Environmental Delivery Plan

Nutrient Pollution

Norfolk: Broads Special Area of Conservation (SAC) (Yare and Bure), Broadland Ramsar and River Wensum SAC

Draft Environmental Delivery Plan for public consultation

[DATE 2026 to DATE 2036]

Contents

1 Executive summary

What is this Environmental Delivery Plan and why is it needed?

1. This Environmental Delivery Plan adopts a strategic approach to assessing the negative effect of new development and provides a catchment scale package of conservation measures, which will deliver environmental benefits beyond those which could be achieved through a site-by-site approach.
2. The Norfolk Broads and the River Wensum and their identified environmental features are affected by excess nutrient pollution, primarily from wastewater treatment works and diffuse agricultural sources, which are contributing to ecological decline. Norfolk needs new homes, and new residential development increases wastewater flows and surface water runoff, leading to additional nutrient pollution to these protected sites. Without appropriate action, these additional nutrient loads will cause greater harm to habitats and species that are already under pressure.
3. This strategic approach is needed for the environment, as the ecological value of the Norfolk Broads and the River Wensum lies not just in individual habitats or species but in the functioning and interdependence of the wider mosaic. The ecological components of these landscapes are closely connected. Changes made to benefit one habitat or species in isolation can have unintended consequences for other parts of the ecosystem. Consequently, conservation and restoration measures have been designed to support the functioning of the broader habitat mosaic rather than targeting a single feature without consideration of wider ecological interactions. By taking a strategic approach to the design and implementation of conservation measures, the Environmental Delivery Plan seeks to deliver benefits across this broader habitat mosaic.

The importance of the Norfolk Broads and River Wensum

4. The Norfolk Broads are an internationally important wetland and Britain's largest protected wetland, forming part of the Norfolk and Suffolk Broads National Park. The Broads are a complex mosaic of habitats including open water, fen, reedbed, wet grassland, marginal habitats and transitional communities, each supporting different assemblages of plants, invertebrates, birds and mammals. As the UK's largest area of calcareous lowland fen, it supports internationally important wildlife, including bittern, marsh harrier and crane, alongside specialist species such as Desmoulin's whorl snail, an indicator of healthy wetlands.
5. The Wensum is a groundwater fed chalk river of national significance. The source of the river is small headwaters (northwest of Norwich), and as it meanders through an increasingly wide floodplain it develops into a bigger slower river. The river supports characteristic aquatic plants, including brook water-crowfoot, abundant invertebrates, and important fish populations such as bullhead, brook lamprey, and brown trout. Its

floodplain supports valuable fen, reedbed, swamp, meadow, scrub and scattered woodland habitats.

6. Together, these habitats provide vital ecosystem services, including water purification, carbon storage, flood regulation and climate resilience. However, poor water quality, over-abstraction, habitat modification, invasive species, saline intrusion and climate change threaten their condition. Restoring natural processes through catchment-scale water management, river and wetland restoration, improved fish connectivity and freshwater habitat creation will strengthen ecological resilience. The Norfolk Broads and River Wensum Environmental Delivery Plan will help ensure development in the area contributes to a healthier, more resilient ecosystem and to long-term nature recovery.

7. Wider action (as outlined in Norfolk's Local Nature Recovery Strategy) is required to fully restore these sites and reduce nutrient levels in catchments. This Environmental Delivery Plan sits alongside a broader range of existing measures and projects in place to reduce the level of nutrients in these catchments. The positive outcomes that the conservation measures will have for the identified protected habitats and species of these sites will contribute to returning the habitats to a more natural state, supporting the species that live there and providing multiple benefits to people.

How does the Environmental Delivery Plan deliver an overall improvement?

8. The Overall Improvement Test is the central test within an Environmental Delivery Plan (EDP) to assess whether by the EDP end date the positive impact of the conservation measures set out in the EDP materially will outweigh the negative impact of the EDP development on the conservation status of each environmental feature specified in the EDP.

    - The Overall Improvement Test does not consider other factors that might influence the conservation status of the identified features, such as pollution from agriculture.
    - An Environmental Delivery Plan satisfies the Lawton principles of creating 'more, bigger, better and joined spaces'[1] for nature'; prioritising conservation measures that focus on restoring ecosystem health, structure and function alongside reducing the pressures on the wider environment by working at a landscape-scale.

9. Where possible, we have selected measures that contribute to multiple ecological attributes to ensure that restoration actions address the conservation requirements of habitats, species and assemblages simultaneously. This maximises the opportunities for achieving improvements across the environmental features as a whole, rather than securing benefits for one feature at the expense of another. In Natural England's opinion, the effect of the selected conservation measures will materially outweigh the negative effect of the Environmental Delivery Plan (EDP) development on the conservation status of the identified environmental features by the EDP end date, and therefore Natural England considers this EDP passes the Overall Improvement Test.

What will this Environmental Delivery Plan do?

10. This Environmental Delivery Plan identifies protected environmental features which are likely to be negatively affected by the development covered by this Environmental Delivery Plan, form part of the Broads Special Area of Conservation (the Yare and Bure catchments), Broadland Ramsar and River Wensum Special Area of Conservation. Each identified protected environmental feature, except for the Desmoulin's whorl snail in the Wensum Special Area of Conservation, naturally fall into one of four habitat groups, including open water habitats, fen wetlands, wet woodlands and river habitats. Environmental features include internationally important bird populations, rare wetland plants and invertebrates, and protected species including otter, white-clawed crayfish, brook lamprey and Desmoulin's whorl snail.

11. The Environmental Delivery Plan assesses the nutrient impacts expected from 15,780 new homes and the effects these additional nutrients could have on the conservation status of the identified environmental features of the protected sites.

12. The Environmental Delivery Plan identifies a programme of strategic conservation measures designed to address these impacts and support the long-term recovery of the identified protected habitats and species of these protected sites (see Table 1). These measures have been selected in alignment with Norfolk's Local Nature Recovery Strategy and will be secured and, where required, maintained for at least 100 years, providing lasting benefits for nature. Natural England will use funding from the Nature Restoration Fund to secure and deliver these measures, working collaboratively with partners wherever appropriate.

13. Natural England will monitor the delivery and effectiveness of the conservation measures throughout the lifetime of the Environmental Delivery Plan and beyond the 10-year Environmental Delivery Plan period. If monitoring shows that measures are not achieving the expected outcomes, back-up conservation measures can be deployed. The Environmental Delivery Plan can also be amended if required to ensure it continues to meet the Overall Improvement Test.

14. In relation to this Environmental Delivery Plan (EDP), Natural England will publish a midpoint report in 2031 and a final report in 2036. These reports will summarise the amount of development available under the EDP, funding received through the Nature Restoration Levy, what conservation measures have been implemented, why certain conservation measures have not yet been implemented, whether the conservation measures have had their intended effect, costings for conservation measures and how this compares with expected costs, whether any amendments to the EDP have taken place or are expected (including changes to the charging schedule) and, depending on timing, assess whether the EDP is likely to pass/has passed the Overall Improvement Test.

Table 1 summarises the programme of conservation measures that will be taken under this Environmental Delivery Plan.

Conservation measure	Quantum of conservation measure
Fen-type wetland habitat creation and restoration	109 hectares (Bure: 18 hectares, Yare: 91 hectares)
Land use change to semi-natural habitat - contiguous with wetland creation/restoration	109 hectares (Bure: 18 hectares, Yare: 91 hectares)
Land use change (wider catchment, not associated with any wetland)	286 hectares (Bure: 30 hectares, Yare/Wensum: 256 hectares)
Fen-type wetland habitat management	162 hectares (Yare)
Catch-dyke remediation	500 metres onsite or contiguous (Yare)
Deer Management Project	Focused on Yare and Bure protected sites with buffer, covering at least 3700 hectares
River naturalisation and restoration scheme	Removal or modification of one structure (weir / impoundment) on the River Wensum, alongside 1 kilometre of river restoration (contiguous)
Fen creation for Desmoulin's whorl snail	10 hectares
Planning conditions to secure standards for non-mains drainage	Condition imposed on all development not connecting to mains sewers for foul water.

How does the Environmental Delivery Plan work and what will it cost?

15. Developers can choose to use this Environmental Delivery Plan on a voluntary basis. Where a development is committed to paying the levy, this will discharge their relevant environmental obligations in respect of the environmental impact of such development. For the purposes of this Environmental Delivery Plan, that is nutrient pollution, specifically the wastewater and surface water runoff from new dwellinghouses (including flats) on either/both the Broads Special Area of Conservation, the Broadland Ramsar and/or River Wensum Special Area of Conservation, under the Habitats Regulations 2017.

Scope of the Environmental Delivery Plan for development

16. This Environmental Delivery Plan only applies to dwellinghouses (including flats), within the development area (and not in an excluded area).

17. This Environmental Delivery Plan will cover a 10-year period, starting from [DD/MM/YEAR], and expiring [DD/MM/YEAR]. Dates cannot be stated by Natural England prior to Secretary of State making this Environmental Delivery Plan. However, the Environmental Delivery Plan will close for development committing to pay the levy at the end of the sixth year (after the Environmental Delivery Plan start date).

18. The maximum amount of development covered by this Environmental Delivery Plan is 15,780 units.

The levy

19. A developer may commit to a pay the Nature Restoration Levy and the levy will be secured through the planning process and paid into the Nature Restoration Fund.

20. The levy rate is £2,675 per house or flat, plus indexation.

21. Natural England will use the levy payments to:

    a. deliver the conservation measures identified in this Environmental Delivery Plan;

    b. monitor and maintain those conservation measures;

    c. recover administrative costs associated with this Environmental Delivery Plan and reasonably attributable costs in respect of the Nature Restoration Fund.

22. Development that opts to use this Environmental Delivery Plan and is managing foul water drainage by non-mains drainage, will be subject to a planning condition. This planning condition is a conservation measure and secures the performance of the package treatment plant.

23. An overview of the developer journey is set out in Figure 1, overleaf.

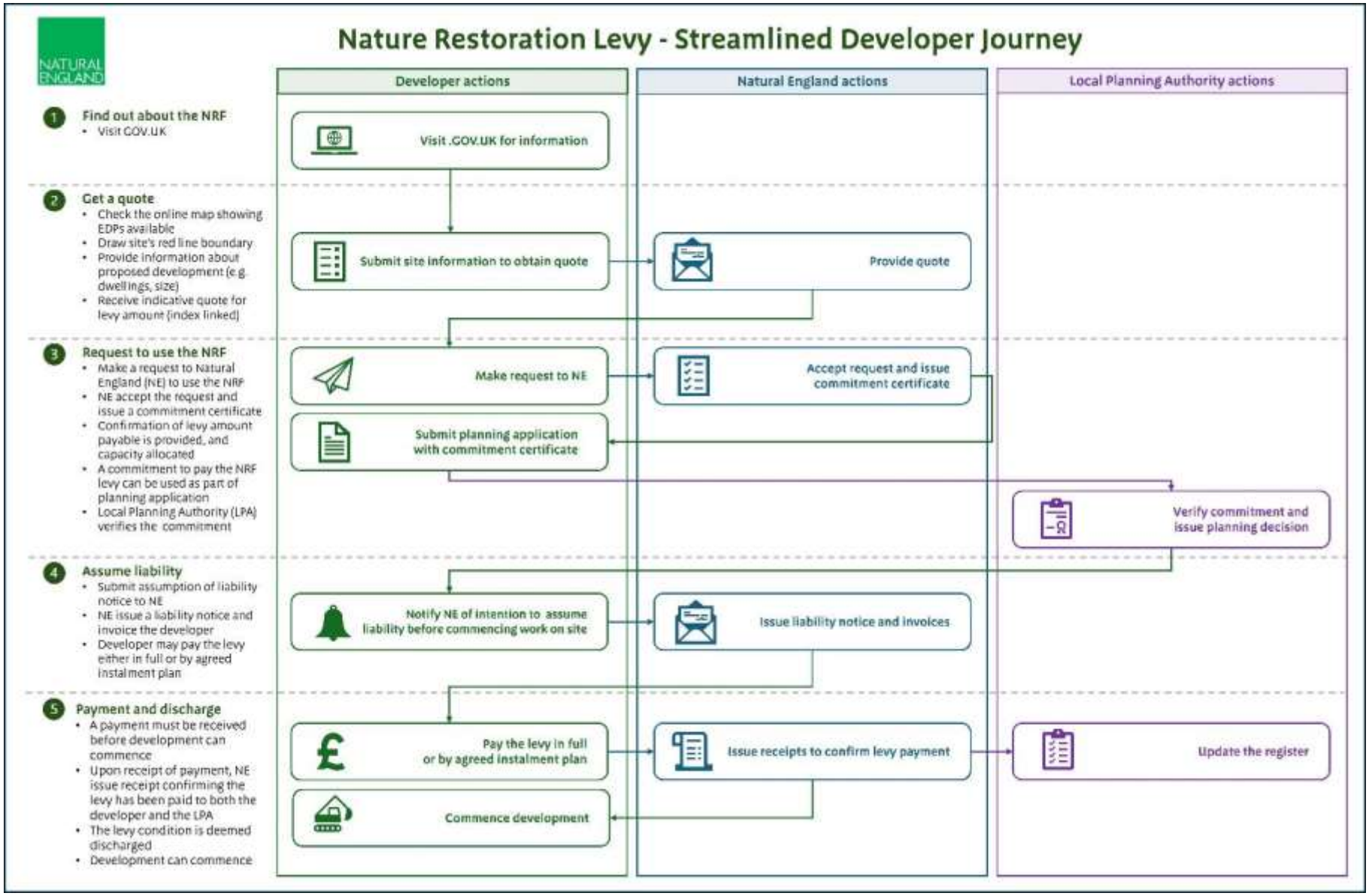

Figure 1: An overview of the developer journey

2 Introduction

The Broads and River Wensum

24. The Broads Special Area of Conservation and Broadland Ramsar site, situated in East Anglia, are underpinned by multiple Sites of Special Scientific Interest (SSSI), including the (i) Bure Broads and Marshes and (ii) Yare Broads and Marshes sub-catchments. Formed from medieval peat digging, the interconnected wetlands of The Broads contain numerous lakes and ditches which support one of the richest collections of rare and locally specific aquatic species throughout the UK. Over 250 different plants can be found, and they provide important habitat that help to support populations of vulnerable and endangered snail species. Overall, The Broads is a biodiversity hotspot with more than a quarter of the rarest wildlife in the UK found here, including notable species such as otter, cuckoo, and fen orchid.

25. The River Wensum Special Area of Conservation is underpinned by the River Wensum Site of Special Scientific Interest. The River Wensum begins in the north-west of Norfolk and flows through to Norwich where it joins the River Yare. Chalk streams and rivers are a rare habitat globally, with most the world's chalk streams found in England, of which 10% are in Norfolk. The largest chalk stream in the area is the River Wensum. The River Wensum supports a variety of invertebrates and fish, such as the white-clawed crayfish, brook lamprey and bullhead.

Nutrient pollution in Norfolk

26. Nitrogen and phosphorus cycles play a fundamental role in regulating the ecosystem[2,3]. However, excess nutrients in water bodies can disturb the interactions between plant species and algae, causing dominant plant and algae to grow too much, crowding out more sensitive species and competing for resources. Oxygen levels in the water can become too low, and light is blocked out, affecting fish and plant species, and those that rely on the more sensitive species that have been overwhelmed. These complex interactions can result in effects across the whole ecosystem.

27. Both The Broads Special Area of Conservation/Broadland Ramsar and the River Wensum Special Area of Conservation suffer from excess nutrient pollution. Water quality targets are set for freshwater habitats by the Common Standards Monitoring Guidance[4]. To achieve compliance with phosphorus targets, substantial reductions in phosphorus inputs are required. In the Bure Broads and Marshes, reductions in the range of 55% to 97% dependent on location are necessary. For the Yare Broads and Marshes, the required reductions range from 87% to 91%. For the River Wensum to achieve compliance with phosphorus targets, reductions of between 34% and 74% are needed.

28. Similarly, significant reductions are required to meet nitrogen targets. For the Bure Broads and Marshes, reductions between 62% and 67% are necessary (this range excludes Cockshoot Broad, where the nitrogen target is currently being met). In the Yare Broads and Marshes, nitrogen reductions of between 50% and 83% are required.

The River Wensum is excluded from this part of the assessment, as there is no nitrogen target for this catchment.

Sources of nutrient pollution

29. Sources of nitrogen and phosphorus inputs varies between catchments in England[5]. Typical sources include rural land use (agriculture), wastewater, urban runoff, highways drainage, and non-mains sewage discharges. Table 2 below shows the percentage input loads of nitrogen and phosphorus in the catchment by sector with all modelling undertaken by the Environment Agency[6,7,8,9]. The information in the table is used to provide a general understanding rather than inform specific on-the-ground measures.

30. Table 2 shows that in The Broads Special Area of Conservation, rural land use (agricultural) sources of both nitrogen and phosphorus dominate the Bure sub catchment, and of nitrogen in the Yare. Point sources (such as sewage treatment works) are most significant for phosphorus in the Yare and remain important in the Bure. In the River Wensum Special Area of Conservation, rural land use sources dominate and point sources remain important. Further details on the modelling scenario undertaken to complete this table is in Annex 2A.

31. Planned upgrades to wastewater treatment works through both the Levelling Up and Regeneration Act 2023 (LURA)[10] and the Water Industry National Environment Programme (WINEP)[11], will reduce the amount of nutrients coming from urban sources. However, it will remain the case that additional nutrient loads from new development entering the catchment will require addressing to ensure the identified environment features of the protected sites are not negatively impacted. See the 'Other measures by public authorities' section in chapter 4 for further details.

Table 2: **Source apportionment (input load) by sector for 'Actual 2014-2020' scenario** for The Broads Special Area of Conservation (SAC) and River Wensum Special Area of Conservation.

Source	Explanation	The Broads SAC: Bure Broads and Marshes sub-catchment		The Broads SAC: Yare Broads and Marshes sub-catchment		River Wensum SAC: River Wensum
		Total Phosphorus (TP)	**Total Nitrogen (TN)**	**TP**		**TN** **TP**
Point sources	Sewage treatment works, intermittent discharges (storm overflows) and industry.	26.3%	5.1%	45.5%	20.1%	18%

Source	Explanation	The Broads SAC: Bure Broads and Marshes sub-catchment		The Broads SAC: Yare Broads and Marshes sub-catchment		River Wensum SAC: River Wensum
		Total Phosphorus (TP)	**Total Nitrogen (TN)**	**TP**		**TN** **TP**
Rural land use	Inputs from agriculture (livestock and arable). Also includes forestry, grassland etc.	50%	92.3%	40.5%	74.7%	68%
Urban	Estimation of urban runoff from impermeable surfaces potentially contaminated from misconnected drains.	19.4%	0.3%	12.7%	1%	13%
Septic tanks	Estimation of unsewered properties.	4.4%	0%	1.2%	0.1%	1%
Others	All other sources of nutrients.	0%	2.3%	0.1%	4%	0%

Habitat Regulations Assessment, Environmental Delivery Plans and the Nature Restoration Fund

32. Under The Conservation of Habitats and Species Regulations 2017, a new terrestrial development likely to have a significant effect on a European protected site would need to undergo an 'appropriate assessment' of its implications for the protected sites. Following that assessment, permission could only be given if the authority responsible for the decision to grant consent had ascertained that the development would not adversely affect the integrity of the protected site[12].

33. This is required for new housing developments within nutrient sensitive catchments of the European protected site(s) to prevent adding further pollution stress to habitats and species that are already in unfavourable condition due to the existing nutrient pollution.

34. In March 2022, Natural England provided advice to local planning authorities for development proposals that have the potential to affect water quality and how this

could be addressed through mitigation. This guidance suggested a means of developers overcoming the problem by making their housing developments 'nutrient neutral'. That is, to ensure nutrient pollution from their development site would be the same or less than it was pre-development. This can be achieved through on-site technology and design choices as well as reducing nutrient pollution elsewhere in the same catchment, so that overall inputs to the protected site do not rise. The planning requirement for nutrient neutrality is that it be effective before a new housing development is occupied. In this way, nutrient neutrality is seen to mitigate the effects of new development, meaning that harm from pollution is averted before it can be caused.

35. Part 3 of the Planning and Infrastructure Act[13] makes provision for the Nature Restoration Fund, a new strategic approach to address specific environmental impacts arising from developments. In most instances, Environmental Delivery Plans will be voluntary but there may be some scenarios in which they are mandatory.

36. This Environmental Delivery Plan focusses on nutrient pollution and provides developers with an alternative option to pay a Nature Restoration Levy. This is received by Natural England and used to address the harm caused to environmental features of protected sites, which will materially outweigh the negative effect of development impact. The developer then has certainty that risks of nutrient pollution will be addressed once they have committed to the levy.

37. The Planning and Infrastructure Act introduces a new and more ambitious test (the Overall Improvement Test) than that applied under the Habitats Regulations.

38. This test requires us to go beyond demonstrating there is no adverse effect on site integrity, and instead demonstrate a positive impact that materially outweighs the negative impact of nutrient pollution from development on the conservation status of the environmental features specified in the Environmental Delivery Plan.

Structure of this Environmental Delivery Plan

39. This Environmental Delivery Plan is structured to support the application of the Overall Improvement Test. It sets out the evidence relating to conservation status, development impacts and conservation measures before applying expert evaluation to allow Natural England to assess whether the measures will materially outweigh the negative effects of development and deliver an overall improvement in conservation status. The structure of the Environmental Delivery Plan can be found in 10 below. Further to this, a list of annexes is provided in Chapter 10, a glossary of terms in Chapter 11, and references in Chapter 22.

40. Regulations listed in this document are hyperlinks which will take you to the piece of legislation where available online. Table and chapter numbers are also links (cross-references). Click on the number to take you to the relevant place in the document. References are shown as superscript numbers. Clicking on the number will take you to the reference list entry for that item at the end of the document. Where one reference is used in multiple places, instead of taking you to the reference list, the number will be a cross-reference link which takes you to the previous instance it is referenced, until you get to the first one from where you can click the link to the reference list.

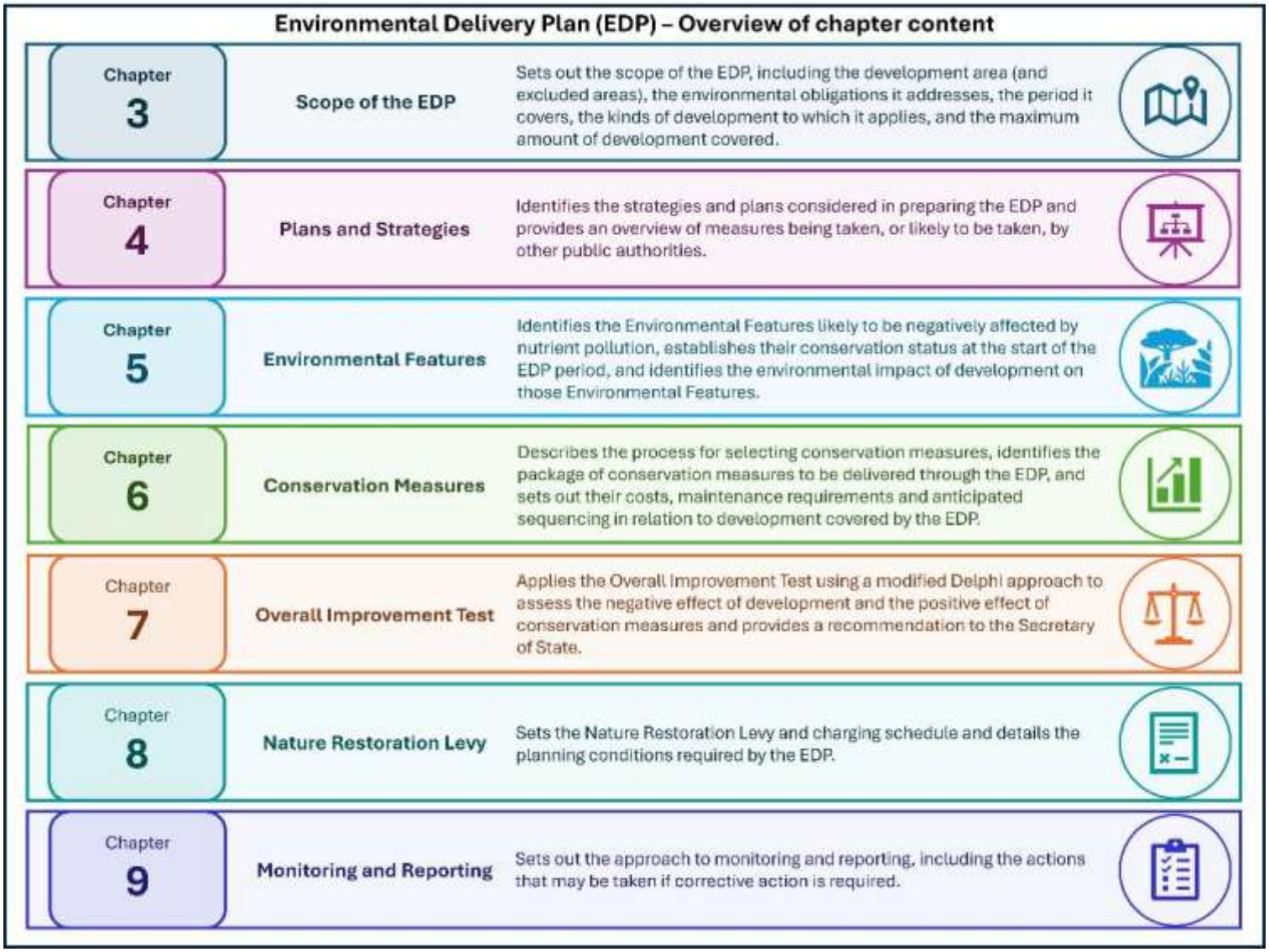

Figure 2: Environmental Delivery Plan - Overview of chapter content

3 Scope of the Environmental Delivery Plan

41. This chapter, in accordance with section 60 of the Planning and Infrastructure Act, specifies the development to which this Environmental Delivery Plan (EDP) applies by reference to the area in which the development may be undertaken (the "development area") and the kind of development. It includes a map (Figure 4) showing the boundaries of the development area and sets out the reasons for its application, and the reasons for excluding certain areas. It specifies the maximum amount of development to which this EDP may apply. It also specifies the date on which the EDP comes into force (the "EDP start date") and the date on which it expires (the "EDP end date").

Development area

Protected sites

42. This Environmental Delivery Plan relates to environmental features of the following protected sites:

- **The Broads Special Area of Conservation** is designated for its calcareous fens, forming large-scale mosaics with other fen types and contains several examples of naturally nutrient-rich lakes. These lakes and artificially dug ditches support relict vegetation of the original Fenland flora and collectively contains one of the richest assemblages of rare and local aquatic species in the UK. The complex includes complete successional sequences from open water through reed swamp to alder woodland, all of which have developed on fen peat;
- **Broadland Ramsar** is a low-lying wetland complex straddling the boundaries between east Norfolk and northern Suffolk. The area includes the river valley systems of the Bure, Yare and Waveney and their major tributaries. The open distinctive landscape comprises a complex and interlinked mosaic of wetland habitats including open water, reedbeds, carr woodland, grazing marsh and fen meadow. The region is important for recreation, tourism, agriculture and wildlife;
- **The River Wensum Special Area of Conservation** is designated for its naturally enriched, calcareous lowland river. The upper reaches are fed by springs in the chalk and by run-off from calcareous soils rich in plant nutrients, creating beds of submerged and emergent vegetation characteristic of a chalk stream. Lower down boulder clay and river gravels overlay the chalk resulting in aquatic plant communities more typical of a slow-flowing river on mixed substrate. The mosaic of meadow and marsh habitats provides niches for a wide variety of specialised plants and animals, reflecting the adjacent land managed for hay crops and grazing. The river supports an abundant and rich invertebrate fauna and flora.

Development area

43. Figure 4 below presents a map showing this Environmental Delivery Plan's development area, which is the area in which development relying on the Environmental Delivery Plan may be undertaken.

44. The development area has been chosen because development coming forward across this area will have a negative effect on the conservation status of the environmental features of the protected sites set out above.

45. The development area is made up of the catchments of the Bure Broads and Marshes Site of Special Scientific Interest (SSSI), the Yare Broads and Marshes SSSI (both component SSSIs of The Broads Special Area of Conservation) and the River Wensum Special Area of Conservation. These protected sites are all unfavourable for phosphorus nutrient pressure(s) and the Bure Broads and Marshes SSSI and the Yare Broads and Marshes SSSI are also unfavourable for nitrogen pressure(s).

46. There are currently five SSSIs within the Broads Special Area of Conservation where there is good evidence that the site is unfavourable for both nitrogen and phosphorus nutrient pressure(s). Ant Broads and Marshes SSSI, Trinity Broads SSSI and Upper Thurne Broads and Marshes SSSI have not been included in the development area for this Environmental Delivery Plan due to the limited development coming forward in the catchments for these sites.

47. The development area is derived using catchments of two component SSSIs of The Broads Special Area of Conservation with nutrient and development pressure. However, for the purpose of this Environmental Delivery Plan these SSSIs are considered with regard to the environmental features set out in relation to the habitat sites above.

48. The development area is derived from surface water catchment data and evidence held by both Natural England and the Environment Agency to identify functional catchment areas of protected sites that are failing to meet their conservation objectives because of nutrient pollution.

49. The primary source is Geographic Information Systems (GIS) data, which is available on Defra Data Services Platform (i.e. the published nutrient neutrality catchments)[14], itself extracted from N2K Diffuse Water Pollution Plans Catchments data, alongside Water Framework Directive catchment data, River Basin Management Plans and surface water catchment mapping with local authorities and the Environment Agency. In certain areas, the catchment has been extended so that wastewater treatment works catchment areas, which fall outside of the surface water catchments, are included within the Environmental Delivery Plan area. Development within such extended areas may discharge treated sewage within the Environmental Delivery Plan area, though surface water will drain elsewhere.

Excluded areas

50. The Environmental Delivery Plan does not apply to development in specified areas within the development area; these are the excluded areas (and shown in the map at Figure 4 below).

51. The excluded areas of the Environmental Delivery Plan are:

- The land forming part of the Yare Broads and Marshes SSSI, Bure Broads and Marshes SSSI as component SSSIs of the Broads Special Area of Conservation and the River Wensum Special Area of Conservation;
- A 50-metre buffer around the Yare Broads and Marshes SSSI, Bure Broads and Marshes SSSI as component SSSIs of the Broads Special Area of Conservation and the River Wensum Special Area of Conservation. Any development site that falls either wholly or partly within this zone will not be able to use the Environmental Delivery Plan.

52. The reasons for these excluded areas are:

- Any development coming forward within the protected sites may have nutrient impacts on the environmental features of the protected sites during construction and occupation of the development, for which Natural England does not consider it is possible to adequately assess (at this strategic scale) and plan/cost necessary conservation measures as part of this Environmental Delivery Plan. The development should therefore be subject to Habitats Regulations Assessment;
- The 50-metre buffer around the protected sites has been applied as a further precautionary measure. The buffer reflects that a development cannot meet the general binding rules if the discharge is within 50 metres of a Special Area of Conservation, Special Protection Area (SPA), Ramsar site or SSSI and would therefore require a permit from the Environment Agency[15]. Any development coming forward in this zone may have nutrient impacts on the environmental features of the protected sites during construction and occupation (including impacts from direct discharges or discharges to ground) which may not be addressed by the conservation measures set out in the Environmental Delivery Plan and should therefore be subject to Habitats Regulations Assessment.

Environmental obligations

53. Where a development is within the development area and relying on an Environmental Delivery Plan, a commitment to pay the Nature Restoration Levy results in a specific environmental impact of development on an identified protected feature of a protected site being disregarded for the purposes of obligations under the Habitats Regulations 2017.

54. For the purposes of this Environmental Delivery Plan, the relevant environmental impact of development is the nutrient pollution, specifically the wastewater and surface water runoff from new dwellinghouses (including flats) on either/both the Broads Special Area of Conservation and/or River Wensum Special Area of Conservation, under the Habitats Regulations 2017. All other environmental obligations remain in respect of any other environmental impact from the development.

Environmental Delivery Plan period

55. The Planning and Infrastructure Act requires that an Environmental Delivery Plan (EDP) must specify the date in which it comes into force (EDP start date) and the date on which it expires (EDP end date). Once made, development may opt to use this EDP after the EDP start date until the EDP end date, unless an earlier date is specified in the charging schedule.
56. This Environmental Delivery Plan will cover a 10-year period. As this document is in draft Natural England is unable to include the start and end dates. These will be included at the point the Secretary of State makes the Environmental Delivery Plan.
57. The charging schedule for this Environmental Delivery Plan expires before the EDP end date. The charging schedule for this Environmental Delivery Plan expires at the end of the sixth year after the EDP start date, so Natural England has time to implement conservation measures to address the negative effect of the EDP development in order meet the Overall Improvement Test by the EDP end date. Further detail is provided at Chapter 8.

Kinds of development

58. The kind of development to which this Environmental Delivery Plan applies is dwellinghouses including flats. A dwellinghouse is taken to cover a building or part of a building occupied or intended to be occupied as a separate dwelling.
59. Each dwellinghouse (house or flat) will be treated as one 'unit' of development for the purposes of the Environmental Delivery Plan charging schedule.

Maximum amount of development

60. The maximum amount of development covered by this Environmental Delivery Plan is 15,780 units.
61. The maximum amount of development is determined by Ministry of Housing, Communities and Local Government (MHCLG) analysis that apportions local housing need to the Environmental Delivery Plan catchment (development area). Historic housebuilding data is used to calculate what percentage of each local authority's past housing delivery fell within the catchment. This percentage is then applied to each local authority's current local housing need, to estimate a catchment-level need, and these are summed for all local authorities overlapping the Norfolk Environmental Delivery Plan. This figure is subsequently adjusted twice, firstly to reflect expected delivery rates and secondly to assume an 80% uptake of the Nature Restoration Fund and Environmental Delivery Plan option. Natural England ensured there was sufficient opportunity to deliver the required conservation measures for this amount of development. The result is the maximum development figure. The full methodology is contained in Annex 3A.

Figure 3: Map of development area for this Environmental Delivery Plan

4 Plans and strategies considered during Environmental Delivery Plan preparation

62. In accordance with Section 94(3) of the Planning and Infrastructure Act, this section sets out the relevant plans and strategies Natural England has had regard to when preparing this Environmental Delivery Plan. This is to ensure effective join up where possible with other positive actions being delivered in the Environmental Delivery Plan area, and to ensure the Environmental Delivery Plan provides additional benefits where possible to the environmental features that would have come forward without the Nature Restoration Fund.

63. Figure 4 is a high-level diagram summarising the interactions between such plans and strategies and this Environmental Delivery Plan.

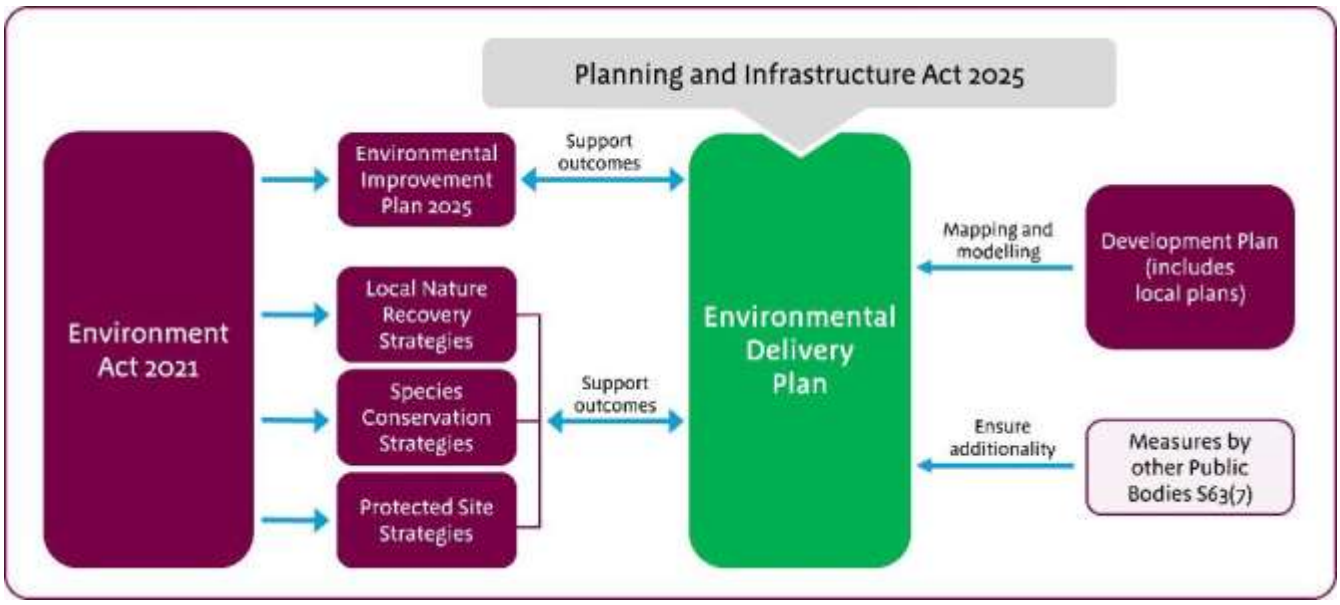

Figure 4: Summary of main interactions between the Environmental Delivery Plan and other strategies and plans

Development plan

64. In preparing this Environmental Delivery Plan, Natural England has had regard to the development plan for the area. This Environmental Delivery Plan area includes a total of six local planning authorities which are all within the County of Norfolk. The extent that the administrative boundaries of each local planning authority fall within the Environmental Delivery Plan area varies significantly, as does the extent of development planned within each. The district, borough, city, and national park authorities are as follows:

- South Norfolk and Broadland District Council

- Norwich City Council
- Breckland Council
- Broads Authority
- Borough Council of King's Lynn and West Norfolk
- North Norfolk District Council.

65. The development plan is at the heart of the planning system with a requirement set in law that planning decisions must be taken in line with the development plan unless material considerations indicate otherwise. The development plan for an area includes; each spatial development strategy (where relevant), adopted local plan, adopted mineral and waste plan, made neighbourhood development plans and policies maps for that area[16]. The plan-making process is informed by statutory requirements, the National Planning Policy Framework[17] (along with other government policy) and local considerations. Local plans are a key aspect of the development plan, especially where they are considered to be 'up-to-date' and set out the spatial strategy for development across an area, including making site allocations for housing development.
66. For this Environmental Delivery Plan, local plans have been used to spatially apportion housing trajectory estimates from the Ministry of Housing, Communities and Local Government (MHCLG) and underpin assessment of environmental impact (Chapters 1 and 4). The latest available local plan data has been used upon request from local planning authorities in December 2025. This will ensure that this Environmental Delivery Plan can deliver the appropriate conservation measures for the expected environmental impact of development.
67. For completeness, the relevant adopted Local Plans in the Environmental Delivery Plan area considered at the time of drafting are:
    - Greater Norwich Local Plan 2018 to 2038[18] (adopted by South Norfolk and Broadland, and Norwich City Council in March 2024);
    - Breckland Local Plan 2023 to 2036[19] (adopted November 2023);
    - Local Plan for the Broads 2015 to 2036[20] (adopted May 2019);
    - King's Lynn and West Norfolk Local Plan 2021-2040[21] (adopted March 2025);
    - North Norfolk Local Plan 2024-2040[22] (adopted December 2025).

Environmental Improvement Plan

68. The current Environmental Improvement Plan (EIP) was published and laid in Parliament in December 2025[23]. It is a strategic framework for improving England's natural environment, with an over-arching goal of restored nature. As part of this goal, the following action has been identified: Use the Nature Restoration Fund to pool developer contributions for environmental mitigations, allowing for strategic conservation measures at scale.

69. In preparing this Environmental Delivery Plan, Natural England has had regard to the Environmental Improvement Plan and will support the following goals and commitments through conservation measure delivery:

Goal 1 Restored nature:

- Commitment 1: Mobilising private investment and finance to restore and protect nature in England;
- Commitment 7: Effectively conserve and manage 30% of the UK's land by 2030 (30by30);
- Commitment 8: By December 2030 50% of SSSI features to have actions on track to achieve favourable condition (this is an Environment Act interim target);
- Commitment 9: Increase the contribution that Protected Landscapes are making to Environment Act and EIP targets, measured through the Protected Landscapes Targets and Outcomes Framework;
- Commitment 10: Restore or create a total of 250,000 hectares of a range of wildlife-rich habitats outside of protected sites by December 2030 (this is an Environment Act interim target);
- Commitment 11: Increase England's tree canopy and woodland cover by 0.33% of land area by December 2030 from the 2022 baseline of 14.9% (this is an Environment Act interim target);
- Commitment 14: Take action to conserve and recover threatened species.

Goal 3 Water:

- Commitment 25: Reduce phosphorus loadings from treated wastewater by 55% by December 2030 against a 2020 baseline (this is an Environment Act interim target);
- Commitment 26: Reduce total nitrogen, phosphorus and sediment pollution from agriculture to the water environment:
    - by at least 12% by December 2030, compared to 2018 levels.
    - by at least 18% in catchments containing protected sites in unfavourable condition due to nutrient pollution by December 2030 (these are Environment Act interim targets).
- Commitment 28: Restore chalk streams to better ecological health, ensuring protections and investment towards these habitats.

Goal 9 Biosecurity:

- Reduce the rate of establishment of Invasive Non-Native Species (INNS) by at least 50% by December 2030, compared to 2000 levels (this is an Environment Act interim target).

Goal 10 Access to nature:

- Commitment 90: Improve the condition, diversity and character of our landscapes.

Goal 10: Access to nature:

- Commitment 86: Make sure that everyone has access to green or blue spaces within a 15-minute walk from home;
- Commitment 88: Develop measures to improve responsible access that protect and enhance nature and visitor experiences, aiming to increase the number of people visiting the countryside and coast for leisure and tourism purposes.

Environment Act strategies

70. An Environment Act strategy under the Planning and Infrastructure Act means a strategy prepared under any of the following provisions of the Environment Act 2021: Local Nature Recovery Strategies (section 104), Species Conservation Strategies (section 109), and Protected Site Strategies (section 110).

Table 3: Summary environmental improvement plans and strategies considered for this Environmental Delivery Plan

Environment Act Strategy	Relevance for this Environmental Delivery Plan
Norfolk Local Nature Recovery Strategy (LNRS)	Norfolk County Council [24] is the responsible authority appointed to lead the Norfolk Local Nature Recovery Strategy. Local strategic and spatial priorities identified in Local Nature Recovery Strategy will be central to the delivery of selected conservation measures as the Nature Restoration Levy will be able to finance conservation measures that focus on restoring and connecting different habitats, directly supporting these priorities. Indeed, the Norfolk Local Nature Recovery Strategy identified that for planners and developers it will provide information to support the implementation of Environmental Delivery Plans. The Norfolk Local Nature Recovery Strategy identifies habitat opportunities that are supported by the selected conservation measures in this plan. The wider priority to "reduce water pollution pressure on nature from all sources" and the supporting measures, align with the measures set out in this Environmental Delivery Plan, including: ■ Reduce emissions of damaging water pollutants from all sources. ■ Implement in-field measures to reduce run-off. ■ Benefit the marine environment by improving the quality of the freshwater entering it. The Local Habitat Map[25] for the Norfolk Local Nature Recovery Strategy provides a shared vision for where conservation measures can be focused to have the greatest impacts for nature and deliver connectivity as per the Lawton principles[1]. This will be used to guide delivery of conservation measures.

Environment Act Strategy	Relevance for this Environmental Delivery Plan
Species Conservation Strategies (SCS)	At the time of preparation, there is no made Species Conservation Strategy within the Environmental Delivery Plan area.
Protected Site Strategies (PSS)	At the time of preparation, there is no made Protected Site Strategy within the Environmental Delivery Plan area.

Other relevant plans and strategies

71. Natural England considers the following other strategies relevant and has had regard to them:

Natural England's Strategy: Recovering Nature for Growth, Health and Security – November 2025

72. Natural England's strategy[26] includes seeking to increase the recovery, regeneration and resilience of ecosystems, and to embed nature into the heart of development, ensuring that everyone benefits from green spaces, cleaner environments and resilient ecosystems close to where they live. It has four strategic outcomes, with the most relevant to this Environmental Delivery Plan being:

    - Outcome 1 – Recovering Nature;
    - Outcome 2 – Building Better Places;
    - Outcome 3 – Improving Health and Wellbeing.

73. Outcome 2 specifies one of the ways in which it will be achieved is through working with councils, government and businesses to increase the offer and uptake of tools like Environmental Delivery Plans, helping us to build homes and infrastructure that benefit both growth and nature.

74. Outcome 3 relates to access to nature and sets out that Natural England will increase the provision of high-quality inclusive access for all.

Strategic Policy Statement for Natural England – March 2026

75. The Strategic Policy Statement from Government to Natural England[27], sets out the strategic priorities of ministers.

76. In relation to 'the growth duty', Environmental Delivery Plans enable sustainable development and implement streamlined regulatory processes within the planning system; as such supporting and promoting economic growth.

Broads Plan 2022 – 2027

77. The strategic objectives of the Broads Plan are divided into six themes and are aligned with the Environmental Improvement Plan 2025 and have been considered as part of this Environmental Delivery Plan.

78. The most relevant themes of the Broads Plan are;

- improving landscapes for biodiversity and agriculture;
- protecting landscape character;
- promoting understanding and enjoyment, and;
- connecting and inspiring communities.

79. The Broads Plan has been considered during conservation measures selection and will be considered in targeting delivery.

UK's National Biodiversity Strategy and Action Plan

80. The UK has ratified the Kunming-Montreal Global Biodiversity Framework[28], which seeks to respond to the worldwide decline in biodiversity. The UK's National Biodiversity Strategy and Action Plan[29] commits the UK to achieving all 23 of the Kunming-Montreal Global Biodiversity Framework (GBF) targets at home. England has set legally binding targets to halt decline in species abundance by 2030 and tackle environmental pressures, with actions to achieve this set out in the Environmental Improvement Plan.

Environment Act targets

81. One of the main objectives of the Environment Act 2021 is to provide targets, plans and strategies for improvement of the natural environment. It requires the setting of long-term targets in priority areas (interim targets are set by the Environmental Improvement Plan). Whilst preparing this Environmental Delivery Plan, Natural England has considered the Environment Act and believes the Environmental Delivery Plan will contribute towards long-term targets in two priority areas; water and biodiversity:

82. The Environmental Targets (Biodiversity) (England) Regulations 2023[30] made under the Environment Act:

- For species' extinction risk to reduce the risk of species' extinction by 2042, when compared to the risk of species' extinction in 2022 increase species abundance so that by 2042 it is greater than in 2022, and at least 10% greater than 2030.
- For the restoration or creation of wildlife-rich habitat that on or after the day these regulations come into force, in excess of 500,000 hectares of a range of wildlife-rich habitats are to be restored or created by 31 December 2042.
- That the overall relative species abundance index on the specified date indicates that the decline in the abundance of species has been halted.

83. Natural England in preparing this Environmental Delivery Plan has had regard to these targets and will contribute by creating and restoring habitats helping enable species to flourish, creating actions for features on Sites of Special Scientific Interest (SSSI) that will contribute towards achieving favourable condition, reducing invasive non-native species, and addressing the effects of nutrient pollution from development that could negatively impact species.

The Environmental Targets (Water) (England) Regulations 2023[31] made under the Environment Act 2021:

- Wastewater[32]: the load of total phosphorus discharged into freshwaters from relevant discharges is, by 31 December 2038, at least 80% lower than the baseline;
- Agriculture[33]: the load of each of the following— total nitrogen, total phosphorus, and sediment entering the water environment through agricultural diffuse pollution is, by 31 December 2038, at least 40% lower than the baseline.

84. Conservation measures employed by this Environmental Delivery Plan will be aimed at addressing the negative effects of nitrogen and phosphorus from residential developments within its area impacting The Broads and River Wensum Special Area of Conservations and the Broads Ramsar site – all of which have freshwater components.

Levelling Up and Regeneration Act 2023 (LURA)

85. Upgrades to mains wastewater treatment works have been secured through the Levelling Up and Regeneration Act 2023[34].

86. The Levelling Up and Regeneration Act mandates that water companies in Nutrient Sensitive Catchments upgrade wastewater treatment works (serving a population equivalent of greater than 2,000) to meet Technically Achievable Limits (TAL) by 2030. Currently, the nutrient pollution standards specified are 10 milligrams (mg) per litre for nitrogen and 0.25 mg per litre for phosphorus. Statutory deadlines ensure that these upgrades must be achieved by April 2030 which will coincide with the duration of the Environmental Delivery Plan period.

87. Given that this is a widespread mandated schedule of works, Natural England discounted upgrading mains wastewater treatment works as part of the conservation measures prioritisation process (see chapter 6).

Shared Standards in Water Efficiency for Local Plans

88. The Shared Standards in Water Efficiency for Local Plans[35] is a joint initiative developed by Natural England, the Environment Agency, and water companies endorsed by Water Resources East to support local planning authorities to deliver sustainable growth.

89. The water company partners are Anglian Water, Cambridge Water, Essex and Suffolk Water and Affinity Water. The Shared Standards provide advice and evidence to local planning authorities on how they can secure higher water efficiency standards for new homes and for commercial developments.

90. The Shared standards provide various recommendations for local planning authorities to develop local plan policies, including to:

- Require new homes to be more water efficient than standard, recommending an efficiency of between 85 and 95 litres per person per day, as opposed to the optional Building Regulations standard of 110 litres per person per day.

91. This has been considered in the modelling used to inform this Environmental Delivery Plan, to determine and capacity, and negative effect of development on features.

Environmental principles

92. Natural England has considered the environmental principles when preparing this Environmental Delivery Plan; as contained within s.17(5) of the Environment Act 2021:
    - (a) the principle of preventative action to avert environmental damage;
    - (b) the precautionary principle, so far as relating to the environment;
    - (c) the principle that environmental damage should as a priority be rectified at source, and;
    - (d) the polluter pays principle.
93. Natural England will continue to have regard to the environmental principles, in so far as they are relevant, when administering, implementing and delivering an Environmental Delivery Plan.
94. When making (or amending) an Environmental Delivery Plan, the Secretary of State will have due regard to the environmental principles policy statement, in line with the Environment Act 2021.

Overview of other measures by public authorities

95. To satisfy section 63(7) of the Planning and Infrastructure Act, Natural England wrote to relevant public authorities (including Natural England's area team), to collate information on other measures that are being taken or are likely to be taken with the aim of improving the conservation status of each identified environmental feature in this Environmental Delivery Plan.
96. Natural England considered measures in two categories: existing (those currently being taken) and future (those not yet being taken). Future measures were further categorised into the following: (1) all measures not yet being taken but which (i) have been legally and/or financially secured, or; (ii) have a clear regulatory driver to be secured and (2) any other measures, not yet being taken and not legally and/or financially secured, but for which there are plans or strategies or ambitions for them to be taken.
97. Natural England received a wide variety of returns in response to the information request. The returns showed that there are a variety of public authority measures, both existing and future, that may improve the conservation status of the environmental features in the Environmental Delivery Plan area.
98. The returns highlighted that a number of broader schemes, plans and funding opportunities are in place across the Environmental Delivery Plan area, including:
99. Agri-environment schemes: There are several agri-environment scheme options that may be considered as aiming to improve the conservation status of an identified environmental feature. These schemes can be entered into at various windows with some available on a rolling basis (such as Countryside Stewardship Higher Tier). Consequently, short-term, agricultural management type measures have been discounted as conservation measures from this Environmental Delivery Plan in Chapter 6. Further, to ensure any conservation measures undertaken as part of this

Environmental Delivery Plan are additional to any such schemes, land parcels being considered for conservation measure delivery will be checked against Rural Payments Agency databases as part of the site selection and delivery process.

100. Local Nutrient Mitigation Fund (LNMF): This is active in the Norfolk catchment with South Norfolk and Broadland District Council receiving Round 2 funding allocations to progress the nutrient credit market. The scheme generates nutrient reductions sold as credits to developers from a variety of measures including land use change and private onsite wastewater treatment system upgrades. Delivery of this Environmental Delivery Plan (EDP) will be underpinned by working collaboratively with the relevant local planning authorities. Where unallocated nutrient mitigation is available in the catchment under existing schemes, and are consistent with the conservation measures being delivered under this EDP, Natural England will seek opportunities, where appropriate, to incorporate these measures into EDP conservation measure delivery.

101. Diffuse Water Pollution Plans (DWPPs): The River Wensum and catchments across the Broads have DWPPs in place. They are tools to help reduce pollution at protected sites, including those covered in this Environmental Delivery Plan. They are non-statutory and are produced jointly by Natural England and Environment Agency. DWPPs are used to plan and agree strategic action at the catchment-scale, however, they do not have any funding attached to them for delivery. Therefore, the actions are not legally or financially secured.

102. Upgrading of mains wastewater treatment works (WwTW): This has been secured through the Levelling Up and Regeneration Act 2023. In addition to this, the Water Industry National Environment Programme (WINEP)[36], represents a set of actions that the 19 water companies operating in England should complete between 2025 and 2030, in order to contribute towards meeting their environmental obligations. For the 2025 – 2030 period (PR24), WINEP has secured investments to improve WwTW performance including through upgrading additional WwTW to Technically Achievable Limits. Consequently, this has been discounted from selection in this Environmental Delivery Plan (see Chapter 6) because there are other mechanisms in place to achieve this

103. Wendling Beck: A large-scale project occurring within the Environmental Delivery Plan area is Wendling Beck[37,38], a multi-stakeholder project including numerous landowners, local authorities, public authorities and environmental non-governmental organisations. This is a large-scale nature recovery project including new areas of species rich grassland, wet woodland, heathland and scrub, and new wetlands. The core project area is within the wider upper Wensum catchment.

104. In addition, Natural England also recognised a degree of overlap between public authority measures, which have varying degrees of certainty, and the conservation measures selected for this Environmental Delivery Plan (see Chapter 6). Natural England is not prevented from delivering the same or similar measures at different spatial and temporal scales. Where appropriate, public authority returns will be used at the point of delivery to identify any overlap with measures already being undertaken and to ensure that Environmental Delivery Plan-funded measures are additional.

5 Environmental features: conservation status and negative effect

105. In accordance with Sections 61 and 63 of the Planning and Infrastructure Act, this chapter: identifies the environmental features likely to be negatively affected by the Environmental Delivery Plan development; defines conservation status; explains the negative effect of the development on the environmental features; and describes the conservation status of each identified environmental feature at the Environmental Delivery Plan start date.

Environmental features likely to be negatively affected by development

106. The environmental features which are likely to be negatively affected by the development covered by this Environmental Delivery Plan are detailed in Table 4, at the end of this chapter. The table displays each feature's habitat group, and at which component Sites of Special Scientific Interest (SSSI), the environmental features are present.

107. The River Wensum Special Area of Conservation is only comprised of a single SSSI (the River Wensum SSSI). The Special Area of Conservation and SSSI have identical boundaries and the environmental features for which the Special Area of Conservation is designated are the same as the SSSI. Therefore, Table 4 does not distinguish between the environmental features negatively affected by development in the Special Area of Conservation and SSSI.

108. Each environmental feature has been placed in one of four different habitat groups. Within these habitat groups, Natural England judges that the impact of additional nutrients will affect environmental features similarly, with negative effects on a habitat feeding through to negative effects on characteristic species of that habitat.

109. Applying this approach, three habitat groups are identified for the Broads Special Area of Conservation and Broadland Ramsar (open water, fen and fen-type wetland, and wet woodland), and one habitat group for the River Wensum Special Area of Conservation (river).

110. There is one exception - Desmoulin's whorl snail (Vertigo moulinsiana) within the River Wensum Special Area of Conservation. In this case, the species' supporting habitat is not fully covered by the notified habitat, so it must be assessed individually.

Defining conservation status

111. Section 63(1) of the Planning and Infrastructure Act requires that an Environmental Delivery Plan "must describe the conservation status of each identified environmental feature as at the Environmental Delivery Plan start date". Natural England has exercised its judgement in defining and applying the conservation status of features when preparing the Environmental Delivery Plan.

112. Conservation status has a broad meaning and is used at variable spatial scales; from biogeographical regions to specific sites. When considering the potential definitions of conservation status, the parameters of conservation status generally converge around the following[39]:

- For habitats: area, structure and function;
- For species: population, available habitat for the species in question;
- For habitats and species: natural range and distribution, future prospects.

113. Nutrient enrichment most directly affects the processes that underpin the structure or function of the environmental features (or the structure and function of the habitat on which the species depend). The parameters of natural range & distribution, area and population are generally not affected unless a critical tipping point in the system has been reached.

114. Structure and function refers to the physical and biological composition of a habitat and the underlying natural processes that maintain it over time. When considering the structure and function of water-dependent habitats, Mainstone[40] identifies four components which should be considered. These components are embedded in UK Common Standards Guidance on setting targets for monitoring the conditions of Sites of Special Scientific Interest and Natura 2000[41] sites. Consequently, there are data readily available to assess these components of structure and function and Natural England specialists have matched these components of structure and function to the attributes outlined in the Supplementary Advice on Conservation Objectives where applicable[42].

115. These components are as follows:

- Physical – Structural and spatial architecture of the environment (e.g. geomorphology, microclimate etc.);
- Hydrological – Quantity and distribution of water;
- Chemical – Quality of the water (e.g. nutrient enrichment, heavy metals, pollutants etc.);
- Biological – Living components of the ecosystem.

116. These components must be considered together rather than in isolation. Changes in one component can influence how nutrient enrichment affects environmental features. For example, improving hydrology can dilute nutrient concentrations or reduce residence times, lowering the risk of algal accumulation. Likewise, improving physical habitat can increase the resilience of features to nutrient pressures.

117. These components of structure and function are intrinsically linked to future prospects, as the future prospects of an environmental feature depend on whether they are likely to be maintained, restored or further degraded over time.

118. Therefore, for the purposes of this Environmental Delivery Plan, conservation status is assessed through the structure and function of environmental features, using these components as the basis of that assessment. Future prospects are considered through the expected trajectory of these components, including the effect of secured actions and interventions to maintain, restore or improve structure and function.

119. This is expressed on a qualitative Red Amber Green scale (RAG), including black for irrecoverable status:

- Black - Structure and function of the habitat or habitat of the species are/is degraded beyond the point of recovery;
- Red – Deteriorating - Structure and function of habitat or habitat of the species are/is severely degraded. Recovery will require significant intervention over a long timescale;
- Amber – Recovering - Structure and function of habitat or habitat of the species are/is degraded. Recovery is in progress due to limited secured intervention to address pressures;
- Green - Recovered or remains good - Structure and function of the habitat or habitat of the species are/is recovered or remains good.

Conservation status of environmental features (at Environmental Delivery Plan start date)

120. Using data gathered in relation to Sites of Special Scientific Interest (SSSI) Common Standards Monitoring Guidance (CSMG)[4] condition assessment and Habitats Regulations requirements and other extant assessment methods (such as the Water Framework Directive), Natural England specialists have assessed the conservation status of each identified environmental feature at the Environmental Delivery Plan start date.

121. The conservation status of each identified environmental feature has been defined with reference to the previously discussed environmental feature groupings of open water, fen and fen-type wetland, and wet woodland for the Broads Special Area of Conservation and Ramsar, and river habitat and Desmoulin's whorl snail for the River Wensum.

122. Table 4 describes the conservation status of each identified environmental feature at the Environmental Delivery Plan start date. To determine the conservation status, the components of conservation status are considered individually (physical, hydrological, chemical and biological), and then overall conservation status is assigned using Natural England's expert judgement. This reflects the fact that the components are interdependent and may be in different states of condition, such that conservation status cannot be robustly determined by a simple arithmetic calculation. The overall assessment is based on the available evidence for each component and provides a qualitative description of the conservation status of each identified environmental feature. The detail behind each assessment can be found at Annex 5A.

123. In Table 4, each identified environmental feature is individually assessed within its relevant habitat group through consideration of the habitat structure and function that supports it. As the conservation status of the species is dependent on the status of that supporting habitat, the conservation status assigned to individual features within a habitat group is the same as that assigned to the habitat group. Any deterioration,

maintenance or recovery in habitat condition will therefore be reflected in the conservation status of the dependent species.

124. All identified environmental features have a deteriorating conservation status, even though some components of conservation status of some identified environmental features do have some actions secured to improve them.

Environmental impact on environmental features

125. Development within the Environmental Delivery Plan area contributes additional nutrient loading that impacts on the identified environmental features through 'urban wastewater', which broadly arises from two sources:

- Wastewater discharges: wastewater arising from occupation within the new development requires treatment and subsequent discharge. Although treated, effluent typically contains residual nitrogen and phosphorus, contributing to increased nutrient loads.
- Land use change and surface water runoff: where new development involves changes in land use, constructed surfaces and drainage typically result in reduced permeability of land and altered drainage pathways. This can increase volume and rate of surface water runoff, facilitating the transfer of nutrients to nearby waterbodies.

126. Natural England (working with the Environment Agency) has used modelling to estimate the increase in the concentration of nutrients (post-2030 and Levelling-up and Regeneration Act wastewater treatment works upgrades), for phosphorus:

- Increase in concentration from maximum amount of development, compared to site target: Bure 5.3%, Yare 5.3%, Wensum 1.3%
- Increase in concentration from maximum amount of development, compared to recent monitored concentration: Bure 2.4%, Yare 0.7%, Wensum 0.4%

127. The additional nutrient loading arising from development has the potential to negatively affect the identified environmental features through changes to their conservation status (e.g. biological, chemical, physical and hydrological components). The relative scale of these effects has been assessed using a structured scoring approach that takes account of the scale of development (15,780 dwellings), the associated nutrient loading, current nutrient concentrations relative to nutrient targets, and the conservation status of each environmental feature at the Environmental Delivery Plan start date. Conservation status is an important consideration because the response of environmental features to additional nutrient loading is influenced by the condition of structure and function components. Further details of the assessment methodology, scoring approach and assessment outcomes are provided in Chapter 7 (Overall Improvement Test), with further detail provided at Annex 5B and Annex 7B.

Table 4: Environmental features of The Broads Special Area of Conservation and Broadland Ramsar likely to be negatively affected by development to which this Environmental Delivery Plan applies, by component Sites of Special Scientific Interest (SSSI) with conservation status RAG rating at Environmental Delivery Plan start date

Bure Broads and Marshes SSSI	RAG	Yare Broads and Marshes SSSI	RAG	River Wensum	RAG
Open water habitat group features: ■ Intermediate between H3150 natural eutrophic lakes with Magnopotamion or Hydrocharition and H3140 Hard oligo-mesotrophic waters with benthic veg of Chara spp. This includes many ditches. ■ S1355 otter, Lutra lutra ■ S1016 Desmoulin's whorl snail, Vertigo moulinsiana ■ Wetland invertebrate assemblage ■ Wetland plant assemblage ■ Aggregations of non-breeding birds	Red	Open water habitat group features: ■ Intermediate between H3150 natural eutrophic lakes with Magnopotamion *or* Hydrocharition and H3140 Hard oligo-mesotrophic waters with benthic veg of *Chara spp.* This includes many ditches. ■ S1355 otter, Lutra lutra ■ S1016 Desmoulin's whorl snail, Vertigo moulinsiana ■ Wetland invertebrate assemblage ■ Wetland plant assemblage ■ Aggregations of breeding birds ■ Aggregations of non-breeding birds	Red	River habitat group features: ■ H3260 watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation ■ Brook Lamprey, Lampetra planeri ■ Bullhead, Cottus gobio ■ White-clawed crayfish, Austropotamobius pallipes	Red
Fen and fen-type wetland habitat group features: ■ H6410 Molinia meadows on calcareous, peat or clay-silt soil	Red	Fen and fen-type wetland habitat group features: ■ H6410 Molinia meadows on calcareous, peat or clay-silt soil	Red	**Desmoulin's** whorl snail, *Vertigo moulinsiana*	Red

Bure Broads and Marshes SSSI	RAG	Yare Broads and Marshes SSSI	RAG	River Wensum	RAG
■ H7140 transition mires and quaking bogs ■ H7210 calcareous fens with C. mariscus and species of C. davallianae ■ H7230 alkaline fens ■ S1903 fen orchid, Liparis loeselii ■ S1016 Desmoulin's whorl snail, Vertigo moulinsiana ■ Wetland plant assemblage ■ Wetland invertebrate assemblage ■ Floodplain fen ■ Aggregations of breeding birds ■ Aggregations of non-breeding birds		■ H7140 transition mires and quaking bogs ■ H7210 calcareous fens with C. mariscus and species of C. davallianae ■ H7230 alkaline fens ■ S1016 Desmoulin's whorl snail, Vertigo moulinsiana ■ Wetland plant assemblage ■ Wetland invertebrate assemblage ■ Floodplain fen ■ Aggregations of breeding birds ■ Aggregations of non-breeding birds			
Wet woodland habitat group features: ■ H91E0 alluvial woods with A. glutinosa, F. excelsior ■ Floodplain alder woodland ■ Wetland invertebrate assemblage	Red	Wet woodland habitat group features: ■ H91E0 alluvial woods with A. glutinosa, F. excelsior ■ Floodplain alder woodland	Red	N/A	

6 Conservation measures

128. This chapter, in accordance with Section 61 and Section 63 of the Planning and Infrastructure Act, sets out the conservation measures to be taken under this Environmental Delivery Plan to address the environmental impact of development on the identified environmental features, and contribute to an overall improvement in their conservation status. This includes conservation measures that are not expected to be needed at the time the Environmental Delivery Plan is made but may be drawn upon later (backup conservation measures). It sets out the anticipated sequencing of the implementation of the conservation measures by reference to the Environmental Delivery Plan development. It states how much the conservation measures are expected to cost and how they are to be secured and maintained.

129. The chapter begins by setting out the statutory framework for conservation measures, summarises the Nature Restoration Fund's approach (and the steps taken) to satisfy the statutory framework), and details the steps taken for conservation measure selection and prioritisation.

Overview of approach to identifying and selecting conservation measures

Statutory framework:

130. Conservation measures are measures taken under the Environmental Delivery Plan to address the environmental impact of development on identified environmental features and to contribute to an overall improvement in the conservation status of those features (Section 61(3)).

131. As discussed in chapter 5, development results in nutrient pollution, the 'environmental impact' for the purposes of Section 61(1), which has a negative effect on the conservation status of the environmental features concerned.

132. The Planning and Infrastructure Act requires an Environmental Delivery Plan to set out the following regarding conservation measures:

- conservation measures that are to be taken to address the environmental impact of development on the identified environmental feature and contribute to an overall improvement in the conservation status of the identified environmental feature (Section 61(3));
- conservation measures that are not expected to be needed at the time that the Environmental Delivery Plan is made, but which must be implemented in the circumstances set out in the Environmental Delivery Plan. Those circumstances must relate to the effectiveness of the conservation measures that have already been implemented, as revealed by the monitoring of the Environmental Delivery Plan (Sections 61(7) and (8));

- how the process of discounting conservation measures as set out in the legislation was followed, what alternatives to the conservation measures were considered but not included in the final programme of measures, and a reason for their exclusion (section 63(2)(c));
- the anticipated sequencing of the implementation of conservation measures, by reference to the development to which the Environmental Delivery Plan applies. Natural England ties primary conservation measures to various development phases, aligned with the timing and scale of development to which the Environmental Delivery Plan applies (Section 61(4));
- how much the conservation measures are expected to cost and how the conservation measures are to be maintained (Section 61(9)).

Appropriate Prioritisation (AP) Regulations 2026

133. The Appropriate Prioritisation Regulations 2026[43] assist Natural England in determining the prioritisation of conservation measures. Where Natural England considers it appropriate, it must prioritise avoidance measures over mitigation and compensation measures, and mitigation measures over compensation measures, in each case setting out which of those categories a specific measure falls into, in whole or part. Refer to Table 5 for definitions.

134. In considering whether it is appropriate to prioritise conservation measures as above, Natural England must have regard to the extent to which the conservation measures deliver value for money (Regulation 3 (1) – (3)). Table 8 sets out how value for money has been considered in respect of each primary conservation measures.

Table 5: Provides definitions of avoidance, mitigation and compensation conservation measures from the Appropriate Prioritisation Regulations 2026.

Measure	Definition
Avoidance measures	Avoidance measures are conservation measures which are intended to avoid the negative effect of the Environmental Delivery Plan development on the conservation status of an identified environmental feature.
Mitigation measures	Mitigation measures are conservation measures which are intended to mitigate the negative effect of the Environmental Delivery Plan development on the conservation status of an identified environmental feature.
Compensation measures	Compensation measures are conservation measures which are intended to compensate for the negative effect of the Environmental Delivery Plan development on the conservation status of an identified environmental feature.

Approach to selecting and prioritising conservation measures

135. The approach to identifying and selecting conservation measures is set out in Stages 1-4 in this chapter. The structure is presented in the Figure 5.

136. To select primary conservation measures and to identify the circumstances in which back up conservation measures are required, the effectiveness of a conservation measure must be defined. In this Environmental Delivery Plan, the effectiveness of a conservation measure is the extent to which the successful delivery of a conservation measure results in the intended positive effect on the conservation status of the environmental features in the protected sites.

137. The delivery of conservation measures contains inherent flexibilities and uncertainties, with judgements of "success" or "failure" often being misleadingly binary. The following examples are non-exhaustive:

- A measure may be highly effective in one place, and less so in another.
- Increasing or decreasing the area of a conservation measure may change its effectiveness in a non-linear way.
- One kind of measure may appear more effective than another, but require more, and more expensive, after-care than the other.
- Ostensibly similar measures delivered using different methodologies may bring different results.
- The costs and effectiveness of monitoring and after-care can vary under different land ownership arrangements.

138. The 'effectiveness' of a conservation measure is therefore defined broadly by Natural England under Section 61(8). The following are some examples of primary conservation

measures that are not 'effective', and would trigger the deployment of backup conservation measures:

- Implemented measures that are not sufficiently addressing the conservation status of the environmental feature in question, and therefore putting the satisfaction of the Overall Improvement Test in doubt; and
- A measure that has not yet been implemented, but evidence to date would suggest it is unlikely to be effective in addressing the conservation status of the environmental feature in question. This may be because a similar measure has been implemented elsewhere and has not been effective in addressing the conservation status of the environmental feature. Or it, may be because unforeseen circumstances (e.g. third-party rights) on the ground put the successful implementation and monitoring of that conservation measure in doubt.

139. Both implemented and unimplemented primary conservation measures may therefore be deemed ineffective under section 61(8) and trigger the deployment of backup conservation measures.

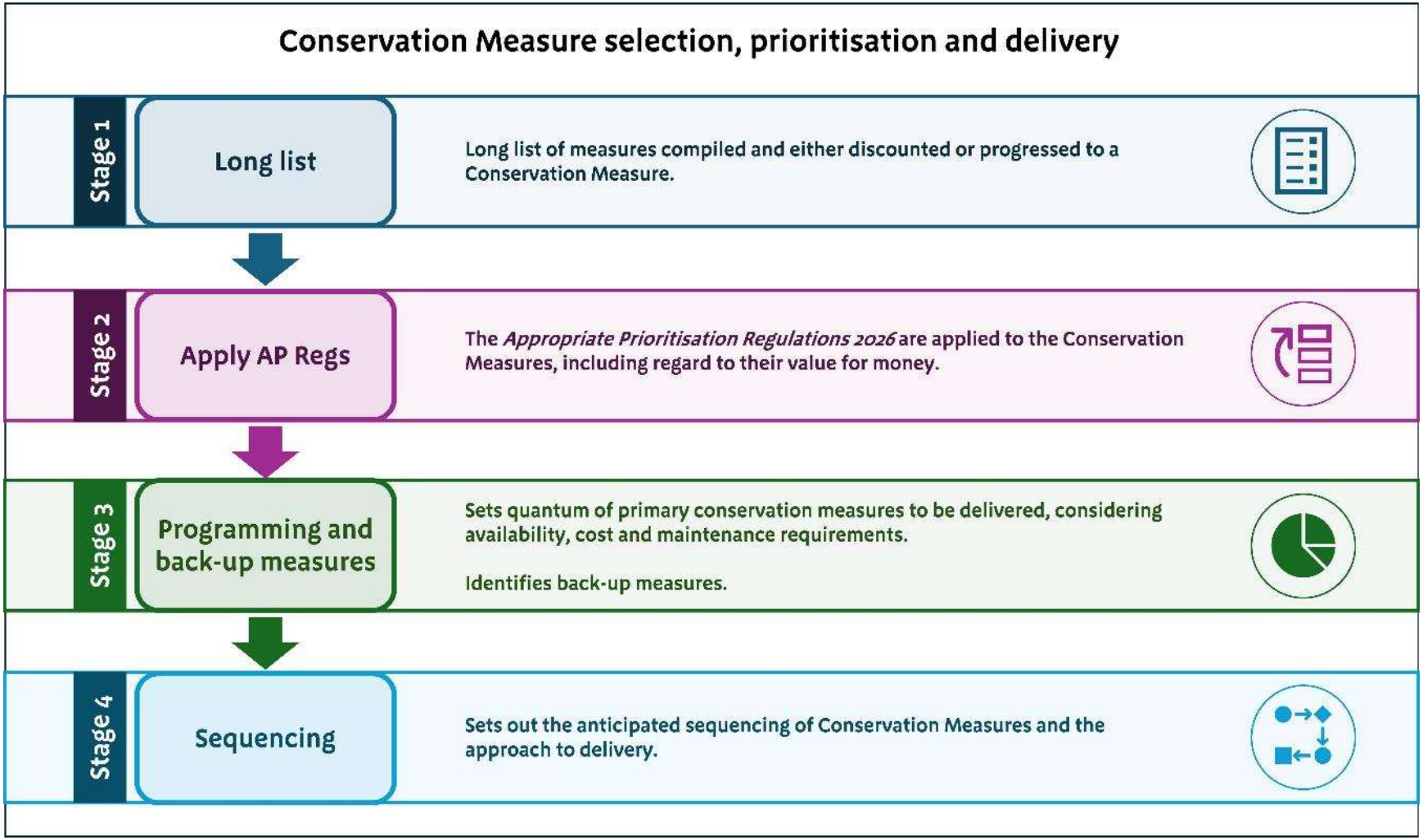

Figure 5: Diagram showing the process for conservation measure selection, prioritisation and delivery.

Stage 1: Long list of measures

140. Identification of potential measures began with a review of relevant case studies and published evidence, drawing on Natural England's extensive experience in managing nature reserves and in providing advice on their effective management. This process resulted in a list of measures considered capable of delivering benefits to the identified environmental features.

141. The longlist of measures was then subject to further assessment to identify: (i) conservation measures (including backup measures); and (ii) alternative measures that were considered but discounted (with reasons). Alternative measures are measures that were discounted from the initial long list of measures.

142. Table 6 presents a scorecard to evaluate each measure against a set of key considerations. This scorecard assessment takes account of a range of factors, including the strength of evidence to show the measure can deliver the intended ecological outcome, additionality, ease of implementation, whole life cost, maintenance requirements, environmental risks and local and system-level benefits associated with each measure.

143. This scorecard assessment ensures Natural England's selection of measures is based on robust evidence to have confidence the measures taken forward to Stage 2 are realistic and effective.

144. Measures that are not deliverable, lack evidence of effectiveness, present a high environmental risk, or fail to offer additional ecological benefits beyond actions already required (e.g., regulatory requirements) are discounted and do not progress to Stage 2. See Annex 6A for description of the scoring approach used to identify a list of conservation measures including use of the 'Balance Evidence Assessment Method' and associated Ziggurat plots[107].

145. Each measure is assessed against the criteria using a red, amber or green rating, alongside options for 'evidence gap' or 'not applicable' (see Annex 6A for details of the assessment criteria). The 'not applicable' category is applied where a measure has been discounted before a full assessment against all criteria is completed.

146. Section 63(7) requires Natural England to set out any other measures (in addition to the conservation measures set out in the Environmental Delivery Plan) that are being taken or likely to be taken by Natural England, or another public body authority, with the aim of improving the conservation status of each identified environmental feature. Chapter 4 in this Environmental Delivery Plan provides an overview of other measures that are being taken or likely to be taken by Natural England or another public authority, as required under Section 63(7). Refer to Chapter 4 for further information on the other measures that were excluded from the long list of measures.

147. The measures that were scored as red for more than one criteria were discounted, with the exception of one measure (removal, modification or bypassing structures in rivers) which was not discounted due to its high potential for local and system level benefits. A full summary of the rationale for discounting and selecting measures is provided in the final column of Table 6.

Table 6: Assessment of long list of measures to identify (i) conservation measures and (ii) alternative measures that were considered but discounted, presented as a scorecard. See Annex 6A for details of the assessment criteria

Measure	Strength of evidence base	Addition-ality	Ease of implement-ation	Whole life cost	Maintenance requirements	Environ-mental risk	Local and system-level benefits	Outcome and rationale for decision
Beaver introduction – releasing wild beavers	N/A	Red	Red	N/A	N/A	N/A	Green	**Discounted** – Despite high potential to deliver local and system-level benefits, this measure is discounted due to low additionality and low ease of implementation. This measure is not additional because beavers are already present on the River Wensum. Ease of implementation is low because of requirements including extensive feasibility assessments and a wild release licence.
Biomanipulation – targeted manipulation of fish communities	Amber	Amber	Amber	Red	Red	Green	Green	**Discounted** – Despite high potential to deliver local and system-level benefits and low environmental risks, this measure is discounted due to high whole life cost and high long-term maintenance requirements. Frequent intervention is likely required to maintain the effect of the measure due to high hydrological connectivity in the Broads which may

Measure	Strength of evidence base	Addition-ality	Ease of implement-ation	Whole life cost	Maintenance requirements	Environ-mental risk	Local and system-level benefits	Outcome and rationale for decision
								promote recolonisation by fish species that have been removed.
Combat saline intrusion – improving flood defence infrastructure to prevent tidal surges	N/A	Amber	Red	Red	N/A	N/A	Green	**Discounted** – Despite high potential to deliver local and system-level benefits, this measure is discounted because of low ease of implementation and high whole life cost. This is due to the requirement for hard engineering approaches such as strengthening flood walls and installing flood barriers.
Deer management* - managing deer species type and population numbers to reduce pressure on habitats	Amber	Amber	Amber	Green	Red	Green	Green	**Conservation measure** – This measure is deliverable, has a low whole life cost and limited identified environmental risks. The measure has high potential to deliver local and system-level benefits as it would address pressure on habitats in the Broads caused by local deer populations.
Fen-type wetland habitat creation/ restoration - creation or	Amber	Amber	Amber	Amber	Amber	Green	Green	**Conservation measure** – This is a deliverable measure with limited identified environmental risk. The measure has high potential to deliver

Measure	Strength of evidence base	Addition-ality	Ease of implement-ation	Whole life cost	Maintenance requirements	Environ-mental risk	Local and system-level benefits	Outcome and rationale for decision
restoration of fen habitat, reedbeds and/or restoration or extension of littoral margin/ecotone								local and system-level benefits as it would support restoration of the fen-type wetland habitat mosaic.
Fen-type wetland habitat management by vegetation management and biomass removal	Green	Amber	Green	Green	Red	Amber	Green	**Conservation measure** – This is a deliverable measure with a strong evidence base. The measure has high potential to deliver local and system-level benefits as it would support sustainable management of vegetation in fen-type wetlands, addressing a current challenge in the Broads.
Lake chemical precipitation – adding chemical agents to bind and settle nutrients	Amber	Green	Amber	Red	Red	Amber	Red	**Discounted** – This measure is discounted due to high whole life cost and high long-term maintenance requirements. This is because repeated intervention is likely to be required to maintain effectiveness. Overall evidence for long-term effectiveness at the lake scale is limited.

Measure	Strength of evidence base	Addition-ality	Ease of implement-ation	Whole life cost	Maintenance requirements	Environ-mental risk	Local and system-level benefits	Outcome and rationale for decision
Lake flushing – opening hydrological pathways to reduce nutrient residence times	Amber	Green	Red	Red	Amber	Amber	Red	**Discounted** – This measure is discounted due to high whole life cost, low ease of implementation and limited potential to deliver local and system-level benefits.
Lake sediment removal – removing a layer of nutrient-rich sediment from the lakebed	Amber	Amber	Amber	Red	Red	R ed	Amber	**Discounted** – This measure is discounted due to high whole life cost, high maintenance requirements and high environmental risk. It is likely to require repeated intervention to maintain effectiveness. There are high potential environmental risks associated with damage to benthic vegetation.
Land use change to semi natural habitat – securing cessation of artificially fertilised agricultural land	Amber	Amber	Amber	Green	Green	Green	Green	**Conservation measure** – This is a deliverable and low-cost measure with low long-term maintenance requirements and low environmental risks.

Measure	Strength of evidence base	Addition-ality	Ease of implement-ation	Whole life cost	Maintenance requirements	Environ-mental risk	Local and system-level benefits	Outcome and rationale for decision
Removal, modification or bypassing structures in rivers – including culverts, mills, weirs and sluices	Amber	Amber	Red	Red	Green	Amber	Green	**Conservation measure** – Despite high initial cost and low ease of implementation, this measure is self-sustaining after implementation therefore has low maintenance requirements. On balance, high potential for local and system-level benefits are considered to outweigh these initial costs and implementation requirements.
Restore hydrological function – modifying, blocking, or removing artificial drainage features including catch dykes, ditches and drains	Green	Amber	Green	Green	Green	Green	Green	**Conservation measure** – This is a deliverable measure with a strong evidence base, low long-term maintenance requirements and low identified environmental risk. This measure has high potential to deliver local and system-level benefits due to its capacity to restore natural hydrological regimes.
Riparian buffer strips to intercept	Green	Amber	Amber	Amber	Red	Green	Red	**Discounted** – This measure has high maintenance requirements to ensure long-term effectiveness including

Measure	Strength of evidence base	Addition-ality	Ease of implement-ation	Whole life cost	Maintenance requirements	Environ-mental risk	Local and system-level benefits	Outcome and rationale for decision
nutrients from agriculture								vegetation and sediment removal. Whilst this measure has a strong evidence base and limited identified environmental risk, it has low local and system-level benefits because it does not align with the priority to restore ecosystem structure, function and resilience at the habitat scale.
River restoration (channel and floodplain functioning) – restoring functioning riparian habitat, floodplain habitat and hydrologically and morphologically functioning river	Green	Amber	Amber	Red	Amber	Amber	Green	**Conservation measure** – This is a deliverable measure with a strong evidence base. It has high potential to deliver local and system-level benefits by benefiting many attributes across the identified environmental features.
Tackle invasive non-native plant species identified in the Site	N/A	Amber	Red	N/A	Red	N/A	Amber	**Discounted** – This measure is discounted due to low ease of implementation and high maintenance requirements because

Measure	Strength of evidence base	Addition-ality	Ease of implement-ation	Whole life cost	Maintenance requirements	Environ-mental risk	Local and system-level benefits	Outcome and rationale for decision
Improvement Plans								a high scale of delivery would be required for the measure to be effective.
Upgrade inefficient septic tanks and package treatment plants with more efficient package treatment plants	Amber	Amber	Green	Amber	Amber	Evidence gap	Red	**Discounted** – Whilst this measure has high deliverability, it is discounted due to low potential for local and system-level benefits. This is because it does not align with the priority to restore ecosystem structure, function and resilience at the habitat scale.

** NB: deer management was added as an additional measure for review following the first assessment of the draft programme of measures as part of the modified Delphi process. See chapter 7 for more information on this process.*

148. Conservation measures can also take the form of a request, by Natural England, that a condition of development may be imposed (s.61(10)). These kinds of measures have been included in the long list of measure as outlined in Table 7. However, additional tests have been applied to each planning condition measure to ensure these kinds of measures will be deliverable and effective.

149. The National Planning Policy Framework (Planning Conditions and Obligations, DM6)[44] sets out guidance to ensure any conditions and obligations are enforceable, precise and reasonable. As such, any potential planning conditions that could be used as a conservation measure were assessed to ensure they are enforceable, precise, and reasonable; they would be achievable by most developers, and in line with the National Planning Policy Framework and aims of this Environmental Delivery Plan.

150. Each measure in the long list of measures is either identified as a conservation measure or discounted at this point with a rationale for this decision in Table 7. Assessment of planning conditions and other conservation actions is further set out in Annex 6A, 6B and 6C.

Table 7: Long list of planning conditions measures assessed for using as conservation measures

Conservation measure	Conservation action	Outcome	Rationale for scoping of measure
Planning condition measure to secure non-mains drainage performance of developments for which it is impossible or unreasonable to connect a public foul sewer	Impose planning condition measure to secure non-mains drainage performance of developments for which it is impossible or unreasonable to connect a public foul sewer.	Conservation measure	Enforceable, precise, reasonable, and achievable.
Planning condition measure for water efficiency	Impose planning condition measure for water efficiency.	Discounted	Whilst enforceable, precise, achievable, current building regulations require new dwellings to achieve 110 litres per person per day (l/p/d), and the Local Plan policies for the relevant local planning authorities all require 110 l/p/d, therefore discounted as delivered by other means, and not required as part of the scope

Conservation measure	Conservation action	Outcome	Rationale for scoping of measure
			of this Environmental Delivery Plan.
Planning condition measure for construction phase controls - environmental	Impose planning condition measure for construction phase controls – environmental.	Discounted	Not within the scope of this Environmental Delivery Plan due to the localised effect, which is prevented by the 50m excluded area around protected sites.
Planning condition measure for construction phase controls - drainage	Impose planning condition measure for construction phase controls – drainage.	Discounted	Not within the scope of this Environmental Delivery Plan due to the localised effect, which is prevented by the 50m excluded area around protected sites.
Planning condition measure for Sustainable Drainage Systems (SuDS)	Impose planning condition measure for SuDS.	Discounted	SuDs conditions could not be applied to all developments in this Environmental Delivery Plan (such as small or brownfield sites), therefore have been discounted as a blanket measure. SuDS provision is embedded in national planning policy and is not an additional conservation measure that could be uniquely secured through the Environmental Delivery Plan. Policy F8 of the National Planning Policy Framework sets out more details about Sustainable Drainage Systems[45].
Planning condition measure for delayed occupation	Impose planning condition measure for delayed occupation.	Discounted	Not reasonable given the strategic nature of conservation measures in place as part of this Environmental Delivery Plan.

151. The outcome of Stage 1, as presented in Table 6 and Table 7, was an evidence review of 22 measures in total, of which six were planning condition measures. Only nine of these 22 measures were selected as conservation measures as these measures are based on robust evidence to provide confidence the measures taken forward to Stage 2 are realistic and effective. Note, two measures (upgrades to wastewater treatment and agricultural management measures) were screened out of the long list of measures and not reviewed in Stage 1 as they are considered measures delivered by other public authorities and previously addressed in Chapter 4.

Stage 2: Appropriate prioritisation of conservation measures

152. Based on Stage 1, Natural England has determined a list of conservation measures for this Environmental Delivery Plan. These are detailed in Table 8 below.

153. This table categorises the measures as either avoidance, mitigation or compensation measures in accordance with Regulations 3(4) of the Appropriate Prioritisation Regulations 2026 (see Table **5**).

- No avoidance measures have been identified under this Environmental Delivery Plan. This reflects the nature of the negative effect of nutrient pollution, which arise from population growth associated with site occupation and land use change resulting from the development, both of which are inherent consequences of development.
- All conservation measures are defined as compensation measures, with the exception of one conservation measure to be requested as a planning condition which is a mitigation measure.

154. In accordance with Regulation 3(1), Natural England has prioritised the sole available mitigation measure, with all remaining measures identified as compensation measures. This Environmental Delivery Plan adopts a precautionary approach to the application of the Appropriate Prioritisation Regulations 2026 by treating measures as compensation unless there is clear evidence that they meet the definition of mitigation. However, Natural England recognises that conservation measures delivered strategically to intercept nutrient loads before they reach the identified environmental features may, in some circumstances, be considered mitigation rather than compensation.

155. In accordance with Regulation 3(3), Table 8 sets out the extent that these conservation measures deliver value for money using evidence summarised in Table 6. Value for money is a broad concept and Natural England, in considering its approach, has had regard to the principles in Managing Public Money[46]. The following criteria have been used:

- Whole-life cost, including all necessary after-care: Evidence on the likely cost of implementing, securing and maintaining each type of conservation measure for 100 years was collected as part of an evidence review in the early stages of developing this Environmental Delivery Plan. The evidence review used Natural England's understanding of, and commissioned work on, local land values with information and knowledge of upfront costs and

subsequent maintenance works to arrive at indicative costs for each conservation measure. An indicative cost of each conservation measure is outlined in Table 6 as either green, amber or red to reflect low, medium or high costs, respectively.

- Effectiveness of conservation measures: The effectiveness of conservation measures has been determined with reference to evidence review (undertaken in Stage 1) (see Annex 6A) and is detailed further at Annex 7B.
- Opportunity to deliver conservation measures: Conservation measures that have less suitable habitat in the Environmental Delivery Plan area to deliver the conservation measure are likely to bring higher implementation costs, due to the scarcity of suitable locations. Therefore, ensuring there is sufficient scale of opportunity in the Environmental Delivery Plan area to deliver each conservation measure is an important factor in assessing the deliverability, potential ecological effectiveness and value for money. Information was collated from river restoration strategies and Norfolk's Local Nature Recovery Strategy Local Habitat Map, alongside internal modelling to understand and, where possible, calculate the scale of opportunity for each conservation measure.

156. Other considerations: Other factors that, in the circumstances, are relevant. For example, co-benefits (perspective of additional gain to society), environmental risks, implementation barriers et cetera.

157. Further information may be found in Annex 6C.

Table 8: The list of conservation measures, a description of each conservation measure, categorisation as mitigation or compensation and subsequent value for money assessment.

Conservation measure	Description of measure	Avoidance / Mitigation / Compensation	Regard to Value for Money (VfM)
Planning conditions on the performance of non-mains drainage for new development	There is a wide range in treatment efficiency performance of non-mains drainage systems on the market. Some do not include wastewater treatment techniques designed to reduce nutrients. Securing high-performance standards for non-mains drainage systems reduces nutrient inputs at source, from otherwise dispersed and difficult-to-regulate sources. This protects both groundwater and surface water pathways and contributes to improved ecological condition of the environmental feature. This condition ensures any new systems will have a discharge concentration of 5 mg/l for Total Phosphorus and 27 mg/l for Total Nitrogen or lower, and a maintenance plan in place.	Mitigation	Cost – There are no costs to Natural England associated with this measure. Effectiveness – There is evidence to show measurable improvements to wastewater treatment delivered through this measure on some developments permitted under this Environmental Delivery Plan will provide direct benefits to all the identified environmental features. Opportunity – N/A Other considerations – The benefits from this measure have been assessed by comparing the additional improvement in standard of water treatment against the standard required by regulators, to ensure the benefits delivered are additional. Conclusion – On balance, this measure is highly effective at improving the environmental features, has no implementation costs for Natural England and brings low environmental risks which presents excellent value for money.

Land use change to semi-natural habitat not associated with wetland (in wider catchment)	Land use change takes intensively managed agricultural land in the most polluting areas of a catchment out of agricultural production, converting them to semi-natural habitat. This measure reduces nutrient pollution and sediment losses by stopping application of fertilisers, manure, slurry, or stopping or significantly reducing livestock numbers. This prevents runoff from entering nearby waterways, stabilises soil and over time allows soils and vegetation to naturally take up excess nitrogen and phosphorus.	Compensation	Cost – Findings are from Natural England's previous work delivering land use change sites, which identify medium initial costs to implement this measure and minimal costs for its long-term maintenance. Effectiveness – This measure is effective at reducing nutrient and sediment loads from agricultural land, which can improve the chemical component of structure and function of multiple environmental features (including the open water features). It can also potentially improve water retention, providing some improvements to the hydrological component. Opportunity – Suitable criteria were identified to scope the scale of opportunity to implement this measure in the Environmental Delivery Plan area. The results from Natural England's modelling found there is 5,196 ha, 1,475ha and 10,819ha in the Yare, Bure and Wensum catchments, respectively, and this shows there is plenty of opportunity to implement this measure. Other considerations – Minimal other environmental risks are likely to result from land use change and multiple additional co-benefits can be provided for nature networks and local communities through careful design of this measure. Conclusion – On balance, this measure has a moderate cost and is highly effective at improving key components of the environmental features. Thereby it offers very good value for money. This is especially the case given the large scale of opportunity in the Environmental Delivery Plan areas, minimal environmental risks associated with this measure and potential additional benefits this measure can deliver for the public.

Conservation measure	Description of measure	Avoidance / Mitigation / Compensation	Regard to Value for Money (VfM)
Catch-dyke remediation or other significant hydrological restoration (on site)	This measure restores natural or near-natural hydrological function by altering or reversing artificial drainage. This includes modifying ditches and dykes, removing artificial drainage features, or restoring springs and seepages. This measure slows the flow of water, allowing the landscape to act as a natural filter that processes nutrients, reducing diffuse nutrient pollution in waterways.	Compensation	Cost – This measure has low upfront cost, but ongoing maintenance is likely to be required in the short to medium term. This will result in moderate overall costs. Effectiveness – Hydrological restoration measures such as catch-dyke remediation are effective at restoring natural hydrological pathways. This helps to restore habitat condition and supports ecological processes, which has the potential to benefit all components of structure and function (see Annex 7B). Opportunity – An investigation into the management of catch dykes in the Broads[75] identifies future management options and remedial actions for the existing catch dykes in the Broads and shows sufficient opportunity to implement this conservation measure. Conclusion – On balance, this measure has moderate costs and is likely to be highly effective therefore offering good value for money.

Conservation measure	Description of measure	Avoidance / Mitigation / Compensation	Regard to Value for Money (VfM)
Deer management	This measure aims to maintain deer populations at levels that can reduce ecological damage on the identified environmental features. This measure addresses damage caused by high numbers of certain deer species in The Broads. This will be achieved by targeted deer culling, coordinating action across the wider landscape, and use of fencing where appropriate. By reducing pressure from deer on wet woodland, fen and reedbed habitats, as well as the banks of open water habitats, this measure can reduce trampling and damage to vegetation. It can also reduce browsing pressure on young trees and shrubs, with the aim of preserving seedings and coppice for regrowth, improving the structure of woodland habitat.	Compensation	Cost – This measure has low initial cost but relatively high maintenance requirements in the medium to long term. Effectiveness – Coordinated deer management is effective at reducing browsing and trampling pressure where it is implemented at sufficient scale. This is particularly beneficial for the wet woodland feature, where it can improve tree and shrub regeneration, ground-layer diversity, woodland-edge vegetation, soil stability and structural complexity. Opportunity – N/A Other considerations – Delivery will have regard to animal welfare and animal sentience, ensuring that any management actions are evidence-based, proportionate, legally compliant, and implemented using legally recognised best practice methods. Conclusion – On balance, this measure is supported by strong evidence on its effectiveness and is low cost, showing it offers value for money.

Conservation measure	Description of measure	Avoidance / Mitigation / Compensation	Regard to Value for Money (VfM)
Fen-type wetland creation and restoration	Fen-type wetland habitat creation and restoration involve re-establishing permanently or seasonally waterlogged, peat-forming ecosystems including fens, swamps, reedbeds and fen meadows. By raising water tables and managing hydrology to restore-near natural hydrological conditions, this measure restores mineral-rich wetlands that support unique biodiversity, sequester carbon, and naturally manage flood risks.	Compensation	Cost – This measure has moderate upfront costs and low maintenance costs in the short to medium term. Therefore, the overall cost of this measure is moderate to high. Effectiveness – Fen-type wetland creation and restoration is effective at re-establishing functioning wetland systems, addressing key components of ecosystem condition, including habitat extent, connectivity, nutrient processing and resilience. Where delivered contiguous to existing fen-type wetlands, this measure directly enhances the structure and ecological function of the habitat. When delivered off-site, this measure contributes to the wider ecological network. Opportunity – Through the mapping of suitable fen-type wetland habitat, Norfolk's Local Nature Recovery Strategy Local Habitat Map identifies sufficient scale of opportunity for implementing this conservation measure, specifically calculating there is 412ha and 1107ha in the Bure and Yare catchments, respectively. Other considerations – The evidence review identified limited environmental risks with using this measure. Conclusion – All in this measure offers value for money, despite the moderate to high costs associated. The additional beneficial effects come from improving the environmental features by ensuring the conservation measure is hydrologically and ecologically connected to existing habitat. This is further confirmed through the large scale of opportunity in the Environmental Delivery Plan area to deliver this measure with limited environmental risks.

Conservation measure	Description of measure	Avoidance / Mitigation / Compensation	Regard to Value for Money (VfM)
Fen-type wetland habitat management (on-site)	This measure maintains and enhances existing fen-type wetland habitats by vegetation management and biomass removal. Management of fen-type wetland relies on low-intensity grazing and rotational cutting with removal and disposal of arisings off site. Removal of arisings from the site lowers the amount of nutrients in the system. This measure helps to maintain diverse habitats, sustain characteristic vegetation communities, protect peat soils, and prevent the site from turning into dry scrub or woodland.	Compensation	Cost – This measure has low upfront costs but high maintenance requirements over 100 years so overall the costs are moderate. Effectiveness – Fen-type wetland management is effective at maintaining and enhancing habitat structure and ecological condition. This will help sustain characteristic vegetation communities and prevent succession, preserving habitat quality. In addition, removal of biomass contributes to nutrient reduction. Overall, this will improve the chemical and physical components of structure and function of the fen-type wetland features, with co-benefits for the wet woodland and open water features. Opportunity – There is 395 hectares of existing fen-type wetland habitat on site that is currently not in favourable condition[47]. By delivering on site, this measure will deliver the greatest benefit by maintaining and enhance habitat structure and ecological condition. Other considerations – There are minimal risks associated with this measure. Conclusion – On balance, the moderate cost of this measure and suitable scale of opportunity available to deliver positive impacts on the environmental features means this measure, with a strong evidence base of its effectiveness, offers good value for money.

Conservation measure	Description of measure	Avoidance / Mitigation / Compensation	Regard to Value for Money (VfM)
Land use change to semi-natural habitat contiguous with wetland creation	Land use change converts agricultural land in the areas contiguous with the protected sites or restored wetland habitats to semi-natural habitat type that extend the opportunity for transition habitats to form. This measure significantly improves ecological connectivity, enhances buffering capacity for the wetland habitat and supports wider habitat networks, which contributes to improved resilience and supports the long-term condition of environmental features. This measure can also moderately reduce nutrient pollution and sediment losses by stopping application of fertilisers, manure, slurry, or stopping or significantly reducing livestock numbers, in some cases.	Compensation	Cost – Findings from Natural England's previous experience delivering land use change sites identify medium initial costs to implement this measure and low to minimal costs for its long-term maintenance. Effectiveness – When contiguous with the protected sites, restored or created fen-type wetlands, land use change is effective at restoring transition habitat and supporting ecological processes operating within wetland systems. This can improve ecological connectivity, enhance buffering capacity and support wider habitat networks. When sited in areas that are hydrologically or ecologically connected to protected sites and fen-type wetland habitat, this will be beneficial to all components of structure and function. Opportunity – Opportunities will be assessed on a site-by-site basis before wetland creation is undertaken, targeting wetland creation on sites where contiguous land use change can be secured. Other considerations – Minimal other environmental risks are likely to result from land use change, and multiple additional benefits can be provided for local nature networks and communities through careful design of this measure. Conclusion – When considered together, the low to moderate cost of this measure and the strong evidence showing its effectiveness at delivering beneficial ecological outcomes for environmental features, means this measure offers good value for money.

Removal or modification of structures (weirs, culverts, impoundments)	Removal or modification of in-channel structures that alter natural flow conditions helps to restore a watercourse to a more natural, free-flowing state. This measure removes, modifies, or bypass a structure such as a weir, culvert or impoundments. This helps process excess nutrients to improve water quality, and has direct benefits by restoring natural flow regimes, removing impoundments, improving longitudinal connectivity and enabling more natural sediment transport.	Compensation	Cost – The measure has high initial costs but no long-term maintenance requirements following initial establishment phase making the overall cost moderate. Effectiveness – Removing, modifying or bypassing structures in rivers, when combined with river restoration, is effective at restoring the river's physical and hydrological functioning, improving the hydrological and physical components of structure and function of the river feature. Additionally, this can benefit riparian vegetation and habitat suitability for Desmoulin's whorl snail. Opportunity – The River Wensum Restoration Strategy[48] identifies 14 redundant mill structures in the River Wensum where modification or removal of some structures would help achieve the Special Area of Conservation's conservation status, showing sufficient opportunity to deliver this type of conservation measure. Other considerations – Greater environmental risks are associated with this measure's implementation which can be managed through careful design, risk management and early collaboration with regulators. This measure can be hard to implement highlighting some possible delivery constraints. Additional consents or licenses will usually be required, including an environmental permit and licence to impound water from the Environment Agency[49,50]. Planning permission may also be required depending on the nature, scale and location of the works. Conclusion – On balance, the moderate cost of this conservation measure combined with its high level of potential effectiveness at benefiting the ecological processes and subsequently improving environmental features offers good value for money, despite potential environmental risks and implementation delays that may result if the measure is poorly designed or implemented.

Conservation measure	Description of measure	Avoidance / Mitigation / Compensation	Regard to Value for Money (VfM)
River restoration (channel and floodplain functioning)	This measure restores reaches of river by improving natural hydrological functioning of both the channel and its floodplain. Specific actions, that will be tailored to the site, could include restoring natural channel morphology, narrowing overwide rivers, removing embankments, and restoring the riparian margin. Re-establishing the connection between a river and its floodplain combats nutrient pollution through hydrological, physical, biological and chemical processes. Restoration of channel form and floodplain connectivity enhances habitat diversity, supports natural flow variability, improves sediment dynamics and contributes to improved water quality.	Compensation	Cost – This measure has high initial costs and will require maintenance into the short to medium term. Effectiveness – River restoration, combined with structure removal, is effective at restoring the physical structure and hydrological functioning of the river, improving the hydrological and physical components of structure and function of the river feature. This measure can also benefit the biological component by improving connectivity and spawning habitat for fish, and the chemical component by increasing nutrient cycling and reducing siltation. Opportunity – The River Wensum Restoration Strategy (cited above) identifies 55 kilometres of river habitat where a river restoration measure would be considered suitable. Other considerations – Evidence indicates multiple co-benefits are likely to result from this conservation measure by improving multiple physical and hydrological processes achieved through reconnecting the river to its floodplain and restoring natural function. Conclusion – On balance, the high initial costs of this measure will be offset by the high level of confidence the evidence provides in the effectiveness of this measure at not only improving the conservation status of the relevant environmental features but also the wider co-benefits the measure is likely to create.

Stage 3: Programme of conservation measures and backup conservation measures

Developing a programme of conservation measures

158. Following the above prioritisation process, an initial programme of the primary conservation measures was developed by Natural England, using subject-matter and local expertise to inform the scale of delivery required to achieve the intended ecological outcome and indicative costs, drawing on Natural England's evidence review and opportunity mapping.

159. In developing the programme, account was taken of the differing functions of individual measures, recognising that some interventions deliver benefits across multiple features and conservation status components, while others provide more targeted benefits to individual identified environmental features or to specific components of conservation status. This helped ensure that the final programme maximised ecological gains and overall effectiveness.

160. A two-stage process was used to assess the negative effect of the maximum amount of development included in the Environmental Delivery Plan, and the beneficial effect of the programme of conservation measures. This involved the preparation of a draft programme of conservation measures and draft feature assessments which were subject to expert evaluation (see Chapter 7). This process 'stress-tested' the programme of primary conservation measures against the negative effect of development to ascertain whether they were likely to materially outweigh the negative effect.

161. The expert evaluation process assessed the draft programme of measures providing a vital reference point from which the final programme of conservation measures was produced. The final programme of conservation measures, as set out in Table 9, has been assessed by Natural England and is considered to meet the Overall Improvement Test.

Cost of conservation measures

162. In accordance with Section 61(9)(a), Table 9 details the anticipated cost range per quantum for each conservation measure, with a reasonable level of prudence contained within the figures where uncertainty exists.

Maintenance of conservation measures

163. In accordance with Section 61(9)(b), Table 9 details how the conservation measures are to be maintained.

164. Natural England considers that conservation measures need to address the environmental impact of nutrient pollution arising from urban wastewater from Environmental Delivery Plan development. A period of 100 years maintenance allows the conservation measures to address the environmental impact of Environmental Delivery Plan development. The environmental impact from housing is likely to continue for as long as the housing is occupied and generating wastewater discharges and/or surface water runoff. The period of occupation in any particular case may

depend on many factors, including build quality, macroeconomic and cultural issues, as well as the ability of owners from time to time to repair or upgrade their properties. Having regard to these variables, and the need for a standard approach within the Environmental Delivery Plan, Natural England considers that the period of 100 years maintenance is an appropriate and reasonable period to enable the conservation measures to reach ecological maturity to address the environmental impact of the Environmental Delivery Plan development.

Deliverability

165. In developing the programme, consideration has been given to the availability of suitable habitat and delivery opportunities for each measure type. The scale of intervention has been set proportionately to ensure deliverability, with no individual conservation measure exceeding 15% of the total extent of suitable habitat available within the Environmental Delivery Plan area, with the exception of fen-type wetland management - this threshold has been set at 50% which is considered to be an achievable quantum given the measure is management of an existing habitat. This approach ensures that the programme remains realistic and achievable while making a meaningful contribution to the condition and resilience of the protected site features.

166. No network compensation measures are included in the programme of conservation measures with all measures proposed in the Bure, Wensum or Yare catchment areas.

Table 9: Programme of conservation measures to be taken in this Environmental Delivery Plan period, including quantum required, anticipated cost bands, maintenance required (s.61(9)(b)) and figures on the percentage of available opportunity used.

Conservation measure	Quantum required	Anticipated cost range per quantum	Scale of opportunity represented as a % of available land used by the measures required under this Environmental Delivery Plan	Maintenance of conservation measures
Fen-type wetland habitat creation & restoration BURE	18 hectares (ha)	£50,000-£75,000 per ha	The quantum required equates to 4% of land suitable for creation and restoration of this habitat.	Maintenance will require an adaptive, water-first approach focused on sustaining a high water table and controlling aggressive vegetation. More frequent maintenance is likely to be required in the early years of delivery leading to less frequent maintenance over time.
Land use change to semi-natural habitat BURE	18ha contiguous with wetland creation/restoration	£25,000-£50,000 per ha	The quantum required will be delivered in areas suitable for wetland habitat creation or restoration where contiguous land use change can also be secured.	Legal agreement will secure cessation of agriculture for 100 years. Ongoing maintenance is required and this is dependent on the type of habitat being created or restored.
Land use change to semi-natural habitat BURE	30ha not associated with any wetland	£25,000-£50,000 per ha	The quantum required represents roughly 2% of the total extent of agricultural land within the catchment	Legal agreement will secure cessation of agriculture for 100 years. Ongoing maintenance is required and this is dependent on the type of habitat being created or restored.

Conservation measure	Quantum required	Anticipated cost range per quantum	Scale of opportunity represented as a % of available land used by the measures required under this Environmental Delivery Plan	Maintenance of conservation measures
			identified as having a high nutrient export coefficient.	
Fen-type wetland habitat creation & restoration YARE	91ha	£50,000-£75,000 per ha	Quantum required equates to 8% of land suitable for creation and restoration of this habitat.	Maintenance will require an adaptive, water-first approach focused on sustaining a high water table and controlling aggressive vegetation. More frequent maintenance is likely to be required in the early years of delivery leading to less frequent maintenance over time.
Land use change to semi-natural habitat YARE	91ha contiguous with wetland creation/restoration	£25,000-£50,000 per ha	The quantum required will be delivered in areas suitable for wetland habitat creation or restoration where contiguous land use change can also be secured.	Legal agreement will secure cessation of agriculture for 100 years. Ongoing maintenance is required and this is dependent on the type of habitat being created or restored.
Land use change to semi-natural habitat YARE	256ha not associated with any wetland	£25,000-£50,000 per ha	The quantum required represents less than 1% and roughly 2% of the total extent of agricultural land within the catchments identified as having a high nutrient export	Legal agreement will secure cessation of agriculture for 100 years. Ongoing maintenance is required and this is dependent on the type of habitat being created or restored.

Conservation measure	Quantum required	Anticipated cost range per quantum	Scale of opportunity represented as a % of available land used by the measures required under this Environmental Delivery Plan	Maintenance of conservation measures
	- 19ha delivered in the Yare sub-catchment - 237ha delivered in the Wensum sub-catchment.		coefficient in the Yare and Wensum, respectively.	
Catch-dyke remediation or similarly significant hydrological restoration YARE	500m onsite or contiguous with the site.	£10,000 - £25,000 per 100 metres	Quantum needed is expected to be less than 15% of total extent catch-dyke systems in the catchment.	Maintenance will focus on low-intervention, rotational cycle to preserve hydrological connectivity and prevent rapid plant succession.
Fen-type wetland habitat management YARE	162ha of existing Fen-type wetland	£10,000 - £25,000 per ha	Quantum needed represents 50% of the current on-site fen-type wetland habitat not in favourable condition.	Maintenance will focus on managing a mosaic of fen, reedbed or wetland and, where needed, removing tree and scrub and control invasive species.
Deer management	At least 3700 ha, focused on the Yare	£175,000 - £200,000	N/A	Maintenance will focus on sustaining reduced deer population numbers by monitoring

Conservation measure	Quantum required	Anticipated cost range per quantum	Scale of opportunity represented as a % of available land used by the measures required under this Environmental Delivery Plan	Maintenance of conservation measures
YARE AND BURE	and Bure protected sites with a 500m buffer.	per annum for 0 - 20 years, £25,000 - £50,000 per annum for 21 – 100 years.		population size and dynamics in the protected sites, and by assessing the extent of vegetation recovery, to ensure future deployment of deer management measures deliver beneficial ecological effects to the identified environmental features.
Removal or modification of structures (weirs, culverts and impoundments WENSUM	1 structure on the river Wensum	£400,000 - £425,000 per structure	Quantum needed equates to 7% of available redundant structures on the River Wensum.	Legal agreement will secure removal or modification of structure. No ongoing maintenance is required.
River restoration (channel and floodplain functioning)	1km reach of river Wensum.	£1,250,000 – £1,300,000 per km	Quantum needed equates to 2% of available reaches.	Maintenance will ensure natural geomorphic and ecological processes are present to self-sustain the river quality. More frequent maintenance is likely to be required in the early

Conservation measure	Quantum required	Anticipated cost range per quantum	Scale of opportunity represented as a % of available land used by the measures required under this Environmental Delivery Plan	Maintenance of conservation measures
WENSUM				years of delivery leading to minimal maintenance over time.
Fen-type wetland habitat creation & restoration WENSUM	10ha	£50,000-£75,000 per ha	Quantum required equates to 1.3% of land suitable for creation and restoration of this habitat.	Maintenance will require an adaptive, water-first approach focused on sustaining a high water table and controlling aggressive vegetation. More frequent maintenance is likely to be required in the early years of delivery leading to less frequent maintenance over time.
Planning conditions ALL	Every dwellinghouse using the Nature Restoration Fund where it is not feasibly possible to connect to mains drainage	£0	N/A	Mitigation measures that will be secured via planning conditions imposed by local planning authorities.

Back-up conservation measures

167. Back-up conservation measures are those measures which are not expected to be required at the point the Environmental Delivery Plan is made, but which must be implemented if the Environmental Delivery Plan's programme of monitoring suggests this to be necessary (see Chapter 9), in accordance with Section 61(7) of the Planning and Infrastructure Act.

168. The Environmental Delivery Plan includes back-up measures to ensure that, if the primary conservation measures do not perform as expected, there remains a clear and deliverable pathway to achieving the Overall Improvement Test. Back-up measures may be required where monitoring indicates that selected measures are not effective, or where there is a risk that the Environmental Delivery Plan will not achieve the required overall improvement and this cannot be addressed through adjustment of the existing measures.

169. Prior to implementing back-up measures, Natural England will first consider whether adjusting the existing programme of primary conservation measures would provide a more effective solution, provided that such changes would not materially affect the conclusions of the Overall Improvement Test.

170. Measures identified as primary conservation measures are also in the list of back-up conservation measures because there is an expectation that additional delivery of these conservation measures may be required if monitoring of the effectiveness of these measures indicates a need for implementing back-up measures.

171. The back-up measures are listed below. Each back-up measure also forms part of the suite of primary conservation measures. As the delivery of any primary conservation measure would utilise no more than 15% of the total identified opportunity for that measure, except for fen-type wetland management which requires 50%, sufficient remaining opportunity is expected to be available to implement the back-up measures if required, as demonstrated by the opportunity mapping described in Table 8 and Table 9.

- Fen-type wetland creation and restoration;
- River restoration (channel and floodplain function);
- Hydrological restoration measures;
- Removal or modification of in-river structures;
- Land-use change to semi-natural habitats in wider catchment;
- Land-use change to wetland habitats contiguous with the site;
- Management of fen-type wetland habitats;
- Deer management.

Stage 4: Sequencing and delivery of conservation measures

172. This section sets out the anticipated sequencing and delivery of conservation measures to be delivered through the Environmental Delivery Plan which is based on three phases of delivery that is aligned to the scale of development anticipated to come forward (see Table 10).

173. The sequencing has been informed by the functional assessment, spatial analysis, deliverability, whole life cost of measure and the time required for measures to become effective. This has been informed by local expertise, site-specific knowledge, and an understanding of how individual measures contribute to different aspects of conservation status.

174. The approach to sequencing of conservation measures includes:

- the implementation of the mitigation conservation measure will be applied to all relevant development in each phase;
- consideration of the ease of implementation and time until effectiveness of different conservation measures;
- consideration of the compounding benefits resulting from simultaneous delivery of different conservation measures to maximise value for money offered by potential synergistic effects.

175. Natural England is mindful of the complexities that may unfold during the implementation phase and does not therefore consider the sequencing in Table 10 to be fixed.

176. In summary, measures that are more complex to deliver, or require longer lead-in times to achieve ecological benefit have been prioritised for implementation in the earlier phases and will be delivered as the required funding becomes available through developer contributions or alternative funding avenues. Measures with fewer deliverability constraints, and where there is an established track record of successful implementation, have been scheduled for later phases. This phased approach ensures early action is taken where it is most critical to secure timely ecological benefits by the end of the Environmental Delivery Plan period, while maintaining flexibility and efficiency in delivery over the lifetime of the Environmental Delivery Plan.

Table 10: Anticipated sequencing of conservation measures into three phases

Phase	Conservation measures	Location	Rationale for sequencing
Phase 1 – first 5,000 homes	Planning condition to secure standard water treatment rates on non-mains drainage	Yare, Wensum, Bure	This mitigation measure will be applied to all relevant development in this phase.
	Land use change (wider catchment) – 237 ha	Yare	This measure delivers a large-scale of land use change in the first phase to provide direct nutrient reductions to the site. Although this measure is easier to deliver, it is integral to deliver direct nutrient reductions to the site's environmental features early utilising opportunities created by local partners.
	Deer management project – 3,700 ha	Yare and Bure	Early delivery of deer management in these locations will ensure beneficial ecological outcomes are realised, improving the environmental features earlier on in the Environmental Delivery Plan period. This will help manage future negative nutrient impacts from development using this Environmental Delivery Plan by increasing site resilience.
	River Restoration – 1km	Wensum	This measure will be implemented at an early stage to allow sufficient time for channel adjustments, geomorphological processes and ecological communities to establish and settle, so the beneficial ecological effects are delivered within the Environmental Delivery Plan period.
	1x Weir Removal	Wensum	The combined delivery of river restoration and weir removal in the Wensum offer value for money when delivered in the same phase. This is by enabling synergistic effects to maximise hydrological and ecological benefits.
	Fen-type wetland habitat management	Yare	Management of fen-type wetland habitat will provide immediate benefit and direct to the identified features providing a quick win for the conservation status of the relevant environmental feature.

Phase	Conservation measures	Location	Rationale for sequencing
	(removal of arisings) – 162ha		
	Fen-type habitat creation / restoration – 18 Ha	Bure	Early delivery of this measure will provide sufficient time for habitat establishment within the Environmental Delivery Plan period.
Phase 2 – second 5,000 homes	Planning condition to secure standard water treatment rates on non-mains drainage	Yare, Wensum, Bure	This mitigation measure will be applied to all relevant development in this phase.
	Fen-type wetland creation/restoration – 91Ha	Yare	This measure is sequenced in Phase 2 following delivery of initial interventions, allowing wetland creation to build upon established hydrological and ecological improvements while providing sufficient time for habitat establishment.
	Hydrological restoration measures – 0.5km	Yare	The measures sequenced in Phase 2 alongside fen-type wetland habitat creation as hydrological restoration supports establishment and resilience of Fen-type habitat.
	Fen-type wetland creation/restoration – 10Ha	Wensum	This measure is sequenced in Phase 2 as a smaller habitat area is required within the Wensum catchment, whilst still providing sufficient time for establishment and delivery of the required ecological outcomes.
Phase 3 – third	Planning condition to secure standard water treatment rates on non-mains drainage	Yare, Wensum, Bure	This mitigation measure will be applied to all relevant development in this phase.

Phase	Conservation measures	Location	Rationale for sequencing
5,000 homes	Land-use change 19 Ha in wider catchment	Yare (some may be delivered in the Wensum sub-catchment)	Sequenced in Phase 3 as this measure has a shorter time until effectiveness making it suitable for a later phase. Natural England has an established track record of delivering this measure which reduces delivery constraints.
	Land-use change 91 Ha contiguous with wetland/site	Yare	Sequenced following wetland restoration measures in Phase 2 to provide buffering, enhance habitat connectivity and support the establishment of restored wetland habitats.
	Land-use change 30 Ha in wider catchment	Bure	Sequenced in Phase 3 as this measure has a shorter time-till effectiveness making it suitable for Phase 3. Natural England has an established track record of delivering this measure which reduces delivery constraints.
	Land-use change 18 Ha contiguous with wetland/site	Bure	Sequenced following wetland restoration measures in Phase 2 to provide buffering, enhance habitat connectivity and support the establishment of restored wetland habitats.

177. The design, implementation and establishment of each conservation measure in this Environmental Delivery Plan will be carefully developed in conjunction with regulators, including the Environment Agency, and in collaboration with local catchment partners to ensure conservation measures are implemented in suitable locations, and most importantly, in accordance with regulatory requirements. This will avoid conservation measure delivery creating damaging outcomes or additional environmental risks, such as flooding.

178. Natural England will use a variety of means to deliver, maintain and monitor conservation measures. The primary objectives for all conservation measure implementation will be to secure the desired environmental effect. In parallel with but not to the extent that this detracts from the primary purpose noted above or adds cost, Natural England will wherever possible secure opportunities to:

- promote strategic interventions at scale;
- deliver wider public benefits such as increasing public access to nature in communities;
- secure multiple environmental benefits on the same land, including opportunities to combine conservation measures in an Environmental Delivery Plan with payments for other environmental services where permitted by regulation and additionality tests;
- support local partnerships to empower local decision making;
- contribute to the goal of 30by30.

179. Conservation measures will be sourced in line with Natural England procurement policies and wider public procurement regulations. The main routes will be competitive procedure and direct award (where justifiable from a value for money perspective and compliant with applicable procurement law). There is also the potential for the use of grant schemes to be considered where there is a genuine rationale for the use of a grant.

180. Conservation measures will be established through several mechanisms, the choice of which will depend on the context and the type of conservation measure. These include but are not limited to:

- contracting for works and / or services as required to establish a conservation measure. This option can be used in combination with the following options;
- establishing a conservation measure on existing His Majesty's Government or Natural England land;
- acquiring land upon which to establish a conservation measure;
- acquiring a land-based agreement to establish a conservation measure.

181. Legal agreements will be required to ensure that selected measures taken by this Environmental Delivery Plan are secured for 100 years. The options for securing conservation measures will depend on the context and the type of conservation measure. The following are considered suitable:

- Conservation covenant agreements (Part 7 of the Environment Act 2021) – A form of statutory contract between a landowner and a responsible body, able to attach management obligations to land and binding on persons deriving title from the original covenantor. Although Natural England is registered as a responsible body[51], it is not required that Natural England act as the responsible body in every case.
- Planning obligations: Section 106 agreements or unilateral undertakings made under Section 106 of the Town and Country Planning Act 1990. A form of statutory contract between a landowner and a local planning authority, able to attach management obligations to land and binding on persons deriving title, from the original covenantor. For example, in relation to a land use change agreement.
- Agreements pursuant to Section 7 of National Environment Research Council Agreements (s7 NERC agreements) – A form of statutory contract available only to Natural England, designed to attach management obligations to land and binding on persons deriving title from the original covenantor. This has been used for Natural England's Nutrient Mitigation Scheme for long-term agreements with established conservation charities.

182. The legal agreements will set out how the conservation measures will be managed, monitored and maintained and how these obligations will be funded and enforced to ensure long-term compliance.

183. If necessary and as a last resort, Natural England may, where authorised by the Secretary of State, opt to use compulsory purchase powers to acquire land (Section 89) in order to take conservation measures. This removes full reliance on voluntary agreements to take conservation measures so essential land can be secured where voluntary acquisition is not possible.

184. To facilitate the delivery of conservation measures under Environmental Delivery Plans, changes are proposed to the Town and Country Planning (General Permitted Development) (England) Order 2015. A national grant of planning permission via permitted development rights to support the implementation and maintenance of conservation measures would allow Natural England, and operators on its behalf, to undertake specified development on a site relating to the implementation of an Environmental Delivery Plan and ongoing maintenance of that site. This would speed up the delivery of conservation measures which will deliver an earlier environmental benefit.

185. Additionally, the Planning and Infrastructure Act provides Natural England with statutory powers to support the implementation and oversight of conservation measures. Sections 83–85 enable entry to land, with or without a warrant, to survey and investigate sites. Section 95 imposes a duty of co-operation on public authorities, ensuring Natural England can obtain information and assistance to enforce obligations. Taken together, these provisions give Natural England the power to secure the implementation of conservation measures and to monitor the effectiveness of the conservation measures.

7 Overall Improvement Test

Statutory test

186. The Planning and Infrastructure Act section 65(3) sets out that the Secretary of State can only make an Environmental Delivery Plan if satisfied that it passes the Overall Improvement Test. The Government's interpretation of the Overall Improvement Test is set out in Annex 7A.

187. An Environmental Delivery Plan (EDP) passes the Overall Improvement Test if, by the EDP Plan end date, the effect of the conservation measures will materially outweigh the negative effect of the EDP development on the conservation status of each identified environmental feature and will maintain a favourable balance for as long as the development will be causing negative effects.

188. Section 65(5) states "the negative effect of the Environmental Delivery Plan development" means the effect, caused by the environmental impact, as identified in the Environmental Delivery Plan in accordance with section 61(1)(b), of the maximum amount of development to which the Environmental Delivery Plan may apply, as specified in accordance with section 60(5). The maximum amount of development to which the Environmental Delivery Plan may apply is 15,780 housing units.

189. The judgement of whether the effect of conservation measures will materially outweigh negative effect and retain a favourable balance is a matter of expert understanding, to be applied rationally and reasonably in light of the circumstances and evidence available at the time when the decision falls to be taken. Natural England and the Secretary of State will take account of the best available scientific evidence.

190. The Overall Improvement Test must be passed in relation to each identified environmental feature, but the extent to which the effect of conservation measures must materially outweigh the negative effect of the Environmental Delivery Plan development need not be the same for each of those features. Natural England considered what extent of improvement constitutes a material outweighing on a feature-by-feature basis when preparing this Environmental Delivery Plan.

191. Whilst the test must be passed at the Environmental Delivery Plan end-date (reflected in the endpoint report), it must also be assessed at the following points in time (although it is not limited to these points):

- by Natural England, in drafting it and finalising the draft following consultation;
- by the Secretary of State in deciding to make the Environmental Delivery Plan;
- at the half-way reporting point (mid-point report) (where Natural England must assess whether the Environmental Delivery Plan is likely to pass the Overall Improvement Test, taking account of conservation measures implemented thus far and planned for the remainder of the Environmental Delivery Plan, and informed by events to date);

- in the course of any decisions relating to amendment or revocation of the Environmental Delivery Plan, and;
- from the Environmental Delivery Plan end-date, going forward, the test must be met for as long as the development is having environmental impact. Natural England assesses that period to be 100 years. The extent to which the effect of conservation measures may continue to materially outweigh the negative effect of the Environmental Delivery Plan development may differ over this period, but the overall positive balance must remain material.

192. What needs to be outweighed is the negative effect of nutrient pollution on the conservation status of the identified environmental features that the maximum amount of new Environmental Delivery Plan development would otherwise have, and not the impact of the existing pollution burden or additional background impacts occurring after the Environmental Delivery Plan start-date. The positive outcome required by the Overall Improvement Test is only considered against the additional negative effect of development included in the Environmental Delivery Plan, it does not require the wider pollution burden (unrelated to the Environmental Delivery Plan development) to be addressed.

193. In this context it is noteworthy that the Overall Improvement Test relates to the effects (be they positive or negative) on the conservation status of identified environmental features, rather than, a proxy for an effect, such as the solely the amount or extent of nutrient pollution.

194. Conservation status is a quality informed by many variables. When assessing conservation status Natural England will consider all environmental components that are having a negative effect on the conservation status of identified environmental features. When planning and implementing conservation measures Natural England will consider measures capable of addressing any of the components that are having a negative effect on the conservation status of the identified environmental features.

195. The next part of this chapter illustrates the way in which the Overall Improvement Test is met by this Environmental Delivery Plan, bringing together expertise, data and evidence from previous chapters, and concludes with Natural England's recommendation to the Secretary of State.

196. The following are considered:

- the environmental features of the Norfolk Broads Special Area of Conservation, the Broadland Ramsar and the Wensum Special Area of Conservation that are likely to be negatively affected by nutrient pollution;
- the baseline conservation status of those identified features;
- the likely negative effect of Environmental Delivery Plan development on the conservation status of those identified features;
- the conservation measures to be taken to address the negative effects on those environmental features, including scale, location, sequencing and implementation risks;

- the extent to which the conservation measures will outweigh the likely negative effects of nutrient pollution from Environmental Delivery Plan development on the conservation status of the identified features.

Environmental features of protected sites that are likely to be negatively affected by nutrient pollution

197. Section 61 (2) of the Planning and Infrastructure Act states that an environmental feature may be a protected feature of a protected site or a protected species. Chapter 5 shows how the development to which the Environmental Delivery Plan applies is likely to affect the structure and function of environmental features of the Broads Special Area of Conservation, Wensum Special Area of Conservation and Broadland Ramsar protected sites (habitats and species).

198. As set out in Chapter 5, except for the Desmoulin's whorl snail in the Wensum Special Area of Conservation, each environmental feature naturally falls into one of four different habitat groups. Within these habitat groups, Natural England judges that the impact of additional nutrients will affect environmental features similarly, with negative effects on a habitat feeding through to negative effects on species that depend on that habitat. The groups make the assessment across a broad range of features simpler to read while still allowing the consideration of the Overall Improvement Test against each environmental feature.

Conservation status of the environmental features at Environmental Delivery Plan start date

199. Chapter 4 describes how conservation status for each environmental feature has been defined for the purposes of this Environmental Delivery Plan using expert judgement informed by existing published work on conservation status, conservation objectives and supplementary advice for the protected sites.

200. The conservation status of the identified environmental features is assessed to be broadly red - deteriorating, with no features categorised as green – recovered or good (see Table 4).

201. There are several reasons why the conservation status of most features is so poor including nutrient pollution, water quantity, sedimentation, climate change, invasive non-native species and loss of natural function through historic water course modification.

Likely negative effect of proposed new housing development on the conservation status of environmental features

202. The scale of development to be addressed by the Environmental Delivery Plan is set out in Chapter 3. Chapter 5 describes the likely effects of nutrient pollution from this development on the conservation status of the identified environmental features of the protected sites.

203. Nutrient pollution from new development forms a small proportion of the nutrient pollution pressure from other sources including agriculture and existing wastewater treatment works. For example, the maximum amount of development to be addressed by the Environmental Delivery Plan is predicted to generate a maximum of 0.4%

increase in phosphorus concentration in the River Wensum, a maximum increase of 2.4% in the Bure, and a maximum of 0.7% in the Yare. Nutrient pollution is itself one of a number of pressures on protected sites, as described above.

Conservation measures to be taken to protect environmental features

204. Conservation measures have been selected based on a range of criteria including effectiveness, implementation time, additionality, cost and value for money (see Chapter 6). The package of conservation measures has been developed and refined following expert evaluation by a range of specialists using a modified-Delphi process to ensure it is capable of materially outweighing the negative effects of nutrient loading from Environmental Delivery Plan development.

Implementation confidence of conservation measures

205. Several factors have been considered to provide confidence the Overall Improvement Test will be met, including:

206. Timeframe to implement measures - measures must be capable of being implemented within the lifetime of the Environmental Delivery Plan to reach required efficacy by the Environmental Delivery Plan end date.

- Range of measures available – a range of measures is preferable to spread the risk of reliance upon a single or small number of measures, and to address different existing negative effects;
- Availability of land on which to implement measures – there should be a range of locations at sufficient scale to spread the risk of reliance upon limited land options and scales;
- Cost of measures, which must be sufficient to pay for implementation, maintenance and monitoring while achieving value for money.

Applying the Overall Improvement Test

Methodology

207. The negative environmental impacts of nutrient loading arising from the Environmental Delivery Plan development, and the positive effects of the programme of conservation measures (Table 9), are assessed using a common scoring framework to enable direct comparison between them. The framework assesses the extent to which development and conservation measures are expected to influence the conservation status of each environmental feature, taking account of the biological, chemical, physical and hydrological components of structure and function and considering future prospects.

208. A symmetrical scoring scale ranging from -100 to +100 is applied (Table 11). Negative scores represent the predicted negative effect of nutrient loading from development on conservation status, whilst positive scores represent the predicted positive effect of conservation measures on conservation status. The use of a common description in both directions provides a consistent basis for assessing environmental impacts

against the benefits of conservation measures across all environmental features, and therefore making a judgement on the Overall Improvement Test.

Table 11: Scoring framework for scale of negative and positive effect on conservation status to assess judgements for the Overall Improvement Test.

Effect on conservation status	Description	Score
Very high positive effect	An extremely high positive effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	+91 to +100
	A very high positive effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	+81 to +90
High positive effect	A high positive effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	+71 to +80
	A clear and larger positive effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	+61 to +70
Medium positive effect	A clear positive effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	+51 to +60
	A minor but more detectable positive effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	+41 to +50
Low positive effect	A low positive effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	+31 to +40
	A very small but discernible positive effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	+21 to +30
Very low positive effect	An extremely small positive effect is expected on (i) the structure and function of habitat and/or (ii) the	+11 to +20

Effect on conservation status	Description	Score
	supporting habitat of the species, and their future prospects for recovery.	
	No or negligible positive effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	0 to +10
Very low negative effect	No or negligible negative effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	0 to -10
	An extremely small negative effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	-11 to -20
Low negative effect	A very small but discernible negative effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	-21 to -30
	A low negative effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	-31 t0 -40
Medium negative effect	A minor but more detectable negative effect on expected in (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	-41 to -50
	A clear negative effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	-51 to -60
High negative effect	A clear and larger negative effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	-61 to -70

Effect on conservation status	Description	Score
	A high negative effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	-71 to -80
Very high negative effect	A very high negative effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	-81 to -90
	An extremely high negative effect is expected on (i) the structure and function of habitat and/or (ii) the supporting habitat of the species, and their future prospects for recovery.	-91 to -100

The assessment process

209. The assessment of the negative effect of the maximum amount of development included in the Environmental Delivery Plan, and the beneficial effect of the programme of conservation measures, was undertaken as a two-stage process. This two-stage process involved the preparation of a draft programme of conservation measures, and draft features assessments which were subjected to expert evaluation through a modified Delphi process. This process scored the programme of conservation measures, using the Framework in Table 11, against the negative effect of nutrient loading from Environmental Delivery Plan development to ascertain whether the measures were likely to materially outweigh the negative effect.

210. The process of developing the package of conservation measures and scoring was undertaken by specialists with expertise relating to the environmental features and/or protected sites. The modified Delphi process was designed (developed with reference Hemming et al. (2017)[52]) to identify any weaknesses in the draft programme of conservation measures, and discuss uncertainties and gaps in the evidence, providing a vital reference point from which to prepare the final programme of conservation measures. The conservation measures and features assessments were then revised, in response to the outcome of the modified Delphi process, ahead of final assessment. The stages in the assessment process are summarised below:

- Draft programme of conservation measures prepared, informing draft feature assessments setting out the negative effect of development and beneficial effect of conservation measures;
- A two-round scoring process with an expert panel to review draft features assessments and provide indicative scoring of negative effect of development and beneficial effect of draft programme of conservation measures;
- Outcome of Delphi scoring reviewed, using statistical analysis, and programme of conservation measures revised and finalised;

- Final scoring of negative effect of maximum amount of development, and beneficial effect of final programme of conservation measures undertaken by Natural England, including evaluation against the Overall Improvement Test.

Assessment of overall improvement for environmental features

211. The final assessment of the Environmental Delivery Plan is undertaken based on the final programme of conservation measures and their evidence on positive effect presented in Annex 7B. This final assessment is a predictive assessment.

212. The final assessment uses the scoring criteria set out in Table 11 above to assess the negative effect of the maximum amount of development, and the beneficial effect of the final programme of conservation measures against each of the environmental features. This ensures consistency with the first stage of the assessment (modified Delphi process). The results of the final assessment, and assessment of overall improvement are set out in the tables below.

213. The following tables (Table 12 to Table 15) display the results of the Overall Improvement Test by Special Area of Conservation (The Broads Special Area of Conservation, Broadland Ramsar and River Wensum Special Area of Conservation), with the environmental features in each table organised by primary habitat type, and then by species (single or aggregate). Please refer to Table 11 for descriptions of the scoring. Please note the tables provide summaries – the full assessment of negative effect can be found in Annex 5B, further details on the programmed conservation measures can be found in Annex 6C, further details on the scoring of conservation measures cab be found in Annex 7B.

Table 12: Overall Improvement Test for environmental features in open water habitat groups of The Broads Special Area of Conservation and Broadland Ramsar

Habitat group Environmental feature(s)	Open water features • **Intermediate between H3150 Natural eutrophic lakes with** *Magnopotamion* or *Hydrocharition* and H3140 Hard oligo-mesotrophic waters with benthic veg of *Chara spp.* This includes many ditches. • **S1355 Otter,** *Lutra lutra* • **S1016 Desmoulin's whorl snail,** *Vertigo moulinsiana* • **Wetland Invertebrate assemblage** • Wetland Plant assemblage • Aggregations of non-breeding birds • **Aggregations of breeding birds**
Assessment of negative effect of the Environmental Delivery Plan (max) development (s.65(5))	Negative effect on eutrophic lakes and hard oligo-mesotrophic waters: The Environmental Delivery Plan development will lead to additional phosphorus and nitrogen entering open water systems already enriched above their ecological targets. The effect of eutrophication on freshwater habitat is well understood and include increase phytoplankton, reduced water clarity and the light available to submerged plants. Algae growing on plant surfaces can further suppress photosynthesis. Changes to sediment structure can prevent rooting of macrophytes. These mechanisms can disadvantage charophytes and other characteristic submerged plants and favour nutrient-tolerant species. Although the increased nutrient load from the Environmental Delivery Plan development is relatively low (when compared to current nutrient levels), ecological responses of these sensitive habitats can be non-linear and additional nutrients (notably phosphorus) can accumulate in sediments, having potentially long-lasting impacts. Additional negative effects on other features: Excessive plant and algal biomass (especially when decomposing) leads to reduction in dissolved oxygen levels, reducing habitat quality for aquatic invertebrates and other fauna. Anoxic sediments can also release phosphorus, exacerbating the negative effects. Loss or simplification of submerged and marginal vegetation reduces structural habitat, refuges, feeding surfaces and breeding or nursery habitat. Collectively these effects may negatively impact wetland plant and invertebrate assemblages, Desmoulin's whorl snail, fish-eating or plant-dependent birds and the prey-base available to otters.
Score of negative effect	Medium negative effect (-41 to -50)

Habitat group Environmental feature(s)	Open water features • **Intermediate between H3150 Natural eutrophic lakes with** *Magnopotamion* or *Hydrocharition* and H3140 Hard oligo-mesotrophic waters with benthic veg of *Chara spp.* This includes many ditches. • **S1355 Otter,** *Lutra lutra* • **S1016 Desmoulin's whorl snail,** *Vertigo moulinsiana* • **Wetland Invertebrate assemblage** • Wetland Plant assemblage • Aggregations of non-breeding birds • **Aggregations of breeding birds**
Relevant Programmed Conservation measure(s)	• Nutrient performance standards for non-mains drainage • Fen-type wetland creation • Land-use change • Catch-dyke remediation • Deer management
Assessment of positive effect	Positive effect on eutrophic lakes and hard oligo-mesotrophic waters: The conservation measures will reduce nutrient and sediment inputs, countering many of the negative impacts of this Environmental Delivery Plan development. Land-use change will convert intensively managed agricultural land to semi-natural habitat, providing a range of benefits, notably substantial reduction of fertiliser, manure, slurry and livestock-derived inputs, combined with permanent vegetation and more stable soil. This reduces phosphorus, nitrogen and sediment transmission to connected waters and limits future accumulation of phosphorus in water-body sediments. The non-mains drainage condition reduces nutrients at source. In addition, the creation and restoration of fens (managed to remove arisings) wil lead to larger and better-connected wetland mosaics and removes nutrients from connected water bodies. Additional measures, including catch-dyke remediation will lead to improved hydrological functioning and connectivity and deer management will reduce trampling and damage particularly to marginal and open water vegetation in the smaller waterbodies. Additional positive effect on other features: The package of conservation measures will lead to larger, better connected wetland mosaics which provide more diverse aquatic and marginal habitat, transitional zones and refuges. This is expected to directly benefit associated species: wetland plant and invertebrate assemblages, Desmoulin's whorl snail, fish-eating or plant-dependent birds and enhance the prey-base available to otters.
Score of positive effect	Medium positive effect (+51 to +60)

Habitat group Environmental feature(s)	Open water features • **Intermediate between H3150 Natural eutrophic lakes with** *Magnopotamion* or *Hydrocharition* and H3140 Hard oligo-mesotrophic waters with benthic veg of *Chara spp.* This includes many ditches. • **S1355 Otter,** *Lutra lutra* • **S1016 Desmoulin's whorl snail,** *Vertigo moulinsiana* • **Wetland Invertebrate assemblage** • Wetland Plant assemblage • Aggregations of non-breeding birds • **Aggregations of breeding birds**
Assessment of Overall Improvement for the identified feature(s)	Although there is still likely to be a very small increase in nutrients going into this sensitive system, the combined package acts on chemical, hydrological, physical and biological components. This leads to wider structure and function improvements that will deliver a material net benefit to this feature group, relative to the negative effect.
Conclusion on satisfaction of Overall Improvement Test	By the Environmental Delivery Plan end date, the effect of the conservation measures will materially outweigh the negative effect of the Environmental Delivery Plan development on the conservation status on all of the identified environmental features within the open water habitat group. Overall Improvement Test: PASS

Table 13: Overall Improvement Test for environmental features in the fen and fen-type habitat groups of The Broads Special Area of Conservation and Broadland Ramsar

Habitat group	Fen habitats and Fen-type wetlands
Environmental feature(s)	• **H6410 Molinia meadows on calcareous, peat or clay**-silt soil • H7140 Transition mires and quaking bogs • H7210 Calcareous fens with *C. mariscu*s and species of *C. davallianae* • **H7230 Alkaline fens** • Floodplain fen • **S1903 Fen orchid,** *Liparis loeseli*i • **S1016 Desmoulin's whorl snail,** *Vertigo moulinsiana* • **Wetland Plant assemblage** • Wetland Invertebrate assemblage • Aggregations of breeding birds • **Aggregations of non**-breeding birds
Assessment of negative effect of the Environmental Delivery Plan (max) development (s.65(5))	Negative effects on Fen habitats and Fen-type wetlands: The Environmental Delivery Plan development will lead to additional phosphorus and nitrogen entering catchments where the fen features are already in poor condition and the connected open waters generally exceed nutrient targets. Nutrient enrichment can increase nutrient availability to fen vegetation and favour taller, faster-growing and nutrient-tolerant plants. This can accelerate shifts towards reed, tall-herb and other eutrophic communities, reduce the abundance of less competitive plants characteristic of calcareous and species-rich fen, and simplify the composition and structure of the habitat. Increased plant production and litter accumulation can recycle nutrients and reinforce succession towards rank vegetation, scrub or woodland where management is absent or insufficient. Additional negative effects on other features: Changes in fen vegetation and hydrology can reduce the quality and continuity of supporting habitat for fen orchid, Desmoulin's whorl snail, wetland plants and invertebrates and breeding and non-breeding birds. Loss of fine-scale vegetation structure, open fen and transition zones can reduce feeding, breeding, refuge and dispersal opportunities. The effect is primarily through changes to supporting habitat and the ecological processes maintaining it.
Score of negative effect	Low negative effect (-31 to -40)

Habitat group	Fen habitats and Fen-type wetlands
Environmental feature(s)	• **H6410 Molinia meadows on calcareous, peat or clay**-silt soil • H7140 Transition mires and quaking bogs • H7210 Calcareous fens with *C. mariscus* and species of *C. davallianae* • **H7230 Alkaline fens** • Floodplain fen • **S1903 Fen orchid,** *Liparis loeselii* • **S1016 Desmoulin's whorl snail,** *Vertigo moulinsiana* • **Wetland Plant assemblage** • Wetland Invertebrate assemblage • Aggregations of breeding birds • **Aggregations of non**-breeding birds
Relevant Programmed Conservation measure(s)	• Nutrient performance standards for non-mains drainage • Fen-type wetland creation and restoration • Land-use change contiguous with wetland creation/restoration • Wider-catchment land-use change • Fen-type wetland management in the Yare • Catch-dyke remediation • Deer management

Habitat group	Fen habitats and Fen-type wetlands
Environmental feature(s)	• **H6410 Molinia meadows on calcareous, peat or clay**-silt soil • H7140 Transition mires and quaking bogs • H7210 Calcareous fens with *C. mariscus* and species of *C. davallianae* • **H7230 Alkaline fens** • Floodplain fen • **S1903 Fen orchid,** *Liparis loeselii* • **S1016 Desmoulin's whorl snail,** *Vertigo moulinsiana* • **Wetland Plant assemblage** • Wetland Invertebrate assemblage • Aggregations of breeding birds • **Aggregations of non**-breeding birds
Assessment of positive effect	Positive effects on Fen habitats and fen-type wetlands: The measures directly address important drivers of poor fen condition. Wider-catchment and contiguous land-use change to semi-natural habitats will reduce nutrient and sediment losses by stopping or substantially reducing fertiliser, manure, slurry and livestock inputs and by establishing more stable semi-natural vegetation. The non-mains drainage condition reduces nutrients at source. Fen type-habitat creation and restoration will increase habitat extent and, where hydrologically and ecologically connected, restore wetland processes, transition zones and habitat mosaics. Contiguous land-use change will buffer the restored fen and strengthen ecological connectivity. Fen management, including cutting or grazing and removal of arisings, will maintain characteristic vegetation structure, prevent succession and remove nutrients held in biomass. Catch-dyke remediation will help restore natural hydrological pathways, water levels and wetland zonation. Deer management will reduce browsing and trampling pressure and support vegetation recovery. Additional positive effects on other features: The measures will lead to increased extent, quality and connectivity of fen-type habitats which will directly benefit the dependent plant assemblages, fen orchid, Desmoulin's whorl snail, and invertebrate and bird assemblages by providing a larger and more varied habitat mosaic.
Score of positive effect	Medium positive effect (+51 to +60)

Habitat group Environmental feature(s)	Fen habitats and Fen-type wetlands • **H6410 Molinia meadows on calcareous, peat or clay**-silt soil • H7140 Transition mires and quaking bogs • H7210 Calcareous fens with *C. mariscus* and species of *C. davallianae* • **H7230 Alkaline fens** • Floodplain fen • **S1903 Fen orchid,** *Liparis loeselii* • **S1016 Desmoulin's whorl snail,** *Vertigo moulinsiana* • **Wetland Plant assemblage** • Wetland Invertebrate assemblage • Aggregations of breeding birds • **Aggregations of non**-breeding birds
Assessment of Overall Improvement for the identified feature(s)	The conservation measures will increase fen extent, restore hydrological function, improve management and rebuilding ecological connectivity. Collectively, these measures will improve chemical, hydrological, physical and biological components and increase resilience to future nutrient and climate pressures. They are considered to materially outweigh the negative effects arising from Environmental Delivery Plan-related nutrient inputs.
Conclusion on satisfaction of Overall Improvement Test	By the Environmental Delivery Plan end date, the effect of the conservation measures will materially outweigh the negative effect of the Environmental Delivery Plan development on the conservation status on all of the identified environmental features within the fen and fen type environmental features group. Overall Improvement Test: PASS

Table 14: Overall Improvement Test for environmental features in the wet woodland habitat group of The Broads Special Area of Conservation and Broadland Ramsar

Habitat group Environmental feature(s)	Wet woodland habitat features • **H91Eo Alluvial woods with** A. glutinosa, F. excelsior • Floodplain alder woodland • Wetland invertebrate assemblage
Assessment of negative effect of the Environmental Delivery Plan (max) development (s.65(5))	Negative effects on Wet woodland habitat: The Environmental Delivery Plan development will lead to additional nitrogen and phosphorus which may enter wet woodland through floodwater, ditches, groundwater and runoff. Increased nutrient availability can alter soil fertility and decomposition, favour competitive and nutrient-tolerant vegetation and change the composition of woodland ground flora. Nutrient enrichment can also affect peat formation and nutrient cycling. These effects are likely to be exacerbated because the system is already enriched and suffers from artificial drainage or water-resource pressure, invasive plants and high deer pressure. Additional negative effects on other features: Changes in ground flora, litter, tree and shrub regeneration and woodland structure can reduce habitat quality for wetland invertebrates. Nutrient effects are likely to be mediated by hydrological connectivity and woodland soils rather than expressed uniformly across all woodland stands.
Score of negative effect	Low negative effect (-31 to -40)
Relevant Programmed Conservation measure(s)	• Nutrient performance standards for non-mains drainage • Fen-type wetland creation and restoration and contiguous land-use change • Wider-catchment land-use change • Fen-type wetland management • Catch-dyke remediation or significant hydrological restoration • Deer management

Habitat group Environmental feature(s)	Wet woodland habitat features • **H91Eo Alluvial woods with** A. glutinosa, F. excelsior • Floodplain alder woodland • Wetland invertebrate assemblage
Assessment of positive effect	Positive effects on wet woodland habitat: Land-use change and non-mains drainage standards will reduce nutrient and sediment inputs to connected wetland systems. Fen-type habitat creation, contiguous semi-natural habitat and catch-dyke remediation will improve the hydrological and ecological context of wet woodland by restoring water movement, buffering woodland and enhancing connections between fen, swamp, open water and woodland. Fen management will sustain the surrounding wetland mosaic and limit nutrient recycling through removal of arisings. Deer-management directly addresses a significant pressure. Reducing browsing and trampling can improve tree and shrub regeneration, ground-layer diversity, woodland-edge vegetation, soil stability and structural complexity. Additional positive effects on other features: Improved woodland structure, hydrology and connectivity will provide more varied habitat for wetland invertebrates and strengthen transitions within the wider Broads wetland mosaic.
Score of positive effect	Medium positive effect (+51 to +60)
Assessment of Overall Improvement for the identified feature(s)	The inclusion of deer management focused on the Bure and Yare protected sites and a buffer around these sites, directly addresses woodland regeneration, browsing and ground degradation, while the other measures improve hydrology, buffering and connectivity. Taken together, the final package is expected to provide a positive effect on wet woodland structure, function and future prospects.
Conclusion on satisfaction of Overall Improvement Test	By the Environmental Delivery Plan end date, the effect of the conservation measures will materially outweigh the negative effect of the Environmental Delivery Plan development on the conservation status on all of the identified environmental features within the 'wet woodland' environmental features habitat group. Overall Improvement Test: PASS

Table 15: Overall Improvement Test for environmental features in The River Wensum Special Area of Conservation

Habitat group Environmental feature(s)	River habitat features • **H3260 Water courses of plain to montane levels with** the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • **Brook Lamprey,** *Lampetra planeri* • **Bullhead,** *Cottus gobio* • **White**-clawed crayfish, *Austropotamobius pallipes*	**Desmoulin's whorl snail,** *Vertigo moulinsiana* **Desmoulin's whorl snail,** *Vertigo moulinsiana*
Assessment of negative effect of the Environmental Delivery Plan (max) development (s.65(5))	Negative effects on river habitat: The Environmental Delivery Plan development is estimated to increase phosphorus concentrations by 0.4 micrograms per litre, equivalent to 1.3% of the river phosphorus target, when modelled based on post-2030 scenario. Although relatively small, this enters a river already failing phosphorus and dissolved-oxygen targets and affected by low flows, impoundment, extensive channel modification and siltation. Additional phosphorus may therefore increase attached and floating algae, suppress characteristic Ranunculus and Callitriche vegetation and increase dissolved-oxygen fluctuations. Additional negative effects on other features: Loss of macrophytes and accumulation of fine sediment reduce shelter, food, flow diversity and clean gravel habitat. This can affect the spawning, juvenile, feeding, refuge and dispersal requirements of brook lamprey, bullhead and white-clawed crayfish. Phosphorus can bind to fine sediment and persist as legacy loading, delaying recovery.	The Environmental Delivery Plan development is estimated to increase phosphorus concentrations by 0.4 micrograms per litre, equivalent to 1.3% of the river phosphorus target, when modelled based on post-2030 scenario. Additional nutrients may nevertheless worsen the condition of supporting riparian and floodplain fen habitat by favouring rank, nutrient-demanding or invasive vegetation and altering vegetation composition, litter and habitat structure. These effects may interact with changes in water level, drainage and succession. The likely effect on Desmoulin's whorl snail is consequently indirect through supporting habitat rather than direct toxicity. The species population is already in poor condition, with contracted and fragmented habitat, limited resilience and dependence on consistently wet calcareous swamp and tall-sedge vegetation. Small changes may therefore be important where populations or habitat patches are isolated.
Score of negative effect	Low negative effect (-31 to -40)	Low negative effect (-21 to -30)

Habitat group Environmental feature(s)	River habitat features • **H3260 Water courses of plain to montane levels with** the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • **Brook Lamprey,** *Lampetra planeri* • **Bullhead,** *Cottus gobio* • **White**-clawed crayfish, *Austropotamobius pallipes*	**Desmoulin's whorl snail,** *Vertigo moulinsiana* **Desmoulin's whorl snail,** *Vertigo moulinsiana*
Relevant programmed conservation measure(s)	• Nutrient performance standards for non-mains drainage • Wider-catchment land-use change delivered in the Wensum sub-catchment to benefit the Yare • Removal or modification of one structure on the River Wensum • 1 km of contiguous river restoration • Fen-type wetland creation/restoration	• Fen-type wetland creation/restoration targeted for Desmoulin's whorl snail • Wider-catchment land-use change • Removal or modification of one Wensum structure with 1 km contiguous river restoration • Nutrient performance standards for non-mains drainage
Assessment of positive effect	Positive effects on river habitat: Targeted land-use change will stop or substantially reduce fertiliser, manure, slurry and livestock inputs and stabilise soil, reducing phosphorus and fine sediment entering the river. Removal or modification of a weir will reduce impoundment, restore more natural flow and sediment transport, improve dissolved oxygen and reconnect habitat. Contiguous river restoration can restore channel form, flow diversity, substrate condition, riparian vegetation, woody material and channel-floodplain connectivity. Additional positive effects on other features: Improvements to the river feature will improve habitat for macrophytes, invertebrates and fish and support movement and recolonisation. A freer-flowing and more physically diverse reach of river will be better able to flush fine sediment, oxygenate gravels and reduce conditions favouring algal accumulation.	Supporting habitat: The principal benefit is creation or restoration of 10 ha of suitable wet, calcareous swamp or fen habitat, targeted to directly benefit the snail. River and floodplain restoration may improve lateral connectivity and hydrological functioning, while catchment land-use change reduces nutrient and sediment pressure on the valley system.
Score of positive effect	Medium positive effect (+41 to +50)	Low positive effect (+31 to +40)

Habitat group Environmental feature(s)	River habitat features • **H3260 Water courses of plain to montane levels with** the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • **Brook Lamprey,** *Lampetra planeri* • **Bullhead,** *Cottus gobio* • **White**-clawed crayfish, *Austropotamobius pallipes*	**Desmoulin's whorl snail,** *Vertigo moulinsiana* **Desmoulin's whorl snail,** *Vertigo moulinsiana*
Assessment of Overall Improvement for the identified feature(s)	The programme of measures will support the restoration of the physical, hydrological and biological processes in the river. This provides material benefits including improved connectivity, flow, substrate, habitat diversity and resilience.	The targeted habitat measure directly addresses the principal determinants of the species' conservation status: supporting-habitat extent, quality, hydrological suitability, connectivity and future prospects. These benefits are supplemented by river restoration and catchment nutrient reduction. Provided the habitat creation is delivered where it can function hydrologically and be reached by existing populations, the feature-specific habitat gain is expected to outweigh the relatively small development effect.
Conclusion on satisfaction of Overall Improvement Test	By the Environmental Delivery Plan end date, the effect of the conservation measures will materially outweigh the negative effect of the Environmental Delivery Plan development on the conservation status on all of the identified environmental features within the river habitat environmental feature of the River Wensum Special Area of Conservation. Overall Improvement Test: PASS	By the Environmental Delivery Plan end date, the effect of the conservation measures will materially outweigh the negative effect of the Environmental Delivery Plan development on the conservation status of the Desmoulin's whorl snail environmental feature. Overall Improvement Test: PASS

Recommendation to Secretary of State

214. The judgement of whether the effect of conservation measures will materially outweigh negative effect is a matter of expert understanding, to be applied rationally and reasonably in light of the circumstances and evidence available at the time when the decision falls to be taken. Natural England and the Secretary of State will take account of the best available scientific evidence.

215. For the reasons set out in the previous section, it is Natural England's independent and expert opinion that the benefits of the package of conservation measures set out in this Environmental Delivery Plan will materially outweigh the negative effect of the maximum amount of development on the conservation status of each identified environmental feature. The conservation measures will collectively deliver both increased resilience of the wider ecosystem as well as direct benefits to identified features. Natural England recommends to the Secretary of State that this Environmental Delivery Plan does satisfy the Overall Improvement Test.

8 Nature Restoration Levy

Introduction

216. The conservation measures set out in this Environmental Delivery Plan will be funded by developers who pay the Nature Restoration Levy.

217. In accordance with the Nature Restoration Levy Regulations 2026, the levy funds will be used to fund the conservation measures listed in this Environmental Delivery Plan (related to this Environmental Delivery Plan's environmental features). The levy funds will be used for the delivery, management, long-term monitoring and maintenance of the conservation measures as well as administrative expenses connected with this Environmental Delivery Plan.

218. The rate of the Nature Restoration Levy is set out in the charging schedule below and the following section in this chapter explains how the rate of Nature Restoration Levy has been set.

219. Developers will be able to access an online service to obtain an indicative quote for their proposed development before they make a request to use the Nature Restoration Levy. The amount of the Nature Restoration Levy for a development will be calculated based on the total number of units planned for a site. Developers will be able to obtain multiple quotes before making a request to use the Nature Restoration Levy. The guidance on using the Nature Restoration Levy can be found on GOV.UK.

220. When Natural England accepts a developer's request to use the Nature Restoration Levy under this Environmental Delivery Plan, the developer will then be committed to using the Nature Restoration Levy. This commitment will result in the environmental impact from their development from nutrient pollution on the protected feature being disregarded for the purposes of part 6 of the Habitats Regulations 2017.

221. When a developer is committed to pay the Nature Restoration Levy, Natural England will issue a commitment certificate which the developer will need to submit to the relevant authority as part of the planning process. The local planning authority will impose a pre-commencement condition to any planning permission where the developer has committed to pay the Nature Restoration Levy, prohibiting development from commencing until payment of the levy (either in full, or the first instalment). Where a development has planning permission through a general consent, liability (and the requirement to pay) arises at the point Natural England accepts the request to use the Nature Restoration Levy, and a commitment is made. If the general consent requires prior approval, liability is assumed when approval is given.

222. Part 4 of The Nature Restoration Levy Regulations 2026 set out enforcement powers for Natural England. These include surcharges when liability is not assumed prior to commencement, late payment and failure to notify Natural England of a material change in development. Interest will accrue on any late payments. This enables the recovery of additional costs incurred to Natural England through the delay in payment. Further enforcement may be taken where required.

Setting the levy rate

Context

223. The rate of the levy in the charging schedule has been set in accordance with Regulation 23 of the Nature Restoration Levy Regulations 2026[53]. The scheme's recoverable costs including outlay (both capital and revenue) and overhead costs will be fully recovered through levy payments while additionally ensuring that Natural England makes no profit. This is consistent with one of the core principles of His Majesty's Treasury's Managing Public Money[54] "that the government neither profits at the expense of consumers nor makes a loss for taxpayers to subsidise".

224. When setting the levy rate, Natural England is utilising the best available scientific evidence to create a total conservation measure price which has been divided equally across the maximum amount of development set out in this Environmental Delivery Plan. This has been done with input from Natural England's specialists and experts from across government, including the Government Actuary's Department.

225. The conservation measure price includes the initial implementation cost and the long-term monitoring and maintenance costs. The levy sum collected to pay for long-term monitoring and maintenance costs will be invested by Natural England for up to 100 years. This investment will be carried out in line with government guidelines and, as far as practicable, invested in opportunities that align with Natural England's priorities.

226. Component costs:

- Conservation measure delivery: these are the costs of implementing the conservation measures (see Regulation 23(1)(b)(ii)) needed to materially outweigh the impact of development on the environmental features identified within this Environmental Delivery Plan. These costs are covered in further detail in Chapter 6;
- Conservation measure maintenance: these cover the long-term costs required to maintain conservation measures (see Regulation 23(1)(a)) to the necessary standard to achieve the Overall Improvement Test;
- Apportioned administration costs: these costs cover central and nutrient specific costs that have been reasonably apportioned across Environmental Delivery Plans as allowed within the Planning and Infrastructure Act. These include the costs of preparing, implementing and administrating this Environmental Delivery Plan and reasonably attributable cost in respect of the Nature Restoration Fund (see Regulation 23(1)(b));
- Environmental Delivery Plan specific costs and monitoring: this covers costs specific to this Environmental Delivery Plan including cost of legal work (including landowner agreements) (see Regulation 23(1)(a) and (b)) and the monitoring requirements (see Regulation 23(1)(a)) as set out in Chapter 9.

227. The total levy fee also includes a contingency of 5%, which has been priced in to cover the cost of delivery of back-up conservation measures in the event they are needed.

228. All levy funds collected are ringfenced for the delivery of the Environmental Delivery Plan they relate to. In the event that any levy funds for an Environmental Delivery Plan

exceed the amount required for funding the conservation measures (including delivery, management, maintenance, monitoring and administrative expenses), Natural England will spend the levy funds on additional conservation measures which relate to the identified environmental feature for which the levy was charged.

Fund investment and associated levy discount rate

229. Natural England will invest levy income to the fund which is needed for long-term costs, including maintenance, management and monitoring (over a 100-year period). This is necessitated so that the fund does not depreciate and investment returns match and preferably outpace inflationary pressures over the medium to long term.

230. In order to set an appropriate level for the levy, the value of the expected cost for the future works need to be discounted back to the present day, thereby accounting for the expected investment returns within the Nature Restoration Fund. The discount rate is therefore a key assumption, as it directly influences the levy amount paid by developers and the Nature Restoration Fund's long-term ability to meet the fund's objectives.

231. In designing the investment approach and discounting rate, Natural England has worked and will continue to work closely with the Government Actuary's Department, taking a balanced approach with suitable levels of prudence. The discount rate used when calculating the levy is 2.05%.

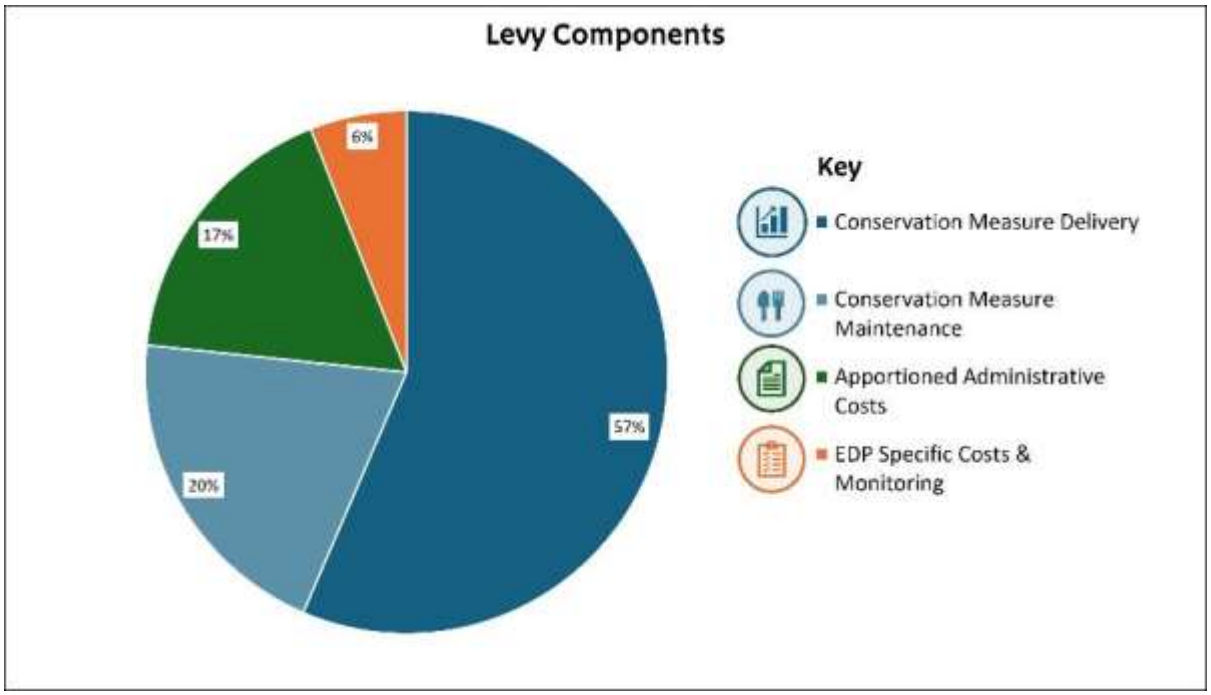

Figure 6: A breakdown of The Nature Restoration Levy component costs.

Charging schedule

232. The charging schedule included within this Environmental Delivery Plan sets out the rate of the Nature Restoration Levy on a per unit basis (rounded to the next £25) and relates to the environmental impact of development on the environmental features which are set out in this Environmental Delivery Plan. As set out under Chapter 3, the kind of development that applies to this Environmental Delivery Plan are: dwellinghouses (including flats). A unit is a house or a flat.

233. The Planning and Infrastructure Act requires the consideration of the negative effect of new development on the environmental features of a protected site. As the Environmental Delivery Plan addresses these impacts at a plan scale, it looks at the potential development across an area and considers the negative effect of this development as a whole. Consequently, the Environmental Delivery Plan charging schedule accounts for this plan level approach and charges a per unit rate based upon an average for all development that can use the Environmental Delivery Plan.

234. Developers may have the option to pay the Nature Restoration Levy in instalments (as per Reg 11), this will take the form of instalment plans and further details may be found on GOV.UK.

Table 16: Charging schedule

Charging schedule
£ 2,675 per unit

Nature Restoration Levy – indexing function

235. The levy payments will be adjusted by inflation in line with the Royal Institution of Chartered Surveyors (RICS) Community Infrastructure Levy (CIL) Index, as per the requirements of Regulation 26. Inflation will be applied annually for a given calendar year based on the RICS CIL Index published on 1 November of the preceding calendar year. The levy is calculated from the charging schedule as set within the Environmental Delivery Plan), with inflation applied for the calendar year in which the payment is made.

Charging schedule expiry date

236. This charging schedule will expire and so not be available for new requests to pay the Nature Restoration Levy, after the charging schedule end date.

237. The end date for this charging schedule is [DD/MM/YEAR] (at the end of the sixth year after the Environmental Delivery Plan start date). Dates cannot be stated by Natural England prior to Secretary of State making this Environmental Delivery Plan.

238. It is necessary for the charging schedule to expire before the Environmental Delivery Plan end date and for the Environmental Delivery Plan to be closed to new requests after this point. This is so Natural England has time to implement conservation measures to address the negative effect of the Environmental Delivery Plan

development in order meet the Overall Improvement Test by the Environmental Delivery Plan end date.

Planning conditions

239. When a relevant authority grants planning permission for development for which a developer has committed to pay the Nature Restoration Levy, it will be necessary for specific planning conditions to be imposed.

Statutory pre-commencement condition

240. The Nature Restoration Levy Regulations 2026 require that a public authority, when granting planning permission for a relevant development (with reliance on a commitment to pay the Nature Restoration Levy), must impose the condition of development. That condition is set out at regulation 5(4):

> Development must not begin before either—
>
> (a) liability to pay the levy is discharged, or
>
> (b) if the levy is to be paid by instalments, liability to pay the first instalment is discharged.

Conservation measure as a planning condition

241. In addition to the statutory planning condition to secure the levy and as discussed in Chapter 6 this Environmental Delivery Plan requires planning condition(s) as conservation measures to be imposed. The relevant condition is set out in Table 17.

Table 17: Planning conditions to be imposed on planning permission

Planning condition	Condition to be imposed*	Reason
Non-mains drainage	The development shall not be occupied unless a package treatment plant is installed on the site and operational to manage foul water; with operating efficiency rates achieving a discharge concentration of 5 mg/l for Total Phosphorus and 27 mg/l for Total Nitrogen or lower, that will be maintained thereafter for lifetime of the development.	To secure the performance of development not draining to main sewers and secure the standards on which the levy rate is calculated.
***Planning decision-makers may make limited and reasonable amendments to planning conditions (with the exception of the levy condition), to ensure conditions are operable for specific developments providing the intended outcome is maintained.**		

9 Monitoring and reporting

242. This chapter sets out the approach to monitoring and reporting for compliance, validation and effectiveness across this Environmental Delivery Plan period. The monitoring plan will be set out in a monitoring framework for the Nature Restoration Fund. The approach set out in this chapter, introduces the five broad types of monitoring that will be undertaken and outlines when backup conservation measures will be deployed to undertake corrective action, should it be necessary. The chapter also provides a summary of the reports that will be issued in relation to this Environmental Delivery Plan. Finally, the process of revoking this Environmental Delivery Plan and applying remedial action is described, should this be required.

243. Where suitable, data outputs from monitoring activities will be underpinned by Q-FAIR data principles[55] to ensure that data are of sufficient quality, consistency, and usability.

Monitoring

244. It is a requirement under section 61(8), 63(8) and 82(4) of the Planning and Infrastructure Act for Natural England to monitor Environmental Delivery Plans, in relation to the effectiveness of that conservation measures implemented under the Environmental Delivery Plan. The Secretary of State has the power to issue guidance to Natural England about how monitoring is to be carried out (section 82(5) Planning and Infrastructure Act), but no such guidance has been issued to date.

245. Natural England has decided to adopt five themes of monitoring:

- development and capacity monitoring;
- levy and financial monitoring;
- conservation measure implementation monitoring;
- conservation measure effectiveness monitoring;
- forecast validation.

246. These monitoring themes collectively provide a comprehensive structure to track delivery, assess effectiveness, and support deployment of corrective measures across the Environmental Delivery Plan.

247. Data from online services will be used for monitoring purposes where relevant.

Development and capacity monitoring

248. The total development capacity of this Environmental Delivery Plan will be monitored through the service. Monitoring will track development capacity covered in the Environmental Delivery Plan and will draw on the service data including unique identifiers, development size and kind, geospatial boundaries, planning application notifications and decisions, and commitments to pay the Nature Restoration Levy.

249. Monitoring will also identify the volume of development that has been taken forward under the Environmental Delivery Plan, including development that has received

planning permission and development where a developer has assumed liability (prior to commencement).

250. Capacity is reserved when Natural England accepts the developer's request to pay the Nature Restoration Levy and issues a commitment certificate. A commitment may be cancelled subject to certain conditions.

Levy and financial monitoring

251. Payments of the Nature Restoration Levy will be managed and monitored through the service. The service will record levy liabilities, payments, adjustments, refunds for an overpayment and invoice details, and will ensure that payments are linked to the correct development, and Environmental Delivery Plan(s).

Conservation measure implementation monitoring

252. Conservation measure implementation will be monitored by recording:

- the conservation measures secured against the sequencing set out in phases by reference to the Environmental Delivery Plan development;
- the spatial location of conservation measures;
- actual cost of the conservation measures.

253. This monitoring will provide assurance that conservation measures are:

- delivered in the correct locations;
- delivered in-step with development uptake, and;
- implemented in accordance with legal agreements.

254. Mechanisms within the Environmental Delivery Plan, including back-up measures, will enable Natural England to respond and manage delivery risks, including failure by third parties to implement, monitor or maintain conservation measures, or where external factors affect delivery.

255. Monitoring will track delivery progress against planned timelines to identify delays or slippage and to ensure backup conservation measures are engaged where necessary.

Conservation measure effectiveness monitoring

256. The monitoring objective is to assess whether conservation measures achieve their expected effects on the conservation status of the relevant identified environmental features, as set out in Table 4.

257. All conservation measures must deliver and retain the predicted level of efficacy for up to 100 years unless otherwise stated. Monitoring will be undertaken to provide proportionate assurance that conservation measures are delivered and functioning effectively. After the Environmental Delivery Plan end date, long term monitoring will focus on periodic verification to ensure that the favourable balance is maintained.

258. Conservation measures will mainly be secured through legal agreements (for example conservation covenant agreements, Section 7 Natural Environment Research Council agreements, s106 planning obligations etc.). These will include provisions for monitoring and maintenance to ensure conservation measures continue to function as

intended. Natural England's monitoring work will include verifying and, where appropriate, enforcing contractual obligations with counterparties. Natural England may use subcontractors to assist with monitoring.

259. This Environmental Delivery Plan will use a targeted, representative monitoring approach to monitor conservation measures (for example spot-checks, surveys and sampling).

260. Frequency and intensity of monitoring will vary depending on the type of conservation measure and stage of implementation. Monitoring is expected to be more frequent during the initial establishment phases (e.g. for the first five years from the conservation measure being delivered) to ensure greater certainty on implementation and functionality. Thereafter, the monitoring frequency is expected to reduce to periodic intervals for the first 50 years.

261. The reduction in monitoring intensity after five years reflects increasing confidence through evidence in the successful establishment and functionality of conservation measures, while the transition after 50 years reflects the expectation that measures will be mature, their effectiveness well evidenced, and the primary monitoring need will be to confirm their continued maintenance and management.

262. Beyond 50 years up to 100 years, monitoring will reduce to only focus on confirming that, where appropriate, conservation measures are being maintained in accordance with the Environmental Delivery Plan. The spatial-temporal monitoring coverage may reflect the diversity, efficacy, reliability, and time to effectiveness of conservation measures. The Nature Restoration Levy has been set appropriately to ensure that costs for ongoing monitoring of the conservation measures are sufficiently secured.

263. Both qualitative and quantitative monitoring data will be collected by monitoring the conservation measures, which will be analysed and interpreted by Natural England to determine whether the effect of the conservation measures on the conservation status of the environmental feature continues to materially outweigh the impact of Environmental Delivery Plan development, as supported by independent expert judgement.

264. Effectiveness targeted monitoring will take a risk-based approach and will distinguish between monitoring implementation performance and effects of the conservation measures post-implementation. For example:

- Implementation performance: Where conservation measures have high reliability (as informed by available evidence), monitoring will focus on checking whether measures have been delivered in accordance with legal agreements, and, where relevant, that any supporting or enabling actions are in place and are functioning as expected.
- Effects of conservation measures: This will assess whether conservation measures have demonstrated the intended outcomes through comparison of pre- and post-intervention condition of indicators associated with the conservation status of the relevant environmental features, and appropriate longer-term monitoring. In certain cases when reliability of conservation measures is low or when intended outcomes are not being met, local case-

studies may be selected to assess whether the effects are being realised and potential reason for the effects not being realised.

265. Given the complexity of ecological systems and broader environmental pressures on the environmental features, direct attribution of site or catchment scale ecological change to individual or grouped conservation measures may not always be feasible within the Environmental Delivery Plan timescale. Other policy actions on the protected sites (Figure 4) or broader pressures within catchments could affect the features on the protected sites positively or negatively, independently of this Environmental Delivery Plan, as recognised in Chapter 7. Effectiveness of Environmental Delivery Plan measures will therefore be assessed using a weight of evidence approach, combining implementation verification, empirical monitoring, local case studies (where appropriate), existing evidence on the expected performance of conservation measures and interpreting effect of broader environmental pressures on the features based on pre-implementation conditions. Where appropriate, methods and data from existing monitoring and evidence programmes will be utilised, supplementing these only where additional information is required.

266. Where monitoring results indicate the effectiveness of the conservation measure is unclear or not performing as expected, before invoking Environmental Delivery Plan corrective measures (see below), in some cases additional targeted monitoring may be undertaken. This may include, but is not limited to, increasing frequency or expanding the range of monitoring. This ensures that any risks to the measure's effectiveness are identified and addressed.

267. Primary data collection efforts will adhere to Q-FAIR principles[55], ensuring data quality, consistency and interoperability.

268. Besides primary data collection, relevant existing datasets from the Environmental Delivery Plan area will be used to support analysis while maximising value of available evidence. Wider secondary data sources and supplementary evidence may be used as pre-intervention and contextual evidence on wider environmental trends; to identify emerging pressures or unexpected patterns; support interpretation of monitoring results; and inform assumptions about the expected performance of conservation measures. These sources may include, but are not limited to, regulatory monitoring data, catchment-scale partnership datasets, remote sensing products, citizen science records and academic studies.

269. Annex 9A is an overview illustrating the ecological theory of change with monitoring and interpretations pathways to support assessment of conservation measure effectiveness during the ten-year Environmental Delivery Plan period, beyond which monitoring will mainly focus on proportionate assurance that conservation measures are functioning effectively to maintain a favourable balance.

Forecast validation

270. Monitoring will include:

- Comparison of forecast development levels with actual development levels to inform management of development capacity, resource demand, and in exceptional circumstances, potential amendment of Nature Restoration Levy;

- Comparison of forecast costs of conservation measures, as set out in the Environmental Delivery Plan, with actual costs.

271. This will identify any deviations from forecasts or assumptions, assess associated risks and determine whether corrective action is required. Through monitoring the implementation and effects of conservation measures, using independent expert judgement, it will be validated whether environmental features can maintain a favourable balance between benefits of conservation measures and potential harm of development. The findings will inform decisions, including whether amendments, back-up conservation measures, revocation, or other corrective actions are required and will support Natural England's assessment of whether the Environmental Delivery Plan is likely to meet the Overall Improvement Test.

Environmental Delivery Plan management

272. If monitoring indicates that the Environmental Delivery Plan may not pass the Overall Improvement Test, the following corrective management options are available.

Deployment of back-up conservation measures

273. The programme of monitoring of conservation measures gives Natural England the possibility of managing and improving specific measures during the period of the Environmental Delivery Plan and will also flag up any need for the implementation of backup measures.

274. Triggers for implementation of back-up measures can include, for example:

- Findings from Environmental Delivery Plan monitoring indicating that the package of measures is unlikely to meet the Overall Improvement Test;
- Evidence from Environmental Delivery Plan reporting that measures delivered, or anticipated to be delivered, will not achieve the required outcomes;
- Identification that primary measures are not functioning effectively, and performance cannot be addressed through corrective management adjustments alone.

Amendment of the Environmental Delivery Plan

275. Section 68 of the Planning and Infrastructure Act allows the Secretary of State to amend this Environmental Delivery Plan, either on request from Natural England, or on their own initiative.

276. Amendments to this Environmental Delivery Plan may be requested by Natural England to enable corrective action. For example, changes to the overall area or capacity of the Environmental Delivery Plan development, the list of conservation measures or the charging schedule. The Secretary of State must direct Natural England to undertake a consultation on the proposed amendments to the Environmental Delivery Plan where it relates to one or more of the following: a change solely to the charging schedule, an increase to the maximum amount of Environmental Delivery Plan development, changes to the development area to include new area to which the Environmental

Delivery Plan does not currently apply or adds new kinds of conservation measures that are not currently included in the Environmental Delivery Plan.

277. An amendment can only be made if the Secretary of State considers that the Environmental Delivery Plan as amended passes the Overall Improvement Test.

Reporting

278. To satisfy sections 67(1) and (5) to (7) of the Planning and Infrastructure Act, progress on the implementation of this Environmental Delivery Plan and its conservation measures will be set out in the following reports. Dates cannot be stated by Natural England prior to Secretary of State making this Environmental Delivery Plan:

    - **Midpoint report** - covering the period from this Environmental Delivery Plan's start date [DD/MM/YEAR] to this Environmental Delivery Plan's midpoint [DD/MM/YEAR].
    - **Endpoint report -** covering the period from this Environmental Delivery Plan's midpoint [DD/MM/YEAR] to this Environmental Delivery Plan's end date [DD/MM/YEAR].

279. In accordance with section 67(2) of the Planning and Infrastructure Act, both the midpoint and endpoint reports will be published unless the Environmental Delivery Plan is revoked before either of those points, in which case a revocation report will be published in accordance with section 67(2) of the Planning and Infrastructure Act.

280. To satisfy section 67(2) of the Planning and Infrastructure Act, where an Environmental Delivery Plan is revoked, a revocation report will be published setting out progress on the implementation of the Environmental Delivery Plan and its conservation measures up to the date of revocation.

    - Where the Environmental Delivery Plan is revoked before the midpoint, the revocation report will cover the period from the Environmental Delivery Plan start date [DD/MM/YEAR] to the revocation date;
    - Where the Environmental Delivery Plan is revoked after the midpoint, the revocation report will cover the period from the Environmental Delivery Plan midpoint [DD/MM/YEAR] to the revocation date.

281. A report at the midpoint, endpoint and revocation date will state:

    - how much of the maximum amount of development available under the Environmental Delivery Plan remains available;
    - the amounts of nature restoration levy received by Natural England under the Environmental Delivery Plan;
    - whether the conservation measures have been implemented and if not, why not;
    - whether the conservation measures are having, or have had, their intended effect;

- what the conservation measures are costing, and how this compares with what they were expected to cost as set out in the Environmental Delivery Plan;
- whether the rates or other criteria set out in each charging schedule have been amended or are expected to be amended;
- whether anything else in the Environmental Delivery Plan has been amended or is expected to be amended.

282. The midpoint report will also include an assessment of whether the Environmental Delivery Plan is likely to pass the Overall Improvement Test. The final report will include an assessment of whether the Environmental Delivery Plan has passed the Overall Improvement Test, and if the assessment is that this Environmental Delivery Plan has not passed the test, the extent to which the conservation measures have failed to materially outweigh the negative effect of the Environmental Delivery Plan development.

283. If an Environmental Delivery Plan is revoked, a revocation report will also include an assessment of whether the Environmental Delivery Plan would be likely to pass the Overall Improvement Test if it were not being revoked. In carrying out this assessment, conservation measures are to be taken as those that have been delivered or will be delivered (excluding any remedial measures), and the development is to be taken as all development for which the levy has been or will be paid, despite revocation. If the assessment is that the Environmental Delivery Plan would not be likely to pass the Overall Improvement Test, the report will also set out the extent to which the conservation measures would fail to outweigh the negative effect of the development.

284. Where an endpoint report or a revocation report contains an assessment that the Environmental Delivery Plan has not passed, or would be unlikely to pass, the Overall Improvement Test, the Secretary of State must take remedial action, as it considers proportionate, in accordance with Section 70 of the Planning and Infrastructure Act.

10 List of annexes

The table below signposts the technical annexes that support and evidence this Environmental Delivery Plan and what each annex contains.

Table 18: List of annexes

Chapter	Annex
	Glossary
Chapter 1 – Executive summary	
Chapter 2 – Introduction	Annex 2A – Modelling undertaken with the Environment Agency
Chapter 3 – Scope of the Environmental Delivery Plan	Annex 3A – Methodology for maximum amount of development
Chapter 4 – Plans/strategies	
Chapter 5 – Environmental features and conservation status	Annex 5A – Environmental features: Conservation status Annex 5B – Environmental impact and negative effect
Chapter 6 – Conservation measures	Annex 6A – Scoring approach to identify a list of conservation measures Annex 6B – Conservation measures secured by planning conditions Annex 6C – Overview of conservation measure specifications
Chapter 7 – Overall Improvement Test	Annex 7A – His Majesty's Government Overall Improvement Test interpretation Annex 7B – Assessment of the effect of the programme of conservation measures
Chapter 8 – Levy	
Chapter 9 – Monitoring and reporting	Annex 9A – Conservation measure effectiveness monitoring
	References

11 Glossary

Additionality: a change that would not have occurred in the absence of delivery of the conservation measure. This refers to whether the measure is already being delivered or will be delivered through other mechanisms.

Alternative measures: measures that were identified and assessed through the prioritisation process but were not selected for inclusion as conservation measures. In accordance with Section 63(2)(c), Natural England has considered these alternative measures and has discounted them where they were not considered appropriate to include in this Environmental Delivery Plan.

Conservation measures: measures that are to be taken by, or on behalf of, Natural England, under the Environmental Delivery Plan in order to:

a) address the environmental impact of development on the identified environmental feature, and

b) contribute to an overall improvement in the conservation status of the identified environmental feature

Conservation status: refers to the status of an environmental feature as considered for the purposes of the Planning and Infrastructure Act 2025, including in relation to the Overall Improvement Test (section 65).

For the purposes of this Environmental Delivery Plan, the conservation status of environmental features will be considered against structure and function. The rationale for this decision is that nutrient enrichment does not directly alter the other parameters used to define conservation status as set out at paragraph 61; namely; range, distribution or population in the first instance. Rather, it affects ecological condition through its influence on the processes that underpin habitat structure and function.

Development: the same meaning as in the Town and Country Planning Act 1990 (see section 55 of that Act), but also including

a) development within the meaning of the Planning Act 2008 (see section 32 of that Act),

b) works required to be authorised under section 8 of the Planning (Listed Buildings and Conservation Areas) Act 1990, and

c) licensable marine activities, within the meaning of Part 4 of the Marine and Coastal Access Act 2009 (see section 66 of that Act);

Development area: the area specified in an Environmental Delivery Plan within which development to which the Environmental Delivery Plan applies may be undertaken, as required by section 60 of the Planning and Infrastructure Act 2025.

Dwellinghouse: a dwellinghouse is taken to cover a building or part of a building occupied or intended to be occupied as a separate dwelling. Each dwellinghouse (house or

flat) will be treated as one 'unit' of development for the purposes of the Environmental Delivery Plan charging schedule.

Environmental Delivery Plan: a plan prepared by Natural England, and made by the Secretary of State, pursuant to Part 3 of the Planning and Infrastructure Act 2025.

Environmental feature: an environmental feature identified in an Environmental Delivery Plan whose conservation status is likely to be negatively affected by development, within the meaning of section 61 of the Planning and Infrastructure Act 2025.

Environmental obligation: an environmental obligation in relation to development which is discharged, disapplied, or otherwise modified as provided for in an Environmental Delivery Plan where the nature restoration levy is paid, in accordance with section 59(1)(d) of the Planning and Infrastructure Act 2025 and section 72 and Schedule 3 of that Act.

Environmental impact: means one or more ways in which the negative effect of the development to which the Environmental Delivery Plan applies on the environmental feature is likely to be caused by the development, within the meaning of section 61 of the Planning and Infrastructure Act 2025.

Environmental impact of development: for the purposes of this Environmental Delivery Plan, the relevant environmental impact of development is the nutrient pollution, specifically the wastewater and surface water runoff from new dwellinghouses (including flats) on either/both the Broads Special Area of Conservation and/or River Wensum Special Area of Conservation, under the Habitats Regulations 2017.

Excluded areas: specified areas within the development area to which the Environmental Delivery Plan does not apply.

Existing measures: measures that are already being undertaken, or are likely to be undertaken, by Natural England or other public authorities with the aim of improving the conservation status of the identified environmental features. These measures are described in accordance with Section 63(7) of the Planning and Infrastructure Act 2025.

European site: the same meaning as in the Conservation of Habitats and Species Regulations 2017 (see regulation 8).

Habitats Regulation Assessment: an assessment carried out by a competent authority in accordance with the Conservation of Habitats and Species Regulations 2017, to determine if a plan or project may affect the designated features of a European Site, before deciding whether to undertake, permit or authorise it. This includes existing and proposed Special Areas of Conservation (Special Area of Conservations), Special Protection Areas (SPAs) and Ramsar Sites.

Kind of development: the kind of development to which the Environmental Delivery Plan applies, as specified pursuant to section 60(1)(b) of the Planning and Infrastructure Act 2025. For the purposes of this Environmental Delivery Plan, the kind of development is Dwellinghouses (including flats).

Marine Conservation Zone: means an area designated as such under section 116 of the Marine and Coastal Access Act 2009.

Nature Restoration Levy: a payment charged to developers who are relying upon an Environmental Delivery Plan to fund the cost of the conservation measures in accordance with the draft of the Nature Restoration Levy Regulations 2026.

Negative effect of the Environmental Delivery Plan development: has the meaning given by section 65(5) of the Planning and Infrastructure Act 2025 and means the effect, caused by the environmental impact, as identified in the Environmental Delivery Plan in accordance with section 61(1)(b), of the maximum amount of development to which the Environmental Delivery Plan may apply, as specified in accordance with section 60(5).

Nutrient loading: used within this Environmental Delivery Plan to refer to the nutrient burden of nitrogen and phosphorus added to the catchment from various sources.

Overall Improvement Test: the test set out in section 65(4) of the Planning and Infrastructure Act 2025 which is passed if, by the Environmental Delivery Plan end date, the effect of the conservation measures will materially outweigh the negative effect of the Environmental Delivery Plan development on the conservation status of each identified environmental feature.

Protected feature: in relation to a protected site, means any habitat or species, or assemblage of habitats or species, or any feature of geological, geomorphological or physiographical interest by reason of which the site is a protected site.

Protected site: means -

A European Site;

A Site of Special Scientific Interest;

A Ramsar Site; or

A Marine Conservation Zone

Ramsar Convention: means the Convention on Wetlands of International Importance especially as Waterfowl Habitat signed at Ramsar on 2 February 1971, as amended by—

(a) the Protocol known as the Paris Protocol done at Paris on 3 December 1982, and

(b) the amendments known as the Regina Amendments adopted at the Extraordinary Conference of the Contracting Parties held at Regina, Saskatchewan, Canada, between 28 May and 3 June 1987;

Ramsar Site: means a site that has been designated under paragraph 1 of article 2 of the Ramsar Convention for inclusion in the list of wetlands of international importance referred to in that article.

Site of Special Scientific interest (SSSI): a site within the meaning of part 2 of the Wildlife and Countryside Act 1981.

Special Area of Conservation (SAC): an area within the meaning of Part 3 of The Conservation of Habitats and Species Regulations 2017:

"“Special area of conservation” has the meaning given by Article 1(l) of the Habitats Directive and includes any such site designated after exit day under the retained transposing regulations”.

Article 1 of the Directive states: special area of conservation means a site of community importance designated by the member states through a statutory, administrative and/or contractual act where the necessary conservation measures are applied for the maintenance or restoration, at a favourable conservation status, of the natural habitats and/or the populations of the species for which the site is designated;

Unit: a unit is the term given to development for the purposes of the Environmental Delivery Plan charging schedule. One unit is taken as a single dwellinghouse, in accordance with the above dwellinghouse definition.

Urban wastewater: water arising from development which creates, increases, or alters a pathway for nutrient loading to surface waters or groundwater, including foul sewage, surface water runoff, and water arising from land use change, whether discharged directly or indirectly, on a continuous or intermittent basis, where such water is attributable to the development.

12 Annex 2A – Modelling undertaken with the Environment Agency

285. Water quality modelling has been undertaken by the Environment Agency56.

286. PR24 Simcat SAGIS models were used for this work alongside Farmscoper v5. Simcat SAGIS (Source Apportionment Geographical Information System) integrates ArcGIS-based digital information management and visualisation with SIMCAT (simulated catchment), the Environment Agency's water quality model. The PR24 Simcat SAGIS model is calibrated to 2014 – 2020 data, following United Kingdom water industry research agreed model build and calibration standards. Farmscoper is a decision support tool that can be used to assess diffuse agricultural pollutant loads and quantify the impacts of farm mitigation methods on these pollutants.

Table 19: Description of Simcat-SAGIS Scenario modelled by the Environment Agency

Scenario name	Point sector measures	Diffuse sector measures	Model used
Actual 2014 - 2020	Observed discharge flow and quality (2014 – 2019). Where not available, defaults used.	Current activities as represented post model calibration.	PR24 Calibration

13 Annex 3A – Methodology for maximum amount of development

Summary:

287. This methodology is provided by the Ministry for Housing, Communities and Local Government, it seeks to estimate the required capacity of Environmental Delivery Plans using the historic distribution of housing to apportion local authority local housing need.

Step 1: For each local authority, calculate the percentage of housebuilding that is in an Environmental Delivery Plan

288. Data on the location of new housebuilding is used to identify the distribution of new dwellings across England. This data is produced by combining spatial data from Ordnance Survey with information on Energy Performance Certificates (EPC) for new dwellings[57]. All new dwellings are required to have an EPC. The date these EPCs are lodged is a good indicator of when a dwelling's construction is complete. This analysis uses data from 2015-18 (before nutrient neutrality was introduced) to show the distribution of housebuilding without the impact of nutrient neutrality. Data is averaged across multiple years reducing the influence of short-term fluctuations in housebuilding to produce robust estimates.

289. This data is combined with information on the location of Environmental Delivery Plans. Nutrient Environmental Delivery Plans align to nutrient neutrality catchments[58]. For each local authority, the percentage of housebuilding that occurs within an Environmental Delivery Plan is calculated[59].

Step 2: Estimating potential development in the Environmental Delivery Plan

290. We estimate potential development in the Environmental Delivery Plan by applying percentages (from step 1) to apportion local housing need for each local authority to a catchment level.

291. Local housing need is an unconstrained assessment of the minimum number of homes needed in a local authority. We use the most recent local housing need estimates (from 2024-25), as the basis of the housing capacity needed for Environmental Delivery Plans[60]. We adjust the local housing need for each local authority to reflect the historic percentage of housebuilding within an Environmental Delivery Plan. The six local authorities that overlap with the Norfolk Environmental Delivery Plan collectively yield **a total estimate of 2,630 homes per year for the catchment.**

Step 3: Adjustments for capacity of Environmental Delivery Plan

292. We apply two adjustments to reflect: (1) actual delivery as a % of local housing need and (2) uptake of Nature Restoration Fund as a % of expected delivery. First, actual housing delivery is uncertain and heavily driven by macroeconomic conditions. In aggregate, net additions have been consistently below local housing need. Delivery is

unlikely to meet local housing need across the Norfolk area Environmental Delivery Plan. In Norfolk, delivery is about 80% of local housing need. In other catchments, delivery averages at about 70% of local housing need. We apply an assumption that 75% of local housing need will be delivered.

293. Second, we apply an assumption that 80% of expected delivery in Norfolk will use the Nature Restoration Fund, based on emerging evidence that the Nature Restoration Levy will be cheaper than alternative routes to mitigating nutrient impacts. As new Environmental Delivery Plans come forward, these adjustments should be updated to reflect emerging evidence. After applying these two adjustments, we reach an estimate of capacity of 1,578 homes per year (shown in Table 20).

Table 20: Adjustments to local housing need

For area covered by Norfolk area Environmental Delivery Plan	Homes per year
Local housing need	2,630
Expected delivery (75% of local housing need)	1,973
Expected Nature Restoration Fund uptake (80% of expected delivery)	**1,578**

Uncertainty in estimates of maximum development

- The spatial data provides a reasonable, though not perfect, indication of historic housing delivery in catchments. However, future housing delivery may be different, as the burden of nutrient neutrality means development is displaced outside of the catchment.
- Across England, local housing need (370k) is significantly higher than actual delivery (230k average between 2021-22 and 2023-24). For the Norfolk area Environmental Delivery Plan, actual delivery is only 20% lower than local housing need. However, this conceals significant variation between local authorities in the Norfolk Environmental Delivery Plan. Norwich only delivers 45% of its local housing need whereas South Norfolk exceeds its local housing need by 7%. Capacity should be flexible and adjustable based on emerging evidence.
- Use of the Nature Restoration Fund is voluntary. Developers may pursue bespoke mitigation outside of the Nature Restoration Fund. Usage of the Nature Restoration Fund will depend on its competitiveness. As the Nature Restoration Fund will not provide the only route to meeting local housing need in most areas, an Environmental Delivery Plan's capacity is not a limit on the total development that can occur in that area.

14 Annex 5A – Environmental features: Conservation status

Open water features

294. The Broads are a complex, interconnected mosaic of wetland habitats, comprising fen, open water (including deeper historic broads and shallower successional turf ponds), swamp, reedbeds, wet woodland, wet grassland and fen meadows.

295. There is also a highly important transition zone at valley sides leading into grassland and wet and dry heath. This transition has been simplified by land use change and catch dykes and is associated with significant numbers of local priority species extinctions[61]. Whilst not often fully included within protected site boundaries or environmental features it is a vital part of the ecosystem and restoration will make a significant contribution to the overall improvement of The Broads system.

296. The Broads should be viewed and managed as an integrated wetland landscape composed of interdependent habitats and ecological transitions. Habitat creation, restoration, and mitigation measures should therefore focus on restoring and maintaining contiguous, site-specific habitat mosaics and associated hydrological processes, rather than treating individual habitat features in isolation. Therefore, it is not possible or appropriate to treat any impact, feature, or conservation measure as an entirely separate entity limited to any one habitat type and there are multiple synergies and commonalities between them.

Environmental features covered by assessment

297. The environmental features in the Broads Special Area of Conservation and Ramsar covered by this open water feature habitat group assessment include:

- Intermediate between H3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition and H3140 Hard oligo-mesotrophic waters with benthic veg of Chara spp. This includes many ditches;
- S1355 Otter Lutra lutra;
- S1016 Desmoulin's whorl snail, Vertigo moulinsiana;
- Aggregations of breeding birds;
- Aggregations of non-breeding birds.

298. The Environmental Delivery Plan area only includes the Bure Broads and Marshes Site of Special Scientific Interest (SSSI) and Yare Broads and Marshes SSSI areas of the Broads Special Area of Conservation and Ramsar sites and their catchments.

299. Natural environmental processes conserve freshwater and wetland habitats for characteristic biological communities and their individual species. Rare and threatened species associated with freshwater and wetlands all have their niches within naturally functioning ecosystems. The ecological needs of freshwater and wetland species are satisfied by the conditions that are provided by natural

processes i.e. structure and function (chemical, physical, hydrological and biological)[40].

300. The populations of otter, Desmoulin's whorl snail, and the breeding and non-breeding birds are dependent on the H3150/H3140 Special Area of Conservation open water habitats. The impact of development and benefits of the conservation measures to the conservation status of these notified species will come from changes to the open water supporting habitat and its structure and function[40].

301. Therefore, this assessment is undertaken based on the open water H3150/H3140 Special Area of Conservation feature and the conclusions drawn also pertain to the Special Area of Conservation and Ramsar species that it supports set out above.

302. The open water feature consists of thirteen waterbodies (six in the Bure sub catchment and seven in the Yare sub catchment) and a series of ditches within the two catchments.

Conservation status at Environmental Delivery Plan start date

303. This section provides an overview and specifics of the structure and function attributes that underpin conservation status for the environmental features in the open water habitat group for Bure Broads and Marshes and Yare Broads and Marshes catchments.

304. Structure and function are based on naturally functioning ecosystems. This provides the ecological context around the physical and biogenic components and the ecological processes that are necessary for the functioning and conservation of the habitat.

305. Lakes of artificial origin, like the broads formed from flooded historic peat diggings, can still function naturally. Naturally functioning open water and wetland habitats are moulded by natural abiotic and biotic processes which include hydrological, geomorphological, chemical and biological processes[40], the four pillars of natural function that all interact. The specific combination of these processes acting together create a characteristic habitat populated by characteristic biological communities and their individual species. The natural spatial and temporal variability of these processes creates habitat mosaics at a range of spatial scales. All of our native species have their ecological positions in naturally functioning habitat mosaics, where their traits (physical and behavioural) evolved to fill specific habitat niches[40].

306. Nutrients are one of the key abiotic processes underpinning function with other abiotic and biotic processes having the ability to influence and modify the effects of nutrients. This has the effect of making features potentially more or less resilient to the same level of nutrients. For example, inflow increases can provide additional dilution reducing nutrient concentrations and/or decreased residence times reducing the risk of algal accumulation.

307. Human intervention in the landscape can alter the underlying abiotic and/or biotic processes[40]. This includes increased nutrient inputs from various sources including housing development and its associated infrastructure. Conservation measures address the environment impact of nutrients from Environmental Delivery Plan development on the river feature either directly or indirectly to improve the long-term resilience of the structure and function of a feature, therefore improving the

overall conservation status. Improving conservation status of the identified environmental features for nutrient Environmental Delivery Plans is therefore best focused on all of these abiotic and biotic factors which underpin structure and function[40].

308. In addition, sustainability into the future (resilience) is considered so that good future prospects are secured[62].

309. Lake habitat as a notified feature is defined in a holistic way, encompassing all physical components (the full habitat mosaic including marginal zones and other hydrologically connected areas) and the full characteristic biological assemblage. This means that the entire lake and its full hydrosere (regardless of where plants occur) and all the species it contains (including but not restricted to plants, fish and invertebrates) are protected and for any proposed restoration, the aspiration is to restore the lake habitat to as close to natural conditions as possible enabling it to support all the species representative of its typology.

310. Whilst the open water designations for the Broads are H3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition and H3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp, all the Broads waterbodies have been typed as intermediate between the two[63]. They are all typed as high alkalinity and very shallow according to the Water Framework Directive typology based on catchment geology and lake depth. This suggests that the underlying natural environmental conditions in all the Broads are fundamentally similar and would not justify them being considered as different habitat types. In addition, the palaeolimnology of the Broads indicate that the Broads represent an intermediate lake type which under natural conditions would support elements of the vegetation associated with both H3140 and H3150[64].

311. For this environmental feature assessment information has come from the following sources - data gathered in relation to Site of Special Scientific Interest Common Standards Monitoring Guidance (SSSI CSMG)[4] condition assessment and Habitats Regulations (Supplementary Advice on Conservation Objectives, SACO) requirements and other extant assessment methods (such as Water Environment Water Framework Directive, (England and Wales) Regulations). The overall rating is formed from a combination of available data.

312. For the Broads there are two sub catchments: the Bure Broad and Marshes and the Yare Broads and Marshes, which will be considered separately for each of the status components listed below.

Chemical

313. The open water feature habitat group in both the Bure and Yare sub catchments has a RAG status of red for the chemical component of structure and function.

314. For nutrient chemistry, lakes have both phosphorus and nitrogen targets (assessed as Total Phosphorus (TP) and Total Nitrogen (TN)) with targets for the intermediate lake type as described above. These targets are set to protect all other features that can be negatively impacted by excess nutrients. It therefore follows that where lakes are failing nutrient targets these other features will also be negatively affected by excess nutrients. All individual lakes in the Bure and the Yare sub catchments far exceed

targets for both TP and TN where there is data (except Cockshoot in the Bure which is still close to breaching its TN target.

Hydrological

315. The open water feature habitat group in both the Bure and Yare sub catchments has a RAG status of red for the hydrological component of structure and function.

316. Hydrological function is key to identifying the pathways by which nutrients may impact sites and conversely, potential restoration mechanisms such as the availability of increased volumes of water for flushing.

317. Both the Bure and the Yare sub catchments are parts of highly interconnected systems within the protected site boundaries and with their respective hydrologically connected river valleys. Hydrological connectivity of the open water feature is complex and highly variable. They can be connected to the main river directly, partially and/or intermittently via overtopping / flooding and with their catchments via ditch networks and overland and groundwater flows. The ditch network and surface and sub-surface water flows connect features with each other and the wider catchment. The open water habitat features are therefore affected by combinations of these water supply mechanisms and the quantity, quality and chemistry of the water.

318. Water resources is an active pressure on the open water feature across the Bure and Yare sub catchments (Broads Special Area of Conservation Site Improvement Plan), with groundwater and surface water abstraction and artificial drainage pressures acting on the open water feature, so the feature is not currently meeting hydrology targets. There is a Restoring Sustainable Abstraction (RSA) mechanism in place although action to tackle artificial drainage impacts has not yet been comprehensively planned or addressed.

Physical

319. The open water feature habitat group in both the Bure and Yare sub catchments has a RAG status of red for the physical component of structure and function

320. Lake substrate, shoreline and sediment load, as well as physical hydrological control structure pressures, can be included when assessing physical component components (from Common Standards Monitoring Guidance for lake habitat, CSMG)[4]. Connectivity is also important and spans physical, hydrological, chemical and biological components.

321. For shoreline, this includes having largely unmodified shoreline, and near natural bank material with low percentage affected by hard or soft engineering.

322. Currently we don't have sufficient available evidence to make this assessment with high confidence. Sediment load/siltation is an active pressure in the Broads Special Area of Conservation Site Improvement Plan. As demonstrated by the Hoveton restoration project its removal, in conjunction with other measures and improvement in water quality in the river, makes a significant contribution to the overall improvement of the broad. This improvement would infer that sediment loads are similarly detrimental to other broads in both catchments which have impoverished macrophyte communities similar to that at Hoveton before restoration. Some of the broads in the Yare have been isolated from the river in the 1980s to avoid effects of the

hypereutrophic river water. This however has affected their functional connectivity, and as river water quality improves will be less beneficial.

Biological

323. The open water habitat group in the Bure has a RAG status of amber and red in the Yare for the biological component of structure and function.

324. The most recent macrophyte classifications from Environment Agency Water Framework Directive Monitoring are generally poor or moderate for the Bure, although not a direct measure of the macrophytes for Common Standards Monitoring Guidance, they give an indication of the macrophyte assemblage. The macrophyte Water Framework Directive data is not available for The Yare.

325. The Broads Authority monitor aquatic macrophytes across the Broads annually[65]. Species abundances vary between individual broads and rivers, but generally in the Yare there has been some increases in species abundance since 2020. The between year variability and low abundances in some broads is indicative of a less resilient system vulnerable to nutrient driven tipping points between macrophyte and algal dominated systems. Condition assessments of four broads in The Bure and one in The Yare in 2009 found all broads failed to meet macrophyte community targets and four showed high levels of algal turbidity. For the Bure and the Yare, noteworthy plant species (Ramsar citation) usually associated with open water features, are noted as generally declining or not present, with nutrient status and hydrological impairment the main pressures in both sub catchments[66].

326. There are no/few very recent assessments of fen vegetation (which can form part of the hydrosere in open water features) in the Bure or Yare catchments, however, the very comprehensive Broads Fen Survey[67] identified various changes/trends across the Broads Fens since the previous survey in 1995, summarised below;

- An expansion of eutrophic fens;
- An expansion of fens dominated by greater and lesser pond sedge Carex riparia and C. acutiformis;
- An increase in common reed Phragmites australis, so that it is ubiquitous in almost all fen, swamp and mire communities. Reed-based fen appears to have replaced a variety of communities including Cladium mariscus and Glyceria maxima;
- A probable increase in the extent and range in communities showing a brackish water influence;
- A decrease in Glyceria maxima communities, especially in the Yare, where there appears to have been wholesale change in much of the valley floodplain;
- A reduction in the extent and quality of S24 tall herb fens, partly as a consequence of the expansion of the above vegetation types;
- The truncation of hydroseral and hydro-topographical zonations, with the loss of much of the aquatic and pioneer swamp phases, the early secondary

swamp communities such as Carex paniculata fen, and the upslope dryland to floodplain transitions;

- Autogenic change within fen communities through growth of the peat surface, the succession to drier fen types and the accumulation of surface nutrients;
- A loss of all fen types to scrub and woodland over-growth including the middle hydrosere floodplain tall herb fens;
- Loss of structural and compositional diversity and complexity of the fen's consequent upon the above changes.

327. Invasive Non-Native Species (INNS) are listed as an active pressure in the Broads Special Area of Conservation Site Improvement Plan (SIP).

Future prospects

328. Open water features have a high sensitivity to climate change[68]. Given the latest predictions on the speed and scale of climate change, this threat will be increasingly active and influential during the lifetime of this Environmental Delivery Plan.

329. Climate change has a synergistic effect on nutrient impacts. Not just through raised water temperatures which can amplify the impacts of smaller amounts of nutrients, and favour growth of algae, but also through more unpredictable and extreme heavy rainfall and drought events. These can make soils more friable and nutrients more mobile. Extreme storm events can mobilise these into water bodies, exacerbate wave wash and erosion impacts generating more sediment. Other impacts can include changes to stratification, mixing, distribution of oxygen and temperature, and changes to evaporation rates and drawdown regime. The Broads are also highly sensitive to additional pressures from sea level rise, storm surges and saline intrusion.

330. The open water feature of the Bure and Yare sub catchments are subject to various pressures and threats as identified above, all of which interact, and in many cases will act synergistically. Removal of one of more of those pressures increases resilience of the overall system, but ultimately reduction or removal of all pressures, and addressing the current pressures is necessary to reduce long term impacts of climate change and achieve good future prospects.

Overall conservation status at Environmental Delivery Plan start date

331. The overall conservation status at Environmental Delivery Plan start date of the open water habitat group environmental features considering the status of the structure and function components is summarised in Table 21 and Table 22, below. The overall conservation status for both the Bure and Yare sub catchments is Red.

Table 21: Bure Broads and Marshes open water feature assessment of the overall conservation status, based on underpinning structure and function components

Structure and function components	Summary of evidence for open water feature	Status of component	Overall conservation status
Biological	Macrophyte and other biological aspects of condition monitoring not met targets. Hoveton restoration project in place and positive trajectory	Amber	Red
Physical	Sediment load is a pressure	Red	
Hydrological	Water resources is an active pressure, with Restoring Sustainable Abstraction (RSA) mechanism in place to resolve. Additional hydrological restoration through catch dyke infilling not currently actioned	Red	
Chemical	Environment Agency (EA) data and Diffuse Water Pollution Plan (DWPP) show failure and sufficient measures to resolve not in place. Anglian Water Services Water Industry National Environment Programme (AWS WINEP) includes fair share actions for Phosphorus. Nutrient targets not being met. Sediment load is a pressure	Red	

Table 22: Yare Broads and Marshes open water feature assessment of the overall conservation status, based on underpinning structure and function components

Structure and function components	Summary of evidence for open water feature	Status of component	Overall conservation status
Biological	Associated bird assemblages favourable, have active Invasive Non-Native Species (INNS) pressure Other aspects data not readily available, but water quality targets being hugely exceeded	Red	Red
Physical	Sediment ingress active pressure with no clear mechanism secured Other aspects data not readily available	Red	
Hydrological	Water resources is an active pressure, with Restoring Sustainable Abstraction (RSA) mechanism in place to resolve. Additional hydrological restoration through catch dyke infilling not currently actioned	Red	
Chemical	Environment Agency (EA) data and Diffuse Water Pollution Plan (DWPP) show failure and sufficient measures to resolve not in place. Anglian Water Services Water Industry National Environment Programme (AWS WINEP) includes fair share actions for Phosphorus. Nutrient targets not being met. Sediment load is a pressure	Red	

Fen and fen type wetland features

332. The Broads are a complex, interconnected mosaic of wetland habitats, comprising fen (here including fens, swamps, reedbeds, fen meadows), open water (including deeper historic broads and shallower successional turf ponds) wet woodland, and wet grassland.

333. There is also a highly important transition zone at valley sides leading into grassland and wet and dry heath. This transition has been simplified by land use change and catch dykes and is associated with significant numbers of local priority species extinctions[61]. Whilst not often fully included within protected site boundaries or environmental features it is a vital part of the ecosystem and restoration will make a significant contribution to the overall improvement of The Broads system.

334. The Broads should be viewed and managed as an integrated wetland ecosystem composed of interdependent habitats - the location, quality and extent of which are determined by the unique environmental conditions - and the species that both shape and are supported by these habitats. Habitat creation, restoration, and mitigation measures should therefore focus on restoring and maintaining contiguous, site-specific habitat mosaics and associated hydrological processes, rather than treating individual habitat features in isolation. Therefore, it is not possible or appropriate to treat any feature, negative effect from Environmental Delivery Plan development, or conservation measure as entirely separate and limited to one habitat type as there are multiple synergies and commonalities between them. This assessment looks at the negative effects of nutrient pollution from development on the below identified protected site features that are located within the Broadland Special Area of Conservation and Ramsar.

Environmental features covered by assessment

335. The Special Area of Conservation and Ramsar environmental features in the Broads covered by this fen and fen-type habitat group feature assessment include:

- H6410 Molinia meadows on calcareous, peat or clay-silt soil;
- H7140 Transition mires and quaking bogs;
- H7210 Calcareous fens with C. mariscus and species of C. davallianae;
- H7230 Alkaline fens;
- S1903 Fen orchid, Liparis loeselii;
- S1016 Desmoulin's whorl snail, Vertigo moulinsiana;
- Wetland Plant assemblage;
- Wetland Invertebrate assemblage;
- Floodplain fen;
- Aggregations of breeding birds;
- Aggregations of non-breeding birds.

336. The Environmental Delivery Plan area only includes the Bure Broads and Marshes Site of Special Scientific Interest (SSSI) and Yare Broads and Marshes SSSI areas of the Broads Special Area of Conservation and Ramsar sites and their catchments.

337. Natural environmental processes conserve freshwater and wetland habitats for characteristic biological communities and their individual species. Rare and threatened species associated with freshwater and wetlands all have their niches within naturally functioning ecosystems. The ecological needs of freshwater and wetland species are satisfied by the conditions that are provided by natural processes, i.e. structure and function (chemical, physical, hydrological and biological)[40].

338. The different notified fen type habitats within the Broads (H6410, H7140, H7210, H7230 and floodplain fen) make up an interconnected mosaic of wetland fen habitat. The impacts and benefits to these habitats are all interlinked and therefore it is best to consider them as one overall fen type habitat[69] from ecosystem management, protection and restoration perspectives.

339. The populations of fen orchid, Desmoulin's whorl snail, wetland invertebrate assemblage and the breeding and non-breeding birds are dependent on the range of fen type habitats (H6410, H7140, H7210, H7230 and floodplain fen). The impact of development and benefits of the conservation measures to the conservation status of these notified species will be largely driven by changes to the fen type supporting habitat and its structure and function.

340. Therefore, this assessment is undertaken based on the fen type habitat feature and the conclusions drawn pertain to all the environmental features in the fen and fen-type habitat group set out above.

Conservation status of the fen features at the Environmental Delivery Plan start date

341. This section provides an overview of the structure and function components that underpin conservation status for the grouped fen environmental features for Bure Broads and Marshes and Yare Broads and Marshes.

342. Concepts of structure and function are founded on processes occurring in naturally functioning ecosystems. This approach provides the ecological context around the physical and biogenic components and the ecological processes that are necessary for the functioning and conservation of the habitat.

343. Naturally functioning open water and wetland habitats are moulded by natural abiotic and biotic processes which include hydrological, geomorphological, chemical and biological processes[70], four of the pillars of natural function that all interact. The specific combination of these processes acting together creates a characteristic habitat populated by characteristic biological communities and their individual species. The natural spatial and temporal variability of these processes creates habitat mosaics at a range of spatial scales. All of our native species have their ecological positions in naturally functioning habitat mosaics, where their traits (physical and behavioural) evolved to fill specific habitat niches[40].

344. While the Broads has clearly been subject to various human interventions and modifications, it remains the most important floodplain fen system in England, supporting a large proportion of the UK's tall calcareous fen resource[71] (Natural

England, in prep.), with flows of groundwater and surface water interacting with the partially modified floodplain environment giving rise to a complex matrix of highly protected fen types including calcareous fens with *Cladium*, alkaline fens, transition mires and quaking bogs, and molinia meadows, as well as extensive reedbeds and other more nutrient-demanding wetlands[72]. From an international perspective, the Broads fens are also highly significant given the endangered assessment assigned to both tall-sedge base-rich fens (the major type of fen in the Broads) and small-sedge base-rich fens (present in the Broads but with smaller extent) in the European Red List of Habitats[73].

345. Nutrient availability is one of the key abiotic factors underpinning function in fens[74], recognising that other abiotic and biotic processes have the ability to influence and modify the availability of nutrients to biota. This has the effect of making sites potentially more or less resilient to the same level of nutrients. For example, flow increases (i.e. hydrological change/factors) can provide additional dilution reducing nutrient concentrations and/or decrease residence times reducing the risk of uptake by plants and accumulation within an ecosystem.

346. Human intervention in the landscape can alter the underlying abiotic and/or biotic processes[40]. This includes increased nutrient inputs from various sources including housing development and its associated infrastructure. Conservation measures address the environment impact of nutrients from Environmental Delivery Plan development on the river feature, either directly or indirectly, to improve the long-term resilience of the structure and function of a feature, therefore improving the overall conservation status. Improving conservation status of the identified environmental features for nutrient Environmental Delivery Plans is therefore best focused on all of these abiotic and biotic factors which underpin structure and function[40].

347. In addition, sustainability into the future is considered so that good future prospects are secured[62].

Chemical

348. The fen feature habitat group has a RAG status of red for the chemical component of structure and function in both the Bure and Yare sub-catchments.

349. While direct measurement of nutrient and hydrochemical status is not routinely done within the fen environment, the status of these parameters in the open water component of the site is used to assess the overall status at freshwater ecosystem level. The open water feature assessment provides details on the current nutrient status. This indicates that the open water feature is failing its chemicals status and that all of the 13 waterbodies are failing their nutrient targets (except nitrogen in Cockshoot broad which is just passing). The assessment is consistent with findings from vegetation surveys and species analysis which show increases in species characteristic of higher nutrient status in the fen[77], and decreases and losses of those characteristics of lower nutrient availability[66].

Hydrological

350. The fen feature habitat group has a RAG status of red for the hydrological component of structure and function in both the Bure and Yare sub-catchments.

351. Groundwater abstraction and artificial drainage are pressures acting on fen ecosystems across the Broads, including both the Yare and Bure sub-catchments. Action is underway to tackle groundwater and surface water abstraction across the Broads, while action to tackle artificial drainage impacts, including the damaging effect of catch dykes[75], has not yet been comprehensively planned or addressed.

Physical

352. The fen feature habitat group has a RAG status of red for the physical component of structure and function for both the Bure and Yare sub catchments.

353. Functional connectivity: Maintain and where necessary restore the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the site[76].

354. This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches and watercourses outside of the protected site boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying habitat features of the site.

355. The hydrological connections here are of particular importance for the fen features. One of the major losses of functional connectivity in the Broads has been the truncation and loss of wetland zonations (at upper and lower ends of the system), as a result of modifications to natural hydrological systems, land use change and invasive species, with the consequent loss of component, and in some cases highly restricted, species.

356. Vegetation structure/management: Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to maintain the structure, functions and supporting processes associated with the feature[76].

357. Active and ongoing conservation management is needed to protect, maintain and restore this feature at this site. Although occurring within natural systems, the extent and composition of the Broads fen types has been influenced by vegetation management, i.e. cutting and grazing, and in the absence of this, many open fens would develop into fen woodland. While some open fen species persist in wet woodland, others are lost as woody plant cover and shading increases. Development of woodland can also be accelerated by nutrient enrichment and/or artificial drainage The cessation of management across parts of the Broads has been a reason for poor condition over the last few decades[69], and re-establishment of appropriate cutting or grazing regimes can be expensive and practically difficult.

358. Exposed substrate: Maintain and where necessary restore a low cover of exposed substrate of between 5% & 25% across the feature[76].

359. For some fens, maintaining some extent of exposed, open ground surface is required to support the establishment and survival of component plant species which rely on a

low competition environment, which in this context is generally driven by very wet and low nutrient conditions, rather than through physical intervention. This necessary extent and scale will vary depending on the type of fen.

360. Overall, the modifications to hydrological function, the ongoing difficulty in managing the fens and the consequent impacts on of the Broads fen features, result in a red assessment for the physical component of structure and function.

Biological

361. The fen feature habitat group has a RAG status of red for the biological component of structure and function in both the Bure and Yare sub-catchments.

362. There are few very recent assessments of fen vegetation in the Bure or Yare catchments, however, the very comprehensive Broads Fen Survey[77] identified various changes and trends across the Broads Fens since the previous surveys, in particular the Broadland Fen Resource Survey[78], and these are summarised below:

- An expansion of eutrophic fens;
- An expansion of fens dominated by greater and lesser pond sedge Carex riparia and C. acutiformis;
- An increase in common reed *Phragmites australis*, so that it is ubiquitous in almost all fen, swamp and mire communities. Reed-based fen appears to have replaced a variety of communities including Cladium mariscus and Glyceria maxima;
- A probable increase in the extent and range in communities showing a brackish water influence;
- A decrease in *Glyceria maxima* communities, especially in the Yare, where there appears to have been wholesale change in much of the valley floodplain;
- A reduction in the extent and quality of S24 tall herb fens, partly as a consequence of the expansion of the above vegetation types;
- The truncation of hydroseral and hydro-topographical zonations, with the loss of much of the aquatic and pioneer swamp phases, the early secondary swamp communities such as Carex paniculata fen, and the upslope dryland to floodplain transitions;
- Autogenic change within fen communities through growth of the peat surface, the succession to drier fen types and the accumulation of surface nutrients;
- A loss of all fen types to scrub and woodland over-growth including the middle hydrosere floodplain tall herb fens;
- Loss of structural and compositional diversity and complexity of the fen's consequent upon the above changes.

363. These conclusions are consistent with known environmental and management changes in the Broads, which include cessation or reduction of management, eutrophication of Broadland waters, ongoing surface and groundwater abstraction, changes to flow regimes in some rivers and an increase in catchment salinity. While the detail of change is uncertain, the above conclusions are robust in terms of the general direction of change and the overall impact on the fens, both of which are interpreted as negative.

364. At a sub-catchment level, the survey found a high proportion of Bure fens (74%) to comprise 'high value' types (roughly consistent with Annex 1 fen-types), compared with a lower proportion in the Yare, where only 33% were 'high value', with the majority comprising low-diversity fens characteristic conditions of higher nutrient availability[79] [80].

Future prospects

365. The fen features within the Bure and Yare catchments are subject to various pressures and threats as identified above, all of which interact and, in many cases, will act synergistically. Removal of one of more of those pressures increases resilience of the overall system, but ultimately reduction or removal of all pressures is necessary to achieve good future prospects. Climate change impacts, particularly changes to rainfall patterns and temperature are likely to exacerbate the effects of existing threats and pressures in addition to generating direct impacts, so tackling the existing pressures is critical to reducing long-term impacts of climate change and improving future prospects.

Overall baseline conservation status

366. The conservation status for the fen feature habitat group considering the status of the structure and function component is summarised in Table 23 and Table 24. The overall conservation status for the Bure and Yare sub-catchments is red.

Table 23: Assessment of the overall conservation status, based on underpinning structure and function component for fens in the Bure Broads and Marshes.

Structure and function component	Summary of evidence for Broads fen feature	Status of component	Overall conservation status
Biological	Condition ranges from favourable to unfavourable. Readily available data suggest not all sub attributes met. System-wide declines in distinctive species, and those of lower nutrient conditions.	Red	Red
Physical	Readily available data indicates not all sub attributes met. Sufficient management measures are not in	Red	

Structure and function component	Summary of evidence for Broads fen feature	Status of component	Overall conservation status
	place for all pressures for all of the site.		
Hydrological	Water resources is an active pressure, with Restoring Sustainable Abstraction mechanism in place to resolve. Widespread modifications to natural hydrological regime, e.g. Catch dykes.	Red	
Chemical	By inference from lakes and known system-wide nutrient levels in all water bodies	Red	

Table 24: Assessment of the overall conservation status, based on underpinning structure and function component for fens in the Yare Broads and Marshes.

Structure and function component	Summary of evidence for Broads fen feature	Status of component	Overall conservation status
Biological	Condition assessment has mix from unfavourable to favourable but narrative unclear. Readily available data suggest not all sub attributes met. System-wide declines in distinctive fen species, particularly those of lower nutrient conditions.	Red	Red
Physical	Detailed data not readily available but sufficient management measures are not in place for all pressures for all of the site.	Red	
Hydrological	Water resources is an active pressure, with Restoring Sustainable Abstraction mechanism in place to resolve. Widespread modifications to natural hydrological regime, e.g. Catch dykes.	Red	
Chemical	By inference from lakes and known system-wide nutrient levels in all water bodies.	RED	

Wet woodland

367. The Broads are a complex, interconnected mosaic of wetland habitats, comprising fen, open water (including deeper historic broads and shallower successional turf ponds), swamp, reedbeds, wet woodland, wet grassland and fen meadows.

368. There is also a highly important transition zone at valley sides leading into grassland and wet and dry heath. This transition has been simplified by land use change and catch dykes and is associated with significant numbers of local priority species extinctions[61]. Whilst not often fully included within protected site boundaries or environmental features it is a vital part of the ecosystem and restoration will make a significant contribution to the overall improvement of The Broads system.

369. The Broads should be viewed and managed as an integrated wetland landscape composed of interdependent habitats and ecological transitions. Habitat creation, restoration, and mitigation measures should therefore focus on restoring and maintaining contiguous, site-specific habitat mosaics and associated hydrological processes, rather than treating individual habitat features in isolation.

370. Therefore, it is not possible or appropriate to treat any feature, negative effect from Environmental Delivery Plan development or conservation measure as an entirely separate and limited to one habitat type as there are multiple synergies and commonalities between them.

Environmental features covered by assessment

371. The Special Area of Conservation and Ramsar features in the Broads covered by this wet woodland feature habitat group assessment include:

- H91E0 Alluvial woods with A. glutinosa, F. excelsior
- Floodplain alder woodland
- Wetland invertebrate assemblage.

372. The Environmental Delivery Plan area only includes the Bure Broads and Marshes Site of Special Scientific Interest (SSSI) and Yare Broads and Marshes SSSI areas of the Broads Special Area of Conservation and Ramsar sites and their catchments.

373. Natural environmental processes conserve freshwater and wetland habitats for characteristic biological communities and their individual species. Rare and threatened species associated with freshwater, and wetlands all have their niches within naturally functioning ecosystems. The ecological needs of freshwater and wetland species are satisfied by the conditions that are provided by natural processes i.e. structure and function (chemical, physical, hydrological and biological)[40].

374. The floodplain alder woodland Ramsar habitat and the H91E0 Special Area of Conservation wet woodland habitat are essentially the same habitat.

375. The invertebrate assemblage is dependent on the H91E0 habitat. The impact of development and benefits of the conservation measures to the conservation status of this assemblage will come from changes to the wet woodland supporting habitat and its structure and function[40], Therefore, this assessment is undertaken based on the wet

woodland feature (H19E0) and the conclusions drawn also pertain to the Ramsar habitat and invertebrate assemblage that it supports set out above.

Conservation status at the Environmental Delivery Plan start date

376. This section provides an overview of the structure and function components that underpin conservation status for the environmental features in the wet woodland habitat group for Bure Broads and Marshes and Yare Broads and Marshes catchments.

377. Concepts of structure and function are founded on processes occurring in naturally functioning ecosystems. This approach provides the ecological context around the physical and biogenic components and the ecological processes that are necessary for the functioning and conservation of the habitat.

378. Naturally functioning open water and wetland habitats are moulded by natural abiotic and biotic processes which include hydrological, geomorphological, chemical and biological processes[70], four of the pillars of natural function that all interact. The specific combination of these processes acting together creates a characteristic habitat populated by characteristic biological communities and their individual species. The natural spatial and temporal variability of these processes creates habitat mosaics at a range of spatial scales. All of our native species have their ecological positions in naturally functioning habitat mosaics, where their traits (physical and behavioural) evolved to fill specific habitat niches[40].

379. Human intervention in the landscape can alter the underlying abiotic and/or biotic processes[81]. This includes increased nutrient inputs from various sources including housing development and its associated infrastructure. Conservation measures address the environment impact of nutrients from Environmental Delivery Plan development on the river feature either directly or indirectly to improve the long-term resilience of the structure and function of a feature, therefore improving the overall conservation status. Improving conservation status of the identified environmental features for nutrient Environmental Delivery Plans is therefore best focused on all of these abiotic and biotic factors which underpin structure and function[40].

380. In addition, sustainability into the future (resilience) is considered so that good future prospects are secured[62].

381. The complex of sites in the Broads contain the largest blocks of alder Alnus glutinosa wood in England. Within the complex, complete successional sequences occur from open water through reedswamp to alder woodland, which has developed on fen peat. There is a correspondingly wide range of flora, including uncommon species such as marsh fern Thelypteris palustris.

382. In the Bure Broads and Marshes Site of Special Scientific Interest (SSSI), there is an extensive area of alder carr woodland which is better developed here than in the other Broadland valleys and the site now forms probably the finest example of swamp alder carr in Britain.

383. H91E0 alluvial woods with A. glutinosa, F. excelsior is a feature of the Broadland Special Area of Conservation, within the area covered by the Bure Broads and Marshes SSSI and

Yare Broads and Marshes SSSI. It is not a feature at the River Wensum Special Area of Conservation.

Chemical

384. The H91E0 alluvial forests feature has a RAG status of red for the chemical component of structure and function for both the Bure and Yare sub catchments.

385. The water quality target in the Conservation Objectives Supplementary advice document[82] for the SAC is "Where the feature is dependent on surface water and/or groundwater, maintain and where necessary restore water quality and quantity to a standard which provides the necessary conditions to support the feature".

386. This is expressed as "Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of the conservation objectives for the Special Area of Conservation, but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the Special Area of Conservation" [76].

387. There is a limitation in the data specifically relating to the H91E0 feature in that there are no water quality monitoring points within the Site of Special Scientific Interest units where wet woodland is a feature. The best available evidence is at monitoring points in close proximity and with hydrological connection. While direct measurement of nutrient and hydrochemical status is not routinely carried out within the woodland condition assessments, the status of these parameters in the open water component of the site can be used to assess the overall status at the freshwater ecosystem level. The open water feature assessment provides details on the current nutrient status. This indicates that the open water feature is failing its chemicals status and that all of the 13 waterbodies are failing their nutrient targets (except nitrogen in Cockshoot broad which is just passing).

Hydrological

388. The H91E0 alluvial Forests feature has a RAG status of red for the hydrological component of structure and function for both the Bure and Yare sub catchments.

389. The hydrology target in the Conservation Objectives Supplementary advice document for the Special Area of Conservation[76] is:

- "At a site, unit and/or catchment level (as necessary, maintain or as necessary restore natural hydrological processes to provide the conditions necessary to sustain the feature within the site."
- "Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present.
- This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. Alluvial forests can be dynamic in nature, being part of successional habitats

and transitions to drier woodlands. Hydrological processes (including periodic inundation) are critical to how they function and must not be negatively impacted."

390. Both the Bure and Yare are part of highly interconnected systems within-site and with their respective wider river valleys.

391. They are connected to the main river directly, partially and intermittently or overtopping with their catchments via ditch networks and overland groundwater flows. There is a lack of detailed information on constrained hydrological processes relating specifically to the H91E0 feature. However, more generally, water resources is an active pressure upon the condition of these sites, and a key issue potentially affecting the full range of Broads' habitats and species. This was flagged as an issue in the Broads Special Area of Conservation Site Improvement Plan (SIP). Therefore, it should be considered that the site is currently failing for hydrology. However, there is a Restoring Sustainable Abstraction (RSA) mechanism in place to resolve abstraction. Therefore, the position should be an improving one regarding this. However, as action to tackle artificial drainage impacts has not yet been comprehensively planned or addressed, there will be unresolved impacts upon hydrological restoration.

Physical

392. There is a lack of evidence for the H91E0 Alluvial Forests feature to ascertain the RAG status of the physical component for of structure and function for both the Bure and Yare sub catchments.

393. For this feature, there are three aspects to consider for the physical component: Functional connectivity; Soils, substrate and nutrient cycling; and Illumination.

394. Functional connectivity: Maintain and where necessary restore the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the site[76].

395. This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the protected site boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site.

396. The hydrological connections here are of particular importance in terms of the H91E0 feature. However, there is little available data on how disrupted these hydrological connections are currently in relation to the H91E0 feature.

397. Soils, substrate & nutrient cycling: Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal:bacterial ratio, to within typical values for the habitat[76].

398. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this feature. Elevated nutrients increase soil fertility in typically nutrient-moderate wet woodland soils. This increases productivity which leads to increased leaf litter and organic debris, raising decomposition rates.

Accelerated decomposition can alter soil structure, reducing peat formation in wetter areas.

399. There is no data available for the H91E0 feature specifically.

400. Illumination: Ensure artificial light is maintained to a level which is unlikely to affect natural phenological cycles and processes to the detriment of the feature and its typical species at this site[76].

401. Disturbance or modification of light levels can influence numerous aspects of plant and animal behaviour. Flowering and development of trees and plants can also be modified by un-natural illumination which can disrupt natural seasonal responses.

402. There is no data available to inform whether illumination is a significant issue at the Bure and Yare but nutrient input and increased growth of understorey within wet woodlands could increase shading and reduce light levels, which could cause impacts upon natural functioning of the H91E0 feature.

Biological

403. The H91E0 alluvial Forests feature has a RAG status of red for the biological component of structure and function for both the Bure and Yare sub catchments.

404. Invasive, non-native and/or introduced species: Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the feature[76].

405. Wild deer populations in the Broads are known to be high, as detailed in 'The Impact of Deer on Wetland Habitats in the Broads National Park'[83]. This includes high numbers of introduced non-native species such as Muntjac, Fallow and Chinese water deer. This did not look specifically at impact upon wet woodlands, in part due to the difficulty of accessing such woodland. However, wet woodland can be a key habitat for deer. The impact of high deer numbers on woodland habitats is well understood, although much of the research regarding deer and woodland took place on drier types it can be assumed similar impacts are experienced by most Broads woodland, and therefore it is likely to fail on this sub-attribute.

406. Deer are widely understood to have significant impacts on woodland, principally:

- Browsing of young shoots whether seedlings, maiden saplings or coppice regrowth. This can prevent natural regeneration of woodland and kill coppice;
- Preferential grazing of species (documented in for instance in Puttman 1986[84]) can affect woodland composition over time. It may explain the recent apparent increase in holly in woodland, this species being avoided by deer;
- Grazing of understorey species such as brambles and roses, or coppice regrowth, has removed whole structural layers. Dense understorey is important as habitat for a wide range of breeding birds and invertebrates;
- Grazing of woodland ground flora can impoverish herb species-richness and through grazing responses, promote grassy or rushy grounds over broadleaved herbs and ferns;

- Wholesale habitat change can rapidly lead to changes in associated faunal communities.

407. In the Yare Broads and Marshes, invasive plant species are listed as a pressure on the Site of Special Scientific Interest (SSSI). Himalayan balsam is present patchily throughout the SSSI. In some units it grows thickly and must be removed by hand-pulling or by brush cutting. Several consecutive years of doing this empties the seed bank. Himalayan balsam creates a monoculture which, on the riverbank, can form large expanses where the riverbank is made vulnerable by the poor root systems of the plant which allow material to be washed into the watercourse increasing the sediment load and losing riverbank habitat. This will be a threat to wet woodland habitats.

408. Key structural, influential and/or distinctive species: Maintain and where necessary restore the abundance of the typical species to enable each of them to be a viable component of the Annex 1 habitat.

- Constant and preferential plant species of W2a, W5, W6 and W7 NVC vegetation types at this Special Area of Conservation;
- 80% of ground flora cover referable to W2a, W5, W6 and W7 NVC communities.

409. Vegetation community composition: Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification types:

- W2a Alnus glutinosa-Filipendula ulmaria woodland;
- W5 Alnus glutinosa-Carex paniculata woodland;
- W6 Alnus glutinosa-Urtica dioica woodland;
- W7 Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum woodland.

410. These last two aspects are similar in nature and could be considered together. There is no available data to suggest that the vegetation communities are being shifted or changing from the core National Vegetation Classification communities and species. However, poor water quality as evidenced in the chemical component is likely to influence this and drive communities to a more eutrophic situation.

Future prospects

411. The climate change adaptation manual lists wet woodland as medium risk.

412. Woodlands are incredibly adaptive habitats, and available evidence indicates that most of our native tree species are likely to remain ecologically viable and within their respective climate envelope under projected climate change. Our native trees also have significant adaptation potential, through long distance gene flow.

413. Furthermore, and critically, ecological resilience in UK woodland is not driven by canopy tree composition alone. It arises from multi-layered structural and functional diversity, including small trees and shrubs all of which contribute to microclimate buffering, regeneration niches, and trophic complexity.

414. In many instances, wet woodland is a successional habitat that will move towards dry woodland over time and reductions in summer rainfall and water tables are likely to

hasten this process. Increases in the abstraction of water from catchments during dry periods will exacerbate the direct effects of climate change.

415. Rainfall is likely to be the main cause of change in wet woodlands rather than temperature. At present, there is significant uncertainty in the climate projections for precipitation. Even if the current projections of drier summers and wetter winters prove to be accurate, the overall impact on wet woodlands is uncertain. The management of water availability and levels will become increasingly important in catchments in the Broads.

Overall baseline conservation status

416. The overall conservation status at the Environmental Delivery Plan start date of the H91E0 alluvial forests considering the status of the structure and function components is summarised in Table 25. The overall conservation status for the Bure and Yare sub catchments is red.

Table 25: Broads Wet woodland assessment of the overall conservation status, based on underpinning structure and function components for Bure and Yare.

Structure and function attribute	Summary of evidence for H91E0 feature	Status of component	Overall conservation status
Biological	Presence and negative impact of invasive species (non-native deer and Himalayan balsam)	Red	Red
Physical	Lack of clear evidence	**Unknown**	
Hydrological	Water resources an active pressure	Amber	
Chemical	Site is failing for total phosphorus and nitrogen	Red	

River habitat

417. This assessment looks at the negative effects of nutrient pollution from development on the below identified environmental features of the River Wensum Special Area of Conservation (SAC):

- H3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation;
- S1092 White-clawed crayfish, Austropotamobius pallipes;
- S1096 Brook Lamprey, Lampetra planeri;
- S1163 Bullhead, Cottus gobio.

418. Natural environmental processes conserve freshwater and wetland habitats for characteristic biological communities and their individual species. Rare and threatened species associated with freshwater and wetlands all have their niches within naturally functioning ecosystems. The ecological needs of freshwater and wetland species are satisfied by the conditions that are provided by natural processes i.e. structure and function (chemical, physical, hydrological and biological)[81].

419. The populations of white-clawed crayfish (S1092), brook lamprey (S1096) and bullhead (S1163) are dependent on the overarching Special Area of Conservation river habitat (H3260). We therefore take the approach that the condition of the river habitat type is a suitable representative of these species condition[85]. This approach is also taken here as the impact and benefits to the conservation status of these notified species will come from changes to the river supporting habitat and its structure and function.

420. Therefore, this assessment is undertaken based on the river (H3260) Special Area of Conservation environmental feature and the conclusions drawn also pertain to the three SAC species (white-clawed crayfish (S1092), brook lamprey (S1096) and bullhead (S1163)) that it supports.

Conservation status at Environmental Delivery Plan start date

421. Conservation status for the river feature (H3260) is defined by reference to the structure and function components in the Wensum and this section provides an overview and specifics of the structure and function components that underpin conservation status for the river feature.

422. Structure and function are based on naturally functioning ecosystems. This provides the ecological context around the physical and biogenic components and the ecological processes that are necessary for the functioning and conservation of the habitat.

423. Naturally functioning open water and wetland habitats are moulded by natural abiotic and biotic processes which include hydrological, geomorphological, chemical and biological processes[40], four of the pillars of natural function that all interact. The specific combination of these processes acting together create a characteristic habitat populated by characteristic biological communities and their individual species. The natural spatial and temporal variability of these processes creates habitat mosaics at a range of spatial scales. All of our native species have their ecological positions in naturally functioning habitat mosaics, where their traits (physical and behavioural) evolved to fill specific habitat niches[81].

424. Nutrients are one of the key abiotic factors underpinning function with other abiotic and biotic processes having the ability to influence and modify the effects of nutrients. This has the effect of making features potentially more or less resilient to the same level of nutrients. For example, inflow increases can provide additional dilution reducing nutrient concentrations and/or decreased residence times reducing the risk of algal accumulation.

425. Human intervention in the landscape can alter the underlying abiotic and/or biotic processes[81]. This includes increased nutrient inputs from various sources including housing development and its associated infrastructure. Conservation measures address the environment impact of nutrients from Environmental Delivery Plan

development on the river feature either directly, or indirectly by influencing the other biotic and abiotic processes thereby improving the long-term resilience of the structure and function of the river feature and improving the overall conservation status. Improving the conservation status of the identified environmental features for nutrient Environmental Delivery Plans is therefore best focused on all of these abiotic and biotic factors which underpin structure and function[81].

426. In addition, sustainability into the future (resilience) is considered so that good future prospects are secured[62].

427. The most recent River Wensum Site of Special Scientific Interest (SSSI) condition assessment 2024[85] provides the most up to date assessment of the current conservation status of the structure and functional components for the river feature (the SSSI and Special Area of Conservation river feature are the same). A summary of the evidence of the current conservation status for the river feature, largely informed by the recent condition assessment is set out below.

Chemical

428. The river feature has a RAG status of red for the chemical component of structure and function as set out in more detail below.

429. Excessive nutrients are one of the greatest pressures on our freshwater environments and have significant detrimental impacts on the healthy and resilient functioning of the system[86]. Elevated phosphorus levels interfere with competitive interactions between higher plant species and between higher plants and algae, leading to dominance by attached forms of algae and a loss of characteristic plant species (which may include lower plants such as mosses and liverworts). The respiration of artificially large growths of benthic or floating algae may generate large diurnal sags in dissolved oxygen and poor substrate conditions (increased siltation) for fish and invertebrate species[4].

430. Most rivers in England are limited by phosphorus. Orthophosphate, or soluble reactive phosphorus, is the determinant used to assess nutrient loading in the River Wensum.

431. The river feature fails compliance with the nutrient (orthophosphate) target (20-30µg/l). All monitoring points across the site failed the target for the three-year mean and growing season mean. Target exceedance ranged from 124% to 400%. Excess nutrients can cause eutrophication and symptoms of eutrophication include changes in species composition resulting in a dominance by phytoplankton, algal blooms, oxygen sags and at the extreme fish kills.

432. It should be noted that nitrogen (from both agriculture and development) may also be important in river eutrophication and can originate from the same or different sources. Both phosphorus and nitrogen compounds should naturally be scarce. Although not assessed inorganic nitrogen (TIN) concentrations are also likely to exceed levels that support structure and function of the river feature. JNCC (2016[4]) recommend that targets of around ten times greater than the soluble reactive phosphorus (SRP) target (so 200ug/l in the headwaters and 300ug/l in the river) can be applied where there is site-specific evidence for nitrogen-mediated eutrophication that is not amenable to control by applying phosphorus targets in isolation.

433. Dissolved oxygen is one of the most important indicators of water quality, as fish and other aquatic life depend on oxygen to respire. The river feature fails compliance with the dissolved oxygen target with failures occurring across all sites (except for unit 52) with the largest failure at Sculthorpe Mill. Low levels of dissolved oxygen can indicate organic (carbon) and/or nutrient (phosphorus and/or nitrogen) pollution. Dissolved oxygen sags occurring at night can be triggered by excessive plant or algae growth and this may cause macroinvertebrate and fish mortality[86].

434. Biochemical Oxygen Demand (BOD) is an indicator of organic pollution and can be correlated to microbiological activity. High BOD levels reduce the availability of oxygen in the system and have similar consequences to low dissolved oxygen[86]. The river feature passes the target for mean BOD demand but there is low confidence in the assessment due to insufficient monitoring data.

435. Excessive ammonia concentrations in freshwater systems can have a direct toxic impact on freshwater species[86]. The river feature passes the targets for total ammonia and unionised ammonia.

436. A large range of different chemicals may be present in rivers, and many have the potential to have direct or indirect toxic effects on freshwater species. The river feature also failed compliance with other chemical pollutant targets, specifically for polybrominated diphenyl ethers (PBDE). PBDEs are a group of man-made organobromine compounds and have been used for a wide range of uses, for example flame retardants, although there are now legislative restrictions to prevent their use in products.

Hydrological

437. The river feature has a RAG status of red for the hydrological component of structure and function as set out in more detail below

438. A near-natural flow regime is required for favourable structure and function of the river feature, supporting flushing flows, seasonal base-flows, natural low flows and seasonal recession (for ephemeral habitats). It shapes and sustains characteristic biotope mosaics affecting factors such as current velocities and bed hydraulics, water levels and depths, wetted area, temperature regime and dissolved oxygen regime[87].

439. There is failure of both temporal and spatial compliance with the flow targets detailed in the Monitoring Specification for the Wensum[88] although it is variable across the site[89]. Units 48, 49, 51, 52, 53 and 55 are compliant for flow and units 45, 46, 47, 50 and 54 fail temporal flow compliance. Most failures occur due to the impact of abstractions on flows although unit 47 fails due to the impact of excess flows caused by Fakenham wastewater treatment works (WwTW). When spatial compliance is considered, the feature is compliant for flows at Q50 (average flow) or higher, but there are significant failures during periods of lower flow. These occur on the Tat upstream of the Wensum confluence (units 45 and 46) and on the Wensum downstream of Bintree Mill (unit 50) and downstream of Taverham Mill (unit 54). These reflect the impact of summer abstractions for irrigation at times of low flows and impacts from gravel pit abstractions (in particular for unit 54 downstream of Taverham Mill).

440. Lower water flows and levels lead to a further increase in nutrient/chemical concentrations through reduced dilution, causing reduced water quality and the

potential for increased algal blooms. Low flows also cause an increase in water temperatures which increases algal growth and lowers dissolved oxygen levels, further exacerbating the negative effects of algae.

Physical

441. The river feature has a RAG status of red for the physical component of structure and function as set out in more detail below.

442. Modifications to the river mean that large parts of the channel length can be uniformly over-deepened or over-wide, devoid of shade and with slow flow velocities. This can lead to reduced water quality as the channel doesn't have sufficient energy to flush nutrients and fine material through the system or facilitate oxygen diffusion into the water column, promoting the expression of nutrients as enhanced plant or algae growth. Disconnection from the floodplain due to over-deepening or embankments also removes the potential for the floodplain to filter sediment during flood flows. Lack of bank side trees (in particular in the headwaters) and large woody material in the channel that promote flow and habitat diversity and locally stabilises temperature can provide the conditions that encourages the growth of algae.

443. Artificial in-channel structures such as weirs, dams, sluices, fords, groynes and culverts may constitute barriers to the free movement of water, sediment and aquatic organisms, and may affect river-bed structure and hydrology downstream[4]. They can also cause a flow impoundment where sediment will accumulate and this will store phosphorus as well as creating still conditions for algae to form, potentially increasing dissolved oxygen fluctuations. Many species, including fish and invertebrates, require natural freedom of movement to complete their life cycle in rivers and maximise their population size and genetic diversity. Longitudinal connectivity within the river channel and lateral connectivity between the channel and the floodplain are both critical to a healthy river ecosystem[90]. Watercourses with strong structure and function have a very high degree of naturalness with good longitudinal connectivity within the river channel and lateral connectivity between the channel and the floodplain and no artificial barriers to movement of species, sediment and flow[87].

444. A high degree of naturalness supports a mosaic of characteristic physical habitats or biotopes, including a range of substrate types, variations in flow, channel width and depth, in-channel and side-channel sedimentation features (including transiently exposed sediments), bank profiles (including shallow and steep slopes), erosion features (such as cliffs) and both in-channel and bankside (woody and herbaceous) vegetation cover. All of these biotopes, and their characteristic patterns within the river corridor, are important to the full expression of the river's biological community and ability to fully support the characteristic species including the notified fish and crayfish species[87].

445. The river feature, assessed as highly modified, fails the target for channel planform naturalness[91] due to extensive evidence of straightening, re-sectioning, over-deepening, re-alignment away from the river's natural course and artificial drainage. Much of this is due to historical modification, including mills, dredging and land drainage which has had a negative impact on the hydrological function of the river.

446. The river feature fails the target for more than 65% of sites surveyed to be classed as semi-natural. This is due to the habitat modification scores (HMS) indicating significant physical modification. Only one site (out of 21 sites) was recorded to be in semi-natural condition. Three sites were recorded as significantly modified with the remaining sites severely modified due to re-sectioned/reinforced banks, embankments, poaching and in-channel structures.

447. The river feature also fails the target for in-channel structures with nine of the ten river channel Site of Special Scientific Interest units impacted by culverts, weirs, mill infrastructure, bridges or fords. These structures are largely attributed to historic mills which either cause impoundment with accumulations of sediment, restrict lateral river migration, impact sediment transport and/or degrade the habitat structure. Impoundment to flow encourages sediment to deposit and accumulate, storing phosphorus as well as creating still conditions for algae to form. There are 14 water control structures along the river from the downstream boundary of the Special Area of Conservation which can inhibit the movement of migratory fish and aquatic fauna[90].

448. Woody material that falls into streams plays an important role in increasing habitat diversity, providing shelter for fish, supplying a food source for aquatic invertebrates, and for slowing the passage of nutrients downstream[4,90]. It is also a key driver of geomorphological change in chalk streams and should be frequent throughout the river system, creating partial blockages to flow, promoting sinuosity, generating slack water refuges upstream and scour holes downstream throwing up bars of gravels[70].

449. The river feature fails compliance for woody material. Two units (45 and 46) passed the woody material target, however, overall woody material was only recorded 'present' at 29% of the sites surveyed and no sites recorded woody material as 'extensive'. Generally, it is rare along much of the length of the river except in restored sections. Bankside trees were variable along the river, however they were recorded at all sites surveyed.

450. Riparian vegetation that has been modified by land use change, management or nutrient enrichment so that it lacks species or structural diversity can negatively impact on the in-channel and riparian biota. The target for bankside and riparian vegetation naturalness is that it is predominantly semi-natural and large woody material generated naturally by riparian trees occurs within the channel and helps to shape the physical structure of the channel, and in smaller watercourses temporary coarse woody dams should be a feature of channel[70,87].

451. In addition, an integral fully functional riparian zone (which may lie outside of the site boundary) consists of a mosaic of natural and semi-natural riparian vegetation types typically including 30-50% patchy tree cover creating a mixture of light and shade on the river channel, tree root systems and a supply of large woody debris that adds channel complexity[87].

452. The river feature is compliant for bank and riparian vegetation naturalness. All of the Site of Special Scientific Interest units (except unit 53 for bank vegetation naturalness) passed the target criteria. Bank top habitats consisted predominantly of broadleaved or mixed woodland (semi-natural), wetland and rough or unimproved grassland / pasture. Where individual sites scored lower than the target this was due to the presence of either tall herb or parklands and gardens. It should, however, also be noted that 13 out

of the 21 sites (units 45, 46, 47, 48, 49, 52, 53, 54) recorded modified bank top habitats such as conifer plantation, suburban / urban development, tilled land and parkland and gardens. Four of these sites (units 45, 52, 54) recorded one of these habitats as extensive on one bank top. In addition, 90% of the sites assessed also recorded over-deepening and/or embankments providing a lack of hydrological continuity between the river and its floodplain.

453. Siltation is the unnatural accumulation of silt on other substrates (including aquatic plants). It is caused by high particulate loads or reduced scour within the channel[4]. Excessive fine sediment supply can smother the coarse substrates, degrading the habitat for macroinvertebrates and fish, and it also reduces the amount of oxygen in gravels (note that impoundment of the river can have the same effects)[90]. For river types characterised by extensive Ranunculus beds, there should be a predominance of 'clean' gravels, pebbles and cobbles with relatively low cover by silt-dominated substrates. Localised accumulations of silt on the inside of bends, in back channels or beneath macrophyte stands do not necessarily indicate a problem[87].

454. Phosphorus also binds to fine sediment particles and bed gravels, where it is stored until it is disturbed and released. This phosphorus can become an additional source to the water column in the future where it can be released if concentrations in the water column are reduced, thus artificially maintaining high levels. This is referred to as 'legacy phosphorus' or internal loading The river features fails compliance with the siltation target. Chalk rivers are characterised by very low levels of siltation and only two units (units 45 and 46) were not impacted by unnaturally high levels of siltation. In the remaining Site of Special Scientific Interest units, heavy siltation was observed. It is thought likely that most of the silt can be attributed to agricultural and road verge soils within the wider catchment. The accumulation of silt is likely exacerbated by the highly modified channel, as well as degradation of the naturally patchy macrophyte assemblages, causing slower velocities in the river encouraging deposition of, and reducing the flushing of fines through the system.

Biological

455. The river feature has a RAG status of red for the biological component of structure and function as set out in more detail below.

456. Some plant or animal species (or related groups of such species) make a particularly important contribution to the structure, function and/or quality of the river habitat feature. These species will include;

- Structural species which form a key part of the habitat's structure or characterise an Annex I habitat on a site;
- Influential species which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat);
- Site-distinctive species which are considered special and distinguishing component to the River Wensum habitat feature[90].

457. The Annex 1 habitat (H3260) river habitat (watercourses of plain to montane levels, with the Ranunculion fluitantis and Callitricho Batrachion vegetation) is characterised in the Wensum by the sub-type one habitat variant that is found on chalk substrates. It is also a UK priority habitat which forms one of the environmental typologies that can be used to inform Site of Special Scientific Interest site selection alongside other environmental, plant and macro-invertebrate typologies[40].

458. Aquatic plants form an important structural and functional element in rivers[4]. Beds of Ranunculus and the wider plant assemblage associated with the river habitat type beneficially modifies water flow and levels by impeding flow in some places and also creating faster flowing dynamic channels, where gravel flushing occurs. These plants also provide shelter and food for invertebrates and fish. Ranunculus also supports millions of blackfly larvae which filter diatoms from the water[92] helping to maintain water quality.

459. In situations where phosphorus is excessive, higher plants can be outcompeted by algae, which will further accelerate the loss of higher plants by reducing light penetration and preventing photosynthesis. When this occurs widespread siltation swiftly follows and smothering of the river gravels will degrade the habitat for macroinvertebrates and fish by reducing the area of clean habitat and reducing the amount of oxygen in gravels and excessive plant or algae growth can also trigger oxygen sags during the night which can lead to macroinvertebrate and fish mortality.

460. The river feature fails compliance with the macrophyte target (Water Framework Directive (WFD) 'high status') achieving an overall assessment of WFD 'moderate' status. None of the Site of Special Scientific Interest units achieved WFD 'high status'. Only one out of 23 individual survey sites[91] achieved high status and five sites were classified as poor (results from survey sites are averaged at the unit level). There were varying trends across the survey sites with both gains and losses to the plant communities, however overall, the JBA assessment indicates general degradation in aquatic macrophyte diversity since the last time surveys were undertaken (varying dates between 1996 and 2018). Several sites have experienced species loss potentially caused by management or environmental changes such as nutrient enrichment (these sites were located in SSSI Units 45, 47-50, 52, 53). Losses include moss species and forbs such as spiked water-milfoil Myriophyllum spicatum, yellow water lily Nuphar lutea, various pondweeds Potamogeton and Stuckenia spp. water-starworts Callitriche spp. and notably water-crowfoot Ranunculus aquatilis and Ranunculus penicillatus spp. pseudofluitans which have been lost from three sites (Site of Special Scientific Interest units 50,52 and 53).

461. The loss of submerged macrophytes such as Ranunculus and Callitriche, which are highly characteristic of the Annex 1 river type also removes a structural habitat component of the river that beneficially modifies water flow and levels by impeding flow in some places and also creating faster flowing dynamic channels, where gravel flushing occurs. The loss of structurally important plants also results in a loss of shelter and food for invertebrates and fish. Ranunculus also supports millions of blackfly larvae which filter diatoms from the water[92].

462. Overall, the survey indicates a degradation in aquatic macrophyte diversity, driven by cumulative impacts of historic modification and management that have significantly altered the natural hydraulics causing sedimentation and pressure from nutrient enrichment.

463. Macroinvertebrates form a major part of the biological community of rivers and are sensitive to a range of environmental pressures[4]. It should be noted that they are less sensitive to the change in nutrients than plants therefore they are not a reliable indicator of eutrophication and are more directly influenced by habitat and flows.

464. The river feature fails compliance with the target of achieving Water Framework Directive (WFD) high status for macro-invertebrates. This is, however, based on limited data with only one site surveyed in unit 53 (Wensum WFD waterbody) in 2024 and one site in unit 46 (Tat WFD waterbody) in 2023. Unit 53 achieving WFD high ecological status (pass) and unit 46 achieving WFD moderate ecological status (fail). In general, when considering data from six sites (Units 45, 46, 48, 50, 53 and 51) surveyed between 2010 to 2024 the river feature has tended (66% of the results) towards a WFD classification of high. However, data is limited to six surveys, no site has repeated data and two of the sites failed compliance with the target and so confidence in the overall assessment as favourable is compromised[87].

465. Fish are a key component of freshwater ecosystems, and the natural characteristic fish assemblage forms an integral component of freshwater habitats. Fish assemblages in the fresh waters of the UK vary naturally owing to a combination of environmental tolerances, competitive interactions and barriers to colonisation. Freshwater fish communities, probably more than any other biological group, are heavily influenced by human introductions.

466. Fish populations on the Wensum are severely degraded, with poor recruitment of characteristic sensitive species such as brown trout and grayling. Primary causes for this include extensive habitat modification and channel uniformity, siltation of spawning gravels, lack of flow diversity and barriers impeding fish passage[87,93].

467. Non-native species constitute a major threat to many river systems. For example, species such as signal crayfish have been responsible for much of the decline of the white clawed crayfish through competition, habitat damage and the introduction of crayfish plague[87]. Increased nutrient levels can encourage the spread of non-native invasive plant species such as Himalayan balsam can lead to bank destabilisation and increased run-off.

468. The river feature fails compliance with the targets for negative indicators. Seven of the ten Site of Special Scientific Interest units support self-sustaining populations of Invasive Non-Native Species (INNS) including Himalayan balsam, signal crayfish, American mink and Elodea nuttallii. Units 45, 46 and 47 did not record populations of INNS which would impact the site integrity so individually pass the criteria[91]. Non-native barbel Barbus barbus have also been artificially stocked to the Wensum in the past, however it should be noted that the population may now be declining and the level of impact is therefore likely to be low[94].

Future prospects

469. The climate change risk assessment for the Wensum[91] identified the risk level for the Wensum as high. In particular, the assessment highlighted that lower rainfall and higher temperatures in summer months can lead to lower water levels which may result in lower dissolved oxygen levels. This could increase concentrations of chemicals including nutrients in the water through reduced dilution, causing reduced

water quality, algal blooms, increased disease, eutrophication, invertebrate and fish kills and a reduction or over-simplification of macrophyte communities.

470. This could be problematic to the Wensum as flow velocities are low due to over-deepening and bank re-sectioning which may further exacerbate these issues. Areas where structures are present causing impoundment of flows or over-widened sections of river are particularly vulnerable due to reduced flows. Put simply, the current pressures and cause of failure are likely to be magnified under the additional pressure of climate change.

Conservation status at the Environmental Delivery Plan start date

471. The conservation status at the Environmental Delivery Plan start date for the river feature (watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachio*n* vegetation, bullhead, lamprey and white clawed crayfish) based on the status of each of the structure and function components is summarised in Table 26. The overall conservation status for the river feature is red or poor status, i.e. the structure and function of the habitat or the habitats of the species is severely degraded, and recovery will require significant intervention over a long timescale.

Table 26: River Wensum, river feature assessment of the conservation status at the Environmental Delivery Plan start date, based on each of the underpinning structure and function components.

Structure and function attribute	Summary of evidence for Wensum River feature	Status of component	Overall conservation status
Biological	Degraded macrophyte, invertebrate communities and impacted fish communities. Invasive Non-Native Species presence noted,	Red	Red
Physical	Multiple pressures and structural modification including weirs, impoundment, canalization and over-deepening, re-alignment and loss of natural features and processes.	Red	
Hydrological	Main flow failure in downstream reach (unit 54) and intermittent failures in units 45, 46 and 50 at low flows.	Red	
Chemical	Phosphate enrichment and dissolved oxygen failures	Red	

Desmoulin's whorl snail

Environmental features covered by assessment

472. Desmoulin's whorl snail is a qualifying feature of the River Wensum Special Area of Conservation. It is highly specialised and can inhabit riparian vegetation and floodplain fen.

473. Natural environmental processes conserve freshwater and wetland habitats for characteristic biological communities and their individual species. Rare and threatened species associated with freshwater and wetlands all have their niches within naturally functioning ecosystems. The ecological needs of freshwater and wetland species are satisfied by the conditions that are provided by natural processes i.e. structure and function (chemical, physical, hydrological and biological)[40].

474. Desmoulin's whorl snail is dependent upon the structure and function of the riparian vegetation which is at least in part linked to the river feature and floodplain fen in the River Wensum.

475. The adaptations and ecological traits of Desmoulin's whorl snail are inextricably linked to the habitat such that the definition of conservation status for Desmoulin's whorl snail, the negative effect of development on the conservation status and the benefits of conservation measures on the conservation status are very much reflected by the supporting habitat.

476. Desmoulin's whorl snail is also a qualifying feature of the Broads Special Area of Conservation. The assessment for Desmoulin's within the Broads is covered within the Broads open water and Fen type habitat feature assessments, which are the supporting habitats in the Broads for Desmoulin's.

477. This feature assessment for Desmoulin's will therefore focus on the River Wensum.

Conservation status at the Environmental Delivery Plan start date

478. Conservation status for the Desmoulin's whorl snail (S1016) is defined by reference to the structure and function components of its supporting habitat in the Wensum and this section provides an overview of the structure and function components of supporting habitat of the Desmoulin's whorl snail.

479. Naturally functioning open water and wetland habitats are moulded by natural abiotic and biotic processes which include hydrological, geomorphological, chemical and biological processes[70], the four pillars of natural function that all interact. The specific combination of these processes acting together create a characteristic habitat populated by characteristic biological communities and their individual species. The natural spatial and temporal variability of these processes creates habitat mosaics at a range of spatial scales. All of our native species have their ecological positions in naturally functioning habitat mosaics, where their traits (physical and behavioural) evolved to fill specific habitat niches[40], including Desmoulin's whorl snail.

480. Nutrients are one of the key abiotic processes underpinning function with other abiotic and biotic processes having the ability to influence and modify the effects of nutrients. This has the effect of making features potentially more or less resilient to the same level

of nutrients. For example, inflow increases can provide additional dilution reducing nutrient concentrations and/or decreased residence times reducing the risk of algal accumulation.

481. Human intervention in the landscape can alter the underlying abiotic and/or biotic processes[40]. This includes increased nutrient inputs from various sources including housing development and its associated infrastructure. Conservation measures address the environment impact of nutrients from Environmental Delivery Plan development on the river feature either directly or indirectly by influencing the other biotic and abiotic processes to improve the long-term resilience of the structure and function of a feature, therefore improving the overall conservation status. Improving conservation status of the identified environmental features for nutrient Environmental Delivery Plans is therefore best focused on all of these abiotic and biotic factors which underpin structure and function[40].

482. In addition, sustainability into the future (resilience) is considered so that good future prospects are secured[62].

483. Desmoulin's whorl snail is highly specialised and inhabits the riparian vegetation, and floodplain fen both within and outside the River Wensum Special Area Conservation boundary.

484. Desmoulin's whorl snail although the largest of the genus, is tiny, only 1.6mm wide and up to 2.7mm high. It is an air breathing terrestrial snail, feeding on the epiphytic microflora (surface film of fungi, alga and bacteria) on living and dead leaves mostly of tall monocotyledons, especially reed sweet-grass Glyceria maxima, greater and lesser pond-sedges Carex riparia and C.acutiformis, and tussocks of greater tussock-sedge Carex paniculata. It is restricted to calcareous wetlands where the reed-grasses and sedges grow in thick stands, usually bordering lakes or rivers and ditches, or in fens, and transition zones to willow or alder carr.

485. The small size of the animals means that it is vulnerable to desiccation such that high humidity is a strong determining factor in persistence of populations. In addition, it is easily dislodged from the reed-grasses and sedges by fast flowing water, strong winds, heavy rains and the movement and grazing of large herbivores. Provided the reed-grasses and sedges form thick stands with water at or near to the ground surface, or even somewhat above the surface, the necessary humidity will be maintained to enable the animals to safely emerge from their shells and graze.

486. Some accumulated litter will enable the snails to find refuge during drier conditions. The food source, the epiphytic microflora will also be dependent on adequate humidity. Wetland trees and shrubs can contribute to maintaining humidity and buffering from disturbance and thermal stress, but only in so far as the shading effect of the trees does not decrease the abundance of the reed-grasses and sedges. This is because the tiny snails only have a limited ability to move horizontally through vegetation. In a riparian situation, sheltered, stable conditions are provided by wide bands of emergent, or floating rafts of sedges and reed-grasses on the edges of the river.

487. Although the snails can climb vertically up the vegetation, in response to humidity and temperature, they could not outpace rapidly rising floodwater. However, the main means of dispersal is through water movement, as the snails can survive short periods

of time floating in water, or attached to floating vegetation, and establish new populations or augment existing, provided, suitable habitat is available before the snails drown.

488. Desmoulin's whorl snail can recover relatively quickly in number and establish at new locations because each animal, though short lived (up to 15 months), is hermaphrodite and mostly self-fertilising. Rapid growth from egg stage can result in up to four generations per year. The meta-population in the River Wensum valley was widely distributed, occupying well vegetated sections of the river margins, and areas of fen in the floodplain, alongside ditches and around ponds[95]. Periodic dispersal events between populations separated by unsuitable habitat, and ability to rapidly establish new populations is an adaptation for species occupying dynamic habitats. However, the number and distribution of populations of Desmoulin's have contracted significantly in the last 25 years particularly from the lower section of the River Wensum Special Area of Conservation (see section biological below). Breakdown of the meta-population functioning will result where perturbations remain frequent, but populations become too widely separated to re-colonise.

489. Due to the sensitivity of the species, snail populations may disappear from stands of vegetation before there are obvious macro-changes in species composition, density and extent of the vegetation. For example, Glyceria maxima in particular is relatively tolerant of nutrient loading and fluctuations in water level, and large stands could superficially appear to be remain suitable but no longer support Desmoulin's. In this sense, the species can be viewed as an indicator that environmental changes have occurred, perhaps due to changes in the hydrological regime (prolonged, excessive flooding or dry periods), and/or nutrient loading. Ultimately, the macro-vegetation will manifest the pressures, such as by transitioning to "rank" vegetation[95] including nettles Urtica dioica, bramble Rubus fruticosus, cleavers Galium aparine and great willowherb Epilobium hirsutum, indicative of drying and nutrient enrichment.

Biological

490. The Desmoulin's whorl snail feature has a RAG status of red for the biological component of structure and function of riparian vegetation and floodplain fen as set out in more detail below

491. Of the underlying habitats, the river feature fails biological status, one of the issues being the loss of submerged macrophytes such as Ranunculus and Callitriche, leading to less varied flow pathways, and more siltation being more widespread, including in/on riparian margins where there could be Desmoulin's habitat. This is exacerbated where phosphorus is excessive, and algae growth leads to reduced light penetration and loss of submerged aquatic plants. When this occurs more siltation swiftly follows with further degradation of the habitat for Desmoulin's whorl snail on the riparian margins.

492. The river feature also fails compliance with the targets for negative indicators, including the presence of Invasive Non-Native Species (INNS) Himalayan balsam Impatiens glandulifera which can outcompete native vegetation and therefore reduce suitability of the habitat for Desmoulin's.

493. Desmoulin's whorl snail was first recorded in the upper River Wensum valley in 1970. M.P. Kerney and E.B. Rands found it in a swamp by the river at Guist (TF994251) (now Site of Special Scientific Interest (SSSI) unit 22, adjacent to river unit 49) and in a ditch at Shereford Common (TF885300) (outside the SSSI, in wetland south of river unit 47). R.C. Preece (undated but probably around the same time period) found it at Hempton (TF9129) 'frequent on sedges by the River Wensum' (SSSI river unit 47). Populations were again found at Guist Common and Hempton in 1999[96], although the finds may not have been at precisely the same locations.

494. A more extensive survey at 31 sample points, following a standardised sampling method was carried out by Killeen (2001[95]). Desmoulin's whorl snail was found at 16 locations, occupying *Carex* dominated fens, *Glyceria* dominated fens, botanically diverse marshes, choked ditches and river margins. The main centres of the populations were around Fakenham, and from Ringland through to Hellesdon Mill where it was found at virtually every sample location. Only one population was found between Guist and Ringland – at Great Witchingham, but this section of river was less well sampled during this survey. Overall Killeen concluded the species was widely distributed from Sculthorpe downstream to Hellesdon which is the lowest reach of the River Wensum Special Area of Conservation, and was likely to present at other locations that were not sampled at this time. It was not found at the source of the River Tat, the upper tributary of the Wensum (Site of Special Scientific Interest wetland units 1-4 and river unit 46, and part of 47) downstream to Sculthorpe, despite the presence of suitable looking vegetation.

495. Killeen did not find it at the historic 1970 location at Shereford Common (note that the 1970 record lacked precision for direct comparison). Negative results from individual sampling efforts do not necessarily mean the snail has been lost from sites as it could be present in very low numbers and difficult to find, and therefore still with the potential for the population to recover. However, Shereford has since been searched again[97] with no Desmoulin's whorl snail found. By this time the most suitable looking habitat in this survey was restricted to small areas near the river and the remainder of Shereford Common was too heavily cattle grazed. If this population has been lost from this section of the valley (adjacent to Site of Special Scientific Interest unit 47), this represents a range contraction of approximately 1.5km.

496. Further targeted (not comprehensive) surveys have followed: Article 17/regulation 9A reporting[98 99]; a Norwich road scheme proposal[100 101] and Site of Special Scientific Interest condition monitoring[97]. Whilst these do not constitute a systematic monitoring programme, a declining trend in the number of populations, and in abundance of snails where populations are still extant is notable over the last 20-25 years, particularly in the lower reach between Ringland and Hellesdon. Killeen described this section as one of the main population centres with snails in nearly every sample, occasional to frequent. In the vicinity of Ringland, in 2001[95] the mean count was 36.2 animals per sample but sampling in 2011, 2021 and 2025 have all consistently shown lower counts and the species becoming more localised. Another large population was found on Ringland Common in 2021, but by 2025 numbers here had also declined and there was widespread evidence of drying.

497. A similar picture emerges downstream at Taverham to Cotessey Pits where in 2001 Desmoulin's was on Glyceria of the river margins (Site of Special Scientific Interest (SSSI)

river unit 54) but very few found in 2024, with marginal vegetation reduced to narrow bands, the bankside sedge beds too dry and Invasive Non-Native Species (INNS) Himalayan balsam becoming dominant.

498. Further downstream at Drayton, Desmoulin's was previously common (2001), but none were found in 2017, with the habitat showing signs of drying and by 2024 no Desmoulin's were found and the habitat unsuitably dry. Similarly at sample locations from Cotessey to Hellesdon (SSSI units with fen habitats 38-44) no Desmoulin's were found in 2024, with INNS Himalayan balsam dominant in places, absence of tall sedge beds and heavy horse grazing. If the species has been lost from the lower river section between Cotessey Pits and Hellesdon this represents a contraction in range of approximately 6km.

499. In summary there has been a sustained decline in the number of populations and abundance of animals in samples over the last 25 years in the River Wensum Special Area of Conservation, not offset by recent discoveries of previously unknown populations at Swanton Morley (2024) and Pensthorpe[102]. Declines are less marked for both these population attributes in the upper reaches of the Wensum valley where the floodplain habitats tended to be in more suitable condition for Desmoulin's[97]. Here hydrology and management were more favourable for supporting the desired species composition and structure of the habitat. Populations were not always found at exactly the same locations, but sufficient extent of habitat remained and, in some areas, floodplain marsh was being actively encouraged to expand.

500. The decline in quality and extent of suitable habitat and number and size of populations becomes most apparent at Great Ryburgh and downstream towards Guist Common where there have been losses, but Guist Marshes still supports a good population. At Guist Common, the River Wensum is influenced by the impounding effects of Bintree Mill, and there are significant banks of spoil on both sides of the river. The hydrological relationship between the river and its floodplain is therefore significantly modified and fen habitat of Desmoulin's has experienced drying and inappropriate grazing.

501. It is several kilometres further downstream to the next known population at Swanton Morley. There is a risk that meta-population function has already started to break down due to fragmentation and isolation of populations which impairs successful (re)colonisation due to smaller size of source populations and higher risk of mortality during dispersal events.

502. The extent of suitable habitat has reduced, with marginal riparian habitat more restricted in width, by physical modification of the river channel and occasionally by overshading of bankside trees; and floodplain habitats have experienced structural and species composition change due to inappropriate grazing and mowing regimes, drying and increased dominance of Invasive Non-Native Species Himalayan balsam. Range, in terms of distance (km) along the river has reduced due to losses from the upper parts of the Special Area of Conservation at Shereford, but most especially from the lower reach, potentially by as much as 7km in total.

Chemical

503. The Desmoulin's feature has a RAG status of red for the chemical component of structure and function of riparian vegetation and floodplain fen as set out in more detail below.

504. The reliance of Desmoulin's whorl snail on very specific environmental conditions highlights the importance of the integrity of local hydrology and natural processes, both of the river itself and in the connectivity of the river with the floodplain fen. The assessments for the river feature in the Wensum and the open water and fen habitats in the Broads sets out how nutrient enrichment can affect the structure and function of these habitats, often in combination with other pressures, such as channel modification, changes in water flow regimes and land management in the floodplain, which in turn will impact on Desmoulin's.

505. Environmental pH and availability of minerals for shell development is a known driver of mollusc distribution, and it is quite likely that there are also direct metabolic effects on the soft body tissues of the snails due to changes in water chemistry, such as nutrient enrichment and other forms of pollution. This could affect the snails when immersed in the water or in contact with it, when climbing on the damp surfaces of the plants. Nutrients are also likely to affect the community composition of the epiphytic microflora, the food source of the snails, particularly where deposition of silt and growth of macro-algae coat the surfaces of the sedges and reed-grasses, but little research exists on these factors, the focus having been on known macro-changes in habitat.

506. Eutrophication impacts in the river such as changes in aquatic plant species composition in channel resulting in a dominance by phytoplankton, algal blooms and oxygen sags will extend into the potential Desmoulin's habitat, the riparian (marginal) vegetation, leading to a coating of macro-algae on the emergent and floating plants. It is highly likely to impact the growth and species composition of the epiphytic microflora, the food source of Desmoulin's, through changes in water chemistry at the surface of the leaves.

507. Direct measurement of nutrient and hydrochemicals is not routinely done within fen communities, rather vegetation survey is used to detect increases in species characteristic of higher nutrient levels. However, it is not unreasonable to use chemical status of the river as an indication of status of the fens, habitat for Desmoulin's. This is because the River Wensum Special Area of Conservation includes "river supporting habitats" in Site of Special Scientific Interest units 1-44, the definition being "any adjacent semi-natural, wet habitat which is intimately linked with the river and which is probably dependent on the river for its continued existence"[87].

508. In a naturally functioning, interconnected river and floodplain there will be transference of nutrients and chemicals between the floodplain and the river depending on degree and direction of connectivity, spatial and temporal variation and presence of physical modifications.

Hydrological

509. The Desmoulin's feature has a RAG status of red for the hydrological component of structure and function of riparian vegetation and floodplain fen as set out in more detail below.

510. The river fails hydrological status due to failures in both temporal and spatial compliance with the flow targets, with some variability along the river length. Most failures occur during percentiles below Q50, caused by abstraction for summer irrigation and gravel pit abstraction. An exception is unit 47 failing due to the impact of excess flows caused by Fakenham wastewater treatment works (WwTW). Artificially lowered flows in the river will increase drying of the terrestrial wetlands, exacerbated by the presence of artificial land drainage and groundwater abstraction. Deposition of nutrients during prior flood events, followed by excessive drying periods will promote rapid vegetation change to rank conditions, as described in conservation status above, unsuitable for Desmoulin's.

511. Lower water flows and levels lead to a further increase in chemical (including nutrients) concentrations in the river water due to reduced dilution and increased water temperatures increasing algal growth and lowers dissolved oxygen levels, further exacerbating the negative effects of algae which will impact on the riparian vegetation, habitat of the Desmoulin's whorl snail.

Physical

512. The Desmoulin's feature has a RAG status of red for the physical component of structure and function of riparian vegetation and floodplain fen as set out in more detail below

513. The river fails physical status, due to artificial modification such as straightening / re-sectioning, over-deepening and re-alignment away from the river's natural course for water mills and land drainage, with associated infrastructure such as weirs, bridges and impoundments. These modifications have a negative impact on the hydrological function of the river and cause a direct reduction in marginal vegetation suitable for Desmoulin's whorl snail. Opportunities for vegetated riparian margins are reduced to narrow strips or removed altogether due to abrupt transition from deepened channel to bank top. The physical modifications also interfere with the connectivity of the river with the floodplain supporting habitats, with failures in this respect at 90% of sites assessed[91].

514. Low flow velocities caused by channel modifications can reduce water quality as the channel doesn't have sufficient energy to flush nutrients and fine material through the system, enabling enhanced plant or algae growth and enabling deposition and accumulation of silt and internal loading of phosphorus, especially behind impoundments. These effects will impact the structure and function of what remains of the riparian vegetation as habitat for Desmoulin's whorl snail, by driving change in the plant species composition and abundance, reducing the extent of ideal habitat, and quality/suitability of the food source, the epiphytic microflora.

515. Physical condition of the fen vegetation of the floodplain, including such attributes as average vegetation height is measured during Desmoulin's whorl snail survey as an indicator of habitat suitability. If a marked reduction in average vegetation height is

noted, this could be caused by unsuitable management such as heavy grazing by cattle or horses thus destroying the necessary thick stands of reed-grasses and sedges.

516. Conversely an increase in average height could be an indication of increasing tree and scrub cover, which could lead to excessive shading of the sedge beneath. Increase in average vegetation height could also be due to invasion by common reed *Phragmites australis*, which could be in response to increased inundation and nutrients. Whilst Desmoulin's can still be found in reed beds and in habitats transitioning away from optimal conditions, overall population numbers will be lower and more vulnerable to extirpation.

Future prospects for Desmoulin's whorl snail

517. The river feature and river supporting habitats are subject to various pressures and threats as summarised above and explained in more detail in the assessments for the river feature. The pressures interact and, in many cases, will act synergistically. Removal of one or more of those pressures increases resilience of the overall system, but ultimately reduction or removal of all pressures is necessary to achieve good future prospects for the underlying habitat features and thereby improving prospects for Desmoulin's whorl snail. The overall trend has been a decline over last 25 years and future prospects are poor without addressing pressures on habitat structure and function attributes, and increasing availability of habitat, maintained in suitable condition with adequate water supply.

518. Climate change, particularly changes to rainfall patterns, and temperature are likely to exacerbate the effects of existing threats and pressures in addition to generating direct impacts, so tackling the existing pressures is critical to reducing long-term impacts of climate change and improving future prospects. The climate change risk assessment for the Wensum is high[91] as flow velocities are low due to over-deepening and bank re-sectioning which may further exacerbate the issues caused by lower summer rainfall and higher temperatures.

Overall conservation status at the Environmental Delivery Plan start date

519. The conservation status for the Desmoulin's whorl snail feature, considers the status of the structure and function of the underlying habitat river feature, condition assessment of fen habitat units in the Site of Special Scientific Interest (SSSI) and adjacent to the SSSI, as well as vegetation parameters and snail population data from targeted mollusc survey in the river valley, and is summarised in Table 27 below. The overall conservation status for Desmoulin's is red.

Table 27: Desmoulin whorl snail feature assessment of the overall conservation status, based on underlying habitats and snail population data

Structure and function attribute	Summary of evidence for underlying river habitat feature, supporting habitat fen and Desmoulin's whorl snail	Status of attribute	Overall Conservation Status
Biological	Underlying habitat: River Wensum and floodplain fen habitats degraded through invasive non-native species, altered flow	Red	Red

	pathways, river modification, floodplain drainage and land management practices. Sustained long-term decline in Desmoulin's whorl snail population and abundance. Population at risk of breakdown due to fragmentation and isolation. Future prospects poor without addressing pressures.		
Physical	Underlying habitat: River Wensum - multiple pressures and structural modifications impact natural processes, riparian marginal habitat and floodplain connectivity. Floodplain fen habitat structure and species composition changes due to drying, eutrophication and land management practices. Desmoulin's whorl snail - above results in reduced humidity, thermal and physical stresses, alterations to food source, reduced survival during drying and flood events due to poorer quality and fragmented habitat.	**Red**	
Hydrological	Underlying habitat of River Wensum – main flow failure in downstream reach (unit 54), intermittent failures in units 45,46, and 50. Floodplain fen has widespread modifications to natural hydrological regimes. Natural function is impaired through river disconnection. Desmoulin's whorl snail - artificially lowered flows, artificial land drainage and groundwater abstraction increase drying of habitat. Nutrient deposition promotes rapid vegetation change to rank conditions unsuitable for Desmoulin's.	**Red**	
Chemical	Underlying habitat of River Wensum - phosphate enrichment and dissolved oxygen failures. Chemical status of floodplain fen inferred from habitat changes - transition to species tolerant of more nutrient rich and/or drier conditions.	**Red**	

	Desmoulin's whorl snail – marginal riparian vegetation impacted by river hydrochemistry, potentially affecting food source, and metabolism. Increased nutrients degrade habitat quality of floodplain fen especially in combination with drying (nettles, cleavers, brambles, great willowherb), or increased water levels (common reed).		

15 Annex 5B - Environmental impact and negative effect

Introduction

520. This annex provides an overview of the modelling used to determine the environmental impacts and associated negative effects on the environmental feature groups. It then sets out a narrative assessment of the effects on each environmental feature.

Modelling environmental impact

521. Modelling has been used across the assessment of the negative effect on the environments. The result of this modelling is explained below and used to inform the likely effect of nutrient increase from development on the conservation status of each environmental feature group.

522. The impact of the development on the in-river concentrations was modelled by the Environment Agency. Two scenarios were modelled per sub-catchment: pre and post 2030 when the PR24 wastewater treatment works upgrades will come into effect. The method also takes account of increased loads from potential new private package treatment plants for developments which are outside of existing wastewater treatment works catchments, as well as load changes from the change in land use of the development land.

523. Whilst the pre 2030 scenario levels are higher, these are likely an over estimation as they are based on the total predicted development for the Environmental Delivery Plan, and only a portion of this is likely to happen within the next three to four years. Therefore, the post 2030 scenarios have been considered, as they are most relevant for considering the impact post 2030 and the following 100 years.

524. The positive effects of the following planning condition in the Environmental Delivery Plan have been considered in the calculation of the impact of development:

525. 'The development shall not be occupied unless a package treatment plant is installed on the site and operational to manage foul water; with operating efficiency rates achieving a discharge concentration of 5 mg/l for Total Phosphorus and 27 mg/l for Total Nitrogen or lower, that will be maintained thereafter for the lifetime of the development.'

Bure and Yare sub catchments

526. Development within the Bure and Yare sub catchments will increase the wastewater discharge at 13 wastewater treatment works. There are 831 new dwellings predicted in the Bure sub catchment. The increase of nutrients from the Environmental Delivery Plan development in the Bure is relatively small (90kg/yr P and 891 kg/yr N).

527. There are 14,953 new dwellings predicted in the Yare sub catchment. The increase of nutrients from the Environmental Delivery Plan development in the Yare is 980kg/yr P and 8415 kg/yr N). The majority of this growth is at Whitlingham wastewater treatment works (13,286 dwellings) downstream of Norwich.

528. The increase in phosphorus concentration just upstream of both the Bure Broads and Marshes Site of Special Scientific Interest and Yare Broads and Marshes is 1.6µ/l which equates to 5.3% of the lake target. So, whilst the additional loads from development to the Bure are much lower than the Yare, the impact on concentration is the actual equivalent likely due to differences in available dilution. The increase in the nitrate concentration is 0.007mg/l which equates to 0.7% of the lake target in the Bure and 0.03mg/l which equates to 2.8% of the lake target in the Yare.

Wensum sub catchment

529. Development within the Wensum sub catchment will increase the wastewater discharge at four wastewater treatment works: Fakenham, Foulsham, Reepham and Sculthorpe.

530. The combined increase in phosphorus load from the 500 dwellings in the Wensum is, on average over the next 100 years, 33kg/TP year.

531. The increase in phosphorus concentration from the development on the River Wensum has been modelled by the Environment Agency. The increase in concentration varies along the Special Area of Conservation river depending on the location of the development load source of where the additional load from development comes in.

532. Please note that various assumptions had to be made including on where the additional load particularly for new package treatment plant and the land use change elements would occur. This model output therefore provides an estimation of what may occur, but the exact increases within different stretches of the Wensum will be dependent on exactly what development ends up being located. The largest increase in phosphorus concentration within the Wensum Special Area of Conservation occurs at Fakenham wastewater treatment works and is a 0.4µ/l increase which equates to 1.3% of the river target.

Open water features

Environmental features for this assessment

533. The relevant environmental features are:

Open water features – Bure Broads and Marshes Sites of Special Scientific Interest

- Intermediate between H3150 natural eutrophic lakes with Magnopotamion or Hydrocharition and H3140 hard oligo-mesotrophic waters with benthic veg of *Chara spp.* This includes many ditches;
- S1355 otter, *Lutra lutra;*
- S1016 Desmoulin's whorl snail, Vertigo moulinsiana;
- Wetland invertebrate assemblage;

- Wetland plant assemblage;
- Aggregations of non-breeding birds.

Open water features – Yare Broads and Marshes Sites of Special Scientific Interest

- Intermediate between H3150 natural eutrophic lakes with Magnopotamion or Hydrocharition and H3140 hard oligo-mesotrophic waters with benthic veg of Chara spp. This includes many ditches;
- S1355 otter, Lutra lutra;
- S1016 Desmoulin's whorl snail, Vertigo moulinsiana;
- Wetland invertebrate assemblage;
- Wetland plant assemblage;
- Aggregations of breeding birds;
- Aggregations of non-breeding birds.

Negative effect of the Environmental Delivery Plan development on conservation status

534. Nutrient pressures on open water features such as those found in the Broads most commonly arise offsite and are imported from the wider catchment. Nutrient loading arises from a variety of sources in the catchment (as outlined in Annex 5A). These affect the conservation status of the open water features.

535. Both phosphorus and nitrogen compounds should naturally be scarce but in excessive amounts can cause detrimental damage to a freshwater ecosystem's health and resilience.

536. Eutrophication is the process by which unnaturally high concentrations of nutrients increase the overall productivity of a water body, promoting the growth rate of primary producers including phytoplankton such as cyanobacteria. These 'algal blooms' cause reductions in water clarity and degraded light regimes. Without light, aquatic plants starve, causing dead organic matter to accumulate on sediments. Organic matter is mineralised by bacteria, which consume and deplete oxygen in the process, driving fish mortality.

537. Anoxic conditions promote the release of phosphorus from sediments, creating a positive feedback loop that reinforces eutrophication. Together, these effects lead to simplified plant assemblages and the loss of structurally complex habitats, reducing the ecological niches available for other organisms. Inadequate physical habitat and poor water quality favour fish communities that are dominated by pollution-tolerant species. Such species often predate on primary consumers, reinforcing the switch to an algae dominated state.

538. These processes disproportionally effect shallow, standing lakes such as the broads and has led to the loss of many species from its previously biodiverse water bodies.

539. Open water features are prone to resuspension as a result of increased organic matter deposition, which can make a lake turbid. This is a high nutrient state with phytoplankton dominance, poor light penetration, few macrophytes, and frequent hypoxia. If nutrient enrichment pushes the system across a threshold to the turbid state, internal loading and resuspension may maintain it even if external inputs fall.

540. Returning the system back to a pre-impact ecological state requires a much larger reduction in nutrients than the increase that created the shift. Therefore, preventing the shift is vital. Tipping points can be unpredictable and unstable, particularly when impacted by multiple stressors, with even small amounts of additional nutrients triggering a shift.

541. Tipping points are a critical threshold at which a relatively small additional change in environmental conditions causes an ecosystem to shift abruptly into a different state.

542. When combined with the effects of additional pressures, they are unpredictable, and make estimating the severity, timing and duration of nutrient loading impacts difficult. These factors are also often site specific and exacerbated by climate change, making predictability even more challenging.

543. Increased sediment and nutrient loads and/or water abstraction and drainage can lead to an acceleration of successional processes in lakes, particularly in small water bodies like the Broads.

544. Excess nutrients also encourage growth of non-native invasive species, both in the lakes and on the banks. Non-native species can outcompete native species and damage lake habitats, thereby disrupting species composition and abundance.

545. Nutrients may not directly change water inputs but increased algal growth can indirectly modify how water behaves inside a lake such as by:

- Strengthening stratification – through changes to how solar energy is absorbed at the lake surface and reducing the effectiveness of wind-induced mixing;
- Reducing mixing;
- Altering oxygen and temperature distribution;
- Increasing water retention and internal cycling;
- Changes to sediment regimes that can increase accumulation of sediment and change water movement through the system;
- Changes to evaporation rates, increased evaporation can change water volume and impact drawdown regime of the lake.

546. In slow-flushing lowland lakes like the Broads, longer residence time allows nutrients and blooms to accumulate, which is exacerbated by reductions of the natural flow regime.

547. The Broads are comprised of 13 different waterbodies and a series of ditches, therefore the exact increase in nutrients from development is also likely to vary between the different waterbodies due to the differences in their hydrological connectivity and the scale of development within their catchment. It should therefore be recognised that there is some inherent uncertainty in predicting changes in conservation status from the increased nutrients. Nevertheless, all are currently impacted by nutrients and other pressures, making them less resilient systems and vulnerable to nutrient driven tipping points, where they are not already more algal dominated systems.

548. Even small increases in nutrients may risk a waterbody reaching its tipping point and shifting it into an irrecoverable state. Prolonged nutrient increases may cause

accumulation within the features' sediments, thus increasing internal loading within the feature while decreasing its resilience and recovery potential.

549. Climate change is also likely to increase the impact of nutrient pollution. Therefore, controlling nutrient levels has become increasingly vital, and the achievement of ecologically appropriate concentrations is becoming increasingly challenging.

Conclusion

550. Considering Intermediate between H3150 natural eutrophic lakes with Magnopotamion or Hydrocharition and H3140 hard oligo-mesotrophic waters with benthic veg of Chara spp.

551. The Environmental Delivery Plan development will lead to additional phosphorus and nitrogen entering open water systems already enriched above their ecological targets. The effect of eutrophication on freshwater habitat is well understood and include increase phytoplankton, reduced water clarity and the light available to submerged plants. Algae growing on plant surfaces can further suppress photosynthesis. Changes to sediment structure can prevent rooting of macrophytes.

552. These mechanisms can disadvantage charophytes and other characteristic submerged plants and favour nutrient-tolerant species. Although the increased nutrient load from the Environmental Delivery Plan development is relatively low (when compared to current nutrient levels), ecological responses of these sensitive habitats can be non-linear and additional nutrients (notably phosphorus) can accumulate in sediments, having potentially long-lasting impacts.

553. Considering otter, Desmoulin's whorl snail, wetland Invertebrate assemblage, wetland plant assemblage, aggregations of non-breeding birds, aggregations of breeding birds: excessive plant and algal biomass (especially when decomposing) leads to reduction in dissolved oxygen levels, reducing habitat quality for aquatic invertebrates and other fauna. Anoxic sediments can also release phosphorus, exacerbating the negative effects. Loss or simplification of submerged and marginal vegetation reduces structural habitat, refuges, feeding surfaces and breeding or nursery habitat. Collectively these effects may negatively impact wetland plant and invertebrate assemblages, Desmoulin's whorl snail, fish-eating or plant-dependent birds and the prey-base available to otters.

554. In conclusion, the negative effect from the Environmental Delivery Plan development will impact the biological, physical and chemical components of structure and function and future prospects of open water habitat features.

Fen and fen type wetland features

Environmental features for this assessment

555. The relevant environmental features are:

Fen and fen type wetland habitat features – Bure Broads and Marshes Sites of Special Scientific Interest

- H6410 Molinia meadows on calcareous, peat or clay-silt soil;

- H7140 transition mires and quaking bogs;
- H7210 calcareous fens with *C.* mariscus and species of *C.* davallianae;
- H7230 alkaline fens;
- S1903 fen orchid, Liparis loeselii;
- S1016 Desmoulin's whorl snail, Vertigo moulinsiana
- Wetland plant assemblage;
- Wetland invertebrate assemblage;
- Floodplain fen;
- Aggregations of breeding birds;
- Aggregations of non-breeding birds.

Fen and fen type wetland habitat features – Yare Broads and Marshes Sites of Special Scientific Interest

- H6410 Molinia meadows on calcareous, peat or clay-silt soil;
- H7140 transition mires and quaking bogs;
- H7210 calcareous fens with C. mariscu*s* and species of C. davallianae;
- H7230 alkaline fens;
- S1016 Desmoulin's whorl snail, Vertigo moulinsiana;
- Wetland plant assemblage;
- Wetland invertebrate assemblage;
- Floodplain fen;
- Aggregations of breeding birds;
- Aggregations of non-breeding birds.

Negative effect of the Environmental Delivery Plan development on conservation status

556. In lowland fens, extra anthropogenic nutrient inputs disrupt naturally determined nutrient conditions, driving higher productivity, altered peat and water dynamics, and oxygen depletion. These physical and hydrological changes shift vegetation composition in favour of tall, competitive species, leading to loss of specialist fen flora and the dependent fauna. This loss of complexity leads to reduced biodiversity, and transitions to reed-dominated or other highly productive, low diversity wetlands, with the loss of rare and globally threatened low-nutrient components of wetland ecosystems, for which the Broads is so important.

557. The negative effect of nutrient pollution impacts the physical, chemical and hydrological components of habitat structure and function. Increased phosphorus and nitrogen levels raise nutrient availability, whilst shifts in pH and redox conditions can occur, altering other chemical equilibria. Primary productivity is increased and plant species which can utilise elevated nutrient availability are favoured, resulting in dense and tall stands with increased plant litter.

558. Subsequent higher decomposition rates reduce the stability and accumulation of peat, potentially lowering the capacity for water retention. Increased quantities of organic matter cause oxygen depletion in waterlogged soils. Under anoxic conditions, more phosphorus is released from sediments and peat, creating a positive feedback mechanism that reinforces nutrient enrichment. There are additional hydrological impacts.

559. Dense vegetation increases evapotranspiration, potentially reducing the local water tables. Changes in peat structure and compaction influence water storage and flow pathways. Eutrophication can disrupt the balance between groundwater and surface water that is critical to the function of fen habitat. These effects will be exacerbated by reductions in the natural flow regime.

560. Nutrient pollution alters biology through competitive displacement. Species characteristic of low-nutrient conditions, such as brown mosses, small and slender sedges and small forbs, are outcompeted by species better able to exploit increased nutrient availability, driving declines in rare, distinctive and obligate species associated with species-rich fens and reducing overall biodiversity. Nutrient enrichment favours fast-growing tall species such as common reed (Phragmites australis) reedmace (Typha spp.) and other large grasses and sedges which outcompete shorter vegetation through shading and more effective nutrient uptake.

561. The development of tall, dense vegetation causes a reduction of light availability at ground level, suppressing low-growing bryophytes and herbs that are important to fen structure and function. Over time, nutrient enrichment can drive broad changes and succession in plant communities, causing transition for species-rich fen to species-poor fen, reedbed or grassland. In severe cases, particularly where reduced water supply contributes to drying, succession may lead to replacement by nettle-dominated scrub or woodland. Changes in community composition can result in the loss of locally or nationally significant species. These include The Broads fen orchid (Liparis loeselii), milk parsley (Thysselinum palustre), which is the larval food plant of the UK-restricted swallowtail butterfly (Papilio machaon britannicus), and Desmoulin's whorl snail (Vertigo moulinsiana).

562. There are several feedback mechanisms relevant to increased nutrient pollution. For example, nutrient enrichment leads to more biomass leading to more decomposition and more nutrient release, the loss of bryophyte layer reduces peat formation and water retention which further destabilises fen hydrology, and the dominance of tall plants reinforces high nutrient demand and nutrient cycling, locking in degraded conditions.

563. The increase in nutrients from the Environmental Delivery Plan development is likely to exacerbate existing impact on the structure and function of the fen type feature. Although it should be noted that there is some uncertainty in extent of this effect, which is dependent on the location and hydrological connectivity of the specific area of fen habitat. For example, while nutrient inputs from development are lower in the Bure, this catchment supports a greater extent of higher-value fen. In contrast, nutrient inputs are substantially higher in the Yare, where higher-value fen is less common, possibly reflecting existing degradation from long-term nutrient enrichment.

Additional nutrient inputs from development are therefore likely to reinforce these existing pressures.

Conclusion

564. Considering Molinia meadows on calcareous, peat or clay-silt soil, Transition mires and quaking bogs, Calcareous fens, Alkaline fens and Floodplain fen: The Environmental Delivery Plan development will lead to additional phosphorus and nitrogen entering catchments where the fen features are already in poor condition and the connected open waters generally exceed nutrient targets. Nutrient enrichment can increase nutrient availability to fen vegetation and favour taller, faster-growing and nutrient-tolerant plants. This can accelerate shifts towards reed, tall-herb and other eutrophic communities, reduce the abundance of less competitive plants characteristic of calcareous and species-rich fen, and simplify the composition and structure of the habitat. Increased plant production and litter accumulation can recycle nutrients and reinforce succession towards rank vegetation, scrub or woodland where management is absent or insufficient.

565. Considering Desmoulin's whorl snail, wetland plant assemblage, wetland invertebrate assemblage, aggregations of breeding birds, aggregations of non-breeding birds and fen orchid: Changes in fen vegetation and hydrology can reduce the quality and continuity of supporting habitat for fen orchid, Desmoulin's whorl snail, wetland plants and invertebrates and breeding and non-breeding birds. Loss of fine-scale vegetation structure, open fen and transition zones can reduce feeding, breeding, refuge and dispersal opportunities. The effect is primarily through changes to supporting habitat and the ecological processes maintaining it.

566. In conclusion, the negative effect from the Environmental Delivery Plan development will impact the biological, physical and chemical components of structure and function and future prospects of fen-type wetland features.

Wet woodland

Environmental features for this assessment

567. The relevant environmental features are:

Wet woodland habitat features – Bure Broads and Marshes Sites of Special Scientific Interest:

- H91E0 alluvial woods with A. glutinosa, F. excelsior;
- Floodplain alder woodland;
- Wetland invertebrate assemblage.

Wet woodland habitat features – Yare Broads and Marshes Sites of Special Scientific Interest:

- H91E0 alluvial woods with A. glutinosa, F. excelsior;
- Floodplain alder woodland.

Negative effect of the Environmental Delivery Plan development on conservation status

568. Wet woodland can be negatively affected by increased nutrients via the mechanisms outlined below. The effects of nutrients interact with other biotic and abiotic factors. This creates complex interrelationships that limit the ability to make simple, binary straight-line links between a quantum of nutrients and a quantum of biological or ecological effect. It is clear, however, that increased nutrients can negatively affect all the components.

569. In lowland wet woodland, nutrient enrichment increases soil fertility and productivity, alters waterlogged soil processes, and intensifies decomposition and oxygen depletion. These changes affect hydrology and soil structure, favouring fast-growing, competitive plant species. The result is a shift away from diverse, semi-natural woodland ground flora toward species-poor communities dominated by nutrient-demanding plants, with long-term impacts on woodland structure and biodiversity.

570. Elevated nutrient concentrations change water and soil chemistry, increasing soil fertility in typical nutrient-moderate wet woodland soils, raising productivity and generating greater amounts of leaf litter and organic debris.

571. Accelerated decomposition rates alter soil structure and reduce peat formation in wetter areas. Decomposition under waterlogged conditions also increases oxygen demand, often creating anoxic soils that mobilise phosphorus and further reinforce nutrient cycling and availability. Increased organic matter can alter redox conditions and chemical equilibria, driving changes in plant communities. Nutrient enrichment can also affect hydrological functioning: greater biomass increases evapotranspiration and may lower local water tables, whilst organic matter breakdown can reduce soil porosity, affecting water storage and flow pathways.

572. Nutrient pollution impacts on the biology through changes in ground flora, as nutrient enrichment favours fast-growing, competitive species such as nettles (Urtica dioica) and grasses, which outcompete species adapted to lower-nutrient conditions, including specialist woodland herbs and bryophytes. Understorey dominance, where dense growth of tall herbs and shrubs reduces light availability at ground level, suppresses the regeneration of sensitive species and reduces structural diversity.

573. Increased nutrient availability may favour tree species that respond strongly to enhanced fertility, such as alder and willow, leading to imbalanced regeneration that alters long-term woodland composition. Collectively, these changes simplify plant communities, reducing the number of ecological niches available and leading to an overall decline in species richness.

574. There are several feedback mechanisms relevant to increased nutrient pollution. For example, more nutrients lead to more biomass which leads to more decomposition and more nutrient release (internal cycling) and shading by vigorous vegetation reinforces the dominance of nutrient-loving species. Climate change also has synergistic effect on nutrient impacts. Raised temperatures can amplify the impacts of smaller amounts of nutrients, and favour large fast-growing plants, but also through more unpredictable and extreme heavy rainfall and drought events. These can make soils and peat more friable and vulnerable to loss and nutrients more mobile.

575. There has been limited feature-specific monitoring and there is incomplete evidence for some physical components of conservation status which means there is some

uncertainty with regard to the level of connectivity with open water bodies which are a complex set of waterbodies and ditches.

Conclusion

576. Considering alluvial woods and floodplain alder woodland; additional nitrogen and phosphorus from the Environmental Delivery Plan development may enter wet woodland through floodwater, ditches, groundwater and runoff. Increased nutrient availability can alter soil fertility and decomposition, favour competitive and nutrient-tolerant vegetation and change the composition of woodland ground flora. Nutrient enrichment can also affect peat formation and nutrient cycling. These effects are likely to be exacerbated because the system is already enriched, and suffers from artificial drainage or water resource pressure, invasive plants and high deer pressure.

577. Considering wetland invertebrate assemblages; additional nitrogen and phosphorus from the Environmental Delivery Plan development may enter wet woodland through floodwater, ditches, groundwater and runoff. Increased nutrient availability can alter soil fertility and decomposition, favour competitive and nutrient-tolerant vegetation and change the composition of woodland ground flora. Nutrient enrichment can also affect peat formation and nutrient cycling. These effects are likely to be exacerbated because the system is already enriched, and suffers from artificial drainage or water-resource pressure, invasive plants and high deer pressure. Changes in ground flora, litter, tree and shrub regeneration and woodland structure can reduce habitat quality for wetland invertebrates. Nutrient effects are likely to be mediated by hydrological connectivity and woodland soils rather than expressed uniformly across all woodland stands.

578. In conclusion, the negative effect from the Environmental Delivery Plan development will impact the biological, physical and chemical components of structure and function and future prospects of wet woodland habitat features.

River habitat

Environmental features for this assessment

579. The relevant environmental features are:

- H3260 watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation;
- Brook Lamprey, Lampetra planeri;
- Bullhead, Cottus gobio;
- White-clawed crayfish, Austropotamobius pallipes.

Negative effect of the Environmental Delivery Plan development on conservation status

580. Whilst the potential effects of nutrient increases can be listed and described, there are uncertainties around predicting ecological changes such as the severity, timing and duration of impacts. This is due to synergistic effects of nutrients with other pressures on the system, and the unpredictability of tipping points and the lagging of the

physical effect behind the cause, which are site specific and exacerbated by climate change.

581. Elevated nutrients affect key biological components by increasing algae and nutrient loving macrophytes, shading and outcompeting the characteristic low nutrient species and simplifying community structure and composition. This in turn reduces the physical complexity and ecological niches available to invertebrates and fish, altering their communities. Decomposition of excessive plant and algal growth can smother gravels and lead to oxygen depletion.

582. Riverine eutrophication often occurs in combination with other anthropogenic stresses (such as siltation or physical modification). These stresses can be important in controlling the manifestation of eutrophication effects meaning that the relationship between nutrient concentration and ecological effects is not straightforward[103].

583. Nutrients and flows, as well as the physical and biological habitat, work interactively to shape the river environment. If any of these is in a suboptimal condition, the others will become degraded. The worst effects of eutrophication will occur when all of these factors are in a suboptimal condition, because the river is not functioning as a resilient system. Eutrophication impacts on the algae flora (change in floristic composition and increased growth rates) are most pronounced between near natural and 70-80ugl^{-1} soluble reactive phosphorus (SRP). At around 70-80ugl^{-1} SRP nutrient tolerant species of diatom outnumber intolerant species and possible changes to the macrophyte community also occur with a loss of characteristic species. The most marked biomass response (substantial increases) from Ranunculus in lowland rivers has also been documented over a concentration range from less than 10ugl^{-1} up to around 100ugl^{-1} SRP.

584. The biological response to enrichment above concentrations of the order of 100ugl^{-1} soluble reactive phosphorus (SRP) tends to plateau. The reason for this seems to be associated with saturation of phosphorus uptake mechanisms in most (but not all) algae. It seems likely that algal proliferation associated with enrichment above 100ugl^{-1} SRP is often related to an impairment of grazing intensity, due to other mechanisms of impact (for example, organic pollution, siltation) on grazer populations or issues of palatability of algal masses, and/or to the specific presence of Cladophora which has a growth response to phosphorus concentrations that allows it to take advantage of SRP levels in excess of 100 ugl^{-1} [103].

585. The measured concentrations for the Wensum (generally between 50-70ugl^{-1} SRP) are within the range where eutrophication impacts on the algae flora are most pronounced. At around 70-80ugl^{-1} soluble reactive phosphorus (SRP) is where changes in the diatom and macrophyte community occur with a possible loss of characteristic species and so any increase in nutrients is likely to cause an increase in algae and further negative effects on macroalgae and macrophytes.

586. Loss of characteristic species including Ranunculus has already been reported on the Wensum[104] and while it is sometimes difficult to disentangle the abiotic pressures driving macrophyte deterioration, the background concentration of phosphorus is at levels where eutrophication impacts are already evident and therefore further increases in nutrients may exacerbate this further.

587. The condition assessment undertaken in 2024 shows that dissolved oxygen sags are currently occurring on the River Wensum. An increase in nutrients that leads to increased algal growth during periods of low flows and high temperature, could further increase the risk of these occurring or the severity.

588. Additional nutrients can favour the growth of Himalayan balsam over native species leading to bank destabilisation and increased runoff[105].

589. Climate change is projected to exacerbate the impact that the increased nutrients would otherwise have on the River Wensum. Lower summer flows and increased temperatures are likely to result in increased concentrations of nutrients, greater risk of dissolve oxygen sags, increased mobilisation of phosphate and fine sediment and reduced resilience of aquatic communities to existing stressors[104 85] (Natural England, 2025). This may in turn result in reduced water quality, macrophyte loss and increases in algal blooms, disease, invertebrate and fish kills. Areas where structures are present causing impoundment of flows or re-sectioned, over-deep or over-wide sections of river are particularly vulnerable due to existing reduced flow velocities[104].

590. The predicted effects of climate change make the control of riverine nutrient levels even more critical, and the achievement of ecologically appropriate concentrations even more difficult[103].

591. The maximum amount of development covered by the Environmental Delivery Plan will lead to an increase in phosphorus concentration (post 2030), of 0.4 µ/l per year. This equates to 1.3% of the phosphorus target concentration for the River Wensum. This is likely to lead to a worsening of the ecological effects of phosphorus as outlined above, however, the scale of the impact from development on the river feature is likely to be relatively small. There is uncertainty in predicting the exact scale of change due to the synergistic effect of phosphorus in combination with the other anthropogenic pressures on the river feature and high levels of modification, widespread siltation and low summer flows are present on the river system reducing overall resilience to additional nutrient pressure (as detailed in Annex 5A). Localised impacts are likely to be variable, being greater near discharge points or within impounded or low-flow river reaches.

Conclusion

592. Considering the river with Ranunculus (H3260); the Environmental Delivery Plan development is estimated to increase phosphorus concentrations by 0.4 micrograms per litre, equivalent to 1.3% of the river phosphorus target, when modelled based on post-2030 scenario. Although relatively small, this enters a river already failing phosphorus and dissolved-oxygen targets and affected by low flows, impoundment, extensive channel modification and siltation. Additional phosphorus may therefore increase attached and floating algae, suppress characteristic Ranunculus and Callitriche vegetation and increase dissolved-oxygen fluctuations.

593. Considering Brook Lamprey, Bullhead and white-clawed crayfish; loss of macrophytes and accumulation of fine sediment reduce shelter, food, flow diversity and clean gravel habitat. This can affect the spawning, juvenile, feeding, refuge and dispersal requirements of brook lamprey, bullhead and white-clawed crayfish. Phosphorus can bind to fine sediment and persist as legacy loading, delaying recovery.

594. In conclusion, the negative effect from the Environmental Delivery Plan development will impact the biological, physical and chemical components of structure and function and future prospects of river habitat features.

Desmoulin's whorl snail

Environmental features for this assessment:

595. The relevant environmental feature is:

- Desmoulin's whorl snail, Vertigo moulinsiana

Negative effect of the Environmental Delivery Plan development on conservation status

596. The likely potential effects of nutrient increases have been described in the river feature assessment for the River Wensum and these will also impact the riparian vegetation, and any adjacent fen vegetation in hydrological contact with eutrophic water, the potential habitats for Desmoulin's whorl snail.

597. The background concentration of phosphorus is at levels where eutrophication impacts are already evident and therefore further increases in nutrients will exacerbate this further. Currently dissolved oxygen sags occur on the Wensum. An increase in nutrients that leads to increased algal growth during periods of low flows and high temperature could further increase the risk of these occurring, or the severity.

598. Dominance by phytoplankton, algal blooms and oxygen sags effects will extend into the potential Desmoulin's habitat, the riparian (marginal) vegetation, potentially leading to a coating of macro-algae on the emergent and floating plants. It is highly likely to impact the growth and species composition of the epiphytic microflora, the food source of Desmoulin's, through changes in water chemistry at the surface of the leaves. Change in hydrochemistry is likely to impact the snails directly when the soft tissues of the animals are in direct contact with the water.

599. The species composition of the emergent aquatic macrophyte zone is also likely to alter, especially if compounded by low flows and drying events. Nutrient enrichment favours fast-growing, tall plants such as common reed *Phragmites australis* and reedmace *Typha* spp. which although can support Desmoulin's in lower numbers, is sub-optimal probably due to structural differences, there being more air flow and reduced humidity through the stems and large leaves of these species. Additional nutrients can favour the growth of Himalayan balsam over native species which is not suitable habitat for Desmoulin's and can lead to bank destabilisation and increased runoff[105].

600. Long-term enrichment can drive succession and whole community change from tall sedge to reedbed and when exacerbated by reduced water supply, drying and succession can lead to replacement with nettle-dominated scrub or woodland. Natural connectivity of river and floodplain enables dynamic functioning of the whole wetland ecosystem but would also lead to connectivity with inappropriate nutrient loads. This works in both directions between river and floodplain fen, depending on water supply, and is affected by natural gradient, artificial drainage and channel modification.

601. Nutrients, flows, as well as the physical and biological habitat, work interactively to shape the river environment and if any of these is in a suboptimal condition the others will become degraded. The worst effects of eutrophication will occur when all these factors are suboptimal.

602. The projected impacts of climate change on the Wensum include lower summer flows, increased temperature, greater risk of dissolved oxygen sags, increased mobilisation of phosphate and fine sediment and reduced resilience of aquatic communities to existing stressors [85, 104]. Climate change is likely to increase the impact that the increased nutrients would otherwise have, resulting in increased concentrations and lowered dissolved oxygen levels. This may in turn result in reduced water quality, macrophyte loss and increases in algal blooms.

603. The predicted effects of climate change make the control of riverine nutrient levels even more critical, and the achievement of ecologically appropriate concentrations even more difficult[103].

604. As the estimated concentration increase from development is small (1.3% of river target) it is likely to also have only a small increase in river concentration. Whilst this is likely to lead to a worsening of the ecological effects of phosphorus as outlined above, there is uncertainty in predicting the exact scale due to the synergistic effect of phosphorus in combination with the other anthropogenic pressures (high levels of modification, widespread siltation, low summer flows) on the river and species features reducing overall resilience and the pathway from nutrient enrichment to population response is uncertain. However, due to the small scale of predicted phosphorus increase, the negative effect from the Environmental Delivery Plan development is likely to be relatively small.

Conclusion

605. Considering Desmoulin's whorl snail; the Environmental Delivery Plan development is estimated to increase phosphorus concentrations by 0.4 micrograms per litre, equivalent to 1.3% of the river phosphorus target, when modelled based on post-2030 scenario. Additional nutrients may nevertheless worsen the condition of supporting riparian and floodplain fen habitat by favouring rank, nutrient-demanding or invasive vegetation and altering vegetation composition, litter and habitat structure. These effects may interact with changes in water level, drainage and succession.

606. The likely effect on Desmoulin's whorl snail is consequently indirect through supporting habitat rather than direct toxicity. The species population is already in poor condition, with contracted and fragmented habitat, limited resilience and dependence on consistently wet calcareous swamp and tall-sedge vegetation. Small changes may therefore be important where populations or habitat patches are isolated.

607. In conclusion, the negative effect from the Environmental Delivery Plan development will impact the biological, physical and chemical components of structure and function and future prospects of Desmoulin's whorl snail feature.

16 Annex 6A – Scoring approach to identify a list of conservation measures

608. This annex sets out the approach taken by Natural England to select conservation measures from an initial longlist of potential measures. This annex describes the seven criteria that were selected to score each measure against, using a red, amber, green rating. Evidence has been used to inform how each measure has been scored. This has included evidence from published academic literature, grey literature, case studies, guidance documents and expert opinion.

Strength of evidence base

Methodology

609. The strength of the evidence base for each measure was assessed using approaches recommended in a policy brief produced by researchers at Oxford University[106]. This policy brief recommended the Balance Evidence Assessment Method[107] which assesses pieces of evidence according to three dimensions (source reliability, information reliability, and relevance) and the extent to which they support an assumption. The assumption tested was that each measure would be effective at addressing the environmental impact of development on the identified environmental features and contributing to an overall improvement in their conservation status. The scoring categories, adapted from a variety of published sources[107,108,109,110], are outlined below:

610. Reliability of information:

- High (3): A well-designed systematic review that clearly states its methodology including search terms and screening criteria;
- Moderate (2): A well-designed observational or experimental study with a clear reference or control;
- Low (1): An observational study or study with limited reliability;
- None (0): A study with no reliable information. Evidence collected in a way that is misleading, unreliable, and invalid, and cannot be relied upon.

611. Reliability of source:

- High (3): An evidence source that is highly trustworthy with no concerns over their credibility or reliability as a source of evidence;
- Moderate (2): An evidence source that is probably trustworthy, but there are some concerns that reduce confidence that they are a reliable source;
- Low (1): An evidence source that is either unknown or there are several concerns over its credibility, meaning information should be treated with caution;
- None (0): An evidence source that is unreliable and cannot be trusted. Information provided may be misleading, false or untrue.

612. Relevance:

- High (3): A study conducted within the UK on the same habitat type using an intervention that is directly comparable to the measure of interest;
- Moderate (2): A study not conducted in the UK but in the same climate zone on the same habitat type using an intervention that is directly comparable to the measure of interest;
- Low (1): A study conducted in a different climate zone but similar habitat type and intervention or an evidence synthesis of many studies that encompass a range of geographic locations;
- None (0): A study conducted in a different climate zone, habitat, and non-comparable intervention.

613. The weight of each piece of evidence was calculated by multiplying these three scores (information reliability, source reliability, relevance) and dividing by 27 (the maximum possible score). Each piece of evidence was then assigned one of the following categories according to its strength of support for the assumption:

- Refutes
- Mixed support
- Weakly supports
- Strongly supports.

614. The weight and strength of evidence scores for each action were visualised using Ziggurat plots to assess confidence in the assumption (Figure 7 - Figure 19). This was done using an application developed by the authors of the Balance Evidence Assessment Method[107]. Qualitatively, this assessment of the evidence base resulted in the following scoring categories:

- Red: Not confident that the measure will be effective because several pieces of evidence refute the assumption or there is a very limited amount of evidence;
- Amber: Mixed or weak support for the assumption that the measure will be effective. This reflects that on average there is mixed support for the assumption or high variability in support;
- Green: Confident that the measure will be effective because there are multiple pieces of strong evidence that support the assumption and limited pieces with mixed support or refuting it.

Assessment of strength of evidence – Ziggurat plots

615. Method:

- This is a Balance Evidence Assessment Method (BEAM)-informed method for showing the distribution and weighted balance of evidence in an accessible visual form, based on Christie et al. (2023)[107]. Assessing diverse evidence to improve conservation decision-making. It retains BEAM's core weighting of relevance, source reliability and information reliability, but simplifies the full framework into four support categories and a stacked-rectangle (Ziggurat)

visualisation. Each rectangle represents one evidence source: width reflects relevance and height reflects combined reliability, so the area provides a visual representation of the combined relevance and reliability of each source. The black point represents the weighted average strength of support, with each source scored from –2 (refutes) to +2 (strongly supports), and the line shows the 95% bootstrap confidence interval around this weighted balance;

- This is not a full implementation of BEAM: the simplified scoring, four-category presentation and visualisation do not capture all of the methodological detail and assessment steps in the original framework. It should therefore be viewed as a transparent evidence-visualisation tool informed by BEAM, rather than a standalone formal evidence-assessment method.

616. Interpretation:

- Wider rectangles indicate more relevant evidence, while taller rectangles indicate greater reliability. The area of each rectangle therefore provides a visual indication of its combined evidence weight. Stacking the rectangles allows the number and relative weight of evidence within each support category to be seen, while n shows the number of sources per category. The black point summarises the overall direction of the weighted evidence, while a wider confidence interval indicates greater variation or uncertainty in the evidence base. The plot shows where the evidence is concentrated and how relevance and reliability affect its weight; it is not a statistical test or a probability that the proposition is true;
- The Ziggurat plots presented below represent the weight of each piece of evidence reviewed and their strength of support for the assumption that the measure would be effective at addressing the environmental impact of development on the identified environmental feature/s and/or contributing to an overall improvement in the conservation status of the identified environmental features.

617. Description of plots:

- Each graph is a Ziggurat plot (Figure 7 - Figure 19) which shows how strongly the evidence assessed for each measure demonstrates that it will be effective. Each block represents one piece of evidence. Each block's location along the x-axis represents how strongly it shows the measure will be effective. Each block's dimensions show its relevance (width) and reliability (height). The block dot shows the average strength of support across all the pieces of evidence.

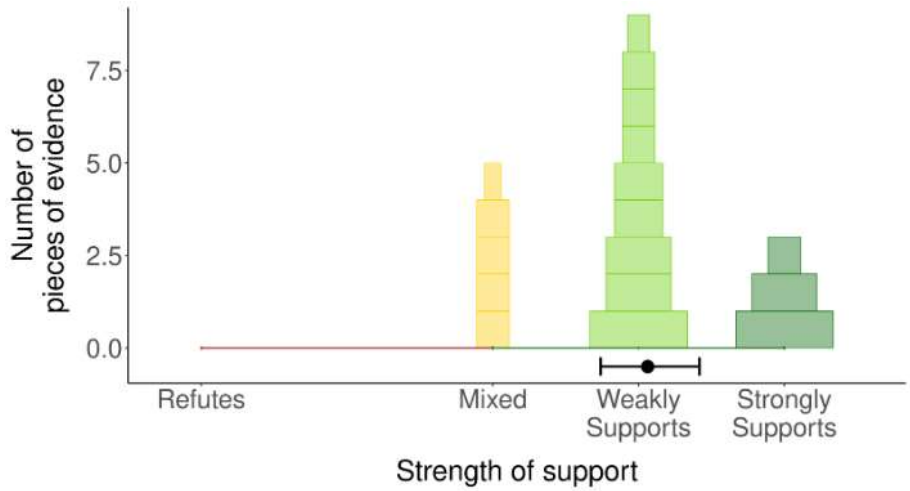

Figure 7: Graph showing strength of assessed evidence for biomanipulation

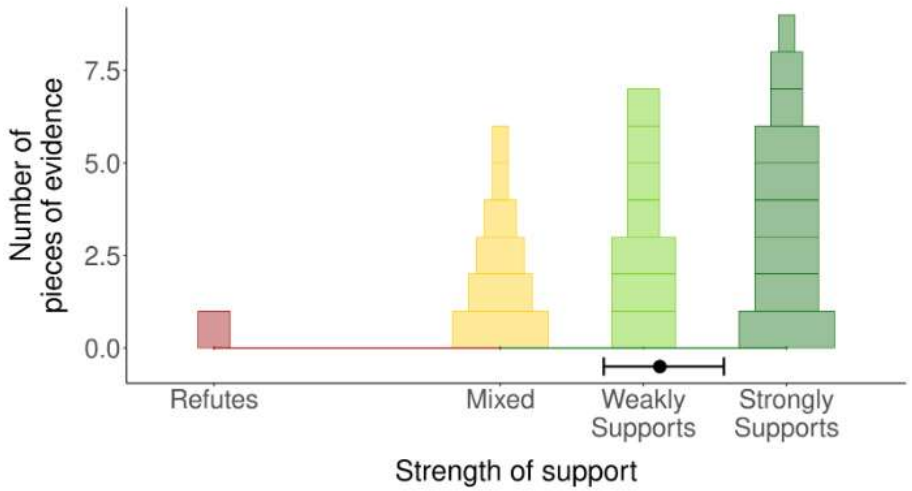

Figure 8: Graph showing strength of assessed evidence for deer management

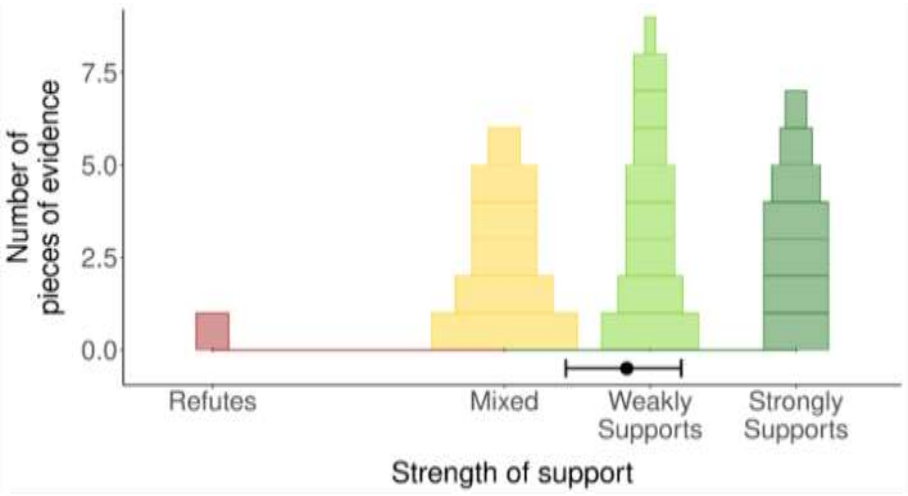

Figure 9: Graph showing strength of assessed evidence for fen-type wetland habitat creation/ restoration

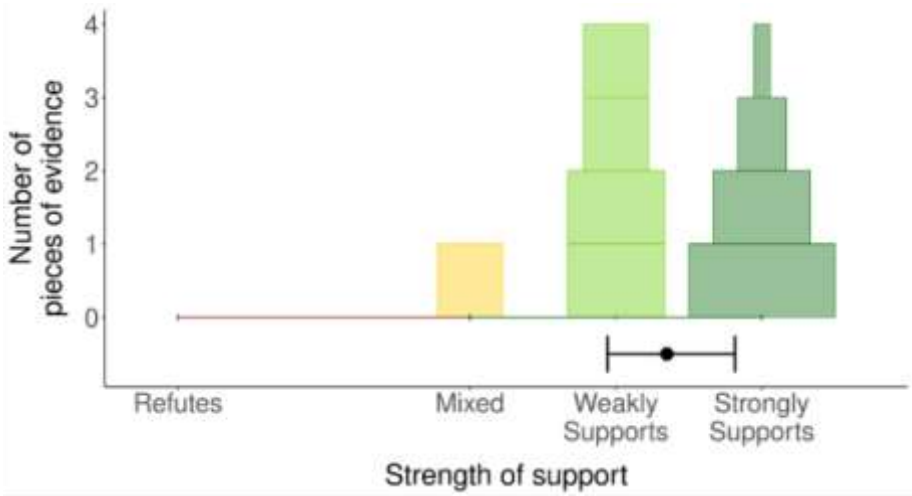

Figure 10: Graph showing strength of assessed evidence for fen-type wetland habitat management

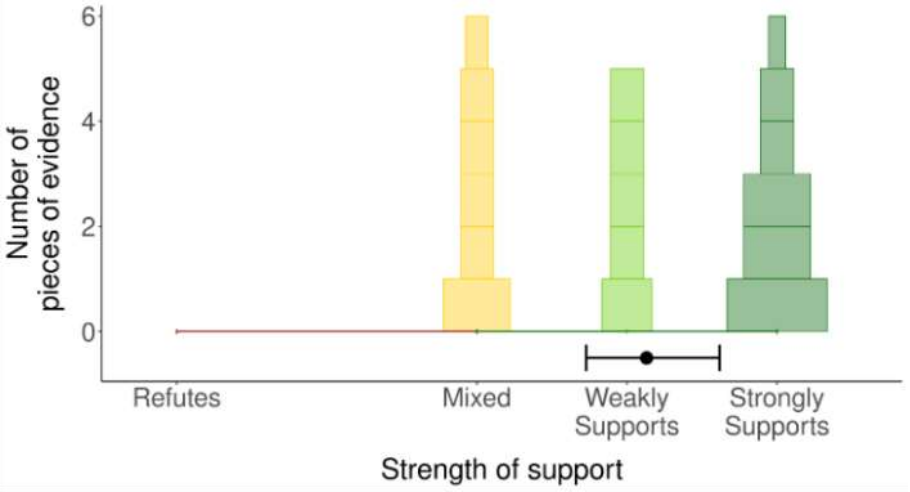

Figure 11: Graph showing strength of assessed evidence for lake chemical precipitation

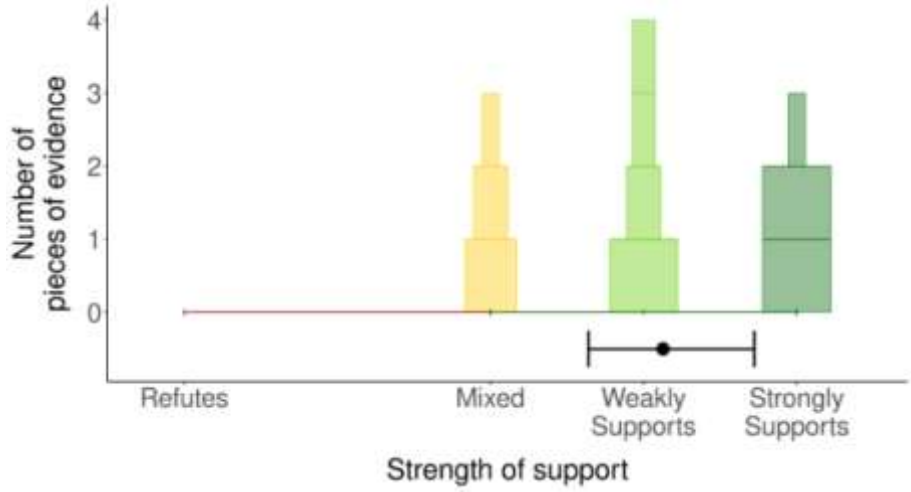

Figure 12: Graph showing strength of assessed evidence for lake flushing

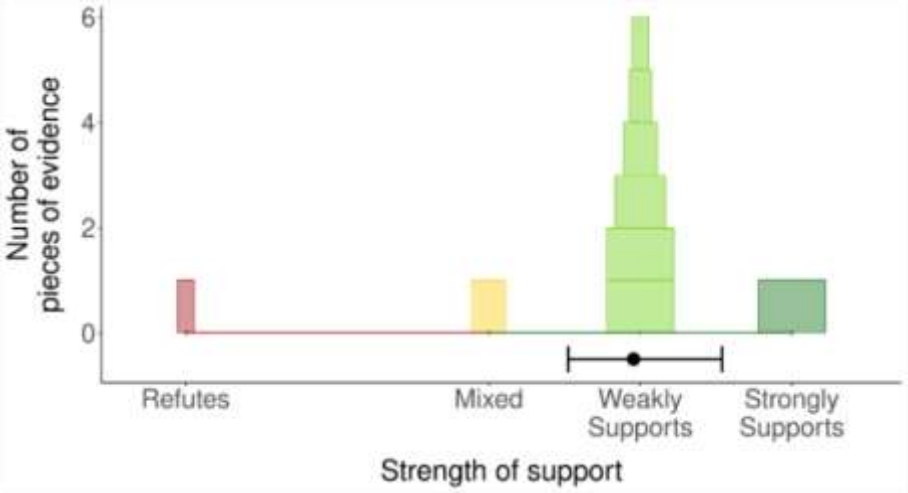

Figure 13: Graph showing strength of assessed evidence for lake sediment removal

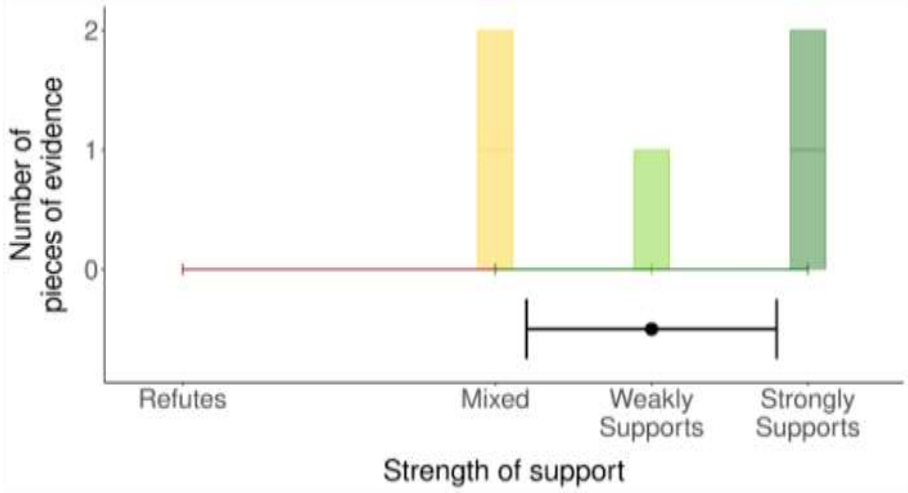

Figure 14: Graph showing strength of assessed evidence for land use change to semi-natural habitat

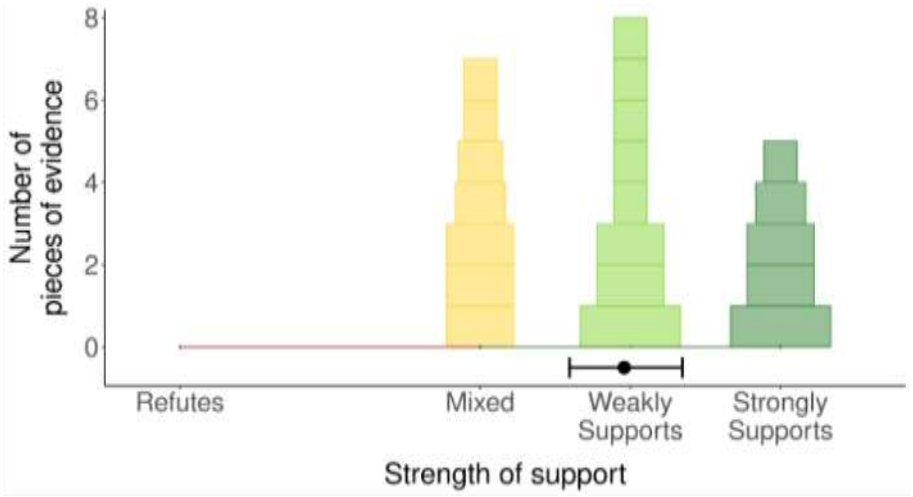

Figure 15: Graph showing strength of assessed evidence for removal, modification or bypassing structures in rivers

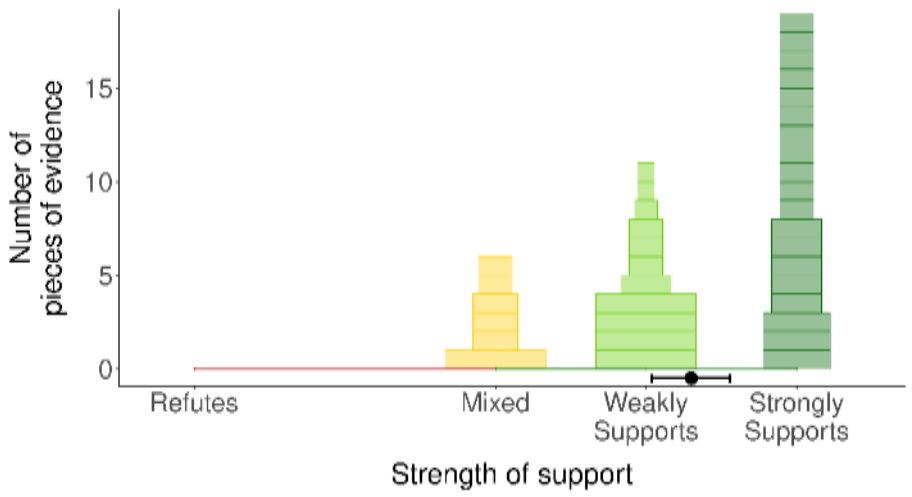

Figure 16: Graph showing strength of assessed evidence for restoring hydrological function

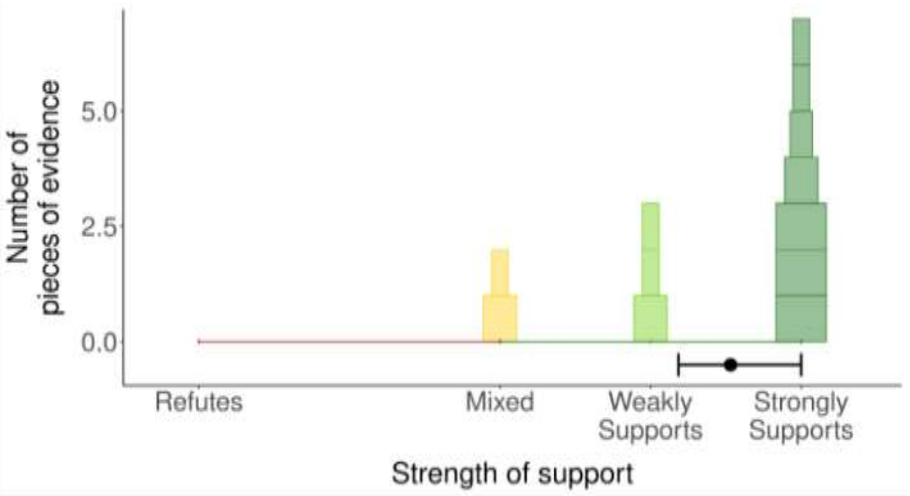

Figure 17: Graph showing strength of assessed evidence for riparian buffer strips

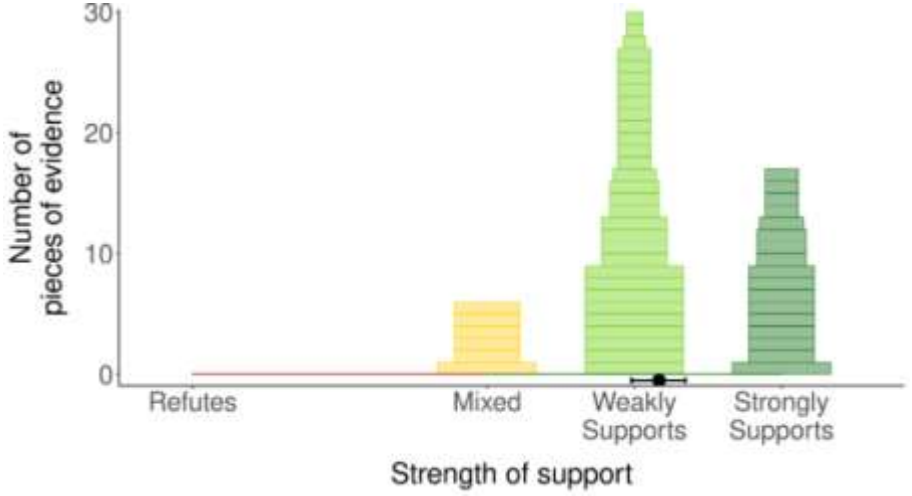

Figure 18: Graph showing strength of assessed evidence for river restoration (channel and floodplain functioning)

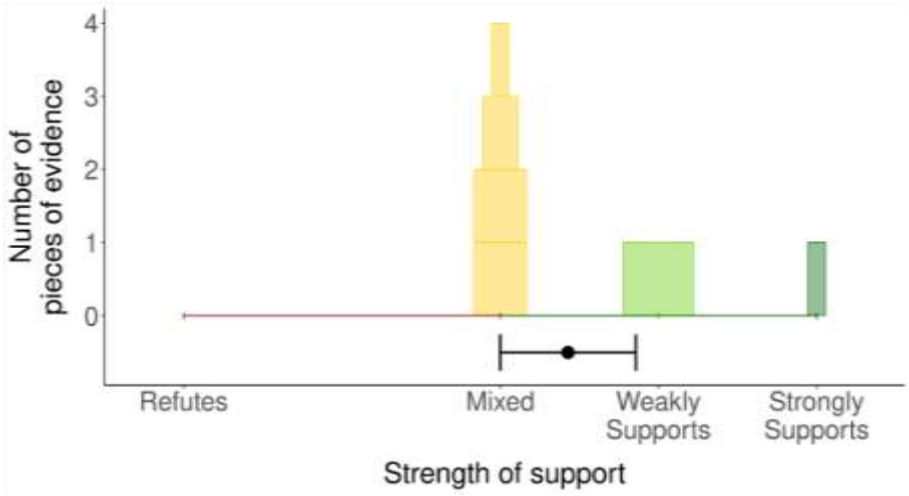

Figure 19: Graph showing strength of assessed evidence for upgrading inefficient septic tanks and package treatment plants

Deliverability

618. An assessment of deliverability was split into two categories: additionality and ease of implementation.

619. Additionality: A change that would not have occurred in the absence of delivery of the measure. This refers to whether the measure is already being delivered or will be delivered through other mechanisms within the Environmental Delivery Plan area.

    - Red: There is a legal or other regulatory requirement for the measure to be delivered through a different mechanism, therefore delivery using an Environmental Delivery Plan would not be additional;
    - Amber: There is no legal or other regulatory requirement for the measure to be delivered but the measure may be delivered in the Environmental Delivery Plan area through other mechanisms, such as a strategic scheme through nutrient neutrality, countryside stewardship, or by public authorities;
    - Green: There is no legal or other regulatory requirement for the measure to be delivered and the measure is not currently being delivered at scale through other mechanisms.

620. Ease of implementation: Assessment of the expected difficulty and complexity of implementing the measure. Relevant considerations include the number of landowners, requirement for complex legal agreements, hard engineering approaches, and historical local delivery of the measure.

    - Red: Limited or no existing delivery routes for the measure; implementation is likely to require complex legal agreements, feasibility studies, or hard engineering approaches; multiple landowners would be involved;
    - Amber: There are existing delivery routes available or evidence of successful local delivery, however the measure will involve one or more of the possible complications listed in the 'red' category;
    - Green: There are existing delivery routes available within the UK. For example, because the measure has previously been delivered via existing schemes including Biodiversity Net Gain, the Nutrient Mitigation Scheme, or the Landscape Recovery Scheme. There are multiple case studies of successful delivery locally.

Cost

621. An assessment of cost scored measures according to their whole-life cost, covering both upfront and long-term management costs.

    - Green: less than £50,000 per hectare or kilometre;
    - Amber: £50,000 to £100,000 per hectare or kilometre;
    - Red: more than £100,000 per hectare or kilometre.

Maintenance requirements

622. Conservation measures were scored according to the requirement for maintenance activities to secure their effectiveness in perpetuity. 'Maintenance activities' were defined as any measure taken post-implementation to support the ability of the measure to deliver its effect on the identified environmental feature/s. This included, but was not limited to, vegetation removal, sediment removal, desludging and repeated application of the measure.

- Red: Frequent (between monthly and annually) and high intensity (e.g. requiring specialist contractors or machinery) maintenance activities required. This includes repeated application/implementation of the measure;
- Amber: Frequent and low intensity (e.g. activities that can be carried out by the landowner) or infrequent (less than annually) but high intensity maintenance activities required;
- Green: Infrequent and low intensity maintenance activities required.

Environmental risk

623. Environmental risk considered the potential for the conservation measure to have negative non-target effects. This included environmental toxicity, increased flood risk, and disturbance to habitats. As it would be impracticable to quantify this consistently across a range of potential effects, the ratings were based on the number of possible types of risk that were considered likely based on the evidence review. Ratings are as follows:

- Red: Three or more identified environmental risks;
- Amber: Two identified environmental risks;
- Green: No identified environmental risks or one identified environmental risk.

Local and system-level benefits

624. Local and system-level benefits considered whether the measure was locally relevant (i.e. suitable for the complex Broads and Wensum habitat mosaics) and would meet the priority for system restoration and multiple benefits across many attributes of the environmental features. This reflects whether a measure could support restoration of habitat mosaics, addressing the conservation requirements of habitats, species and assemblages simultaneously. Ratings are as follows:

- Red: Not locally relevant and does not meet the priority for system restoration and multiple benefits;
- Amber: Locally relevant but does not meet priority for system restoration and multiple benefits;

- Green: Locally relevant and meets priority for system restoration and multiple benefits.

17 Annex 6B – Conservation measures secured as planning conditions

625. Natural England may request the imposition of planning conditions to (a) secure payment of the Nature Restoration Levy (achieved by section 72(3) and regulation 5 of the draft Nature Restoration Levy Regulations 2026) and (b) as a form of conservation measure (section 61(10)). In the case of the latter, this is to minimise the impact from new development (complying with the principle of prevention within the Environment Act 2021) and ensure that the assumptions used to model the impact of development (e.g. water usage) are sufficiently secured. Planning decision-makers, as public authorities, are required to impose relevant conditions, or variations to conditions, on development under the duty to co-operate on the implementation of Environmental Delivery Plans (Section 95(2)). Once the Nature Restoration Levy has been secured, the environmental impact of nutrient loading from urban wastewater on the environmental feature need not be considered as part of a Habitat Regulations Assessment.

Assessment of potential planning conditions as conservation measures

626. The National Planning Policy Framework (Planning Conditions and Obligations) (NPPF), DM6[111] sets out guidance to ensure any conditions and obligations are enforceable, precise and reasonable. All conservation measures in this Environmental Delivery Plan were screened for deliverability. As such, any potential planning conditions considered for use as conservation measures were additionally screened to ensure they are enforceable, precise and reasonable, and in line with both the NPPF and aims of this Environmental Delivery Plan.

627. The following red, amber, green (RAG) scoring system displayed in Table 28 was used to assess potential planning conditions:

Table 28: Description of RAG criteria and scoring for planning condition assessment

Criteria	Green	Amber	Red
Enforceable	Can easily and practicably be applied and enforced by the local planning authority (LPA).	Could practicably be applied and enforced by the LPA, but not easily (e.g. due to resource required).	Could not practicably be applied and enforced by the LPA (e.g. undue burden on resource).
Precise	Requirement is clear and therefore feasible to comply with.	Requirement is lacking detail and would require further clarification to enable compliance.	Requirement is vague and therefore not feasible to comply with.
Reasonable	The time and cost required for implementation is deemed proportionate to the development and the intended outcome of the condition.	The time, and cost required for implementation may be deemed proportionate to the development and intended outcome of the condition, but this is dependent on other factors (e.g. site, location).	The time and cost required for implementation is not deemed proportionate to the development and intended outcome, i.e. the time and/or cost to achieve compliance would outweigh the benefit of the condition and so not be proportional to the intended outcome.
Achievable	Easily achievable by all developers.	Possible to achieve by some developers.	Not possible to achieve by developers.
Within scope of Environmental Delivery Plan	Yes, it is within the scope of the Environmental Delivery Plan to require this condition.	N/A – either red or green, no amber rating for this category.	No, such a condition would be outside the scope of this Environmental Delivery Plan.

Criteria	Green	Amber	Red
In line with Environmental Delivery Plan/Planning and Infrastructure Act aims	Yes, the condition is in line with the aims of the Planning and Infrastructure Act and the Environmental Delivery Plan of achieving win-wins for nature and the environment.	N/A – either red or green, no amber rating for this category.	No, the condition is not in line with the aims of the Planning and Infrastructure Act and the Environmental Delivery Plan of achieving win-wins for nature and the environment, for example because it prevents or delays development despite strategic plans being in places to ensure any negative effect from such development are outweighed.

Outcome

- If any category is red, the condition is discounted.
- If any condition is amber for two or more categories out of six, it is discounted.
- If all categories are green, the condition is selected.

628. Assessed planning conditions and their ratings are displayed in Table 29 below:

Table 29: Assessment of potential planning conditions as conservation measures

Planning condition measure type	General description	Enforceable	Precise	Reasonable	Achievable	Within scope of Environmental Delivery Plan	In line with Environmental Delivery Plan/Planning and Infrastructure Act aims	Outcome
Sustainable drainage systems (SuDS)	Condition to ensure the development shall be constructed to and be maintained in line with the national standards for sustainable drainage systems (SuDs).[112]	Green	Green	Amber	Amber	Green	Green	Discounted
Delayed occupation	Condition to delay construction and/or occupation of the development.	Green	Green	Green	Green	Green	Red	Discounted

Planning condition measure type	General description	Enforceable	Precise	Reasonable	Achievable	Within scope of Environmental Delivery Plan	In line with Environmental Delivery Plan/Planning and Infrastructure Act aims	Outcome
Water efficiency	Condition to ensure the development shall be constructed so as to achieve a water efficiency standard of 100 litres per person per day or less.	Green	Green	Red	Green	Green	Green	Discounted
Condition to secure non-mains drainage performance of developments for which it is impossible or unreasonable to connect a public foul sewer	Condition ensuring that the development may not be occupied unless a package treatment plant is installed on the site and operational to manage foul water; with operating efficiency rates achieving at least a minimum discharge concentration of 5 mg/l for Total Phosphorus and 27 mg/l for Total Nitrogen.	Green	Green	Green	Green	Green	Green	Selected

Planning condition measure type	General description	Enforceable	Precise	Reasonable	Achievable	Within scope of Environmental Delivery Plan	In line with Environmental Delivery Plan/Planning and Infrastructure Act aims	Outcome
Construction phase controls – environmental	Condition requiring submission and implementation of a construction environmental management plan.	Green	Green	Green	Green	Red	Green	Discounted
Condition construction phase controls – drainage	Condition requiring submission and implementation of a construction drainage strategy.	Green	Green	Green	Green	Red	Green	Discounted

Selected planning conditions required to be imposed

629. Based on the above assessment, Table 30 details planning conditions which must be imposed on planning decisions which rely upon this Environmental Delivery Plan and Nature Restoration Levy.

Table 30: Planning conditions to be imposed by the local planning authority at request of Natural England

Planning condition	Reason	Condition to be imposed*
Non-mains drainage	To secure the performance of development not draining to main sewers and secure the standards on which the levy rate is calculated.	The development shall not be occupied unless a package treatment plant is installed on the site and operational to manage foul water; with operating efficiency rates achieving a discharge concentration of 5 mg/l for Total Phosphorus and 27 mg/l for Total Nitrogen or lower, that will be maintained for lifetime of the development.
*Planning decision-makers may make limited and reasonable amendments to planning conditions (with the exception of the levy condition), to ensure conditions are operable for specific developments providing the intended outcome is maintained.		

18 Annex 6C – Overview of conservation measure specifications

Introduction

630. This annex provides detail in addition to the conservation measures chapter (Chapter 6) to define key objectives, spatial targeting, delivery considerations and secondary benefits for conservation measures identified in the Environmental Delivery Plan. It also provides further information on the scale of opportunity within the Environmental Delivery Plan where the conservation measure would be suitable to deliver, or represents areas where a conservation measure will be targeted.

631. The detail provided is intended to be an overview of conservation measure specifications at the start of this Environmental Delivery Plan, to support the understanding of the program of conservation measures, the outcomes they will deliver and how the conservation measures will enable the Environmental Delivery Plan to pass the Overall Improvement Test.

632. The maps identify potential opportunity areas for each conservation measure by highlighting land that may be suitable for each type of conservation measure. Natural England developed these maps using internal modelling and Norfolk's Local Nature Recovery Strategy Local Habitat Map, and published reports on the protected sites and pressures affecting the protected sites. These maps shown below are indicative only and do not confirm that the land shown is technically suitable for conservation measures or that specific holdings are targeted: in all cases, site-specific assessments will be needed.

633. Conservation measure specifications are expected to evolve over time to reflect best practice. Where appropriate and considered necessary, Natural England will develop and publish more detailed conservation measure specifications. This may be the case for standardised measures which are replicable across multiple Environmental Delivery Plans to ensure that measures are effective and deliverable at scale. For example, conservation measure specifications may set standards to simplify the planning, design, implementation, management and monitoring of interventions whilst maintaining high-quality conservation measures.

Overarching considerations for delivery of conservation measures

634. All conservation measures are planned and to be delivered in a coordinated manner, securing more effective and joined-up outcomes for nature recovery (for example, in alignment with the Lawton principles of more, bigger, better and joined-up spaces for nature[1]). Conservation measures aim to facilitate delivery of the Environmental Improvement Plan), including but not limited to effectively conserve and manage 30% of the UK's land by 2030 (30by30).

635. The implementation of this Environmental Delivery Plan will, wherever appropriate, seek to secure, facilitate and enhance public access to nature, aligning with a key objective for Natural England's strategy and the Environmental Improvement Plan. When implementing this Environmental Delivery Plan and delivering conservation measures, Natural England will seek to support the implementation of current and future Local Nature Recovery Strategies.

636. All conservation measures must be secured and, where appropriate, maintained for 100 years. Natural England considers that the period of 100 years maintenance is an appropriate and reasonable period to enable the conservation measures to reach ecological maturity to address the environmental impact of development for as long as the housing is occupied and generating wastewater discharges and/or surface water runoff.

637. A high-level summary of the overarching requirements for each conservation measure, in the final programme of conservation measures, is set out below. Further site-specific requirements will be considered at the point of implementation. This will include commissioning and working with key delivery partners and regulators to identify a range of suitable sites/projects and to ensure all conservation measures relied upon in this Environmental Delivery Plan will be deliverable at the expected efficacy in their final location. For clarification purposes, the process to successfully deliver a conservation measure project is likely to require the following steps before the measure can be legally secured.

    - Identify suitable sites in the Environmental Delivery Plan area, for example, undertake a call for sites/projects
    - Feasibility assessment to understand the site, identify constraints and manage risks
    - Undertake a detailed design process related to the key objective of the conservation measure
    - Engagement with key stakeholders
    - Set a robust monitoring regime and long-term management plan.

Fen-type wetland habitat creation and restoration

Description of measure

638. Fen-type wetland habitat creation and restoration involve re-establishing permanently or seasonally waterlogged, peat-forming ecosystems including fens, swamps, reedbeds and fen meadows. By raising water tables and managing hydrology to restore-near natural hydrological conditions, this measure restores mineral-rich wetlands that support unique biodiversity, sequester carbon, and naturally manage flood risks. The expected delivery is 18ha in the Bure and 91ha in the Yare, totalling 109ha. Additionally, a further 10ha of fen-type habitat creation/restoration will be targeted in the Wensum in locations where it will be beneficial for Desmoulin's whorl snail.

Key objectives

639. To re-establish permanently or seasonally waterlogged, peat-forming ecosystems including fens, swamps, reedbeds and fen meadows, restoring mineral-rich wetlands that support unique biodiversity.

640. To create 10ha of fen-type habitat that supports calcareous fen and swamp vegetation that is specifically targeted to support the recovery of Desmoulin's whorl snail by increasing the extent, quality and resilience of suitable habitat for existing Desmoulin populations, preferably with significant components of Glyceria maxima, Carex species and Cladium mariscus[113] by working with and restoring natural hydrological and ecological functions.

Spatial targeting

641. This measure must be in a location with either a perennial supply of water (such as a groundwater-fed spring) or which retains water, or both of which result in high levels of surface 'wetness' for all or part of the year. This will enable the creation of mineral rich wetlands to improve biodiversity. Delivery should be within 2km of the relevant protected site to ensure the same or greater scale of benefit will be achieved, however, there is some flexibility in the exact location of the delivery of the total area of this measure.

642. For Desmoulin's whorl snail, the delivery of this measure must be:

- located in areas in close proximity to, or adjacent to, areas with resident snail populations
- located in areas that remain permanently wet throughout the year
- created within the Wensum floodplain or along the floodplain edge where suitable hydrological conditions can be restored and maintained such as restored river reaches, floodplain fens and mires, valley-side seepages and springs, flush habitats, feedwater springs and streams, floodplain valley side transition mires.
- located in areas that support active management of the newly created habitat by ensuring site access options are available

Delivery considerations

643. Delivery should focus on securing permeant change to secure and create new fen-type habitat for snail populations to thrive in.

644. Delivery considerations include, but are not limited to, the following:

- All projects should be tailored to local hydrology, topography and geology, and this should be fully understood at the feasibility stage of conservation measure delivery.
- The long-term maintenance plan will be developed in line with the Fen Management Handbook[114].

645. Where sites are targeted for Desmoulin's whorl snails, sites should be assessed beforehand for the presence of resident population in proximity to the site, especially

where they are adjacent to existing potentially suitable habitat, and to ensure there are suitable conditions for dispersal and establishment of snail populations to expand into suitable new habitat aided by good hydrological and habitat connectivity.

Secondary benefits

646. Secondary benefits of this conservation measure include the following but are ultimately dependent on the final site's location and its design as a conservation measure:

- Naturally reduce flood risk;
- Greater water storage to reduce vulnerability during dry periods;
- Sequester carbon;
- Improve water quality through nutrient retention as part of the natural function/processes;
- Prevent deterioration of neighbouring habitat quality through effective assessment and management of ecological transition;
- Complement wider river and floodplain restoration initiatives to maximise ecological resilience and support a functioning ecosystem.

Indicative map

647. To determine opportunities for conservation measures, Natural England has used information from Norfolk's Local Nature Recovery Strategy to identify and calculate the scale of opportunity for each conservation measure. The Norfolk Local Nature Recovery Strategy Local Habitat Map[115] indicates suitable locations for nature recovery opportunities. This opportunity mapping has been used to assess the availability of suitable land in the Environmental Delivery Plan area for implementing fen-type wetland habitat restoration and creation, and this data is presented in Figure 20.

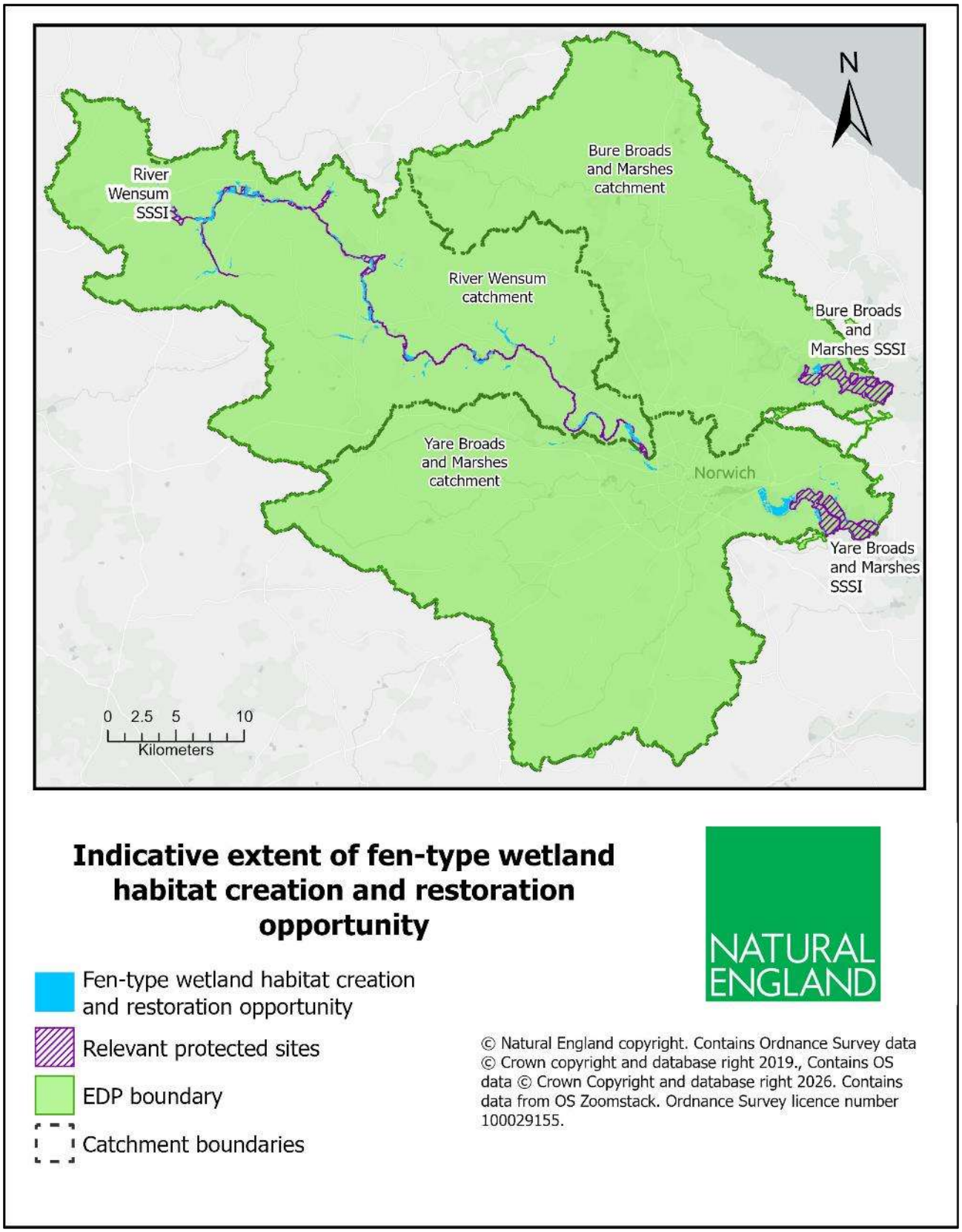

Figure 20: An indicative map showing the extent of fen-type habitat creation and restoration opportunities within 2km of one of the relevant protected sites in the Environmental Delivery Plan area.

Land use change to semi-natural habitat – contiguous with fen-type wetland creation/restoration

Description of measure

648. Land use change converts agricultural land to semi-natural habitats, specifically targeted at areas contiguous with protected sites or restored fen-type wetland habitats. This measure significantly improves ecological connectivity, enhances buffering capacity for the restored fen-type wetland habitat and supports wider habitat networks. In turn this contributes to improved resilience and supports the long-term condition of environmental features. The expected delivery is 18ha in the Bure and 91ha in the Yare, totalling 109ha.

Key objectives

649. To secure a permanent change from intensive agricultural land to semi-natural habitat, increasing the buffering capacity around restored fen-type wetland, improving ecological connectivity, in addition to reducing nutrient pollution and sediment entering waterways.

Spatial targeting

650. Target land use change contiguous with fen-type wetland including areas directly adjacent to the relevant protected site and areas of created or restored fen-type wetland habitat. To ensure that the greatest scale of benefit will be achieved, delivery closest to the relevant protected site is preferable.

651. Target land that is hydrologically and ecologically connected to protected sites or fen-type wetland habitat.

Delivery considerations

652. Delivery should focus on securing permeant change of land use in areas adjacent to fen-type wetland habitat to create space for natural fen transition or, where appropriate, other types of semi-natural habitat including grassland, woodland or transitional habitats using native species of local provenance.

653. Delivery considerations include, but are not limited to, the following:

- Feasibility assessment to ensure suitable buffering of fen-type wetland habitats either within or outside of protected sites that takes account of nutrient pathways outside and into the site to inform the buffering capacity;
- Ensuring all regulatory obligations are addressed, such as gaining appropriate permissions, consents or assents from public authorities (including Natural England), where relevant;
- Assessment of environmental risk and managing all identified risks, where necessary, for example managing flood risk and potentially new pollution pathways;

- Assessment of the long-term maintenance requirements for the conservation measure, including any actions necessary to maintain the cessation of agricultural activities and nutrient inputs, to support the development and persistence of semi-natural habitat and the associated environmental benefits;
- Site access to deliver long term maintenance and monitoring requirements;
- Other factors related to measure implementation such as time till effectiveness, species succession, seasonal constraints.

Secondary benefits

654. Secondary benefits of this conservation measure include the following but are ultimately dependent on the final site's location and its design as a conservation measure:
    - Increasing public access to nature;
    - Increased habitat connectivity and ecological resilience;
    - Increased carbon storage;
    - Support recovery of native and some protected species through increasing the extent of habitat they depend on;
    - Decrease drought risk and improve climate resilience.

Indicative map

655. This conservation measure will be targeted on land contiguous with existing or recently created areas of fen-type wetland habitat, or on land that is hydrologically and ecologically connected to fen-type wetland habitat in protected sites. The opportunity area to deliver this measure is, therefore, dependent on the spatial distribution of fen-type wetland habitat in the EDP area, and this will increase over the EDP period as additional fen-type wetland habitat creation and restoration is delivered as a conservation measure. Refer to Figure 20 for an indicative spatial distribution of land in the Environmental Delivery Plan area that is suitable for fen-type wetland habitat creation and restoration opportunities within 2km of the relevant protected sites, as this map provides an indicative illustration of where land use change contiguous with fen-type wetland habitats could be targeted.

Land use change to semi-natural habitat – wider catchment, not associated with any wetland

Description of measure

656. Land use change takes intensively managed agricultural land in the most polluting areas of a catchment out of production. This measure reduces nutrient pollution and sediment losses by stopping application of fertilisers, manure, slurry, and stopping or significantly reducing livestock numbers to conservation grazing levels. This prevents runoff from entering nearby waterways, stabilises soil and over time allows soils and

vegetation to naturally take up excess nitrogen and phosphorus. The expected delivery is 30ha in the Bure and 256ha in the Yare (comprised of 19ha in the Yare sub-catchment and 237ha in the Wensum), totalling 286ha across all catchments under this Environmental Delivery Plan.

Key objectives

657. To secure a permanent change of land use from intensive agriculture to semi-natural habitat, reducing nutrient pollution and sediment entering waterways and improving hydrological functioning, by legally securing the cessation of nutrient application from fertilisers, manure, and slurry, and the permanent cessation or significant reduction in livestock to conservation grazing levels for 100 years.

Spatial targeting

658. Targeting land with the highest phosphorus exports to provide the greatest overall nutrient reduction.

659. Aim to avoid the most valuable agricultural land to protect national food security and support agricultural production on the most productive soils or areas.

660. Aim to prioritise delivery adjacent to rivers where change in land use offers benefits to riparian habitat and/or in areas that enhance ecological connectivity using Norfolk's Local Habitat Map produced through the Local Nature Recover Strategy.

Delivery considerations

661. Securing land use change to semi-natural habitats such as grassland, woodland or riparian habitats using native species of local provenance, where appropriate.

662. Take account of local communities' needs and the delivery considerations include, but are not limited to, the following:

- Ensuring the target habitat can be achieved and assessing alternative opportunities to secure stacking funding that will help to maximise returns for nature, e.g., habitat that support wider species recovery, and aligning to national character areas;[116]
- Support the implementation and delivery of Norfolk's Local Nature Recovery Strategy and key government targets listed in the above mentioned Environmental Improvement Plan.

Secondary benefits

663. Secondary benefits associated with this conservation measure include the following but are ultimately dependent on the site's location and its design as a conservation measure:

- Increased space for biodiversity and new opportunities to provide additional ecosystem services;
- Increased habitat connectivity;
- Increasing public access to nature;

- Multiple benefits for the local community;
- Improved carbon sequestration and storage;
- Improved soil health, structure and resilience;
- Reduced surface water runoff and flood risk.

Indicative map

664. To assess the extent of opportunity for land use change in the Environmental Delivery Plan area, Natural England mapped the extent of land in the Wensum, Bure and Yare catchments that is currently under agricultural use. This is presented in Figure 21.

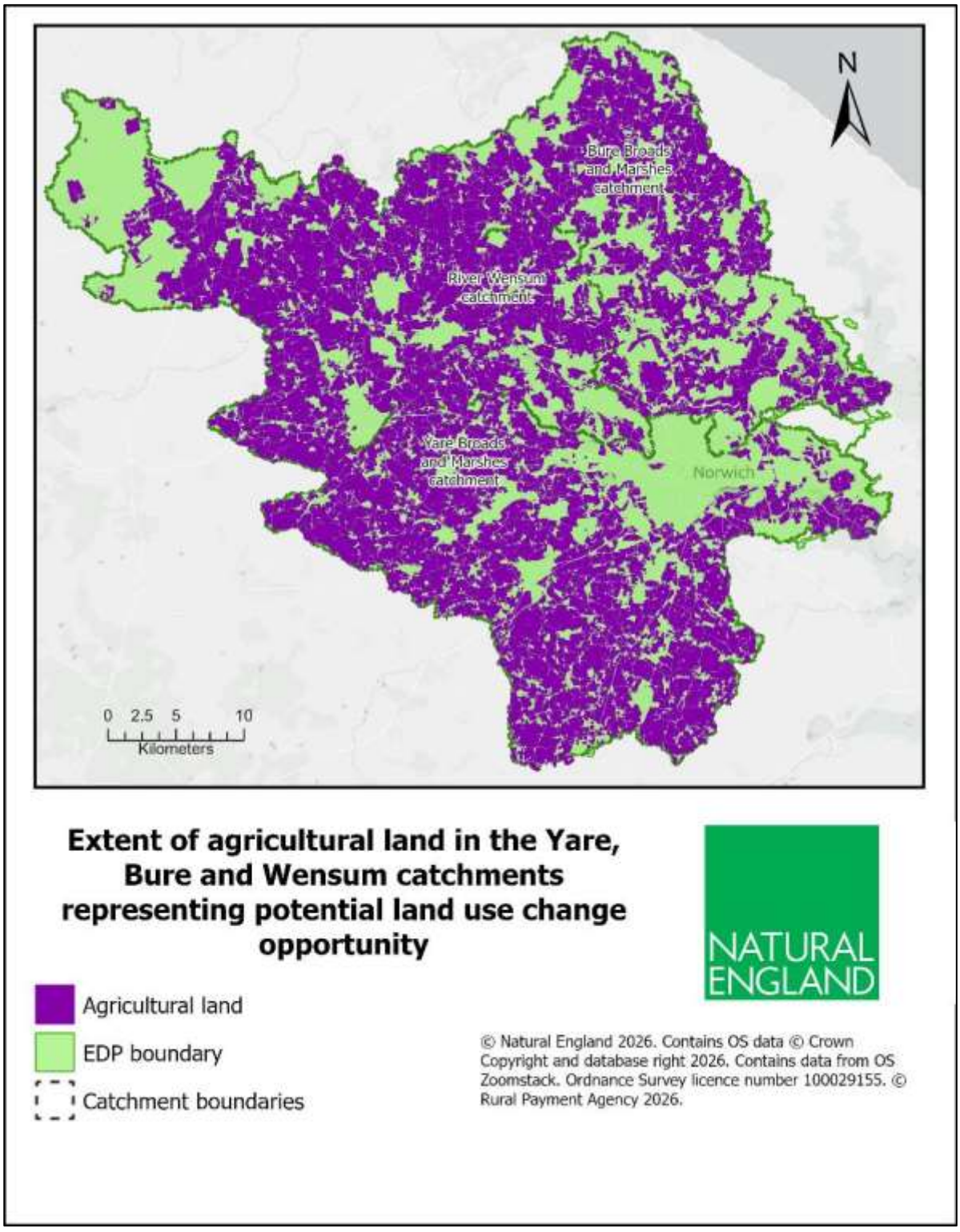

Figure 21: An indicative map showing the extent of opportunity for land use change in the Environmental Delivery Plan area

Fen-type wetland habitat management

Description of measure

665. This measure maintains and enhances existing fen type wetland habitats by vegetation management and biomass removal. Management of fen-type wetland relies on low intensity grazing and optimising the frequency of rotational cutting with removal and disposal of arising off site. Removal of arisings from the site lowers the amount of nutrients in the system. This measure helps to maintain diverse habitats, sustain characteristic vegetation communities, protect peat soils, and prevent the site from turning into dry scrub or woodland. The total proposed delivery is 162ha in the Yare.

Key objectives

666. To maintain and enhance existing fen-type wetland habitats by vegetation management and biomass removal. Helping to sustain characteristic vegetation communities and prevent succession to preserve habitat quality. Biomass removal will contribute towards nutrient reduction by removing nutrients accumulated within vegetation from the system. To address the current challenges of managing fen type wetlands at scale with particular focus on developing a sustainable system for removal and disposal, or re-use, of arisings. As arisings left in situ break down and leach nutrients, their removal is critical to both avoid effects of concentrated leachate and to lower nutrients within the system as a whole.

Spatial targeting

667. The area proposed (162 ha) is indicative that this measure is a large-scale action that goes far beyond simple replication of business-as-usual management.

668. Targeting existing on-site fen-type wetland habitat that is in poor or degraded condition, or not in favourable condition, then prioritise land that is hydrologically or ecologically connected to protected sites or fen-type wetland habitat to support ecological connectivity.

Delivery considerations

669. Management of fen will abide by relevant fen management best practice, such as the Fen Management Handbook[114], and management of fen will be determined by the local topography, hydrology and geology. Management may include the procurement and operation of machinery (e.g. a fen harvester).

670. Delivery considerations include, but are not limited to, the following:

- Management regime will be based on the type of fen[69]. In practice this measure would be adopted for areas currently managed where removal of arisings is not currently optimal and for areas not currently under optimal management. Management will also be informed by site condition assessments, including the hydrological regime;
- Timings, or most appropriate seasons for managing arising;
- Environmental risks such as taking appropriate measures to avoid altering natural water regimes or disrupting natural peat forming systems;

- Health and safety factors such as undertaking risk assessments and appropriate licences and use of machinery;
- Regulatory requirements such as gaining consents and assents from public authorities (including Natural England) and permission for the appropriate disposal of arising off site;
- Co-ordination with broader catchment management and site improvement programmes to provide additional benefits;
- Management of fen will abide by relevant fen management best practice, such as the Fen Management Handbook[114], and management of fen will be determined by the local topography, hydrology and geology. Management may include the procurement and operation of a fen harvester.

Secondary benefits

671. Secondary benefits associated with this fen-type wetland habitat management include the following but are ultimately dependent on the long-term management regime:
    - Improved carbon storage;
    - Increase biodiversity, by supporting a diverse range of target species, and improving habitat connectivity;
    - Reduce flood risk;
    - Improve water quality;
    - Support climate adaptation and drought resilience;
    - Reduce peat loss and reduce land subsidence.

Indicative map

672. Figure 22 outlines the areas targeted to deliver this conservation measure showing that fen-type wetland habitat management will primarily focus on condition units of the Yare Broads and Marshes Sites of Special Scientific Interest (SSSI) currently not in favourable condition. Then, if funds allow, this conservation measure will target condition units in the Bure Broads and Marshes SSSI currently not in favourable condition.

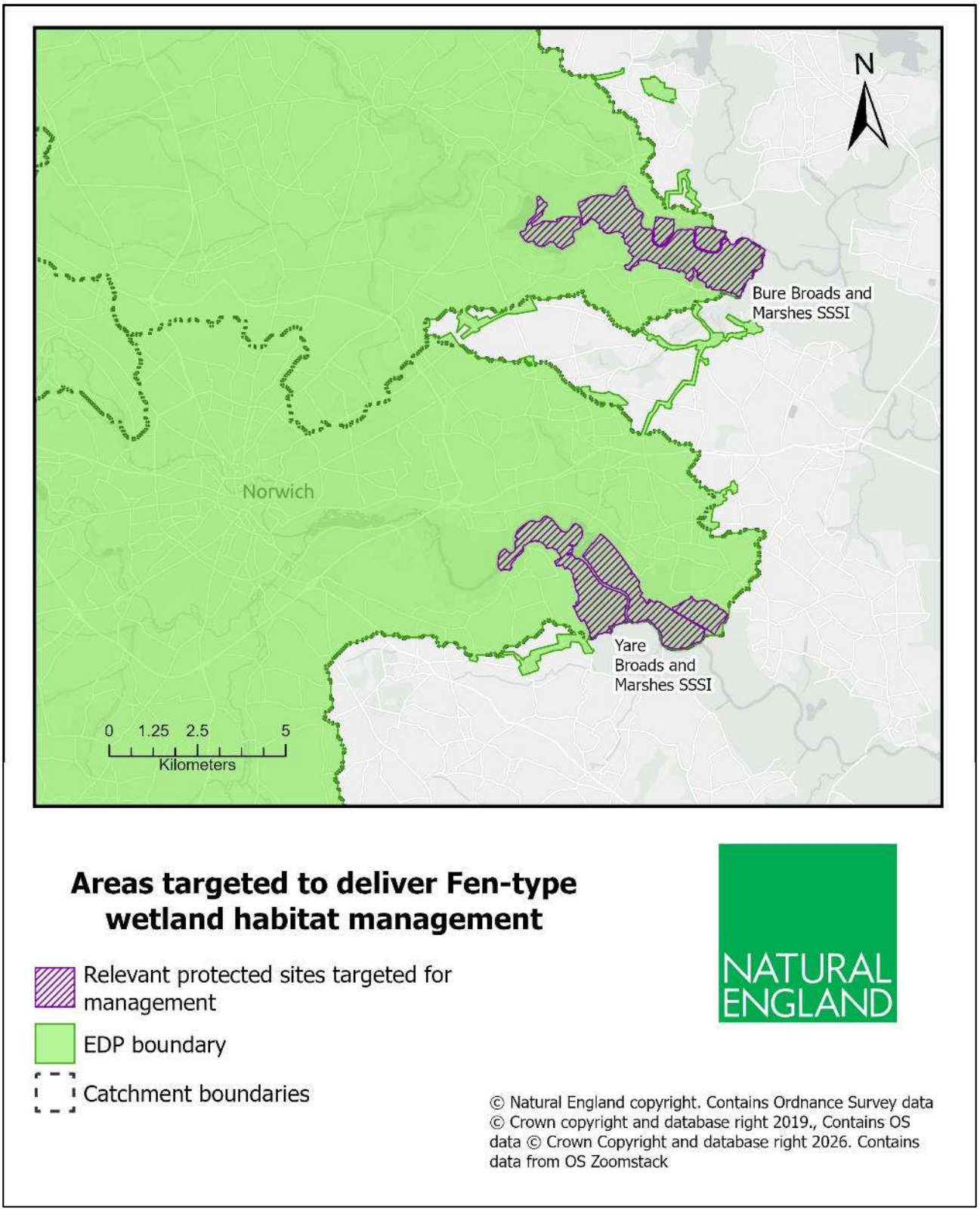

Figure 22: An indicative map showing at a high level the areas in the Environmental Delivery Plan area that will be targeted for fen-type wetland habitat management.

Catch-dyke remediation or other significant hydrological restoration

Description of measure

673. This measure restores natural or near-natural hydrological function by altering or reversing artificial drainage. This includes modifying ditches and dykes, removing artificial drainage features, or restoring springs and seepages. This measure slows the flow of water, allowing the landscape to act as a natural filter that processes nutrients, reducing nutrient pollution in waterways. The total proposed area is 500m onsite or contiguous in the Yare.

Key objectives

674. To restore natural or near-natural hydrological function through remediation of catch dykes which intercept groundwater inflows from valley edge and surface flows form upslope, disrupt hydrology, prevent wetland hydrosere development, dehydrate fen habitats, and destroy natural transitions into drier habitats. This measure acts primarily through hydrological processes, with consequential benefits for biological, physical and chemical components.

Spatial targeting

675. Target delivery of the conservation measure on site to restore natural hydrological regimes, supporting improved habitat condition and ecological processes.

676. Aim to prioritise locations where catch dykes currently intercept groundwater inflows from valley sides or surface water flows from upslope and areas where hydrological reconnection will restore natural water movement into fen-type habitat.

Delivery considerations

677. Delivery considerations include, but are not limited to, the following:

- Implementation of this measure must satisfy regulatory and planning requirements;
- A site-specific hydrological assessment should be completed prior to works to identify groundwater flow paths, surface water connectivity, and the likely impacts of dyke remediation on adjacent habitats and land uses;
- A feasibility assessment should be completed to ensure the conservation measure is proposed in a suitable location to deliver the intended outcome and to identify and assess the likelihood of risks;
- Remediation design should avoid adverse impacts on neighbouring land, infrastructure, flood risk, or existing water management functions;
- Works should be timed to minimise disturbance to protected species, breeding birds, and sensitive habitats, with appropriate ecological surveys undertaken where required.

Secondary benefits

678. Secondary benefits associated with this fen-type wetland habitat management include the following but are ultimately dependent on the long-term management regime:

- Re-establish natural hydrological gradients and ecological transitions;
- Improve resilience of fen habitats to climate change;
- Increased opportunities for peat formation and carbon storage;
- Enhance water retention.

Indicative map

679. Figure 23 shows areas in the Environmental Delivery Plan area that may be suitable and may be targeted for delivering catch-dyke remediation or other significant hydrological work. There is a 500m buffer around the Yare Broads and Marshes Sites of Special Scientific Interest (SSSI) to reflect that this conservation measure should be delivered on site, or on land contiguous to the SSSI, so it can restore natural hydrological function. Until more detailed feasibility studies have been undertaken to determine suitability, Figure 24 only represents indicative areas where this measure may be delivered.

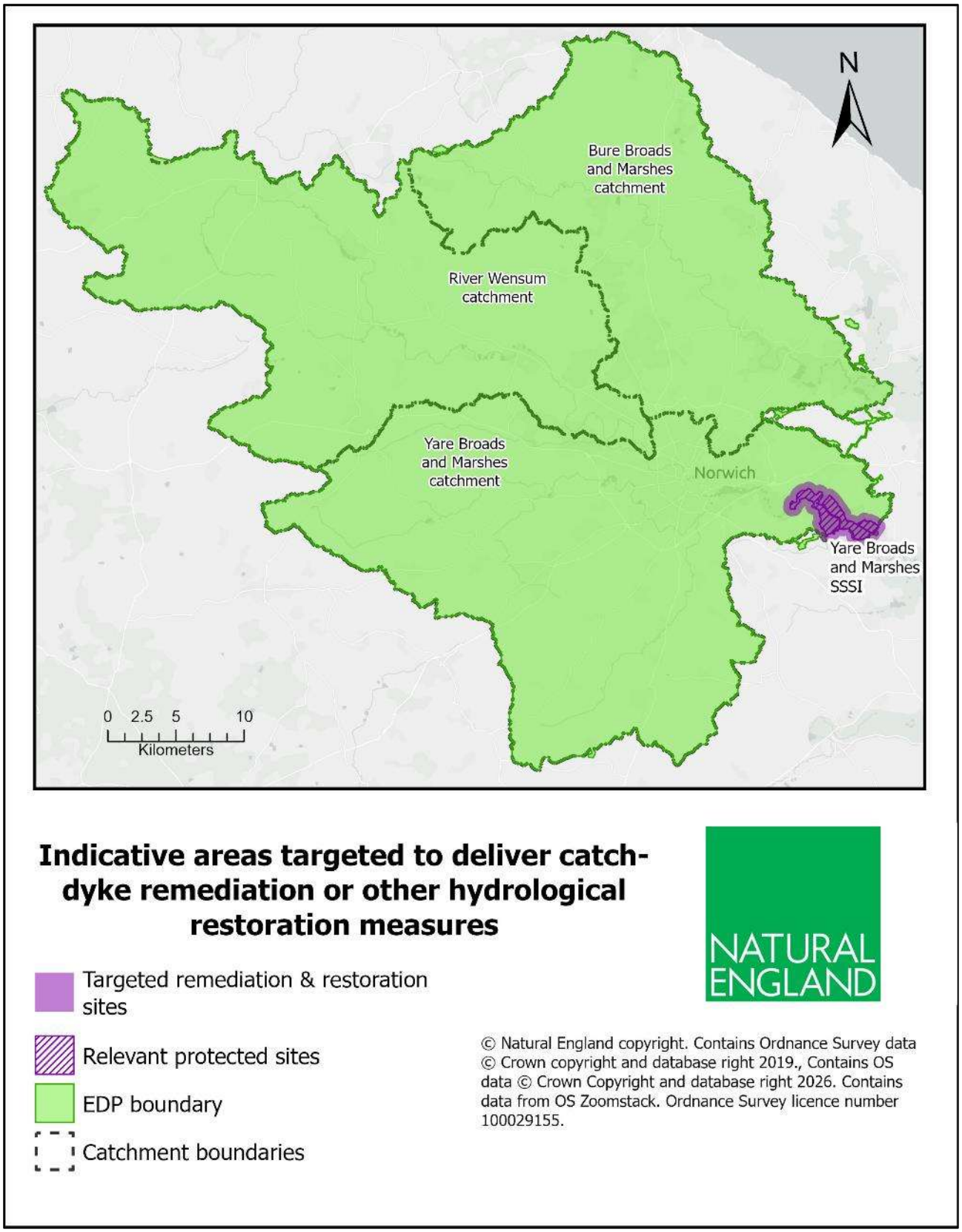

Figure 23: An indicative map showing areas targeted to deliver catch-dyke remediation or other significant hydrological restoration measures in the Environmental Delivery Plan area.

Deer management

Description of measure

680. Maintenance of deer populations at levels that can reduce ecological damage on the identified environmental features. This measure addresses damage caused by high numbers of certain deer species in The Broads. This will be achieved by targeted deer culling, coordinating action across the wider landscape, and use of fencing where appropriate.

681. By reducing pressure from deer on wet woodland, fen and reedbed habitats, as well as the banks of open water habitats, this measure can reduce trampling and damage to vegetation. It can reduce browsing pressure on young trees and shrubs with the aim of preserving seedings and coppice for regrowth, improving the structure and function of woodland habitat. This will be focused on Bure and Yare protected sites with a buffer, covering at least 3,700ha.

Key objectives

682. To manage deer species type and population numbers such that the impacts to the Environmental Delivery Plan environmental features are materially reduced

683. To increase the survival and recruitment of sensitive plant species and young trees

Spatial targeting

684. The main focus will be on the Bure and Yare but, if possible, it may expand to cover (in order of preference):

- (a) Ant Broads and Marshes, Trinity Broads, Upper Thurne Broads and Marshes;
- (b) conservation measures implemented under the Environmental Delivery Plan;
- (c) protected sites in the Environmental Delivery Plan area.

685. Prioritise areas where impacts from deer, such as overgrazing, are the highest, or areas where deer numbers are persistently high compared to other areas, whilst avoiding areas where measures are already being delivered by other plans and strategies.

686. Target deer management activity across a sufficiently large area to avoid displacing deer impacts elsewhere in The Broads.

687. Coordinate activity across a large enough area to avoid displacing impacts elsewhere in The Broads.

Delivery considerations

688. This conservation measure will include Deer Management Project, consisting of a senior project officer with £100k budget per year (for 20 years) as well as ongoing funding for deer management (years 20 to 100). The appointed officer will prepare and implement a Deer Action Plan as well as an annual published report, taking care to co-ordinate with existing deer management projects.

689. Delivery considerations include, but are not limited to, the following:

- having regard to animal welfare and animal sentience considerations, ensuring that any management actions are evidence-based, proportionate, legally compliant, and implemented using legally recognised best practice methods;
- population distribution and dynamics of different deer species populations, in relation to site condition assessments and Natural England's understanding of the areas of vegetation most adversely affected by excess deer numbers;
- the outcome of ongoing monitoring into the impact of deer management on the condition of vegetation (specifically its structural diversity, woodland regeneration and species diversity);
- cost of implementation;
- timing of the delivery, including appropriate seasons;
- regulatory requirements to comply with the law which may require certain permissions and licences to access the site, undertake culling operations and disposal of carcasses;
- other risks including environmental risks, biosecurity risks and operational risks.

Secondary benefits

690. Secondary benefits of this conservation measure include the following but are ultimately dependent on the delivery plan for this conservation measure:

- continue to support existing deer management partnerships and networks, including the implementation of the Government deer management strategy in the area;
- increased species biodiversity;
- enhanced woodland regeneration in the wider Environmental Delivery Plan area supporting ancient woodland and other priority habitat types that may be affected by excess deer numbers, providing improved carbon sequestration;
- reduced agricultural damage;
- enhanced soil and water retention;
- help facilitate the venison supply chain.

Indicative map

691. Figure 25 shows indicative areas where deer management measures will be targeted in the Environmental Delivery Plan area. The Yare Broads and Marshes and Bure Broads and Marshes Sites of Special Scientific Interest (SSSIs) with a 500m buffer around each are marked as primary target areas on the map, with the Ant Broads and Marshes, Trinity Broads and Marshes and Upper Thurne Broads and Marshes SSSIs, plus respective 500m buffers marked as additional target areas if funds are available.

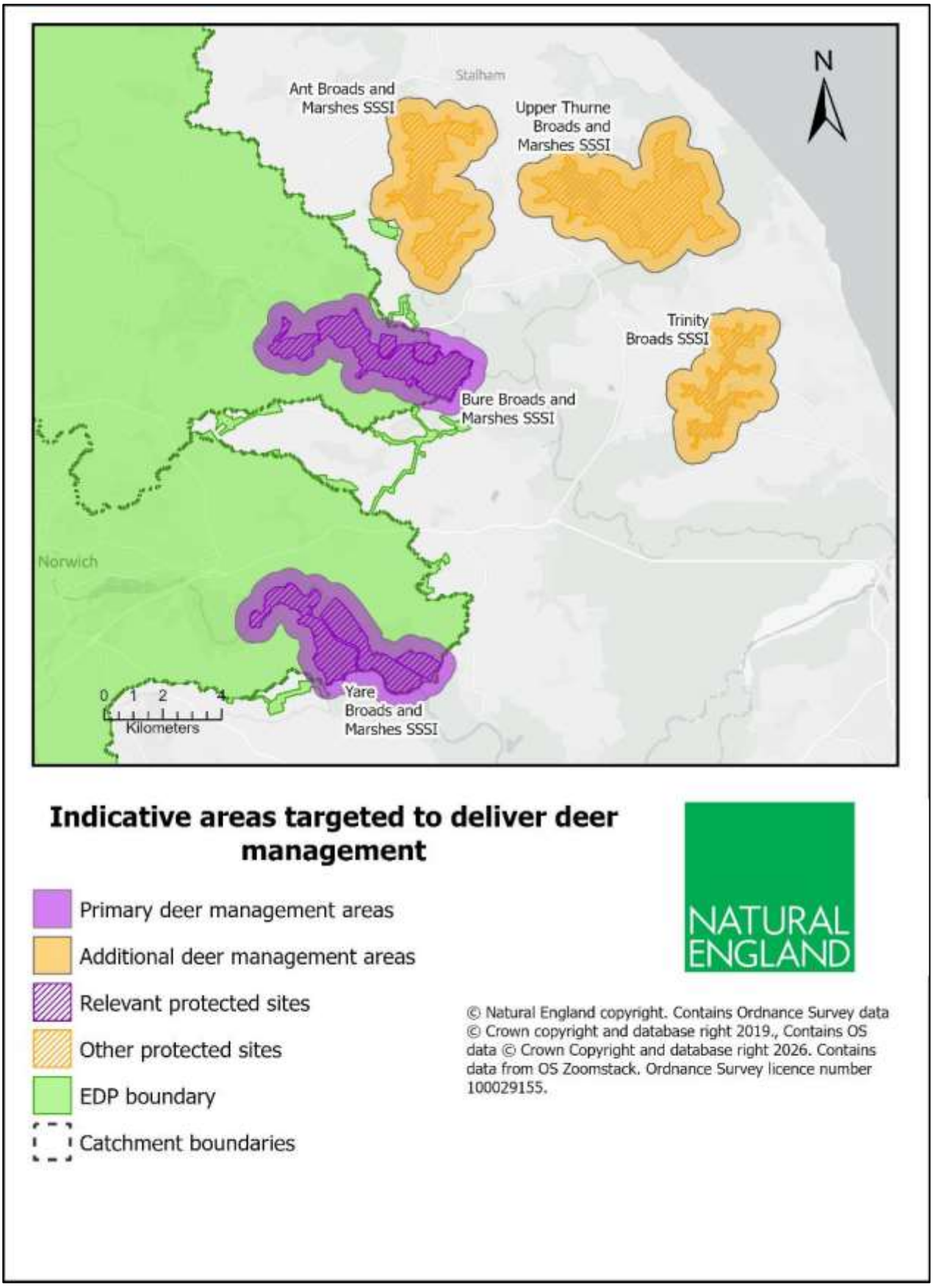

Figure 24: A map showing indicative areas that will be targeted to deliver deer management, in relation to the Environmental Delivery Plan area and its relevant protected sites.

Removal or modification of structures (weirs, culverts, impoundments)

Description of measure

692. This measure includes the removal or bypass of one structure. This does not include technical fish passes or fish easements. Removal or bypass of structures will be combined with restoration of the affected river reach (see river restoration below) and that removal work is completed prior to any channel restoration up and downstream.

693. The River Wensum Restoration Strategy[48] identifies 14 redundant mill structures along the Wensum, none of which have yet been removed or sufficiently modified to address their impact on the river. They are the most significant factor affecting the morphology of the river channel as 67% of the river is backed up behind these structures. Out of a total fall in head along the Wensum of 34 metres (from above Sculthorpe Mill to downstream of Hellesdon Mill), 60% of the drop occurs at mill structures, rather than progressively along the channel. This will be reflected in the in-channel and the riparian vegetation.

Key objectives

694. To modify or remove in-channel structures to restore a watercourse to a more natural, free-flowing state to help improve water quality, restore natural flow regimes, increase longitudinal connectivity and enable natural sediment transport.

Spatial targeting

695. Implementation of this measure must be combined with restoration of the affected river reach (co-location of two conservation measures).

696. Target the delivery of this conservation measure in areas identified the River Wensum Restoration strategy that is also deemed suitable for river restoration measures along the same stretch.

697. Avoid the delivery of this conservation measure in areas that would not satisfy regulatory requirements through early-stage engagement and collaboration with the Environment Agency's flood and fish colleagues and other regulators.

Delivery considerations

698. Delivery aims to focus on securing the permeant removal or bypass of structures in the river to restore a watercourse to a more natural, free flowing state, in line with site-specific recommendations and best practice guidance[117].

699. Delivery considerations include, but are not limited to, the following:

- ensuring the design objective (the key objective of the conservation measure) is met;
- feasibility assessment to ensure the proposed removal or bypass of the structure in the river is in a suitable location, identify associated risks and to

inform the implementation of the measure, with particular consideration of the following:

- check the reaches upstream of the structure where *Glyceria* beds could establish (due to sluggish flows and deep accumulation of sediment) for potentially resident populations of Desmoulin's snail, or other protected species, before any works can commence;
- assess how the alteration of flow regimes will affect the riparian habitat and river supporting fen-habitat within the influence of the mill structures may (despite improved hydrological function and floodplain connectivity likely to result from this conservation measure).

- ensuring implementation satisfies all regulatory or planning requirements, for example by obtaining environmental permits for flood risk activities;
- site access to monitor the measure in the long-term;
- other factors related to measure implementation such as time till effectiveness, species succession, seasonal constraints.

Secondary benefits

700. Secondary benefits of this conservation measure include the following, but are ultimately dependent on the delivery location in which this conservation measure is delivered and its design:

- increasing recreational access to waterways;
- improve wider aquatic connectivity;
- increase resilience of river systems to climate change;
- reduce long-term maintenance requirements associated with ageing structures where appropriate.

Indicative map

701. To assess the scale of opportunity to remove or modify structures in the river Wensum, existing redundant mill structures have been mapped in Figure 25. These mill structures represent areas along the river Wensum that have artificially altered natural river processes and present potential locations for removing or modifying structures to restore the river to a more natural, free-flowing state to help improve water quality.

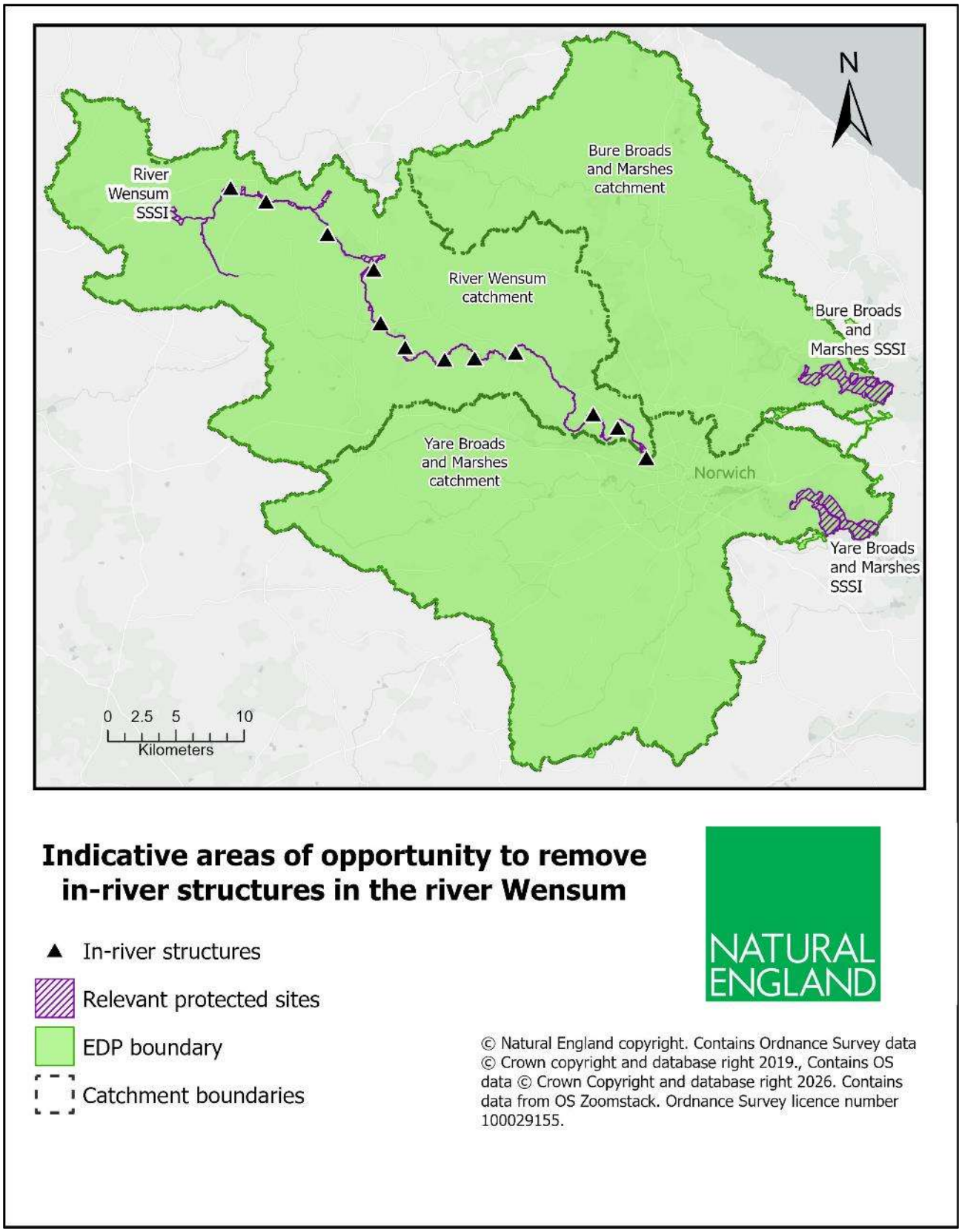

Figure 25: An indicative map showing potential opportunity areas to remove in-river structures in the river Wensum.

River restoration (channel and floodplain functioning)

Description of measure

702. The length/area of river and floodplain restoration assumes that a minimum 50m width of floodplain habitat will be restored on both banks. One restoration project is to be associated with the weir removal, totalling a minimum of 1km and will need to be tailored to the site, i.e. the width of riparian/floodplain habitat may be narrower or wider depending on the restoration need. Wider bands of vegetation of appropriate species composition, structure and hydrology will support larger, more resilient populations of Desmoulin's.

703. Restored reaches should be full hydro-morphological lengths as identified in the River Wensum Restoration Strategy[48] or geomorphic appraisal and not isolated fragments. The measures implemented must restore natural geomorphological processes as the top priority.

704. The River Wensum Restoration strategy[48] includes river restoration measures such as re-meandering, channel narrowing, bed raising, riffle or glide re-establishment and re-connection with the floodplain. The majority of the Site of Special Scientific Interest river channel would benefit from improvements. Riparian vegetation would need to be assessed for impacts on current populations of Desmoulin's and for potential to create new riparian habitat and adjacent fen suitable for the species.

Key objectives

705. To restore natural geomorphological and hydrological processes.

Spatial targeting

706. This measure must be located in the River Wensum Special Area of Conservation and its associated floodplain habitat (50m on both banks).

707. Location must prioritise reaches where restoration will re-establish natural physical processes to maximise benefits.

708. Implementation of this measure must be in areas that avoid adverse effects on protected site features, and comply with all regulatory requirements (for example Natural England consents).

Delivery considerations

709. A catchment-scale approach is required to consider natural processes properly[70]. Good-quality river restoration requires a resolved understanding of what one is trying to restore, informed by a knowledge of the history of the river and the processes which have shaped and continue to shape it[92]. Opportunities and recommendations for site specific Desmoulin's whorl snail recovery are outlined in Abrehart[97] and should be incorporated into an overall river and river valley restoration plan.

710. Working in conjunction with regulators, and in collaboration with partners, Natural England will carefully design and implement a river restoration project in co-location with a weir removal, to restore natural processes. The project will be funded over

multiple years to ensure the primary objective is realised by the end of the Environmental Delivery Plan period and to deliver wider secondary benefits.

711. Delivery considerations include, but are not limited to, the following:

- Feasibility study of the proposed stretch of river and its adjacent floodplain, including hydrological and geomorphological assessment, that also takes into account the impact of the proposed structure removal. The feasibility study must identify any risks associated with the proposed restoration measures and outline how these risks will be mitigated or avoided;
- Opportunities to increase or maximise ecological improvements and habitat connectivity, e.g., re-establishment of riverbanks;
- Co-ordinate with wider programmes in the catchment already delivering water quality improvements or river restoration programmes, where available;
- Regulatory and consenting requirements through early engagement with regulators include the Environment Agency, Natural England and other public authorities;
- Landowner and stakeholder engagement;
- Maintenance plan to sustain the beneficial impacts of the river restoration measure.

Secondary benefits

712. Secondary benefits of this conservation measure include the following but are ultimately dependent on the delivery location in which this conservation measure is delivered and its design:

- Re-establish natural channel form and function;
- Improve the diversity of flow conditions, water depths, substrates and channel habitats characteristic of a healthy chalk stream ecosystem;
- Restore natural erosion, sediment transport and deposition processes to reduce excessive siltation and improve channel and floodplain functioning;
- Improve habitat quality and ecological connectivity for Special Area of Conservation qualifying species, including bullhead, brook lamprey and white-clawed crayfish;
- Enhance Ranunculus dominated chalk river habitats and associated aquatic and marginal vegetation communities;
- Reconnect rivers with their floodplains to promote natural flood storage, sediment retention, nutrient processing and wetland habitat creation;
- Restore functioning riparian corridors to increase habitat complexity for identified environmental features, improve water quality and climate resilience;
- Increase river resilience to nutrient pollution, drought, flooding and climate change.

Indicative map

713. This conservation measure should be implemented in co-location with the removal or modification of in-river structures in the river Wensum. Figure 26 represents potential stretches of the river Wensum where river restoration measures may be suitable. These directly align to the opportunity areas identified for the removal or modification of in-river structures. Detailed feasibility studies of potential sites and thorough engagement is needed prior to confirming any sites where this conservation measure will be implemented.

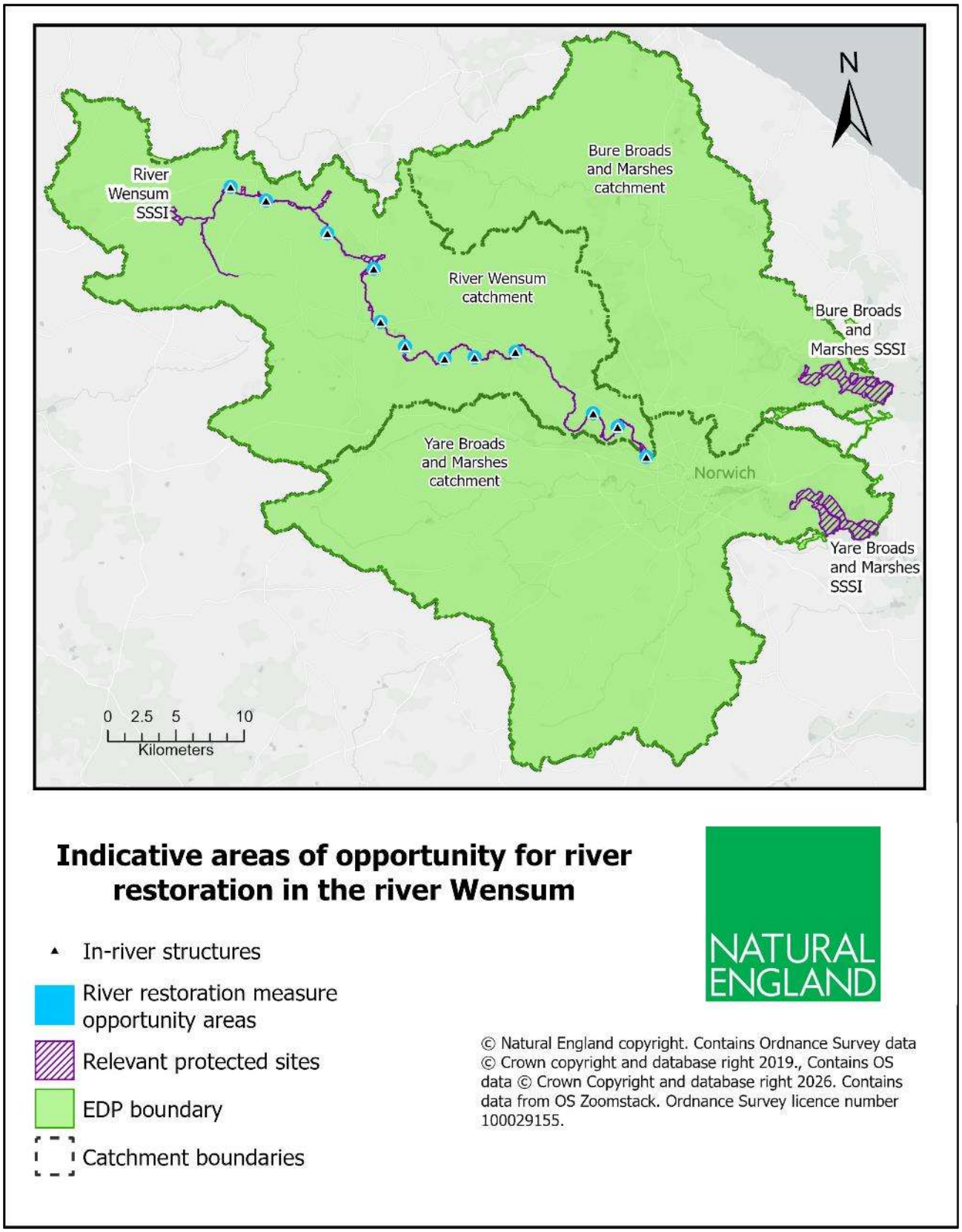

Figure 26: An indicative map showing areas of opportunity to implement river restoration, in combination, with the removal or modification of structures, in the river Wensum.

19 Annex 7A – His Majesty's Government (HMG) Overall Improvement Test interpretation

Context

714. His Majety's Government (HMG) officials have written to Natural England and provided HMG's interpretation of the Overall Improvement Test.

HMG interpretation:

Introduction

715. The purpose of this document is to set out HMG's view on the interpretation of the Overall Improvement Test in the Planning and Infrastructure Act 2025 that should be applied both when Natural England drafts, and when the Secretary of State considers making, an Environmental Delivery Plan.

716. The Overall Improvement Test applies to Natural England when it is preparing an Environmental Delivery Plan. Natural England is required by s.63(2)(b) Planning and Infrastructure Act 2025 to set out in an Environmental Delivery Plan its opinion on how the conservation measures will enable the Environmental Delivery Plan to pass the Overall Improvement Test. In turn, the Secretary of State may only make an Environmental Delivery Plan if she considers that the Environmental Delivery Plan passes the Overall Improvement Test: s.65(3) Planning and Infrastructure Act 2025. Because the same test applies to both Natural England and the Secretary of State, it is desirable that both should interpret the Overall Improvement Test in the same way – although it will be for each to apply the test and reach their own judgements when doing so.

The Overall Improvement Test

717. In summary, s.65(4) Planning and Infrastructure Act 2025 provides that an Environmental Delivery Plan passes the Overall Improvement Test if "by the Environmental Delivery Plan end date, the effect of the conservation measures will materially outweigh the negative effect of the Environmental Delivery Plan development on the conservation status of each identified environmental feature". The concept of "the negative effect of the Environmental Delivery Plan development" is defined by s.65(5) Planning and Infrastructure Act 2025 to mean "the effect, caused by the environmental impact, as identified in the Environmental Delivery Plan in accordance with section 61(1)(b), of the maximum amount of development to which the Environmental Delivery Plan may apply, as specified in accordance with section 60(5)".

The balancing exercise required

718. The Secretary of State considers that the Overall Improvement Test involves a balancing exercise which involves weighing the "negative effects of the Environmental Delivery Plan" (as defined in s.65(5) Planning and Infrastructure Act 2025) and the "effects of the conservation measures". The Overall Improvement Test is passed if the positive effects of the conservation measures "materially outweigh" the negative effects of the Environmental Delivery Plan "by the Environmental Delivery Plan end date".

The time by which the favourable balance must be achieved and the requirement to maintain it for the duration of the negative effects

719. Having regard to the purpose of the Overall Improvement Test as an environmental safeguard, the Secretary of State interprets this to require a two-limbed consideration:

- (1) By the Environmental Delivery Plan end date, a favourable balance must have been achieved in practice, i.e. the material outweighing of negative effects of Environmental Delivery Plan development that has occurred by the accrued benefits of the conservation measures on the conservation status for each identified environmental feature. In other words, the situation on the ground is that benefits materially outweigh negative effects by the Environmental Delivery Plan end date; and also
- (2) a favourable balance between conservation benefits and negative effects from development will be maintained for as long as the development will be causing negative effects.

The meaning of negative effects

720. In terms of the negative effects side of the scales, the statutory definition in s.65(5) Planning and Infrastructure Act 2025 means that one has to consider the terms of the particular Environmental Delivery Plan. Section 61(1) Planning and Infrastructure Act 2025 requires an Environmental Delivery Plan to identify "(a) one or more environmental features which are likely to be negatively affected by development to which the Environmental Delivery Plan applies, and (b)one or more ways in which that negative effect is likely to be caused by the development (the "environmental impact")".

721. Additionally, s.60(5) Planning and Infrastructure Act 2025 requires an Environmental Delivery Plan to "specify the maximum amount of development to which it may apply". Thus, the "negative effects of the Environmental Delivery Plan" is the "environmental impact" (as described in the Environmental Delivery Plan) of the theoretical maximum amount of development that the Environmental Delivery Plan applies to. Whenever the Overall Improvement Test falls to be applied, that is what the "negative effects of the Environmental Delivery Plan" means (although as explained below the actual assessment of the extent of those negative effects may vary over time in light of the most up to date data and scientific knowledge).

Passing the Overall Improvement Test

722. In terms of the positive side of the scales, when preparing or making an Environmental Delivery Plan it is relevant to consider all the conservation measures that are proposed

to see if what is proposed will achieve a favourable balance by the end date and maintain it thereafter.

723. To pass the Overall Improvement Test at the Environmental Delivery Plan end date, the following conditions must have been met:

- (1) the positive impact of implemented conservation measures by the Environmental Delivery Plan end date materially outweighs the negative impact of development that has been realised by the Environmental Delivery Plan end point. This is a question of scientific assessment of these impacts; and also;
- (2) The projected impact of conservation measures that will happen if they are required must be such that it will maintain a favourable balance against the projected impact of the maximum level of development under the Environmental Delivery Plan (i.e. total Environmental Delivery Plan capacity as specified under s.60(5) Planning and Infrastructure Act 2025) as it is brought forward. This is a question of predictive evaluation which will require an exercise of ecological and practical judgement. This can be informed by the negative impacts of development and performance of conservation measures during the life of the Environmental Delivery Plan up to this point, identified through monitoring.

724. When looking at the projected impact of conservation measures that will happen, it is relevant to consider any conservation measures (including backup measures) which as a matter of fact and degree are judged to be within Natural England's control to deliver. That may be through Natural England having secured the measure by a legally binding mechanism, or some other state of affairs that means the decision-maker can be reasonably confident that the conservation measure is within Natural England's control to deliver, for example, Natural England owns the land required to implement the measure and does not need any other form of permission or licence, or because the market for the particular conservation measure is sufficiently liquid that there would be no difficulty in Natural England putting the measure in place.

Judging if benefits materially outweigh harm

725. In terms of the balancing exercise, the Secretary of State considers that whether the "materially outweigh" requirement of the Overall Improvement Test is satisfied will be an evaluative judgement. The factors that may need to be considered will be context-specific, however they may include factors such as:

- the likely efficacy of the conservation measures in delivering their intended aims;
- the relevant modelling of the timeline for negative effects materialising from development;
- the expected timeframes for delivering conservation measures and the sequencing of the delivery of those measures relative to the delivery of development.;
- the strength of monitoring measures and the robustness of the back-up measures they would trigger;

- the strength of proposals for maintenance and the ongoing funding of conservation measures.

726. The term "materially" is not defined in the Planning and Infrastructure Act 2025 and will be a matter of judgement for Natural England and the Secretary of State in any given case whether conservation benefits materially outweigh negative effects. In particular, there is no minimum or fixed percentage to meet the "materially outweigh" threshold. Instead, it is a broad question of ecological judgement.

727. What is "material" will depend on the context. In judging materiality, it would also be relevant to consider the matters specifically identified as relevant to the exercise of Natural England and the Secretary of State's functions in s.94(3) Planning and Infrastructure Act 2025, including the current environmental improvement plan and any Environment Act 2021 strategies.

728. The degree to which the conservation measures outweigh the negative effect of the Environmental Delivery Plan development does not have to remain constant beyond the Environmental Delivery Plan end date. However, a favourable balance (i.e. a material outweighing) does need to be maintained. The specific level of outweighing at the Environmental Delivery Plan end date does not have to continue at the same level thereafter. But it needs to continue as a favourable balance beyond the Environmental Delivery Plan end date.

No need to second guess the midpoint assessment when preparing or making an Environmental Delivery Plan

729. The Overall Improvement Test is also relevant at the midpoint because Natural England must publish a report on an Environmental Delivery Plan covering the period from the Environmental Delivery Plan start date to the Environmental Delivery Plan midpoint (s.67(1)(a) Planning and Infrastructure Act 2025) and that "midpoint report" must include "an assessment of whether the Environmental Delivery Plan is likely to pass the Overall Improvement Test": s.67(6) Planning and Infrastructure Act 2025. But the Secretary of State does not consider that Natural England (when preparing an Environmental Delivery Plan) or the Secretary of State (when making an Environmental Delivery Plan) need to try to predict what a midpoint report might say in relation to the Overall Improvement Test.

730. Rather, the assessment when preparing or making an Environmental Delivery Plan looks forward to the Environmental Delivery Plan end date and asks whether the Overall Improvement Test will be met at the end date: see the definition of passing the Overall Improvement Test in s.65(4) Planning and Infrastructure Act 2025 which is framed by reference to the position "by the Environmental Delivery Plan end date".

20 Annex 7B – Assessment of the effect of programmed conservation measures

Introduction

731. This annex assesses the positive effects of the programmed conservation measures to support the Overall Improvement Test. The assessment is structured by feature group. For each group, the relevant environmental features are identified, the conservation measures that are expected to benefit the conservation status of those features are identified, and the positive effects of those conservation measures are described on their conservation status. Not all conservation measures are expected to benefit all environmental features. Accordingly, for each feature group, the conservation measures considered relevant to those features are identified and their positive effects are assessed.

732. Full details of each conservation measure, including its specification and delivery, and how the measures deliver for the biological, physical, hydrological and chemical components and future prospects of the features are provided in Annex 6C.

733. All assessments are subject to a number of common sources of uncertainty. These include, but are not limited to, the location and extent of the conservation measures ultimately delivered, the quality of their design and implementation, the time required for species recovery and colonisation of restored habitats, and the extent to which persistent background nutrient enrichment may constrain the condition and ecological functioning of restored habitats. Back-up measures provide a safety net to address this uncertainty so that the Overall Improvement Test can be met.

Planning condition securing the performance of non mains drainage

734. All feature groups will benefit from the conservation measure secured through a planning condition requiring the performance of non-mains drainage systems (see Chapters 6 and 8, and Table 17). The positive effects of this measure have already been taken into account in the assessment of negative effects and are therefore not repeated in this annex.

Open water features

Environmental features for this assessment:

735. The relevant environmental features are:

Open water features – Bure Broads and Marshes Sites of Special Scientific Interest

- Intermediate between H3150 natural eutrophic lakes with Magnopotamion or Hydrocharition and H3140 hard oligo-mesotrophic waters with benthic veg of Chara spp. This includes many ditches
- S1355 otter, Lutra lutra

- S1016 Desmoulin's whorl snail, Vertigo moulinsiana
- Wetland invertebrate assemblage
- Wetland plant assemblage
- Aggregations of non-breeding birds.

Open water features – Yare Broads and Marshes Sites of Special Scientific Interest

- Intermediate between H3150 natural eutrophic lakes with Magnopotamion *or* Hydrocharition and H3140 hard oligo-mesotrophic waters with benthic veg of *Chara spp.* This includes many ditches.
- S1355 otter, Lutra lutra
- S1016 Desmoulin's whorl snail, Vertigo moulinsiana
- Wetland invertebrate assemblage
- Wetland plant assemblage
- Aggregations of breeding birds
- Aggregations of non-breeding birds.

Relevant programmed conservation measures

736. The relevant programmed conservation measures:

- Nutrient performance standards for non-mains drainage
- Fen-type wetland creation
- Land-use change
- Catch-dyke remediation
- Deer management.

737. Further detail on the conservation measures may be found in Chapter 6 and Annex 6C.

Effect of the conservation measures on conservation status

Conservation measure 1 – Fen-type habitat creation

738. The creation and restoration of fen-type wetland habitats and mosaics provide benefits primarily through biological and hydrological processes, supported by improvements to physical structure and water quality. By re-establishing functioning wetland systems, these measures address key components of ecosystem condition, including habitat extent, connectivity, nutrient processing and resilience.

739. For open water features, the greatest benefits occur where measures are delivered contiguous to the feature and/or site. An increase in extent of fen-type habitat in the catchment of the open water feature will deliver both water quality and hydrological benefits. It will also result in a larger, more functionally coherent wetland and open water system. Restoring near-natural hydrological conditions is fundamental to this process, as it enables the re-establishment of characteristic vegetation communities in the fen-type habitat, with more diverse species and structure, and supports natural

nutrient cycling and removal. This, in turn, contributes to improved resilience of the habitat to environmental pressures, including climate change. This can buffer the open water habitat more effectively hydrologically and reduce the nutrient load entering the waterbodies.

740. In contrast, non-contiguous measures provide more moderate benefits, contributing to the wider ecological network and supporting catchment-scale processes, but with a reduced direct influence on the conservation status of the open water features. By targeting fen type habitat creation closest to the site will maximise the potential benefits and achieve a more functionally coherent wetland and open water system.

741. Fen and reedbed creation and restoration provide nutrient benefits through (i) reduced nutrient losses from the land-use change required to create or restore the habitat, and (ii) additional phosphorus interception and retention by the restored habitat. In the Bure, the associated land-use change is estimated to reduce phosphorus losses by 0.42 kg P/yr, with a further 39.89 kg TP/yr retained by restored habitat, giving a total quantified benefit of 40.3 kg TP/yr, equivalent to approximately 37% of the predicted 110 kg P/yr increase from development, from this measure alone. In the Yare, the corresponding figures are 1.18 kg P/yr from land-use change and 325.9 kg TP/yr from retention, giving 327.1 kg TP/yr, or approximately 41% of the predicted 795 kg P/yr increase, from this measure alone.

742. For nitrogen, only the land-use-change element associated with fen and reedbed creation/restoration has been quantified, at 3.5 kg N/yr in the Bure and 10.58 kg N/yr in the Yare. Additional nitrogen interception and processing by restored habitat have not been quantified, so the overall nutrient benefit is likely to be greater.

743. This is only one of the benefits provided by this measure and does not capture its full contribution to improving conservation status. Fen and reedbed creation and restoration can also improve habitat extent, connectivity, ecological processes and the wider structure and function of protected sites. Overall, these measures therefore represent a highly effective intervention, particularly where implemented on-site or in close spatial association with environmental features.

Conservation measure 2 – Land use change targeted to be contiguous with fen

744. The potential benefits and effectiveness depend on the location where land use change is being delivered. Land-use change provides greater benefits than reduced-intensity farming by removing nutrient inputs entirely and restoring natural processes. Where measures are contiguous with protected sites or restored or created wetland habitats, and open water features, they can significantly improve ecological connectivity, enhance buffering capacity and support wider habitat networks. This contributes to improved resilience and supports the long-term condition of environmental features, including open waters.

745. Where measures are non-contiguous, benefits are more moderate and occur primarily through wider catchment processes, particularly nutrient reduction and improved hydrological functioning.

746. This land use change is specifically at land contiguous with the existing protected site or the restored or created wetland habitats to maximise the benefits from achieving a more functionally coherent wetland and open water system.

747. The nutrient reduction from the change in land use can be estimated. As the land being targeted is contiguous with the fen habitat type creation, the scale of the predicted nutrients reductions are likely to be the same. This is only one of the benefits that this measure provides to improving the structure and function and does not capture its full contribution to conservation status.

748. Overall, land-use change to semi-natural habitat represents a highly beneficial catchment-scale intervention, and will be significantly more beneficial to all components of structure and function when sited in areas that are hydrologically or ecologically connected to protected sites and the existing or created fen habitat.

Conservation measure 3 – Land use change targeted for water quality benefit

749. Converting agricultural land to semi natural habitat targeted within areas of the catchment with higher phosphorus loading can have benefits for reducing nutrient and sediment losses into the catchment, through cessation from nutrient application from fertilisers, manure, slurry or cessation or significant reduction from livestock excreta, stabilisation of soil and establishment of permanent vegetation. It can also potentially improve water retention which can also help provide greater opportunity for nutrient removal processes to take place.

750. Reducing the nutrients reaching the open water feature will also reduce further nutrient accumulation, particularly phosphorus, within the system and its potential future re-release, supporting long-term resilience and ecological recovery. In the Bure, this measure is estimated to reduce losses by 31.9 kg TP/yr and 284.7 kg N/yr. This equates to approximately 29% and 32% of the predicted phosphorus and nitrogen increase from development, respectively, from this measure alone.

751. In the Yare and Wensum, this measure is estimated to reduce losses by 268.6 kg TP/yr and 1,312 kg N/yr. This equates to approximately 34% and 16% of the predicted phosphorus and nitrogen increase from development, respectively, from this measure alone.

752. This is only one of the benefits provided by this measure and does not capture its full contribution to improving conservation status. The main benefit of this land-use change would be an improvement in the chemical component of the structure and function of the open water feature, alongside some improvement in the hydrological component.

Conservation measure 4 – Fen management – development of strategic approach to enable removal of arisings

753. Delivery on-site provides the greatest benefit by maintaining and enhancing habitat structure and ecological condition. Active management helps sustain characteristic vegetation communities and prevents succession, thereby preserving habitat quality, with more diverse species and structure, with co-benefits for the open water features.

This can buffer and connect the open water habitat more effectively hydrologically and reduce the nutrient load entering the waterbodies. In addition, the removal of biomass can contribute to nutrient reduction, as nutrients accumulated within vegetation are removed from the system.

754. Overall, fen management measures play an important maintenance role, and are likely to contribute particularly to improvements in chemical and physical components of structure and function, and possibly biological and hydrological if new areas are brought into cutting management, but their effectiveness is generally lower than restoration measures.

Conservation measure 5 - Hydrological restoration (catch dyke removal)

755. Delivery on-site provides strong benefits by restoring natural hydrological regimes, which are critical for maintaining habitat condition and supporting ecological processes. This can lead to improvements in lake hydrosere vegetation communities, including re-establishment of lost vegetation types and zonations, habitat stability and overall resilience. In addition, depending on the location of the restoration and the hydrological connectivity of the site, there can be availability of additional water volume to the open water features, which will bring benefits provided the water quality is good. On-site hydrological restoration can improve inflow regimes (where these are relevant), sediment transport and nutrient cycling, supporting overall lake function.

756. Where delivered off-site, the magnitude of benefit depends on hydrological connectivity. Contiguous measures can significantly improve the hydrological functioning of adjacent habitats and contribute directly to site and feature condition, whereas non-contiguous measures provide more moderate benefits through improvements to wider catchment hydrology.

757. Overall, hydrological restoration is a key enabling measure, underpinning improvements across multiple ecological processes and potentially delivering material benefits to all components of structure and function. Maximum improvement to all components of structure and function is achieved when this measure is applied in combination and co-location with the others.

Conservation measure 6 – Deer management

758. Deer populations can have a variety of negative effects on open water habitats including physical damage to banks, dyke edges and in some areas may cause localised loss of aquatic, marginal and littoral habitats. Deer movement may also facilitate the spread of Invasive Non-Native Species, such as *Crassula.*

759. Reducing the numbers of deer at scale will reduce these impacts to a sustainable level and enable sites to respond better to the habitat restoration and creation, hydrological restoration and management conservation measures.

Conclusions

760. Considering Intermediate between H3150 natural eutrophic lakes with Magnopotamion or Hydrocharition and H3140 hard oligo-mesotrophic waters with benthic veg of Chara spp. The conservation measures will reduce nutrient and

sediment inputs, countering many of the negative impacts of this Environmental Delivery Plan development. Land-use change will convert intensively managed agricultural land to semi-natural habitat, providing a range of benefits, notably substantial reduction of fertiliser, manure, slurry and livestock-derived inputs, combined with permanent vegetation and more stable soil. This reduces phosphorus, nitrogen and sediment transmission to connected waters and limits future accumulation of phosphorus in water-body sediments. The non-mains drainage condition reduces nutrients at source.

761. In addition, the creation and restoration of fens (managed to remove arisings) removes nutrients from connected water bodies. Additional measures, including catch-dyke remediation will lead to improved hydrological functioning and connectivity and deer management will reduce trampling and damage particularly to marginal and open water vegetation in the smaller waterbodies.

762. Considering otter, Desmoulin's whorl snail, wetland invertebrate assemblage, wetland plant assemblage, aggregations of non-breeding birds, aggregations of breeding birds:

- The package of conservation measures will lead to larger, better connected wetland mosaics, which provide more diverse aquatic and marginal habitat, transitional zones and refuges.
- This is expected to directly benefit associated species: wetland plant and invertebrate assemblages, Desmoulin's whorl snail, fish-eating or plant-dependent birds and enhance the prey-base available to otters.

763. In conclusion, the positive effects from the above conservation measures will benefit the biological, physical, hydrology and chemical components of structure and function and future prospects of open water features.

Fen and fen type wetland features

Environmental features for this assessment:

764. The relevant environmental features are:

Fen and fen type wetland habitat features – Bure Broads and Marshes Sites of Special Scientific Interest

- H6410 Molinia meadows on calcareous, peat or clay-silt soil
- H7140 transition mires and quaking bogs
- H7210 calcareous fens with C. mariscus and species of C. davallianae
- H7230 alkaline fens
- S1903 fen orchid, Liparis loeselii
- S1016 Desmoulin's whorl snail, Vertigo moulinsiana
- Wetland plant assemblage
- Wetland invertebrate assemblage
- Floodplain fen

- Aggregations of breeding birds
- Aggregations of non-breeding birds.

Fen and fen type wetland habitat features – Yare Broads and Marshes Sites of Special Scientific Interest

- H6410 Molinia meadows on calcareous, peat or clay-silt soil
- H7140 transition mires and quaking bogs
- H7210 calcareous fens with C. mariscus and species of C. davallianae
- H7230 alkaline fens
- S1016 Desmoulin's whorl snail, Vertigo moulinsiana
- Wetland plant assemblage
- Wetland invertebrate assemblage
- Floodplain fen
- Aggregations of breeding birds
- Aggregations of non-breeding birds.

Relevant programmed conservation measures:

765. The relevant programmed conservation measures are:

- Nutrient performance standards for non-mains drainage
- Fen-type wetland creation and restoration
- Land-use change contiguous with wetland creation/restoration
- Wider-catchment land-use change
- Fen-type wetland management in the Yare
- Catch-dyke remediation
- Deer management.

766. Further detail on the programmed conservation measures can be found in Annex 6C.

Effect of the conservation measures on conservation status of the grouped fen features

Conservation measure 1 – Fen type habitat creation

767. The creation and restoration of fen-type wetland habitats and mosaics provide benefits primarily through biological and hydrological processes, supported by improvements to physical structure and water quality. By re-establishing functioning wetland systems, these measures address key components of ecosystem condition, including habitat extent, connectivity, nutrient processing and resilience.

768. The greatest benefits arise where measures are delivered contiguous to the feature, where they directly enhance the structure and ecological function of the habitat or off-

site, and also increase extent and resilience thereby resulting in a larger, more functionally coherent wetland and open water system. Restoring near-natural hydrological conditions is fundamental to this process, as it enables the re-establishment of characteristic vegetation communities and supports natural nutrient cycling and removal. This, in turn, contributes to improved resilience of the habitat to environmental pressures, including climate change.

769. In contrast, non-contiguous measures provide more moderate benefits, contributing to the wider ecological network and supporting catchment-scale processes, but with a reduced direct influence on the condition of the environmental features. Hence the fen type habitat creation is targeted, taking account of deliverability constraints, closest to the site and therefore the open water feature to maximise the potential benefits that can be achieved and achieve a more functionally coherent wetland and open water system.

770. Fen and reedbed creation and restoration provide nutrient benefits through (i) reduced nutrient losses from the land-use change required to create or restore the habitat, and (ii) additional phosphorus interception and retention by the restored habitat. In the Bure, the associated land-use change is estimated to reduce phosphorus losses by 0.42 kg P/yr, with a further 39.89 kg TP/yr retained by restored habitat, giving a total quantified benefit of 40.3 kg TP/yr, equivalent to approximately 37% of the predicted 110 kg P/yr increase from development, from this measure alone. In the Yare, the corresponding figures are 1.18 kg P/yr from land-use change and 325.9 kg TP/yr from retention, giving 327.1 kg TP/yr, or approximately 41% of the predicted 795 kg P/yr increase, from this measure alone.

771. For nitrogen, only the land-use-change element associated with fen and reedbed creation/restoration has been quantified, at 3.5 kg N/yr in the Bure and 10.58 kg N/yr in the Yare. Additional nitrogen interception and processing by restored habitat have not been quantified, so the overall nutrient benefit is likely to be greater.

772. This is only one of the benefits provided by this measure and does not capture its full contribution to improving conservation status. Fen and reedbed creation and restoration can also improve habitat extent, connectivity, ecological processes and the wider structure and function of protected sites. Overall, these measures therefore represent a highly effective intervention, particularly where implemented on-site or in close spatial association with environmental features.

Conservation measure 2 – Land use change targeted to be contiguous with fen

773. Land-use change to semi-natural habitat, contiguous to the sites, restored or created wetland habitat will restore the transition habitat and support the ecological processes operating within wetland systems. Consequently, it is vital to provide contiguous land-use connections for Fen-type wetland creation, and where catch dykes are remediated.

774. Potential benefits and effectiveness depend on the location where this is delivered. Land-use change provides greater benefits than reduced-intensity farming by removing nutrient inputs entirely and restoring natural processes. Where measures are contiguous with designated sites or restored or created wetland habitats, and fen features, they can significantly improve ecological connectivity, enhance buffering capacity and support wider habitat networks. This contributes to improved resilience

and supports the long-term condition of environmental features, including fen-type habitats.

775. Where measures are non-contiguous, benefits are more moderate and occur primarily through wider catchment processes, particularly nutrient reduction and improved hydrological functioning. This land use change is specifically targeted taking account of deliverability constraints, at land contiguous with the existing protected site or the restored or created fen habitats to maximise the benefits from achieving a more functionally coherent wetland system.

776. The nutrient reduction from the change in land use can be estimated. As the land being targeted is contiguous with the fen habitat type creation, the scale of the predicted nutrients reductions are likely to be the same. This is only one of the benefits that this measure provides to improving the structure and function and does not capture its full contribution to conservation status.

777. Overall, land-use change to semi-natural habitat represents a highly beneficial catchment-scale intervention, and will be significantly more beneficial to all components of structure and function when sited in areas that are hydrologically or ecologically connected to protected sites and the existing or created fen habitat. Land-use change that is more remote from existing Fen features or those under restoration will deliver fewer benefits to components of structure and function, and may not deliver at all for some components.

Conservation measure 3 – Land use change targeted for water quality benefit

778. Converting agricultural land to semi natural habitat targeted within areas of the catchment with higher phosphorus loading can have benefits for reducing nutrient and sediment losses into the catchment, through cessation from nutrient application from fertilisers, manure, slurry or cessation or significant reduction from livestock excreta, stabilisation of soil and establishment of permanent vegetation.

779. It can also potentially improve water retention which can also help provide greater opportunity for nutrient removal processes to take place. Therefore, reducing both phosphorus and nitrogen loads as well as sediment that reach the fen type habitat feature.

780. Reducing the nutrients that reach the fen feature will also reduce the further accumulation of nutrients (particularly phosphorus) within the fen helping long term resilience and ecological recovery of the fen habitats.

781. Reducing the nutrients reaching the open water feature will also reduce further nutrient accumulation, particularly phosphorus, within the system and its potential future re-release, supporting long-term resilience and ecological recovery. In the Bure, this measure is estimated to reduce losses by 31.9 kg TP/yr and 284.7 kg N/yr when targeted at land with the highest nutrient losses. This equates to approximately 29% and 32% of the predicted phosphorus and nitrogen increase from development, respectively, from this measure alone.

782. In the Yare and Wensum, this measure is estimated to reduce losses by 268.6 kg TP/yr and 1,312 kg N/yr. This equates to approximately 34% and 16% of the predicted

phosphorus and nitrogen increase from development, respectively, from this measure alone.

783. This is only one of the benefits provided by this measure and does not capture its full contribution to improving conservation status. The main benefit of this land-use change would be an improvement in the chemical component of the structure and function of the open water feature, alongside some improvement in the hydrological component.

Conservation measure 4 – Fen management – development of strategic approach to enable removal of arisings

784. For fen-type wetland features, delivery on-site provides the greatest benefit by maintaining and enhancing habitat structure and ecological condition. Active management helps sustain characteristic vegetation communities and prevents succession, thereby preserving habitat quality. In addition, the removal of biomass can contribute to nutrient reduction, as nutrients accumulated within vegetation are removed from the system.

785. Overall, fen management measures play an important maintenance role, and are likely to contribute particularly to improvements in chemical and physical components of structure and function, and possibly biological and hydrological if new areas are brought into cutting management, but their effectiveness is generally lower than restoration measures.

Conservation measure 5 – hydrological restoration (catch dyke removal)

786. For fen-type wetland features, delivery on-site provides strong benefits by restoring natural hydrological regimes, which are critical for maintaining or restoring habitat condition and supporting ecological processes such as nutrient cycling. This leads to improvements in vegetation communities, including re-establishment of lost vegetation types and zonations, particularly at 'upland'/valley bottom transition, habitat stability and overall resilience. Where delivered off-site, the magnitude of benefit depends on hydrological connectivity. Contiguous measures can significantly improve the hydrological functioning of adjacent habitats and contribute directly to site condition, whereas non-contiguous measures provide more moderate benefits through improvements to wider catchment hydrology.

787. Overall, hydrological restoration is a key enabling measure, underpinning improvements across multiple ecological processes and potentially delivering material benefits to all components of structure and function. In common with the other measures, maximum improvement to all components of structure and function is achieved when this measure is applied in combination and co-location with the others.

Conservation measure 6 – Deer management

788. Deer browsing and grazing directly damages flora and alters community structure. This affects the habitats suitability for breeding birds and other species. Deer presence also directly damages vegetation and peat, releasing carbon and nutrients, hindering ability

to access and manage fens appropriately and creating pathways that may facilitate increased predator access.

789. Reducing the numbers of deer at scale will reduce these impacts to a sustainable level and enable sites to respond better to the habitat restoration and creation, hydrological restoration and management conservation measures.

Conclusions:

790. Considering Molinia meadows on calcareous, peat or clay-silt soil; transition mires and quaking bogs, calcareous fens, alkaline fens and floodplain fen: the measures directly address important drivers of poor fen condition. Wider-catchment and contiguous land-use change will reduce nutrient and sediment losses by stopping or substantially reducing fertiliser, manure, slurry and livestock inputs and by establishing more stable semi-natural vegetation. The non-mains drainage condition reduces nutrients at source. Fen creation and restoration will increase habitat extent and, where hydrologically and ecologically connected, restore wetland processes, transition zones and habitat mosaics. Contiguous land-use change will buffer the restored fen and strengthen ecological connectivity.

791. Fen management, including cutting or grazing and removal of arisings, will maintain characteristic vegetation structure, prevent succession and remove nutrients held in biomass. Catch-dyke remediation will help restore natural hydrological pathways, water levels and wetland zonation. Deer management will reduce browsing and trampling pressure and support vegetation recovery.

792. Considering Desmoulin's whorl snail, wetland plant assemblage, wetland invertebrate assemblage, aggregations of breeding birds, aggregations of non-breeding birds and fen orchid: The measures will lead to increased extent, quality and connectivity of fen-type habitats which will directly benefit the dependent plant assemblages, fen orchid, Desmoulin's whorl snail, and invertebrate and bird assemblages by providing a larger and more varied habitat mosaic.

793. In conclusion, the positive effects from the above conservation measures will benefit the biological, physical, hydrology and chemical components of structure and function and future prospects of fen-type wetland features.

Wet woodland

Environmental features for this assessment:

794. The relevant environmental features are:

Wet woodland habitat features – Bure Broads and Marshes Sites of Special Scientific Interest

- H91E0 alluvial woods with *A. glutinosa, F. excelsior*
- Floodplain alder woodland
- Wetland invertebrate assemblage.

Wet woodland habitat features – Yare Broads and Marshes Sites of Special Scientific Interest

- H91E0 alluvial woods with *A. glutinosa, F. excelsior*
- Floodplain alder woodland.

Relevant programmed conservation measures:

795. The relevant programmed conservation measures are:
    - Nutrient performance standards for non-mains drainage
    - Fen-type wetland creation and restoration and contiguous land-use change
    - Wider-catchment land-use change
    - Fen-type wetland management
    - Catch-dyke remediation or significant hydrological restoration
    - Deer management.
796. Further detail on the programmed conservation measures can be found in Annex 6C.

Effect of the conservation measures on conservation status of the wet woodland feature

Conservation measure 1 – Fen-type wetland habitat creation

797. The creation and restoration of fen-type wetland habitats and mosaics provide benefits primarily through biological and hydrological processes, supported by improvements to physical structure and water quality. By re-establishing functioning wetland systems, these measures address key components of ecosystem condition, including habitat extent, connectivity, nutrient processing and resilience.
798. When delivered on-site or contiguous, improvements in hydrological conditions and ecological connectivity can support the maintenance and enhancement of existing woodland condition. Off-site delivery has a reduced direct influence on the conservation status but contributes to wider ecological connectivity and catchment hydrological function, which can indirectly support the resilience and long-term condition of wet woodland habitats. Hence the fen-type habitat creation is targeted, taking account of deliverability constraints, closest to the site and therefore the open water feature to maximise the potential benefits that can be achieved and achieve a more functionally coherent wetland and open water system.
799. Fen and reedbed creation and restoration provide nutrient benefits through (i) reduced nutrient losses from the land-use change required to create or restore the habitat, and (ii) additional phosphorus interception and retention by the restored habitat. In the Bure, the associated land-use change is estimated to reduce phosphorus losses by 0.42 kg P/yr, with a further 39.89 kg TP/yr retained by restored habitat, giving a total quantified benefit of 40.3 kg TP/yr, equivalent to approximately 37% of the predicted 110 kg P/yr increase from development, from this measure alone. In the Yare, the corresponding figures are 1.18 kg P/yr from land-use change and 325.9 kg TP/yr from retention, giving 327.1 kg TP/yr, or approximately 41% of the predicted 795 kg P/yr increase, from this measure alone.

800. For nitrogen, only the land-use-change element associated with fen and reedbed creation/restoration has been quantified, at 3.5 kg N/yr in the Bure and 10.58 kg N/yr in the Yare. Additional nitrogen interception and processing by restored habitat have not been quantified, so the overall nutrient benefit is likely to be greater.

801. This is only one of the benefits provided by this measure and does not capture its full contribution to improving conservation status. Fen and reedbed creation and restoration can also improve habitat extent, connectivity, ecological processes and the wider structure and function of protected sites. Overall, these measures therefore represent a highly effective intervention, particularly where implemented on-site or in close spatial association with environmental features.

Conservation measure 2 – Land use change to semi-natural habitat contiguous with fen creation/restoration

802. Land-use change to semi-natural habitat, contiguous to the sites, restored or created wetland habitat will restore the transition habitat and support the ecological processes operating within wetland systems. Consequently, it is vital to provide contiguous land-use connections for fen-type wetland creation, and where catch dykes are remediated. Consequently, it is vital to provide contiguous land-use connections for fen-type wetland creation, and where catch dykes are remediated.

803. The potential benefits and effectiveness depend on the location where this is delivered. Land-use change provides greater benefits than reduced-intensity farming by removing nutrient inputs entirely and restoring natural processes. Where measures are contiguous with protected sites or restored or created wetland habitats, and fen features, they can significantly improve ecological connectivity, enhance buffering capacity and support wider habitat networks. This contributes to improved resilience and supports the long-term condition of environmental features, including wet woodland. Where measures are non-contiguous, benefits are more moderate and occur primarily through wider catchment processes, particularly nutrient reduction and improved hydrological functioning.

804. This land use change is specifically targeted taking account of deliverability constraints, at land contiguous with the existing protected site or the restored or created fen habitats to maximise the benefits from achieving a more functionally coherent wetland system.

805. The nutrient reduction from the change in land use can be estimated. As the land being targeted is contiguous with the fen habitat type creation, the scale of the predicted nutrients reductions are likely to be the same. This is only one of the benefits that this measure provides to improving the structure and function and does not capture its full contribution to conservation status.

806. Overall, land-use change to semi-natural habitat represents a highly beneficial catchment-scale intervention, and will be significantly more beneficial to all components of structure and function when sited in areas that are hydrologically or ecologically connected to protected sites and the existing or created fen habitat. Land-use change that is more remote from existing Fen features or those under restoration will deliver fewer benefits to components of structure and function, and may not

deliver at all for some components.

Conservation measure 3 – Land use change targeted for water quality benefit

807. Converting agricultural land to semi natural habitat targeted within areas of the catchment with higher phosphorus loading can have benefits for reducing nutrient and sediment losses into the catchment, through cessation from nutrient application from fertilisers, manure, slurry or cessation or significant reduction from livestock excreta, stabilisation of soil and establishment of permanent vegetation.

808. It can also potentially improve water retention which can also help provide greater opportunity for nutrient removal processes to take place. Therefore, reducing both phosphorus and nitrogen loads as well as sediment that reach the wet woodland feature.

809. Reducing the nutrients that reach the wet woodland feature will also reduce the further accumulation of nutrients (particularly phosphorus) within the woodland helping long term resilience and ecological recovery of the wet woodland habitat.

810. Reducing the nutrients reaching the open water feature will also reduce further nutrient accumulation, particularly phosphorus, within the system and its potential future re-release, supporting long-term resilience and ecological recovery. In the Bure, this measure is estimated to reduce losses by 31.9 kg TP/yr and 284.7 kg N/yr. This equates to approximately 29% and 32% of the predicted phosphorus and nitrogen increase from development, respectively, from this measure alone.

811. In the Yare and Wensum, this measure is estimated to reduce losses by 268.6 kg TP/yr and 1,312 kg N/yr. This equates to approximately 34% and 16% of the predicted phosphorus and nitrogen increase from development, respectively, from this measure alone.

812. This is only one of the benefits provided by this measure and does not capture its full contribution to improving conservation status. The main benefit of this land-use change would be an improvement in the chemical component of the structure and function of the open water feature, alongside some improvement in the hydrological component.

Conservation measure 4 – Fen management – development of strategic approach to enable removal of arisings

813. For fen-type wetland features, delivery on-site provides the greatest benefit by maintaining and enhancing habitat structure and ecological condition. Active management helps sustain characteristic vegetation communities and prevents succession, thereby preserving habitat quality, with more diverse species and structure, with co-benefits for the wet woodland feature. This can buffer and connect the wet woodland habitat more effectively hydrologically and reduce the nutrient load entering the wet woodland. In addition, the removal of biomass can contribute to nutrient reduction, as nutrients accumulated within vegetation are removed from the system.

814. Overall, fen management measures play an important maintenance role, and are likely to contribute particularly to improvements in chemical and physical components of structure and function, and possibly biological and hydrological if new areas are brought into cutting management, but their effectiveness is generally lower than restoration measures.

Conservation measure 5 – Hydrological restoration (catch dyke removal)

815. For wet woodland, on-site measures support appropriate soil moisture regimes and ecological function, contributing to habitat condition and resilience. Off-site measures can provide indirect benefits where they influence connected hydrological systems, particularly where delivered in close proximity to the site.

816. Overall, hydrological restoration is a key enabling measure, underpinning improvements across multiple ecological processes and potentially delivering material benefits to all components of structure and function. In common with the other measures, maximum improvement to all components of structure and function is achieved when this measure is applied in combination and co-location with the others.

Conservation measure 6 – Deer management

817. Deer presence negatively impacts woodlands through browsing seedlings and understory and grazing ground flora. This leads to impoverished communities. Grazing and browsing directly damaging flora and altering community structure.

818. Reducing the numbers of deer at scale will reduce these impacts to a sustainable level and enable sites to respond better to the habitat restoration and creation, hydrological restoration and management conservation measures.

Conclusion

819. Considering alluvial woods and floodplain alder woodland: Land-use change and drainage standards will reduce nutrient and sediment inputs to connected wetland systems. Fen creation, contiguous semi-natural habitat and catch-dyke remediation will improve the hydrological and ecological context of wet woodland by restoring water movement, buffering woodland and enhancing connections between fen, swamp, open water and woodland. Fen management will sustain the surrounding wetland mosaic and limit nutrient recycling through removal of arisings.

820. Deer-management directly addresses a significant pressure. Reducing browsing and trampling can improve tree and shrub regeneration, ground-layer diversity, woodland-edge vegetation, soil stability and structural complexity.

821. Considering Wetland Invertebrate assemblages: Land-use change and drainage standards will reduce nutrient and sediment inputs to connected wetland systems. Fen creation, contiguous semi-natural habitat and catch-dyke remediation will improve the hydrological and ecological context of wet woodland by restoring water movement, buffering woodland and enhancing connections between fen, swamp, open water and woodland. Fen management will sustain the surrounding wetland mosaic and limit nutrient recycling through removal of arisings.

822. Deer-management directly addresses a significant pressure. Reducing browsing and trampling can improve tree and shrub regeneration, ground-layer diversity, woodland-edge vegetation, soil stability and structural complexity.

823. Improved woodland structure, hydrology and connectivity will provide more varied habitat for wetland invertebrates and strengthen transitions within the wider Broads wetland mosaic.

824. In conclusion, the positive effects from the above conservation measures will benefit the biological, physical, hydrology and chemical components of structure and function and future prospects of the wet woodland features.

River habitat

Environmental features for this assessment:

825. The relevant environmental feature is:

- H3260 Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
- Brook Lamprey, Lampetra planeri
- Bullhead, Cottus gobio
- White-clawed crayfish, Austropotamobius pallipes

Relevant programmed conservation measures:

826. The relevant programmed conservation measures are:

- Nutrient performance standards for non-mains drainage
- Wider-catchment land-use change delivered in the Wensum sub-catchment to benefit the Yare
- Removal or modification of one structure on the River Wensum
- 1km of contiguous river restoration
- Fen-type wetland creation/restoration

827. Further detail on the programmed conservation measures can be found in Annex 6C.

Effect of the conservation measures on conservation status of the river features

Conservation measure 1 – Removal or bypass of structures (weirs, culverts and impoundments)

828. The positive effects of removing or modifying a weir will potentially be different depending on the specific weir and exact works that take place. However, these will likely include:

- Removing ponding and restoring natural flow patterns and velocity and stabilising temperatures which improves habitat diversity and supports chalk stream species[118,119,] particularly, some of the key chalk stream

macrophytes, like Ranunculus, invertebrates and fish species which thrive in cool, swift and well oxygenated water;[92]

- Improving sediment transport and geomorphic processes;[120, 92]
- Reducing the accumulation of silt that can lead to eutrophic conditions[92];
- Removing the build-up of sediment and attached phosphorus that has accumulated behind the structure – locally improving the habitat[118], restoring gravel porosity and flow connectivity to the groundwater which supports characteristic plants, invertebrates and fish[92];
- Increased linear connectivity to allow free movement of fish and other organisms (for feeding, reproduction and migration) [118,119,121 118, 119] . Vertical drops of >18-20 cm are sufficient to prevent upstream movement of adult bullhead, and nearly all in-channel structures are known to either completely or partially block access to historical spawning grounds for brook lamprey. Structures also prevent recolonisation of upper reaches affected by lethal pollution episodes, and will also lead to constraints on genetic interactions that may have adverse consequences; [87]
- Improved hydrological function through improving floodplain connectivity; [119, 121,]
- Improved dissolved oxygen status upstream of the structure;
- Reduced siltation and stable temperatures improving the localised nutrient status potentially reducing any algal blooms upstream of the weir location; [92]
- A free-flowing chalk stream with good hydrological connectivity with the floodplain will be less adversely impacted by nutrient / sediment pollution, than a dredged or impounded channel which cannot flush itself or escape onto the floodplain in high flows[92].

Conservation measure 2 – River restoration (functional channel and floodplain)

829. The positive effects of the river restoration that restores natural processes will potentially be different depending on the specific restoration need and the technique or combination of techniques undertaken. However, positive effects of restoring natural processes will likely include:

    - Restoring the natural channel planform (re-meandering or re-alignment) and gradient increases the diversity of flows and area and complexity of habitats that in turn benefits a range of aquatic species (deep pools form in meander bends and varied flow types support diverse bed morphology and substrate). This includes the species in the river feature group. Restoring the characteristic chalk stream channel morphology provides the diversity of water depths, current velocities and substrate types necessary to fulfil the spawning, juvenile and dispersal requirements of bullhead, the diversity of refuge and feeding opportunities to support the white clawed crayfish, and whilst some river sections will be unsuitable for lamprey, across the river system the biotope mosaic will cater for all lamprey life stages to a degree characteristic of the river[87]. This may also:

- Restoring more natural patterns of erosion, transport and deposition of sediment which may increase nutrient cycling[70,122]
- Reduce siltation of the channel restoring gravel porosity and flow connectivity to the groundwater which supports plants, invertebrates and fish[92]
- Support aquatic and riparian vegetation, which increases nutrient uptake
- Provide niches for a wider range of species and life stages, for example, blackfly larvae in Ranunculus beds filter diatoms from the water[92] and microbes that can adsorb and transform nutrients
- Reduce bank erosion and associated nutrient inputs
- Increase resilience to climate change[70] and nutrient pollution.

- Narrowing overwide rivers also increases the diversity of flows and area and complexity of habitats to the river channel and will have similar benefits detailed under restoring the channel planform above. It may also help restore a more natural water table to the floodplain supporting a greater diversity of riparian and wet floodplain habitats and species. Healthy riparian margin consisting of trees provides soil protection, reduced nutrient and other diffuse pollution run off, increased infiltration, increased roughness to slow floodwater, provides shade and helps regulate water temperature and has biodiversity improvements including reducing excessive algal growth[122]. Restoring a natural flood regime also allows fine sediment to be filtered in the floodplain potentially storing and removing nutrients from the river[70,92,122].
- Removing embankments or bed-raising over-deep rivers will have similar benefits as narrowing above.
- Trees and large woody material are key drivers of geomorphology in chalk streams and add a high degree of habitat complexity. Large woody material provides a habitat in its own right and also niches for a wide range of species, and in particular invertebrates. Large wood diversifies flow, promotes sinuosity, generates slack water refuges upstream and scour holes downstream throwing up bars of gravels[70]. This provides niches for a wider range of species including invertebrates and microbes that can adsorb and transform nutrients. Bullheads are particularly associated with woody debris in lowland reaches, where it is likely that it provides an alternative source of cover from predators and floods. Submerged tree-root systems and woody material also provide important cover and refuges from flood flows for white clawed crayfish[87].
- Restoring a functioning riparian margin can filter out fine sediment which can carry nutrients and other pollutants and smother habitats. A healthy riparian margin consisting of semi-natural vegetation (trees, shrubs and tall grasses and herbs) also provides soil protection, reduced nutrient and other diffuse pollution run off, increased infiltration, increased roughness to slow floodwater, provides shade and helps regulate water temperature and has

biodiversity improvements including reducing excessive algal growth. The riparian margin also provides much of the primary food that supports river life[122]. Marginal vegetation including riparian trees provides important habitat for lamprey ammocoetes, as it encourages and stabilises the formation of silt beds in which ammocoetes burrow and provides important cover and feeding opportunities for white-clawed crayfish. Riparian trees also add substrate diversity and aid the formation of silt beds and clean gravels. They also provide temperature gradients in the channel that improves the availability of suitable micro-habitat for all the river species features.[87]

- Blocking drains and disabling sub-surface field drainage to restore fen habitat on floodplains with have similar benefits to restoring a functioning riparian margin above.

830. Implementing river restoration in conjunction with the structure removal/bypass would restore the physical structure and functioning of the river locally. There would be a likely significant improvement in the hydrological function and physical habitat of the river feature and potential benefits in the chemical status, particularly if the floodplain is re-connected. This would lead to significant improvements in the biology of the reach(es) where restoration work is undertaken and particularly improving fish movement within a much greater length of the river.

Conservation measure 3 – Fen type habitat creation/restoration targeted to provide **habitat for Desmoulin's whorl snail**

831. Fen-type habitat creation/restoration will likely have limited reduction in nutrient inputs from the change in land use as the land likely to be targeted is less likely to be existing high nutrient loss land. The creation of fen habitat and the restoration of hydrological function of this land, will however, have benefits for the river feature by slowing water flows and creating better conditions for nutrient interception and removal particularly for nitrogen. The small area of land involved though means the nutrient benefits are still likely to be negligible.

832. Creating functioning wetland is important for species such as Desmoulin's whorl snail as it will provide additional functional habitat to support this species.

833. Active management of the fen will be important as it helps sustain characteristic vegetation communities and prevents succession, thereby preserving habitat quality. Habitat management measures play an important role in maintaining habitat for Desmoulin's whorl snail in suitable condition, but their effectiveness is generally lower than restoration measures which restore suitable hydrology and increase the extent of suitable vegetation types and habitat connectivity.

834. Restoring areas of fen habitat within the Wensum valley, although small, will provide additional suitable and resilient habitat for Desmoulin's whorl snail and will contribute to restoring a more natural hydrological regime and functional river ecosystem that supports the river feature by improving resilience.

Conservation measure 4 – Land use change targeted for water quality for the Wensum

835. Converting agricultural land to semi natural habitat targeted within areas of the catchment with higher phosphorus loading can have benefits for reducing nutrients and sediment losses into the river, through cessation from nutrient application from fertilisers, manure, slurry or cessation or significant reduction from livestock excreta, stabilisation of soil and establishment of permanent vegetation. It can also potentially improve water retention[123] which can also help provide greater opportunity for nutrient removal processes to take place.

836. Reducing the nutrients that enter the river will also reduce any further accumulation of nutrients (in particular phosphorus) within the system and future re-release improving the structure and functioning of the river feature helping long term resilience and ecological recovery.

837. This measure is estimated to achieve a minimum reduction of 248.5kg/yr of phosphorus. This load reduction is greater than the predicted load increase from development (33kg/yr) to the river feature. This is only one of the benefits that this measure provides to improving the structure and function and does not capture its full contribution to conservation status.

838. The re-creation of areas of wet grassland and woodland in targeted areas of the floodplain also can help to naturalise sediment regimes by trapping fine sediments carried by flood waters[70].

839. The main benefit from this land use change would be an improvement in the chemical status which is greater than the impact from development. This could lead to some small improvements in the chemical and biological components of the structure and function of the river feature.

Conclusion

840. Considering the river with Ranunculus (H3260); targeted land-use change will stop or substantially reduce fertiliser, manure, slurry and livestock inputs and stabilise soil, reducing phosphorus and fine sediment entering the river. Removal or modification of a weir will reduce impoundment, restore more natural flow and sediment transport, improve dissolved oxygen and reconnect habitat. Contiguous river restoration can restore channel form, flow diversity, substrate condition, riparian vegetation, woody material and channel-floodplain connectivity

841. Considering Brook Lamprey, Bullhead and white-clawed crayfish; improvements to the river feature will improve habitat for macrophytes, invertebrates and fish and support movement and recolonisation. A freer-flowing and more physically diverse reach of river will be better able to flush fine sediment, oxygenate gravels and reduce conditions favouring algal accumulation.

842. In conclusion, the positive effects from the above conservation measures will benefit the biological, physical, hydrology and chemical components of structure and function and future prospects of the river features.

Desmoulin's whorl snail

Environmental features for this assessment:

843. The relevant environmental feature is:

- Desmoulin's whorl snail, *Vertigo moulinsiana*

Relevant programmed conservation measures

844. The relevant programmed conservation measures are:

- Fen-type wetland creation/restoration targeted for Desmoulin's whorl snail
- Wider-catchment land-use change
- Removal or modification of one Wensum structure with 1 km contiguous river restoration
- Nutrient performance standards for non-mains drainage.

Effect of the conservation measures on conservation status of Desmoulin's whorl snail

Conservation measure 1 – Removal or bypass of structures (weirs, culverts and impoundments)

845. The positive effects of removing or modifying a weir will potentially be different depending on the specific structure and exact works that take place. Removal and lowering of the structure could lower the water table in the surrounding aquifer where the current bed level is over deep. This risk can be addressed if bed raising or channel re-alignment is done along with the removal/modification so that floodplain connectivity is maintained and/or improved[123].

846. Removing the impacts from one structure would restore the physical functioning of the river in the affected section. There would be a likely significant improvement in the hydrological function and physical habitat of the river feature and potentially small benefits in chemical status, particularly if stored sediments are managed/removed. This would lead to significant improvements in the biology in the affected section with potential benefits to riparian vegetation and suitability for Desmoulin's.

Conservation measure 2 – River restoration (functional channel and floodplain)

847. A free-flowing chalk stream with good hydrological connectivity with the floodplain will be less adversely impacted by nutrient / sediment pollution, than a dredged or impounded channel which cannot flush itself or escape onto the floodplain in high flows[92].

848. The positive effects of the river restoration that restores natural processes will potentially be different depending on the specific restoration need and the technique or combination of techniques undertaken. Narrowing overwide rivers increases the diversity of flows and area and complexity of habitats to the river channel and margin, and will help restore a more natural water table to the floodplain supporting a greater diversity of riparian and wet floodplain habitats. Removing embankments or bed-

raising over-deep rivers will have similar benefits as narrowing above. For much of the Wensum it is likely to be more beneficial to restore natural bed levels through channel re-alignment.

849. Restoring a functioning riparian margin can filter out fine sediment which can carry nutrients and other pollutants and smother habitats which is not ideal for Desmoulin's whorl snail. However, a healthy riparian margin consisting of semi-natural vegetation (trees, shrubs and tall grasses and herbs) also provides soil protection, reduced nutrient and other diffuse pollution run off, increased infiltration, increased roughness to slow floodwater, provides shade and helps regulate water temperature and has biodiversity improvements including reducing excessive algal growth.

850. Blocking drains and disabling sub-surface field drainage to restore fen habitat on floodplains will have similar benefits to restoring a functioning riparian margin above.

851. Implementing two hydro-morphologically coherent ~1km lengths of river restoration in conjunction with the structure removal/bypass would restore the physical functioning of the river in these sections. There would be a likely significant improvement in the hydrological function and physical habitat of the river feature and potential benefits in chemical status, particularly if the floodplain is re-connected. This would lead to significant improvements in the biology in these sections of river, and if carefully planned in association with an assessment of impacts on riparian and river supporting fen habitats suitable for Desmoulin's whorl snail, there could lead to significant benefits for this species too.

Conservation measure 3 - Fen type habitat creation/restoration

852. Fen-type habitat creation/restoration will likely have limited reduction in nutrient inputs from the change in land use as the land likely to be targeted is less likely to be existing high nutrient loss land. In addition, the creation of fen habitat and the restoration of hydrological function of this land, will slow water flows and create better conditions for nutrient interception and removal particularly for nitrogen. The small area of land involved though means the nutrient benefits are still likely to be negligible.

853. Creating functioning wetland is important for species such as Desmoulin's whorl snail as it will provide additional functional habitat to support this species. The snail populations will be able to expand into suitable new habitat, provided conditions are suitable for dispersal and establishment aided by good hydrological and habitat connectivity.

854. Active management of the fen will be important as it helps sustain characteristic vegetation communities and prevents succession, thereby preserving habitat quality. Habitat management measures play an important role in maintaining habitat for Desmoulin's whorl snail in suitable condition, but their effectiveness is generally lower than restoration measures which restore suitable hydrology and increase the extent of suitable vegetation types and habitat connectivity.

855. Overall, this measure will provide additional suitable and resilient habitat for Desmoulin's whorl snail and make a contribution to improving the resilience and

functionality of the River Wensum and its wider ecosystem.

Conservation measure 4 – Land use change targeted for water quality for the Wensum

856. Converting agricultural land to semi natural habitat targeted within areas of the catchment suffering additional phosphorus loading can have benefits for reducing nutrients and sediment losses into the river, through cessation from nutrient application from fertilisers, manure, slurry or cessation or significant reduction from livestock excreta, stabilisation of soil and establishment of permanent vegetation.

857. It can also potentially improve water retention[123] which can also help provide greater opportunity for nutrient removal processes to take place.

858. Land use change from agricultural land to semi natural habitat with no additional nutrient inputs or livestock inputs would have an estimated minimum reduction of 248.5kg/yr of phosphorus (See conservation measure spatial targeting and nutrient reduction method document for methodology and assumptions). This load reduction is greater than the predicted load increase from development to the river supporting habitat of the Desmoulin's whorl snail. This is only one of the benefits that this measure provides to improving the structure and function and does not capture its full contribution to conservation status.

859. The main benefit from this land use change would be an improvement in the chemical status which is greater than the impact from development. This could lead to some small improvements over the current status in the biology of the river feature as well as preventing any further decline from additional nutrients to the supporting habitat of Desmoulin's whorl snail in the Wensum.

Conclusion

860. Considering Desmoulin's whorl snail, the principal benefit is creation or restoration of 10ha of suitable wet, calcareous swamp or fen vegetation, targeted to directly benefit the snail. River and floodplain restoration may improve lateral connectivity and water-level functioning, while catchment land-use change reduces nutrient and sediment pressure on the valley system.

861. In conclusion, the positive effects from the above conservation measures will benefit from the biological, physical, hydrology and chemical components of structure and function and future prospects of Desmoulin's whorl snail feature.

21 Annex 9A - Conservation measure effectiveness monitoring

862. This ecological theory of change presented in Figure 27 provides the framework that will be used to design, target and interpret conservation measure effectiveness monitoring within the Environmental Delivery Plan (Environmental Delivery Plan). It sets out the expected logic pathway from intervention to resulting changes in habitat structure and function components and the ultimate benefit to the conservation status of the environmental features. The theory of change recognises that conservation measures first influence specific habitat structure and function components, including biological, chemical, hydrological and physical characteristics. These changes are expected to generate improvements in ecological function, condition and resilience over time, which in turn contribute to favourable changes in conservation status. Monitoring activities will therefore be focused on gathering evidence at different points along this pathway, from implementation and management of conservation measures through to observable ecological responses.

863. Based on the theory of change a proportionate and risk-based monitoring approach will be undertaken. For conservation measures supported by a strong evidence base and with high confidence in delivery, monitoring will primarily focus on implementation performance, providing assurance that measures have been established and managed in accordance with legal agreements and recognised good practice. Where this is demonstrated, the expected ecological outcomes may reasonably be inferred based on existing evidence. For conservation measures with greater uncertainty, or where monitoring indicates expected outcomes are not being achieved, additional targeted monitoring and local case studies may be undertaken to examine whether the anticipated ecological effects are being realised. Based on the weight of available evidence and monitoring expert judgement will be used to evaluate whether the effect of conservation measures materially outweigh the negative impacts of development on the conservation status of each of the identified environmental features.

864. The monitoring plan recognises that conservation measures are implemented within a wider environmental and policy context. Existing environmental management mechanisms in the EDP area, such as, Price Review 24, nutrient credit schemes, agri-environment schemes, Conservation Enhancement Schemes, Water Restoration Fund, Water Environment Improvement Fund etc. may already be contributing to improvements in habitat condition and ecological resilience

865. Environmental Delivery Plan conservation measures are intended to complement and be additional to these existing interventions, with benefits assessed in the context of this cumulative management landscape. At the same time, environmental features remain subject to ongoing external pressures, including climate change, hydrological variability, land-use change, pollution and other catchment or regional-scale influences. These pressures may affect habitat structure, function and species responses independently of the Environmental Delivery Plan. Consequently, monitoring and interpretation of effectiveness will consider these wider inputs to ensure conservation measure performance are not over or under-estimated.

866. The first row of Figure 27 shows the Ecological Theory of Change within the scope of the Environmental Delivery Plan, the second row shows monitoring and interpretation logic to determine conservation measure effectiveness, and the third row presents the external factors that may influence the habitat outcomes but not within the scope of this Environmental Delivery Plan.

867. Alternative text description for Figure 27 (for accessibility purposes): This Theory of Change shows how conservation measures are expected to lead to environmental outcomes. Within the Environmental Delivery Plan, conservation measures will be delivered in phases with respect to development capacity to outweigh negative impact of nutrient pollution from the development. Delivering specific type of conservation will lead to short-term changes in one or more specific habitat structure and function components such as biology, chemical, hydrology and physical habitat characteristics. The outcome will be changes in the structure and function components due to conservation measures result in predicted benefits of the function and resilience of environmental features over a longer term. The impact of the Environmental Delivery Plan activities will be that the effect of the conservation measures will materially outweigh the negative effect on the conservation status of each of the identified environmental features.

868. The effectiveness will be monitored based on this Theory of Change. By tracking that the conservation measure implementation is following "good practice", resulting changes in habitat structure and function components can be directly attributed to the Environmental Delivery Plan activities. For measures with strong evidence, good practice implementation can be used to infer expected outcomes in habitat structure and function components. Expert judgement to assess whether the effect of the conservation measures will materially outweigh the negative effect of the Environmental Delivery Plan development on the conservation status of identified environmental features. Any changes in the ecosystem biological components and resilience due to external indirect factors acting locally or regionally that cannot be directly linked to the conservation measures

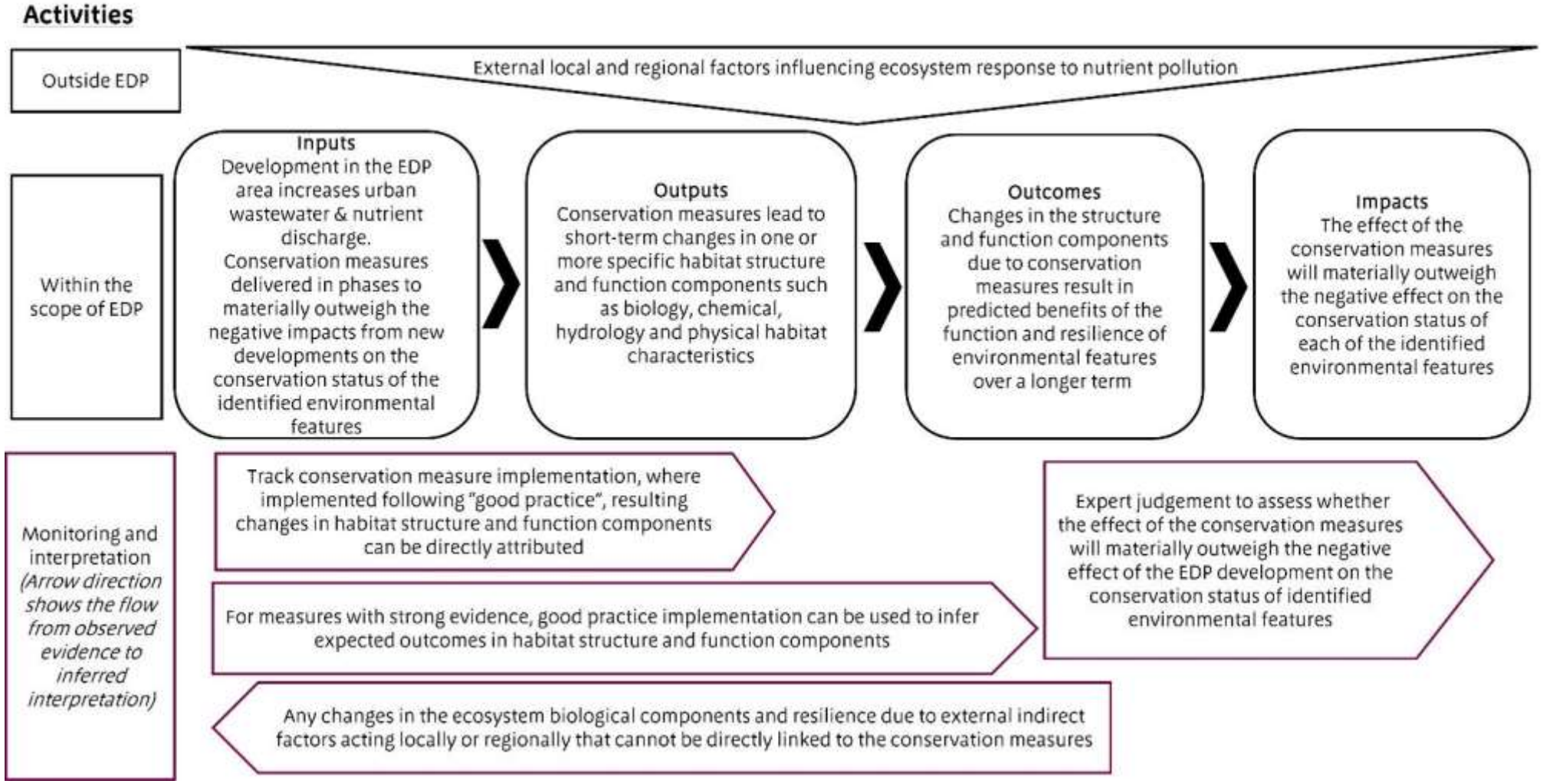

Figure 27: Ecological Theory of Change with monitoring and interpretation logic to determine conservation measure effectiveness within the ten-year Environmental Delivery Plan period

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