115a
4 River Coquet (Forest Burn to Tidal Limit) and Northumberland South transitional waterbody are at potential risk from deterioration from current Good status due to the impact of abstraction at full licence at Warkworth.	Our Warkworth surface abstraction rates at full licence may cause a decline in flow in the downstream surface water bodies which could lead to deterioration in WFD status.	To determine the potential impact of abstraction from the Warkworth surface abstraction at full licence on the River Coquet and Northumberland South coastal waterbodies.	08NW104124	
	WFD_ND_WRF_{low}			
Essex and Suffolk	5 There is a risk of deterioration of the WFD status of the Chediston Watercourse, Blyth (New Reach through Halesworth, downstream of Halesworth, and upstream of Halesworth), Alde and Ore water bodies due to the Holton & Halesworth, Walpole & Rockstone Lane and Little Glemham abstractions in the Waveney and East Suffolk Chalk and Crag groundwater body.	Increasing abstraction to full licence in the Waveney and East Suffolk Chalk and Crag groundwater body are expected to cause a decline in flow in associated surface water bodies.	Reduce the impact of the Holton & Halesworth, Walpole & Rockstone Lane and Little Glemham groundwater abstractions in the Waveney and East Suffolk Chalk and Crag groundwater body on WFD status of associated Chediston Watercourse, Blyth, Alde and Ore water bodies.	08ES100120

	Risk / Issue	Root Cause	Need	WINEP Action ID	
Essex and Suffolk	6	There is a risk of deterioration of the WFD status of Alde, Ore and Hundred River water bodies due to the Benhall, Parham & Samantha, Coldfair Green and Leiston abstractions in the East Suffolk Chalk and Crag groundwater body.	Increasing abstraction to full licence in the East Suffolk Chalk and Crag groundwater body are expected to cause a decline in flow in associated surface water bodies.	Reduce impact of the Benhall, Parham & Samundham, Coldfair Green and Leiston groundwater abstractions in the East Suffolk Chalk and Crag groundwater body on WFD status of associated Alde, Ore and Hundred River water bodies.	08ES100121
	7	There is a risk of deterioration of the WFD status of the Roman River and Blackwater (Combined Essex) water bodies due to abstractions at the Ball Lane and Langford Trench Boreholes, respectively.	Increasing abstraction to full licence rates of abstraction at the Ball Lane and Langford Trench Boreholes are expected to cause a decline in flow in associated surface water bodies.	Reduce the impact of groundwater abstraction at the Langford Trench and Ball Lane Boreholes on WFD status of associated Blackwater (Combined Essex) and Roman River surface water bodies.	08ES100122
	8	There is a risk of deterioration of the WFD status of the Stour (Lamarsh to River Brett) waterbody due to abstractions at the Langham Boreholes.	Increasing abstraction to full licence rates of abstraction at the Langham Boreholes are expected to cause a decline in flow in the Stour (Lamarsh to R Brett) surface water body.	Reduce impact of groundwater abstraction at the Langham Boreholes on WFD status of the Stour (Lamarsh to R Brett) surface water body.	08ES100123
	9	There is a risk of deterioration of the WFD status of Little Ouse (upstream of Thelnetham), Waveney (upstream of Frenze Beck), Tributary of the Upper Waveney, Deben (upstream of Brandeston Bridge), Gipping (upstream of Stowmarket) surface water bodies due to abstractions in the Hartismere Water Resource Zone.	Increasing abstraction to full licence in the Hartismere Water Resource Zone is expected to cause a decline in flow in associated surface water bodies.	Reduce impact of groundwater abstraction in the Hartismere Water Resource Zone on WFD status of Little Ouse (upstream of Thelnetham), Waveney (upstream of Frenze Beck), Tributary of the Upper Waveney, Deben (upstream of Brandeston Bridge), Gipping (upstream of Stowmarket) surface water bodies.	08ES100124
	10	There is a risk of deterioration of the status of WFD Waveney (Ellingham Mill to Burgh St Peter), Bure (Horstead Mill to St Benet's Abbey) and Spixworth Beck water bodies due to abstractions in the Broadlands Chalk and Crag groundwater body.	Increasing abstraction to full licence in the Broadlands Chalk and Crag groundwater body are expected to cause a decline in flow in associated surface water bodies.	Reduce impact of groundwater abstraction in the Broadlands Chalk and Crag groundwater body on WFD status of Waveney (Ellingham Mill – Burgh St Peter), Bure (Horstead Mill to St Benet's Abbey) and Spixworth Beck surface water bodies.	08ES100125

	Risk / Issue	Root Cause	Need	WINEP Action ID
	WFD_IMP_WRFflow			
Essex and Suffolk	11 The Stour waterbody (downstream of River Brett) is at moderate ecological status with supporting elements at moderate. There is uncertainty regarding the volume and timing of flows over the EA's Judas Gap weir, with concern that at times excessive water is being lost to tide while at other times there are insufficient flows for fish passage.	Our abstraction from the Stour waterbody, combined with river support via the EA's Ely Ouse to Essex Transfer system and the EA's Judas Gap Weir which act as a barrier to flows and fish passage, are contributing to the Reasons for Not Achieving Good ecological status in this waterbody.	To demonstrate that we are meeting our commitments for flow management and provision with the EA, especially with regard to ensuring sufficient flow to enable fish passage through the EA's proposed fish pass at the Judas Gap Weir.	08ES100119
	12 The Stour waterbody (downstream of River Brett) does not achieve Good status and AMP7 investigations have concluded that the current Hands Off Flow (HOF) arrangement on the abstraction licence does not enable the WFD supporting elements to achieve good or address specific concerns with low flows in the North Channel at Cattawade.	Our abstraction from the Stour waterbody, following the current HOFs on the licence, combined with river support via the EA's Ely Ouse to Essex Transfer system and the EA's Judas Gap Weir which act as a barrier to flows and fish passage, are contributing to the Reasons for Not Achieving Good ecological status in this waterbody.	Implement measures to amend the HOF conditions on the existing abstraction licence, including creating a new HOF agreed with the EA at Judas Gap to reduce the impact of abstraction on the WFD status of the River Stour.	08ES100117
	13 The WFD status of Roman River is at risk of deterioration if we operate at our full licence surface water abstraction (8/37/24/*S/0062)	Full licence rate of abstraction at Roman River surface water source (8/37/24/*S/0062) is predicted to cause a decline in flow in the Roman River.	Implement measures to reduce / mitigate the impacts of full licence abstraction on flow in the Roman River.	08ES100118
	14 River Waveney (upstream of Frenze Beck) does not achieve Good status. Our groundwater abstraction is in the locality at Wortham. AMP7 investigations identified that the compensation discharge is not providing additional flow to the river as intended and is not supporting the achievement of Good ecological status.	The compensation discharge to the Hall Farm tributary of the River Waveney is not achieving the intended purpose of augmenting flows in upper Waveney (upstream of Frenze Beck) as the compensation discharge is into a dry ditch and does not reach the River Waveney.	Reduce impacts of groundwater abstraction at Wortham on flow and ecological function of the River Waveney (u/s Frenze Beck).	08ES100115

	Risk / Issue	Root Cause	Need	WINEP Action ID	
Essex and Suffolk	15	Current hydrological regime in Hundred River is insufficient to meet EFI at recent actual abstraction (marginal failure). Lack of formal numerical trigger on current river support at Coldfair Green may contribute.	Current river support on Coldfair Green licence (7/35/03/*G/0044) does not have a numerical trigger for us to release water from the borehole to support flows in the Hundred River, which may contribute to current marginal failure of waterbody to achieve EFI compliance at recent actual abstraction rates.	To agree a numerical trigger for the compensation discharge on the Coldfair Green licence (7/35/03/*G/0044) to contribute to achieving water body objective status of the Hundred River.	08ES100113
	16	Hundred River is failing to meet Good ecological status and AMP7 investigations concluded that our groundwater abstraction at Coldfair Green is impacting the water body due to low flows.	Current rates of abstraction at Coldfair Green are affecting flows in the Hundred River surface water body.	To reduce/mitigate impacts of our abstractions at Coldfair Green on flows in the Hundred River to improve ecological functioning of the river and contribute to achieving water body objective status.	08ES100108
	17	Little Ouse (US Thelnetham) surface water body is failing to meet Good ecological status and AMP7 investigations have concluded that groundwater abstractions at Wortham and Rickingham are impacting the water body.	Rates of abstraction at Wortham and Rickingham are affecting flows in the Little Ouse (US Thelnetham) surface water body.	To mitigate impacts of abstractions at Wortham and Rickingham on flows in the Little Ouse and to improve ecological functioning of the river and contribute to achieving water body objective status.	08ES100107
	18	The hydrological regime in the River Alde surface water body Does Not Support Good and AMP7 investigations have concluded that the river augmentation discharge to mitigate the impact of abstraction at Benhall (7/35/04/*G/0067) is not sufficient to contribute to achieving waterbody objective status.	Current rates of abstraction at Benhall (7/35/04/*G/0067) are affecting flows in the Alde water body.	To mitigate impacts of abstractions at Benhall on flows in the Alde River to improve ecological functioning of the river.	08ES100114
	19	River Blackwater Heavily Modified Water Body is failing to meet Good Ecological Potential with low flows impacting habitat condition and AMP7 investigations have identified that mitigation measures are moderate or less.	Current rates of abstraction at the Langford Blackwater intake affect flow in the River Blackwater water body, and we are unable to reduce abstraction.	To mitigate impacts of abstraction on flows and geomorphology of the River Blackwater to improve ecological functioning of the river.	08ES100112

	Risk / Issue	Root Cause	Need	WINEP Action ID	
Essex and Suffolk	20	Three surface water bodies along the River Blyth, Chediston Watercourse, Blyth (New Reach through Halesworth) and Blyth (upstream of Halesworth), are not compliant with the EFI at recent actual abstraction, and AMP7 investigations have identified that groundwater abstractions at Holton, Halesworth and Walpole are impacting hydrological regime.	Current rates of abstraction at Holton, Halesworth and Walpole are affecting flow in three surface water bodies along the River Blyth.	Mitigate impacts of abstractions from Holton, Halesworth and Walpole on flow in the three surface water bodies along the River Blyth (Chediston Watercourse, Blyth (New Reach through Halesworth) and Blyth (upstream of Halesworth)) and mitigate impact of low flows to improve ecological functioning of the river.	08ES100106
	21	The River Ore surface waterbody is failing to meeting Good WFD status and AMP7 investigations have identified that groundwater abstractions at Little Glemham and Parham are impacting hydrological regime.	Current rates of abstraction at Little Glemham and Parham are affecting flow in the River Ore surface water body.	Mitigate impacts of abstractions from Little Glemham and Parham on flow diversity in the River Ore to improve ecological functioning of the river.	08ES100109
	22	River Stour (Stour (Lamarsh - R. Brett) and Stour (d/s R. Brett) Heavily Modified Water Bodies) is failing to meet Good ecological potential and AMP7 investigations have concluded that surface and groundwater abstractions at Langham are impacting flows and habitat condition.	Current rates of surface and groundwater abstraction at Langham are causing a decline in flow in the two water bodies along the River Stour.	Mitigate impacts of surface and groundwater abstraction at Langham on flow and hydromorphology of the River Stour and improve ecological functioning of the river.	08ES100110
	23	Waveney (Ellingham Mill - Burgh St. Peter) Water Body does not achieve Good status and AMP7 investigations have identified that abstraction from the Waveney surface abstraction at full licence could impact the hydrological regime and ecology of the river.	Full licence rates of abstraction at the Waveney Shipmeadow surface abstraction may cause a decline in flow in the lower River Waveney with impacts on ecology.	Implement measures to amend the HOF conditions on the existing surface abstraction licence to prevent deterioration at full licence abstraction and reflect change in use of EA's Waveney Augmentation Groundwater Scheme (WAGS).	08ES100116
WFD_NDINV_WRFflow					
	24	The WFD status of the Bure (Horstead Mill to St Benet's Abbey) is at risk of deterioration at full licence surface water abstraction (7/34/09/*S/0054).	Full licence rates of abstraction at the Bure (Belaugh) surface abstraction may cause a decline in flow in the Bure (Horstead Mill to St Benet's Abbey) waterbody with impacts on ecology.	To determine whether existing HOFs are sufficient to protect flows in the Bure (Horstead Mill to St Benet's Abbey) waterbody at full licence abstraction.	08ES100128

2.6.2 Water Resources Artificial and Heavily Modified Water Bodies

We have identified 11 needs against the A/HMWB driver that we intend to deliver in AMP8. Our needs are outlined in Table 8, alongside their issue and root cause, and the Action ID that has been assigned to the need as part of our WINEP submission to the EA. The majority of our needs are in our Northumbrian region and are investigations.

In our Northumbrian region, our three AMP7 investigations at Kielder, Fontburn and Waskerley reservoirs (Section 2.2.2) identified our AMP8 IMP_WRHWB needs at these sites (08NW104102, 08NW104103 and 08NW104104 respectively). During AMP8, these needs are associated with putting mitigation measures in place to ensure Good Ecological Potential in rivers downstream.

Through our engagement with the EA during AMP7, we identified six INV_WRHWB needs in our Northumbrian region. These investigations will determine the impacts of our infrastructure and operations on the WFD status of associated HMWBs.

In our Essex and Suffolk regions, our AMP7 work associated with protecting and enhancing the environment at Muck Fleet (Section 2.2.2) led to the identification of our AMP8 IMP_WRHWB need to implement measures to enable fish and eel migration past Muck Fleet sluice (08ES100016). During AMP7, as part of a national process, the EA also identified our INV_WRHWB need at Muck Fleet (08ES100130) to confirm what is impacting dissolved oxygen levels downstream of the sluice and identify options to improve them.

Our investigation at Catcleugh reservoir to understand the impacts of our releases on the downstream River Rede (08NW104108), will be delivered in conjunction with two of our other AMP8 needs associated with this river system under the Biodiversity driver¹⁶. Under the Biodiversity driver, we have two IMP needs: one to reduce sediment loads into the North Tyne River to improve habitat condition and to protect species (08NW104006), and one to mitigate the impact of fine sediment and metals from historic scour operations on the Redesdale pipeline on freshwater pearl mussel habitat in the Redesdale catchment (08NW104007).

Similarly at Muck Fleet, we have two WRHWB IMP needs to improve water body health and function. Our need to determine if a mitigation measure for downstream dissolved oxygen levels is required to achieve Good Ecological Potential of Muck Fleet (08ES100130) will be delivered alongside our need to enable fish (and continue to enable eels) to migrate past Muck Fleet sluice (08ES100016).

¹⁶ The Biodiversity driver is included in our [Water - WINEP - Protected Areas and Biodiversity](#) business case.

TABLE 8: DEFINING THE NEEDS FOR THE WATER RESOURCES ARTIFICIAL AND HEAVILY MODIFIED WATER BODIES DRIVER

	Risk / Issue	Root Cause	Need	WINEP Action ID
	WFD_IMP_WRHWB			
	1 There is a deterioration of geomorphology and habitat in North Tyne downstream of Kielder Reservoir	The presence of Kielder Reservoir on the North Tyne is impeding flow and sediment releases from the reservoir.	Mitigate the impact of Kielder Reservoir to improve the geomorphological and ecological function of the downstream North Tyne.	08NW104102
	2 There is a deterioration of geomorphological and ecological function of the River Font downstream of Fontburn Reservoir	The presence of Fontburn Reservoir on the River Font is impeding flow and sediment releases from reservoir.	Mitigate the impact of Fontburn Reservoir to improve the geomorphological and ecological function of the downstream River Font.	08NW104103
	3 There is a deterioration of geomorphological and ecological function of Waskerley Beck downstream of Waskerley Reservoir	The presence of Waskerley Reservoir on Waskerley Beck is impeding the flow and sediment releases from the reservoir.	Alter the flows from Waskerley Reservoir to improve the ecological function of Waskerley Beck downstream.	08NW104104
	WFD_INV_WRHWB			
Northumbria	4 The Balder Catchment (tributary of the River Tees) waterbody does not achieve Good Ecological Potential under the WFD due to missing mitigation measures.	There may be missing mitigation measures associated with the Balderhead, Blackton & Hury reservoirs causing impoundments of the River Balder.	Understand the impacts the reservoirs along the River Balder have on the waterbodies downstream of the reservoirs and identify options to put relevant mitigation measures in place to meet WFD objectives in the designated HMWB.	08NW104109
	5 The Baydale Beck has limited ecological function, contributing to failure of Upper Cocker Beck Catchment (tributary of the River Skerne) waterbody to achieve WFD Good status.	The Baydale Beck has been subject to historic modifications associated with Broken Scar Water Treatment Works (culverting, diversions) which have affected its ecological function.	Develop a scheme to reduce/mitigate the impact of physical modifications on the Baydale Beck to improve its ecological function, including potentially restoring the watercourse to its original channel.	08NW104107
	6 The River Rede from Source to Cottonshope Burn waterbody does not achieve Good Ecological Potential under the WFD due to missing mitigation measures.	There may be missing mitigation measures associated with flow releases from Catcleugh reservoir that may affect geomorphology and ecological function of the River Rede from Source to Cottonshope Burn waterbody e.g. due to scouring, habitat loss.	Understand the impacts of releases from Catcleugh Reservoir on the downstream River Rede identify options to put relevant mitigation measures in place.	08NW104108

	Risk / Issue	Root Cause	Need	WINEP Action ID
Northumbria	7 39 water bodies are failing to achieve Good Ecological Potential due to potentially missing mitigation measures.	The Environment Agency (EA), through national screening, has identified the potential for missing mitigation measures within 39 WFD surface (river) water bodies that are designated as heavily modified as a result of our assets (principally reservoirs and other impounding / regulating structures), that may be preventing the movement of sediment that is required to achieve Good Ecological Potential in these 39 water bodies.	Determine if missing mitigation measures within 39 WFD surface (river) water bodies are required to meet Good Ecological Potential, and identify next steps to put relevant mitigation measures in place.	08NW104120
	8 The Lockwood Beck Reservoir waterbody does not achieve Good Ecological Potential under the WFD due to missing mitigation measures.	There may be missing mitigation measures associated with impoundment of the headwaters of the Lockwood Beck that may be impacting flows into this coastal stream.	Understand the impact of Lockwood Beck on flows into the coastal stream and identify potential options to put relevant mitigation measures in place.	08NW104110
	9 Waterbodies along the River Lune upstream and downstream of Selset Reservoir (Lune from Long Grain to Selset Reservoir, Lune from Selset Reservoir to the River Tees) have Poor to Moderate WFD Status.	The root cause of the Poor to Moderate Ecological Potential is not understood however is suspected to be associated with flow releases from Selset Reservoir and impacts of this on invertebrate populations.	Understand and confirm the flow impacts of Selset Reservoir on River Lune waterbodies (Lune from Long Grain to Selset Reservoir, Lune from Selset Reservoir to the River Tees) and identify options to mitigate impacts if required.	08NW104111
Essex and Suffolk	10 Failure to achieve Good Ecological Potential on the Muck Fleet waterbody due to missing mitigation measure for downstream dissolved oxygen levels (8.4.3 ¹⁷).	The root cause of the dissolved oxygen issues in the Muck Fleet waterbody is not fully understood.	Determine if mitigation measure 8.4.3 is required in the Muck Fleet water body to meet Good Ecological Potential. Confirm what is impacting dissolved oxygen levels downstream of Muck Fleet sluice and identify options to improve them.	08ES100130
	WFD_IMP_WRHWB			
	11 Fish are becoming trapped in large numbers in a small stretch of watercourse along the Muck Fleet waterbody and there are concerns for their welfare and survival at key times of year.	The Muck Fleet sluice is preventing fish migration, and limited habitat features upstream and downstream of the sluice within the Muck Fleet channel exacerbate welfare and survival concerns.	Enable fish (and continue to enable eels) to migrate past Muck Fleet sluice and mitigate welfare concerns associated with current limited habitat availability.	08ES100016

¹⁷ 8.4.3 refers to 'Good downstream dissolved oxygen levels' with a description of 'Ensure good dissolved oxygen levels are recorded down stream of impoundments and abstractions'

2.6.3 Groundwater Pressures

We have identified three needs against the WFDGW driver that we intend to deliver in AMP8. Our needs are outlined in Table 9, alongside their issue and root cause, and the Action ID that has been assigned to the need as part of our WINEP submission to the EA. We have one INV, IMP and ND need and most of our needs are in our Northumbrian region.

In our Northumbrian region, an AMP7 investigation by Anglian Water into the interaction between the Darlington Magnesian Limestone aquifer and nearby surface water bodies (Section 2.2.3) led the EA to identify our WFDGW_INV need to understand the impacts of our own abstractions from this aquifer on the Skerne surface water body and the Hells Kettle SSSI (08NW104113). Additionally, our AMP7 investigation into saline intrusion in the Sunderland Magnesian Limestone (Section 2.2.3) identified our WFDGW_IMP need to monitor salinity and groundwater levels in this aquifer as we abstract water from it for drinking water supply (08NW104112).

In our Essex and Suffolk region, the EA identified our need to revoke our Aldeburgh Well abstraction licence (08ES100126) as it is un-used and confirmed as being untradeable.

TABLE 9: DEFINING THE NEEDS FOR THE STATUTORY WINEP NEEDS RELATING TO GROUNDWATER PRESSURES DRIVER

	Risk / Issue	Root Cause	Need	WINEP Action ID
	WFDGW_INV			
Northumbria	1 Skerne Magnesian Limestone groundwater body status is classified as Poor due to impacts on water quantity and quality, which may be due to our groundwater abstractions. There is also a risk that Skerne WFD water body and Hells Kettles SSSI may be impacted.	Groundwater abstraction from our source at Broken Scar may impact both water quantity and quality (salinity) status in the groundwater body and impact the status of Skerne WFD water body and Hells Kettles SSSI.	To understand the potential impacts of our groundwater abstraction from the Magnesian Limestone on the Skerne surface water body and the Hells Kettle SSSI (receptors identified by the AMP7 Hartlepool Water investigation) and identify options to reduce or mitigate any impacts, now and in the future.	08NW104113
	WFDGW_IMP			
	2 There is the risk that saline intrusion in the Sunderland Magnesian Limestone aquifer could result in deterioration of WFD status, and prevent groundwater being abstracted from it for public water supply.	Groundwater abstraction from our drinking water boreholes in the Sunderland Magnesian Limestone aquifer may influence saline intrusion.	To monitor salinity and groundwater levels in the Sunderland Magnesian Limestone aquifer between the coast and NWG's groundwater abstraction points to understand the presence and movement of saline intrusion.	08NW104112
Essex and Suffolk	WFDGW_ND			
	3 The EA identified the Aldeburgh well abstraction licence is unused and needs to be revoked as it has the potential to deteriorate the WFD status of the Alde and Ore (Tidal) transitional surface water body if used or traded.	The Aldeburgh abstraction licence is a permanent licence and therefore does not have a licence renewal trigger to prompt revocation.	Revoke the Aldeburgh abstraction licence.	08ES100126

2.6.4 Water Framework Directive Physical Habitat and Fish Passage

We have identified five needs against the WFD_PHYS_HAB driver that we intend to deliver in AMP8. Our needs are outlined in Table 10, alongside their issue and root cause, and the Action ID that has been assigned to the need as part of our WINEP submission to the EA. We have two INV needs in our Northumbrian region, and three IMP needs in our Essex and Suffolk region.

Our AMP7 efforts have highlighted our need to investigate the impact of our assets at Kitty's Burn on water quality and environmental deterioration (08NW104009). As outlined in Section 2.2.4, we are uncertain if our assets in the Northumbrian area are preventing natural fish movement along our rivers. Therefore, we identified our WFD_INV_PHYS_HAB need to assess the need for and provide fish passage at 25 barriers (08NW104102) identified collaboratively with the EA.

Our three WFD_IMP_PHYS_HAB needs in our Essex and Suffolk region (08ES100014, 08ES100015 and 08ES100017) were identified from our AMP7 abstraction sustainability investigations and associated options appraisals (Section 2.2.4) and collaboratively with the EA. These three sites form part of a longer-term programme of work to improve fish migration, as we have delivered fish migration improvements at higher priority sites in previous AMPs.

In many cases, the fish passage needs under the WFD_IMP_PHYS_HAB driver are part of a wider scope of work within a waterbody to achieve WFD GEP, with other needs aligned to other WINEP drivers. For example, for the Roman River, in addition to the need to enable fish and eel migration at the Roman River weir (08ES100017), we also have a need to reduce the impacts of our abstraction on flow in the Roman River under WFD_IMP_WRFflow (08ES100118 in Section 2.6.1) and the need to improve ecological function and enhance biodiversity in the lower Roman River under NERC_IMP¹⁸ (08ES100111). Together these needs intend to move the Roman River waterbody towards 'good' WFD status.

¹⁸ This driver is included in our [Water – WINEP – Protected Areas and Biodiversity](#) business case.

TABLE 10: DEFINING THE NEEDS FOR THE WFD PHYSICAL HABITAT AND FISH PASSAGE DRIVER

	Risk / Issue	Root Cause	Need	WINEP Action ID
	WFD_INV_PHYS_HAB			
Northumbria	1 There is a risk of water quality and environmental deterioration in the Kitty's Burn waterbody.	In the past we physically modified Kitty's Burn to allow wastewater discharge to the burn. However, a diversion is now in place so that we discharge our wastewater to the main River Tyne. However, physical modification on Kitty's Burn still has an impact on watercourse condition.	Investigate the impact of our assets and their operation at Kitty's Burn on water quality and environmental deterioration and identify options to mitigate these impacts.	08NW104009
	2 The overall WFD ecological status of 11 waterbodies is affected by the fish element not being at good status.	There are 25 potential barriers to fish movement ascribed to our assets and their operation in these 11 waterbodies.	Assess the need to provide fish passage at 25 identified barriers and appraise options for delivering a solution in AMP9.	08NW104012
	WFD_IMP_PHYS_HAB			
Essex and Suffolk	3 The Stour water body, downstream of the River Brett, does not meet Good WFD status and physical modifications including fish passage are identified as the reason for not achieving Good status.	Glenfield Gates weir, along the River Stour, is preventing fish migration.	Enable fish migration at the Glenfield Gates Weir at Stratford St Mary to allow natural fish behaviour.	08ES100014
	4 The Chelmer water body, downstream from the confluence with Can, does not meet Good WFD status although the Fish element is assessed as Good. The hydrological regime does not support good.	Hoe Mill Tilting Weir, on the River Chelmer, is preventing fish and eel migration.	Enable fish and eel migration at the Hoe Mill tilting weir to allow natural behaviour.	08ES100015
	5 Roman River water body does not meet Good WFD status and physical modifications including barriers causing ecological discontinuity are identified as an RNAG.	Fish passage is currently impeded at Roman River weir.	Enable fish and eel migration at the Roman River weir to allow natural behaviour.	08ES100017

2.6.5 Link to long term strategy

This investment is needed as part of the 'protecting the local environment' investment area under our [Long-Term Strategy](#) (LTS) core pathway.

Our LTS sets out our long-term target to work with partners to eliminate all impediments to our rivers achieving good ecological status caused by our operations, to ensure that 75% of our rivers achieve good ecological status. To achieve this, we need to improve and restore biological quality elements and reduce the nutrients and pollution in rivers – but we also need to improve the hydromorphology of rivers (that is, the impact of our physical activities on river health). This means investigating and tackling issues where our abstraction and physical infrastructure could cause deterioration, or where removing or modifying infrastructure could help to achieve good ecological status.

We consider this is low / no regret investment because it is needed to meet statutory requirements in 2025-30.

We have a legal obligation to deliver this investment by 2030 to meet our environmental obligations under the Water Framework Directive, as captured against the following four WINEP drivers:

- Water Resources Hydrological Regime;
- Water Resources Artificial and Heavily Modified Water Bodies;
- Groundwater Pressures; and
- Water Framework Directive Physical Habitat and Fish Passage.

This includes delivering some investigations to understand future needs in more detail, to enable us to prepare for 2030-35 and beyond.

We therefore consider this investment is necessary in 2025-30 to deliver our LTS.

Our 2030-35 business plan will include investments identified as necessary through our investigations.

2.7. CUSTOMER SUPPORT FOR THE NEED

These projects are all a consequence of statutory requirements, and so we have not discussed the specific needs with customers. That is because our research shows that customers expect us to meet our statutory obligations, and it is not appropriate to discuss delaying or phasing investment where there are no alternatives to meet the statutory requirement to deliver our part of WINEP.

Our research shows that customers support investment in the environment, including wider environmental and social benefits – though they do not necessarily think they should always pay for this through their water and wastewater bills. In particular, our customers rank dealing with sewage effectively and improving the quality of rivers as two of their “medium” priorities ([prioritisation of common PCs](#), NES44).

In our [qualitative affordability and acceptability testing](#) (NES49), customers supported our “preferred” plan which included these WINEP projects. Customers found this plan acceptable because it focused on the right things, is good for future generations, and is environmentally friendly. Customers who did not find this plan acceptable said that this was expensive, and water companies should pay out of their own profits. We did not ask specifically about WFD (as our individual items were limited only to the largest investments), but customers supported maintaining rivers and reducing pollution (NES49). In our [quantitative research](#) (NES50), 74% of customers supported our preferred plan, including this investment.

3. BEST OPTION FOR CUSTOMERS

To determine the best option for customers to address each Need in Table 10, we applied three different optioneering methodologies depending on the driver code.

- For the INV driver code, where there is a clear need to investigate and address a knowledge gap, we worked with the EA, Mott MacDonald and Stantec team to scope up an appropriate means of investigation.
- For the ND driver code, as needs are associated with licence changes, the solution was clear and did not require optioneering.
- For the IMP driver code, we applied a methodology based on the principles of HM Treasury’s *The Green Book: Central Government Guidance on Appraisal and Evaluation*¹⁹ and the *WINEP Options Development Guidance*²⁰, as outlined in Figure 1. A full description of each of the steps and the output from it is contained in the following sections.

Table 11 summarises how our options development process aligns with the six WINEP options development principles.

¹⁹ HM Treasury, The Green Book, Central Government Guidance on Appraisal and Evaluation 2022

²⁰ Environment Agency, July 2022, *Water Industry National Environment Programme (WINEP), Options Development Guidance*.

FIGURE 1: PROCESS FOR DEVELOPING AND FILTERING OPTIONS TO ADDRESS OUR IMPLEMENTATION NEEDS

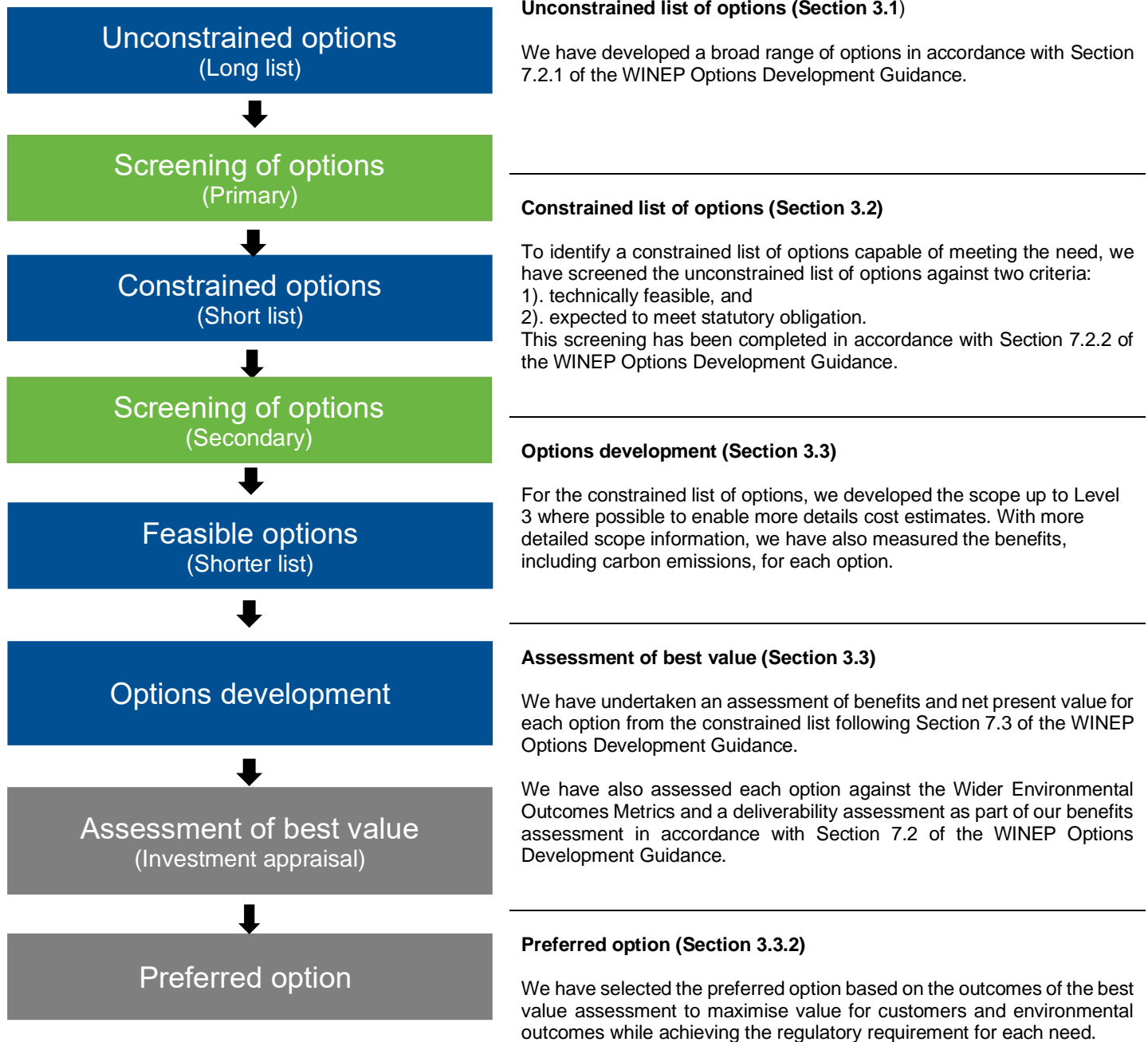


TABLE 11: WINEP OPTIONS DEVELOPMENT PRINCIPLES

Expectation	How this has been met
Environmental net gain	Our Value Framework enables an assessment of environmental net gain for options through assessing the potential environmental impacts of each option with consideration for natural environment, net zero, catchment resilience, access, amenity and engagement. We use this assessment to choose the option that provides the greatest overall environmental benefit/cost ratio.
Natural capital	We have assessed each of our options against the full range Wider Environmental Outcomes required by the Environment Agency methodology, with the determined benefits or dis-benefits being valued via a natural capital approach.
Catchment and nature-based solutions	We have considered a range of solutions within our catchments to address the need including stopping abstraction, establishing new abstractions and participating in catchment partnership projects as shown in Figure 2.
Proportionality	We have taken a proportional approach to options development based on Green Book principles. Further information on our optioneering is outlined in Section 3.
Evidence	We present evidence on our reasoning to discard options within Section 3.2, and evidence how we developed option costs in Section 4.1. Additional evidence of our options development process including data used is available in our Options Development Report and Options Assessment. Our WINEP submission has been independently audited by a third party (Jacobs) and there are no outstanding actions.
Collaboration	We have collaborated with the EA and other stakeholders to define our AMP8 needs as outlined in Section 2.2 and 3.4. We will continue to collaborate with our stakeholders as part of the delivery process.

3.1. BROAD RANGE OF OPTIONS

3.1.1 Water Resources Hydrological Regime

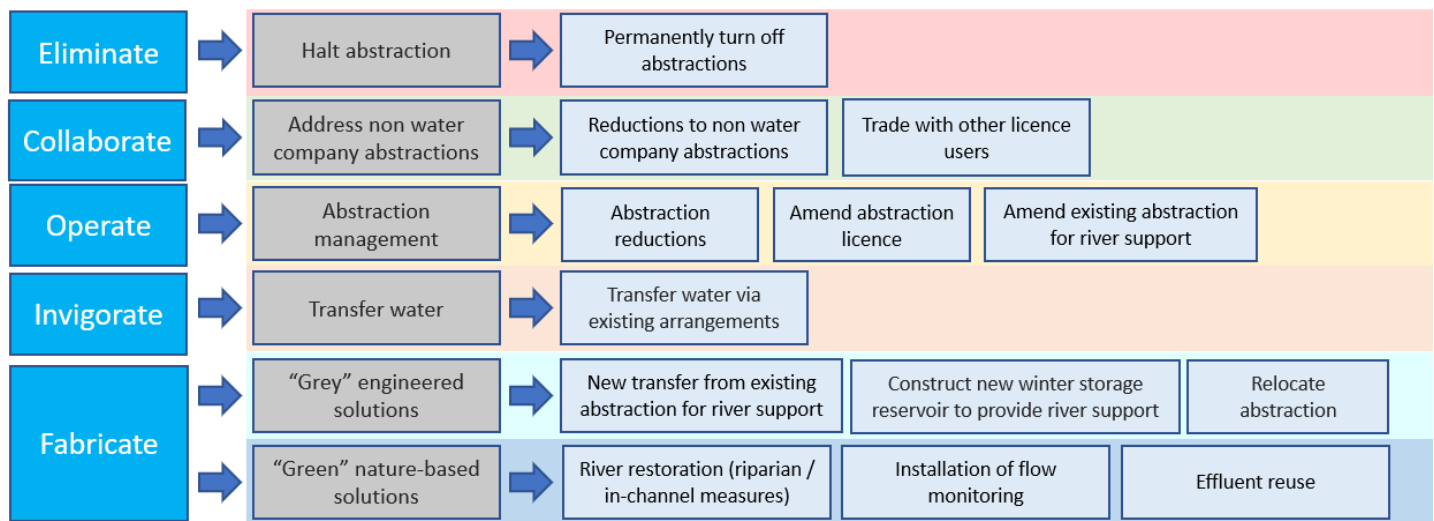
WFD_IMP_WRFflow Needs

Our list of unconstrained options to address our 13 WFD_IMP_WRFflow needs was informed by our PR19 WINEP Investigations into the sustainability of our abstractions (Section 2.2.1), and in consultation with the EA, and in line with AMP7 WINEP Options Development Guidance.

SEVERAL OPTIONSTOIMPROVEFLOWCOMPLIANCEANDORMAINTAINFLOWCONDITIONSINSPECIFICWATERCOURSE REACHESATCERTAINTIMES WERE CONSIDERED, SUCHAS ABSTRACTION CESSATION, REDUCING AND/OR RELOCATING ABSTRACTIONS, WATER RESOURCES SUPPORT AND EFFLUENT REUSE OPTIONS. RIVER RESTORATION AND IMPROVED RIVER MANAGEMENT WERE ALSO CONSIDERED, EITHER AS STAND-ALONE OPTIONS, OR IN COMBINATION WITH OTHER OPTIONS, WHERE RIVER ENGINEERING HAS AFFECTED RIVER MORPHOLOGY AND RESULTED IN MODIFICATIONS TO RIVER HABITATS THAT WOULD MEAN SIMPLY RECTIFYING LOW FLOWS CAUSED BY ABSTRACTION WOULD HAVE LIMITED BENEFIT IN IMPROVING WFD STATUS. OUR LIST OF UNCONSTRAINED OPTIONS TO ADDRESS OUR WFD_ IMP_ WRFLOW NEEDS IS PRESENTED IN

Figure 2 alongside our Totex Hierarchy categories, and demonstrates the broad range of options considered.

FIGURE 2: THE UNCONSTRAINED LONG LIST OF OPTIONS IDENTIFIED TO ADDRESS THE WATER RESOURCES HYDROLOGICAL REGIME IMPLEMENTATION NEEDS, AND THEIR ALIGNMENT TO THE TOTEX HIERARCHY CATEGORIES



The options development process considers a range of options that can be categorised under a Totex hierarchy approach, as presented in Figure 2. Our unconstrained options consider options with differing levels of costs and benefits categorised as follows:

- **Eliminate** - measures that remove the need. Eliminate options are likely to have the lowest costs to deliver the benefit. In this case, we have considered permanently stopping our abstractions to remove the need.
- **Collaborate** - work with stakeholders to address the need including co-funding. Costs can be shared with third parties either to deliver the same or an additional level of social and environmental benefit. In this case, this includes collaborating with our stakeholders so they either reduce their own abstractions or to agree to trade abstractions with us to address the need.
- **Operate** – this considers amendments or improvements to operational management practices. In this case, this includes making changes to our abstractions including reducing or amending our licences and amending our abstractions for river support.
- **Invigorate** - invest in the existing infrastructure to improve performance. These options will provide an increased level of benefit compared to other options however at a lower cost than fabricate options. In this case invigorating existing infrastructure so that we can transfer water from elsewhere to meet demand thereby reducing our abstractions.
- **Fabricate** - new assets to augment or replace existing. These options are likely to have the highest costs. Green options will have lower carbon and potentially higher biodiversity and amenity benefits. Traditional grey options are likely to have highest certainty that service-related benefits will be realised. Innovative options have the potential for greater benefits and lower costs but have the lower certainty that benefits will be realised. In this case, new infrastructure could be grey or green to address the needs.

WFD_INV_WRFlow, WFD_NDIV_WRFlow and WFD_ND_WRFlow Needs

OPTIONS TO ADDRESS OUR FIVE INVESTIGATIONS (INV AND NDIV)(SECTION 2.6.1) WERE IDENTIFIED DURING PR24 PLANNING FOLLOWING THE WINEP OPTIONS DEVELOPMENT GUIDANCE. OPTIONS TO ADDRESS OUR SIX ND NEEDS (SECTION 2.6.1) WERE IDENTIFIED DURING PR24 PLANNING BY THE EA FOLLOWING THEIR WORK IN AMP7 THAT IDENTIFIED OUR NEED FOR ABSTRACTION LICENCE REDUCTIONS (SECTION 2.2.1). AS THESE NEEDS HAVE ONE DISTINCT SOLUTION, SUCH AS AN INVESTIGATION OR REQUIRE A LICENCE CAP, THEY WERE NOT SUBJECT TO OPTIONEERING. A SUMMARY OF THE SOLUTIONS AGAINST EACH NEED IS INCLUDED IN

Table 12.

We expect the primary solutions to abstraction pressure, as reflected in our ND and some IMP needs, to be changes to abstraction licences and operations to achieve sustainable abstraction. In addition, there are complementary actions under WFD_IMP_WRFlow (and NERC_IMP for Roman River (08ES100111)²¹) to improve geomorphology, restore habitats, and increase recharge capacity through working with natural processes. These actions can improve the resilience of catchments and potentially increase the benefits achieved from changes in abstraction and flow recovery.

If our AMP8 investigations identify actions are required for us to meet our environmental obligations under the WFD, then these will either be addressed during AMP8 where possible or be put forward for AMP9 investment.

²¹ This need is in our A3-05 WINEP Protected Areas and Biodiversity enhancement business case.

TABLE 12: THE OPTIONS TO ADDRESS THE HYDROLOGICAL REGIME INVESTIGATIONS (WFD_INV_WRFLOW AND WFD_NDINV_WRFLOW) AND NO DETERIORATION (WFD_ND_WRFLOW) NEEDS

	Need	WINEP Action ID	Option (type of investigation)
WFD_INV_WRFLOW			
	1 To determine whether groundwater abstraction could lead to deterioration in WFD status in the Skerne (Demon's Beck to Tees) water body and if so, to confirm a solution to mitigate the quantified impact.	08NW104106	Investigation into the effect of the abstraction on the Skerne (Demon's Beck to Tees) water body's failure to achieve Good Ecological Status and options appraisal to identify a solution if a causal link is identified
WFD_NDINV_WRFLOW			
Northumbria	2 To determine whether our groundwater abstractions in the Berwick area has the potential to cause a derogation of the WFD status of North Low (from Berrington Burn to North Sea) water body and if there is, to confirm a solution to mitigate the quantified impact.	08NW104115b	Investigation into the risk of surface water body WFD status deterioration from future abstraction. An options appraisal will be undertaken to remove or mitigate the risk if identified.
	3 To determine whether our groundwater abstractions in the Berwick area has the potential to cause a derogation of the WFD status of North Low (from Source to Berrington Burn) water body and if so, to confirm a solution to mitigate the quantified impact.	08NW104115a	Investigation into the risk of surface water body WFD status deterioration from future abstraction. An options appraisal will be undertaken to remove or mitigate the risk if identified.
	4 To determine the potential impact of abstraction from the Warkworth surface abstraction at full licence on the River Coquet and Northumberland South coastal waterbodies.	08NW104124	Investigation of the potential impact of abstraction at full licence on the River Coquet and Northumberland South coastal waterbodies
WFD_ND_WRFLOW			
Essex and Suffolk	5 Reduce the impact of the Holton & Halesworth, Walpole & Rockstone Lane and Little Glemham groundwater abstractions in the Waveney and East Suffolk Chalk and Crag groundwater body on WFD status of associated Chediston Watercourse, Blyth, Alde and Ore water bodies.	08ES100120	The EA are introducing no deterioration licence caps on the following licences in the Waveney and East Suffolk Chalk & Crag groundwater body, within the Suffolk Coastal surface water operation catchment which we need to implement: Holton & Halesworth BHs (TLV expires 31/03/2026 – may cap entire licence at this point & add multi-year aggregate to licence) 7/35/02/*G/0083; Walpole & Rockstone Lane BH (TLV expires 31/03/2026 – may cap entire licence at this point & add multi-year aggregate to licence) 7/35/02/*G/0082; Little Glenham BH (whole licence expires 31/03/2026) AN/035/0004/014/R01 - 7/35/04/*G/0105. Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation.

	Need	WINEP Action ID	Option (type of investigation)
Essex and Suffolk	6 Reduce impact of the Benhall, Parham & Samundham, Coldfair Green and Leiston groundwater abstractions in the East Suffolk Chalk and Crag groundwater body on WFD status of associated Alde, Ore and Hundred River water bodies.	08ES100121	The EA are introducing a no deterioration licence caps on the following licences in the Waveney and East Suffolk Chalk & Crag groundwater body, within the Suffolk Coastal surface water operation catchment that must be implemented by 31/3/30: Benhall, Parham, Saxmundham BHs 7/35/04/*G/0067; Coldfair Green BHs 7/35/03/*G/0044; Leiston BH 7/35/03/*G/0072. Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation.
	7 Reduce the impact of groundwater abstraction at the Langford Trench and Ball Lane Boreholes on WFD status of associated Blackwater (Combined Essex) and Roman River surface water bodies.	08ES100122	The EA are introducing no deterioration licence cap on the Langford Trench and Ball Lane borehole licences (whole licence expires 31/03/2028) that are likely to be required to be implemented by 31/3/28 to protect surface water body status in the Blackwater (Combined Essex) and Roman River catchments, respectively. Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation.
	8 Reduce impact of groundwater abstraction at the Langham Boreholes on WFD status of the Stour (Lamarsh to R Brett) surface water body.	08ES100123	The EA are introducing a no deterioration licence cap on the Langham boreholes (8/36/15/*G/0092) that must be implemented by 31/3/30 to protect surface water body status in the Stour (Lamarsh to River Brett) catchment. Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation.
	9 Reduce impact of groundwater abstraction in the Hartismere Water Resource Zone on WFD status of Little Ouse (upstream of Thelnetham), Waveney (upstream of Frenze Beck), Tributary of the Upper Waveney, Deben (upstream of Brandeston Bridge), Gipping (upstream of Stowmarket) surface water bodies.	08ES100124	The EA are introducing no deterioration licence caps on the Rickingham BH (may have been capped prior to start of AMP8) - 6/33/42/*G/0069; Redgrave Group licence (Redgrave, Wortham, Eye, Mendlesham, Syleham). 7/34/16/*G/0048; Bedingfield (whole licence may expire before start of AMP8 – currently in process of renewal) AN/034/0017/001 - 7/34/17/*G/0078; Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation.

	Need	WINEP Action ID	Option (type of investigation)
10	Reduce impact of groundwater abstraction in the Broadlands Chalk and Crag groundwater body on WFD status of Waveney (Ellingham Mill – Burgh St Peter), Bure (Horstead Mill to St Benet’s Abbey) and Spixworth Beck surface water bodies.	08ES100125	The EA are introducing no deterioration licence caps on the Broadlands Rivers Chalk Crag groundwater body, within the Waveney surface water operation catchment are: Broome Common 7/34/18/*G/0036 Barsham Puddingmoor 7/34/19/*G/0058; Grange and Jubby Farm (7/34/09/*G/0054). Barsham Nunnery Farm BH 7/34/19/*G/0103 Barsham Hall BH 7/34/19/*G/0104 Bungay Outney Common 7/34/18/*G/0037 Shipmeadow Emergency Chalk BH 7/34/19/*G/0135. Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation.
WFD_NDINV_WRFflow			
24	To determine whether existing HOFs are sufficient to protect flows in the Bure (Horstead Mill to St Benet’s Abbey) waterbody at full licence abstraction.	08ES100128	Investigation into Full Licence compliance and potential changes required to Hands Off Flow (HOF) conditions on Bure (Belaugh) licence to protect Q95 EFI at Full Licence.

3.1.2 Water Resources Artificial and Heavily Modified Water Bodies

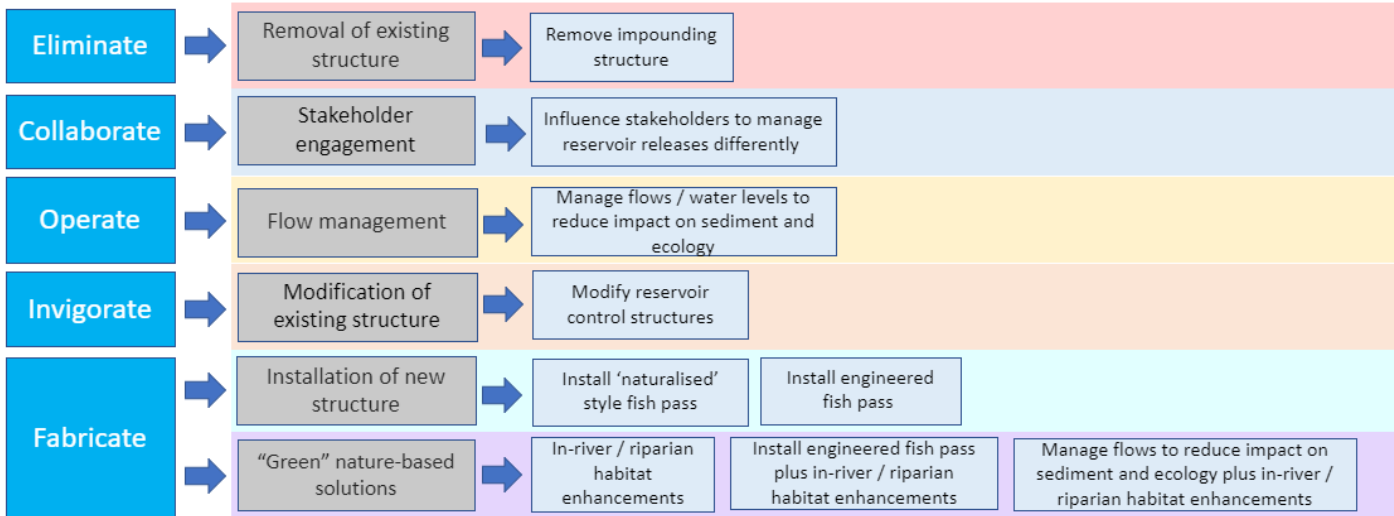
WFD_IMP_WRHWB Needs

We identified our list of unconstrained options to address our three WFD_IMP_WRHWB needs at Kielder, Fontburn and Waskerley (08NW104102, 08NW104103 and 08NW104104 respectively in Section 2.6.2) during AMP7 following our PR19 investigations at these sites (Section 2.2.2) in line with AMP7 WINEP Options Development Guidance.

FOR OUR FOURTH WFD_IMP_WRHWB NEED AT MUCK FLEET (08ES100016 IN SECTION 2.6.2), WE IDENTIFIED OUR LIST OF UNCONSTRAINED OPTIONS DURING PR24 PLANNING FOLLOWING THE AMP8 WINEP OPTIONS DEVELOPMENT GUIDANCE. THIS INVOLVED REVIEWING THE OUTCOMES OF RELEVANT LITERATURE REVIEWS AND PREVIOUS INVESTIGATIONS, AND THROUGH DISCUSSIONS WITH OUR CONSULTANTS. OUR LIST OF UNCONSTRAINED OPTIONS FOR THE WFD_IMP_WRHWB NEEDS IS DEMONSTRATED IN

Figure 3 alongside our Totex Hierarchy categories, to demonstrate a broad range of options considered.

FIGURE 3: THE UNCONSTRAINED LONG LIST OF OPTIONS IDENTIFIED TO ADDRESS THE WATER RESOURCES ARTIFICIAL AND HEAVILY MODIFIED WATER BODIES IMPLEMENTATION NEEDS, AND THEIR ALIGNMENT TO THE TOTEX HIERARCHY CATEGORIES



The options development process considers a range of options that can be categorised under a Totex hierarchy approach, as presented in Figure 2. Our unconstrained options consider options with differing levels of costs and benefits categorised as follows:

- **Eliminate** - identification of measures that remove the need. In this case, this would mean removing the impounding structure.
- **Collaborate** - work with stakeholders to address the need including co-funding. Costs can be shared with third parties either to deliver the same or an additional level of social and environmental benefit. In this case, this would mean influencing stakeholders to manage their reservoir releases differently to address the need.
- **Operate** – this would cover improved operational management practices. In this case, this would mean managing flows and water levels to reduce the downstream impact on sediment and ecology.
- **Invigorate** - invest in the existing infrastructure to improve performance. These options can provide an increased level of benefit compared to other options however at a lower cost than fabricate options. In this case, this would involve modifying the reservoir structures to address the need.
- **Fabricate** - new assets to augment or replace existing. These options are likely to have the highest costs. Our fabricate options include a combination of grey and green solutions. Green options will have lower carbon and potentially higher biodiversity and amenity benefits. Traditional grey options are likely to have highest certainty that service-related benefits will be realised. Innovative options have the potential for greater benefits and lower costs but have the lower certainty that benefits will be realised.

WFD_INV_WRHWP Needs

Options to address our seven WFD_INV_WRHWP needs (Section 2.6.2) were identified during PR24 planning following the WINEP Options Development Guidance. As these needs require investigations, and therefore have one distinct solution, they were not subject to further optioneering. These investigations were scoped in consultation with our consultants. A summary of the solutions against each WFD_INV_WRHWP need is included in Table 13.

If our AMP8 investigations identify actions are required for us to meet our environmental obligations under the WFD, then these will either be addressed during AMP8 where possible or be put forward for AMP9 investment.

TABLE 13: THE OPTIONS TO ADDRESS WATER RESOURCES ARTIFICIAL AND HEAVILY MODIFIED WATER BODIES INVESTIGATION (WFD_INV_WRHWB) NEEDS

	Need	WINEP Action ID	Option (type of investigation)
Northumbria	4 Understand the impacts the reservoirs along the River Balder have on the Balder Catchment (trib of Tees) waterbody downstream of the reservoirs and identify options to put relevant mitigation measures in place to meet WFD objectives in the designated HMWB.	08NW104109	Investigation of current mitigation measures and potential impacts on WFD water body. Options appraisal to mitigate any impacts.
	5 Understand the feasibility of measures to reduce/mitigate the impact of physical modifications on the Baydale Beck to improve its ecological function.	08NW104107	Investigation into feasibility of renaturalising the course of Baydale Beck and the potential impacts on the flow regime, water quality and ecology.
	6 Understand the impacts of releases from Catcleugh Reservoir on the downstream River Rede and identify options to put relevant mitigation measures in place.	08NW104108	Investigation into the impacts of Catcleugh reservoir flows on the downstream River Rede. Assessment of the nature and scale of impacts on geomorphology and ecological function (e.g. habitat, fish counts). Identification and appraisal of mitigation options including opportunities for habitat creation and river restoration.
Northumbria	7 39 water bodes are failing to achieve Good Ecological Potential due to potentially missing mitigation measures for sediment management.	08NW104120	Investigation to determine if missing mitigation measures are required in waterbody to meet Good Ecological Potential, and identify next steps if needed to address this ²² .
	8 The Lockwood Beck Reservoir waterbody does not achieve Good Ecological Potential under the WFD due to missing mitigation measures.	08NW104110	Investigation to identify the current impact of impoundment on the headwaters of the Lockwood Beck and identify mitigation options if required.
	9 Waterbodies along the River Lune upstream and downstream of Selset Reservoir (Lune from Long Grain to Selset Reservoir, Lune from Selset Reservoir to the River Tees) have Poor to Moderate WFD Status.	08NW104111	Investigation into the potential to provide mitigation measures for upstream and downstream water body areas and to provide suitable options for mitigation.
Essex and Suffolk	10 Failure to achieve Good Ecological Potential on the Muck Fleet waterbody due to missing mitigation measure for downstream dissolved oxygen levels (8.4.3).	08ES100130	Undertake WINEP investigation into missing mitigation measures as confirmed by EA.

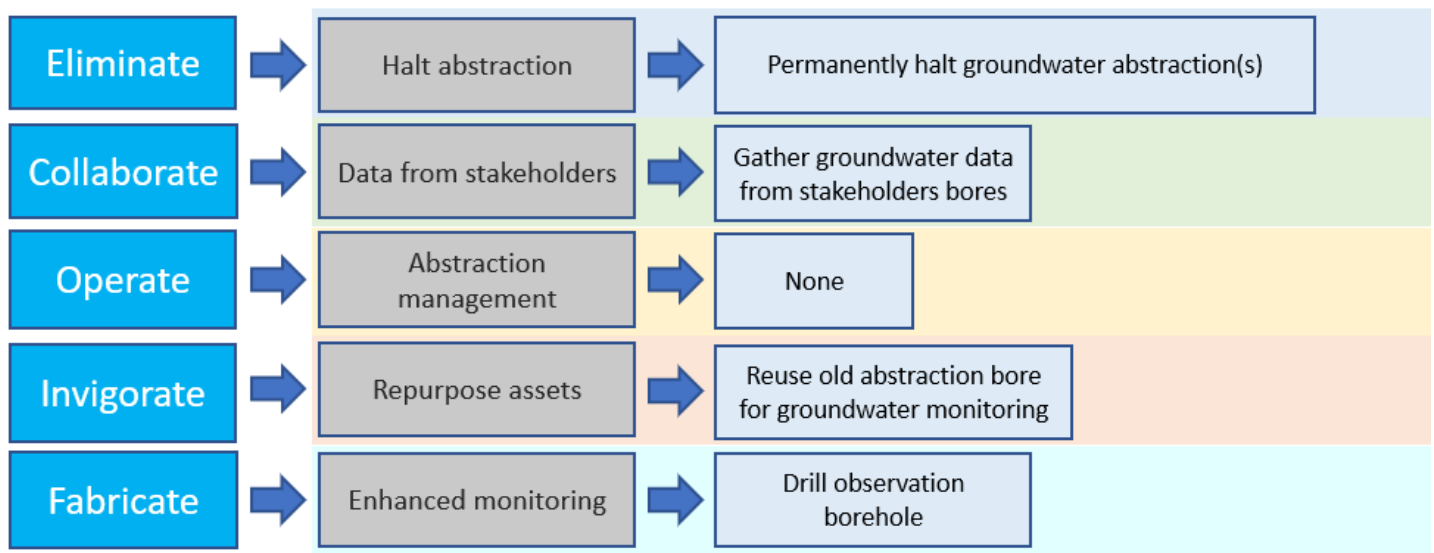
²² Note - This is awaiting confirmation from local EA of validity of EA national data upload.

3.1.3 Groundwater Pressures

WFDGW_IMP Need

We identified our list of unconstrained options to address our WFDGW_IMP need in the Sunderland Magnesian Limestone aquifer (08NW104112) following our PR19 WINEP investigation into understanding saline intrusion in the aquifer (Section 2.2.3) in line with AMP7 WINEP Options Development Guidance. Our list of unconstrained options is demonstrated in Figure 4 alongside our Totex Hierarchy categories, to demonstrate a broad range of options considered.

FIGURE 4: THE UNCONSTRAINED LONG LIST OF OPTIONS IDENTIFIED TO ADDRESS THE GROUNDWATER PRESSURES IMPLEMENTATION NEED, AND THEIR ALIGNMENT TO THE TOTEX HIERARCHY CATEGORIES



The options development process considers a range of options that can be categorised under a Totex hierarchy approach, as presented in Figure 2. Our broad range of options considers options with differing levels of costs and benefits categorised as follows:

- **Eliminate** - measures that remove the need. Eliminate options are likely to have the lowest costs to deliver the benefit. In this case, eliminating the need would mean ceasing to abstract water from our drinking water sources.
- **Collaborate** - work with stakeholders to address the need including co-funding. Costs can be shared with third parties either to deliver the same or an additional level of social and environmental benefit. For this driver, this means collaborating with stakeholders in the area who have groundwater data that can be used to monitor groundwater salinity and address the need.
- **Operate** – this considers amendments or improvements to operational management practices. In this case, there are no options to alter our operations to address the need.

- **Invigorate** - invest in existing infrastructure to improve performance. These options will provide an increased level of benefit compared to other options however at a lower cost than fabricate options. In this case, we could invigorate abandoned abstraction boreholes for the purpose of groundwater modelling and therefore address the need.
- **Fabricate** - new assets to augment or replace existing. These options are likely to have the highest costs. Green options will have lower carbon and potentially higher biodiversity and amenity benefits. Traditional grey options are likely to have highest certainty that service-related benefits will be realised. Innovative options have the potential for greater benefits and lower costs but have the lower certainty that benefits will be realised. In this case new infrastructure would mean drilling an observation borehole specifically for the purpose of monitoring groundwater quality and therefore addressing the need.

WFDGW_INV and WFDGW_ND Needs

The option to address our WFDGW_INV need (08NW104113 in Section 2.6.3) was identified during PR24 planning following an AMP7 investigation into the Darlington Magnesian Limestone (Section 2.2.3) following AMP8 WINEP Options Development Guidance. As outlined in Section 2.2.3, the option to address our WFDGW_ND need (08ES100126 in Section 2.6.3) was identified following an AMP7 investigation in consultation with the EA. As these needs require investigations or have one distinct solution, they were not subject to further optioneering. A summary of the solutions against our WFDGW_INV and WFDGW_ND needs is included in Table 14.

If our AMP8 investigations identify actions are required for us to meet our environmental obligations under the WFD, then these will either be addressed during AMP8 where possible or be put forward for AMP9 investment.

TABLE 14: THE OPTIONS TO ADDRESS OUR GROUNDWATER PRESSURES INVESTIGATION (WFDGW_INV) AND NO DETERIORATION (WFDGW_ND) NEEDS

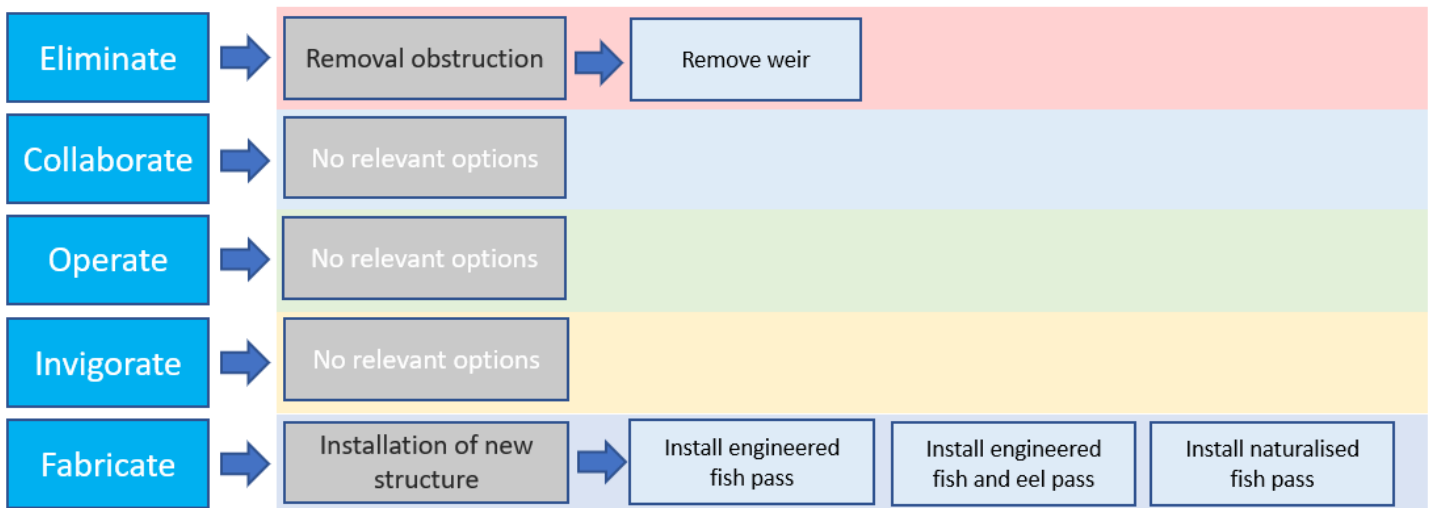
	Needs	WINEP Action ID	Option (type of investigation)
WFDGW_INV			
Northumbria	1 To understand the potential impacts of our groundwater abstraction from the Magnesian Limestone on the Skerne surface water body and the Hells Kettle SSSI (receptors identified by the AMP7 Hartlepool Water investigation) and identify options to reduce or mitigate any impacts, now and in the future.	08NW104113	Investigate potential impacts of our groundwater abstractions from the Skerne Magnesian Limestone at Broken Scar on the WFD waterbody status of the dependent surface water bodies, and identify options to reduce or mitigate any identified impacts (including potential deterioration risks). This work will be supported by numerical groundwater modelling, facilitated through development of existing groundwater models.
WFDGW_ND			
Essex and Suffolk	3 Revoke the Aldeburgh abstraction licence.	08ES100126	Revoke the Aldeburgh abstraction licence.

3.1.4 Water Framework Directive Physical Habitat and Fish Passage

WFD_IMP_PHYS_HAB Needs

We identified our list of unconstrained options to address our two WFD_IMP_PHYS_HAB needs at Glenfield Gates (08ES100014) and Roman River (08ES100017) as part of AMP7 investigations of the Essex System and in line with AMP7 WINEP Options Development Guidance. We identified our list of unconstrained options to address our Hoe Mill WFD_IMP_PHYS_HAB need (08ES100015) during PR24 planning following the AMP8 WINEP Options Development Guidance. This involved reviewing the outcomes of relevant literature reviews and previous investigations. Our list of unconstrained options for the WFD_IMP_PHYS_HAB needs is demonstrated in Figure 5 alongside our Totex Hierarchy categories, to demonstrate a broad range of options considered.

FIGURE 5: THE UNCONSTRAINED LONG LIST OF OPTIONS IDENTIFIED TO ADDRESS THE WFD PHYSICAL HABITAT AND FISH PASSAGE IMPLEMENTATION NEEDS, AND THEIR ALIGNMENT TO THE TOTEX HIERARCHY CATEGORIES



The options development process considers a range of options that can be categorised under a Totex hierarchy approach, as presented in Figure 2. Our broad range of options considers options with differing levels of costs and benefits categorised as follows:

- **Eliminate** - identification of measures that remove the need. In this case, this would mean removing the impounding structure.
- **Collaborate** - work with stakeholders to address the need including co-funding. Costs can be shared with third parties either to deliver the same or an additional level of social and environmental benefit. For this driver, there are no options to collaborate with others to address the need.
- **Operate** – this considers amendments or improvements to operational management practices. In this case, there are no options to alter our operations to address the need.

- **Invigorate** - invest in the existing infrastructure to improve performance. These options will provide an increased level of benefit compared to other options however at a lower cost than fabricate options. In this case invigorating existing infrastructure will not help to address the need.
- **Fabricate** - new assets to augment or replace existing. These options are likely to have the highest costs. Green options will have lower carbon and potentially higher biodiversity and amenity benefits. Traditional grey options are likely to have highest certainty that service-related benefits will be realised. Innovative options have the potential for greater benefits and lower costs but have the lower certainty that benefits will be realised. In this case, new infrastructure to deliver a style of fish pass will help to address the need.

WFD_INV_PHYS_HAB Needs

Options to address our two WFD_INV_PHYS_HAB needs (Section 2.6.4) were identified during PR24 planning following the AMP8 WINEP Options Development Guidance. As these needs require investigations, and therefore have one distinct solution, they were not subject to further optioneering. These investigations were scoped in consultation with our consultants. A summary of the solutions against our WFD_INV_PHYS_HAB needs is included in Table 15.

If our AMP8 investigations identify actions are required for us to meet our environmental obligations under the WFD, then these will either be addressed during AMP8 where possible or be put forward for AMP9 investment.

TABLE 15: THE OPTIONS TO ADDRESS THE PHYSICAL HABITAT AND FISH PASSAGE INVESTIGATION (WFD_INV_PHYS_HAB) NEEDS

	Need	WINEP Action ID	Option (type of investigation)
Northumbria	1 Investigate the impact of our assets and their operation at Kitty's Burn on water quality and environmental deterioration and identify options to mitigate these impacts.	08NW104009	Investigation to assess opportunities to restore Kitty's Burn, including geomorphological assessment.
	2 Assess the need to provide fish passage at 25 identified barriers.	08NW104012	Assess the need to provide fish passage at 25 identified barriers and appraise options for delivering a solution in AMP9.

3.2. PRIMARY AND SECONDARY SCREENING OF OPTIONS

Primary screening has been completed for all our IMP needs in accordance with the AMP8 WINEP Options Development Guidance²³ or via PR19 investigations which followed AMP7 WINEP Options Development Guidance and broadly aligns with the AMP8 guidance, as relevant. This involved screening each option in the unconstrained (long) lists for each need shown in Section 3.1 against two criteria to ensure that each option is:

²³ WINEP Options Development Guidance - Section 7, Environment Agency, July 2022

- technically feasible (to implement), and
- expected to meet the statutory obligation.

If an option does not meet these criteria, then it has been discarded. This screening process produced a constrained (short) list of options for each need. The outcomes of the primary screening of the options for each driver are outlined in this section. Note that INV needs are not subject to full optioneering and solutions to these needs are outlined in Section 3.1.

Secondary screening of the remaining options was undertaken to determine their costs and the benefits the option would deliver. This was completed to understand whether the options were obviously higher in cost, carbon or would deliver less benefit compared to other options. This process produced a feasible list of options for each need. Our assessment of benefits is included in Section 3.3.1, and our approach to costing is outlined in Section 4.1. These have then been used to inform the cost benefit appraisal to determine the preferred option in Section 3.3.2.

3.2.1 Water Resources Hydrological Regime

The outcomes of the primary screening of the unconstrained list of options to meet the WFD_IMP_WRFlow needs (as outlined in Section 3.1.1) are summarised in Table 16. This screening was carried out during the AMP7 investigations. Catchment walkovers and a desk-based analysis was undertaken as part of the AMP7 investigations to identify solutions.

TABLE 16: THE OUTCOMES OF THE PRIMARY SCREENING PROCESS FOR OUR WFD_IMP_WRFLOW NEEDS

Totex Hierarchy Category	Option	Technically Feasible?	Meets Statutory Obligation?	Primary Screening Outcome
Eliminate	1 Permanently turn off abstractions	Yes	Yes	Carried forward
Collaborate	2 Reductions to non-water company abstractions	No	Yes	Rejected: not feasible as we do not have the authority. This would require action by the EA, where we may have the ability to influence, however there would be no guarantee it would work.
	3 Trade with other license users	Yes	Yes	Carried forward
Operate	4 Abstraction reductions	Yes	Yes	Carried forward
	5 Amend abstraction license	Yes	Yes	Carried forward
	6 Amend existing abstraction for river support	Yes	Yes	Carried forward
Invigorate	7 Transfer water via existing arrangements	Yes	Yes	Carried forward
	8 New Transfer from existing abstraction for river support	Yes	Yes	Carried forward
	9 Construct new winter storage reservoir to provide river support	Yes	Yes	Carried forward
Fabricate	10 Relocate abstraction	No	Yes	Rejected: there are no suitable alternative locations to relocate the abstraction that will allow us to achieve our statutory obligations
	11 River restoration (riparian / in-channel measures)	Yes	Yes	Carried forward
	12 Installation of flow monitoring	Yes	Yes	Carried forward
	13 Effluent reuse	No	No	Rejected: effluent discharges not available locally to relevant waterbodies or not deliverable within AMP8.

Options that did not satisfy the two criteria were rejected through this primary screening processes and have been captured in a Rejection Register for future reference. Of the 13 options in the unconstrained list, ten are expected to address both criteria and are therefore carried through for secondary screening. The short-listed options for each WFD_IMP_WRFLOW need are summarised in Table 17.

TABLE 17: THE SHORT LIST OF OPTIONS TO ADDRESS THE HYDROLOGICAL REGIME IMPLEMENTATION (WFD_IMP_WRFLOW) NEEDS

Need	WINEP Action ID	Totex Hierarchy Category	Option		
12	To demonstrate that we are meeting our commitments for flow management and provision with the EA, especially with regard to ensuring sufficient flow to enable fish passage through the EA's proposed fish pass at the Judas Gap Weir.	08ES100119	Fabricate	12	Installation of flow monitoring
13	Implement measures to amend the HOF conditions on the existing abstraction licence, including creating a new HOF agreed with the EA at Judas Gap to reduce the impact of abstraction on the WFD status of the River Stour.	08ES100117	Operate	5	Amend abstraction licence
14	Implement measures to reduce / mitigate the impacts of full licence abstraction on flow in the Roman River.	08ES100118	Operate	5	Amend abstraction licence
15	Reduce impacts of groundwater abstraction at Wortham on flow and ecological function of the River Waveney (u/s Frenze Beck).	08ES100115	Fabricate	8	New transfer from existing abstraction for river support ²⁴
				11	River restoration (riparian / in-channel measures)
16	To agree a numerical trigger for the compensation discharge on the Coldfair Green licence (7/35/03/*G/0044) to contribute to achieving water body objective status of the Hundred River.	08ES100113	Operate	5	Amend abstraction licence
17	To reduce/mitigate impacts of our abstractions at Coldfair Green on flows in the Hundred River to improve ecological functioning of the river and contribute to achieving water body objective status.	08ES100108	Fabricate	6	Amend existing abstraction for river support
				11	River restoration (riparian / in-channel measures)
18	To mitigate impacts of abstractions at Wortham and Rickinghall on flows in the Little Ouse and to improve ecological functioning of the river and contribute to achieving water body objective status.	08ES100107	Fabricate	8	New transfer from existing abstraction for river support
				11	River restoration (riparian / in-channel measures)
19		08ES100114	Eliminate	1	Permanently turn off abstractions

Essex and Suffolk

²⁴ This option will be delivered under our WRFlow_ND need (08ES100121) and so will not be taken forward under this need.

	To mitigate impacts of abstractions at Benhall on flows in the Alde River to improve ecological functioning of the river.		Operate	4	Abstraction reductions
			Fabricate	6	Amend existing abstraction for river support
				11	River restoration (riparian / in-channel measures)
20	To mitigate impacts of abstraction on flows and geomorphology of the River Blackwater to improve ecological functioning of the river.	08ES100112	Fabricate	11	River restoration (riparian / in-channel measures)
			Eliminate	1	Permanently turn off abstractions
			Operate	4	Abstraction reductions
				9	Construct new winter storage reservoir to provide river support
21	Mitigate impacts of abstractions from Holton, Halesworth and Walpole on flow in the three surface water bodies along the River Blyth (Chediston Watercourse, Blyth (New Reach through Halesworth) and Blyth (upstream of Halesworth)) and mitigate impact of low flows to improve ecological functioning of the river.	08ES100106	Fabricate	11	River restoration (riparian / in-channel measures)
			Eliminate	1	Permanently turn off abstractions
			Collaborate	3	Trade with other licence users
			Operate	4	Abstraction reductions
22	Mitigate impacts of abstractions from Little Glemham and Parham on flow diversity in the River Ore to improve ecological functioning of the river.	08ES100109		8	New transfer from existing abstraction for river support
			Fabricate	11	River restoration (riparian / in-channel measures)
			Invigorate	7	Transfer water via existing arrangements
23	Mitigate impacts of surface and groundwater abstraction at Langham on flow and hydromorphology of the River Stour and improve ecological functioning of the river.	08ES100110		11	River restoration (riparian / in-channel measures)
			Fabricate	12	Installation of flow monitoring
24	Implement measures to amend the HOF conditions on the existing surface abstraction licence to protect flows at full licence abstraction and reflect change in use of EA's Waveney Augmentation Groundwater Scheme (WAGS).	08ES100116	Operate	5	Amend abstraction licence

3.2.2 Water Resources Artificial and Heavily Modified Water Bodies

THE OUTCOMES OF THE PRIMARY SCREENING OF THE UNCONSTRAINED OPTIONSTO MEET THE WFD_IMP_WRHWN NEEDS (AS OUTLINED IN SECTION 3.1.2) ARE SUMMARISED IN

Table 18. This screening was carried out during the AMP7 investigations following the AMP7 WINEP Options Development Guidance, and in consultation with the EA where relevant.

TABLE 18: THE OUTCOMES OF THE PRIMARY SCREENING PROCESS FOR WFD_IMP_WRHMB

Totex Hierarchy Categories	Options	Technically Feasible?	Meets Statutory Obligation?	Primary Screening Outcome
Eliminate	1 Remove impounding structure	No	Yes	Rejected: Structures required to control water levels for water supply and environment.
Collaborate	2 Influence stakeholders to manage reservoir releases differently	Yes	No	Rejected: Changes in reservoir releases required to meet statutory obligation need to be delivered by us.
Operate	3 Manage flows / water levels to reduce impact on sediment and ecology	Yes	Yes	Carried forward
Invigorate	4 Modify reservoir control structures	No	Yes	Rejected: Not technically feasible in AMP8 due to need to carry out compensation flow trials to inform future licence conditions, and therefore whether any modifications to control structures are required.
Fabricate	5 Install 'naturalised' style fish pass	No	No	Rejected: Land suitability/availability and ownership constraints makes the construction of a naturalised style fish pass in AMP8 not feasible.
	6 Install engineered fish and eel pass	Yes	Yes	Carried forward
	7 In-river / riparian habitat enhancements	Yes	No	Rejected: Habitat enhancements alone would not meet statutory requirements.
	8 Install engineered fish and eel pass plus in-river / riparian habitat enhancements	Yes	Yes	Carried forward
	9 Manage flows to reduce impact on sediment and ecology plus in-river / riparian habitat enhancements	Yes	Yes	Carried forward

OPTIONS THAT DID NOT SATISFY THE TWO CRITERIA WERE REJECTED THROUGH THIS PRIMARY SCREENING PROCESSES AND HAVE BEEN CAPTURED IN A REJECTION REGISTER FOR FUTURE REFERENCE. OF THE NINE OPTIONS IN THE UNCONSTRAINED LIST, FOUR ARE EXPECTED TO ADDRESS BOTH CRITERIA AND ARE THEREFORE CARRIED THROUGH FOR SECONDARY SCREENING. THE SHORT-LISTED OPTIONS FOR EACH WFD_IMP_WRHMB NEED ARE SUMMARISED IN

Table 19.

TABLE 19: THE SHORT LIST OF OPTIONS TO ADDRESS WATER RESOURCES ARTIFICIAL AND HEAVILY MODIFIED WATER BODIES NEEDS

	Need	WINEP Action ID	Totex Hierarchy Category	Options
Northumbria	1 Reduce the impact of flow and sediment releases from Kielder Reservoir to improve the geomorphological and ecological function of the downstream North Tyne.	08NW104102	Operate	3 Manage flows / water levels to reduce impact on sediment and ecology
			Fabricate	9 Manage flows to reduce impact on sediment and ecology plus in-river / riparian habitat enhancements
	2 Reduce the impact of flow and sediment releases from Fontburn Reservoir to improve the geomorphological and ecological function of downstream River Font.	08NW104103	Operate	3 Manage flows / water levels to reduce impact on sediment and ecology
			Fabricate	9 Manage flows to reduce impact on sediment and ecology plus in-river / riparian habitat enhancements
	3 Reduce the impact of flow releases from Waskerley Reservoir to improve the geomorphological and ecological function of Waskerley Beck downstream.	08NW104104	Operate	3 Manage flows / water levels to reduce impact on sediment and ecology
Essex and Suffolk	11 Enable fish (and continue to enable eels) to migrate past Muck Fleet sluice and mitigate welfare concerns associated with current limited habitat availability.	08ES100016	Fabricate	6 Install engineered fish pass
			Fabricate	8 Install engineered fish pass plus in-river / riparian habitat enhancements

3.2.3 Groundwater Pressures

The outcomes of the primary screening for the unconstrained options to meet the WFDGW_IMP need (as outlined in Section 3.1.3) are outlined in Table 20. This screening was carried out during the AMP7 investigations following the AMP7 WINEP Options Development Guidance.

TABLE 20: THE OUTCOMES OF THE PRIMARY SCREENING PROCESS FOR GROUNDWATER PRESSURES IMPLEMENTATION NEEDS (WFDGW_IMP)

Totex Hierarchy Categories	Options	Technically Feasible?	Meets Statutory Obligation?	Primary Screening Outcome
Eliminate	1 Permanently halt groundwater abstraction(s)	No	Yes	Rejected - not feasible due to sites being critical to drinking water supply.
Collaborate	2 Gather groundwater data from stakeholders' bores	Yes	No	Rejected – our stakeholders in the area do not have boreholes that we can gather data from.
Invigorate	3 Reuse old abstraction bore for groundwater monitoring	Yes	No	Rejected – there are no unused abstraction boreholes in the area.
Fabricate	4 Drill observation borehole	Yes	Yes	Carried forward

Options that did not satisfy the two criteria were rejected through this primary screening processes and have been captured in a Rejection Register for future reference. Of the four options in the unconstrained list, option number four is expected to address both criteria and is therefore carried through for secondary screening. This short-listed option for our WFDGW_IMP need is summarised in Table 21.

TABLE 21: THE SHORT LIST OF OPTIONS TO ADDRESS THE GROUNDWATER PRESSURES IMPLEMENTATION (WFDGW_IMP) NEED

	Needs	WINEP Action ID	Totex Hierarchy Category	Option
Northumbria	2			
	To monitor salinity and groundwater levels in the Sunderland Magnesian Limestone aquifer between the coast and NWG's groundwater abstraction points to understand the presence and movement of saline intrusion.	08NW104112	Fabricate	4 Drill observation borehole

3.2.4 Water Framework Directive Physical Habitat and Fish Passage

The outcomes of the primary screening for the unconstrained options to meet the WFD_IMP_PHYS_HAB needs (as outlined in Section 3.1.4) are outlined in Table 22. This screening was carried out during the AMP7 investigations following the AMP7 WINEP Options Development Guidance.

TABLE 22: THE OUTCOMES OF THE PRIMARY SCREENING PROCESS FOR PHYSICAL HABITATS IMPLEMENTATION (WFD_IMP_PHYS_HAB) NEEDS

Totex Hierarchy Categories	Options	Technically Feasible?	Meets Statutory Obligation?	Primary Screening Outcome
Eliminate	1 Remove weir	No	Yes	Rejected: The weir needs to remain in place to carry out its function of controlling water levels
	2 Install engineered fish pass	Yes	Yes	Carried forward
	3 Install engineered fish and eel pass	Yes	Yes	Carried forward
Fabricate	4 Install naturalised fish pass	No	Yes	Rejected: Land availability / suitability / ownership risks, along with EA stating requirement for engineered fish pass, means this option is not feasible

Options that did not satisfy the two criteria were rejected through this primary screening processes and have been captured in a Rejection Register for future reference. Of the four options in the unconstrained list, two are expected to address both

criteria and are therefore carried through for secondary screening. This short-listed options to address our WFD_IMP_PHYS_HAB needs are summarised in Table 23.

As mentioned in Section 2.2.4, we intend to align our AMP8 efforts to deliver fish and eel passage schemes at Glenfield Gates weir (08ES100014), Hoe Mill tilting weir (08ES100015) and Roman River weir (08ES100017) with the aims of the Essex Fish Migration Road Map to maximise efforts to improve fish migration within the Essex river system. Designing and delivering fish passes is time and resource intensive work, and so our three sites for AMP8 investment (Glenfield Gates weir, Hoe Mill tilting weir and Roman River weir) represent part of a longer-term programme, with several higher priority sites already having been addressed in previous AMPs. Even though we have been working on fish passages in previous AMPs, each solution often has to be bespoke to each river / structure, so there are only limited opportunities to transfer designs and learnings between sites. Please note that our need to improve eel migration at other locations is covered by the Eels Regulations driver within our A3-05 Enhancement Case WN – WINEP Protected Areas and Biodiversity business case.

TABLE 23: THE SHORT LIST OF OPTIONS TO ADDRESS PHYSICAL HABITAT AND FISH PASSAGE IMPLEMENTATION (WFD_IMP_PHYS_HAB) NEEDS

	Needs	WINEP Action ID	Totex Hierarchy Category	Option
Essex and Suffolk	3 Enable fish migration at the Glenfield Gates Weir at Stratford St Mary to allow natural fish behaviour.	08ES100014	Fabricate	2 Install engineered fish pass
			Fabricate	3 Install engineered fish and eel pass
	4 Enable fish and eel migration at the Hoe Mill tilting weir to allow natural behaviour.	08ES100015	Fabricate	2 Install engineered fish pass
			Fabricate	3 Install engineered fish and eel pass
	5 Enable fish and eel migration at the Roman River weir to allow natural behaviour.	08ES100017	Fabricate	2 Install engineered fish pass
			Fabricate	3 Install engineered fish and eel pass

3.3. BEST VALUE FOR CUSTOMERS

3.3.1 Benefits Scoring

For each option carried forward to this stage we have completed a benefits assessment using our Value Framework²⁵ which contains performance commitments, Wider Environmental Outcomes²⁶ and other metrics. We have incorporated the Wider Environmental Outcomes Metrics (WEOs)²⁷ into our Value Framework, which is embedded into our portfolio optimisation tool, Copperleaf, used to undertake appraisal of options. Table 24 shows the range of benefits (value measures or WEOs),

²⁵ Copperleaf Technologies Inc., 2002, Northumbrian Water Limited Value Framework Definition Document, v1.6.

²⁶ As per the WINEP Options Assessment Guidance March 2022

²⁷ WINEP Wider Environmental Outcome Metrics V2.1 issued 07.04.2022

including their quantification and monetisation values, we have used for the assessment of WFD-related shortlisted options (as included in Section 3.2). These include biodiversity and carbon impact (operational and embedded). We believe our assessment of biodiversity benefit using the WEO approach is more informed and representative than our Biodiversity Value Measure currently available, so we have used this instead within this case.

TABLE 24: RANGE OF BENEFITS IDENTIFIED FOR WATER FRAMEWORK DIRECTIVE-RELATED DRIVERS

Value measures	WEO	Description	Unit	Value	Link to WEO	Performance Commitment?
-	Biodiversity	Change in biodiversity units (BU)	BU	Not monetised	Natural Environment	No
Improved Water Environment	-	Length of water environment improved	Km	Not monetised	Natural environment, Catchment resilience	No
Embedded Emissions	-	tCO ₂ e /year	tCO ₂ e	£256.20 ²⁸	Net zero	No

Table 25 summarises the value measures we have used to measure benefit for each option to address our WFD-related needs, and how these align with the Wider Environmental Outcomes. We have applied the listed value measures as far as possible across these options however subject to the extent of data available to us at this time. There are instances where we have not been able to apply them consistently. For the benefits assessment, Table 25 shows that we first score the impact of continuing business as usual and then we score each of the relevant options. Benefits are scored over time for a 30-year time horizon. This scoring considers the certainty of benefits being realised for different types of options.

Below we provide a summary of some benefits assessment outcomes for options against the different driver codes in this case:

- WRFlow:** Where options have been designed to improve a different length of water environment, we have been able to differentiate between them using the Improved Water Environment model. This is the case for the options to reduce abstraction impacts at Little Ouse (08ES100107), where the option to improve a longer length of river, the ‘new transfer from existing abstraction for river support’ option (4.5 km), will deliver greater benefit to the water environment and deliver more against the Natural Environment Wider Environmental Outcome. However, this particular option will result in the emission of significantly more embodied carbon to meet the need (4542 tCO₂e) compared to ‘river restoration’ (0.8 tCO₂e), and therefore will not deliver as much benefit towards the Wider Environmental Objective of Net Zero. This is due to the extent of new infrastructure (including pipes) required of this option, compared to the more ‘green’ solution to restore the river. We also used the Improved Water Environment model to differentiate between options for 08ES100106, 08ES100115, and 08ES100109 to an extent.

²⁸ £ value per tonne of CO₂e in 2025/26, annual increase (varying rate) reaching £378.6/t CO₂e in 2054/55.

- **WRHMWB:** To enable fish passage at Muck Fleet (08ES100016), we have assessed the benefit of the two short-listed options using the Embedded Emissions and Biodiversity measures. Both options require a similar amount of material to implement, therefore we can't differentiate between them based on their embodied carbon emissions using the Embedded Emissions measure. However, the two options will improve a different length of water environment and therefore we can differentiate between the options based on biodiversity benefit. The option to 'install an engineered fish pass and implement in-river / riparian measures' will deliver greater biodiversity benefit (25.30 BU) compared to an engineered fish pass only (1.05 BU).
- **WFDGW:** There is only one short-listed option for the WFDGW_IMP need (08NW104112), therefore a benefits assessment will not be required to determine the preferred (best value) option. However, we have estimated the embodied carbon associated with this option using the Embedded Emissions measure, and therefore understand the carbon impact to implement this option to understand the presence and movement of saline intrusion in the Sunderland Magnesian Limestone aquifer. Understanding the carbon impact of all our options is critical to our management of carbon, and our efforts to achieve our Net Zero target.
- **PHYS_HAB:** We have the same two short-listed options to address our need to enable fish and eel migration at Glenfield Gates Weir (08ES100014), Hoe Mill Tilting Weir (08ES100015) and Roman River Weir (08ES100017). With the current options scope, we have not been able to distinguish between these options whilst applying the Improved Water Environment and Biodiversity measures to measure benefit. For example, for the Glenfield Gates Weir (08ES100014), the options have been designed to improve the same length of water environment (0.1km), and to deliver the same level of biodiversity benefit (1.05 BU). However, we have been able to differentiate using the Embodied Emissions measure. The option to install more material, 'engineered fish and eel pass', will result in more embodied emissions than the option to install a fish pass only.

TABLE 25: THE VALUE MODELS USED TO MEASURE BENEFITS OF OUR SHORTLISTED OPTIONS AND THEIR ALIGNMENT WITH THE WINEP WIDER ENVIRONMENTAL OUTCOMES

Options carried forward	Related WINEP Action IDs	NWG Value Framework measures	WINEP Outcomes	Wider Environmental
Continue business as usual As is position	All	Embedded Emissions Improved Water Environment	Biodiversity	
For each option, we score the 'as is' position and the 'to be' position against the benefits				
WRFlow				
Permanently turn off abstractions	08ES100106, 08ES100114	08ES100109, Improved Water Environment	Natural environment	
Abstraction reductions	08ES100106, 08ES100109, 08ES100114	Improved Water Environment	Natural environment	
Amend abstraction licence	08ES100113	Embedded Emissions	Natural environment Net zero	
Amend existing abstraction for river support	08ES100108, 08ES100114	Improved Water Environment	Natural environment	
New transfer from existing abstraction for river support	08ES100107, 08ES100115,	08ES100109, Improved Water Environment Embedded Emissions	Natural environment Net zero	
Construct new winter storage reservoir to provide river support	08ES100106, 08ES100120	Improved Water Environment	Natural environment Catchment resilience	
River restoration (riparian / in-channel measures)	08ES100106, 08ES100108, 08ES100110, 08ES100114, 08ES100115, 08ES100120	08ES100107, 08ES100109, Embedded Emissions Improved Water Environment	Natural environment Catchment resilience Net zero	
WRHMWB				
Manage flows / water levels to reduce impact on sediment and ecology	08NW104102, 08NW104103	Embedded Emissions	Biodiversity (Natural environment) Net zero	
Manage flows to reduce impact on sediment and ecology plus in-river / riparian habitat enhancements	08NW104102	Embedded Emissions	Biodiversity (Natural environment) Net zero Amenity, access, and engagement	
Install engineered fish pass	08ES100016	Embedded Emissions	Biodiversity (Natural environment) Net zero	

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Options carried forward	Related WINEP Action IDs	NWG Value Framework measures	WINEP Outcomes	Wider	Environmental
Install engineered fish pass plus in-river / riparian habitat enhancements	08ES100016	Embedded Emissions	Biodiversity (Natural environment) Net zero		
WFDGW					
Drill observation borehole	08NW104112	Embedded Emissions	Net zero		
PHYS_HAB					
Install engineered fish pass	08ES100014, 08ES100017	08ES100015, Embedded Emissions	Biodiversity (Natural environment) Net zero		
Install engineered fish and eel pass	08ES100014, 08ES100017	08ES100015, Embedded Emissions	Biodiversity (Natural environment) Net zero		

3.3.2 Cost benefit appraisal to select preferred option

For each of the technically feasible options we have undertaken a robust cost benefit appraisal within our portfolio optimisation tool to select the preferred option. This calculates an NPV over 30 years in accordance with the PR24 Guidance and cost to benefit ratio for each option. The ratio is calculated by dividing the present value of the profile of benefits by the present value of the profile of costs over the appraisal period of 30 years.

Costs and benefits have been adjusted to 2022-23 prices using the CPIH²⁹ Index financial year average. The impact of financing is included in the benefit to cost ratio calculation. Capital expenditure has been converted to a stream of annual costs, where the annual cost is made up of depreciation/RCV run-off costs and allowed returns over the life of the assets. Depreciation (or run-off) costs are calculated using the straight-line depreciation over the appraisal period. To discount the benefits and costs over time, we have used the social time preference rate as set out in 'The Green Book'.

The NPVs and cost benefit ratios for all short-listed options to address our IMP needs within this case have been generated by our portfolio optimisation tool and are included in Section 6. It is worth noting that, as outlined in Section 3.3.1, we may not have been able to complete the same degree of benefits assessment or incorporate all benefits in the calculation across all short-listed options for some needs due to data limitations. This means that the NPVs shown are primarily driven by cost, and this is reflected in the negative NPVs and low cost to benefit ratios in each case.

Our preferred solutions are also highlighted in Section 6. For our WRFlow options, in all cases but one we have identified the preferred options as being those that will deliver the greatest value as determined by having the highest NPV (Table 34). The exception is for our need to mitigate impacts from our abstractions on the River Stour (08ES100110). This is also the case for the majority of our solutions for our WRHWMB (Table 35) and PHYS_HAB (Table 37) needs where cost is the primary driver in the NPV calculation. In some cases, such as for our PHYS_HAB (Table 37) needs, the EA has specified the preferred solution.

NPVs for the INV solutions are not presented as they are not expected to deliver a benefit in AMP8, rather they will inform future work, and therefore did not require a benefits assessment as outlined in the WINEP Options Development Guidance. This means that our solutions to our INV needs represent our preferred options. Costs for these options are included in Section 3.3.3 below.

We have had independent third party (Jacobs) assurance undertaken on our AMP8 WINEP programme to ensure suitability and reliability of our programme, and to confirm that we have followed the WINEP Options Development Guidance. This exercise utilised a sample of our water WINEP drivers, including WRFlow and WRHWB within this case.

²⁹ Consumer Prices Index including owner occupiers' housing costs.

3.3.3 Costs for Preferred Options

A summary and breakdown of costs to deliver our AMP8 needs against each driver within this business case are outlined in Table 26 to Table 29 below. The cost to address our AMP8 needs is broken down to show the investment required over AMP8, and to maintain them over the next 30 years (up to 2055, end of AMP13). A 30-year cost profile has been included to align with the profile applied to the benefits assessments for these needs and solutions (Section 3.3.1), and the benefit to cost ratio assessment (Section 3.3.2).

TABLE 26: BREAKDOWN OF COSTS REQUIRED TO DELIVER OUR WATER RESOURCES HYDROLOGICAL REGIME IN AMP8 (COSTS ROUNDED TO THE NEAREST £)

Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)	
WFD_INV_WRFflow							
1	08NW104106	Investigation into the effect of the abstraction on the Skerne (Demon's Beck to Tees) water body's failure to achieve Good Ecological Status and options appraisal to identify a solution if a causal link is identified	197,421	0	197,421	197,421	
WFD_NDINV_WRFflow							
Northumbria	2	08NW104115b	Investigation into the risk of surface water body WFD status deterioration from future abstraction. An options appraisal will be undertaken to remove or mitigate the risk if identified.	76,256	0	76,256	76,256
	3	08NW104115a	Investigation into the risk of surface water body WFD status deterioration from future abstraction. An options appraisal will be undertaken to remove or mitigate the risk if identified	76,256	0	76,256	76,256
	4	08NW104124	Investigation of the potential impact of abstraction at full licence on the River Coquet and Northumberland South coastal waterbodies	60,547	0	60,547	60,547

Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)		
at full licence on the River Coquet and Northumberland South coastal waterbodies.								
WFD_ND_WRFlow								
Essex and Suffolk	5	Reduce the impact of the Holton & Halesworth, Walpole & Rockstone Lane and Little Glenham groundwater abstractions in the Waveney and East Suffolk Chalk and Crag groundwater body on WFD status of associated Chediston Watercourse, Blyth, Alde and Ore water bodies.	08ES100120	The EA are introducing no deterioration licence caps on the following licences in the Waveney and East Suffolk Chalk & Crag groundwater body, within the Suffolk Coastal surface water operation catchment which we need to implement: Holton & Halesworth BHs (TLV expires 31/03/2026 – may cap entire licence at this point & add multi-year aggregate to licence) 7/35/02/*G/0083; Walpole & Rockstone Lane BH (TLV expires 31/03/2026 – may cap entire licence at this point & add multi-year aggregate to licence) 7/35/02/*G/0082; Little Glenham BH (whole licence expires 31/03/2026) AN/035/0004/014/R01 -7/35/04/*G/0105. Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation.	0	0	0	0
	6	Reduce impact of the Benhall, Parham & Samundham, Coldfair Green and Leiston groundwater abstractions in the East Suffolk Chalk and Crag groundwater body on WFD status of associated Alde, Ore and Hundred River water bodies.	08ES100121	The EA are introducing a no deterioration licence caps on the following licences in the Waveney and East Suffolk Chalk & Crag groundwater body, within the Suffolk Coastal surface water operation catchment that must be implemented by 31/3/30: Benhall, Parham, Saxmundham BHs 7/35/04/*G/0067; Coldfair Green BHs 7/35/03/*G/0044; Leiston BH 7/35/03/*G/0072. Implications of the reduction in	173,700	0	173,700	173,700

	Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)
			terms of WRZ supply balance and resilience need to be assessed prior to implementation.				
	7	08ES100122	The EA are introducing no deterioration licence cap on the Langford Trench and Ball Lane borehole licences (whole licence expires 31/03/2028) that are likely to be required to be implemented by 31/3/28 to protect surface water body status in the Blackwater (Combined Essex) and Roman River catchments, respectively. Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation.	0	0	0	0
Essex and Suffolk	8	08ES100123	The EA are introducing a no deterioration licence cap on the Langham boreholes (8/36/15/*G/0092) that must be implemented by 31/3/30 to protect surface water body status in the Stour (Lamarsh to River Brett) catchment. Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation.	43,400	0	43,400	43,400
	9	08ES100124	The EA are introducing no deterioration licence caps on the Rickinghall BH (may have been capped prior to start of AMP8) - 6/33/42/*G/0069; Redgrave Group licence (Redgrave, Wortham, Eye, Mendlesham, Syleham). 7/34/16/*G/0048; Bedingfield (whole licence may expire before start of AMP8 – currently in process of renewal) AN/034/0017/001 - 7/34/17/*G/0078; Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation.	0	0	0	0

Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)
10	08ES100125	The EA are introducing no deterioration licence caps on the Broadlands Rivers Chalk Crag groundwater body, within the Waveney surface water operation catchment are: Broome Common 7/34/18/*G/0036 Barsham Puddingmoor 7/34/19/*G/0058; Grange and Jubby Farm (7/34/09/*G/0054). Barsham Nunnery Farm BH 7/34/19/*G/0103 Barsham Hall BH 7/34/19/*G/0104 Bungay Outney Common 7/34/18/*G/0037 Shipmeadow Emergency Chalk BH 7/34/19/*G/0135. Implications of the reduction in terms of WRZ supply balance and resilience need to be assessed prior to implementation	304,000	0	304,000	304,000
WFD_IMP_WRFflow						
11	08ES100119	Installation of flow monitoring associated with the installation of fish passage on the Judas Gap weir (EA structure). To be undertaken when the EA complete their works.	26,375	0	26,375	26,375
12	08ES100117	Licence change to amend HOFs on Stour licence to reflect new reservoir control curves and desire to see more flow down to the Cattawade intake.	25,800	0	25,800	25,800

Essex and Suffolk

	Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)	
Essex and Suffolk	13	Implement measures to reduce / mitigate the impacts of full licence abstraction on flow in the Roman River.	08ES100118	Licence change to Roman River licence (8/37/24/S/0062) to implement a HOF of 8 MI/d (or other value as agreed with the EA at the Roman River weir).	25,800	0	25,800	25,800
	14	Reduce impacts of groundwater abstraction at Wortham on flow and ecological function of the River Waveney (u/s Frenze Beck).	08ES100115	River enhancement works to improve flow and habitat diversity, including constructing berms/flow deflectors and possibly adding gravel to form riffles and bars. This approach may particularly help to improve the aquatic habitat diversity in the areas to the south of Diss. Improved management of the shade/light levels along the reach could assist in preventing stands of macrophytes dominating the channel and backing up flows. an over widening of channel, a straight planform and barriers to fish passage	500,000	0	500,000	500,000
	15	To agree a numerical trigger for the compensation discharge on the Coldfair Green licence (7/35/03/*G/0044) to contribute to achieving water body objective status of the Hundred River.	08ES100113	To agree a numerical trigger for the compensation discharge on the Coldfair Green licence (7/35/03/*G/0044) to contribute to achieving water body objective status of the Hundred River.	130,000	34,750	164,750	164,750
	16	To reduce/mitigate impacts of our abstractions at Coldfair Green on flows in the Hundred River to improve ecological functioning of the river and contribute to achieving water body objective status.	08ES100108	Subject to landowner agreement, river restoration measures in the Hundred River focussed on creating low flow channels. There are sections of straight and overwide channel towards the downstream end of the reach that would benefit from implementing in channel measures including the creation of low flow channels using soft engineering techniques. Includes provision for a Project Officer shared across the Essex and Suffolk river restoration schemes (0.15 FTE for Hundred River). This	634,923	29,304	664,227	664,227

Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)
		WINEP action comprises the in-channel river restoration measures. The option regarding a numerical trigger for the river flow support is outlined in a separate WINEP Action.				
17		Subject to landowner agreement, river restoration measures in the lower reaches of the Little Ouse (upstream of Thelnetham) waterbody along a length of 1.5 km. Works to include: reducing tree shade; alternative tree planting; introduction of buffer strips along 1.5km of river reach; narrowing works (25% of river reach length); gravel augmentation (25% of river reach length); and provision of backwater to provide refuge for low flow periods. In addition, new groundwater pumping tests and water features survey to further assess the potential benefits of the licence change option if required. Includes provision for a Project Officer shared across the Essex and Suffolk river restoration schemes (0.15 FTE for Little Ouse). This option assumes the abstraction from Wortham and Rickinghall remain at their current RA rates	486,027	29,304	515,331	515,331
	08ES100107	To mitigate impacts of abstractions at Wortham and Rickinghall on flows in the Little Ouse and to improve ecological functioning of the river and contribute to achieving water body objective status.				
18		Refinement of Benhall river support trigger to increase river support operation to support Q95 low flows on the Alde. Transformation of modelled Q90 flow targets to EA gauge at Farnham GS; Trials of augmentation to water course to demonstrate compliance of flow targets.	65,000	41,841	106,841	106,841
	08ES100114	To mitigate impacts of abstractions at Benhall on flows in the Alde River to improve ecological functioning of the river.				
19		Subject to landowner agreement, river restoration on the River Blackwater (in-channel measures and habitat enhancement). This option comprises a mixture of (1) Improving	319,211	29,304	348,515	348,515
	08ES100112	To mitigate impacts of abstraction on flows and geomorphology of the River Blackwater to improve				

Essex and Suffolk

Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)	
ecological functioning of the river.		shading/light conditions i.e., tree planting and tree canopy management to control light and shade, and increase in-channel macrophyte growth, and (2) In-channel flow diversification i.e., where channel is over-wide/deep, measures will include the introduction of features such as berms, flow deflectors, and woody debris to create flow diversity, increase macrophyte growth and control water temperature, particularly at low flows. Including provision for a Project Officer shared across the Essex and Suffolk river restoration schemes (0.15 FTE for Blackwater)					
			1,697,107	29,304	1,726,411	1,726,411	
Essex and Suffolk	20	Mitigate impacts of abstractions from Holton, Halesworth and Walpole on flow in the three surface water bodies along the River Blyth (Chediston Watercourse, Blyth (New Reach through Halesworth) and Blyth (upstream of Halesworth)) and mitigate impact of low flows to improve ecological functioning of the river.	08ES100106	Subject to landowner agreement, river restoration measures focused on creating low flow channels (Blyth through Halesworth water body), to help the channel be more resilient to low flows. Includes provision for a Project Officer shared across the Essex and Suffolk river restoration schemes (0.15 FTE for Blyth)			
	21	Mitigate impacts of abstractions from Little Glemham and Parham on flow diversity in the River Ore to improve ecological functioning of the river.	08ES100109	Subject to landowner agreement, in channel river restoration measures in the River Ore: berms/ flow deflectors to improve flow diversity and encouraging faster flow velocities. Includes provision for a Project Officer shared across the Essex and Suffolk river restoration schemes (0.15 FTE for Ore)	686,354	19,536	705,890
	22	Mitigate impacts of surface and groundwater abstraction at	08ES100110	Subject to landowner agreement, river restoration for the Stour including: (1) Improving	685,948	29,304	715,252

Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)		
Langham on flow and hydromorphology of the River Stour and improve ecological functioning of the river.		shading/light conditions i.e., tree planting and tree canopy management to control light and shade extremes, and encourage macrophyte growth in areas where they are currently absent and control the dominance in under-shaded areas; (2) Backwaters/ riparian wetlands i.e.,creation of backwater / wetland area on small, bifurcated channels / ditches that join main river; and (3) Riparian management: Creating buffer strips to mitigate polluted runoff entering channel from arable land / install fencing to prevent cattle entering channel and causing poaching. Note that fish passage at Glenfield Gates is covered by a separate WINEP action						
Essex and Suffolk	23	Implement measures to amend the HOF conditions on the existing surface abstraction licence to protect flows at full licence abstraction and reflect change in use of EA's Waveney Augmentation Groundwater Scheme (WAGS).	08ES100116	Waveney Shipmeadow river water abstraction 7/34/19/*S/0108 - amendments to abstraction licence to incorporate new daily limit of RA+7 MI/d supported by WAGS and a new condition to ensure there is sufficient downstream freshwater flow.	25,800	0	25,800	25,800
	WFD_NDINV_WRFflow							
	24	To determine whether existing HOFs are sufficient to protect flows in the Bure (Horstead Mill to St Benet's Abbey) waterbody at full licence abstraction.	08ES100128	Investigation into FL compliance and potential changes required to Hands Off Flow (HOF) conditions on Bure (Belough) licence to protect Q95 EFI at FL.	88,534	0	88,534	88,534
TOTAL					6,328,459	242,647	6,571,106	6,571,106

TABLE 27: BREAKDOWN OF COSTS REQUIRED TO DELIVER OUR WATER RESOURCES ARTIFICIAL AND HEAVILY MODIFIED WATER BODIES NEEDS IN AMP8 (COSTS ARE ROUNDED TO THE NEAREST £)

	Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)	
	WFD_IMP_WRHWB							
Northumbria	1	Mitigate the impact of Kielder Reservoir to improve the geomorphological and ecological function of the downstream North Tyne.	08NW104102	Manage flows to reduce impact on sediment and ecology plus in-river / riparian habitat enhancements	763,427	0	763,427	763,427
	2	Mitigate the impact of Fontburn Reservoir to improve the geomorphological and ecological function of the downstream River Font.	08NW104103	Manage flows to reduce impact on sediment and ecology plus in-river / riparian habitat enhancements	384,304	0	384,304	384,304
	3	Alter the flows from Waskerley Reservoir to improve the ecological function of Waskerley Beck downstream.	08NW104104	Manage flows / water levels to reduce impact on sediment and ecology	35,931	0	35,931	35,931
	WFD_INV_WRHWB							
	4	Understand the impacts the reservoirs along the River Balder have on the waterbodies downstream of the reservoirs and identify options to put relevant mitigation measures in place to meet WFD objectives in the designated HMWB.	08NW104109	Investigation of current mitigation and potential impacts on WFD water body. Options appraisal to mitigate any impacts.	133,764	0	133,764	133,764

Northumbria	5	Develop a scheme to reduce/mitigate the impact of physical modifications on the Baydale Beck to improve its ecological function, including potentially restoring the watercourse to its original channel.	08NW104107	Investigation into feasibility of renaturalising the course of Baydale Beck and the potential impacts on the flow regime, water quality and ecology.	89,046	0	89,046	89,046
	6	Understand the impacts of releases from Catcleugh Reservoir on the downstream River Rede identify options to put relevant mitigation measures in place.	08NW104108	Investigation into the impacts of Catcleugh reservoir flows on the downstream River Rede. Assessment of the nature and scale of impacts on geomorphology and ecological function (e.g. habitat, fish counts). Identification and appraisal of mitigation options including opportunities for habitat creation and river restoration.	82,797	0	82,797	82,797
	7	Determine if missing mitigation measures within 39 WFD surface (river) water bodies are required to meet Good Ecological Potential, and identify next steps to put relevant mitigation measures in place.	08NW104120	Investigation to determine if missing mitigation measures are required in waterbody to meet Good Ecological Potential, and identify next steps if needed to address this.	253,500	0	253,500	253,500
	8	Understand the impact of Lockwood Beck on flows into the coastal stream and identify potential options to put relevant mitigation measures in place.	08NW104110	Investigation to identify the current impact of impoundment on the headwaters of the Lockwood Beck and identify mitigation options if required.	99,591	0	99,591	99,591

Northumbria	9	Understand and confirm the flow impacts of Selset Reservoir on River Lune waterbodies (Lune from Long Grain to Selset Reservoir, Lune from Selset Reservoir to the River Tees) and identify options to mitigate impacts if required.	08NW104111	Investigation into the potential to provide mitigation measures for upstream and downstream water body areas and to provide suitable options for mitigation.	241,166	0	241,166	241,166
	10	Determine if mitigation measure 8.4.3 is required in the Muck Fleet water body to meet Good Ecological Potential. Confirm what is impacting dissolved oxygen levels downstream of Muck Fleet sluice and identify options to improve them. WFD_IMP_WRHWB	08ES100130	Undertake WINEP investigation into missing mitigation measures as confirmed by EA	48,588	0	48,588	48,588
Essex and Suffolk	11	Enable fish (and continue to enable eels) to migrate past Muck Fleet sluice and mitigate welfare concerns associated with current limited habitat availability.	08ES100016	Install engineered fish pass plus in-river / riparian habitat enhancements	1,093,547	0	1,093,547	1,093,547
	TOTAL				3,225,661	0	3,225,661	3,225,661

TABLE 28: BREAKDOWN OF COSTS REQUIRED TO DELIVER GROUNDWATER PRESSURES NEEDS IN AMP8 (COSTS ARE ROUNDED TO THE NEAREST £)

	Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)
	WFDGW_INV						
Northumbria	1	08NW104113	Investigate potential impacts of our groundwater abstraction from the Skerne Magnesian Limestone on the Broken Scar on the WFD waterbody status of the dependent surface water bodies and identify options to reduce or mitigate any identified impacts (including potential deterioration risks). This work will be supported by numerical groundwater modelling, facilitated through development of existing groundwater models.	217,733	0	217,733	217,733
		WFDGW_IMP					
	2	08NW104112	Drill observation borehole	94,626	0	94,626	94,626
Essex / Suffolk	WFDGW_ND						
	3	08ES100126	Revoke the Aldeburgh abstraction licence.	0	0	0	0
	TOTAL			312,359	0	312,359	312,359

TABLE 29: BREAKDOWN OF COSTS REQUIRED TO DELIVER OUR WATER FRAMEWORK DIRECTIVE PHYSICAL HABITAT AND FISH PASSAGE NEEDS IN AMP8 (COSTS ARE ROUNDED TO THE NEAREST £)

	Need	WINEP Action ID	Option	CAPEX (AMP8) (£)	OPEX (AMP8) (£)	TOTEX (AMP8) (£)	TOTEX (up to 2055 – end of AMP13) (£)	
WFD_INV_PHYS_HAB								
Northumbria	1	Investigate the impact of our assets and their operation at Kitty's Burn on water quality and environmental deterioration and identify options to mitigate these impacts.	08NW104009	Investigation to assess opportunities to restore Kitty's Burn, including geomorphological assessment.	53,896	0	53,896	53,896
	2	Assess the need to provide fish passage at 25 identified barriers and appraise options for delivering a solution in AMP9.	08NW104012	Investigation into the need for and feasibility of providing fish passage at the 25 identified barriers.	240,146	0	240,146	240,146
WFD_IMP_PHYS_HAB								
Essex and Suffolk	3	Enable fish migration at the Glenfield Gates Weir at Stratford St Mary to allow natural fish behaviour.	08ES100014	Install engineered fish and eel pass	781,105	0	781,105	781,105
	4	Enable fish and eel migration at the Hoe Mill tilting weir to allow natural behaviour.	08ES100015	Install engineered fish and eel pass	781,105	0	781,105	781,105
	5	Enable fish and eel migration at the Roman River weir to allow natural behaviour.	08ES100017	Install engineered fish and eel pass	432,959	0	432,959	432,959
TOTAL				2,289,211	0	2,289,211	2,289,211	

3.4. THIRD PARTY FUNDING

We intend to continue to work in partnership with our relevant stakeholders as much as possible to deliver our AMP8 needs. This partnership working at times presents the opportunity for third party funding. For example, in ESW we have been working in partnership at the Trinity Broads, Burgh Common and Muckfleet Marshes since 1995. Through the Trinity Broads Project Board, we work in partnership with the Norfolk Wildlife Trust, Natural England, EA, Broads Authority and Water Management Alliance. The Board sets out the ecological and environmental management activities planned for the Trinity Broads to meet its conservation objectives over the next 5 years. The partners work together to deliver the agreed aims of the Management Plan, sharing knowledge and expertise, and where possible financial and other resources. Our AMP7 efforts to protect and enhance the environment at Muck Fleet (Section 2.2.2) is an example of this partnership working. We will continue to explore opportunities for third party funding during AMP8 delivery.

3.5. DIRECT PROCUREMENT FOR CUSTOMERS

We assessed this programme against the DPC guidance (see our [assessment report](#), NES38). This report concludes there are no opportunities for direct procurement for customers relevant to this programme because the projects are small value and less than <£200m of whole life totex.

3.6. DELIVERABILITY ASSESSMENT

In accordance with the WINEP options development guidance we have undertaken a deliverability assessment. This has considered:

- The technical feasibility of implementing an intervention (Section 3.2) – all of the preferred options are technically feasible to implement.
- The certainty that benefits for each option will be realised. This has been assessed as part of the likelihood scoring in our benefits assessment (Section 3.3.1).
- Lessons learned from AMP7 efforts (Section 2.2) to encourage efficiency.
- The confidence with which we can deliver by 2030.
- Capacity of the supply chain to deliver to support efficiency.
- Early start to ensure delivery by the due dates.

3.7. CUSTOMERS VIEWS INFORMING OPTION SELECTION

In this case, there are no specific options to discuss with customers.

4. COST EFFICIENCY

4.1. COST METHODOLOGY

A full description of our costing methodology is contained in appendix [A3 – Costs](#) (NES04). The costs for our options to address our WFD-related needs are Level 3, except for some IMP solutions, and have been assured by a third party (Mott MacDonald). Table 30 provides a list of the assumptions we applied to the costs for each option. A summary of the costing methodology for our options to address different driver needs is provided below.

TABLE 30: SUMMARY OF ASSUMPTIONS APPLIED TO EACH INVESTIGATION COST BUILD

Cost Element	Assumption
Project Management	<ul style="list-style-type: none"> 15% of total cost excluding risk and uncertainty Will be covered by operational expenditure
Risk	10% of total cost including project management
Uncertainty	20% of total cost including project management and excluding risk

4.1.1 For Investigations (INV and NDINV)

We developed an investigation costing matrix to inform the cost build for all our AMP8 water WINEP investigations. This includes for all options to address our INV and NDINV needs for each driver. The matrix is based on our experience of typical investigation steps, degrees of complexity and costs. It therefore provides us with a standardised approach to inform costs. A summary of the costing matrix that informed our INV and NDINV costings is shown in Table 31.

TABLE 31: INVESTIGATION COSTING MATRIX (£)

Cost Element	Complexity		
	Low	Medium	High
Desk assessment	5,000	10,000	15,000
Monitoring ³⁰	4,500 – 18,000	7,500 – 60,000	12,000 - 180,000
Modelling ³¹	10,000 – 40,000	25,000 - 50,000	50,000 – 150,000
Options appraisal	5,000	10,000	15,000
Reporting	2,000	15%	20%

These cost elements as required, and assumptions as per Table 30, were added together to inform overall option costs. An overview of the cost elements used to build costs for our investigations is shown in Table 32. A summary of costs for our INV needs is included in Section 3.3.3.

³⁰ Cost varies across the degrees of complexity due to the variation in monitoring (water quality, monitoring etc) that may be required. We assume low complexity involves monitoring 3 sites, medium 6 sites, and high 10 sites.

³¹ Cost varies across the degrees of complexity due to the variation in modelling (water quality, 3D etc) that may be required.

4.1.2 For No Deterioration (ND)

Solutions for the majority of our ND needs do not require investment over the AMP, as they involve an activity to prevent deterioration that can be covered through business-as-usual activities such as an abstraction licence amendment. However, there are three exceptions for Essex and Suffolk, and these are to introduce no deterioration caps to groundwater abstraction licences for needs 08ES100121, 08ES100123, 08ES100125. We have determined costs for these needs using the EA's licensing costing guidance³². These costs consider the number of licences that have to be amended in each zone, hence we have arrived at different costs for the three needs above. For Investigations (INV and NDINV) Costs to address our ND needs are summarised in Section 3.3.3.

4.1.3 For Implementation (IMP)

To determine a cost for solutions to address our IMP needs, we have used our experience from previous project work and professional judgement. For the majority of our AMP8 IMP needs, costs were determined as part of AMP7 investigations and options appraisal. These costs have been uplifted to 2022 prices and assumptions for risk and uncertainty applied as shown in Table 31.

The exceptions to this include the following:

- **WRHMWB:** For the two short-listed options to reduce the impact of flow and sediment releases from Kielder (08NW104012), Fontburn (08NW104013), and Waskerley Reservoirs (08NW104014), we have built costs up by bringing together two different assumptions. First, we used unit costs for monitoring from the investigation costing matrix, Section 4.1.1, and secondly we have used our experience from our AMP7 investigations to determine costs for river restoration efforts.
- **PHYS_HAB:** Costs for the two short-listed options for improving fish migration at Glenfield Gates weir (08ES100014), Hoe Mill tilting weir (08ES100015) and Roman River weir (08ES100017) were determined through our experience implementing these solutions (fish and eel passes) at other sites. Costs are high level at this stage, due to limited site-specific information at this point that may influence design. Risk and uncertainty has been built in through applying the assumptions in Table 31. For the fish pass option, we have assumed a pre-fabricated Larinier pass will be fitted to one side of the existing weir in each case. Depending on the width of the pass, we have assumed this will cost between £250-400k. We have assumed it will cost an additional £50-100k to incorporate an eel pass.

4.2. COST BENCHMARKING

In developing our enhancement costs for PR24, we have carried our benchmarking in line with the Infrastructure & Projects Authority (IPA) best practice guidance³³. The following benchmarking activities have been incorporated into our process to

³² [Environmental permits and abstraction licences: tables of charges - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/environmental-permits-and-abstraction-licences-tables-of-charges)

³³ Best Practice in Benchmarking, Government Project Delivery Framework. www.assets.publishing.service.gov.uk

ensure our costs are robust and efficient. Benchmarking activities have included the following, covered in our [Cost Benchmarking Report](#) (NES63).

- Pre-Benchmarking of our cost models
- Sample Project Benchmarking
- Econometric Benchmarking
- Peer/Supplier Benchmarking

Pre-benchmarking of our iMOD cost models was carried out prior to commencement of the cost estimation process for PR24 business cases. Mott MacDonald benchmarked both Direct and Indirect costs (client and contract overheads) against data from a number of comparatively sized water and wastewater companies to determine our relative position. The conclusion of the pre-benchmarking exercise was that cost estimates generated from the iMOD cost models are in line with industry costs, and therefore the use of iMOD was appropriate for costing our PR24 programme.

In addition to pre-benchmarking a representative range of projects were sampled from selected business cases and bottom-up benchmarking estimates produced from Mott MacDonald's sector database to allow comparison with our iMOD generated project costs. The sample group of projects included 30 from our WINEP programme across Water and Wastewater. The sample project benchmarking exercise concluded that our costs are generally in line with or less than the benchmark data, with an average 13% cost efficiency for projects within the sample group.

For most elements of our WINEP programme, including investigations and implementations, we were not able to make direct comparisons with industry benchmarks due to the lack of equivalent comparator data. For this reason, we defined a standard approach for investigations across our water WINEP programme to categorise investigations by scale and complexity and assign to a banded cost category. This is described in Section 4.1.1.

5. CUSTOMER PROTECTION

5.1. PERFORMANCE COMMITMENTS

Performance commitments (PCs) incentivise water companies to improve performance and maximise outcomes for customers and the environment. Our WINEP programme is set by the EA, which determines the statutory and non-statutory investments we should make. The EA assures that WINEP actions are delivered to the agreed timeframe, and environmental obligations are met. As such, there are no performance commitments that will ensure protection of our customers through delivery of our WINEP programme.

Therefore, in Section 5.2 we propose a Price Control Deliverable to ensure protection for customers.

5.2. PRICE CONTROL DELIVERABLE

Our approach to determining Price Control Deliverables (PCD) is outlined in Section 12.3 of [A3 – costs](#) (NES04). In Table 32 below, we assess our WFD-related enhancements to test if the benefits are linked to PCs, against Ofwat’s materiality of 1%, and to understand if there are outcome measures that can be used. Our assessment has highlighted that the benefits we expect to deliver through our AMP8 WINEP programme will not be measured through PCs. Therefore, we propose a PCD to ensure protection for customers through delivery of our WINEP programme.

TABLE 32: ASSESSMENT OF BENEFITS AGAINST THE PCD CRITERIA

Enhancement scheme	Benefits linked to PC?	Materiality	Possible outcomes?
Water WINEP – water framework directive (NES19)	Pass – benefits are environmental or investigations	Fail – 0.3%	Outcome difficult to measure effectively and vary between schemes (particularly investigations). Customers could be protected through an output measure based on delivery of schemes.

Our WINEP programme is set by the Environment Agency, which determines the statutory and non-statutory investments we should make. The EA assures that WINEP actions are delivered to the agreed timeframe, and environmental obligations are met. We therefore propose a PCD that makes sure that costs are returned to customers either where the EA has decided that a project is no longer required, or where we have not delivered to the agreed timeframe and/or environmental obligations have not been met (according to the EA). A summary of our PCD for WINEP programme delivery is outlined in Table 33.

TABLE 33: SUMMARY OF THE PRICE CONTROL DELIVERABLE FOR OUR WINEP PROGRAMME DELIVERY TO PROTECT CUSTOMERS

Description of price control deliverable	Delivery of WINEP projects as specified in our WINEP enhancement cases (NES17, NES18, NES19, NES28, NES29, NES30, NES31, NES34).
Measurement and reporting	We will report on the delivery of WINEP projects at the next price review (PR29), including specifying the individual projects that have been delivered, not delivered, or that the EA has decided are no longer required (under the EA’s WINEP alterations process). This is in addition to the WINEP guidance which specifies how we will need to report progress against delivery of the WINEP actions, and tracking and reporting WINEP delivery in a transparent and auditable manner.
Conditions on allowance	Projects must be delivered to the specification agreed with the Environment Agency under WINEP.
Assurances	The Environment Agency will confirm that WINEP actions have been delivered to the agreed timeframe, and that environmental obligations have been met. As set out in the WINEP guidance , there will be regular liaison between water companies and the EA to discuss progress, risks and issues associated with delivery of the WINEP programme and to identify any alterations. The EA uses the WINEP measures sign-off, technical review and audit guidance for assurance that the environmental obligations as set out in the WINEP are completed as planned.
Price control deliverable payment rate	We will return funds back to customers for individual projects, as specified in Tables 27 to 30 above (for NES19) – 44 individual schemes to be delivered by the dates specified.
Impact on performance in relation to performance commitments	There are some benefits to biodiversity for some schemes in NES19.

We propose a single PCD for most of our WINEP programme delivery (with the exception of storm overflows). This should:

- Be set according to **individual project costs**, rather than a “per project” unit cost. This is because these costs vary considerably, and a single rate would create an incentive to deliver more of the cheapest projects (at the expense of more expensive projects). Ofwat’s guidance in IN23/05 identifies this incentive and expects us to set out scheme level deliverables where costs vary significantly across schemes (so our approach here is consistent with the guidance). If we did not aggregate WINEP schemes, there would be no PCD covering NES17 because this would not be material on its own.
- **Not include an automatic penalty for non-delivery** (beyond returning the costs to customers). This is because this PCD includes projects where the EA has decided these are no longer required, which should not lead to a penalty. If we did not deliver a project that is required (and where we had not agreed a change with the EA), we would not meet our statutory obligations and so this does not require an additional incentive to deliver.
- **Change according to the EA’s WINEP alterations process**. In 2020-25, our ODI for WINEP delivery does not automatically take into account projects that are removed from WINEP by the EA – but this should be for the EA to determine. Costs should be returned to customers for projects that are not required, without further interventions needed from Ofwat.

This is an aggregated PCD across all our WINEP schemes except for storm overflows. We chose to aggregate these PCDs because most of our WINEP enhancement cases or projects would not be individually material, and these share the same reporting, assurance, and conditions.

6. APPENDIX A – COST BENEFIT RATIOS AND PREFERRED OPTION

TABLE 34: NET PRESENT VALUES AND PREFERRED OPTIONS FOR WRFLOW

Need	WINEP Action ID	Option	Net Present Value (30 years) (£)	Benefit to Cost Ratio	Chosen option			
Essex and Suffolk	12	To demonstrate that we are meeting our commitments for flow management and provision with the EA, especially with regard to ensuring sufficient flow to enable fish passage through the EA's proposed fish pass at the Judas Gap Weir.	08ES100119	12	Installation of flow monitoring	-0.023m	0.00	Preferred
		Implement measures to amend the HOF conditions on the existing abstraction licence, including creating a new HOF agreed with the EA at Judas Gap to reduce the impact of abstraction on the WFD status of the River Stour.			08ES100117	5	Amend abstraction licence	-0.022m
	14	Implement measures to reduce / mitigate the impacts of full licence abstraction on flow in the Roman River.	08ES100118	5	Amend abstraction licence	-0.022m	0.00	Preferred ³⁴
	15	Reduce impacts of groundwater abstraction at Wortham on flow and ecological function of the River Waveney (u/s Frenze Beck).	08ES100115	8	New transfer from existing abstraction for river support	-1.106m	0.00	Alternative
				11	River restoration (riparian / in-channel measures)	-0.498m	0.00	Preferred
	16	To agree a numerical trigger for the compensation discharge on the Coldfair Green licence (7/35/03/*G/0044) to contribute to achieving water body objective status of the Hundred River.	08ES100113	5	Amend abstraction licence	-0.139m	0.00	Preferred

³⁴ This option has been agreed with the EA and will include HOF. This option will be completed alongside the NERC_IMP (08ES100111) river restoration solution included in our NES18 A3-05 Enhancement Case WN – WINEP Protected Areas and Biodiversity.

Need	WINEP Action ID	Option	Net Present Value (30 years) (£)	Benefit to Cost Ratio	Chosen option
17	08ES100108	11 River restoration (riparian / in-channel measures)	-0.547m	0.00	Preferred
18	08ES100107	8 New transfer from existing abstraction for river support	-2.187m	0.00	Alternative
		11 River restoration (riparian / in-channel measures)	-0.424m	0.00	Preferred
19	08ES100114	1 Permanently turn off abstractions	-10.034m	0.00	Alternative
		4 Abstraction reductions	-1.595m	0.00	Alternative
		6 Amend existing abstraction for river support	-0.094m	0.00	Preferred
		11 River restoration (riparian / in-channel measures)	-0.439m	0.00	Alternative
20	08ES100112	11 River restoration (riparian / in-channel measures)	-0.287m	0.00	Preferred
21	08ES100106	1 Permanently turn off abstractions	-13.848m	0.00	Alternative
		4 Abstraction reductions	-8.231m	0.00	Alternative ³⁵

³⁵ This option (licence reductions) will be delivered through addressing the WFD_ND_WRFlow need (08ES100120).

Need	WINEP Action ID	Option	Net Present Value (30 years) (£)	Benefit to Cost Ratio	Chosen option
improve ecological functioning of the river.		9 Construct new winter storage reservoir to provide river support	-3.312m	0.00	Alternative
		11 River restoration (riparian / in-channel measures)	-1.419m	0.00	Preferred
Mitigate impacts of abstractions from Little Glemham and Parham on flow diversity in the River Ore to improve ecological functioning of the river.	08ES100109	1 Permanently turn off abstractions	-4.913m	0.00	Alternative
		3 Trade with other licence users	-1.702m	0.00	Alternative
		4 Abstraction reductions	-2.640m	0.00	Alternative ³⁶
		8 New transfer from existing abstraction for river support	-2.604m	0.00	Alternative
		11 River restoration (riparian / in-channel measures)	-0.581m	0.00	Preferred
Mitigate impacts of surface and groundwater abstraction at Langham on flow and hydromorphology of the River Stour and improve ecological functioning of the river.	08ES100110	7 Transfer water via existing arrangements	-0.867m	0.00	Alternative
		11 River restoration (riparian / in-channel measures)	-0.592m	0.00	Preferred
		12 Installation of flow monitoring	-0.030m	0.00	Alternative
Implement measures to amend the HOF conditions on the existing surface abstraction licence to protect flows at full licence abstraction and reflect change in use of EA's Waveney Augmentation Groundwater Scheme (WAGS).	08ES100116	5 Amend abstraction licence	-0.022m	0.00	Preferred

³⁶ This option will be delivered through addressing the WFD_ND_WRFlow need (08ES100121).

TABLE 35: NET PRESENT VALUES AND PREFERRED OPTIONS FOR WRHWMB

	Need	WINEP Action ID	Options	Net Present Value (30 years, £)	Benefit to Cost Ratio	Chosen option	
Northumbria	1	08NW104102	3	Manage flows / water levels to reduce impact on sediment and ecology	-0.052m	0.00	Alternative
			9	Manage flows to reduce impact on sediment and ecology plus in-river / riparian habitat enhancements	-0.627m	0.00	Preferred
	2	08NW104103	3	Manage flows / water levels to reduce impact on sediment and ecology	-0.059m	0.00	Alternative
			9	Manage flows to reduce impact on sediment and ecology plus in-river / riparian habitat enhancements	-0.316m	0.00	Preferred
	3	08NW104104	3	Manage flows / water levels to reduce impact on sediment and ecology	-0.030m	0.00	Preferred
	Essex and Suffolk	11	08ES100016	6	Install engineered fish pass	0.673m	0.00
8				Install engineered fish pass plus in-river / riparian habitat enhancements	0.942m	0.00	Preferred

TABLE 36: NET PRESENT VALUES AND PREFERRED OPTIONS FOR GROUNDWATER PRESSURES IMPLEMENTATION (WFDGW_IMP) NEED

	Needs	WINEP Action ID	Option	Net Present Value (30 years) (£)	Benefit to Cost Ratio	Chosen option
Northumbria	2 To monitor salinity and groundwater levels in the Sunderland Magnesian Limestone aquifer between the coast and NWG's groundwater abstraction points to understand the presence and movement of saline intrusion.	08NW104112	4 Drill observation borehole	-0.085m	0.00	Preferred

TABLE 37: NET PRESENT VALUES AND PREFERRED OPTIONS FOR PHYSICAL HABITAT AND FISH PASSAGE IMPLEMENTATION (WFD_IMP_PHYS_HAB) NEEDS

	Needs	WINEP Action ID	Option	Net Present Value (30 years) (£)	Benefit to Cost Ratio	Chosen option
Essex and Suffolk	3 Enable fish migration at the Glenfield Gates Weir at Stratford St Mary to allow natural fish behaviour.	08ES100014	2 Install engineered fish pass	-0.538m	0.00	Alternative
			3 Install engineered fish and eel pass	-0.673m	0.00	Preferred
	4 Enable fish and eel migration at the Hoe Mill tilting weir to allow natural behaviour.	08ES100015	2 Install engineered fish pass	-0.538m	0.00	Alternative
			3 Install engineered fish and eel pass	-0.673m	0.00	Preferred
	5 Enable fish and eel migration at the Roman River weir to allow natural behaviour.	08ES100017	2 Install engineered fish pass	-0.298m	0.00	Alternative
			3 Install engineered fish and eel pass	-0.373m	0.00	Preferred