

Lower Thames Crossing
6.3 Environmental Statement
Appendices
Appendix 8.21 – Biodiversity
Metric Calculations

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Lower Thames Crossing

6.3 Environmental Statement Appendices

Appendix 8.21 – Biodiversity Metric Calculations

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1 Executive summary

- 1.1.1 This document presents the results of a biodiversity metric assessment to support the Environmental Impact Assessment (EIA) of the A122 Lower Thames Crossing (hereafter ‘the Project’).
- 1.1.2 The purpose of this document is to provide a forecast of the Project biodiversity unit net change outcome and to justify how this forecast has been developed in alignment with the Project design and environmental commitments.
- 1.1.3 The current assessment presented here is based on the preliminary Project design as of August 2022.
- 1.1.4 This report uses the Biodiversity Metric 3.1 Calculation Tool to determine whether the Project could result in a net gain in biodiversity units.
- 1.1.5 The scope of the assessment includes consideration of direct habitat loss and creation and enhancement within all areas of the Order Limits, with the exception of those areas added specifically to the Order Limits as compensation for potential nitrogen deposition affected areas. These nitrogen deposition compensation sites are excluded from the biodiversity assessment as they are bespoke compensation for potential indirect effects of nitrogen deposition on protected sites and irreplaceable habitats (see Section 3.3).
- 1.1.6 The scope of the assessment also excludes irreplaceable habitats that would be lost as a result of the Project and the corresponding bespoke compensation agreed for this loss. This approach is as per the Metric User Guide (Panks *et al.*, 2022b) which states that these impacts require separate consideration which must comply with relevant policy and legislation (see Section 3.4). Any irreplaceable habitat that is within the baseline and not lost has been retained in the assessment baseline.
- 1.1.7 Separate metric assessments are reported for the assessment of the Project north and south of the River Thames as well as for the overall Project.
- 1.1.8 Table 1.1 provides a summary of the forecast biodiversity unit change for the Project, for each type of biodiversity unit assessed (area-based habitats, hedgerows, and rivers and streams).

Table 1.1 Summary of Metric results

Assessment	Biodiversity unit type	Change in biodiversity units (%)
Project (overall)	Area-based	7%
	Hedgerows	-11%
	Rivers and streams	-7%
Project North	Area-based	9%
	Hedgerows	-18%
	Rivers and streams	-7%
Project South	Area-based	3%
	Hedgerows	24%

Assessment	Biodiversity unit type	Change in biodiversity units (%)
	Rivers and streams	-8%

- 1.1.9 At this stage of the Project, the Metric forecasts are based on the preliminary design and a number of limitations and assumptions (as detailed in Section 5), that have had to be made to allow a quantitative forecast of biodiversity unit change. It is considered that this assessment provides a realistic worst-case scenario of the likely performance of the Project in terms of net biodiversity, given the necessarily precautionary nature of the assumptions which have had to be made.
- 1.1.10 It should be noted that the Project would result in the loss of ancient woodland (6.87ha), wood-pasture and parkland (0.07ha) and six potential veteran trees. These habitats are considered irreplaceable, and this loss would technically prevent any overall claim of Biodiversity Net Gain for the Project, whilst biodiversity unit change can still be demonstrated for non-irreplaceable habitats.
- 1.1.11 A number of opportunities are discussed for improving both confidence in the biodiversity unit forecast and for improving the outcomes for biodiversity as the Project progresses through the project lifecycle.

2 Introduction

2.1 Purpose of document

- 2.1.1 National Highways (the Applicant) has submitted an application under section 37 of the Planning Act 2008 for an order to grant development consent for the A122 Lower Thames Crossing (the Project).
- 2.1.2 This document presents the results of the Biodiversity Metric assessment to support the Environmental Impact Assessment (EIA) of the Project.
- 2.1.3 The purpose of this document is to provide a forecast of the Project biodiversity unit net change outcome and to justify how this forecast has been developed in alignment with the Project design and environmental commitments.
- 2.1.4 The current assessment presented here is based on the preliminary Project design as of August 2022.
- 2.1.5 This document is part of a suite of documents which accompanies the application to grant development consent. A full description of all the Application Documents is provided in the Introduction to the Application (Application Document 1.3) which also accompanies the application.

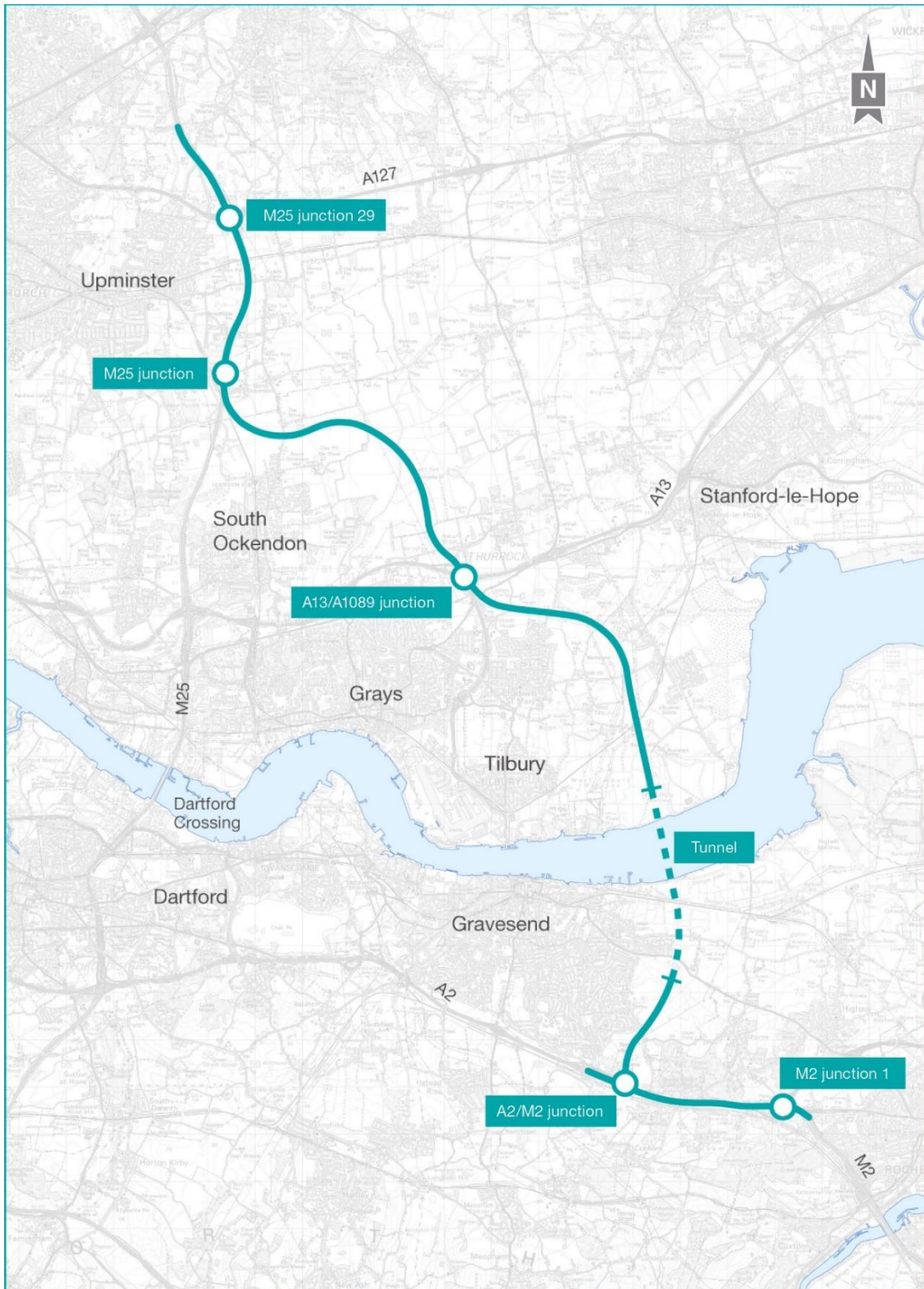
2.2 Project description

- 2.2.1 The Project would provide a connection between the A2 and M2 in Kent and the M25 south of junction 29, crossing under the River Thames through a tunnel. The Project route is presented in Plate 2.1.
- 2.2.2 The A122 would be approximately 23km long, 4.25km of which would be in tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13, M25 junction 29 and the M25 south of junction 29. The tunnel portals would be located to the east of the village of Chalk on the south of the River Thames and to the west of East Tilbury on the north side.
- 2.2.3 Junctions are proposed at the following locations:
 - a. New junction with the A2 to the south-east of Gravesend
 - b. Modified junction with the A13/A1089 in Thurrock
 - c. New junction with the M25 between junctions 29 and 30
- 2.2.4 To align with National Policy Statement for National Networks (Department for Transport, 2014) policy and to help the Project meet the Scheme Objectives, it is proposed that road user charges would be levied in line with the Dartford Crossing. Vehicles would be charged for using the new tunnel.
- 2.2.5 The Project route would be three lanes in both directions, except for:
 - a. link roads
 - b. stretches of the carriageway through junctions

- c. the southbound carriageway from the M25 to the junction with the A13/A1089, which would be two lanes

- 2.2.6 In common with most A-roads, the A122 would operate with no hard shoulder but would feature a 1m hard strip on either side of the carriageway. It would also feature technology including stopped vehicle and incident detection, lane control, variable speed limits and electronic signage and signalling. The A122 design outside the tunnel would include emergency areas. The tunnel would include a range of enhanced systems and response measures instead of emergency areas.
- 2.2.7 The A122 would be classified as an ‘all-purpose trunk road’ with green signs. For safety reasons, walkers, cyclists, horse riders and slow-moving vehicles would be prohibited from using it.
- 2.2.8 The Project would include adjustment to a number of local roads. There would also be changes to a number of Public Rights of Way, used by walkers, cyclists and horse riders. Construction of the Project would also require the installation and diversion of a number of utilities, including gas pipelines, overhead electricity powerlines and underground electricity cables, as well as water supplies and telecommunications assets and associated infrastructure.
- 2.2.9 The Project has been developed to avoid or minimise significant effects on the environment. The measures adopted include landscaping, noise mitigation, green bridges, floodplain compensation, new areas of ecological habitat and two new parks.

Plate 2.1 Lower Thames Crossing route



2.3 Relationship to other documents

2.3.1 The Biodiversity Metric assessment has been developed in conjunction with the following Project documents:

- a. Plants and Habitats (Application Document 6.3, Appendix 8.2)

- b. Design Principles (Application Document 7.5)
 - c. Environmental Masterplan (Application Document 6.2, Figure 2.4)
 - d. Outline Landscape and Ecology Management Plan (oLEMP) (Application Document 6.7)
- 2.3.2 The Plants and Habitats appendix provides details of the baseline habitat types which have been used to inform the baseline used in this assessment.
- 2.3.3 The Design Principles document informs the Environmental Masterplan. The Environmental Masterplan secures the spatial extent and location of landscape and ecology elements required for mitigation and the oLEMP outlines the proposed management of the landscape and ecological elements of the Project.
- 2.3.4 The oLEMP has been developed to provide confidence that the key landscape and ecological measures identified within the Environmental Masterplan will function as intended and will receive the appropriate management and maintenance as required. National Highways' Design Manual for Roads and Bridges (DMRB) standards GM 701 Series 3000 (Highways England, 2020a) and GS 801 Series 3000 (Highways England, 2020b) establish the general maintenance and inspection requirements for motorways and all-purpose trunk roads. The oLEMP focuses on the management requirements for the land parcels within the Order Limits acquired permanently that perform specific landscape and ecological mitigation functions for the Project. It details the management regimes, management expectations and monitoring requirements for each of those land parcels and the typologies contained within.
- 2.3.5 The post-intervention Metric assessment has been developed with reference to the Environmental Masterplan and oLEMP and target habitat type and condition has been assigned in agreement with the Project Landscape Architect. The Environmental Masterplan and oLEMP therefore support both the target habitat types and condition assigned in the post-intervention assessment as well as setting out monitoring requirements which complement the requirements of the Metric i.e. over 30 years and using the UK Habitats Classification (UKHab) (Butcher *et al.* 2020) and Natural England's Biodiversity Metric 3.1 condition assessment methodology (Panks *et al.*, 2022a).

3 Background and policy

3.1 Policy and legislative context

- 3.1.1 The relevant National Policy Statements have influenced the development of the design, construction and operation of the Project and further details on this can be found in Environmental Statement (ES) Chapter 1: Introduction, Chapter 3: Assessment of Reasonable Alternatives, Chapter 4: EIA Methodology and the topic chapters of the ES and the Planning Statement (Application Document 7.2, Appendix A) submitted with the application. The relevant NPSs are as follows:
- a. National Policy Statement for National Networks (NPSNN) (Department for Transport, 2014)
 - b. Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change, 2011a)
 - c. National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Department of Energy and Climate Change, 2011b)
 - d. National Policy Statement for Electricity Networks Infrastructure (EN-5) (Department of Energy and Climate Change, 2011c)
- 3.1.2 The NPSNN (Department for Transport, 2014) sets out the need for, and Government’s policies to deliver, development of Nationally Significant Infrastructure Projects (NSIPs) on the national road and rail networks in England. Chapter 5 of the NPSNN discusses biodiversity and ecological conservation. There is no specific requirement within the NPSNN for NSIPs to deliver Biodiversity Net Gain (BNG), however the document states projects should, *‘show how the project has taken advantage of opportunities to conserve and enhance biodiversity...interests’*. It also states as a general principle that *‘The applicant may also wish to make use of biodiversity offsetting in devising compensation proposals to counteract any impacts on biodiversity which cannot be avoided or mitigated’*. The NPSNN goes on to say that *‘proposals potentially provide many opportunities for building in beneficial biodiversity... features as part of good design. When considering proposals, the Secretary of State should consider whether the applicant has maximised such opportunities in and around developments.’*
- 3.1.3 Major utilities diversions are also required as part of the Project, some of which constitute NSIPs in their own right, and therefore the Project will also be assessed against the Overarching National Policy Statement for Energy (EN-1), National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) and National Policy Statement for Electricity Networks Infrastructure (EN-5). However, the NPSNN forms the “case-making” basis for the Project, and the need for nationally significant utilities diversions arises solely from the need for the road element of the Project.
- 3.1.4 The Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change, 2011a) sets out the Government’s policy for

delivery of major energy infrastructure and sets out the general principles that should be applied in the assessment of biodiversity in respect of EN-4 and EN-5. Chapter 5 of EN-1 discusses biodiversity and geological conservation. There is no specific requirement for NSIPs to deliver BNG, however the document states projects should, *'show how the project has taken advantage of opportunities to conserve and enhance biodiversity...conservation interest'*. It also states that, *'development proposals provide many opportunities for building-in beneficial biodiversity...as part of good design. When considering proposals, the IPC should maximise such opportunities in and around developments, using requirements or planning obligations where appropriate'*. The NPSE goes on to say that the applicant should demonstrate that, *'opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals'*.

- 3.1.5 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government (MHCLG), 2021) sets out the government's planning policies for England and how these are expected to be applied. Chapter 15 of the NPPF details core policy principles with respect to conserving and enhancing the natural environment. Paragraph 174 states that planning decisions are required to contribute to and enhance the natural and local environment by *'minimising impacts on and providing net gains for biodiversity'*, and Paragraph 179 states that plans should, *'identify and pursue opportunities for securing measurable net gains for biodiversity'*.
- 3.1.6 Following a transition period, the Environment Act (2021) will mandate projects in England consented through the Planning Act (2008) to deliver an anticipated 10% BNG. This will be measured using a version of Natural England's Biodiversity Metric which will be consulted on by the Secretary of State prior to adoption as the Metric required to demonstrate mandatory BNG. The Environment Act will be underpinned by secondary legislation, which is currently being consulted on in respect of mandatory BNG. The transition period for NSIPs is likely to come to an end in autumn 2025 by which time a *'biodiversity gain statement'* or statements will have been brought forward and agreed in Parliament setting out the Biodiversity Gain Objective i.e. the % BNG target, required to be delivered by NSIPs. This is expected to be a minimum of 10%. Whilst there is no current legal requirement for the Project to provide BNG, the design has been developed to maximise biodiversity delivery and the Project has been proactive in applying the Biodiversity Metric to assess measurable changes in biodiversity.

3.2 The Biodiversity Metric 3.1

- 3.2.1 This assessment uses the Biodiversity Metric 3.1 (the Metric) calculation tool to determine whether this Project could result in a net gain in biodiversity. The Biodiversity Metric 3.1 was issued by Defra and Natural England in 2022 and the User Guide (Panks *et al.*, 2022b) and Technical Supplement (Panks *et al.*, 2022a) can be referred to for further details. The Metric includes a spreadsheet-based calculation tool into which data is entered to carry out the biodiversity unit calculations.
- 3.2.2 Throughout the development of the Project design, various versions of the Biodiversity Metric have been available to assess the forecast Project

biodiversity unit performance. It should be noted that significant elements of the scheme design were fixed prior to the issue of Metric 3.1. The highways and landscape designs have therefore not been developed specifically in conjunction with the Metric 3.1. But the design has been developed to avoid or minimise significant effects on the environment and based on the principle of maximising biodiversity outcomes by creating the highest distinctiveness habitats appropriate to the Project.

- 3.2.3 At the time of writing, the Metric 3.1 is the latest metric version available which supports standardised BNG calculations in England. A ‘final’ version of the Biodiversity Metric is expected to be published in late autumn of 2022.

3.3 Scope of the assessment

- 3.3.1 This assessment is based on the preliminary Project design as of August 2022. The scope of the assessment presented here includes consideration of all direct habitat loss and creation and enhancement within all areas of the Order Limits, but with the exception of those areas added specifically to the Order Limits as compensation for potential nitrogen deposition affected areas (see below for further discussion on this exclusion). As per the Metric User Guide (Panks *et al.*, 2022b), the metric assessment does not include any consideration of a drop in biodiversity unit value for retained habitats as a result of potential indirect habitat degradation either inside or outside the Order Limits.

- 3.3.2 Separate metric assessments are reported for the assessment of the Project north and south of the River Thames in addition to providing an overall Project assessment:

Exclusion of nitrogen deposition compensation site from the assessment

- 3.3.3 The Project Order Limits include 245.7ha of land identified as nitrogen deposition compensation areas. These areas have been added to the Order Limits as bespoke compensation for potential air quality effects on nationally and locally designated sites which may be affected by nitrogen deposition during operation of the Project (see Designated Sites Air Quality Assessment, Application Document 6.3, Appendix 8.14). For a number of reasons discussed below, it has been considered appropriate to scope these areas out of the assessment despite their inclusion in the Order Limits.
- 3.3.4 The designated sites affected by nitrogen deposition, for which the nitrogen deposition compensation sites have been provided, include sites within and outside the Order Limits on the wider affected road network and no assessment of the potential change in biodiversity units as a result of habitat degradation has been carried out. This is because, the Biodiversity Metric only accounts for direct impacts on habitats within the footprint of a project. In addition, many of the potentially affected sites include irreplaceable ancient woodland habitat for which the value of the habitat should not be assigned using the Metric (see Section 3.4). Without any assessment of the potential biodiversity unit reduction as a result of habitat degradation, any assessment of the nitrogen deposition compensation sites alone could be seen as misleading.
- 3.3.5 In respect of accounting for the unit value change in the nitrogen deposition compensation sites, as a result of the proposed habitat creation, a core principle

of the BNG approach is the need for ‘additionality’. This can be defined as the need for a compensation measure to provide a new contribution to conservation, additional to any existing values, i.e. the conservation outcomes it delivers would not have occurred without it (McKenney and Kiesecker, 2010). Whilst this is an emerging policy area, given the key driver for the addition of these nitrogen deposition compensation sites to the Order Limits is to compensate for potential effects on designated sites, it is considered that the inclusion of the value of this bespoke compensation in the assessment would also be a breach of the additionality principle.

- 3.3.6 Given the specific issues surrounding a BNG assessment of the nitrogen deposition compensations areas which form part of the Order Limits, the calculations for these areas do not form part of this assessment.

3.4 Approach to irreplaceable habitats and statutory designated sites within the Order Limits

- 3.4.1 Impacts on irreplaceable habitats are not considered adequately measured by the Metric. Irreplaceable habitats are defined by the NPPF (MHCLG, 2021) as follows, ‘*Habitats which would be technically very difficult (or take a very significant time) to restore, recreate or replace once destroyed, taking into account their age, uniqueness, species diversity or rarity. They include ancient woodland, ancient and veteran trees, blanket bog, limestone pavement, sand dunes, salt marsh and lowland fen*’. The Metric User Guide (Panks *et al.*, 2022b) states that these impacts require separate consideration which must comply with relevant policy and legislation. In this assessment therefore, where irreplaceable habitat would be lost as a result of the Project, the area of irreplaceable habitat to be lost has been excluded from the baseline and the corresponding bespoke compensation agreed for this loss is also excluded from the post-intervention assessment. Any irreplaceable habitat that is within the baseline and not lost has been retained in the assessment baseline.
- 3.4.2 For statutory designated sites, the current Defra position (Defra, 2022) is that the BNG requirement will be additional to existing legal or policy requirements which must be dealt with separately by the developer and planning authority. In terms of representing this in the Metric 3.1 assessment, current Natural England advice is that habitats within statutory designated sites should be included in the metric assessment (pers. comms Nick White 8 June 2022). Where there is any loss of habitat from within Sites of Special Scientific Interest (SSSIs), this loss should be compensated for through bespoke compensation, the value of which is considered to compensate for the loss, but not to provide any unit net gain. To ensure a net gain on the biodiversity value of SSSIs in the metric assessment, rather than excluding this habitat from the assessment altogether, SSSI habitat which would be lost as a result of the Project has been shown as retained in the baseline, whilst the bespoke compensation has been excluded from the assessment. In this way the loss of the SSSI is considered compensated for by the bespoke compensation, and this is dealt with outside of the metric, but by retaining the value of the SSSI habitat in the baseline, the developer must provide additional biodiversity units to achieve net gain.
- 3.4.3 It is acknowledged at the outset of this assessment that the Project would result in loss of irreplaceable habitats. This includes ancient woodland (6.87ha),

wood-pasture and parkland (0.07ha) and six potential veteran trees (see the Arboricultural Impact Assessment in Appendix 7.12, Application Document 6.3). These areas of irreplaceable habitat loss are excluded from the metric baseline.

- 3.4.4 To compensate for the loss of ancient woodland that would occur as a result of the Project, including that within SSSIs, 81ha of bespoke woodland creation has been included within the Order Limits. This bespoke compensation is excluded from the metric assessment. To compensate for the loss of potential veteran trees, the hulks of these felled trees would be relocated within the same woodland or placed within parkland, timber would be retained to decompose in situ and specimen trees would be planted for which the size and species would be agreed with the relevant bodies. Again, this bespoke compensation is excluded from the metric assessment. The scattered and parkland trees within Cobham Hall School are considered to represent ‘wood-pasture and parkland’ under the Natural Environment and Rural Communities (NERC) Act 2000. The parkland trees within Cobham Hall School, which form the irreplaceable component of this habitat, are outside the Order Limits and so would not be directly impacted by the Project. Only areas of low distinctiveness grassland would be lost within this habitat type hence no specific bespoke compensation is provided.

4 Methodology

4.1 Calculating biodiversity units

- 4.1.1 This assessment uses the Metric 3.1 calculation tool to determine if the Project would likely result in a net gain in biodiversity units. The assessment has been conducted in accordance with the methodology set out in the following guidance documents.
- a. The Biodiversity Metric 3.1 – User Guide (Panks et al., 2022b)
 - b. The Biodiversity Metric 3.1 – Technical Supplement (Panks et al., 2022a).
- 4.1.2 The Metric calculation tool has been used to assess biodiversity unit change for area-based habitats, hedgerows and rivers and streams. These three assessments must be considered as stand-alone and units from one assessment cannot be combined with units from another as per the Metric 3.1 User Guide.
- 4.1.3 Where assumptions have had to be made or limitations exist, these are detailed in Section 5.

4.2 Project boundary

- 4.2.1 The baseline extent of this assessment is defined by the Project Order Limits presented in ES Figure 2.4: Environmental Masterplan (Application Document 6.2) but excludes the areas added as nitrogen deposition compensation sites (see Section 3.3).
- 4.2.2 Separate metric assessments are reported for the following areas (where the term Project is used to describe the Order Limits excluding the nitrogen deposition compensation sites):
- a. Project overall
 - b. Project for areas north of the River Thames
 - c. Project for areas south of the River Thames

4.3 Biodiversity baseline

- 4.3.1 To create the biodiversity baseline, the following data was entered into the Metric 3.1 calculator tool:
- a. Habitat type and extent (hectares (ha) for area-based habitat or kilometres (km) for hedgerow and river and streams habitats): at which point each habitat is automatically assigned a distinctiveness rating (Very Low-Very High, 0-8)
 - b. Habitat condition multiplier: poor (1), moderate (2), or good (3) (or an intermediate value where appropriate) based on condition criteria assessment

- c. Strategic significance multiplier (area-based habitat units and hedgerow units only): based on proximity to local strategies and how ecologically desirable the habitat is (further information on how this has been assigned is provided below)
- d. Strategic significance multiplier (rivers and streams only): whether restoration is part of local and/or catchment scale plans (further information on how this has been assigned is provided below)
- e. Watercourse encroachment (rivers and streams only): where development has replaced natural bank material (e.g., bank reinforcement) or traverses the channel, causing impoundment (e.g., weirs)
- f. Riparian encroachment (rivers and streams only): whether development is present within the designated bank top area extending 10m from the watercourse

4.3.2 This combination of data produces a total number of units for each habitat, and subsequently how many overall habitat units there are in the biodiversity baseline. This is then used to investigate the total units retained and lost. Further information as to how this data was generated is provided below.

Habitat type

Area-based habitats and hedgerows

4.3.3 The baseline area-based habitat and hedgerow data for the Project is largely derived from field data, collected between 2017 and 2020, using the Phase 1 habitat survey methodology (Joint Nature Conservation Committee, 2010).

4.3.4 Changes to the Order Limits and access restrictions meant not all land within the Order Limits was surveyed at the time the field surveys were carried out. These areas were instead mapped through interpretation of aerial photography and Natural England's (2020) Priority Habitat Inventory (i.e., desk-based assessment).

4.3.5 Appendix 8.2: Plants and Habitats (Application Document 6.3) and Figure 8.2: Phase 1 Habitat Map (Application Document 6.2) were used to develop the Project BNG baseline.

4.3.6 Before baseline habitat type data was entered into the Metric, a translation was carried out from Phase 1 habitat types to Metric habitat types supported by use of the Metric Phase 1 habitat translation tool, the UKHab Phase 1 translation tool (Butcher *et al.*, 2020) and using professional judgement. The conversion included the following reasonings:

- a. The Project, and therefore all habitats, are in lowland England.
- b. Parcels identified as parkland habitats in Appendix 8.2, were all assigned to 'Woodland and forest - Wood pasture and parkland', regardless of Phase 1 habitat type i.e. wood pasture and parkland habitat is a collection of different individual habitat types.

- c. Parcels within areas of Open Mosaic Habitat sites, identified through a review of designated site citations and field surveys, were all assigned to ‘Urban - Open Mosaic Habitats on previously developed land’ regardless of their Phase 1 habitat type i.e., Open Mosaic Habitat is a collection of different individual habitat types.
- d. For parcels assigned two Phase 1 habitat types, the dominant habitat type was used for the Metric.

4.3.7 Details of the translation of Phase 1 habitat types to Metric habitat types are provided in Table A.1 and Table A.2.

4.3.8 It should be noted that for ditch habitat, this is included in the rivers and streams assessment, unless the ditch is associated with a hedgerow or a component within areas of habitat identified as Coastal Floodplain Grazing Marsh (CFGM), in which case it is considered a component of these habitat types (this is as per the Metric 3.1 User Guide).

4.3.9 The BNG baseline for the Goshems Farm area was assessed in line with the Ingrebourne Valley Limited (2018) project landscape masterplan, which is set to be completed before the Project begins. Table A.3 identifies the habitats from the landscape masterplan that are present in the Order Limits and the translation of these habitat types into Metric habitat types.

Rivers and streams

4.3.10 Rivers and streams are linear habitats, in which habitat length (measured in km) and its quality are used to calculate the biodiversity units. This is due to their function as ecological corridors. Rivers and streams baseline data include all types of watercourses with a hydraulic function.

4.3.11 The rivers and streams baseline linear habitat data for the Project is derived from desk study information including aerial imagery, historic maps and LiDAR. This data was reviewed using expert judgment to assign habitat type. Field data was subsequently collected to confirm and supplement this assessment. Field surveys were carried out between 20 June and 1 July 2022.

4.3.12 Habitat type for the rivers and streams was first assessed based on the Priority habitats classification, as defined under Section 41 of NERC Act, 2006. Priority river habitats which have high ecological and hydromorphological status were identified using the Priority River Habitats map (JNCC, 2014; Natural England, 2020). These are assigned ‘very high’ distinctiveness and have a weighting of eight in the Metric.

4.3.13 Those rivers and streams (other) not considered a Priority habitat and classified as a ‘main river’ and ‘ordinary watercourse’ as regulated by the Environment Agency (2020) are assigned ‘high’ distinctiveness and have a weighting of six in the Metric.

4.3.14 Using the desk study information, canals and ditches have been identified and assigned ‘medium’ distinctiveness and have a weighting of four in the Metric.

4.3.15 Ditches are included as a linear feature within the rivers and streams metric but have a separate habitat condition assessment (see Table D.6). Ditches are defined as artificially created linear water-conveyancing features that are less

than 5m wide and likely to retain water for more than four months of the year. Their hydraulic function is primarily for land drainage, and although partially or fully connected to a river system, they would not have been present without human intervention (Panks *et al.* 2022b). Ditches associated with hedgerow habitats, or those which are a component of Coastal Floodplain Grazing Marsh (CFGM) habitat, have been assessed as part of the baseline for area-based habitat and hedgerows as per the Metric User Guide.

- 4.3.16 Culverts have also been identified and included in the Metric assessment. These are defined as a covered channel or pipe designed to prevent the obstruction of a watercourse or drainage path by an artificial construction. These have been confirmed by field data and assigned ‘low’ distinctiveness and have a weighting of two in the Metric. Culverts on rivers or ditches are treated differently from open channels. Culverts and ditches are input on a separate line in the Metric calculator tool with their own river type.

Habitat condition

Area-based habitats and hedgerows

- 4.3.17 Metric 3.1 uses habitat condition as a measure of habitat quality. The Metric measures a habitat parcel against the ecological optimum state for that particular habitat type as a means of measuring variation in the quality of patches of the same habitat type (i.e. an ‘intra-habitat’ measure). To determine condition, the assessor must apply the Metric 3.1 condition assessments. This process of assessing habitat condition is tailored to habitat type and considers whether a habitat meets a number of criteria relating to key physical characteristics of that habitat and its ability to support typical species. Condition assessment criteria are provided within the Technical Supplement (Panks *et al.*, 2022b).
- 4.3.18 Although habitat surveys were carried out to determine the extent and type of habitats present within the Order Limits, no specific condition assessment surveys were carried out for the Project BNG baseline as the surveys were largely undertaken prior to the publication of Metric condition assessment guidance.
- 4.3.19 For the purpose of reporting in a previous version of the Natural England Metric, Metric 2.0 (Beta test version) (Crosher *et al.*, 2019b), at an earlier project stage, assumptions on the condition of the baseline habitats within the Project were inferred from existing data using the condition criteria provided with the Metric 2.0 (Crosher *et al.*, 2019a). These assumptions were applied to each habitat parcel and hedgerow based on the information available. To subsequently provide a metric assessment using the updated Metric 3.1 tool, a proportionate approach has been taken to updating the condition assessment already carried out, with reference to the Metric 3.1 condition criteria (i.e. an approach that did not require going back through all >6,000 baseline polygons and trying to use all the data sources available to assign condition from scratch against Metric 3.1 condition criteria). The approach taken in this assessment has been as follows:
- use the answers already determined from the Metric 2.0 assessment where the criteria are the same as for Metric 3.1, or

- b. where the criteria are similar but not the same, apply a further set of assumptions to the answers provided for the Metric 2.0 condition assessment using the updated condition criteria set out for the Metric 3.1 e.g. if answer yes for a certain Metric 2.0 condition criteria answer yes for equivalent 3.1 Metric condition criteria.
- c. If no data was available to answer additional (i.e. new) condition criteria in Metric 3.1, a precautionary approach has been taken i.e. answer 'yes', where it's feasible for that specific condition criteria to be met and we have no evidence to say it's not met.

4.3.20 Further details regarding how condition criteria have been assessed for each habitat type can be found in Annex B.

Rivers and streams

4.3.21 The River Condition Assessment (RCA) provides the condition score component for input into the rivers and streams metric assessment. Field surveys were undertaken using the Modular River Physical (MoRPh) survey technique (Gurnell *et al.*, 2019). The survey data was used to determine a preliminary condition score. Survey data was also combined with a desk study to establish the river type. The river type and preliminary condition score were then used to determine a final condition score for input into the Metric. It should be noted that this approach differs for ditches and culverts and is described separately.

Preliminary condition score

4.3.22 The MoRPh survey characterises the channel, banks and immediate bank tops (to 10m from the bank top edge) of a river. Full details of the MoRPh survey process can be found in the Technical Reference Manual (Gurnell *et al.*, 2019). A single MoRPh survey was applied to a module of river. The length of each module varies depending on the MoRPh river width and is approximately two channel widths. Five contiguous MoRPh surveys were carried out to characterise a sub-reach. This set of surveys is known as a MoRPh5 survey. MoRPh5 surveys were repeated so that a minimum of 20% of the river, within the study area, was surveyed (spaced no more than four times the sub-reach length). Sub-reaches were equally spaced and located to best capture variations along the reach.

4.3.23 A total of 46 MoRPh5 surveys were carried out, with their location shown in Figure D.1. Table D.1 provides further details of the survey requirements.

4.3.24 River condition indicator scores were automatically extracted from MoRPh5 field surveys. Indicators summarise either the 'natural' morphology, sediment and vegetation-related (i.e. positive) aspects of a MoRPh5 subreach or local human interventions and pressures (i.e. negative aspects). The preliminary condition score is an integration of the individual river condition indicator scores for a MoRPh5 subreach. It is automatically calculated from the condition indicator scores by adding the average of all negative river condition indicator scores to the average of all positive river condition indicator scores.

River type

- 4.3.25 Once the preliminary scores had been calculated, a desktop study was undertaken to establish the river type of the reach. The river type was estimated by combining bed material data from the MoRPh5 sub-reach data with geometric information (river planform, valley gradient, valley confinement) for a defined reach within which the Project area is located. The upstream and downstream extent of the reach was defined by the presence of the following:
- a major tributary (contributing >10% flow to the watercourse)
 - a major artificial barrier (e.g., >5m tall -and likely to significantly change flow of sediment movements); or
 - a distinct and persistent change in planform
- 4.3.26 The bed material data and geometric information was used to calculate the indicative river type using the MoRPh River Type Pro application (Cartographer, 2022). There are 15 possible river type outputs; 13 of which are indicative ('natural') river types labelled A-M. Two types are not defined by the desktop study. The first is canals and navigable rivers, identified by the surveyor based on their function. The second is large rivers, identified by the surveyor to be too large and deep to obtain an accurate assessment of the bed features.

Final condition score

- 4.3.27 Using the preliminary condition score, the final condition score was determined according to the river type under consideration.
- 4.3.28 The thresholds for allocating preliminary condition scores to final condition scores are found in the Guide to Assessing River Condition (Gurnell *et al.*, 2020). Where there was change in condition score throughout a reach, the surveyor divided the river length into assessment parcels of each habitat condition. Since only 20% of the site area was covered by MoRPh5 sub-reaches; parcel boundaries between each MoRPh5 sub-reach were determined based on similarity of the river to the character of the sub-reach upstream and downstream. Each parcel was recorded on the map and length measured. Reaches were only separated into separate parcels either when there was a difference in condition or when they were not geographically connected due to changes in condition along the reach.

Overdeep

- 4.3.29 As part of the MoRPh method, the rivers were assessed on whether their cross-section, or 'shape', described the channel as being overdeep. If flagged as potentially overdeep, photographs taken on site were consulted. If the channel was confirmed as being overdeep, the final condition category was manually downgraded before input to the Metric. Table D.2 to Table D.5 show which rivers this applies to.

Ditches

- 4.3.30 The habitat condition score for the ditches included in the rivers and streams assessment are based on eight condition criteria (Table D.6). Desk and field information were used to inform the number of criteria passed and failed using

the same approach as outlined in paragraph 4.3.18 - 4.3.20 i.e. based on available data and a series of assumptions (see Table D.6).

- 4.3.31 The ditches which are part of the Goshems Farm biodiversity area, as shown by the Ingrebourne Valley Limited (2018) project landscape masterplan, are included as part of the baseline data. These ditches are to be created before the Project begins. These ditches have been assumed to have good condition for the baseline habitat condition.

Culverts

- 4.3.32 Following the guidance, all culverts have a default condition score of poor in the metric. This matches with their highly modified, uniform and artificial nature.

Strategic significance

Area-based habitats and hedgerows

- 4.3.33 All habitat parcels and hedgerow lines must be assigned a strategic significance score (both in the baseline and post-intervention sides of the assessment). Recognising strategic significance gives extra value to habitats that are located in optimal locations for biodiversity or are of a type that meet local objectives for biodiversity.
- 4.3.34 For the purposes of this assessment, a review was made of data available for the application of strategic significance. Based on the outcome of that review, the following criteria were used to assign a strategic significance category to each habitat parcel/line of hedgerow:

High (within area formally identified in local strategy)

- a. Any habitats within a statutory or non-statutory designated site (i.e. SSSIs, Local Nature Reserves, Local Wildlife Sites and Site of Importance for Nature Conservation).
- b. Any woodlands listed on the Ancient Woodland Inventory (AWI) or identified as ancient woodland during the course of the Project.
- c. Any habitats within Kent Biodiversity Opportunity Areas (no similar data was available for Essex).
- d. And any habitats within the National Habitat Networks All Habitat Combined (England) layer. This is a spatial dataset available from data.gov.uk that describes the geographic extent and location of Habitat Networks for 18 priority habitats based primarily, but not exclusively, on the priority habitat inventory, with additional data added in relation to habitat restoration-creation, restorable habitat, plus fragmentation action, and network enhancement and expansion zones. This is the combined habitat network

map. Available at: <https://data.gov.uk/dataset/0ef2ed26-2f04-4e0f-9493-fbdfbaeb159/habitat-networks-england>

Medium (location ecologically desirable but not in local strategy)

- a. Any habitats included within the Kent Biodiversity Action Plan (Kent Biodiversity Action Plan Steering Group, 1997) or Essex Biodiversity Action Plan (Essex Field Club, 2019).

Low (not in local strategy/no local strategy)

- a. All other areas were assigned a low strategic significance.

- 4.3.35 Where a habitat parcel was bisected by a data set used to assign strategic significance, the habitat parcel was split accordingly for accurate assessment of each part of the parcel.

Rivers and streams

- 4.3.36 For rivers and streams, strategic significance is based on the delivery of identified actions within the River Basin Management Plans (RBMPs), Catchment Plans, Local Plans and Priority Habitats for Restoration. All rivers and streams in the Project area are part of the Thames River Basin Management Plan, subject to the delivery of actions identified for the respective management catchments covering Essex South and Medway. These watercourses and their associated culverts have been assigned high strategic significance. All ditches and their associated culverts are not identified in any management plans and have been assigned low strategic significance.

River encroachment

Riparian encroachment

- 4.3.37 Details of encroachment of existing development and artificial features within the riparian zone and watercourses are required for input into each reach identified within the rivers and streams baseline data.
- 4.3.38 In the Metric, the riparian zone is defined as a 10m zone from the top of the riverbank. Riparian encroachment is defined as a reduction in the quantity/quality and 'use' of available habitat that forms a specific ecological function for riparian or aquatic specialist species. Where the meaning of 'use' is defined as the ability of a species to; commute, forage, rest/ dwell, or access as part of its life cycle between aquatic and terrestrial phases.
- 4.3.39 Development is defined as: the presence of any habitats of very low distinctiveness found within the riparian zone (as listed within the area-based metric e.g., hard standing etc.). The rivers and streams were assessed for riparian encroachment using aerial imagery and field survey information.
- 4.3.40 Multipliers applied in the Metric for encroachment reflect how far the development has encroached toward the river channel (distance) or how much of the 10m riparian zone (by % area) is covered by the development footprint. Further details can be found in the Biodiversity Metric 3.1 User Guide.

- 4.3.41 Established existing river crossings (footbridges, road bridges, rail crossings etc.) do not constitute encroachment. These are recorded as ‘no encroachment’.

Watercourse encroachment

- 4.3.42 In the Metric, watercourse encroachment is defined as an intervention that adversely affects hydrological and geo-morphological processes, creating localised changes in flow (e.g., eddying, erosion) and/or sediment dynamics and riverine connectivity - longitudinal, lateral or vertical. The result is localised changes in habitat, species and the use of migratory pathways. The rivers and streams were assessed for watercourse encroachment using aerial imagery and field survey information. Bank and bed reinforcement and other in-channel features such as weirs were identified and assigned multipliers (minor or major encroachment) depending on their degree of encroachment.
- 4.3.43 The multipliers reflect how far the development has encroached into the river channel (% width) or along the bank (% length). The percentage length was measured as a percentage of the total length of the watercourse within the Order Limits. Further details can be found in the Biodiversity Metric 3.1 User Guide.
- 4.3.44 Established existing river crossings (footbridges, road bridges, rail crossings etc.) do not constitute encroachment. These were recorded as ‘no encroachment’. Watercourse encroachment at culverts is ‘not applicable’.

4.4 Post-intervention

- 4.4.1 To create an onsite post-intervention unit score, the same data as for the baseline is required in the ‘site-creation’ tab of the Metric calculation tool with the addition of information relating to the timing of habitat creation proposed.
- 4.4.2 This combination of data produces a total number of units for each habitat (within the area-based, hedgerow and rivers and streams assessments), and subsequently how many overall habitat units there are in the biodiversity post-intervention scenario, which can then be used to investigate the total units lost and gained and the net change in biodiversity units. Further information as to how this data was generated is provided below.
- 4.4.3 The following data sets (which all form components of the Environmental Masterplan) were used to calculate land-use change in the post-intervention assessment:
- a. Order Limits (Project boundary)
 - b. Proposed carriageway (highways design)
 - c. Non-Motorised User Routes (additional hard surfaces)
 - d. Retained vegetation model (retained vegetation)
 - e. Environmental design
 - i. Landscape design (habitats created including hard and soft landscape features and ecological mitigation)

ii. Watercourse diversions

- 4.4.4 In addition, the assessment of rivers and streams used the following construction information:
- a. Engineering design (culverts, bridges, drainage)
 - b. Utilities access route
 - c. Main works construction access route

Habitat retained

Area-based habitats and hedgerows

- 4.4.5 Areas shown as within the retained vegetation model were included as retained within the assessment.
- 4.4.6 In addition, a number of areas within the Order Limits where no direct impacts would occur were also included as retained, these included habitats where the tunnel would be underground; a wetland bird mitigation area where the farmer would be paid to leave winter stubble; and intertidal sediment, coastal saltmarsh and rocky shore habitats included in the Order Limits but which lie outside the highways and engineering design and that would be retained without any direct impact occurring. These additional retained areas are illustrated below in Plate 4.1.

Plate 4.1 Additional areas within the Order Limits identified as retained in the metric assessment (blue = coastal habitats, pink = habitats over tunnel, red = wetland bird mitigation area)



Rivers and streams

- 4.4.7 For ‘other rivers and streams’ habitat that would not be impacted by the landscape design or scheme elements, the condition indicators were modified to assess the impact of complete removal of bank top habitat. This showed no change in condition and therefore these habitats were included as retained.

Habitat reinstated

Area-based habitats and hedgerows

- 4.4.8 Areas of habitat that lie within the Order Limits but which are not covered by the highways and engineering design, the environmental design or identified in the retained vegetation model, and which lie within the temporary land-take of the Project, have at this stage of the assessment been assumed to be lost during construction. It has been further assumed that following the completion of construction in these areas, habitats would be reinstated.
- 4.4.9 Where habitat within the temporary land-take of the Project would be lost and then re-instated, it has been assumed that the same habitat would be created, in the same condition, post-construction.
- 4.4.10 In this assessment, where the habitat lowland mixed deciduous woodland would be lost, it has been assumed the habitat other woodland; broadleaved in moderate condition would be created as it is not possible at this stage to have surety that the high distinctiveness habitat lowland mixed deciduous woodland could/would be re-created.
- 4.4.11 As the baseline habitats and conditions for Goshems Farm are based on those in the restoration plan, it has been assumed that any reinstated habitats would be restored to the same habitat type and condition as the original baseline.

Rivers and streams

- 4.4.12 Within the Order Limits there are ditches that form part of the landscape design that are not impacted by a scheme element. As there is no information on what is proposed in these locations, i.e. if these ditches are retained or not, it has been assumed that the habitat would be lost and reinstated.

Habitat created

Area-based habitats and hedgerows

- 4.4.13 The Environmental Masterplan (Application Document 6.2, Figure 2.4) has been used to assess the habitats to be created within the Project on land that would be maintained within the permanent boundary of the operational scheme. Habitat type has been translated from landscape element codes (Highways England, 2020d) to the Metric habitat types based on discussions with the project Landscape Architect along with an assumption for target condition based on the likely maintenance routines as detailed in the oLEMP (Application Document 6.7). Details of landscape element code translations and target condition scores are provided in Table C.1 and Table C.2.

Rivers and streams

- 4.4.14 The condition indicators from the baseline MoRPh surveys were modified to reflect the proposed engineering and environmental design and establish the with-scheme condition. Where the condition and the watercourse and riparian encroachment remained the same as the baseline, the full length of that assessment unit was considered as watercourse habitat retained within the Metric. Loss of watercourse habitat constitutes either a change in condition or change to watercourse and/or riparian encroachment of the existing watercourse, or permanent loss of the existing watercourse. For a total or partial loss of watercourse habitat, the length retained reflects the difference between the baseline length and the length lost.
- 4.4.15 Watercourse habitat creation is defined as creation of watercourses that do not promote natural functions and processes or the development of natural habitats. This includes lengths of existing watercourse where there was a reduction in condition from the baseline, or where there was an increase in watercourse or riparian encroachment. Where engineered, non-natural channels (including culverts) were proposed, these were also added to the Metric as watercourse habitat creation. In addition, the new condition scores and the strategic significance and encroachment multipliers were defined within the Metric. The watercourse habitat creation and the number of units delivered by the creation are shown in Table D.7.

Habitat enhanced

Area-based habitats and hedgerows

- 4.4.16 Currently the landscape design includes no proposals to enhance retained habitats.

Rivers and streams

- 4.4.17 The condition indicators from the baseline MoRPh surveys were modified to reflect the proposed engineering and environmental design and establish the with-scheme condition. Where this showed an improvement in condition, the watercourses were added to the Metric as habitat enhancements. The watercourses that would be enhanced and the number of units that would be delivered by these enhancements are shown in Table D.8.

Timing of habitat creation

- 4.4.18 The Metric calculation tool requires consideration of any advance planting or delays in habitat creation between the time of habitat loss and subsequent creation/re-creation.
- 4.4.19 The construction programme is scheduled to last approximately six years.
- 4.4.20 There will be some advanced planting as part of the Project but this is for essential ecological mitigation at Hole Farm where habitat creation will take place as bespoke compensation for loss of ancient woodland. This habitat creation is not addressed in the Metric given it is bespoke compensation for irreplaceable habitats.
- 4.4.21 Within the assessment of the Project, a precautionary delay of three years is applied to the reinstatement and creation of area-based habitat, hedgerow and

rivers and streams to recognise the length of the construction timetable and that in many places there will be a lag between habitat loss and reinstatement or creation. The timings of habitat creation and reinstatement would in reality vary across the Project depending on the specific location, but this application of a blanket three-year average delay is considered to be an appropriately precautionary approach to the assessment at this stage of the Project. In reality, delays may be more or less than three years and this detail can be added into a refined metric assessment at future project stages.

Strategic significance

Area-based habitats and hedgerows

- 4.4.22 The same approach to strategic significance has been taken in the post-intervention assessment as for the baseline (see Section 4.3). For habitats created as part of the Environmental Masterplan, habitat descriptions have been reviewed to determine if these are likely to constitute Kent Biodiversity Action Plan (Kent Biodiversity Action Plan Steering Group, 1997) or Essex Biodiversity Action Plan (Essex Field Club, 2019) habitats. Where this is the case, these have been assigned a medium strategic significance to acknowledge their local strategic importance.

Rivers and streams

- 4.4.23 The same approach to strategic significance has been taken in the post-intervention assessment as for the baseline (see Section 4.3).
- 4.4.24 All proposed watercourse diversions and culverted channels associated with rivers and streams with high strategic significance have also been assigned high strategic significance. All proposed ditches and culverted ditches were assigned low strategic significance.

4.5 SSSIs and irreplaceable habitats

- 4.5.1 Habitats identified in the baseline as irreplaceable (relevant to area-based habitats only) include areas of ancient woodland, both within and without designated sites, wood-pasture and parkland habitat at Cobham School, and six potential veteran trees (see Appendix 7.12: Arboricultural Impact Assessment, Application Document 6.3).
- 4.5.2 Where irreplaceable habitat would be lost it has been excluded from the baseline and bespoke compensation is correspondingly excluded from the post-intervention assessment (as described in Section 3.3). Within the assessment, 6.87ha of irreplaceable habitat has been excluded from the baseline and 80.75ha of bespoke compensation for this loss has been excluded from the site creation assessment.
- 4.5.3 There is a single SSSI at which there would be direct habitat loss. This is Shorne and Ashenbank Woods SSSI in the Project south assessment area. Here 5.9ha of habitat would be lost of which 0.4ha is irreplaceable ancient woodland habitat. For the purpose of this assessment, the 0.4ha of ancient woodland habitat is excluded from the baseline whereas the 5.5ha of SSSI habitat, not considered ancient woodland/irreplaceable habitat, is shown as retained in the baseline as per current best practice (see Section 3.3). The

bespoke compensation for the loss of woodland at Shorne and Ashenbank SSSI is included in the 80.75ha of proposed bespoke woodland compensation excluded from this assessment.

- 4.5.4 Locations of all designated sites and ancient woodland are presented on Figure 8.1: Designated Sites in ES Chapter 8 (Application Document 6.3), and ancient woodland compensation planting areas (LE8.2) are shown on Figure 2.4: Environmental Masterplan (Application Document 6.2).

4.6 Input of data to the Metric calculator tool

- 4.6.1 The area of all habitat parcels and extent of hedgerow lines with identical attributes (including habitat type, condition, and strategic significance) were summed prior to entry into the Metric calculation tool, which reduced the complexity of data entered (due to limitations of the tool, e.g. limited row allowance).

5 Limitations and assumptions

5.1 Introduction

- 5.1.1 In general, it should be noted that the Metric calculation tool uses habitats as a proxy for biodiversity and is a simplification of the 'real world'. Furthermore, while the scoring of habitats is informed by ecological reasoning and the available evidence, the outputs of biodiversity unit calculations are not scientifically precise or absolute values (Panks *et al.*, 2021a). The Metric and its outputs should therefore be interpreted, alongside ecological expertise and common sense, as an element of the evidence that informs plans and decisions.
- 5.1.2 In addition to the acknowledged limitations of the Metric calculation tool, a number of assumptions and limitations exist in respect of the current metric calculation tool assessment and these are summarised below. It is considered that these assumptions and limitations do not introduce a level of uncertainty that would affect the veracity of the assessment.

5.2 Baseline

Area-based and hedgerow habitats

The Project

- 5.2.1 There are a number of limitations which exist in respect of the field data used for the Project baseline habitats:
- Phase 1 habitat survey data was collected between April 2017 and March 2020 and some of the data is therefore more than five years old and could be considered out of date. It is possible that in some areas baseline habitats may have been subject to improved management which could increase their biodiversity unit value. However, given the predominant land use across the survey area, any significant changes to habitat type are likely to be the result of agricultural changes and would have occurred in areas of low biodiversity value, therefore this is deemed unlikely to be significant as a limitation. The precautionary approach to condition assessment (see c. below) is also likely to offset any issues of undervaluing the baseline.
 - The data was collected using the Phase 1 habitat methodology as opposed to using the UK Habitat (UKHab) classification system (Butcher *et al.* 2020) which the Metric calculation tool is designed to work with. The data on habitat type has therefore had to be translated into the Metric habitat types and this may result in baseline habitat types not being accurately captured in the Metric calculation tool. Given the dominant types are of low and medium distinctiveness this is unlikely to be a significant constraint.
 - As the field data was collected prior to the publication of condition criteria for either the Metric 2.0 or 3.0/3.1, condition assessment has been applied

retrospectively making assumptions where necessary (see Table B.1 and Table B.2). To address this constraint, a precautionary approach has been taken which is likely to over-estimate the baseline and therefore raise the requirement in terms of units for achieving a net gain in biodiversity units i.e. where the information is not available to fully answer specific condition criteria, a pass has been assumed where this is considered possible.

5.2.2 Some areas within the Project were not accessed for field survey for a number of reasons including:

- a. health and safety limitations (e.g. road verges)
- b. lack of access (i.e. private homes and gardens)
- c. refinements to the Order Limits

5.2.3 In these instances, gaps in baseline mapping were filled by digitising features from aerial imagery, checking these areas against desk study data on designated sites and Priority habitats, and using professional judgement to interpret an appropriate Phase 1 habitat type. Areas mapped through interpretation of aerial photography and Natural England's (2020) Priority Habitat Inventory (desk-based assessment) accounted for 11% of the area within the Order Limits. There is a risk that some habitats could be undervalued in the assessment and in the absence of any field data, condition scores have had to be assumed. However, given the dominant habitat types are of low and medium distinctiveness, the use of aerial imagery is unlikely to be a significant constraint. The precautionary approach taken to condition assessment also mitigates the risk of undervaluing the baseline.

5.2.4 At Goshems Farm, the agreed landscape masterplan has been used in the Project baseline as opposed to the existing baseline. This is a precautionary approach that raises the value of the baseline as compared to the existing conditions.

Rivers and streams

5.2.5 There are a number of limitations and assumptions associated with the rivers and streams baseline assessment.

5.2.6 At some locations it was only possible to survey part of a reach, due to access constraints. For subreaches that were not surveyed, the condition was assumed to match with the condition of the nearest surveyed subreach on the same reach.

5.2.7 Due to access constraints, it was not possible to survey some reaches at all. In these cases, the survey was done as a desk-based assessment using aerial photographs and precautionary approach to the application of condition was taken.

5.2.8 At Fort Road Electricity Station the ditches have been modified significantly since the original baseline assessment which was made using aerial imagery from 2018. Therefore, the data in this area was manually updated to match the 2022 configuration of the ditches.

- 5.2.9 At Goshems Farm, the same precautionary approach that was used for the area-based and hedgerow habitats was used for the rivers and streams. The agreed landscape masterplan has been used for the rivers and streams baseline.

5.3 Post-intervention

- 5.3.1 The Environmental Masterplan (Application Document 6.2, Figure 2.4) illustrates the preliminary environmental design and would be developed further for the Project at the detailed design stage. Development of the environmental design as the Project progresses could increase or decrease the number of biodiversity units forecast to be generated by the Project.

Area-based and hedgerow habitats

The Project

- 5.3.2 All areas of habitat which would fall within the Order Limits for the Project, but which are not identified by any other data set e.g. highways design, landscape design, retained vegetation model etc, have been assumed to be lost and reinstated. The exception to this are some specific habitats identified as retained. These include habitats where the tunnel would be underground; a wetland bird mitigation area where the farmer would be paid to leave winter stubble; and intertidal sediment, coastal saltmarsh and rocky shore habitats included in the Order Limits but which lie outside the highways and engineering design and would be retained without any direct impact occurring (see paragraph 4.4.6). The assumption that all other areas would be lost and reinstated, as opposed to some being retained, is likely to be an over-estimate of habitat loss. However, this is considered a proportionate and pre-cautionary approach to the assessment at this stage of the Project using the data currently available.
- 5.3.3 The Environmental Masterplan (Application Document 6.2, Figure 2.4) (as of the design in August 2022) proposes planting of clusters of and lines of single trees in various locations along the Project. However, within the Metric, it is not possible to identify singular non-urban trees as a primary habitat, and therefore it is not possible to include these areas in the Metric 3.1. These single trees have therefore been assumed to form a component of their surrounding habitat. In most cases this surrounding habitat is other neutral grassland, in good condition. This is considered sufficient to capture the biodiversity value (in terms of biodiversity units) of these trees.
- 5.3.4 In some areas of the Environmental Masterplan there are small gaps in the design drawing. These are simply very small areas where gaps exists between lines and polygons (which can occur where drawings are developed in CAD as opposed to GIS). Where this occurs habitat has been assumed as reinstated. This is considered to be a precautionary approach as new habitats would be created in these areas and these would likely to be a of higher distinctiveness and condition than in the baseline.
- 5.3.5 At this stage of the assessment, assumptions have been applied in respect of delays to habitat creation and restoration for the Project assessment. For all areas, a delay of three years is applied to recognise the current construction timetable. This is considered precautionary and some areas of habitat creation,

notably those proposed as ecological mitigation, would in reality be brought forward sooner than this.

Rivers and streams

- 5.3.6 There are a number of limitations and assumptions associated with the rivers and streams post-intervention assessment.
- 5.3.7 The lengths of proposed watercourses and culverts were determined by measuring features in Environment Viewer. Therefore, measurements are approximate and based on the preliminary design.
- 5.3.8 It has been assumed that temporary access routes would remain in place for five years and these have therefore been included in the rivers and streams assessment. It was assumed that any watercourses crossed by temporary access routes would be returned to their baseline condition after the five-year period. In the Metric, the length of affected watercourse was removed from the baseline section and then added back in the creation section.
- 5.3.9 It has been assumed that all temporary access culverts would be 10m long in the direction of flow.
- 5.3.10 Where a river or stream is within the Order Limits, but no scheme elements were shown, it has been assumed that all bank top vegetation would be removed. This change was accounted for by modifying the condition indicators. Where this showed a lowering of condition, it was assumed that the watercourse would be reinstated at its original condition and was therefore added to the Metric as a habitat creation. Where the change in condition indicators did not change the overall condition, the baseline length and condition were retained in the baseline section of the metric.
- 5.3.11 Where a baseline ditch or river intersects a proposed watercourse diversion, it has been assumed that the baseline watercourse would be diverted into the new channel.
- 5.3.12 Generally, proposed river diversions are assumed to match with the baseline conditions of the diverted watercourse. It was assumed that there would be no lowering of condition. The exception to this was where landscape improvements would lead to an increase in condition.
- 5.3.13 In some case diversion channels have been proposed for the diversion of more than one river. Where the baseline condition of the rivers due to be diverted differs, the condition of the diversion channel was assumed to match the lowest condition of the baseline rivers.
- 5.3.14 Any baseline ditches within the Order Limits that do not form part of the landscape design have been assumed to be lost for the duration of construction and then reinstated at their original condition.
- 5.3.15 Proposed highway drainage ditches have been grouped together into one entry in the Metric calculation tool. It has been assumed that these ditches would be engineered channels and would all have a condition of poor. All of the highway drainage ditches would be adjacent to the proposed route alignment so it was assumed that riparian encroachment would be major.
- 5.3.16 Existing and proposed new ditches included primarily for ecological purposes, that form part of the landscape design (i.e. LE6.2) have been added to the

creation section of the Metric with a condition of moderate. An exception to this was for existing ditches that already had a baseline condition of good. In these cases, it was assumed that the condition would not be lowered, and the ditches would be reinstated at a good condition

- 5.3.17 Where the proposed road alignment was on top of an existing ditch and no culverting or diversions were shown, it was assumed that the ditch would be permanently removed.
- 5.3.18 It has been assumed that any proposed non-motorised user (NMU) routes would be hard surfaces. Therefore, the NMUs contribute to an increase riparian encroachment.
- 5.3.19 It has been assumed that the original purpose of any baseline culverts would remain during construction and they would not be removed. Therefore, culverts on rivers and streams and ditches have been retained, rather than being removed and reinstated in creation.
- 5.3.20 Swales have not been included in the rivers and streams metrics. It has been assumed that swales would hold water for less than four months of a year. Therefore, they do not meet the criteria to be recorded as ditches and instead are captured in the area-based assessment.

Additionality

- 5.3.21 The assessment excludes consideration of nitrogen deposition compensation sites, which from part of the Order Limits, for the reasons discussed in Section 3.3 and which include additionality.
- 5.3.22 The assessment of the Project does however include biodiversity units generated by essential ecological mitigation areas included within the Order Limits to mitigate and compensate for effects on protected species. For these areas, the direct impacts they are addressing fall within the Order Limits and do not relate to irreplaceable habitats. Including these areas gives a full assessment of the biodiversity units generated by the current landscape design within the Environmental Masterplan (Application Document 6.2).

Metric area error message

- 5.3.23 The Metric tool flags up a warning message where, for the area-based assessment, the extent of habitat lost (ha) does not match the extent created (ha). A flagged mismatch in areas does not affect the calculation of units lost/gained but any area mismatch should be explained as the metric expects the area (ha) lost to match the area (ha) created.
- 5.3.24 In this assessment there is a mismatch in area between the baseline and post-intervention assessment of 79.18ha where the post-intervention area is smaller than the baseline.
- 5.3.25 The majority of this mismatch is driven by the exclusion of 80.75ha of bespoke compensation from the assessment, but there are number of other details in the application of the data to the Metric that mean the areas totals in the baseline and post-intervention assessment won't be equal. These are outlined in Table 5.1.

Table 5.1 Area based habitat extent Metric exclusions and additions

	Baseline area (ha)	Post intervention area (ha)
Shown in Metric	2,102.80	2,023.62
Excluded in Metric	+6.94 irreplaceable habitat	+80.75 bespoke compensation
Areas double counted in post-intervention areas		- 5.51 SSSI habitat lost as a result of the Project but shown as retained in the baseline (as per Section 3.4) and for which habitats are therefore created in the LEMP
Mismatches caused by gaps in mapping	+0.07 small gaps in baseline mapping that are overlain by habitats in the landscape design.	
Differences in area caused by the removal of area for rivers and ditches which are assessed in the rivers and streams calculation	+13.5	+23.63
Actual area based on known additions and exclusions	2,123.31ha	2,122.49ha
Unexplained difference in areas between baseline and post-intervention assessment	0.82ha more habitat in baseline	

5.3.26 The remaining difference of 0.82ha is considered to occur due to small gaps and overlaps in the baseline mapping.

5.3.27 Given the fact that the total baseline area of the Project Order Limits (excluding the nitrogen deposition compensation sites and areas of irreplaceable habitat lost) is 2,103ha, a difference in area of 0.82ha (i.e. <0.04%) due to data issues will not have a significant effect on the unit output of the assessment.

6 Results

6.1 Summary of results

- 6.1.1 Table 6.1 provides a summary of the expected biodiversity unit change for the Project for each type of unit assessed (i.e. area-based habitats, hedgerows and rivers & streams).
- 6.1.2 For the Project overall (i.e. including both north and south of the River Thames) the assessment shows a forecast net gain in area-based units, a forecast net loss in Hedgerow units, and a forecast net loss in rivers and streams units. These results are discussed further below for the north and south elements of the Project.
- 6.1.3 Full details of the Metric outcomes can be found in the Metric 3.1 calculation tools (v0).

Table 6.1 Summary of the Metric 3.1 assessment (where results are rounded to the nearest whole number)

Unit type	Assessment stage	Project (overall)	Project - North	Project - South
Area-based units	Baseline	7,712	5,541	2,172
	Post-intervention	8,290	6,044	2,246
	Net change units	577	503	74
	Net change %	7%	9%	3%
Hedgerow units	Baseline units	713	602	110
	Post-intervention	632	496	136
	Net change units	-81	-106	26
	Net change %	-11%	-18%	24%
Rivers & streams	Baseline units	257	240	17
	Post-intervention	239	223	16
	Net change units	-18	-17	-1
	Net change %	-7%	-7%	-8%
Trading rules* satisfied (Yes/No)?		No	No	No
Irreplaceable habitat loss (Yes/No)?		Yes	Yes	Yes

6.2 The Project - north

Area-based habitats

- 6.2.1 For area-based habitats there is a forecast gain in units of 9%.
- 6.2.2 Notable losses in units are forecast in the broad habitat group cropland (-1,112 units) which is made up of the habitat type cereal crops in the baseline and for which there is a net loss in extent of -460ha. This low distinctiveness habitat would be lost, either permanently under the highways and landscape design or temporarily during construction, after which it would be reinstated. Where the habitat is reinstated, losses in units compared to the baseline occur due to the application of both, the one year standard time to target condition risk multiplier, plus the three year delay in habitat establishment risk multiplier, which therefore applies a four year final time to target condition multiplier of 0.867 to cereal crop units being reinstated.
- 6.2.3 Smaller unit losses also occur in the broad habitat types sparsely vegetated land (-71 units) (which comprises ruderal/ephemeral habitat), wetland (-21 units) (which comprises reedbeds) and woodland and forest (-7 units) (see below for discussion of loss of woodland units).
- 6.2.4 Losses in units for low distinctiveness cropland habitat are offset by notable forecast gains in units in the broad habitat groups grassland (1,012 units) and urban (475 units). Forecast gains in grassland are due to a combination of grassland reinstatement and creation of grasslands in the landscape design of medium, high and very high distinctiveness. The increase in urban habitat units is driven by the creation of the Priority habitat Open Mosaic Habitats on Previously Developed land.
- 6.2.5 Unit gains are also forecast for the broad habitat types heathland and shrub (which comprises scrub habitats) (114 units) and lakes (which comprises pond habitats) (120 units).

Trading rules

- 6.2.6 The assessment trading summary is provided below in Table 6.2. The trading rules are satisfied for all habitat distinctiveness groups with the exception of the 'high' distinctiveness group.

Table 6.2 Trading summary – Project north

Distinctiveness group	Trading rule	Trading satisfied
Very high	Bespoke compensation likely to be required	Yes
High	Same habitat required	No
Medium	Same broad habitat or a higher distinctiveness habitat required	Yes
Low	Same distinctiveness or better habitat required	Yes

- 6.2.7 For high distinctiveness habitat there is a deficit in units largely driven by a loss of units in lowland mixed deciduous woodland (-123 units). The loss of lowland mixed deciduous woodland has been compensated for by the creation of other broadleaved woodland and other mixed woodland and there is 52ha more woodland habitat in the Environmental Masterplan than in the baseline. However, despite the increase in woodland extent there is a net loss of -7 woodland units and a failure of the trading rules for the following reasons:
- a. The loss of areas of semi-natural, lowland mixed deciduous woodland, which is assigned a high distinctiveness in the Metric, is not replaced on a like for like basis i.e. it has been compensated by the creation of other broadleaved woodland and other mixed broadleaved woodland, which are medium distinctiveness woodland types, due to the acknowledged level of difficulty in creating high distinctiveness woodland.
 - b. Woodland creation takes time and this is recognised in the Metric where significant risk multipliers are applied to woodland creation. This results in an overall loss of woodland units despite an increase in extent of woodland within the Order Limits post-intervention.

Irreplaceable habitats

- 6.2.8 There would be a loss of 1.86ha of irreplaceable habitat in the area of the Project north for which bespoke compensation of 32ha would be provided. The biodiversity unit value of both the irreplaceable habitat lost in the baseline and bespoke compensation created post-intervention are excluded from this metric assessment.

Hedgerows

- 6.2.9 For hedgerows there is a forecast net loss in units of -18%.
- 6.2.10 There is a forecast loss of hedgerow units for nine of the 11 hedgerow types identified in the baseline. There are forecast gains in two hedgerow types, native species-rich hedgerow (29 units) and native species-rich hedgerows with trees (162 units).
- 6.2.11 Despite the fact there is a forecast overall net gain of 12km in extent of hedgerows, the overall loss in hedgerow units is due to the risk multipliers included in the Metric for habitat creation. This means that wherever hedgerows are lost permanently or lost and reinstated, less units are awarded for hedgerow created in the post-intervention assessment than for the same habitat type, condition and extent in the baseline.

Rivers and streams

- 6.2.12 For rivers and streams there is a forecast net loss in units of -7%.
- 6.2.13 This net loss in units occurs despite there being a net increase in length of the rivers and streams habitat types. For 'other rivers and streams' habitat there is a net gain of 0.8km and for ditch habitat of 21.8km. It should be noted that much of the increase in ditch habitat length is associated with the creation of highways drainage ditches which are of limited biodiversity value.

6.2.14 The overall loss of rivers and streams units, despite an increase in extent of these habitats is due to changes in condition and encroachment between the baseline and post-intervention in addition to the application temporal and difficulty multipliers in the creation and enhancement sections of the Metric.

6.3 The Project - south

Area-based habitats

6.3.1 For area-based habitats there is a forecast gain in units of 3%.

6.3.2 Notable losses in units are forecast in the broad habitat group cropland (-299 units) which is made up of the habitat type cereal crops in the baseline and for which there is a net loss in extent of -124ha. This low distinctiveness habitat would be lost, either permanently under the highways and landscape design or temporarily during construction, after which it would be reinstated. Where the habitat is reinstated, losses in units compared to the baseline occur due to the application of both, the one year standard time to target condition risk multiplier, plus the three year delay in habitat establishment risk multiplier, which therefore applies a four year final time to target condition multiplier of 0.867 to cereal crop units being reinstated.

6.3.3 Smaller unit losses also occur in the broad habitat types sparsely vegetated land (-12 units) (which comprises ruderal/ephemeral habitat), wetland (-4 units) (which comprises reedbeds) and woodland and forest (-17 units) (see below for discussion of loss of woodland units).

6.3.4 There are notable forecast gains in units in the broad habitat group grassland (304). Unit gains are also forecast for the broad habitat types heathland and shrub (which comprises scrub habitats) (52 units), urban (31) (which includes the Priority habitat Open Mosaic Habitats on Previously Developed Land) and lakes (which comprises pond habitats) (19 units).

Trading rules

6.3.5 The assessment trading summary is provided below in Table 6.3 The trading rules are satisfied for all habitat distinctiveness groups with the exception of the 'high' distinctiveness group.

Table 6.3 Trading summary – Project south

Distinctiveness group	Trading rule	Trading satisfied
Very high	Bespoke compensation likely to be required	Yes
High	Same habitat required	No
Medium	Same broad habitat or a higher distinctiveness habitat required	Yes
Low	Same distinctiveness or better habitat required	Yes

6.3.6 For high distinctiveness habitat there is a deficit in units largely driven by a loss of units in lowland mixed deciduous woodland (-93 units).

- 6.3.7 The loss of lowland mixed deciduous woodland has been compensated for by the creation of other broadleaved woodland and other mixed woodland and there is 18ha more woodland habitat in the Environmental Masterplan than in the baseline. Despite the increase in woodland extent there is an overall loss of -17 woodland units and a failure of the trading rules for the same reasons outlined for the Project north assessment (see paragraph 6.2.7).

Irreplaceable habitats

- 6.3.8 There would be a loss of 5.01ha of irreplaceable habitat in the area of the Project south for which bespoke compensation of 48.75ha would be provided. The biodiversity unit value of both the irreplaceable habitat lost in the baseline and bespoke woodland compensation created post-intervention, are excluded from this metric assessment.

Hedgerows

- 6.3.9 For hedgerows there is a forecast net gain in units of 24%.
- 6.3.10 There is a forecast net gain in extent of hedgerow habitats of 6km. Whilst there is a forecast loss of hedgerow units for eight of the 10 hedgerow types identified in the baseline, these losses are offset by forecast gains in two hedgerow types, native species-rich hedgerow (22 units) and native species-rich hedgerows with trees 53 units).
- 6.3.11 Rivers and streams
- 6.3.12 For rivers and streams there is a forecast net loss in units of -8%.
- 6.3.13 For the habitat types ‘other rivers and streams’, ‘canals’ and ‘culverts’ there is no change in units or length.
- 6.3.14 For the ‘ditches’ habitat type there is a loss of 1.5 units and no change in the length of ditches.
- 6.3.15 Although there is no change in the length of ditches, the ditches are assumed to be removed during construction and reinstated at the same condition. Therefore, the drop in units is associated with the temporal and difficulty multipliers in the creation section of the Metric.

7 Discussion

7.1 Current design

Metric performance

- 7.1.1 At this stage of the Project, the Metric forecasts are based on the preliminary design and a number of limitations and assumptions (as detailed in Section 5), that have had to be made to allow a quantitative forecast of biodiversity unit change. It is considered that this assessment provides a realistic worst case scenario of the likely performance of the Project in terms of net biodiversity, given the necessarily precautionary nature of the assumptions which have had to be made.
- 7.1.2 The current forecast change in biodiversity units for the overall Project is:
- a. 7% for area-based habitat units
 - b. -11% for hedgerow units; and
 - c. -7% for river units.
- 7.1.3 In the context of these results it should be noted that the Project would result in the loss of ancient woodland, wood-pasture and parkland and six potential veteran trees. These habitats are considered irreplaceable, and this loss would technically prevent any overall claim of BNG for the Project, whilst this assessment demonstrates overall changes in biodiversity units for non-irreplaceable habitats.
- 7.1.4 Whilst acknowledging impacts on designated sites and irreplaceable habitats, the Project design has sought to maximise benefits for biodiversity. It should be noted however that actions taken to do this do not necessarily maximise unit outputs in the Metric.
- 7.1.5 For example, the landscape design in places targets the creation of Priority grasslands where this is considered practical and feasible. An example of how this can affect the unit output is seen where considering grassland creation in the Project south area. In this area, 30ha of lowland calcareous grassland creation and 4ha of lowland meadow creation are proposed in locations where these habitats are considered feasible to create and maintain. These are high and very high distinctiveness Priority grassland habitats chosen to maximise biodiversity value, as opposed to simply settling for creation of medium distinctiveness grassland. If medium distinctiveness grassland (e.g. other neutral grassland) were chosen in the design over high and very high distinctiveness Priority grassland habitats, the performance of the Project south Metric would improve from a gain of 3% to a gain of 11% for area-based habitats. This highlights the fact that the Metric and its outputs should be interpreted, alongside ecological expertise and common sense, as an element of the evidence that informs plans and decisions.
- 7.1.6 The Metric performance for both the Project north and south areas are also impacted by the exclusion of the bespoke woodland compensation planting from the assessment i.e. 7ha of irreplaceable habitat is excluded from the

baseline but over 11 times this extent (81ha) is excluded from the post-intervention side of the assessment. This means a significant area of habitat is not available to generate units in the assessment and that ambitious woodland compensation proposals negatively impact the Metric assessment outputs. Indeed, where the assessment identifies that more irreplaceable habitat can be retained, this actually lowers the overall BNG forecast by increasing the unit value of the baseline, whilst not recognising the bespoke compensation provided.

Trading rules

- 7.1.7 The Metric trading rules are largely satisfied in the current assessment with the exception of losses in units for the high distinctiveness habitat lowland mixed deciduous woodland. A total of 14ha of lowland mixed deciduous woodland (where excluding consideration of irreplaceable habitat) are forecast to be lost as a result of the Project. Whilst there is 70ha more woodland habitat in the Environmental Masterplan than in the baseline, there is a net loss of -24 woodland units and a failure of the trading rules. This is because the loss of areas of semi-natural, lowland mixed deciduous woodland, which is assigned a high distinctiveness in the Metric, have not been replaced on a like for like basis.
- 7.1.8 The forecast loss in lowland mixed deciduous woodland would be compensated for by the creation of a number of woodland habitat types identified in the Environmental Masterplan as LE2.1, LE2.2, LE2.4, LE2.11, LE2.14 and LE8.3 (see Table C1 Annex C). These woodland habitats would serve a number of purposes including visual screening and landscape integration as well as providing compensation for woodland habitat lost during construction. All these habitats have currently been classified as medium distinctiveness woodland types in the metric assessment due to the acknowledged level of difficulty in creating high distinctiveness woodland and the fact that the majority of newly created woodland associated with developments best fits the classification of other woodland broadleaved or other woodland mixed (see Panks *et al.* 2022b). However it may be that some of these areas of woodland creation, notably those classified as LE8.3 woodland mitigation planting, could be considered to represent a higher distinctiveness woodland dependant on the precise location, extent and methods of creation used. This option should be explored at the detailed design stage (see below).
- 7.1.9 There are a number of opportunities for refining the forecast and for improving the outcomes for biodiversity as the Project progresses which are discussed below. The Project would seek to maximise biodiversity performance over the full project lifecycle.

7.2 Development of the post-intervention data and detailed design

- 7.2.1 This assessment represents the current stage of the Project, using the preliminary Project design, and should be updated and refined at key milestones to further develop the forecast for net biodiversity change. Updates to the assessment should be made based on:

- a. refinement of the Project design and construction information, including the habitat lost/retained information and the construction timetable
- b. development of the full landscape design and landscape and ecology management plan (LEMP) including consideration of opportunities to enhance retained habitats
- c. the above should take into account constraints which may exist in respect of maximising biodiversity outcomes relevant to a highways scheme e.g. health & safety implications associated with increased maintenance requirements for certain habitats.

- 7.2.2 As the Project is developed, opportunities should be sought to further apply the mitigation hierarchy and in the first instance to avoid loss of habitats, and subsequently to increase the distinctiveness and condition of the habitats created.
- 7.2.3 Avoidance of habitat loss is the best way to improve biodiversity performance. Therefore, refinement of the data in respect of habitats within the temporary land-take of the project, identifying where these may be retained, as opposed to the current precautionary assumption that all habitats would be lost and re-instated, is likely to improve the biodiversity unit forecast.
- 7.2.4 As the full landscape design and detailed LEMP is development, opportunities should be sought to ensure the condition and distinctiveness of habitats proposed for creation are maximised and that this is captured in future metric assessments. Opportunities to increase the distinctiveness of woodland habitats proposed for creation, where this is feasible, would support trading rules in respect of the loss of lowland mixed deciduous woodland.
- 7.2.5 Reducing the delays between habitat loss and establishment would also improve the forecast biodiversity performance. At present a blanket assessment of a three year delay i.e. between all habitat loss and creation, has been applied in the absence of more detailed programme information. Project programming should look to minimise delays between habitat loss and creation and future updates to the metric assessment should apply updated programme information.
- 7.2.6 For hedgerow habitats, where a current net loss in biodiversity units is forecast, an increase in the distinctiveness of hedgerow types created would improve the biodiversity unit performance. This could be achieved by adding features to created hedgerows such as the addition of trees, ditches or banks.

7.3 Wider biodiversity considerations

- 7.3.1 ES Chapter 8: Terrestrial Biodiversity details the steps taken to avoid and / or reduce adverse biodiversity impacts including on irreplaceable habitats, designated sites and protected species.
- 7.3.2 Protected species licences would be obtained for badgers, bats, great crested newts, dormouse and water vole.
- 7.3.3 ES Chapter 2 summarises the ecological mitigation measures proposed for the Project (see Section 2.3). Further details of the mitigation proposed is provided

in ES Chapter 8 and the oLEMP (Application Document 6.7). The oLEMP also outlines the proposed management of the landscape and ecological elements.

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Glossary

Term	Abbreviation	Explanation
10% BNG		An increase of 10% in the biodiversity units where the post-intervention scenario is compared to the baseline biodiversity unit value.
Area-based units		The unit of measurement used for 'area-habitats' in the Metric 3.1 (Panks et al. 2022b)
Biodiversity Metric 2.0		Version 2.0 (released in July 2019) of the Natural England Biodiversity Metric.
Biodiversity Metric 3.1		Version 3.1 (released in April 2022) of the Natural England Biodiversity Metric.
Biodiversity Net Gain (BNG)		An approach to development, and/or land management, which aims to leave the natural environment in a measurably better state than beforehand (Panks et al. 2022b).
Biodiversity units		The unit of measurement used in the Biodiversity Metric. It is a product of the extent, distinctiveness and condition of habitats.
Environmental Masterplan		A package of information on existing and future environmental commitments and objectives, ongoing actions, and risks to be managed, handed over to those responsible for future management and operation of the asset. The Environmental Masterplan for the Project is provided as Figure 2.4 (Application Document 6.2) of the ES.
Hedgerow units		The unit of measurement used for hedgerows and lines of trees in the Metric 3.1 (Panks et al. 2022b)
Irreplaceable habitats		Irreplaceable habitats are defined by the NPPF (MHCLG, 2021) as follows, 'Habitats which would be technically very difficult (or take a very significant time) to restore, recreate or replace once destroyed, taking into account their age, uniqueness, species diversity or rarity. They include ancient woodland, ancient and veteran trees, blanket bog, limestone pavement, sand dunes, salt marsh and lowland fen'.
Order Limits		The outermost extent of the Project indicated on the Plans by a red line. This is the Limit of Land to be Acquired or Used (LLAU) by the Project. This is the area in which the DCO would apply.
Outline Landscape and Ecology Management Plan (oLEMP)		A document which provides details on the delivery and management of the landscape and ecology elements identified in the Environmental Masterplan for the Project, including their success criteria (Application Document 6.7).
The Project		The A122 Lower Thames Crossing. A proposed new crossing of the Thames Estuary linking the county of Kent with the county of Essex, east of the existing Dartford Crossing.
Rivers & streams units		The unit of measurement used for rivers and streams, and including ditches, in the Metric 3.1 (Panks et al. 2022b)
Trading rules		Rules which are applied automatically by the Metric, that require that any loss of habitat is replaced on a 'like-for-like' or 'like-for-better' principle (Panks et al. 2022b).

Annexes

Annex A Baseline habitat type translation tables

Table A.1 Phase 1 habitat to Metric habitat type translation – area-based habitats

Phase 1 habitat type	Metric 3.1 habitat type	Translation justification (where required)
A1.1.1 Semi-natural broadleaved woodland	Woodland and forest - Lowland mixed deciduous woodland	None
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
A1.1.2 Plantation broadleaved woodland	Woodland and forest - Other woodland; broadleaved	All parcels, except those with target notes that specifically state that it is an orchard.
	Cropland - Intensive orchards	Parcels with target notes that specifically state that it is an ' <i>intensive OR planted orchard</i> ', or where identified as such from aerial photography which showed a plantation, as based on the UKHab definition.
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
A1.2.2 Plantation coniferous woodland	Woodland and forest - Other coniferous woodland	None
A1.3.2 Plantation mixed woodland	Woodland and forest - Other woodland; mixed	None
A2.1 Dense/continuous scrub	Heathland and shrub - Blackthorn scrub	Only parcels with target notes that specifically and solely state blackthorn.
	Heathland and shrub - Bramble scrub	Only parcels with target notes that specifically and solely state bramble.
	Heathland and shrub - Mixed scrub	All parcels, except those that specifically state a single species relating to another heathland and shrub sub-habitat type.
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).

Phase 1 habitat type	Metric 3.1 habitat type	Translation justification (where required)
A4.1 Recently felled broadleaved woodland	Woodland and forest - Lowland mixed deciduous woodland	Only one parcel, which was determined to have previously been lowland mixed deciduous woodland based on target notes. NB: Not translated to <i>Woodland and forest - Felled</i> because of the following clause in the Metric 3.1 Technical Supplement; 'This classification [Felled] should only be used when the original habitat type of the felled woodland cannot be determined'.
B1.1 Grassland - Acid - Unimproved	Urban - Open Mosaic Habitats on Previously Developed Land	All parcels were determined to be within an Open Mosaic Habitat site (see Section 4.3).
B1.2 Grassland - Acid - Semi-improved	Grassland - Other lowland acid grassland	All parcels were determined to be of 'good quality' based on target notes and National Vegetation Classification (NVC) survey data.
B2.1 Unimproved neutral grassland	Grassland - Other neutral grassland	Translated to 'Other Neutral Grassland' instead of 'Lowland Meadow' based on review of aerial imagery and comparison of target notes to the UKHab definition of Lowland Meadow- Lowland Meadow (UKHab definition): 'Rich mixture of native grasses and broad-leaved herbs [...] lowland UK, often on shallow slopes or level ground...' Target notes: 'Very steep exposed sandy quarry face [...] neutral grassland sward [...] species associated with base rich soils.'
B2.2 Semi-improved neutral grassland	Cropland - Arable field margins cultivated annually	Only parcels with notes that specifically state that it is a field margin.
	Grassland - Floodplain Wetland Mosaic (CFGM)	Any parcels identified as Coastal and Floodplain Grazing Marsh (CFGM) Priority habitat, based on interpretation of open-source Priority habitat data and comparison of the Priority habitat descriptions (JNCC, 2014) to the baseline habitat data.
	Grassland - Other neutral grassland	Translations to this habitat type included: All desk-assessed parcels on a precautionary basis (i.e. assume 'good quality'). Field-assessed parcels without target notes in NVC areas (i.e. assume 'good quality'). Field-assessed parcels with target notes that suggest species-rich swards.

Phase 1 habitat type	Metric 3.1 habitat type	Translation justification (where required)
	Grassland - Modified grassland	Field-assessed parcels without target notes outside NVC survey areas (assumed if they were 'good quality' surveyors' would have taken note of this) Field-assessed parcels with target notes that suggest species-poor i.e. 'poor quality'.
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
B3.1 Unimproved calcareous grassland	Cropland - Arable field margins tussocky	Only parcels with notes that specifically state that it is a tussocky field margin.
	Grassland - Lowland calcareous grassland	None
B3.2 Semi-improved calcareous grassland	Grassland - Lowland calcareous grassland	One parcel for which there was no access during field surveys and so assigned this habitat type on a precautionary basis. All other parcels were determined to be of 'good quality' based on target notes.
B4 Improved grassland	Grassland - Floodplain Wetland Mosaic (CFGM)	Any parcels identified as CFGM Priority habitat, based on interpretation of open-source Priority habitat data and comparison of the Priority habitat descriptions (JNCC, 2014) to the baseline habitat data.
	Grassland - Modified grassland	None
	Grassland - Traditional orchards	Only parcels with notes that specifically state that it is an orchard or where identified as such from aerial photography, as based on the UKHab definition.
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
B5 Marsh/Marshy grassland	Grassland - Modified grassland	Parcels with target notes that suggest species-poor habitat. Parcels with no target notes (assumed that, if they were good quality, surveyors would have taken note of this)

Phase 1 habitat type	Metric 3.1 habitat type	Translation justification (where required)
		NB: No parcels were determined to be 'wetland - purple moor grass and rush pastures' due to the geographic location of the Project and the absence of purple moor grass.
	Grassland - Other neutral grassland	Parcels with target notes that suggest species-rich habitat. NB: No parcels were determined to be 'wetland - purple moor grass and rush pastures' due to the geographic location of the Project and the absence of purple moor grass.
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
B6 Poor semi-improved grassland	Grassland - Floodplain Wetland Mosaic (CFGM)	Any parcels identified as CFGM Priority habitat, based on interpretation of open-source Priority habitat data and comparison of the Priority habitat descriptions (JNCC, 2014) to the baseline habitat data.
	Grassland - Modified grassland	None
	Woodland and forest - Wood-pasture and parkland	Only those parcels identified as parkland habitat, based on interpretation of open-source Priority habitat data and comparison of the Priority habitat descriptions (JNCC, 2014) to the baseline habitat data.
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
C1.1 Continuous bracken	Grassland - Bracken	None
C3.1 Tall herb and fern - other - tall ruderal	Sparsely vegetated land - Ruderal/Ephemeral	None
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
C3.2 Tall herb and fern - other - non-ruderal	Sparsely vegetated land - Ruderal/Ephemeral	None
C3.2-I2.2 Non-ruderal/Artificial spoil	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
F1 Swamp	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).

Phase 1 habitat type	Metric 3.1 habitat type	Translation justification (where required)
	Wetland - Reedbeds	Only parcels with target notes that suggest the habitat is dominated by common reed.
G1 Standing water - Lake	Lakes - Ornamental lake or pond	All parcels of this Phase 1 habitat type were determined using target notes and aerial photography to be artificial/ornamental/fishing lakes, rather than natural waterbodies.
G1 Standing water - Pond	Lakes - Ponds (Priority habitat)	All ponds on a precautionary basis.
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
G1 Standing water - reservoir	Lakes - Reservoirs	Parcels determined to be reservoirs from target notes or aerial photography.
G1 Standing water - ditch; and G2 Running water - ditch	Grassland - Floodplain Wetland Mosaic (CFGM)	Any ditch parcels identified as CFGM Priority habitat, based on interpretation of open-source Priority habitat data and comparison of the Priority habitat descriptions (JNCC, 2014) to the baseline habitat data. *According to the metric guidance 'ditches form an integral part of the habitat and should not be recorded separately as linear features in the Rivers & Streams part of the metric.', hence being translated in the area table.
H1.1 Intertidal mud/sand	Intertidal sediment - Littoral mud	Only parcels that were identified as mud only.
	Intertidal sediment - Littoral muddy sand	Only two parcels in the south, no target notes. They have been assumed to be the high distinctiveness 'littoral muddy sand' on a precautionary basis (and because the original phase 1 habitat type is H1.1 Intertidal mud/sand).
H1.2 Intertidal shingle/cobbles	Intertidal sediment - Littoral coarse sediment	None
H1.3 Intertidal boulders/rocks	Rocky shore - Features of littoral rock	None
H2.6 Dense/continuous saltmarsh	Coastal saltmarsh - Saltmarshes and saline reedbeds	None
H3 Shingle above high tide mark	Intertidal sediment - Littoral coarse sediment	Determined to be intertidal due to lack of vegetation (i.e. mobile/within reach of storm waves)

Phase 1 habitat type	Metric 3.1 habitat type	Translation justification (where required)
Hardstanding	Urban - Developed land; sealed surface	None.
I2.1-J4 Quarry/Bare ground	Urban - Actively worked sand pit quarry or open cast mine	The most dominant of the two habitat types was used as the Metric habitat type.
I2.2 Artificial spoil	Urban - Actively worked sand pit quarry or open cast mine	None.
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
I2.2-C3.1 Artificial spoil/Tall ruderal	Sparsely vegetated land - Ruderal/Ephemeral	The most dominant of the two habitat types was used as the Metric habitat type.
I2.2-J4 Artificial spoil/Bare ground	Urban - Actively worked sand pit quarry or open cast mine	The most dominant of the two habitat types was used as the Metric habitat type.
I2.4 Refuse tip	Urban - Artificial unvegetated, unsealed surface	None.
I2.4-J4 Refuse tip/Bare ground	Urban - Artificial unvegetated, unsealed surface	The most dominant of the two habitat types was used as the Metric habitat type.
J1.1 Arable	Cropland - Cereal crops	All parcels, except those with target notes that suggest a non-cereal crop.
	Cropland - Non-cereal crops	Only parcels with target notes that suggest a non-cereal crop.
J1.2 Amenity grassland	Grassland - Modified grassland	All parcels, except those with target notes that suggest a garden.
J1.3 Ephemeral/short perennial	Sparsely vegetated land - Ruderal/Ephemeral	None
	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
J1.4 Introduced shrub	Urban - Introduced shrub	None
J3.4 Caravan site	Urban - Developed land; sealed surface	None

Phase 1 habitat type	Metric 3.1 habitat type	Translation justification (where required)
J3.6 Buildings	Urban - Developed land; sealed surface	None
J4 Bare ground	Urban - Open Mosaic Habitats on Previously Developed Land	Only parcels within Open Mosaic Habitat sites (see Section 4.3).
	Urban - Artificial unvegetated, unsealed surface	Only parcels where target notes suggest the habitat type (e.g. Gravel/hardcore).
	Urban - Vacant/derelict land/bare ground	None
J5 Other - Allotments	Urban - Allotments	Only those parcels with target notes that suggest the habitat is solely an allotment.
J5 Other - Garden	Urban - Vegetated garden	Parcels with target notes/aerial imagery that suggest the habitat is solely a garden.
J5 Other - Railway	Urban - Developed land; sealed surface	None
J5 Other	Urban - Developed land; sealed surface	Horse manège - On aerial photography were either hardstanding, or survey notes stated a rubber surface.

Table A.2 Phase 1 habitat to Metric habitat type translation – hedgerow habitats

Phase 1 habitat	Linear habitat type	Translation justification (where required)
A3.1 Broadleaved scattered trees	Line of trees (ecologically valuable)	Lines of trees with target notes that suggest the trees are mature; plus lines with no notes so a precautionary approach taken to translation. (NB: No 'lines of trees' had associated bank or ditch features)
	Line of trees	Lines with notes that suggest the trees are young or semi-mature. (NB: No 'lines of trees' had associated bank or ditch features)
A3.2 Coniferous scattered trees	Line of trees	None
A3.3 Mixed scattered trees	Line of trees (ecologically valuable)	Lines of trees with target notes that suggest the trees are mature; plus lines with no target notes so a precautionary approach taken to translation.

Phase 1 habitat	Linear habitat type	Translation justification (where required)
		(NB: No 'lines of trees' had associated bank or ditch features)
J2.1.1 Native species-rich intact hedge	Native species-rich hedgerow (associated with bank or ditch)	Hedgerows with a bank or ditch*
	Native species-rich hedgerow	Hedgerows with no bank or ditch
J2.1.2 Species-poor intact hedge	Native hedgerow (associated with bank or ditch)	Hedgerows with a bank or ditch*
	Native hedgerow	Hedgerows with no bank or ditch
J2.2.1 Native species-rich defunct hedge	Native species-rich hedgerow (associated with bank or ditch)	Hedgerows with a bank or ditch*
	Native species-rich hedgerow	Hedgerows with no bank or ditch
J2.2.2 Species-poor defunct hedge	Native hedgerow (associated with bank or ditch)	Hedgerows with a bank or ditch*
	Native hedgerow	Hedgerows with no bank or ditch
J2.3.1 Native species-rich hedge with trees	Native species-rich hedgerow with trees (associated with bank or ditch)	Hedgerows with a bank or ditch*
	Native species-rich hedgerow with trees	Hedgerows with no bank or ditch
J2.3.2 Species-poor hedge with trees	Native hedgerow with trees (associated with bank or ditch)	Hedgerows with a bank or ditch*
	Native hedgerow with trees	Hedgerows with no bank or ditch
	Native hedgerow	Hedgerows with no bank or ditch
J5 Non-Native hedgerow	Hedge ornamental non-native	None

**Rules for hedgerows and lines of trees associated with ditches:*

In the assessment, ditches should only be recorded once, i.e. as a ditch, or as associated with a hedgerow or line of trees. In this assessment it has been assumed that all wet ditches qualify for assessment in the rivers and streams Metric, and all hedgerows or lines of trees within 2m of a dry ditch qualify as associated with a ditch.

Table A.3 Goshems Farm baseline habitat type translation and condition justification

	Phase 1 habitat	Metric 3.1 habitat type	Target condition	Condition justification
Arable farmland	J1.1 - Arable	Cropland - Cereal crops	N/A -Agricultural	None
Green corridor or area managed to promote biodiversity	J1.3 - Ephemeral/ short perennial	Urban - Open Mosaic Habitats on Previously Developed Land	Good	Assessed on a precautionary basis assuming developer aiming for good quality for wildlife
Green corridor or area managed to promote biodiversity (retained LWS)	C3.1 - Tall ruderal herbs	Urban - Open Mosaic Habitats on Previously Developed Land	Good	Assessed on a precautionary basis assuming developer aiming for good quality for wildlife

Annex B Baseline habitat condition assessment

Table B.1 Baseline condition assessment and assumptions – area-based habitats

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Coastal saltmarsh - Saltmarshes and saline reedbeds	H2.6 Dense/continuous saltmarsh	<p>Coastal Saltmarsh condition sheet:</p> <p><u>Coastal Processes</u> - Phase 1 data and aerial photography consulted.</p> <p><u>Presence and abundance of Invasive Non-Native Species</u> - Invasive species data consulted, if none recorded given score of 3, if any present given a score of 1.</p> <p><u>Water quality</u> - All parcels were given a score of 2 (Moderate) as the Thames Middle water body is classed as ‘moderate ecological status’ on the Environment Agency’s Catchment Data Explorer website (Environment Agency, 2020).</p> <p><u>Non-natural structures and direct human impacts</u> - Assumed to fulfil this criterion (assumed score of 3) unless target notes or aerial photography suggest otherwise.</p> <p><u>Litter</u> - Assumed to fulfil this criterion (assumed score of 3) unless target notes or aerial photography suggest otherwise.</p> <p><u>Zonation and transition to other habitats</u> - Considered in combination with criterion 1. Phase 1 data and aerial photography also consulted.</p>
Cropland - Arable field margins cultivated annually	B2.2 Semi-improved neutral grassland	No assessment required - Condition Assessment N/A
	C3.1 Tall ruderal	No assessment required - Condition Assessment N/A
Cropland - Arable field margins pollen & nectar	B2.2 Semi-improved neutral grassland	No assessment required - Condition Assessment N/A
Cropland - Arable field margins tussocky	B3.1 Unimproved calcareous grassland	No assessment required - Condition Assessment N/A

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Cropland - Cereal crops	J1.1 Arable	No assessment required - Condition Assessment N/A
Cropland - Non-cereal crops	J1.1 Arable	No assessment required - Condition Assessment N/A
Cropland - Intensive orchards	A1.1.2 Plantation broadleaved woodland	No assessment required - Condition Assessment N/A
Grassland - Bracken	C1.1 Continuous bracken	No assessment required - Condition Assessment N/A
Grassland - Floodplain Wetland Mosaic (CFGM)	B2.2 Semi-improved neutral grassland	Wetland condition sheet: <u>Water table at or near surface</u> - Phase 1 type and target notes, and aerial photography consulted. <u>Vegetation composition</u> - CFGM - Assume to pass as area is identified as Priority Habitat.
	B4 Improved grassland	<u>Good water quality</u> - Assumed to fail given stock/grazed areas would result in eutrophic water. <u>Scrub <10%</u> - Assumed to pass the criterion unless target notes or Phase 1 type suggest otherwise.
	B6 Poor semi-improved grassland	<u>Bare ground <5 %</u> - Assumed to pass the criterion unless target notes or Phase 1 type suggest otherwise. <u>Invasive Non-Native Species absent</u> - Invasive species data consulted, if none recorded pass, if any present fail. <u>(d) Ditch condition 'Good'</u> - Assumed fail as ditches within Order Limits do generally not meet 'Good' condition.

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Grassland - Modified grassland	B2.2 Semi-improved neutral grassland	<p>Desk-assessed parcels assumed good. Field-based parcels assessed as below:</p> <p>Grassland (Low distinctiveness) condition sheet:</p> <p><u>6-8 species per m²</u> - Parcels with no target notes were assumed to fail this criterion as it was considered that, if there was a higher species diversity, this would have been recorded (assumed fail).</p> <p><u>Sward height is varied</u> - Unless target notes suggest otherwise, assumed to fail this criterion as considering the types of grasslands assigned to this habitat type, it is reasonable to assume most would fail this criterion due to regular management.</p> <p><u>Scrub cover <20%</u> - If no relevant target notes, Phase 1 habitat types and aerial photography were consulted.</p> <p><u>Physical damage evident in <5% of area</u> - Assumed to pass this criterion unless target notes suggest otherwise.</p> <p><u>Cover of bare ground between 1-10%</u> - If no relevant target notes, Phase 1 data and aerial photography were consulted.</p> <p><u>Cover of bracken < 20%</u> - New criteria in Metric 3.1. Assumed to pass, based on professional judgement and knowledge of the Project having little bracken present.</p> <p><u>Invasive Non-Native Species absent</u> - Invasive species data consulted, if none recorded score as pass, if any present score as fail.</p>
	B4 Improved grassland	All parcels were assumed to be in 'Moderate' condition, as where grasslands were assigned this habitat type, it is likely they would fail criteria 1, therefore being unable to achieve 'Good' condition.
	B5 Marsh/Marshy grassland	No desk-assessed parcels. Field-assessed parcels were assessed using the Grassland (Low distinctiveness) criteria assumptions above.
	B6 Poor semi-improved grassland	All parcels were assumed to be in 'Moderate' condition, as where grasslands were assigned this habitat type, it is likely they would fail criteria 1, therefore being unable to achieve 'Good' condition.

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
	J1.2 Amenity grassland	All parcels were assumed to be in ‘Moderate’ condition, as where grasslands were assigned this habitat type, it is likely they would fail criteria 1, therefore being unable to achieve ‘Good’ condition.
Grassland - Lowland calcareous grassland	B3.1 Unimproved calcareous grassland	<p>No desk-assessed parcels. Field-based parcels assessed as below: Grassland (Med/High/Very High Distinctiveness) condition sheet: <u>Appearance and composition</u> - Unless notes suggest otherwise, comparing against the Biodiversity Action Plan habitat of their type: Unimproved B1.1, B2.1, and B3.1 parcels were considered to match well to these Priority habitats and passed this criterion. Semi-improved B1.2, B2.2 and B3.2 parcels were considered to fail for not originally being assigned as unimproved in the Phase 1 survey. Species-rich B5 parcels were assumed to pass this criterion and species-poor B5 parcels were assumed to fail. <u>Sward height is varied</u> - Reasonable to assume pass due to the types of grasslands assigned to this habitat type. <u>Cover of bare ground between 1-5%</u> - If no relevant target notes, Phase 1 habitat types and aerial photography were consulted. <u>Cover of bracken <20% and scrub <5%</u> - Assumed to pass for bracken based on professional judgement and knowledge of the Project having little bracken present. For scrub, if no relevant target notes, Phase 1 habitat types and aerial photography were consulted. <u>Invasive Non-Native Species absent</u> - Invasive species data consulted, if none recorded scored as pass, if any present scored as fail. <u>Species per m² (non-acid types only)</u> - Parcels with no notes were assumed to fail. Parcels with notes are compared to indicator species for the Biodiversity Action Plan habitat of their type to confirmed pass or fail; are likely to pass unless target notes suggest otherwise.</p>
	B3.2 Semi-improved calcareous grassland	<p>No desk-assessed parcels. Field-assessed parcels were assessed using the Grassland (Med/High/Very High distinctiveness) criteria assumptions above.</p>

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Grassland - Lowland meadows	B2.1 Unimproved neutral grassland	No desk-assessed parcels. Field-assessed parcels were assessed in the field using the Grassland (Med/High/Very High distinctiveness) criteria above. No assumptions required.
Grassland - Other lowland acid grassland	B1.2 Grassland - Acid - Semi-improved	No desk-assessed parcels. Field-assessed parcels were assessed using the Grassland (Med/High/Very High distinctiveness) criteria assumptions above (but excluding criterion 6 which is not relevant to acid grassland types).
Grassland - Other neutral grassland	B2.1 Unimproved neutral grassland	All desk-assessed parcels were assumed to be in 'Moderate' condition, as desk-assessed parcels were precautionarily translated to 'Other neutral grassland', and it is assumed they would fail Criteria 1 using the Grassland (Med/High/Very High distinctiveness) criteria assumptions above.
	B2.2 Semi-improved neutral grassland	Field-assessed parcels were assessed using the Grassland (Med/High/Very High distinctiveness) criteria assumptions above.
	B5 Marsh/Marshy grassland	No desk-assessed parcels. Field-assessed parcels were assessed using the Grassland (Med/High/Very High distinctiveness) criteria assumptions above.

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Grassland - Traditional orchards	B4 Improved grassland	<p>Orchard condition sheet:</p> <p><u>Ancient/Veteran trees present</u> - Veteran Trees data consulted, if none were present scored as fail, if any present scored as pass.</p> <p><u>Scrub cover <10%</u> - Assumed pass on precautionary basis following review of data showing minimal scrub in orchard polygons.</p> <p><u>Evidence of pruning</u> - Assumed pass on precautionary basis, no data available.</p> <p><u>Presence of deadwood</u> - Only Traditional Orchards in this condition assessment so reasonable to assume deadwood present. Assumed pass on precautionary basis.</p> <p><u>95% trees free from damage</u> - Assumed to pass this criterion unless target notes or aerial photography suggest otherwise.</p> <p><u>Sward height varied</u> - Assumed to pass this criterion unless target notes or aerial photography suggest otherwise.</p> <p><u>Species richness of grassland</u> - Assumed fail as all parcels of this habitat type indicate that there is not a semi-natural ground layer present.</p> <p><u>Absence of invasive non-native and sub-optimal species</u> - Assumed to pass sub-optimal criteria; invasive species data consulted, if none recorded scored as pass, if any present scored as fail.</p>

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Heathland and shrub - Blackthorn scrub	A2.1 Dense/continuous scrub	<p>Scrub condition assessment:</p> <p><u>Meets UKHab Description</u> - Desk-assessed parcels all assumed to pass this criterion.</p> <p>Field-assessed parcels <i>with no target notes</i> were assumed to fail, as it was assumed that if the habitat was interesting or diverse this would have been recorded.</p> <p>Field-assessed parcels with target notes assessed based on information provided regarding species present but with assumptions made where necessary regarding % cover of species (i.e. assume equal cover of species where not otherwise detailed)</p> <p><u>Good age range</u> - Assumed not to be diverse, fail (based on professional knowledge of the scrub habitats present within the Order Limits, which are known to be mostly of uniform age), unless target notes suggest otherwise.</p> <p><u>Invasive Non-Native Species absent</u> - Pernicious weeds and invasive species are assumed to be absent, pass, unless target notes suggest otherwise or indicated using the invasive species data. If present, these species are assumed to comprise >5% of ground cover, unless otherwise stated.</p> <p><u>Presence of a well-developed edge</u> - Unless target notes suggest otherwise, edge considered to be present when adjacent next to tall ruderal or non-ruderal tall herb and fern habitat in Phase 1 data. Edge considered absent if not adjacent to these habitats.</p> <p><u>Presence of clearings</u> - Considered to be present if they are shown in the Phase 1 data or mentioned within target notes. If not, they are assumed to be absent.</p>
Heathland and shrub - Bramble scrub	A2.1 Dense/continuous scrub	No assessment required - Condition Assessment N/A
Heathland and shrub - Mixed scrub	A2.1 Dense/continuous scrub	All parcels were assessed using the Scrub criteria assumptions above.
	A2.1-I2.1 Dense/continuous scrub/Quarry	

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Intertidal sediment - Littoral coarse sediment	H1.2 Intertidal shingle/cobbles	<p>Intertidal Sediment condition sheet:</p> <p><u>Coastal processes</u> - Phase 1 data, aerial photography, and Environment Agency’s Catchment Data Explorer website (Environment Agency, 2020) consulted.</p> <p><u>Presence of Invasive Non-Native Species</u> - Notes and invasive species data consulted- considered absent (score of 3) if no data and/or not mentioned.</p> <p><u>Water quality</u> - Environment Agency’s Catchment Data Explorer website (Environment Agency, 2020) consulted. Thames Middle water body is classed as ‘moderate’ ecological status therefore a score of 2 points (Moderate) was applied) for all parcels.</p> <p><u>Non-natural structures</u> - Assumed to score 3 unless aerial imagery or target notes suggest otherwise.</p> <p><u>Litter</u> - Assumed to score 3 unless aerial imagery or target notes suggest otherwise.</p>
	H3 Shingle above high tide mark	
Intertidal sediment - Littoral mud	H1.1 Intertidal mud/sand	All parcels were assessed using the Intertidal Sediment criteria assumptions above.
Intertidal sediment - Littoral muddy sand	H1.1 Intertidal mud/sand	All parcels were assessed using the Intertidal Sediment criteria assumptions above.
Lakes - Ornamental lake or pond	G1 Standing water - Lake	<p>Lake condition sheet:</p> <p><u>Physical Naturalness</u> - Phase 1 target notes and aerial imagery consulted.</p> <p><u>Hydrological Naturalness</u> - Phase 1 target notes and aerial imagery consulted.</p> <p><u>Chemical Naturalness</u> - Great crested newt Habitat Suitability Index (HIS) water quality data used to infer chemical naturalness score (Good = 1, Moderate = 2.5, Poor = 3.5, Bad = 5).</p> <p><u>Biological Naturalness</u> - Phase 1 target notes and invasive species data consulted.</p>

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Lakes - Ponds (Priority Habitat)	G1 Standing water - Pond Habitat	<p>Pond condition sheet:</p> <p><u>Good water quality</u> - Great crested newt HSI water quality data consulted. If no data, assumed to fail as it was considered that good water quality would have been recorded. If data or target notes suggest the pond was dry, this criterion was considered not applicable, and therefore failed.</p> <p><u>Semi-natural habitat present within 10m of pond edge</u> - Phase 1 habitat data, target notes, and aerial photography consulted.</p> <p><u>Duckweed/Algae <10%</u> - If no data, assumed to pass.</p> <p><u>Artificial connections</u> - Phase 1 habitat data, target notes, and aerial photography were consulted.</p> <p><u>Water levels</u> - If no data, assumed to pass.</p> <p>Presence of non-native plants and animals - Invasive species data consulted.</p> <p><u>Fish</u> - Great crested newt HSI fish data consulted (present - fail, possible or absent, pass). If no data, assumed to pass.</p> <p><u>Plants (Non-woodland ponds only) covering >50% pond area</u> - Great crested newt HSI macrophytes data consulted. If no data, assumed to fail this criterion as considered floral species would have been recorded. If data suggest the pond was dry, this criterion was considered not applicable, and therefore failed.</p> <p><u>Shade <50% (Non-woodland ponds only)</u> - Great crested newt HSI shading data consulted (pass or fail). If no data, aerial photography consulted.</p>
Lakes - Reservoirs	G1 Standing water - reservoir	All parcels were assessed using the Lake criteria assumptions above.

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Rocky shore - Features of littoral rock	H1.3 Intertidal boulders/rocks	<p>Rocky Shore condition assessment:</p> <p><u>Coastal processes</u> - Aerial photography consulted for presence of artificial structures. If no evidence, scored 3; some/possible evidence scored 2 on a precautionary basis.</p> <p><u>Invasive Non-Native Species</u> - Invasive species data consulted, if none, scored 3; if 1-3 features per 100m², scored 2; if more than 3 features per 100m², scored 1.</p> <p><u>Water quality</u> - Assumed score of 2. Environment Agency's Catchment Data Explorer website (Environment Agency, 2020) consulted. Thames Middle water body is classed as 'moderate' biological water quality therefore a score of 2 points (Moderate) was applied for all parcels.</p> <p><u>Non-natural structures</u> - Assume score of 3 points, unless target notes or aerial photography suggest otherwise.</p> <p><u>Litter</u> - Assume score of 3 points, unless target notes or aerial photography suggest otherwise.</p>
Sparsely vegetated land - Ruderal/Ephemeral	C3.1 Tall herb and fern - other - tall ruderal	<p>Urban condition assessment:</p> <p><u>Vegetation structure is varied</u> - Based on habitat type: Ruderal/ephemeral (C3.1, C3.2, J1.3), allotments (J5 - Allotment), or open mosaic (any parcels in an OMH) = Assumed to pass. Vacant/derelict/bare ground (J4) = Assumed to fail.</p> <p><u>Diverse range of flowering species</u> - Based on habitat type: Ruderal/ephemeral (C3.1, C3.2, J1.3) and open mosaic (any parcels in an OMH) = Assumed Pass, native. Allotment = Assumed to pass, non-native. Vacant/derelict/bare ground (J4) = Assumed to fail.</p> <p><u>Invasive Non-Native Species <5%</u> - Invasive species data consulted, if none - Pass (none), if any - "Pass (<5%)"</p>
	C3.2 Tall herb and fern - other - non-ruderal	
	I2.2-C3.1 Artificial spoil/Tall ruderal	
	J1.3 Ephemeral/short perennial	
	J1.3-J4 Ephemeral/short perennial/Bare ground	
Urban - Actively worked sand pit quarry or open cast mine	I2.1 Quarry	No assessment required - Condition Assessment N/A
	I2.1-J4 Quarry/Bare ground	

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
	I2.2 Artificial spoil	
	I2.2-J4 Artificial spoil/Bare ground	
Urban - Allotments	J5 Other - Allotments	All parcels were assessed using the Urban criteria assumptions above.
Urban - Artificial unvegetated, unsealed surface	I2.4 Refuse tip	No assessment required - N/A - Other
	I2.4-J4 Refuse tip/Bare ground	
	J1.3 Ephemeral/short perennial	
Urban - Developed land; sealed surface	Hardstanding	No assessment required - N/A - Other
	J3.4 Caravan site	
	J3.6 Buildings	
	J5 Other - Railway	
	J5 Other	
Urban - Introduced shrub	J1.4 Introduced shrub	No assessment required - Condition Assessment N/A

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Urban - Open Mosaic Habitats on Previously Developed Land	N/A - Open Mosaic Habitats are comprised of a number of area-based habitats (excluding those captured by the Rivers Metric) (see Table A.1 for component habitat types).	<p>All parcels assessed using Urban condition criteria above, plus criterion 4a below, only applicable to Open Mosaic Habitat areas.</p> <p>4a. <u>Spatial variation and successional communities</u> – NVC survey results and component Phase 1 habitats checked and compared against listed successional communities.</p> <p>NB: One condition assessment was undertaken for each identified Open Mosaic Habitat area (Baker Street, East Tilbury Marshes, Goshems Farm, Low Pit Street LWS, Low Street Station, and Singlewell Substation), considering the area and its constituent habitats as a whole, with the result then applied to all Open Mosaic parcels within that area, regardless of Phase 1 habitat type.</p>
Urban - Vacant/derelict land/bare ground	J4 Bare ground	All parcels were assessed using the Urban criteria assumptions above.
Urban - Vegetated garden	J5 - Garden	No assessment required - Condition Assessment N/A
Wetland - Reedbeds	F1 Swamp	<p>Wetland (+ Reedbed criterion) condition sheet:</p> <p><u>Water table at or near surface</u> - Phase 1 habitat type, target notes, and aerial photography consulted.</p> <p>Vegetation composition matches wetland habitat type - Reedbed</p> <p><u>Good water quality</u> - Assumed to fail given stock/grazed areas would result in eutrophic water, counts as bad water quality.</p> <p><u>Scrub <10%</u> - Assumed to pass the criterion unless target notes or Phase 1 type suggest otherwise.</p> <p><u>Bare ground <5%</u> - Assumed to pass the criterion unless target notes or Phase 1 type suggest otherwise.</p> <p><u>Absence of Invasive Non-Native Species</u> - Invasive species data consulted, if none recorded pass, if any present fail.</p> <p><u>(c) Diverse structure with between 60-80% reeds</u> - Assumed to pass unless target notes suggest otherwise.</p>

<p>Woodland and forest - Lowland mixed deciduous woodland</p>	<p>A1.1.1 Semi-natural broadleaved woodland</p>	<p>All desk-assessed parcels were assumed to be in 'Moderate' condition (chosen as a precautionary middle-ground- 'Good' considered over-precautionary due to lack of information about the sites, and the majority [70/96 parcels] of the field-surveyed parcels were assessed as 'Moderate'). All field-based parcels assessed on the below:</p> <p>Woodland condition sheet</p> <p><u>Age distribution</u> - Assumed score of 2 on a precautionary basis, unless target notes suggested diverse age range, in which case score 3.</p> <p><u>Herbivore damage</u> - Assumed free from damage, score of 3, unless target notes suggested otherwise.</p> <p><u>Invasive plant species</u> - Invasive species were considered to be absent if there were no invasive species mentioned within the target notes or present in the invasive species data (score of 3; Good). If invasive species were present, they were assumed to cover <10% of the parcel (score of 2; Moderate), unless target notes suggested otherwise.</p> <p><u>No. of native trees</u> – Rules for scoring this criterion, from the results of the corresponding Metric 2.0 criterion (criterion 12), were applied in bulk to all parcels. Parcels with no notes were assumed to pass the 2.0 criterion on a precautionary basis, and therefore were given 3 points (Good) for this 3.1 criterion. Parcels with notes that mentioned six or more species passed the 2.0 criterion, and therefore were also given 3 points (Good) for this 3.1 criterion. Parcels with notes that mentioned less than six species failed the 2.0 criterion, and so were given 2 points (Moderate) for this 3.1 criterion on a precautionary basis (as the thresholds for species richness vary between the 2.0 criterion and the 3.1 criterion).</p> <p><u>Cover of native species</u> - If no target notes or no species were recorded, all species are assumed native (score of 3; Good). If only native species and no non-native species were mentioned, non-native species are considered to be absent (score of 3; Good). Any species (including non-native species) mentioned in the notes are considered to account for an equal amount of canopy unless otherwise stated.</p> <p><i>NB: Naturalised species (e.g. sycamore) are treated as native.</i></p> <p><u>Open space</u> - Assumed score of 3 points precautionarily, as most woodland parcels are <10ha, therefore most not likely to have open space >20%.</p>
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Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
		<p><u>Regeneration</u> - Assumed there is evidence of succession (score of 3; Good), unless otherwise stated.</p> <p><u>Tree health</u> - Assumed a score of 3 on a precautionarily basis.</p> <p><u>Vegetation and ground flora</u> - Assumed a score of 2 as a middle ground, data not available from original surveys.</p> <p><u>Vertical structure</u> - Based on habitat type. For Lowland Mixed Deciduous Woodland, assigned score of 3, all other habitats, score of 2.</p> <p><u>Veteran trees</u> - Veteran trees layer was consulted, if any present, score of 3, if none, assume score of 1.</p> <p><u>Deadwood</u> - Assumed to be <25%, score of 1, unless otherwise stated.</p> <p><u>Disturbance</u> - It is assumed there are no signs of significant nutrient enrichment (score of 3), unless target notes suggest otherwise.</p>
	A4.1 Recently felled broadleaved woodland	No assessment required - fixed at 'Good' condition.
Woodland and forest - Other coniferous woodland	A1.2.2 Plantation coniferous woodland	All plantation woodland parcels were assumed to be in 'Poor' condition, except those within the Thames Chase Community Forest and Jeskyns Community Woodland (based on professional knowledge of the plantation woodland habitats present within the Order Limits, which are known to mostly be young species-poor motorway embankment/road verge planting/timber plantation, lacking ground flora and vertical structure, except those in Thames Chase Community Forest and Jeskyns Community Woodland, which are known to be species-rich and well-managed).
Woodland and forest - Other woodland; broadleaved	A1.1.2 Plantation broadleaved woodland	<p>Thames Chase Community Forest and Jeskyns Community Woodland: Desk-assessed parcels were assumed to be in 'Moderate' condition ('Good' condition was deemed to be over-precautionary for plantation woodland, as it is likely to lack age diversity, ancient woodland ground floor, vertical structure, veteran trees, and deadwood).</p> <p>Field-assessed parcels were assessed using the Woodland criteria assumptions above.</p>

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Woodland and forest - Other woodland; mixed	A1.3.1 Semi-natural mixed woodland	All parcels were assessed using the Woodland criteria assumptions above.
	A1.3.2 Plantation mixed woodland	<p>As above, All plantation woodland parcels were assumed to be in ‘Poor’ condition, except those within the Thames Chase Community Forest and Jeskyns Community Woodland.</p> <p>Thames Chase Community Forest and Jeskyns Community Woodland: Desk-assessed parcels were assumed to be in ‘Moderate’ condition (‘Good’ condition was deemed to be over-precautionary for plantation woodland, as it is likely to lack age diversity, ancient woodland ground floor, vertical structure, veteran trees, and deadwood).</p> <p>Field-assessed parcels were assessed using the Woodland criteria assumptions above.</p>
Woodland and forest - Wood-pasture and parkland	B4 Improved grassland	<p>Wood-Pasture & Parkland condition sheet:</p> <p><u>Presence of ancient/veteran trees</u> – Arboriculture survey veteran trees data was consulted, if any ancient or veteran trees present, pass, if none, assume fail.</p> <p><u>Range of tree ages</u> – As all parcels were field surveyed, age and height was not assumed to be diverse (fail), unless target notes suggest otherwise.</p> <p><u>Deadwood</u> - Assumed to be present on a precautionary basis, pass, unless target notes suggest otherwise.</p> <p><u>Tree health</u> - Assumed no adverse impacts on tree health (pass), unless target notes suggest otherwise.</p>
	B6 Poor semi-improved grassland	<p><u>Semi-natural ground cover</u> - Based on grassland/heathland Phase 1 habitat type: as all parcels were B4 Improved grassland or B6 Species-poor semi-improved grassland, they were all considered to fail this criterion (semi-natural grasslands such as B2.1 or B2.2 would have been considered to pass).</p> <p><u>Grassland management</u> – Unless otherwise stated, this was based on Phase 1 habitat type as a proxy: as all parcels were B4 Improved grassland or B6 Species-poor semi-improved grassland, they were all considered to fail this criterion (semi-natural grasslands such as B2.1 or B2.2 would have been considered to pass).</p>

Table B.2 Baseline condition assessment and assumptions – hedgerow habitats

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Hedgerows - Native Hedgerow	J2.1.2 Intact hedge species poor	Hedgerow condition sheet: A1. <u>Height >1.5m</u> - Assumed to pass this criterion unless target notes suggest otherwise. A2. <u>Width >1.5m</u> - Assumed to pass this criterion unless target notes suggest otherwise. B1. <u>Gap (hedge base) <0.5m</u> - Assumed to pass this criterion unless target notes suggest otherwise. B2. <u>Gap (hedge canopy) <10%</u> - Assessed based on Phase 1 habitat type assigned. Intact hedges assumed to pass. Defunct hedges assumed to fail. Hedge with trees assumed to pass unless target notes suggest otherwise. C1. <u>Undisturbed ground and vegetation >1m</u> – Checked for relevant target notes. If no target notes- if arable land present on both sides, or arable on one side and hardstanding on the other, assumed to fail. If still unclear, consult aerial photography. C2. <u>Undesirable vegetation <20%</u> - Assumed to pass unless target notes suggest otherwise. If ground flora has been described as tall ruderal, or mapped as tall ruderal with no notes, this was assumed to consist of undesirable species and to fail (based on professional knowledge of the habitats present within the Order Limits). If nettles, docks, or cleavers are mentioned, these were assumed to comprise more than 20% of ground flora cover i.e. fail. D1. <u>Invasive/neophyte species <10%</u> - Considered to pass this criterion if only native (including archaeophyte) species are mentioned in the target notes, or if there are no target notes. If any invasive or neophyte species are mentioned, these are assumed to account for > 10% of the hedgerow i.e. fail. D2. <u>Damage <10%</u> - Assumed to pass this criterion unless target notes suggest otherwise.
	J2.2.2 Defunct hedge species poor	
	J2.3.2 Hedge and trees species poor	
Hedgerows - Native Hedgerow - Associated with bank or ditch	J2.1.2 Intact hedge species poor	B2. <u>Gap (hedge canopy) <10%</u> - Assessed based on Phase 1 habitat type assigned. Intact hedges assumed to pass. Defunct hedges assumed to fail. Hedge with trees assumed to pass unless target notes suggest otherwise. C1. <u>Undisturbed ground and vegetation >1m</u> – Checked for relevant target notes. If no target notes- if arable land present on both sides, or arable on one side and hardstanding on the other, assumed to fail. If still unclear, consult aerial photography.
	J2.2.2 Defunct hedge species poor	
Hedgerows - Native Hedgerow with trees	J2.3.2 Hedge and trees species poor	C2. <u>Undesirable vegetation <20%</u> - Assumed to pass unless target notes suggest otherwise. If ground flora has been described as tall ruderal, or mapped as tall ruderal with no notes, this was assumed to consist of undesirable species and to fail (based on professional knowledge of the habitats present within the Order Limits). If nettles, docks, or cleavers are mentioned, these were assumed to comprise more than 20% of ground flora cover i.e. fail.
Hedgerows - Native Hedgerow with trees - Associated with bank or ditch	J2.3.2 Hedge and trees species poor	
Hedgerows - Native Species-Rich Hedgerow	J2.1.1 Intact native species-rich hedge	D1. <u>Invasive/neophyte species <10%</u> - Considered to pass this criterion if only native (including archaeophyte) species are mentioned in the target notes, or if there are no target notes. If any invasive or neophyte species are mentioned, these are assumed to account for > 10% of the hedgerow i.e. fail.
	J2.2.1 Defunct hedge native species-rich	
Hedgerows - Native Species-Rich Hedgerow - Associated with bank or ditch	J2.1.1 Intact native species-rich hedge	D2. <u>Damage <10%</u> - Assumed to pass this criterion unless target notes suggest otherwise.
	J2.2.1 Defunct hedge native species-rich	

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Hedgerows - Native Species-Rich Hedgerow with trees	J2.3.1 Hedge and trees native species-rich	E1 <u>Tree age (mature)</u> – Assumed to pass this criterion on a precautionary basis. E2 <u>Tree health</u> - Assumed to pass this criterion on a precautionary basis.
Hedgerows - Native Species-Rich Hedgerow with trees - Associated with bank or ditch	J2.3.1 Hedge and trees native species-rich	
Hedgerows - Hedge Ornamental Non Native	J5 Other habitat	No assessment required - Condition Assessment N/A
Line of trees - Line of Trees	A3.1 Parkland/scattered trees broadleaved	Line of Trees condition sheet: <u>Native species</u> – Phase 1 habitat type was used as a proxy for this criterion: A3.1 and A3.3 habitat types all assumed to pass; A3.2 assumed to fail. <u>Continuous canopy</u> – Aerial photography was used to check for gaps in canopy. <u>Mature or veteran tree(s)</u> – Aerial photography was used to identify any lines of solely newly planted trees (fail), otherwise if trees are not considered newly planted pass, unless target notes suggest otherwise. <u>Undisturbed ground and vegetation</u> – Aerial photography/surrounding land use/Phase 1 habitat types consulted. Lines of trees that were directly bordered by developed land or intensively managed habitats such as arable fields were considered to fail this criterion, whereas lines of trees that were surrounded by at least 6 m of natural habitats, for example, grassland or tall ruderal habitats, were considered to pass. <u>Tree health</u> – All lines of trees were assumed to pass this criterion, on a precautionary basis.
	A3.2 Parkland/scattered trees coniferous	
Line of trees - Line of Trees (Ecologically Valuable)	A3.1 Parkland/scattered trees broadleaved	
	A3.3 Parkland/scattered trees mixed	

General notes (relevant to tables B.1 and B.2):

A precautionary approach to baseline condition assessment is to assume a higher habitat condition than might be the case in reality as this has the effect of raising the biodiversity unit value of the baseline and this correspondingly raising the number of units required to achieve net gain. Where no data is available to answer a specific condition criterion, it is generally assumed that the habitat in question passes that criterion i.e. a precautionary approach is taken, unless otherwise stated.

Annex C Post-intervention habitat type translation and target condition

Table C.1 Target habitat type and condition - area-based habitats

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
LE1.1 Amenity Grassland	Grassland - Modified grassland	Low Distinctiveness Grasslands	Good	<p>The species composition would predominantly be rye grass (coverage at least 60%) with few wildflower and sedge species (between six and eight). Habitat would be under frequent management, being mown regularly.</p> <p>The management regime proposed would allow all seven criteria to be met including the control of scrub and bracken encroachment, area of bare ground and damage, and ensure non-native invasive species account for less than 5% of the total area. Rotational management would promote variation in sward height to meet criterion 2.</p>
LE1.3 Species-Rich Grassland	Grassland - Other neutral grassland	Medium, High and Very High Distinctiveness Grasslands.	Good	<p>Proposed throughout the Project route, on grass verges, embankments and cutting edges adjacent to the carriageway. Although the habitat would have a diverse range of wildflower species it is unlikely to achieve a higher distinctiveness habitat. This is partly due to the location of these proposed habitats making access for management difficult and there is potential for nutrient enrichment from adjacent fields.</p> <p>The management regime proposed would allow all six criteria to be met including the control of scrub and bracken encroachment, area of bare ground and damage, and ensure non-native invasive species and species which indicate sub-optimal conditions, account for less than 5% of the total area. Rotational management would promote variation in sward height to meet criterion 2.</p>

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
LE1.31 Species-Rich Chalk Grassland	Grassland - Lowland calcareous grassland	Medium, High and Very High Distinctiveness Grasslands.	Good	Proposed for locations where there is evidence of chalk substrate or chalk grassland is already present in the area. The management regime proposed would allow all six criteria to be met as described for LE1.3 above.
LE1.32 Annual Wildflower Grassland	Grassland - Lowland meadows	Medium, High and Very High Distinctiveness Grasslands.	Good	The habitat would be located in areas aimed to provide visually vibrant and exciting meadow areas using native species of perennial and annual wildflower and grasses. The annual wildflower meadow would be managed to reflect the former RAF Gravesend runways within Chalk Park South and provide heritage interest. This habitat would be created following consideration of hydrology, soil testing and assessment that the location is suitable to be successfully and appropriately created into lowland meadow grassland. It would be specifically managed to achieve good condition lowland meadow. The management regime proposed would allow all six criteria to be met as described for LE1.3 above.
LE1.4 Rock and Scree	Sparsely vegetated land - Inland rock outcrop and scree habitats	Sparsely Vegetated Land.	Good	This habitat type is proposed on the approach to the South Portal, where the Project route would be within a deep cutting through the underlying chalk geology. The cutting would have steep gradients on the cutting faces to limit the amount of land take within this section of the Project route. Although man-made, it is considered that this habitat would meet all four condition criteria, achieving a condition score of Good. The species composition would be native species typical of this type of habitat; the habitat would be managed to ensure the cover of bracken scrub and trees are less than 25%; Invasive Non-Native Species and species which indicate sub-optimal condition would make up less than 5%; and cover of suitable vegetation would be between 5 and 50%.

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
LE2.1 Native Woodland	Woodland and forest - Other woodland; broadleaved	Woodland	Moderate	<p>Woodland creation consisting of a mix of native trees and shrubs would be provided throughout the Project to mitigate loss of vegetation, to provide visual screening of the road from nearby receptors and to integrate the road into the surrounding landscape.</p> <p>The following points are considered achievable against each condition criteria:</p> <ol style="list-style-type: none"> 1. Age distribution - Moderate - 2 2. Herbivore damage - Moderate - 2 3. Invasives - Good - 3 4. No. native sp. Moderate - 2 5. Cover of native sp. Good - 3 6. Open space - Moderate - 2 7. Woodland regeneration - Moderate - 2 8. Tree health - Good - 3 9. Ground flora - Moderate - 2 10. Vertical structure - Moderate - 2 11. Veteran trees- Poor - 1 12. Deadwood - Poor - 1 13. Disturbance - Moderate – 2 <p>This approach results in a score of 27 points and meets an overall condition value of Moderate.</p> <p>It is considered that the habitat is limited to Moderate condition as the inclusion of veteran trees and 50% presence of standing deadwood, dead branches etc. comes with age which cannot be artificially recreated. Therefore criteria 11 and 12 are limited to 1 point.</p> <p>As this habitat would be created rather than enhanced, an approach has been taken to ensure the condition criteria</p>

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
				<p>can be confidently met within a 30-year time frame. Therefore, for some of the condition criteria, Moderate is considered more appropriate than Good i.e. due to the long times frames required to achieve Good.</p>
LE2.11 Woodland with Non-Native Species	Woodland and forest - Other woodland; mixed	Woodland	Moderate	<p>Woodland, including non-native species to provide resilience against climate change, predominantly proposed for large areas of woodland creation that do not adjoin onto existing woodlands, particularly around junctions. Exceptions are within Thames Chase and the Thames Chase compensation land.</p> <p>Woodland with non-native species is proposed to perform the same function as LE2.1 woodland in terms of providing replacement woodland planting, screening functions for visual mitigation and to integrate the Project route into the surrounding landscape.</p> <p>The approach to condition assessment is the same as that taken for LE2.1 above.</p> <p>The species composition would include non-native trees in order to include species resistant to the impact of climate change. Non-native species would account for less than 20%, therefore, condition criterion 5 would still achieve 3 points.</p> <p>This approach results in a score of 27 points and meets an overall condition value of Moderate.</p>
LE2.14 Wet/Carr Woodland	Woodland and forest - Wet woodland	Woodland	Moderate	<p>The woodland would be located in areas which are poorly drained or on seasonally wet soils. The species composition used would reflect these wet conditions.</p> <p>The approach to condition assessment is the same as that taken for LE2.1 above. This approach results in a score of 27 points and meets an overall condition value of Moderate.</p>

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
LE2.2 Woodland Edge	Woodland and forest - Other woodland; broadleaved	Woodland	Moderate	<p>The woodland edge habitat would be located in areas surrounding woodland parcels.</p> <p>The approach to condition assessment is the same as that taken for LE2.1 above. This approach results in a score of 27 points and meets an overall condition value of Moderate.</p>
LE2.22 Scrub Woodland	Heathland and shrub - Mixed scrub	Scrub	Moderate	<p>Scrub woodland planting is proposed to screen and integrate the Project into the surrounding landscape, whilst still retaining long- distance views to the surrounding woodland ridge.</p> <p>The scrub habitat would achieve criteria 1-4: There would be at least three woody species, with none comprising more than 75%; the habitat would be managed to encourage a good age range, providing opportunity for saplings while retaining more mature shrubs; the coverage of non-native and species indicative of sub-optimal conditions would be kept under 5% coverage; and the scrub would be managed in a way to promote a well-developed edge. The coverage of scrub is unlikely to provide opportunity to create significant clearings or glades to meet criterion 5.</p> <p>Moderate condition is considered the most achievable condition value passing four of the five criteria.</p>
LE2.4 Linear Belts of Shrubs and Trees	Woodland and forest - Other woodland; broadleaved	Woodland	Moderate	<p>Linear belts of shrubs and trees proposed to provide visual screening and landscape integration where there are constraints in land availability within the Order Limits, or overhead and underground utilities mean more traditional woodland planting cannot be achieved. Also proposed to replace existing belts of trees that have been lost due to construction works.</p>

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
				The approach to condition assessment is the same as that taken for LE2.1 above. This approach results in a score of 27 points and meets an overall condition value of Moderate.
LE2.5 Shrub with Intermittent Trees	Heathland and shrub - Mixed scrub	Scrub	Moderate	<p>Shrubs with intermittent tree planting proposed on embankments to structures to soften the appearance of the engineered structures and to tie the earthworks into the adjacent landscape. Proposed adjacent to or directly under/over utilities, where constraints means that larger tree planting cannot be achieved.</p> <p>The approach to condition assessment is the same as that taken for LE2.22 above. This approach results in a score of Moderate by passing four of the five condition criteria.</p>
LE2.7 Scattered Trees	N/A	N/A	N/A	Underlying grassland habitat types are used in the Metric to capture the areas which include individual trees.
LE2.8 Scrub/Scattered Scrub	Heathland and shrub - Mixed scrub	Scrub	Moderate	<p>Scrub planting is proposed throughout the Project to replace vegetation loss, provide visual screening and to provide wildlife and landscape connectivity where appropriate.</p> <p>The approach to condition assessment is the same as that taken for LE2.22 above. This approach results in a score of Moderate by passing four of the five condition criteria.</p>
LE5.1 Individual Trees	N/A	N/A	N/A	Underlying grassland habitat types are used in the Metric to capture the areas which include individual trees.
LE6.11 Water Bodies - Standing Water	Lakes - Ponds (Non-priority)	Pond	Moderate	<p>These would be attenuation ponds.</p> <p>The habitat is considered likely to meet six of the nine Pond condition criteria.</p> <p>The proposed habitat would likely fail criterion 1 as the water quality cannot be guaranteed where the primary</p>

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
				<p>purpose of the feature is as an attenuation pond which would likely result in some polluted runoff.</p> <p>These ponds would also likely fail criteria 4 and 8 by potentially being connected artificially to other water bodies and it is unlikely the pond can be managed to ensure there is at least 50% vegetation cover that is less than 3m deep. Moderate is considered the most likely condition value to be achieved.</p>
LE6.12 Water Bodies and Associated Plants - Shallow Scrape Habitat	Lakes - Temporary lakes, ponds, and pools	Pond	Poor	<p>Shallow scrape habitats are proposed within the Project design, their primary function being to maintain functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar.</p> <p>These are shallow scrapes which would require artificial methods to input water.</p> <p>The habitat is considered likely to fail four of the nine criteria.</p> <p>In addition to the criteria failed in the habitat type above (LE6.11), the pond design would fail criterion 5 as the water level would be managed to provide wet mud as often as possible and so 'natural' levels may not be suitable.</p> <p>Poor condition is considered the most likely condition value to be achieved.</p>
LE6.2 Banks and Ditches (bank element)	Grassland - Other neutral grassland	Medium, High and Very High Distinctiveness Grasslands	Good	<p>Banks along proposed new ditches to offset the loss of watercourses and water vole habitat as a result of the Project. Ditches would be designed to offer water vole foraging and burrowing opportunities with banks profiles at 45° angles above water level to provide burrowing sites, and a diverse range of native riparian vegetation to give foraging opportunities throughout the year.</p> <p>Ditches would be designed to offer water vole foraging and burrowing opportunities with banks profiles at 45° angles</p>

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
				<p>above water level to provide burrowing sites, and a diverse range of native riparian vegetation to give foraging opportunities throughout the year.</p> <p>The management regime proposed would allow all criteria to be met as described for LE1.3 above.</p>
LE6.2 Banks and Ditches (ditch element for Wetland - Floodplain wetland mosaic (CFGM) only)	Ditches are considered separately in the Rivers and Streams assessment unless part of a Wetland - Floodplain wetland mosaic (CFGM)	Ditch	Moderate	See context and justification for LE6.41.
LE6.21 Banks and Ditches - High Tide Roost Features	Wetland - Floodplain wetland mosaic (CFGM)	Wetland	Good	<p>This habitat includes raised ground or bank features within or adjacent to wet scrape habitats that would be suitable for roosting of waterfowl feature species of the Thames Estuary and Marshes SPA / Ramsar during high tides.</p> <p>This habitat type is only used at the land adjacent to Coalhouse Point, indicated on the Environmental Masterplan (Application Document 6.2, Figure 2.4) and described in Clause S9.13 of the Design Principles (Application Document 7.5). The water required to maintain a range of depths within the habitat will be secured prior to completion of the habitat creation works and will, unless otherwise agreed with the Secretary of State, be sourced from the River Thames by means of a self-regulating tide gate or equivalent structure, in the sea wall, at approximately TQ686761, to allow regulated tidal</p>

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
				exchange, unless a formal agreement with Thurrock Council to release water on request from the Coalhouse Fort moat system has been secured (REAC Ref. HR010).
LE6.4 Wet Grassland	Grassland - Other neutral grassland	Medium, High and Very High Distinctiveness Grasslands	Good	<p>Areas of grassland planting containing moisture-loving grass and wildflower species situated around the periphery of water bodies or in grassland areas prone to be seasonally inundated with water.</p> <p>Although the habitat would have a diverse range of wildflower species it is unlikely to achieve a higher distinctiveness habitat.</p> <p>The management regime proposed would allow all criteria to be met as described for LE1.3 above.</p>
LE6.41 Marsh and Wet Grassland - Coastal Grazing Marsh	Wetland - Floodplain wetland mosaic (CFGM)	Wetland	Moderate	<p>The habitat would be located within the areas of enhanced functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar and includes areas of seasonally wet grassland and shallow edged ditches.</p> <p>This habitat type would be created at land adjacent to Coalhouse Point and land adjacent to Thames and Medway Canal as indicated on the Environmental Masterplan (Figure 2.4, Application Document 6.2). The oLEMP management requirements state management would, '<i>...maintain the ditch network as open ditches with shallow profiled banks through ditch clearance and bank profiling on a ten-year rotational management regime. Ditch management to be carried out only on one bank with one fifth of ditches being managed each year</i>'.</p> <p>While there is a commitment to maintain ditch water levels at Coalhouse Point (REAC Ref. HR010) this is not secured for the land adjacent to Thames and Medway Canal. As such a precautionary approach is taken to ditch condition, and it is not assumed that water levels will be maintained</p>

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
				for this habitat type (which is a requirement for condition criteria 7d) and a target condition of Moderate is applied.
LE7.2 Green Roof	Urban - Biodiverse green roof/extensive	Urban	Good	<p>Green roofs are proposed at both the North Portal and South Portal. Both roofs are designed to be extensive green roofs and require low maintenance.</p> <p>The green roof at the South Portal would reflect the surrounding chalk grassland character. The green roof at the North Portal would reflect the character of the surrounding marshland character.</p> <p>The proposed design would meet the definition of a biodiverse green roof with a varied substrate depth of between 80 and 150mm with at least 50% of the roof at 150mm deep; using a wide range of dry grassland wildflowers and sedum species; and include features suitable for invertebrates such as log piles (see criterion 4c2).</p> <p>Good condition would be met through habitat creation and management ensuring the green roof has a varied vegetation structure with a diverse range of flowering plant species and ensuring invasive species cover less than 5% of the total vegetated area.</p>
LE7.3 Car Park	Urban - Developed land; sealed surface	N/A	N/A	N/A.
LE8.1 EHA - Open Mosaic Habitat	Urban - Open Mosaic Habitat on Previously Developed Land	Urban	Good	<p>Open mosaic habitat proposed as essential component of the landscape mitigation design and designed to provide biodiversity value.</p> <p>The habitat would be designed specifically to meet the habitat type and Good condition requirements: There would be a diverse range of native flowering plant species present, creating a diverse vegetation structure; regular</p>

Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
				management would ensure non-native species would cover less than 5%; and the habitat would be designed to include a mosaic landscape including bare substrate, and at least four early successional communities.
LE8.2 Ancient Woodland Compensation Planting	Woodland and forest - Lowland mixed deciduous woodland	Lowland mixed deciduous woodland	N/A	Not included in the Metric assessment as this is bespoke compensation for irreplaceable habitat.
LE8.3 Woodland Mitigation Planting	Woodland and forest - Other woodland; broadleaved	Woodland	Moderate	<p>Woodland mitigation planting proposed within the management areas for Thames Chase compensation land and Hole Farm.</p> <p>These management areas would provide woodland replacement for woodland loss as a result of the Project and provide visual screening, landscape integration and biodiversity benefits.</p> <p>The approach to condition assessment is the same as that taken for LE2.1 above. This approach results in a score of 27 points and meets an overall condition value of Moderate.</p>
LE8.4 Wetland/Fenland Creation	Wetland - Floodplain wetland mosaic (CFGM)	Wetland	Moderate	<p>The marsh and wet grassland – fen typology would be located within the Orsett Fen Management area and include a mosaic of blocks of wet woodland, wet grassland, dry grassland, water bodies, ditches, reed and marginal planting.</p> <p>A precautionary approach of applying Moderate condition has been taken. It is not assumed ditches would achieve Good condition (in respect of the Ditch Condition Sheet) which is a requirement for condition criteria 7d. For ditches water levels (Criterion 6) are not assumed to be maintained.</p>

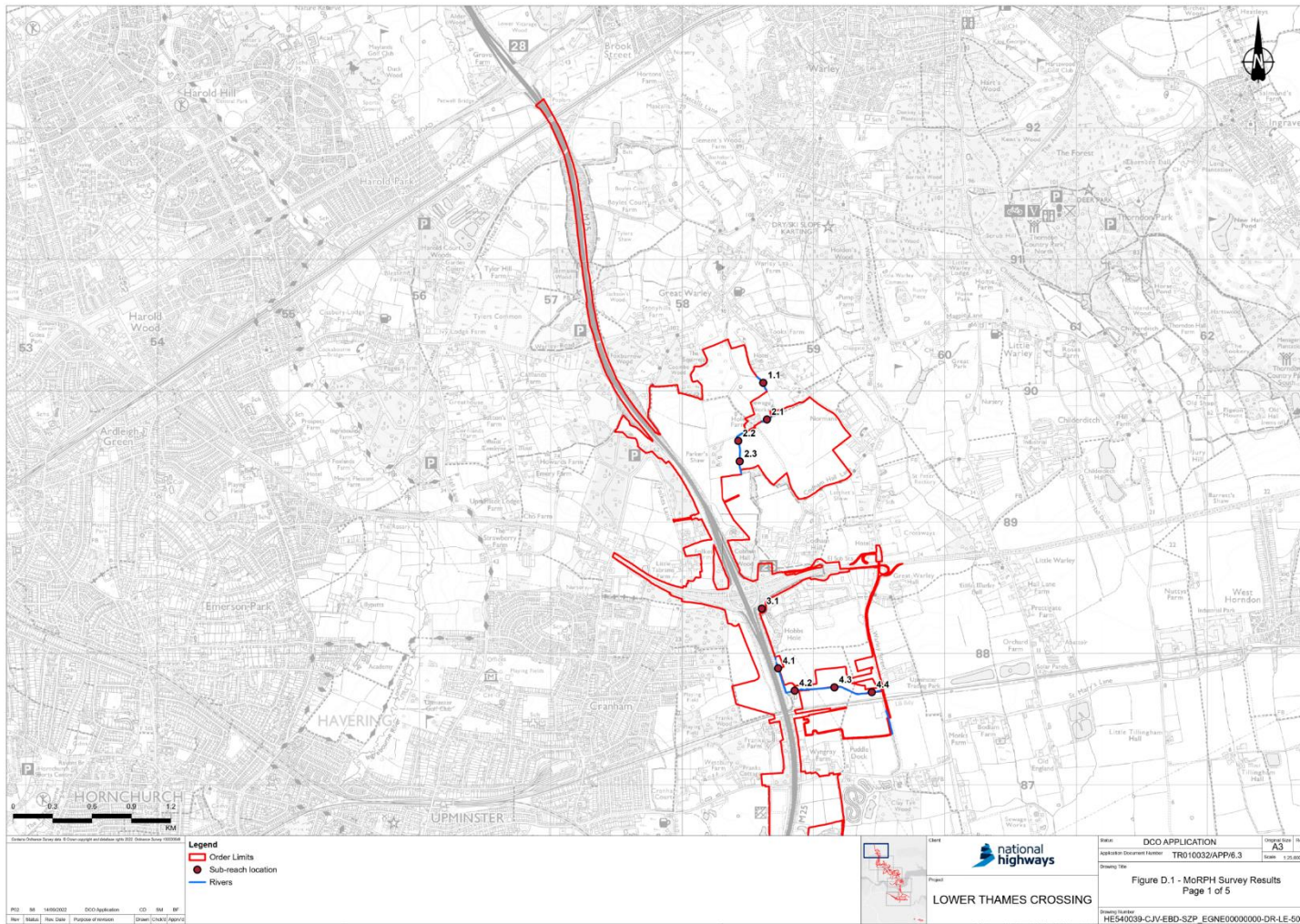
Created habitat (LE code)	Metric 3.1 habitat (area)	Condition assessment sheet	Target condition	Context and justification
LE8.5 EHA - Ecology Pond	Lakes - Ponds (Priority habitats)	Pond	Good	<p>Ponds designed specifically to benefit great crested newts (GCN).</p> <p>Ponds would be managed to target Good condition given their primary function is to support GCN. It is considered that all criteria can be met to achieve Good condition for ponds, including those within woodlands.</p>
LE8.6 EHA - Acid Grassland Soil Salvage	Grassland - Lowland dry acid grassland	Medium, High and Very High Distinctiveness Grasslands.	Good	<p>Acid grassland soil salvage is proposed from Low Street Pit LWS which would be lost as a result of the Project's construction, to be moved to a receptor site on land close to Coalhouse Fort</p> <p>This habitat would be created following consideration of hydrology, soil testing and assessment. The species composition would be that which matches the very high distinctiveness habitat.</p> <p>The management regime proposed would allow all criteria to be met as described for LE1.3 above. Good condition is considered achievable, passing all five criteria.</p>
LE9.2 Open Space Replacement	N/A	N/A	N/A	Captured by other LE codes
LMU routes	N/A	N/A	N/A	Captured by other LE codes
Road surface hatch	N/A	N/A	N/A	Captured by other LE codes

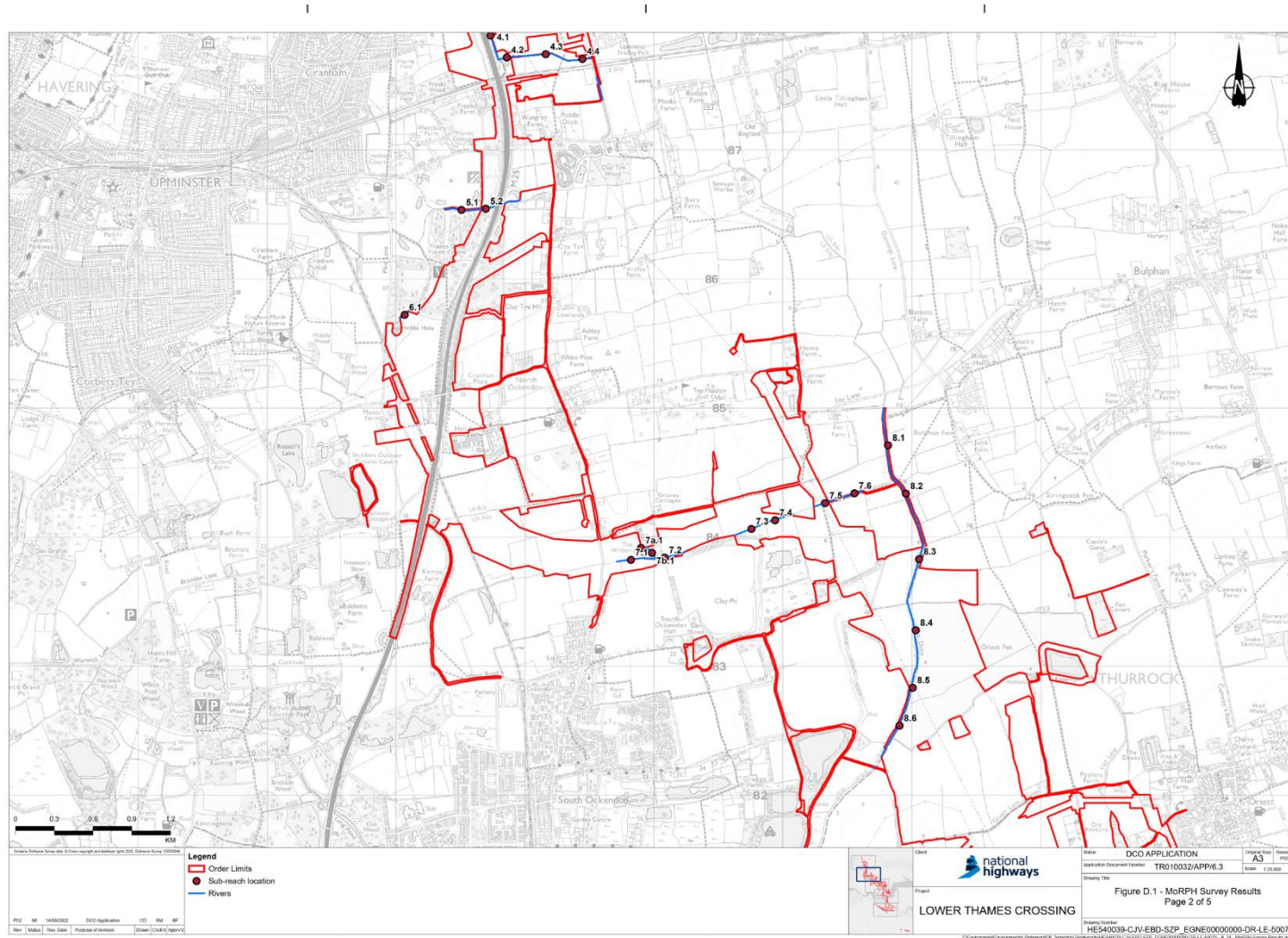
Table C.2 Target habitat type and condition – hedgerow habitats

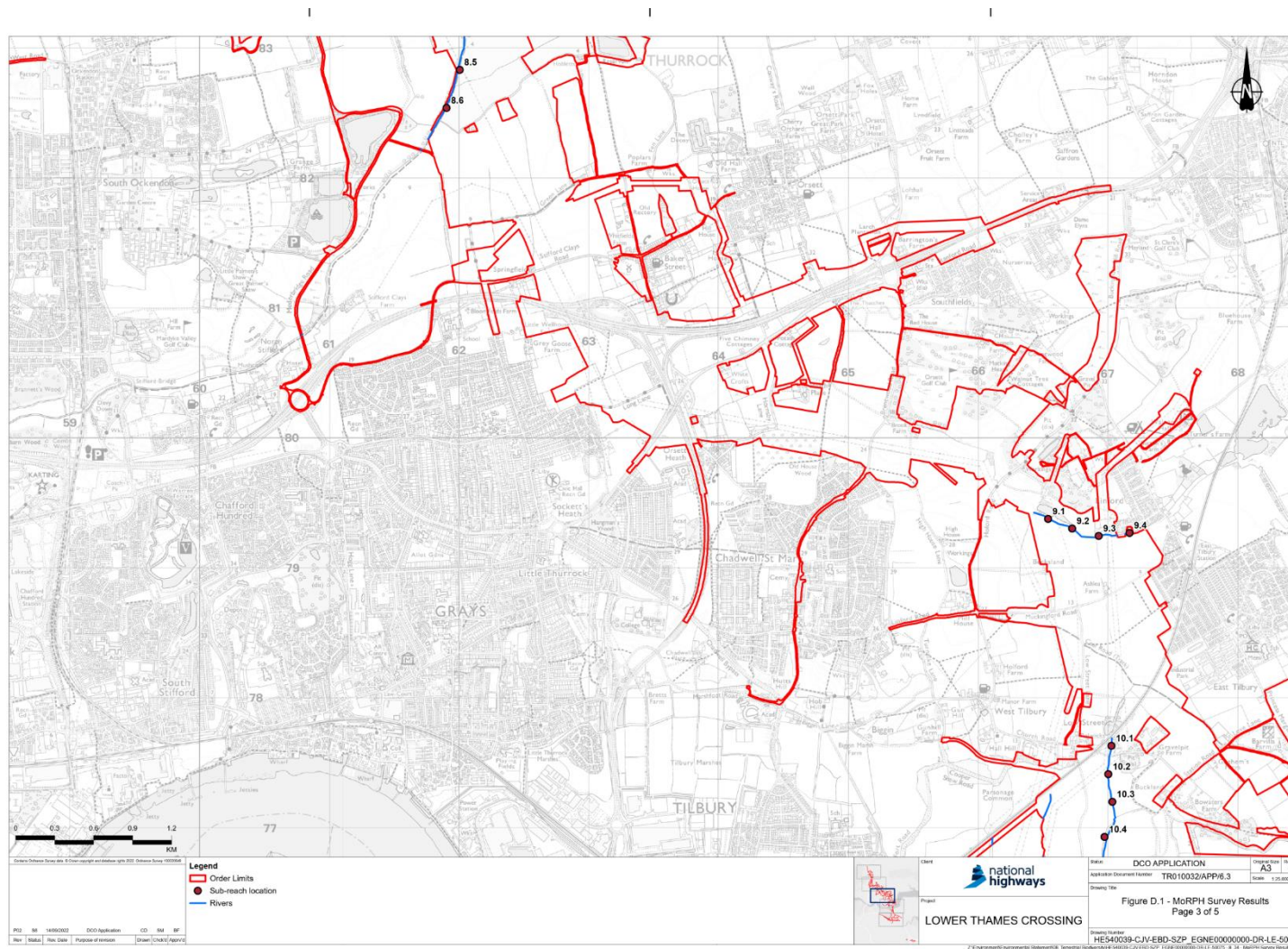
Created habitat (LE code)	Metric 3.1 habitat (linear)	Condition assessment sheet	Target condition	Translation justification and context
LE4.3 Native Species Hedgerow (untrimmed)	Native species-rich hedgerow	Hedgerow	Good	<p>Native species hedges to provide wildlife corridors and habitat connectivity throughout the Project and integrate the Project route into the adjacent landscape.</p> <p>It is considered likely that at least seven of the eight criteria would be met in order to achieve Good condition.</p> <p>Condition criterion C2 would be difficult to confidently ensure as it would be impacted by surrounding environmental factors such as spraying on nearby fields. The management applied would aim to keep nutrient enriched perennial vegetation under 20% coverage. However, this cannot be guaranteed at this stage.</p>
LE4.4 Native Hedgerow with Trees	Native species-rich hedgerow with trees	Hedgerow	Good	<p>Native species-rich hedgerows comprise native scrub species providing containment, significant wildlife habitat and an ecological corridor.</p> <p>It is considered likely that at least nine of the 10 criteria would be met in order to achieve Good condition. However, as above for LE4.3, condition criterion C2 is difficult to guarantee at this stage.</p>

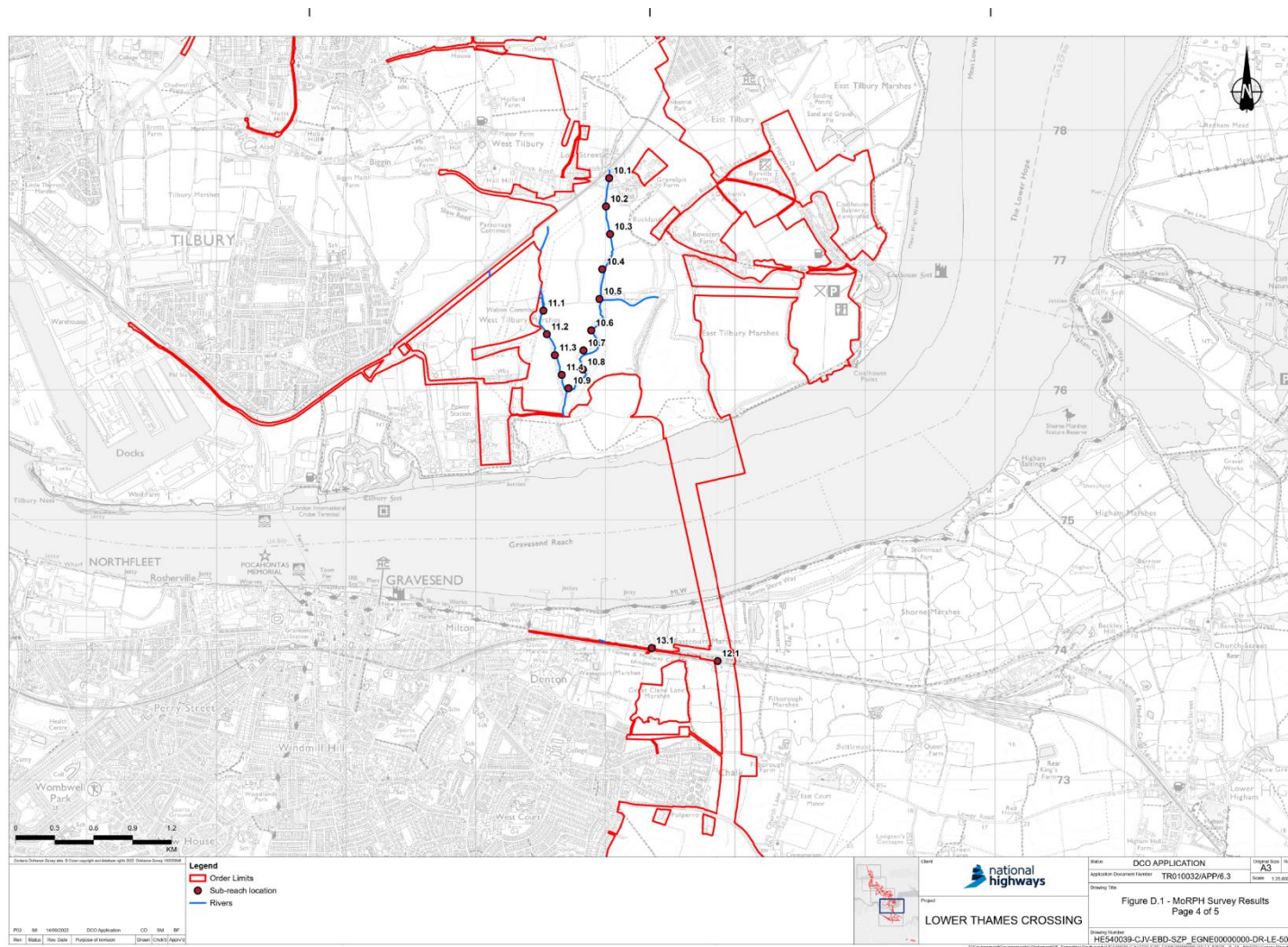
Annex D Rivers and streams

Figure D.1 MoRPH Survey Locations









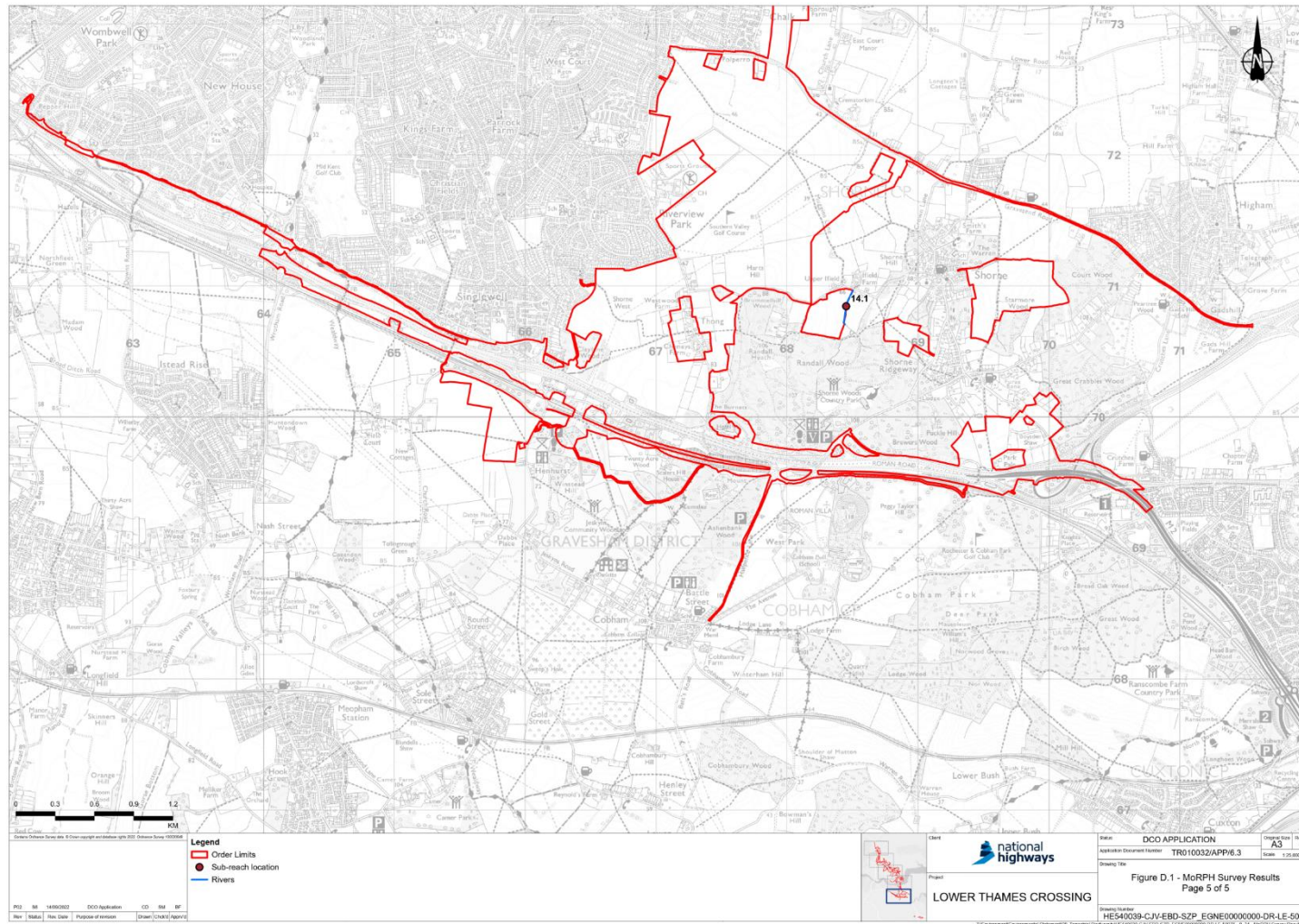


Table D.1 MoRPh5 survey parameters

Reach Number	Reach Name	Reach Length (m)	20% of Length (m)	River width (m)	Module Length (m)	MoRPh5 Length (m)	Number of subreaches
1	Unnamed Watercourse 1	131	26.2	<5	10	50	1
2	Unnamed Watercourse 2	448	89.6	<5	10	50	3
3	Unnamed Watercourse 3	25	5	<5	10	50	1
4	Unnamed Watercourse 4	995	199	<5	10	50	4
5	Unnamed Watercourse 5	546	109.2	<5	10	50	2
6	Unnamed Watercourse 6	89	17.8	<5	10	50	1
7	Unnamed Watercourse 7	1,543	308.6	<5	10	50	7
7b	Unnamed Watercourse 7b	115	23	<5	10	50	1
8	Mar Dyke	2,871	574.2	5-10	20	100	6
9	Unnamed Watercourse 9	762	152.4	<5	10	50	4
10	Unnamed Watercourse 10	1,951	390.2	<5	10	50	9
11	Unnamed Watercourse 11	1,069	213.8	<5	10	50	4
12	Thames and Medway Canal	1,582	316.4	>30	50	250	1

Reach Number	Reach Name	Reach Length (m)	20% of Length (m)	River width (m)	Module Length (m)	MoRPh5 Length (m)	Number of subreaches
13	Unnamed Watercourse 13	38	7.6	<5	10	50	1
14	Unnamed Watercourse 14	275	55	<5	10	50	1

Table D.2 MoRPh5 river baseline condition indicators part 1

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 1		Unnamed Watercourse 2		Unnamed Watercourse 3	Unnamed Watercourse 4				Unnamed Watercourse 5		Unnamed Watercourse 6	Unnamed Watercourse 7
		Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 1	Subreach 1
Bank top	B1: Bank top vegetation structure (+)	2	3	2	2	2	2	1	1	1	3	3	1	1
	B2: Bank top tree feature richness (+)	0	0	1	0	0	0	0	0	0	0	1	0	0
	B3: Bank top water related features (+)	0	0	0	0	0	0	0	0	0	0	0	0	0
	B4: Bank top Non-native Invasive Species (-)	0	0	0	0	0	0	0	0	0	0	0	0	0

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 1		Unnamed Watercourse 2		Unnamed Watercourse 3		Unnamed Watercourse 4			Unnamed Watercourse 5		Unnamed Watercourse 6	Unnamed Watercourse 7
		Subreach 1	Subreach 2	Subreach 1	Subreach 2	Subreach 1	Subreach 2	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 1
	B5: Bank top managed ground cover (-)	-3	-3	-3	0	0	-4	-3	-3	-3	-3	-2	-3	-3
Bank face	C1: Bank face riparian vegetation structure (+)	2	2	2	1	2	3	2	1	2	2	2	3	1
	C2: Bank face tree feature richness (+)	1	0	1	0	1	0	0	0	1	1	3	3	2
	C3: Bank face natural bank profile extent (+)	2	2	2	2	0	2	0	2	2	2	3	2	0
	C4: Bank face natural bank profile richness (+)	1	1	1	1	0	1	0	1	1	3	4	1	0
	C5: Bank face natural bank material richness (+)	1	1	1	1	1	1	1	1	1	1	1	1	1

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 1		Unnamed Watercourse 2		Unnamed Watercourse 3		Unnamed Watercourse 4			Unnamed Watercourse 5		Unnamed Watercourse 6	Unnamed Watercourse 7
		Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 1	Subreach 1
	C6: Bank face bare sediment extent (+)	2	0	0	0	0	3	0	0	0	1	3	3	3
	C7: Bank face artificial bank profile extent (-)	0	0	0	0	-4	-4	-4	0	0	-1	0	0	-4
	C8: Bank face reinforcement extent (-)	0	0	0	0	-3	-3	-3	0	0	0	0	0	0
	C9: Bank face reinforcement material severity (-)	0	0	0	0	-4	-4	-4	0	0	0	0	0	0
	C10: Bank face Non-native Invasive Species Cover (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
Water margin	D1: Channel margin aquatic vegetation extent (+)	0	0	0	0	0	0	0	0	0	3	1	1	0

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 1				Unnamed Watercourse 2				Unnamed Watercourse 3				Unnamed Watercourse 4				Unnamed Watercourse 5				Unnamed Watercourse 6				Unnamed Watercourse 7			
		Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 1	Subreach 1	Subreach 1	Subreach 1	Subreach 1	Subreach 1	Subreach 1	Subreach 1	Subreach 1	Subreach 1	Subreach 1	Subreach 1
	D2: Channel margin aquatic morphotype richness (+)	0	0	0	0	0	0	0	0	0	0	3	0	1	0														
	D3: Channel margin physical feature extent (+)	0	0	0	0	0	0	0	0	0	0	0	1	0	0														
	D4: Channel margin physical feature richness (+)	0	0	0	0	0	0	0	0	0	0	0	1	0	0														
	D5: Channel margin artificial features (-)	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0													
Channel Bed	E1: Channel aquatic morphotype richness (+)	0	0	0	0	0	0	1	0	0	2	2	0	0															
	E2: Channel bed tree feature richness (+)	2	1	0	1	1	1	1	2	2	1	3	2	2															

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 1		Unnamed Watercourse 2		Unnamed Watercourse 3		Unnamed Watercourse 4			Unnamed Watercourse 5		Unnamed Watercourse 6	Unnamed Watercourse 7
		Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 1	Subreach 1
	E3: Channel bed hydraulic features richness (+)	0	0	0	0	0	1	1	1	1	1	2	0	0
	E4: Channel bed natural features extent (+)	0	0	0	0	0	0	0	0	0	1	2	0	0
	E5: Chanel bed natural features richness (+)	0	0	0	0	0	0	0	0	0	1	1	0	0
	E6: Channel bed material richness (+)	1	1	1	1	1	1	1	1	1	3	3	2	2
	E7: Channel bed siltation	0	0	0	0	0	0	-2	0	0	0	-2	0	0
	E8: Channel bed reinforcement extent (-)	0	0	0	0	-4	-4	-4	0	0	0	0	0	0

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 1		Unnamed Watercourse 2		Unnamed Watercourse 3		Unnamed Watercourse 4			Unnamed Watercourse 5		Unnamed Watercourse 6	Unnamed Watercourse 7
		Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 1	Subreach 1
	E9: Channel bed reinforcement severity (-)	0	0	0	0	-4	-4	-4	0	0	0	0	0	0
	E10: Channel bed artificial features severity (-)	0	0	0	0	0	0	0	0	0	0	-1	0	0
	E11: Channel bed Non-native Invasive Species (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
	E12: Channel bed filamentous algae extent (-)	0	0	0	0	0	-3	-3	0	0	0	0	0	0
Average Positive		0.74	0.58	0.58	0.47	0.42	0.79	0.42	0.53	0.63	1.47	1.89	1.05	0.63
Average Negative		-0.23	-0.23	-0.23	0.00	-1.46	-2.00	-2.15	-0.23	-0.23	-0.31	-0.38	-0.23	-0.54
Preliminary Score		0.51	0.35	0.35	0.47	-1.04	-1.21	-1.73	0.30	0.40	1.17	1.51	0.82	0.09

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 1				Unnamed Watercourse 2				Unnamed Watercourse 3				Unnamed Watercourse 4				Unnamed Watercourse 5		Unnamed Watercourse 6		Unnamed Watercourse 7	
		Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 1	Subreach 1				
Preliminary Condition		Moderate	Moderate	Moderate	Moderate	Poor	Poor	Poor	Moderate	Moderate	Moderate	Fairly Good	Moderate	Fairly Poor									
Overdeep		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes										
Final Condition		Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Poor	Poor	Poor	Fairly Poor	Fairly Poor	Fairly Poor	Moderate	Fairly Poor	Poor									

Table D.3 MoRPh5 river baseline condition indicators part 2

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 7						Unnamed Watercourse 7b	Mar Dyke					
		Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6
Bank top	B1: Bank top vegetation structure (+)	2	2	1	3	1	1	3	1	2	1	2	2	2
	B2: Bank top tree feature richness (+)	0	1	0	1	0	0	4	0	0	0	2	0	2
	B3: Bank top water related features (+)	0	0	0	0	0	0	2	0	0	0	0	0	0
	B4: Bank top Non-native Invasive Species (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
	B5: Bank top managed ground cover (-)	-2	-2	-2	-3	-4	-3	-1	-4	-4	-4	-4	-3	-3
Bank face	C1: Bank face riparian vegetation structure (+)	2	2	2	3	1	1	2	2	3	3	3	3	2

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 7						Unnamed Watercourse 7b	Mar Dyke					
		Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6
	C2: Bank face tree feature richness (+)	3	1	2	4	0	0	4	1	2	1	0	1	2
	C3: Bank face natural bank profile extent (+)	2	3	2	2	2	2	2	2	2	2	2	2	2
	C4: Bank face natural bank profile richness (+)	1	2	1	1	1	1	1	2	2	2	1	2	1
	C5: Bank face natural bank material richness (+)	1	1	1	1	1	1	1	1	1	1	1	1	1
	C6: Bank face bare sediment extent (+)	3	0	2	4	0	0	2	0	1	0	0	0	0
	C7: Bank face artificial bank profile extent (-)	-3	0	0	0	0	0	0	0	0	0	0	0	0

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 7						Unnamed Watercourse 7b	Mar Dyke					
		Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6
	C8: Bank face reinforcement extent (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
	C9: Bank face reinforcement material severity (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
	C10: Bank face Non-native Invasive Species Cover (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
Water margin	D1: Channel margin aquatic vegetation extent (+)	0	0	0	1	3	3	0	3	3	3	2	4	2
	D2: Channel margin aquatic morphotype richness (+)	0	0	0	1	1	1	0	1	1	1	1	2	1

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 7						Unnamed Watercourse 7b	Mar Dyke					
		Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6
	D3: Channel margin physical feature extent (+)	0	0	0	0	0	0	1	0	0	0	0	0	0
	D4: Channel margin physical feature richness (+)	0	0	0	0	0	0	1	0	0	0	0	0	0
	D5: Channel margin artificial features (-)	0	0	0	0	0	0	0	0	0	0	-1	0	0
Channel Bed	E1: Channel aquatic morphotype richness (+)	0	0	1	1	2	2	0	1	1	2	1	2	2
	E2: Channel bed tree feature richness (+)	2	2	1	3	0	1	3	1	1	1	1	1	3
	E3: Channel bed hydraulic features richness (+)	1	1	0	2	0	0	2	0	0	0	0	0	0

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 7						Unnamed Watercourse 7b	Mar Dyke					
		Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6
	E4: Channel bed natural features extent (+)	0	0	0	0	0	0	1	0	0	0	0	0	0
	E5: Channel bed natural features richness (+)	0	0	0	0	0	0	1	0	0	0	0	0	0
	E6: Channel bed material richness (+)	3	1	2	1	1	1	2	1	2	1	1	1	1
	E7: Channel bed siltation	0	-4	0	-4	0	0	0	0	0	0	0	0	0
	E8: Channel bed reinforcement extent (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
	E9: Channel bed reinforcement severity (-)	0	0	0	0	0	0	0	0	0	0	0	0	0

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 7						Unnamed Watercourse 7b	Mar Dyke					
		Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6
	E10: Channel bed artificial features severity (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
	E11: Channel bed Non-native Invasive Species (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
	E12: Channel bed filamentous algae extent (-)	0	0	0	0	0	0	0	0	0	0	0	0	-3
	Average Positive	1.05	0.84	0.79	1.47	0.68	0.74	1.68	0.84	1.11	0.95	0.89	1.11	1.11
	Average Negative	-0.38	-0.46	-0.15	-0.54	-0.31	-0.23	-0.08	-0.31	-0.31	-0.31	-0.38	-0.23	-0.46
	Preliminary Score	0.67	0.38	0.64	0.94	0.38	0.51	1.61	0.53	0.80	0.64	0.51	0.87	0.64
	Preliminary Condition	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Fairly Good	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
	Overdeep	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 7					Unnamed Watercourse 7b	Mar Dyke							
		Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 1	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	
Final Condition		Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Moderate	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor

Table D.4 MoRPh5 river baseline condition indicators part 3

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 9				Unnamed Watercourse 10								
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 8	Subreach 9
Bank top	B1: Bank top vegetation structure (+)	2	2	2	3	2	2	2	1	1	1	2	2	1
	B2: Bank top tree feature richness (+)	3	2	0	2	1	0	0	0	0	0	0	0	0
	B3: Bank top water related features (+)	2	4	0	0	0	0	0	0	0	0	0	0	0
	B4: Bank top Non-native Invasive Species (-)	0	-3	0	0	0	0	0	0	0	0	0	0	0
	B5: Bank top managed ground cover (-)	0	-2	-2	-4	-2	-3	-3	-4	-2	-2	-2	-2	-2
Bank face	C1: Bank face riparian vegetation structure (+)	2	2	2	1	3	1	2	1	1	1	1	1	1

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 9				Unnamed Watercourse 10								
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 8	Subreach 9
	C2: Bank face tree feature richness (+)	2	2	2	1	3	0	0	1	0	0	1	2	0
	C3: Bank face natural bank profile extent (+)	2	2	3	3	3	2	2	2	2	2	2	3	2
	C4: Bank face natural bank profile richness (+)	1	1	2	3	2	1	1	2	1	1	1	2	1
	C5: Bank face natural bank material richness (+)	1	1	1	1	1	1	1	1	1	1	1	1	1
	C6: Bank face bare sediment extent (+)	2	0	1	0	4	0	0	0	0	0	0	1	0
	C7: Bank face artificial bank profile extent (-)	0	0	0	0	0	0	0	-3	0	-3	0	-3	0

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 9				Unnamed Watercourse 10								
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 8	Subreach 9
	C8: Bank face reinforcement extent (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
	C9: Bank face reinforcement material severity (-)	0	-1	0	0	0	0	0	0	0	0	0	0	0
	C10: Bank face Non-native Invasive Species Cover (-)	0	-3	0	0	0	0	0	0	0	0	0	0	0
Water margin	D1: Channel margin aquatic vegetation extent (+)	0	0	1	2	2	3	3	3	3	3	3	3	3
	D2: Channel margin aquatic morphotype richness (+)	0	0	1	1	1	1	1	1	1	1	1	1	1

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 9				Unnamed Watercourse 10								
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 8	Subreach 9
	D3: Channel margin physical feature extent (+)	0	0	1	0	1	0	0	0	1	0	0	0	0
	D4: Channel margin physical feature richness (+)	0	0	1	0	1	0	0	0	1	0	0	0	0
	D5: Channel margin artificial features (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
Channel Bed	E1: Channel aquatic morphotype richness (+)	1	0	1	1	1	1	2	1	1	1	1	1	1
	E2: Channel bed tree feature richness (+)	2	2	2	2	3	0	1	1	1	0	0	1	0
	E3: Channel bed hydraulic features richness (+)	0	0	1	1	0	0	0	0	0	0	0	0	0

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 9				Unnamed Watercourse 10								
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 8	Subreach 9
	E4: Channel bed natural features extent (+)	0	0	0	0	0	0	0	0	0	0	0	0	0
	E5: Channel bed natural features richness (+)	0	0	0	0	0	0	0	0	0	0	0	0	0
	E6: Channel bed material richness (+)	1	1	2	1	1	1	1	1	1	1	1	1	1
	E7: Channel bed siltation	0	0	0	-4	0	0	0	0	0	0	0	0	0
	E8: Channel bed reinforcement extent (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
	E9: Channel bed reinforcement severity (-)	0	0	0	0	0	0	0	0	0	0	0	0	0

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 9				Unnamed Watercourse 10								
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 8	Subreach 9
	E10: Channel bed artificial features severity (-)	0	0	0	0	-4	0	0	0	0	0	0	0	0
	E11: Channel bed Non-native Invasive Species (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
	E12: Channel bed filamentous algae extent (-)	0	0	0	0	0	0	0	0	0	0	0	0	0
Average Positive		1.11	1.00	1.21	1.16	1.53	0.68	0.84	0.79	0.79	0.63	0.74	1.00	0.63
Average Negative		0.00	-0.69	-0.15	-0.62	-0.46	-0.23	-0.23	-0.54	-0.15	-0.38	-0.15	-0.38	-0.15
Preliminary Score		1.11	0.31	1.06	0.54	1.06	0.45	0.61	0.25	0.64	0.25	0.58	0.62	0.48
Preliminary Condition		Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Overdeep		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 9				Unnamed Watercourse 10								
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 5	Subreach 6	Subreach 7	Subreach 8	Subreach 9
Final Condition		Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor

Table D.5 MoRPh5 river baseline condition indicators part 4

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 11				Thames and Medway Canal 1	Unnamed Watercourse 13	Unnamed Watercourse 14
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 1	Subreach 1
Bank top	B1: Bank top vegetation structure (+)	2	2	2	2	3	2	2
	B2: Bank top tree feature richness (+)	0	1	0	0	0	0	0
	B3: Bank top water related features (+)	2	0	0	0	3	1	0
	B4: Bank top Non-native Invasive Species (-)	0	0	0	0	0	0	0
	B5: Bank top managed ground cover (-)	-2	-2	-2	-2	-4	-2	-3
Bank face	C1: Bank face riparian vegetation structure (+)	2	1	2	1	1	1	2
	C2: Bank face tree feature richness (+)	1	0	0	1	0	0	0
	C3: Bank face natural bank profile extent (+)	2	2	2	2	0	2	2

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 11				Thames and Medway Canal 1	Unnamed Watercourse 13	Unnamed Watercourse 14
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 1	Subreach 1
	C4: Bank face natural bank profile richness (+)	1	1	1	1	0	1	1
	C5: Bank face natural bank material richness (+)	1	1	1	1	1	1	1
	C6: Bank face bare sediment extent (+)	0	0	1	0	0	0	0
	C7: Bank face artificial bank profile extent (-)	0	0	0	0	-4	0	0
	C8: Bank face reinforcement extent (-)	0	0	0	0	0	0	0
	C9: Bank face reinforcement material severity (-)	0	0	0	0	0	0	0
	C10: Bank face Non-native Invasive Species Cover (-)	0	0	0	0	0	0	0
Water margin	D1: Channel margin aquatic vegetation extent (+)	2	2	2	2	3	0	0
	D2: Channel margin aquatic morphotype richness (+)	1	1	1	1	1	0	0

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 11				Thames and Medway Canal 1	Unnamed Watercourse 13	Unnamed Watercourse 14
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 1	Subreach 1
	D3: Channel margin physical feature extent (+)	0	0	0	0	0	0	0
	D4: Channel margin physical feature richness (+)	0	0	0	0	0	0	0
	D5: Channel margin artificial features (-)	0	0	0	0	0	0	0
Channel Bed	E1: Channel aquatic morphotype richness (+)	1	1	1	1	1	0	0
	E2: Channel bed tree feature richness (+)	2	1	1	1	0	1	1
	E3: Channel bed hydraulic features richness (+)	0	0	0	0	0	0	0
	E4: Channel bed natural features extent (+)	0	0	0	0	0	0	0
	E5: Channel bed natural features richness (+)	0	0	0	0	0	0	0
	E6: Channel bed material richness (+)	1	1	1	1	1	1	1

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 11				Thames and Medway Canal 1	Unnamed Watercourse 13	Unnamed Watercourse 14
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 1	Subreach 1
	E7: Channel bed siltation	0	0	0	0	0	0	0
	E8: Channel bed reinforcement extent (-)	0	0	0	0	0	0	0
	E9: Channel bed reinforcement severity (-)	0	0	0	0	0	0	0
	E10: Channel bed artificial features severity (-)	0	0	0	0	0	0	0
	E11: Channel bed Non-native Invasive Species (-)	0	0	0	0	0	0	0
	E12: Channel bed filamentous algae extent (-)	0	0	0	0	-4	0	0
Average Positive		0.95	0.74	0.79	0.74	0.74	0.53	0.53
Average Negative		-0.15	-0.15	-0.15	-0.15	-0.92	-0.15	-0.23
Preliminary Score		0.79	0.58	0.64	0.58	-0.19	0.37	0.30

Location	Indicator code, description and positive/negative categorisation	Unnamed Watercourse 11				Thames and Medway Canal 1	Unnamed Watercourse 13	Unnamed Watercourse 14
		Subreach 1	Subreach 2	Subreach 3	Subreach 4	Subreach 1	Subreach 1	Subreach 1
Preliminary Condition		Moderate	Moderate	Moderate	Moderate	Fairly Poor	Moderate	Moderate
Overdeep		Yes	Yes	Yes	Yes	No	No	Yes
Final Condition		Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Moderate	Fairly Poor

Table D.6 Rivers and streams baseline condition assessment

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
Rivers - Ditches	G1 - Ditch	<p>Ditch condition sheet:</p> <p><u>Water quality</u> - Consult target notes plus otter and water vole data, or great crested newt HSI data for both desk and field-assessed parcels. In the absence of data to support assessment, desk-assessed parcels assumed to have good water quality i.e. pass. Field-assessed parcels assumed to have poor water quality, fail (considered that good water quality would have been recorded). If data suggest the ditch was dry, this criterion was considered failed.</p> <p><u>>10 species of emergent, submerged and floating leaved plants</u> - Consult target notes plus otter and water vole data, or great crested newt HSI data for both desk and field-assessed parcels. In the absence of data to support assessment, desk-assessed parcels assumed to have range of submerged and floating leaved plants, i.e. pass, and field-assessed parcels assumed to fail (considered that this information would have been recorded if present).</p>
	G2 - Ditch	<p><u>Duckweed/algae <10%</u> - Assumed to pass unless target notes, otter and water vole data, or great crested newt HSI data suggest otherwise.</p> <p><u>Marginal vegetation along >75% ditch</u> - Assumed to pass unless target notes, otter and water vole data, or great crested newt HSI data suggest otherwise.</p> <p><u>Physical damage</u> - It was considered that a review of the surrounding land use (Phase 1 habitat data and aerial photography) would be a suitable proxy for this criterion. Ditches surrounded by any semi-natural habitats (such as semi-natural woodland, meadows, ruderal herbs etc.) were assumed to pass, and those surrounded by modified habitats (such as agricultural, pasture, industrial, urban, etc.) were assumed to fail, unless target notes otter and water vole data, or great crested newt HSI data suggest otherwise</p> <p><u>Water levels 50cm-1m</u> - Assumed to fail unless target notes, otter and water vole data, or great crested newt HSI data suggest otherwise.</p> <p><u>Shade <10%</u> - Aerial photography consulted unless target notes, otter and water vole data, or great crested newt HSI data suggest otherwise.</p>

Metric 3.1 habitat type	Phase 1 habitat type	Condition criteria – approach to assessment and assumptions made where relevant
		<u>Absence of non-native plants and animals</u> - Invasive species data, great crested newt HIS, otter and water vole data, and target notes consulted.
Rivers - Canals	G1 - Canal	Assessed using the MoRPh method.
Rivers - Other Rivers and Streams	G2 - Rivers/streams	Assessed using the MoRPh method.
Rivers - Culverts	G1 - Rivers/streams culverts	All culverts have a default condition of 'poor' in the metric.
	G1 - Ditch culverts	

Table D.7 Rivers and streams creation condition assessment

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
Unnamed Watercourse 7, Subreach 5	Other Rivers and Streams	Fairly Poor	0.044	0.047	No change to condition, but watercourse and riparian encroachment changed by proposed bridge and access road.
1523a_CUL	Culvert	Poor	0.140	0.209	Proposed culvert on diversion of Unnamed Watercourse 9, Subreach 1 and 2.
1523a_DIV	Other Rivers and Streams	Fairly Poor	0.147	0.315	Diversion of Unnamed Watercourse 9, Subreach 1 and 2. Assumed condition matches baseline.
1821a_CUL	Culvert	Poor	0.040	0.060	Proposed culvert on diversion of Unnamed Watercourse 7, Subreach 1 and 2.
1821a_DIV	Other Rivers and Streams	Poor	0.779	1.538	Diversion of Unnamed Watercourse 7, Subreach 1 and 2. Assumed condition matches baseline.
0143_DIV	Other Rivers and Streams	Fairly Poor	0.256	0.695	Diversion of Unnamed Watercourse 7, Subreach 3. Assumed condition matches baseline.
1958_CUL	Culvert	Poor	0.010	0.014	Culvert extension.
Unnamed Watercourse 4, Subreach 2	Other Rivers and Streams	Poor	0.063	0.047	No change to condition, but riparian encroachment changed by proposed access road.
Unnamed Watercourse 4, Subreach 4	Other Rivers and Streams	Fairly Poor	0.063	0.135	No change to condition, but riparian encroachment changed by proposed access road.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
Unnamed Watercourse 4, Subreach 4	Other Rivers and Streams	Fairly Poor	0.009	0.020	No change to condition, but riparian encroachment changed by proposed access road.
Unnamed Watercourse 4, Subreach 3	Other Rivers and Streams	Fairly Poor	0.017	0.036	No change to condition, but riparian encroachment changed by proposed access road.
1820_DIV	Other Rivers and Streams	Moderate	1.090	3.733	Diversion of Unnamed Watercourse 7b, Subreach 1. Assumed condition matches baseline.
Unnamed Watercourse 4, Subreach 3	Other Rivers and Streams	Fairly Poor	0.013	0.027	No change to condition, but riparian encroachment changed by proposed access road.
Unnamed Watercourse 4, Subreach 3	Other Rivers and Streams	Fairly Poor	0.332	0.712	No change to condition, but riparian encroachment changed by proposed access road.
Unnamed Watercourse 4, Subreach 4	Other Rivers and Streams	Fairly Poor	0.025	0.053	No change to condition, but riparian encroachment changed by proposed access road.
Unnamed Watercourse 4, Subreach 2	Other Rivers and Streams	Poor	0.133	0.098	No change to condition, but riparian encroachment changed by proposed access road.
Mar Dyke, Subreach 3	Other Rivers and Streams	Fairly Poor	0.601	1.459	No change to condition, but riparian encroachment changed by proposed NMU route.
0016b_CUL	Culvert	Poor	0.047	0.070	Proposed culvert on diversion of GF_Ph1_ply_0016b

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
0016b_CUL	Culvert	Poor	0.017	0.025	Proposed culvert on diversion of GF_Ph1_ply_0016b
0016b_DIV	Other Rivers and Streams	Fairly Poor	0.103	0.294	Diversion of GF_Ph1_ply_0016b. Assumed condition matches baseline.
Unnamed Watercourse 5, Subreach 2	Other Rivers and Streams	Moderate	0.010	0.034	Temporary access crosses watercourse. Reinstated in post-intervention at baseline condition.
Mar Dyke, Subreach 6	Other Rivers and Streams	Fairly Poor	0.010	0.029	Temporary access crosses watercourse. Reinstated in post-intervention at baseline condition.
Unnamed Watercourse 10, Subreach 9	Other Rivers and Streams	Fairly Poor	0.020	0.057	Two temporary accesses cross watercourse. Reinstated in post-intervention at baseline condition.
Unnamed Watercourse 5, Subreach 2	Other Rivers and Streams	Moderate	0.010	0.033	Temporary access crosses watercourse. Reinstated in post-intervention at baseline condition.
PH1_In_0043	Ditches	Poor	0.207	0.539	Part of ditch removed and reinstated in post-intervention at baseline condition. encroachment changed by proposed route alignment.
PH1_In_0125	Ditches	Poor	0.058	0.201	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_1067	Ditches	Moderate	0.202	0.913	Whole ditch removed and reinstated in post-intervention at baseline condition. Two temporary accesses cross watercourse. Reinstated in post-intervention at baseline condition.
PH1_In_1072	Ditches	Moderate	0.159	0.359	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1073a	Ditches	Moderate	0.100	0.287	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1078	Ditches	Moderate	0.659	2.972	Whole ditch removed and reinstated in post-intervention at baseline condition. Riparian encroachment changed by proposed NMU route.
PH1_In_1079	Ditches	Moderate	0.234	1.407	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1080	Ditches	Moderate	0.230	1.382	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1773	Ditches	Poor	0.115	0.150	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1087	Ditches	Moderate	0.149	0.671	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1790	Ditches	Poor	0.122	0.402	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_1802	Ditches	Moderate	0.170	0.767	Whole ditch removed and reinstated in post-intervention. Moderate condition due to being part of proposed landscaping. Riparian encroachment changed by proposed NMU route.
1805_CUL	Culvert	Poor	0.003	0.004	Proposed culvert for NMU route crossing.
PH1_In_1814	Ditches	Poor	0.224	0.778	Whole ditch removed and reinstated in post-intervention at baseline condition.
1818_DIV	Ditches	Moderate	0.279	1.259	Diversion of PH1_In_1818. Moderate condition due to being part of proposed landscaping.
1818_CUL	Culvert	Poor	0.006	0.008	Culvert for diversion of PH1_In_1818.
PH1_In_1818	Ditches	Moderate	0.172	1.035	Part of ditch removed and reinstated in post-intervention at baseline condition. Reduced riparian encroachment due to being further from road. Temporary access crosses watercourse. Reinstated in post-intervention at baseline condition.
PH1_In_1819	Ditches	Poor	0.154	0.533	Part of ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1841	Ditches	Poor	0.204	0.708	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1845	Ditches	Moderate	0.061	0.365	Whole ditch removed and reinstated in post-intervention at baseline condition

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_1846	Ditches	Poor	0.030	0.078	Part of ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1847	Ditches	Moderate	0.067	0.383	Part of ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1849	Ditches	Poor	0.093	0.323	Part of ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1850	Ditches	Moderate	0.101	0.457	Whole ditch removed and reinstated in post-intervention. Moderate condition due to being part of proposed landscaping.
PH1_In_1853	Ditches	Poor	0.096	0.249	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1854	Ditches	Poor	0.048	0.126	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1859	Ditches	Poor	0.076	0.263	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1861	Ditches	Moderate	0.205	1.048	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1872	Ditches	Poor	0.166	0.547	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_1873	Ditches	Poor	0.290	0.755	Whole ditch removed and reinstated in post-intervention at baseline condition. Riparian encroachment changed by proposed access road.
PH1_In_1874	Ditches	Poor	0.177	0.615	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1891	Ditches	Poor	0.290	1.006	Whole ditch removed and reinstated in post-intervention at baseline condition. Temporary access crosses watercourse. Reinstated in post-intervention at baseline condition.
PH1_In_1893	Ditches	Poor	0.224	0.583	Part of ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1895	Ditches	Moderate	0.100	0.600	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1896a	Ditches	Poor	0.098	0.340	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1898	Ditches	Moderate	0.147	0.375	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1900	Ditches	Poor	0.051	0.067	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1901	Ditches	Poor	0.255	0.331	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_1903	Ditches	Poor	0.038	0.099	Whole ditch removed and reinstated in post-intervention at baseline condition. Change to riparian encroachment for proposed bridge.
PH1_In_1904	Ditches	Moderate	0.118	0.601	Whole ditch removed and reinstated in post-intervention at baseline condition. Change to riparian encroachment for NMU route.
PH1_In_0695	Ditches	Poor	0.944	2.456	Whole ditch removed and reinstated in post-intervention at baseline condition. Change to riparian encroachment for proposed bridge and route alignment.
PH1_In_1512	Ditches	Poor	0.059	0.154	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_0451	Ditches	Poor	0.275	0.952	Whole ditch removed and reinstated in post-intervention at baseline condition. Temporary access crosses watercourse. Reinstated in post-intervention at baseline condition.
PH1_In_1798	Ditches	Moderate	0.163	0.983	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1803	Ditches	Good	0.099	0.561	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
1803_CUL	Culvert	Poor	0.003	0.003	Proposed culvert on baseline ditch PH1_In_1803.
1824_CUL	Culvert	Poor	0.065	0.085	Proposed culvert on diversion of PH1_In_1824.
1824_DIV	Ditches	Moderate	0.016	0.072	Diversion of PH1_In_1824. Moderate condition due to being part of proposed landscaping. Change to riparian encroachment for route alignment.
PH1_In_1824	Ditches	Moderate	0.075	0.338	Part of ditch removed and reinstated in post-intervention. Moderate condition due to being part of proposed landscaping. Change to riparian encroachment for route alignment
PH1_In_1829	Ditches	Moderate	0.581	2.621	Whole ditch removed and reinstated in post-intervention at baseline condition. Change to riparian encroachment for proposed bridge and route alignment.
PH1_In_0836	Ditches	Poor	0.228	0.594	Whole ditch removed and reinstated in post-intervention at baseline condition.
GF_Ph1_ply_0007	Ditches	Good	0.013	0.093	Whole ditch removed and reinstated in post-intervention at baseline condition.
GF_Ph1_ply_0009	Ditches	Good	0.573	4.326	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
GF_Ph1_ply_0011	Ditches	Good	0.651	3.689	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.
GF_Ph1_ply_0013a	Ditches	Good	0.062	0.467	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.
GF_Ph1_ply_0014_CUL	Culvert	Poor	0.003	0.004	Culvert for NMU route.
GF_Ph1_ply_0014	Ditches	Good	0.002	0.015	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.
GF_Ph1_ply_0014	Ditches	Good	0.103	0.782	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_0214	Ditches	Poor	0.012	0.043	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_0238	Ditches	Poor	0.049	0.169	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_0248	Ditches	Poor	0.004	0.010	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_0517	Ditches	Moderate	0.016	0.098	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_0632	Ditches	Poor	0.000	0.000	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_0645	Ditches	Poor	0.033	0.114	Whole ditch removed and reinstated in post-intervention at baseline condition. Temporary access crosses watercourse. Reinstated in post-intervention at baseline condition.
PH1_In_0749	Ditches	Poor	0.001	0.003	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1064	Ditches	Poor	0.047	0.165	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1064	Ditches	Poor	0.106	0.369	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1065a	Ditches	Moderate	0.159	0.954	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1065a	Ditches	Moderate	0.058	0.330	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1069	Ditches	Moderate	0.045	0.102	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1071	Ditches	Moderate	0.018	0.082	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_1074	Ditches	Moderate	0.012	0.053	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1085	Ditches	Moderate	0.212	1.214	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1085	Ditches	Moderate	0.003	0.017	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1085	Ditches	Moderate	0.035	0.156	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1085	Ditches	Moderate	0.001	0.006	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1086	Ditches	Moderate	0.001	0.005	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1513	Ditches	Poor	0.005	0.016	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1668	Ditches	Moderate	0.020	0.045	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1775	Ditches	Poor	0.079	0.274	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1087	Ditches	Moderate	0.007	0.030	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1087	Ditches	Moderate	0.013	0.058	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_1061a	Ditches	Moderate	0.016	0.098	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1061a	Ditches	Moderate	0.027	0.099	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1792	Ditches	Poor	0.012	0.041	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1795	Ditches	Poor	0.012	0.040	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1799	Ditches	Moderate	0.253	1.445	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1800	Ditches	Poor	0.010	0.026	Whole ditch removed and reinstated in post-intervention at baseline condition.
1804_CUL	Culvert	Poor	0.001	0.001	Whole of ditch PH1_In_1804 replaced by culvert for NMU route.
PH1_In_1822	Ditches	Moderate	0.119	0.716	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1842	Ditches	Moderate	0.088	0.531	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1853	Ditches	Poor	0.037	0.121	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1855	Ditches	Moderate	0.064	0.388	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_1856	Ditches	Moderate	0.005	0.027	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1858	Ditches	Moderate	0.045	0.205	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1860	Ditches	Poor	0.006	0.019	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1875	Ditches	Moderate	0.008	0.043	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1878	Ditches	Poor	0.020	0.051	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1891	Ditches	Poor	0.098	0.339	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1892	Ditches	Poor	0.002	0.008	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1897	Ditches	Poor	0.033	0.115	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_0006	Ditches	Poor	0.015	0.053	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_0401	Ditches	Poor	0.004	0.010	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1271	Ditches	Moderate	0.005	0.012	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_1827a	Ditches	Poor	0.003	0.009	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1828	Ditches	Moderate	0.066	0.398	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1831	Ditches	Poor	0.082	0.284	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1836	Ditches	Poor	0.004	0.014	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1836	Ditches	Poor	0.001	0.004	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_0836	Ditches	Poor	0.001	0.005	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1054	Ditches	Moderate	0.056	0.255	Whole ditch removed and reinstated in post-intervention at baseline condition.
GF_Ph1_ply_0012	Ditches	Good	0.079	0.600	Whole ditch removed and reinstated in post-intervention at baseline condition.
GF_Ph1_ply_0012	Ditches	Good	0.207	1.565	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
GF_Ph1_ply_0012	Ditches	Good	0.122	0.920	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.
GF_Ph1_ply_0012	Ditches	Good	0.146	0.937	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate. Change to riparian encroachment for NMU route.
GF_Ph1_ply_0012	Ditches	Good	0.097	0.732	Whole ditch removed and reinstated in post-intervention at baseline condition.
GF_Ph1_ply_0012	Ditches	Good	0.034	0.261	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.
GF_Ph1_ply_0015	Ditches	Good	0.519	2.938	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate. Change to riparian encroachment for NMU route.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
GF_Ph1_ply_0015	Ditches	Good	1.018	7.690	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.
GF_Ph1_ply_0015_DIV	Ditches	Good	0.103	0.778	Diversion of ditch GF_Ph1_ply_0015. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.
PH1_In_1073b	Ditches	Moderate	0.093	0.476	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_2061	Ditches	Moderate	0.188	0.847	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_2059	Ditches	Moderate	0.144	0.648	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_2059	Ditches	Moderate	0.020	0.089	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_2056	Ditches	Moderate	0.040	0.179	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_2057	Ditches	Moderate	0.026	0.116	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_2055	Ditches	Moderate	0.051	0.307	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_1896b	Ditches	Poor	0.008	0.025	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_2067	Ditches	Good	0.018	0.132	Ditch to replace demolished culvert between GF_Ph1_ply_0013a and GF_Ph1_ply_0013b. Assumed condition to be good to match rest of ditch.
GF_Ph1_ply_0013b	Ditches	Good	0.027	0.203	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.
GF_Ph1_ply_0013c	Ditches	Good	0.023	0.172	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.
GF_Ph1_ply_0013d	Ditches	Good	0.014	0.108	Whole ditch removed and reinstated in post-intervention at baseline condition. Part of landscape design, but assumed the condition would remain at good rather than being lowered to moderate.
PH1_In_1827b	Ditches	Poor	0.010	0.033	Whole ditch removed and reinstated in post-intervention at baseline condition.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
Highway drainage ditches	Ditches	Poor	20.183	26.253	Total length of proposed highway drainage ditches. Assumed to be engineered channels with a poor condition. All adjacent to proposed route alignment, so assumed to all have major riparian encroachment. Assumed reinforced channel so major watercourse encroachment
Proposed ditch 1	Ditches	Moderate	0.515	2.324	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.
Proposed ditch 1 culvert	Culvert	Poor	0.010	0.013	Proposed culvert for proposed ditch 1.
Proposed ditch 2	Ditches	Moderate	0.401	1.808	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.
Proposed ditch 3	Ditches	Moderate	0.224	1.011	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.
Proposed ditch 4	Ditches	Moderate	0.238	1.433	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.
Proposed ditch 5	Ditches	Moderate	0.323	1.458	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
Proposed ditch 6	Ditches	Moderate	0.043	0.257	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.
Proposed ditch 7	Ditches	Moderate	0.013	0.078	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.
Proposed ditch 8	Ditches	Moderate	0.166	0.996	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.
Proposed ditch 9	Ditches	Moderate	0.098	0.589	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.
Proposed ditch 10	Ditches	Moderate	0.323	1.456	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.
Proposed ditch 10 culvert	Culvert	Poor	0.054	0.070	Proposed ditch not related to a baseline watercourse. Moderate condition due to being part of proposed landscaping.
Water vole mitigation ditch 1	Ditches	Moderate	0.509	2.297	Proposed ditch for water vole mitigation. Moderate condition due to being part of proposed landscaping.
Water vole mitigation ditch 1 culvert	Culvert	Poor	0.009	0.012	Proposed culvert for water vole mitigation ditch 1.

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
Water vole mitigation ditch 2	Ditches	Moderate	1.813	10.906	Proposed ditch for water vole mitigation. Moderate condition due to being part of proposed landscaping.
Water vole mitigation ditch 3	Ditches	Moderate	0.032	0.146	Proposed ditch for water vole mitigation. Moderate condition due to being part of proposed landscaping.
Water vole mitigation ditch 4	Ditches	Moderate	0.052	0.234	Proposed ditch for water vole mitigation. Moderate condition due to being part of proposed landscaping.
Water vole mitigation ditch 5	Ditches	Moderate	0.645	3.688	Proposed ditch for water vole mitigation. Moderate condition due to being part of proposed landscaping.
PH1_In_0043	Ditches	Moderate	0.053	0.194	Diversion channel. Moderate condition due to being part of proposed landscaping.
PH1_In_0550	Ditches	Moderate	0.033	0.150	Forms part of landscape design. Therefore, condition assumed to be moderate
PH1_In_0580	Ditches	Moderate	0.213	1.298	Forms part of landscape design. Therefore, condition assumed to be moderate
PH1_In_1063	Ditches	Moderate	0.086	0.197	Forms part of landscape design. Therefore, condition assumed to be moderate
PH1_In_1805	Ditches	Moderate	0.041	0.186	Forms part of landscape design. Therefore, condition assumed to be moderate
PH1_In_0103	Ditches	Moderate	0.020	0.116	Forms part of landscape design. Therefore, condition assumed to be moderate

Watercourse name	Habitat type	River condition	Length created (km)	River units delivered from creation	Creation summary
PH1_In_0571	Ditches	Moderate	0.096	0.583	Forms part of landscape design. Therefore, condition assumed to be moderate
PH1_In_1063	Ditches	Moderate	0.086	0.197	Forms part of landscape design. Therefore, condition assumed to be moderate
PH1_In_1938	Ditches	Moderate	0.202	0.911	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1806	Ditches	Poor	0.158	0.550	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1913	Ditches	Poor	0.067	0.176	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_0001	Ditches	Poor	0.083	0.215	Whole ditch removed and reinstated in post-intervention at baseline condition.
PH1_In_1807	Ditches	Moderate	0.315	1.895	Whole ditch removed and reinstated in post-intervention at baseline condition.

Table D.8 Rivers and streams enhancement condition assessment

Watercourse name	Habitat type	River condition	Enhanced river condition	Length enhanced (km)	River Units delivered from enhancement	Enhancement summary
Unnamed Watercourse 9, Subreach 3	River	Fairly Poor	Moderate	0.155	1.808	Arable fields replaced by species-rich grassland and scrub woodland. Improves bank top condition indicators enough to change condition category.

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