East Pye Solar

Biodiversity Net Gain Report

Revision 1

March 2026

Planning Inspectorate Reference: EN0110114

Document Reference: APP/7.23

APFP Regulation 5(2)(q)

Table of Contents

Figures

Tables

Annexes

Non-Technical Summary

This Biodiversity Net Gain (BNG) assessment and the **Biodiversity Net Gain Statutory Metrics [EN0110014/APP/7.24]** have been prepared in relation to a Development Consent Order (DCO) Application for the construction, operation and maintenance, and decommissioning of East Pye Solar (the 'Scheme').

Within this assessment, a Statutory Biodiversity Metric has been completed for:

- The full Order Limits which include the Sites, the Cable Route Corridor (CRC) and areas of Highway Works; and
- For the Sites only (i.e. excluding the CRC and Highway Works).

This approach has been taken to reflect the nature of the impacts and future management applicable to these different elements of the Scheme.

The BNG assessment has identified that for the Order Limits of the Scheme, based on the baseline habitat surveys and the Hedgerow Removals Plan and Green Infrastructure Strategy within the **Outline Landscape and Ecology Management Plan [EN0110014/APP/7.4]** (Outline LEMP), together with the assumptions described in this assessment, the Scheme is able to deliver the following predicted change of biodiversity units:

- 37.42% (1,128.63 units) gain for habitats;
- 31.35% (290.03 units) gain for hedgerows; and,
- 16.08% (16.65 units) gain for watercourses.

Furthermore, the Statutory Biodiversity Metric used to calculate the above biodiversity value change, identifies that Trading Rules are also met.

On the basis of the above, the Scheme can achieve not only a measurable BNG as considered favourable for DCOs, but also at least 10% BNG for Habitat, Hedgerow and Watercourse units through a combination of on-site habitat retention, habitat enhancement and habitat creation.

1 Introduction

1.1 Background

Introduction

1.1.1 Stantec was commissioned by East Pye Solar Limited (the 'Applicant') to undertake a Biodiversity Net Gain (BNG) assessment (hereafter 'BNG assessment') in relation to an application for a Development Consent Order (DCO) (the 'DCO Application') pursuant to the Planning Act 2008, for the Scheme.

1.1.2 The Scheme comprises the construction, operation and maintenance, and decommissioning of a Solar photovoltaic (PV) electricity generating station with a total capacity exceeding 100 megawatts (MW) and associated development including a Battery Energy Storage System (BESS), up to three 132kV Project Substations and up to three 400kV Project Substations, Grid Connection Infrastructure and a new National Grid Substation. A full description of the Scheme is included in **Environmental Statement (ES) Volume 1, Chapter 4 - The Scheme [EN0110014/APP/6.1.4]**.

1.1.3 The Scheme would be located within the Order Limits as shown on the **Location Plan [EN0110014/APP/2.1]** and **Works Plan [EN0110014/APP/2.3]** submitted as part of the DCO Application and secured by Article 3 of the **draft DCO [EN0110014/APP/3.1]**. The Order Limits contain all elements of the Scheme comprising the Solar PV Arrays, 132kV and 400kV Project Substations, the National Grid Substation, the BESS, Grid Connection Infrastructure, interconnecting cables within the Cable Route Corridor (CRC), Mitigation and Enhancement Areas and Highway Works.

1.1.4 The solar PV electricity generating stations would be located across Sites 1, 2, 3, 4, 5, 7, 8, 9 and 10, with the BESS within the BESS Site. Site 6 does not contain electricity generation station, instead being retained as a Mitigation and Enhancement Area.

1.1.5 Highway Works (refer to the **Works Plan [EN0110014/APP/2.3]**) are sections of the highway network that will contain localised improvements, such as improvements to deteriorated road edges or temporary highway and traffic works required to safely accommodate the Abnormal Indivisible Load (AIL) deliveries to construct the Scheme. Highway Works will support the movement of construction vehicles on narrower sections of the local road network within parts of the construction vehicle routes to and within the Order Limits.

1.1.6 The Order Limits are located entirely within the administrative boundary of South Norfolk Council (SNC) and Norfolk County Council (NCC). The Order Limits comprise 1,212.3 hectares (ha) of land, of which 1,051.4ha relates to the Sites.

1.1.7 Within this assessment, a Statutory Biodiversity Metric has been completed for:

- The full Order Limits which include the Sites, the CRC and areas of Highway Works; and
- For the Sites only (i.e. excluding the CRC and Highway Works).

1.2 Site Location and Context

1.2.1 The Scheme is located south of Norwich and north of Harleston, in Norfolk where the landscape is predominantly arable with scattered villages. There are numerous small woodlands and several areas of common land present within 2km of the Order Limits.

1.2.2 The Order Limits are located between the villages of Great Moulton, Long Stratton, Tasburgh, Hempnall, Fritton, Lundy Green, Silver Green, Saxlingham Nethergate, Saxlingham Green, Woodton, Brooke and Seething.

1.2.3 The CRC within the Order Limits comprise interlinking parcels connecting the Sites. Highway Works are proposed, as shown on **ES Volume 1, Figure 1.1 - Site Location Plan [EN0110014/APP/6.2.1.1],** where Highway Works areas are referred to as LCH, LIR, LHL, LSR1, LSR2, LSR3 and LSR4.

1.3 Relevant Legislation and Planning Policy

1.3.1 The Environment Act (the Act) gained Royal Assent on the 9 November 2021 and is now enshrined within UK law. The Act provides a mechanism for implementing the Government's ambitions for 'improving the natural environment', which were previously set out in publications, including the 25 Year Environment Plan (25YEP). The Act provides recognition of the 25YEP as the first "environmental improvement plan" which, through the enactment of relevant regulations serves as the basis for the steps Government intends to take to improve the natural environment. The 25YEP has now been replaced by the Environmental Improvement Plan (also referred to as the EIP23) in January 2023.

1.3.2 While legislation has not yet been passed to implement the BNG requirements of the Environment Act (2021) in relation to DCO applications, Overarching National Policy Statement for Energy (EN-1) (Ref 1) sets out expectations that energy NSIP within England should use the latest version of the biodiversity metric to calculate the BNG outcome and to provide a measurable net gain, where possible.

1.3.3 This BNG assessment therefore applies the statutory biodiversity metric (the Metric) and all relevant associated guidance in the same way as for a Town and Country Planning Act (1990) (TCPA) application subject to the 'biodiversity gain condition', however there is currently no current legal requirement to achieve a 10% gain.

1.3.4 With the presence of irreplaceable habitat within the Order Limits, the Biodiversity Gain Requirements (Irreplaceable Habitat) Regulations 2024 (Ref 2) has also been considered with irreplaceable habitats identified as those detailed within Schedule 7A of the 1990 TCPA (Ref 3).

Scope of Report

1.3.5 This BNG assessment includes details of the baseline habitats and details of how the biodiversity gain target, in this instance of 10% gain, will be met; this provides the Secretary of State with sufficient information to satisfy the minimum policy requirements under NPS EN-1 to inform consideration of the application and specifically alignment of the application with the relevant planning policy.

1.3.6 This BNG assessment is supported by:

- **ES Volume 3, Appendix 8.1 - Ecological Desk Study and Extended Habitat Survey [EN0110014/APP/6.3.8.1]** which contains information on baseline habitats and mapping from the suite of 2024 habitat surveys as well as the suite of surveys carried out in 2025-2026 incorporating the CRC and areas of the Highway Works;
- River Condition Assessment within **Annex A** which contains the details from a full suite of Modular River Physical (morph5) surveys of the rivers and streams that fall within 10m of the Order Limits;
- **Outline LEMP [EN0110014/APP/7.4]**;
- Hedgerow Removals Plan (Appendix B of the **Outline LEMP [EN0110014/APP/7.4]**);
- Green Infrastructure Strategy (Appendix B of the **Outline LEMP [EN0110014/APP/7.4]**); and
- the Metric in the **Biodiversity Net Gain Statutory Metric [EN0110014/APP/7.24]**.

1.3.7 This BNG assessment has been prepared with reference to best practice guidance published by:

- the British Standard 42020:2013 ‘Biodiversity - Code of Practice for Biodiversity and Development’ (Ref 4);
- the Chartered Institute for Ecology and Environmental Management (CIEEM, 2021) (Ref 5);
- the British Standard 8683:2021 ‘Process for designing and implementing Biodiversity Net Gain. Specification’ (Ref 6); and
- CIEEM, CIRIA, IEMA (2016) ‘Biodiversity Net Gain: Good practice principles for development’ (Ref 7).

2 Approach to BNG Assessment

2.1 Key Concepts

2.1.1 Biodiversity net gain planning practice guidance (MHGLC, 2024) states that the Metric has to be used to calculate the biodiversity value of the development, pre and post development. The Metric uses a comparison of habitats as a proxy for biodiversity and as such should be seen as providing relative values. It describes these habitats using standard units referred to as Biodiversity Units (BU). Following Rule 2 within the User Guidance (Defra, 2024) these unit types are distinct and '*must not be summed, traded, or converted between types*'. There are 3 distinct types of BUs:

- Area Habitat BU – describing areas of habitat, including individual trees, based on measurement in hectares;
- Hedgerow BU – describing linear hedgerows and lines of trees measured in kilometres; and
- Watercourse BU – describing linear rivers and streams measured in kilometres.

2.2 Metric Calculation

2.2.1 The following guidance has been used when undertaking the Metric calculations:

- Statutory biodiversity metric calculation tool (Version 1.0.3);
- Statutory biodiversity metric: user guide (July 2025); and
- Statutory biodiversity metric condition assessments (July 2025).

2.2.2 The statutory biodiversity metric calculates the biodiversity value of each parcel of habitat (measured as BU). Habitat area is used, except for linear habitats, where length is used (i.e. for hedgerows and watercourses). The value of each habitat type is adjusted to specific circumstances, taking into account size, distinctiveness, condition and if the habitat parcel is located in an area identified as being of significance for nature, typically in a Local Nature Recovery Strategy (LNRS) where this has been published, or alternatively alternative documents for assigning strategic significance such as a Local Plan, Local Biodiversity Action Plan or other appropriate published documents.

2.2.3 A score is applied to each component, which when multiplied with the habitat area, produces a score which represents the number of BU associated with each habitat parcel. The sum of these scores represents the overall baseline or 'pre-development' value in BU.

2.2.4 The predicted post-intervention (or 'post-development') unit value is calculated in the same way, but with the addition of factors to take into account risks associated with creating, enhancing or restoring habitats. The calculated value of the 'post-development' biodiversity units is then deducted from the calculated value of the 'pre-development' biodiversity units to give a predicted net change biodiversity unit value.

2.2.5 While the Metric does not prescribe the number of decimal places that should be used in data entry, for consistency and in line with the 'tree helper' tool outputs, all Metric data entry has used a default maximum four decimal places. All calculations are reported to two decimal places in line with the Metric headline results. The level of mapping is consistent with the minimum mappable area of $5m^2$ used within the UKHab survey.

2.2.6 Land parcels have been evaluated as a whole, rather than by individual sub-parcels. BU have been calculated for each parcel and provided as a 'per hectare' value for area habitats and a 'per kilometre' value for hedgerows and linear features.

2.2.7 Watercourses have been assessed separately through a River Condition Assessment (see separate **Annex A**)) following a full suite of Modular River Physical (MoRPh5) surveys of the rivers and streams that fall within 10m of the Order Limits.

2.3 Consultation

2.3.1 Whilst consultation with the Norfolk Wildlife Trust and Natural England as detailed in the **Consultation Report [EN0110014/APP/5.1]**, no specific BNG consultation occurred.

3 Habitat Baseline

3.1.1 The habitat baseline which has informed the BNG calculation is based on a habitat survey carried out between May and September 2024 (Solar PV Sites) and May 2025 to January 2026 (CRC and Highway Improvement Areas). A summary of the baseline habitats recorded, and their condition is provided below. Further details are provided in **ES Volume 3, Appendix 8.1 - Ecological Desk Study and Extended Habitat Survey [EN0110014/APP/6.3.8.1]**.

3.1.2 It is understood that existing land management practices (arable farmland management) being carried out at the time of survey will continue until construction and therefore no habitat degradation will occur within the Order Limits compared to the habitat baseline information provided within this assessment.

3.1.3 Figures in **Tables 3.1** to **3.6** have been rounded to the nearest two decimal places so there is a slight difference between the sum of these figures and the final output as shown in Section 4.8.

Sites

3.1.4 The Sites include habitats, hedgerows and watercourses, which are summarised below in **Tables 3.1, 3.2** and **3.3**.

Table 3.1: Sites Results Summary (Habitat)

Habitat Group	On-site existing area (ha)	On-site existing value (BU)
Cropland	942.66	1929.86
Grassland	95.10	529.78
Heathland and shrub	0.82	5.73
Lakes	0.74	5.19
Urban	6.85	0.00
Wetland	0.09	1.52
Woodland and forest	6.15	55.61
Individual trees	5.91	68.14
Total (exc. Area of Individual Trees)	**1,058.31**	**2,595.83**

Table 3.2: Sites Results Summary (Hedgerows)

Hedgerow	On-site existing length (km)	On-site existing value
Species-rich native hedgerow with trees - associated with bank or ditch	0.3809	8.18064
Species-rich native hedgerow with trees	33.853	562.143
Species-rich native hedgerow - associated with bank or ditch	3.5346	61.617
Species-rich native hedgerow	3.5568	42.6816
Native hedgerow - associated with bank or ditch	3.7825	36.3048
Native hedgerow with trees	8.5541	80.2118
Ecologically valuable line of trees	0.0718	0.8616
Native hedgerow	7.0575	37.0304
Line of trees	1.2775	6.9726
Line of trees - associated with bank or ditch	0.1869	0.7476
Total	**62.25**	**836.75**

3.1.5 Watercourses within Sites comprise two main habitat types: Other rivers and streams and Ditches. Further details are outlined in **Annex A**.

3.1.6 Whilst Ditches were not specifically surveyed as part of the MoRPh5 surveys, they were subject to survey during the UKHab surveys where their condition assessment was carried out through UKHab survey methodology. Ditches within the arable field margins were assessed as part of the watercourse assessment. Where a ditch borders a road, 'major' riparian zone encroachment has been assumed on the roadside on the basis that hardstanding encroaches on greater than 25% of the total riparian zone area (the land within 5m of the bank top). Similarly, where a ditch bordered an arable field, this has also been assigned 'major' encroachment on the basis that agricultural management practices are used on greater than 25% of the total riparian zone area. No in-channel watercourse encroachment has been noted or assumed.

Table 3.3: Sites Results Summary (Watercourses)

Watercourse Group	On-site existing length (km)	On-site existing value
Other rivers and streams	3.0	22.3
Ditches	8.2	72.7
Total	**11.2**	**95.0**

Irreplaceable Habitats

3.1.7 A total of 54 veteran trees are present within the Order Limits, of which 46 were included within the Sites.

3.1.8 The Scheme would not require the loss of, or impacts on, irreplaceable habitats (veteran trees).

CRC and Highway Works

3.1.9 The CRC and areas of Highway Works include habitats, hedgerows and watercourses, which are summarised below in **Tables 3.4, 3.5** and **3.6**.

Table 3.4: Habitats Results Summary

Habitat Group	On-site existing area (ha)	On-site existing value
Cropland	129.27	257.18
Grassland	22.86	108.35
Heathland and shrub	0.32	3.00
Urban	6.29	0.00
Woodland and forest	0.88	3.72
Individual trees	1.18	13.05
Total (exc. Area of Individual Trees)	**160.80**	**385.30**

Table 3.5: Hedgerow Results Summary

Hedgerow	On-site existing length (km)	On-site existing value
Species-rich native hedgerow with trees - associated with bank or ditch	1.08	21.68
Species-rich native hedgerow with trees	1.61	15.63
Species-rich native hedgerow - associated with bank or ditch	0.53	8.66
Native hedgerow with trees - associated with bank or ditch	1.01	15.11
Species-rich native hedgerow	0.44	4.13
Native hedgerow - associated with bank or ditch	1.36	13.00
Native hedgerow with trees	0.57	4.54
Native hedgerow	0.56	2.21
Line of trees	0.50	2.01
Line of trees - associated with bank or ditch	0.29	1.54
Total	**7.96**	**88.51**

3.1.10 Watercourses within the CRC and Highway Works area comprise two main habitat types: Other rivers and streams and Ditches. Further details are provided in **Annex A**.

3.1.11 Whilst Ditches were not specifically surveyed as part of the MoRPh5 surveys, they were subject to survey during the UKHab surveys where their condition assessment was carried out through UKHab survey methodology. Ditches within the arable field margins were assessed as part of the watercourse assessment. Where a ditch borders a road, 'major' riparian zone encroachment has been assumed on the roadside on the basis that hardstanding encroaches on greater than 25% of the total riparian zone area (the land within 5m of the bank top). Similarly, where a ditch bordered an arable field this has also been assigned 'major' encroachment on the basis that agricultural management practices are used on greater than 25% of the total riparian zone area. No in-channel watercourse encroachment has been noted or assumed.

Table 3.6: Watercourses Results Summary

Watercourse Group	On-site existing length (km)	On-site existing value
Other rivers and streams	0.7535	22.3
Ditches	0.51	4.88
Total	**1.26**	**13.13**

Irreplaceable Habitats

3.1.12 A total of 0.71ha of Lowland Fen is also located within the Order Limits within CRC7, where the CRC crosses over the Hempnall Beck.

3.1.13 A total of 54 veteran trees are present within the Order Limits, of which seven were included within the CRC and area of the Highway Works.

3.1.14 The Scheme would not require the loss of, or impacts on, irreplaceable habitats (Lowland Fen and veteran trees).

3.2 Strategic Significance

3.2.1 The Environment Act 2021 introduced a statutory requirement for the production of 48 Local Nature Recovery Strategy (LNRS) that:

- Set out agreed priorities for nature recovery;
- Map the most valuable existing areas for nature; and
- Establish shared proposals for action that should be taken to recover nature including where this should take place.

3.2.2 The Norfolk LNRS was published in October 2025. The Norfolk LNRS classifies valuable and desirable habitats into two categories: Areas of Particular Importance (APIBs) which are existing areas of ecological importance within the county's ecological network; and areas that could become of particular importance for biodiversity (ACB) which are areas of opportunity for habitat creation. The location of APIB and ACBs are identified within the Biodiversity Opportunity Mapping within the Norfolk LNRS (Ref 8).

3.2.3 Where a post-development habitat falls within an area of APIB, they will be assigned as High strategic significance: '*Formally identified within the local strategy*'. A post-development habitat will also be assigned High strategic significance if it falls within an ACB and the proposed habitat matches the ACB e.g. created Scrub habitat within an area identified as an ACB for scrub creation.

3.2.4 Where the habitats do not align or they are not located within an area identified as APIB or ACB, the strategic significance has been set as Low.

3.2.5 As the LNRS has been published, no post-development habitats will be assigned Medium strategic significance: '*Location ecologically desirable but not in local strategy*'.

3.2.6 For baseline habitats, none are afforded an elevated strategic significance score and therefore the base Low strategic significance: '*Area/compensation not in local strategy/no local strategy*' was applied to all existing habitats. Only created/post-development habitats are elevated to High strategic significance where applicable. This is discussed in more detail in Section 4.5.

3.3 Retention of Baseline Habitats

3.3.1 As detailed in the Green Infrastructure Strategy in **Outline LEMP [EN0110014/APP/7.4]**, the proposals have been designed to retain, where feasible, medium or higher distinctiveness habitats. This includes existing high distinctiveness habitats which include lowland mixed deciduous woodland. Further retention of medium distinctiveness habitat has been prioritised, including: grassland (other neutral grassland); heathland and shrub (mixed scrub, bramble scrub, willow scrub, hazel scrub); woodland and forest (other broadleaved woodland, other mixed woodland, other Scot's pine woodland); cropland (arable field margins); and individual trees.

3.3.2 Impacts to habitats along the CRC and in the area of the Highway Works will be temporary with all habitats restored to their baseline habitat condition within two years of beginning construction. All habitat within the CRC and Highway Works area affected during the construction phase will be reinstated upon completion of the works.

3.3.3 The design of the Scheme has been informed by an understanding of the spatial distribution of habitats. Lower distinctiveness will support potential for development or actions toward the delivery of the BNG objective through creation. The distribution of higher distinctiveness habitats will inform an understanding of where avoidance should be adopted or, where this is not possible, the mitigation of those effects in line with the biodiversity gain hierarchy.

4 Post-Development Habitats

4.1 Overview

4.1.1 The post-development habitats for the BNG calculation have been determined from the Green Infrastructure Strategy. Loss of individual trees has been informed by the **ES Volume 3, Appendix 7.10 - Preliminary Arboriculture Impact Assessment [EN0110014/APP/6.3.7.10]** and hedgerows has been informed by the Hedgerow Removals Plan within Appendix B of the **Outline LEMP [EN0110014/APP/7.4]**.

4.1.2 Retained habitats are described in Section 4.2 below and enhanced baseline habitats are described in Section 4.3, whilst habitat creation is set out in Section 4.4. Illustrative post-development habitats and hedgerows are shown on the Green Infrastructure Strategy.

4.2 Retained Habitats and Temporary Impacts

Sites

4.2.1 All woodland within the Sites would be retained as well as ponds and non-irreplaceable 'fen (upland and lowland)' habitats.

4.2.2 Hedgerows would largely retained; the exception is where some removal is required between field parcels and to facilitate construction works and access.

4.2.3 Several other habitats will be retained in part including arable farmland that will be utilised for species mitigation (namely skylarks), modified grassland, and other neutral grassland as detailed in the **Outline LEMP [EN0110014/APP/7.4]**.

CRC and Highway Works

4.2.4 All habitat within the CRC and Highway Works affected during the construction phase will be reinstated upon completion of the works.

4.3 Habitat Enhancements (Sites only)

4.3.1 Whilst no specific in-watercourse enhancements are being carried out as part of the Scheme, the reduction of arable encroachment (i.e. increasing the naturalised field boundaries and reducing the impact of arable farming close to field boundaries and therefore watercourse bank-tops) within the 10m riparian corridor will see an improvement to the overall watercourse and associated riparian corridor.

4.3.2 The riparian corridor of several watercourses and ditches (as detailed in the Metric) will be indirectly enhanced through the offsetting of agricultural activity within the riparian corridor with a 10m strip of wildflower and neutral grassland between the Solar PV Arrays and the field boundaries. These habitats, as detailed in the **Outline LEMP [EN0110014/APP/7.4]**, will be managed as neutral grassland habitats (flower rich pollinator, tussocky grassland and neutral grassland) where applicable and as shown on the Green Infrastructure Strategy of the **Outline LEMP [EN0110014/APP/7.4]**. This will see indirect benefits such as improved soil stability, reduced runoff, enhanced water quality and increased habitat connectivity.

4.3.3 Whilst the habitat condition of the watercourses will remain the same as pre-development, riparian encroachment will reduce from e.g. 'Major/Major' and 'Moderate/Moderate' to 'No Encroachment/No Encroachment'. This indirect enhancement will improve the value of watercourses associated with Hempnall Beck – Ephemeral Tributary (The Street), Saxlingham Nethergate – Tributary of the River Tas, Brome Beck Headwaters, River Tas – Ephemeral Headwater and a number of ditches within the Sites. Details of enhancements to the watercourses are presented in **Annex A**.

4.4 Habitat Creation (Sites only)

4.4.1 The land uses shown on the Green Infrastructure Strategy (Appendix B of the **Outline LEMP [EN0110014/APP/7.4]**) has been translated into UK Habitat Classification and Statutory Metric habitat types as shown in **Table 4.1** below.

4.4.2 Moderate condition is to be targeted for applicable habitats which are proposed to be created, owing to the difficulty of achieving good condition that is caused by the presence of nutrient rich arable soils. The exception to this is the modified grassland areas that will be created within the Sites that are largely located underneath the Solar PV Arrays. Due to reduced sunlight exposure and the risk of human disturbance during maintenance, the precautionary target condition for these grasslands is Poor condition.

4.4.3 Planted species-rich native hedgerows all have the capacity to achieve Good condition, however as a precautionary approach, these have also been capped to Moderate condition.

4.4.4 Rural trees in 'Moderate' condition have been included within the post-development habitat provision. This includes individual trees within the wider landscaped areas (Rural trees). All trees have assumed to be 'small' at the point of planting.

4.4.5 Target Condition will be achieved by passing the relevant Condition Assessment Criteria (Ref 9) with **Table 4.1** stating which Condition Sheet is relevant to the created habitat and which of the criteria the habitat is likely to pass and fail.

4.4.6 Habitats presented with no Target Condition or explanation of how Target Condition is to be achieved is a habitat with no available Condition Assessment, usually due to habitats being of Low Distinctiveness (e.g. Cropland) or habitats subject to long term management agreement of arable habitat secured by subsidy incentive (e.g. arable field margins).

Table 4.1: BNG Translation of Land Use Types to UK Habitat Classification Definitions

Green Infrastructure Strategy habitat	UK Habitat Classification Habitat Type in Statutory Metric	Target condition	How Target Condition to be achieved
Arable Field Margins (Priority Habitat)	Cropland - Arable field margins game bird mix	N/A	Condition Assessment N/A
Arable Field Margins (Priority Habitat)	Cropland - Arable field margins tussocky	N/A	Condition Assessment N/A
Skylark Mitigation	Cropland - Non-cereal crops	N/A	Condition Assessment N/A
Modified Grassland	Grassland - Modified grassland	Poor	5. Grassland Low - Expected to pass Criteria C, D, F and G and failing Criteria A, B and E.
Tussocky Grass Mix	Grassland - Other neutral grassland	Moderate	6. Grassland Med High & V. High - Expected to pass Criteria A, B, C, D, E and failing Criteria F
Flower Rich Pollinator Mix		Moderate	6. Grassland Med High & V. High - Expected to pass Criteria A, B, C, D, E and failing Criteria F
Neutral Grassland		Moderate	6. Grassland Med High & V. High - Expected to pass Criteria A, B, C, D, E and failing Criteria F
Mixed Scrub	Heathland and shrub - Mixed scrub	Moderate	20. Scrub - Expected to pass Criteria A, B, C and D, but fail E.

Green Infrastructure Strategy habitat	UK Habitat Classification Habitat Type in Statutory Metric	Target condition	How Target Condition to be achieved
Proposed Ghost Pond Restoration	Lakes - Ponds (priority habitat)	Moderate	18. Ponds - Expected to pass all Criteria except H
Native Broadleaf woodland	Woodland and forest - Lowland mixed deciduous woodland	Moderate	24. Woodland - Expected to score between 26 and 32 out of 39 with Criteria F, G, I, J, K and L not likely to achieve full 3 points per criteria and likely to negatively impact the score.
Native Linear Tree Belt	Woodland and forest - Other woodland; broadleaved	Moderate	24. Woodland - Expected to score between 26 and 32 out of 39 with Criteria F, G, I, J, K and L not likely to achieve full 3 points per criteria and likely to negatively impact the score.
Individual trees	Individual trees - Rural tree	Moderate	9. Individual Trees - Expected to pass criteria A, B, D and F and likely to fail C and E.
Battery Energy Storage System (BESS)	Urban – Developed land, sealed surface	N/A	Condition Assessment N/A
132kV Project Substations			
400kV Project Substation			
National Grid Substations			
Indicative access routes (permanent for access)	Urban – Artificial unvegetated, unsealed surface	N/A	Condition Assessment N/A
Instant Hedgerow (for glint and glare)	Native Hedgerow	Moderate	8. Hedgerow - Expected to pass criteria A1, A2, B1, C1, D1 and D2 and likely to fail B2 and C2.
Native Hedgerow	Species-rich native hedgerow	Moderate	8. Hedgerow - Expected to pass criteria A1, A2, B1, C1, D1 and D2 and likely to fail B2 and C2.
Native Hedgerow with Trees	Species-rich native hedgerow and trees	Moderate	8. Hedgerow - Expected to pass criteria A1, A2, B1, C1, D1, D2 and E2 and likely to fail B2 C2 and E1.

4.5 Strategic Significance of Post Development Habitats

4.5.1 A total of nine post development habitats within the Sites are identified as falling within the corresponding Biodiversity Opportunities within the Biodiversity Opportunity Mapping. These include:

- Cropland – Arable field margins game bird mix;
- Cropland – Arable field margins pollen and nectar;
- Cropland – Arable field margins tussocky;
- Grassland - Other neutral grassland;
- Heathland and shrub – Mixed scrub;
- Lakes - Ponds (priority habitat);
- Woodland and forest – Lowland mixed deciduous woodland;
- Woodland and forest – Other woodland; broadleaved; and,
- Watercourse – Other rivers and streams.

4.5.2 These habitats are proposed within areas that the LNRS identify as suitable to help increase the connectivity and biodiversity value of Norfolk's habitats through connecting woodland and scrub and providing suitable wetland and terrestrial habitats.

4.5.3 Proposed habitats that fall within their corresponding LNRS opportunity habitats have been assigned High strategic significance as '*Formally identified in local strategy*'.

4.5.4 As previously stated, High strategic significance only applies to post-development habitats. All baseline habitats are assigned Low strategic significance of '*Area/compensation not in local strategy/ no local strategy*'.

4.6 Contribution of Protected Species Mitigation to BNG Delivery

4.6.1 As described in the **ES [EN0110014/APP/6.1** to **6.4],** the Scheme necessitates delivery of habitat mitigation and compensation for other environmental impacts, in particular breeding skylarks *Alauda arvensis*. Within the Metric guidance, habitat creation delivered as compensation for protected species can only count in part to the delivery of BNG.

4.6.2 The proposed skylark mitigation includes the provision of skylark plots (16m^2) within areas of approximately 40-60ha of existing arable farmland that will be specifically managed for the benefit of skylarks. This is considered to be a relatively nominable area, with arable land being a low distinctiveness habitat and as such has limited effect on the Scheme achieving 10% BNG, whether excluded from the calculations or not.

4.7 Biodiversity Gain Hierarchy

4.7.1 The biodiversity gain hierarchy is a list of priority actions for developments to follow to achieve BNG, including:

- Avoiding adverse effects to very high, high and medium 'distinctiveness' habitats;
- Mitigating these effects where they cannot be avoided; and
- Compensating for adverse effects on on-site habitats by, in order of priority: enhancing on-site habitat or creating new on-site habitats, securing local off-site BNG provision via the allocation of registered off-site gain and finally, as the last resort, the purchase of statutory credits.

4.7.2 The design for the Scheme has avoided adverse impacts to medium distinctiveness habitats, including the retention of trees where possible. However, given the nature of the Scheme it has not been possible to retain all areas of medium distinctiveness habitat which are present. Where possible opportunities to create new habitat have been explored and will be delivered.

4.7.3 On the basis of the above it is considered that the biodiversity gain hierarchy has been correctly applied in relation to the Scheme and the BNG assessment.

4.8 Biodiversity Net Gain Metric Outcome

Overview

4.8.1 This section contains the headline results of the BNG calculations and confirms how the Scheme complies with legislative and policy requirements. The completed Statutory Metric for the Order Limits and separately for the Sites are provided in full at **Biodiversity Net Gain Statutory Metric [EN0110014/APP/7.24]**.

Statutory Metric Outcome (Order Limits)

4.8.2 The metric of the habitats within the Order Limits (the combined Sites, CRC and areas of Highway Works) will be used as a final submitted biodiversity net gain output for BU change to Habitats, Hedgerows and Watercourses.

4.8.3 Based on design detail and assumptions set out earlier in this report, the habitat retention, creation and management measures, proposed within the Order limits will result in the following changes in biodiversity units (as shown in **Plate 4.1**):

- 37.42% (1128.63 units) gain for habitats;
- 31.35% (290.03 units) gain for hedgerows;
- 16.08% (16.65 units) gain for watercourses; and,
- Trading rules are met.

FINAL RESULTS		
Total net unit change (Including all on-site & off-site habitat retention, creation & enhancement)	*Area habitat units*	1128.63
	Hedgerow units	290.03
	Watercourse units	16.65
Total net % change (Including all on-site & off-site habitat retention, creation & enhancement)	*Area habitat units*	37.42%
	Hedgerow units	31.35%
	Watercourse units	16.08%
Trading rules satisfied?	Yes ✓	

Unit Type	Target	Baseline Units	Units Required	Unit Deficit	
Area habitat units	10.00%	3015.95	3317.55	0.00	No additional area habitat units required to meet target ✓
Hedgerow units	10.00%	925.26	1017.78	0.00	No additional hedgerow units required to meet target ✓
Watercourse units	10.00%	103.54	113.90	0.00	No additional watercourse units required to meet target ✓

Plate 4.1: Headline Results of Statutory BNG Metric for the Order Limits

Statutory Metric Outcome (Sites only)

4.8.4 The metric of the habitats within the Order Limits will be used as a final submitted BNG output for BU change to Habitats, Hedgerows and Watercourses. This metric below for the Sites only is purely shown as a presentation tool to identify the areas where permanent habitat impacts, habitat enhancement and habitat creation will occur within the Order Limits.

4.8.5 Based on design detail and assumptions set out earlier in this report, the habitat retention, creation and management measures proposed within the Sites (excluding the CRC and areas of Highway Works) will result in the following changes in biodiversity units (as shown in **Plate 4.2**):

- 44.22% (1147.82 units) gain for habitats;
- 34.71% (290.03 units) gain for hedgerows;
- 17.52% (16.65 units) gain for watercourses; and,
- Trading rules are met.

FINAL RESULTS		
Total net unit change (Including all on-site & off-site habitat retention, creation & enhancement)	*Area habitat units*	1147.82
	Hedgerow units	290.03
	Watercourse units	16.65
Total net % change (Including all on-site & off-site habitat retention, creation & enhancement)	*Area habitat units*	44.22%
	Hedgerow units	34.71%
	Watercourse units	17.52%
Trading rules satisfied?	Yes ✓	

Unit Type	Target	Baseline Units	Units Required	Unit Deficit	
Area habitat units	10.00%	2595.84	2855.42	0.00	No additional area habitat units required to meet target ✓
Hedgerow units	10.00%	835.62	919.18	0.00	No additional hedgerow units required to meet target ✓
Watercourse units	10.00%	95.02	104.52	0.00	No additional watercourse units required to meet target ✓

Plate 4.2: Headline results of Statutory BNG metric for the Sites only (excluding the CRC and Highway Works)

5 Conclusions and Next Steps

5.1.1 This BNG assessment demonstrates that the Scheme will deliver at least a 10% BNG, delivering the following predicted change in biodiversity units:

- 37.42% (1128.63 units) gain for habitats;
- 31.35% (290.03 units) gain for hedgerows;
- 16.08% (16.65 units) gain for watercourses; and,
- Trading rules are met.

5.1.2 At the time of writing a decision had not been made about the future BNG consideration for DCOs. There is currently no requirement for DCOs to submit a BNG assessment. However, this BNG assessment has been undertaken to demonstrate the Scheme does provide a net benefit for the biodiversity in accordance with NPS Policy EN-1.

6 References

Ref 1 National Policy Statement for Energy Policy EN-1 [Online] – Available at https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1-2025/overarching-national-policy-statement-for-energy-en-1-2025-accessible-webpage

Ref 2 The Biodiversity Gain Requirements (Irreplaceable Habitat) Regulations 2024 [Online] Available at: https://www.legislation.gov.uk/uksi/2024/48/contents/made

Ref 3 Town and Country Planning Act 1990 c. 8, Schedule 7A Part 2 (England).

Ref 4 British Standards. (2013). *42020:2013 Biodiversity - Code of Practice for Biodiversity and Development.* London

Ref 5 CIEEM (2021) *Good Practice Guidance for Habitats and Species.* Winchester

Ref 6 British Standard (2021) *8683:2021 Process for designing and implementing Biodiversity Net Gain. Specification'*. London

Ref 7 CIEEM, CIRIA, IEMA (2016) *'Biodiversity Net Gain: Good practice principles for development'*, Winchester

Ref 8 Norfolk Local Nature Recovery Strategy – Biodiversity Opportunity Mapping (2025) [Online] Available at: https://experience.arcgis.com/experience/3425559ce5b94929b6865d0ba7e34f50

Ref 9 Statutory biodiversity metric condition assessments [Online] Available at: https://www.gov.uk/government/publications/statutory-biodiversity-metric-tools-and-guides

Annex A – River Condition Assessment

East Pye Solar

Biodiversity Net Gain Report

Annex A: River Condition Assessment

Revision 1

March 2026

Planning Inspectorate Reference: EN0110114

Document Reference: APP/7.23

APFP Regulation 5(2)(q)

Contents

Figures

Tables

Appendices

1 Introduction

1.1 Overview

1.1.1 Stantec UK Limited was commissioned by East Pye Solar Limited (hereafter 'the Applicant) to undertake a River Condition Assessment (RCA) for East Pye Solar (the Scheme).

1.1.2 The RCA aims to establish baseline ecological and biodiversity conditions for the rivers and associated riparian habitats in accordance with Biodiversity Net Gain (BNG) requirements under the Environment Act 2021. The baseline data will inform planning, project design and the implementation of appropriate mitigation measures.

1.2 Project Description

1.2.1 The Scheme comprises the construction, operation and maintenance, and decommissioning of a Solar photovoltaic (PV) electricity generating station with a total capacity exceeding 100 megawatts (MW) and associated development including a Battery Energy Storage System (BESS), up to three 132kV Project Substations and up to three 400kV Project Substations, Grid Connection Infrastructure and a new National Grid Substation. A full description of the Scheme is included in **Environmental Statement (ES) Volume 1, Chapter 4 - The Scheme [EN0110014/APP/6.1.4]**.

1.2.2 The Scheme would be located within the Order Limits as shown on the **Location Plan [EN0110014/APP/2.1]** and **Works Plan [EN0110014/APP/2.3]** submitted as part of the DCO Application and secured by Article 3 of the **draft DCO [EN0110014/APP/3.1]**. The Order Limits contain all elements of the Scheme comprising the Solar PV Arrays, 132kV and 400kV Project Substations, the National Grid Substation, the BESS, Grid Connection Infrastructure, interconnecting cables within the Cable Route Corridor (CRC), Mitigation and Enhancement Areas and Highway Works.

1.2.3 The solar PV electricity generating stations would be located across Sites 1, 2, 3, 4, 5, 7, 8, 9 and 10, with the BESS within the BESS Site. Site 6 does not contain electricity generation station, instead being retained as a Mitigation and Enhancement Area.

1.2.4 Highway Works (refer to the **Works Plan [EN0110014/APP/2.3]**) are sections of the highway network that will contain localised improvements, such as improvements to deteriorated road edges or temporary highway and traffic works required to safely accommodate the Abnormal Indivisible Load (AIL) deliveries to construct the Scheme. Highway Works will support the movement of construction vehicles on narrower sections of the local road network within parts of the construction vehicle routes to and within the Order Limits.

1.2.5 The Order Limits are located entirely within the administrative boundary of South Norfolk Council (SNC) and Norfolk County Council (NCC). The Order Limits comprise 1,212.3 hectares (ha) of land, of which 1,051.4ha relates to the Sites.

1.3 Location

1.3.1 The Scheme is located with an approximate centroid at Ordinance Survey National Grid Reference (OSGR) TM 25553 95020. The Order Limits contain five tributaries of the River Tas, all of which are ephemeral, and one ephemeral tributary of the River Waveney, within the River Waveney catchment. These tributaries have been broken down into survey reaches which are listed below. The majority of these watercourses are surrounded by farmland and have been heavily managed, with evidence of historical straightening.

1.3.2 All tributaries fall within the Order Limits, or within 10m of the Order Limits, triggering the requirement for an RCA. These tributaries have been broken down into eight survey sections. The following watercourse sections were identified and surveyed using the MoRPh5 methodology[1]. Surveyed areas are shown in **Figure 1.1**:

1. Hempnall Beck – Ephemeral (TM 22996 94774);
2. Hempnall Beck – Main Waterbody (TM 23031 94734);
3. Hempnall Beck East (TM 25289 94346);
4. Tributary of Hempnall Beck (Southern) (TM 23504 94050)
   4a. Tributary of Hempnall Beck – Pulham Pumpkins (TM 20070 90265);
5. Ephemeral Tributary of Hempnall Beck (TM 23443 93932)
   5a. Ephemeral Tributary of Hempnall Beck – The Street (TM 22967 93399);
6. Saxlingham Nethergate – River Tas Tributary (TM 24612 96057);
7. Tributary of Brome Beck (TM 29865 94958); and
8. Tributary of the River Tas – Ephemeral (TM 26053 97120).

[1] Gurnell, A.M., England, J., Scott, S.J. & Shuker, L.J. (2024) *A Guide to Assessing River Condition: Part of the Rivers and Streams Component of the Biodiversity Metric Watercourse Module for calculating Biodiversity Net Gain*. Modular River Survey. Available at: https://modularriversurvey.org/ (Accessed: *insert date*).

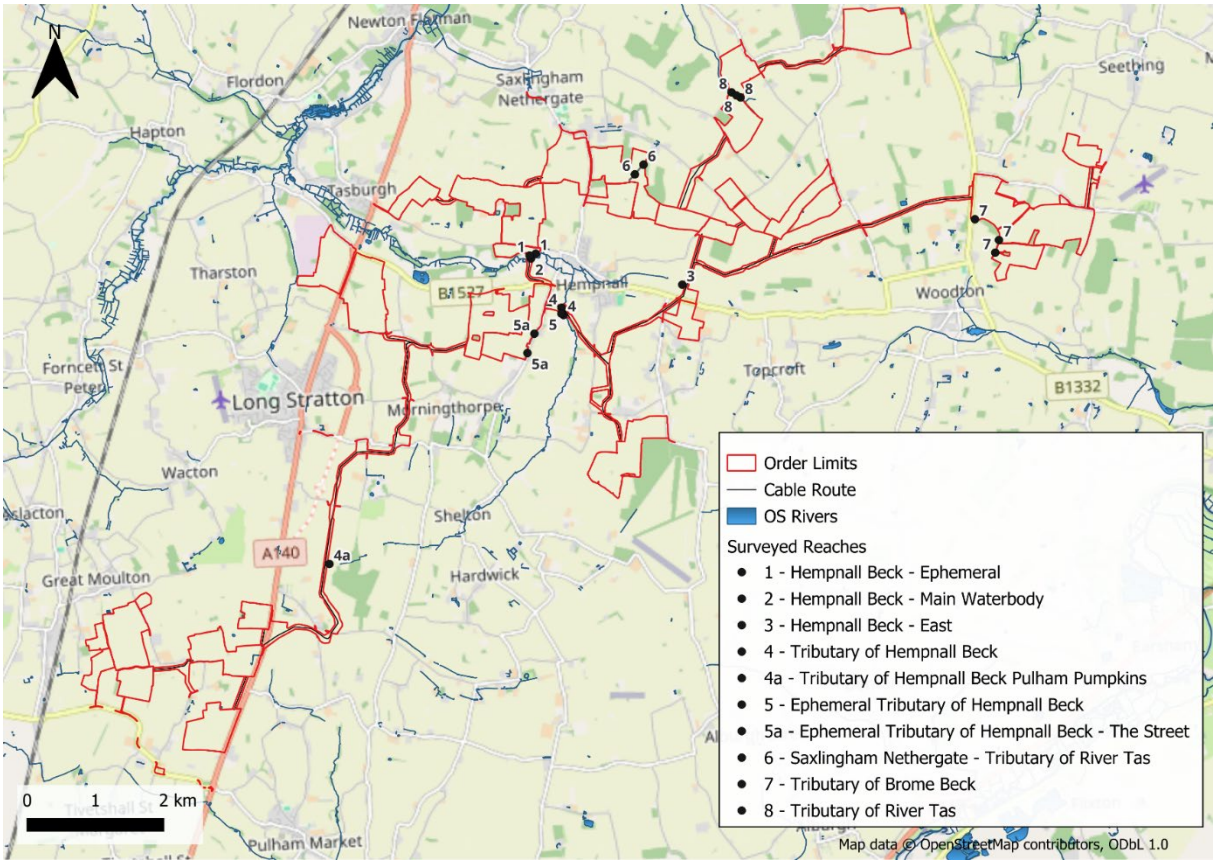

Figure 1.1: Map of Survey Reaches within the Order Limits

1.4 Relevant Policy and Legislation

1.4.1 The Government committed (Spring Statement, 13 March 2019) to mandate BNG in England through the Environment Act 2021, which received Royal Assent on 9 November 2021, and the revision of the National Planning Policy Framework (NPPF). The Government has also stated that the Environment Act 2021 will require development to achieve a 10% net gain for biodiversity from the 12 February 2024.

1.4.2 In addition to the Environment Act 2021, Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006[2] places duties on public bodies to have regard to the conservation of biodiversity in the exercise of their normal functions. Section 41 of the NERC Act 2006 defines Habitats and Species of Principal Importance to nature conservation in England which should be considered by all public bodies, including Local Planning Authorities, when carrying out their Section 40 duties.

[2] HM Government (2006) *Natural Environment and Rural Communities Act 2006*.

1.5 Report Objectives

1.5.1 The purpose of this RCA is to provide comprehensive ecological and physical habitat data on the baseline condition of the watercourse within the Order Limits, in the context of BNG, to support the DCO Application. The RCA is required for the watercourse unit element of the Statutory Biodiversity Metric (SBM) assessment, with the exception of culverts and ditches.

1.5.2 The report will outline both positive and negative impacts on the River Type and River Condition within the Order Limits and within 10m of the Order Limits.

1.5.3 The report includes a River Type and Condition Assessment to support BNG for the Scheme. It involves conducting a series of Modular River Physical (MoRPh5) surveys of the rivers and streams that fall within 10m of the Order Limits to document baseline waterbody conditions, followed by a desk-based assessment to determine the river system type. These findings will be used to calculate an overall score for the watercourse, considering river conditions within the broader landscape.

2 Methods

2.1 Overview

2.1.1 This section outlines the methods used to inform the RCA for the Scheme. The methodology encompasses a desk-based assessment, field survey, and subsequent evaluation of river condition. Any limitations encountered during the assessment are identified, and details of survey personnel are provided.

2.2 Desk-based Scoping Assessment

2.2.1 A desk-based scoping assessment was undertaken to identify all watercourses requiring an RCA. This included a review of existing datasets, Ordnance Survey mapping, including historical records, aerial imagery, statutory main rivers maps, and Light Detection and Ranging LiDAR data to confirm the presence of rivers or streams. The review also facilitated the identification of watercourses that had been historically straightened or otherwise modified to ensure they were adequately assessed.

2.2.2 All rivers and streams located within 10m of the Order Limits were included within the assessment scope, in accordance with legal requirements. In total, eight watercourses were identified for RCA.

2.3 Field Survey – Modular River Physical Survey

2.3.1 Following RCA guidance, the field survey was undertaken in accordance with the MoRPh survey methodology, which provides a standardised framework for assessing river morphology, bank structure and riparian features using three nested spatial units: module, sub-reach and reach.

2.3.2 All surveyed watercourses were less than 5m in width; consequently, 10m modules were applied in accordance with MoRPh guidance, forming MoRPh5 sub-reaches of 50m. This approach was applied consistently across the survey area.

2.3.3 A minimum of 20% of each watercourse located within 10m of the Order Limits was surveyed. Sub-reaches were selected to provide representative coverage and to capture variation in channel morphology, with surveys undertaken from upstream to downstream. The surveyed lengths and number of MoRPh5 sub-reaches for each watercourse are summarised in **Table 2.1**.

2.3.4 Field surveys were undertaken during the optimal survey window from May to September 2025, with locations subject to access restrictions surveyed on the 9–10 October 2025 once access was secured (see further detail in Section 3.3). **Figure 1.1** illustrates the location of each watercourse. All surveys were carried out by an RCA-accredited Consultant Ecologist.

Table 2.1: Length of Module and MoRPh5 Survey based on River Width (all Watercourses were less than 5m wide)

Watercourse ID	Length (m) within or adjacent (<10m to Order Limits)	No. of MoRPh5 sub reaches (20% of length)	Location
1.Hempnall Beck – Ephemeral Sub-reach 1	93	1 x 50 m	Within 10m of the Sites
1.Hempnall Beck – Ephemeral Sub reach 2	104	1 x 50 m	Situated within the CRC and Highway Works area
2. Hempnall Beck – Main Waterbody	77	1 x 50 m	Situated within the CRC and Highway Works area
3. Hempnall Beck – East	52	1 x 50 m	Situated within the CRC and Highway Works area
4. Tributary of Hempnall Beck	179	2 x 50 m	Situated within the CRC and Highway Works area
5 Ephemeral Tributary of Hempnall Beck	55	1 x 50 m	Situated within the CRC and Highway Works area
5a Ephemeral Tributary – The Street	391	2 x 50 m	Bordering the Sites
4a Tributary of Hempnall Beck – Pulham Pumpkins	50	1 x 50 m	Situated within the CRC and Highway Works area
6 Saxlingham Nethergate – River Tas Tributary	400	2 x 50 m	Situated within the Sites
7. Brome Beck Tributary – Reach 1	111	1 x 50 m	Falls within 10m of the Sites boundary
7.Brome Beck Tributary – Reach 2	346	2 x 50 m	Bordering the Sites
8. Tributary of the River Tas	615	3 x 50 m	Situated within the Sites

3 Desk Study River Typing

3.1.1 The river type was determined based on channel planform and bed material supported by the degree to which they are confined by their valley gradient. Other measurements also contribute to the river typing these include braiding/anabranching indices, sinuosity and valley length in accordance with the RCA guidance[1]. Each watercourse was assigned one of 15 morphotypes, including 13 river planform bed material types (A–M), large rivers, and engineered canals, hereafter referred to as 'morphotype'. The river type assessment was conducted in October 2025 by RCA accredited Ecologist.

3.2 Condition Class Determination

3.2.1 The results of each module were compiled over the five modules that form a MoRPh5 survey, and features were assigned a score based on negative and positive indicators using Cartographer software[3]. Positive indicators score 0 to +4 and reflect 'natural' elements, while negative indicators score 0 to -4 and reflect human pressures and interventions.

3.2.2 The RCA provided a preliminary score, representing the condition of the reach, calculated as the sum of the average positive and negative river condition indicator scores and translated into a final condition score according to river type. Five condition classes are available for rivers and streams (Poor, Fairly Poor, Moderate, Fairly Good, and Good). The condition thresholds vary for each river type these are shown in **Appendix A**.

3.2.3 Lateral connectivity and channel form were assessed using the River Shape score, which compares channel width to water depth plus lower bank height[4]. A River Shape score below 2 indicates the sub-reach is highly likely to be over-deep, while a score below 4 suggests it is likely over-deep, particularly if the average channel width exceeds 10m. Over-deepening reduces the final condition score by one class to reflect reduced ecological functionality.

3.2.4 As for distinctiveness and strategic significance, different condition classes are assigned different weightings within the SBM. A higher condition class contributes to a higher watercourse unit baseline. Culverts are automatically assigned a condition class of Poor, while the condition of open watercourse habitat is assessed through the MoRPh5 survey and associated desk study as outlined above.

[3] Cartographer Studios Ltd. (2025) *Cartographer Version 7.29.6.*
[4] Gurnell, A.M., England, J., Scott, S.J. & Shuker, L.J. (2024) *A Guide to Assessing River Condition: Part of the Rivers and Streams Component of the Biodiversity Metric Watercourse Module for calculating Biodiversity Net Gain*. Modular River Survey. Available at: https://modularriversurvey.org/ (Accessed: *10.02.2026*).

3.3 Statutory Biodiversity Metric

3.3.1 The Department for Environment, Food and Rural Affairs SBM Calculation Tool was used to calculate predicted changes in watercourse units between baseline and post-project scenarios. Watercourse units are linear units that cannot be combined with terrestrial habitat units to achieve net gain; any net gain in watercourse units does not automatically translate into an overall project net gain. Therefore, the watercourse component must be calculated and presented separately from terrestrial habitats.

3.3.2 The baseline watercourse units were determined by assessing four key components for each surveyed reach or MoRPh5 sub-reach, along with the watercourse length within the Order Limits or within 10m:

1. **River distinctiveness** – reflects the rarity and ecological value of the habitat. ‘’Very high’’ for priority river habitat, high for other rivers/streams, ‘’medium’’ for ditches and canals, and ‘’low’’ for culverts. Higher distinctiveness results in a higher contribution to baseline watercourse units;

2. **Strategic significance** – automatically assigned to Low due to the Local Nature Recovery Strategy having been the local importance of the watercourse based on its location and habitat type, as informed by Local Nature Recovery Strategies (LNRS), River Basin Management Plans, Catchment Plans, and other local guidance. Strategic significance automatically assigned to Low due to the LNRS having been published;

3. **River condition** – derived from the RCA using MoRPh5 surveys. Positive and negative physical indicators were scored using Cartographer software, and final condition scores were adjusted for over-deep channels where appropriate;

4. **Watercourse and riparian encroachment** – recorded during field surveys following Defra guidance (2024):

    - Watercourse encroachment reflects features that adversely affect the natural function of the channel or modify habitat and migratory pathways. Categories: No encroachment, Minor, Major, or N/A (culvert); and

    - Riparian encroachment reflects features reducing the quantity, quality, or ecological function of riparian habitat. Assessed for each bank individually and categorized as No encroachment, Minor, Moderate, or Major.

3.3.3 These four components, combined with watercourse length, were entered into the SBM Calculation Tool to quantify baseline watercourse units.

3.4 Limitations

3.4.1 The MoRPh field surveys were undertaken in September and October 2025 during low-flow conditions following an unusually dry year; many of the waterbodies surveyed were dry. The optimal survey window for MoRPh assessments is spring–early summer or autumn, to account for seasonal variations such as vegetation growth. Professional judgement was applied throughout the surveys to account for the effects of low flows and vegetation stage on river morphology and condition assessments.

3.5 Report Qualification

3.5.1 The survey and BNG assessment were undertaken in accordance with the best practice methodologies current at the time of commissioning. Site circumstances, scientific knowledge or methodological requirements can change during the course of a project, and these external factors may impact on the scope of subsequent work requirements.

3.5.2 All ecological surveys have an expected validity period owing to the tendency of the natural environment to change over time. This validity period varies from receptor to receptor and is also dependent on the degree of change in a site's management and overall landscape ecology. Where the potential for change is considered to be relevant to the Scheme, this is highlighted in the appropriate section.

3.5.3 This report does not purport to provide detailed, specialist legal advice. Where legislation is referenced, the reader should consult the original legal text, and/or the advice of a qualified environmental lawyer.

4 Results

4.1.1 This section presents the results of the RCA and associated field surveys undertaken within the Order Limits. Results are summarised below, with detailed reach descriptions provided in **Appendix D**.

4.1.2 Results are presented by survey reach and reported separately for watercourses within the Sites and the CRC and Highway Works areas. Information includes river type, condition scores, hydro-morphological features, and key observations relevant to biodiversity and ecological function. Watercourses are described in approximate downstream order within each area.

4.1.3 Full details on reach descriptions, individual indicator scores, riparian and watercourse encroachment bandings, and supporting rationale are provided in **Appendix C** to **Appendix D**. **Appendix B** illustrate the lengths assessed and the location of MoRPh5 sub-reaches overlaid on satellite imagery.

4.2 Baseline River Habitat

Overview

4.2.1 The Order Limits comprise of 11 watercourses sections (reaches), six of which fall within the Sites of the Order Limits, or within 10m of the boundaries and six fall within the CRC and areas of the Highway Works. Hempnall Beck Ephemeral reach is split between the CRC and Highway Works area and the Sites with a sub-reach positioned within each area. All watercourse locations are listed in **Table 2.1** and shown in **Figure 1.1**.

4.2.2 All watercourses were <5m wide. Channels were mostly straightened, over-deepened, and follow field boundaries or roads. Most reaches were dry during the survey, functioning as ephemeral headwaters.

Sites

4.2.3 All watercourses within the Sites are ephemeral and most have been historically heavily modified. Although banks are largely composed of natural materials and are not artificially reinforced, channels are visibly straightened and over-deepened, resulting in reduced morphological diversity.

4.2.4 A total of three culverts were recorded within the Sites:

- Two culverts on the artificially straightened ephemeral tributary feeding the Southern Hempnall Beck along “The Street”; and
- One culvert on the ephemeral tributary of the River Tas.

4.2.5 These structures reduce habitat continuity and local habitat quality.

4.2.6 The most natural watercourse within the Sites is an ephemeral channel located upstream of Hempnall Beck, situated within an extensive fen and wet grassland mosaic, with the channel being difficult to distinguish in upstream modules due to dense wetland vegetation. Despite the low-lying banks nestled within a wetland setting, the upstream section was impacted by Non Native Invasive Plant Species (NNIPS) *Impatiens glandulifera* Himalayan balsam.

CRC and Highway Works Area

4.2.7 Within the CRC and areas of the Highway Works, Hempnall Beck and its southern tributary supported consistent flow at the time of survey and exhibited greater habitat diversity compared to watercourses present within the Sites. Features recorded included pools, riffles, gravel and pebble substrates and aquatic macrophytes.

4.2.8 The main channel of Hempnall Beck was, however, heavily impacted by Himalayan balsam, forming extensive monocultures along the banks.

4.2.9 Along the Southern Tributary of Hempnall Beck, land use differs between banks:

- The western bank is grazed by horses, resulting in poached banks and reduced vegetation structure; and
- The eastern bank remains largely unmanaged, supporting a mosaic of wetland habitat including non-woody wetland vegetation, scrub and woodland.

4.2.10 Adjoining the southern tributary, is an ephemeral tributary which would flow into the watercourse from the south-west. Historic OS mapping (1:25,000, 1937–1961) and LiDAR data indicate that the ephemeral tributary has been realigned from its historic course, with a paleochannel visible across the adjacent field corresponding to the former channel alignment.

4.2.11 Further detail on indicator scores and habitat descriptions are provided in **Appendix D**.

4.2.12 A summary of river type, preliminary condition scores, river shape index values and final condition classes for each assessed sub-reach is presented in **Table 4.1**. Final condition classes marked with an asterisk (*) reflect adjustments following the review of the river shape index to account for over-deepened channels.

Table 4.1: Summary of River Condition Assessment Results across the Order Limits

Watercourse / Section	River Type	Preliminary Condition Score	River Shape Index	Condition Class*
Sites				
Hempnall Beck – Ephemeral Upper Stream SR1	H	0.5466	3.00	Moderate
Ephemeral Tributary – "The Street" SR1	K	0.2267	0.826	Fairly Poor*
Ephemeral Tributary – "The Street" SR2	K	0.0081	1.00	Poor*
Tributary of the River Tas – Ephemeral SR2	K	0.4008	1.54	Fairly Poor*
Tributary of the River Tas – Ephemeral SR2	K	0.4008	1.154	Fairly Poor*
Tributary of the River Tas – Ephemeral SR3	K	−0.3684	1.50	Fairly Poor*
Saxlingham Nethergate – River Tas Tributary SR1	K	0.3198	1.50	Fairly Poor*
Saxlingham Nethergate – River Tas Tributary SR2	K	0.3198	1.50	Fairly Poor*
Brome Beck – Pound Lane (Reach 1) SR1	K	0.2672	1.00	Fairly Poor*
Brome Beck – Pound Lane (Reach 2) SR1	K	0.9798	0.962	Fairly Poor*
Brome Beck – Pound Lane (Reach 2) SR2	K	0.6640	0.938	Fairly Poor*
Cable Route Corridor				
Hempnall Beck – Ephemeral Upper Stream SR2	H	0.7895	5.75	Moderate
Hempnall Beck – Main Waterbody SR1	H	0.7126	4.318	Moderate

Watercourse / Section	River Type	Preliminary Condition Score	River Shape Index	Condition Class*
Hempnall Beck – East (East Tributary) SR2	K	0.3279	1.097	Moderate
Ephemeral Tributary of Hempnall Beck SR1	H	1.3482	1.86	Moderate*
Tributary of Hempnall Beck (Mill Road South) SR1	H	1.4858	2.344	Fairly Poor*
Tributary of Hempnall Beck (Mill Road South) SR2	H	1.7449	2.243	Moderate*
Tributary of Hempnall Beck – Pulham Pumpkins SR1	H	0.2429	2.50	Fairly Poor*

*Final condition scores marked with * following River Shape Index review [1] (over deep channel)*

Strategic Significance

4.2.13 Baseline strategic signficance was automatically assigned to Low due to the LNRS having been published. Full reach-level scoring and supporting rationale are provided in **Appendix D**.

Encroachment Patterns

Watercourse Encroachment

4.2.14 Watercourse encroachment was present only in the Southern Tributary of Hempnall Beck with a plank of wood covering the complete width of the watercourse and historic culvert remnants. This section fell within the CRC and Highway Works (TM 23515 93897).

Riparian Encroachment

4.2.15 Riparian encroachment was considered major across both banks for the majority of waterbodies, representing the dominant pressure affecting river condition across both the Sites and the CRC and Highway Works. These patterns are strongly linked to surrounding land use, particularly arable cultivation, roads and livestock grazing.

4.2.16 To reduce repetition and improve clarity, riparian encroachment results are grouped by encroachment banding, with watercourses listed under each category and reported separately for the Sites and the CRC and Highway Works. This approach highlights shared habitat pressures contributing to similar indicator scores.

4.2.17 A detailed summary of riparian encroachment bandings for all assessed reaches is provided in **Appendix D**.

Baseline Units Order Limits Summary

4.2.18 The SBM was used to calculate baseline watercourse units for eight surveyed watercourses within the Order Limits. In total, approximately 17.70 baseline watercourse units were recorded across 2.51km of watercourse.

4.2.19 Of this length, 0.033km of culverted watercourse was entered into the metric with the automatic condition score of 'Poor', generating 0.03 units. The remaining 2.477km of rivers and streams generated 17.67 units, with condition classes ranging from Poor to Moderate. The majority of reaches were classified as Fairly Poor, reflecting widespread channel modification, over-deepening, and riparian encroachment, with the majority of watercourses having major encroachment on both banks. Of all watercourses present within the Order Limits, only one section exhibited watercourse encroachment. This was identified on the Southern Tributary of Hempnall Beck (SR2), where the encroachment was classified as major.

4.2.20 Strategic significance was low across all sub-reaches mostly due to inclusion in LNRS as outlined in the SBM user guide, except for Brome Beck and East Hempnall Beck, which scored low anyway as they were not included in any local plans or under any catchment management programmes. Watercourse encroachment was rare, but riparian encroachment was frequently Major, driven by intensive arable farming and livestock grazing.

4.2.21 A full breakdown of watercourse lengths, condition scores, strategic significance and encroachment assessments for each surveyed reach is provided in **Table 5.2** and detailed rationale presented in **Appendix D**.

4.2.22 This baseline summary provides the reference point against which proposed enhancements are considered in the following section.

Baseline Units CRC and Highway Works Area Summary

4.2.23 0.519km of the total 2.51km of watercourses within the Order Limits fall within the CRC and areas of Highway Works, equal to 4.63 watercourse units.

5 Enhancement Measures and Opportunities

5.1.1 This section outlines enhancement measures aimed at improving the ecological condition of watercourses within or adjacent to the Order Limits, contributing to the required 10% BNG for rivers and streams. Proposed measures respond directly to pressures identified in the RCA including riparian encroachment, bank-top vegetation management, and habitat restoration. Enhancements have been developed in accordance with the SBM, the RCA methodology[1] local LNRS priorities and opportunities identified during field survey.

5.2 Retained Watercourses

Retained Watercourses within the Sites

5.2.1 Two watercourses are retained within or adjacent to the Sites:

- **Hempnall Beck – Ephemeral SR1** (93m within 10m of the Sites)
    - Grassland, wetland, and tree line bordering the watercourse are to be retained.
    - There is no change in condition, strategic significance, or riparian encroachment.
- **Brome Beck – Reach 1 and Reach 2 Sub-reach 1** (313m retained)
    - The watercourse is approximately 9m from the Sites boundary limiting any effects from the enhancements made within the Sites.
    - This resulted in no change in condition, encroachment, or strategic significance.

Retained Watercourses within the CRC and Highway Works Area

5.2.2 The cable route will have temporary effects on the habitats within the CRC and areas of Highway Works. The proposals include areas of trenchless crossings; it is expected to have no foreseeable permanent changes to the watercourse habitat and therefore the sections of watercourse that fall within this area are to be **retained**.

5.2.3 Retained CRC and Highway Works watercourses include:

1. Hempnall Beck Ephemeral SR2;

2. Hempnall Beck (Main);

3. Hempnall Beck – East;

4. Hempnall Beck Southern Tributary;

4a. Headwaters of Hempnall Beck at Pulham Pumpkins; and

5. Hempnall Beck Southern Ephemeral Tributary.

5.2.4 Baseline condition, strategic significance and encroachment scores remain unchanged. Full reach-level data are provided in **Appendix D** and **E**.

5.3 Enhanced Watercourses

5.3.1 Most watercourses within or adjacent to the Sites will be enhanced. Given the scale and nature of the Scheme, morphological restoration of channel planform is not feasible. Enhancements are therefore focused on riparian buffer creation and reduction of agricultural pressure. These benefits have been quantitatively assessed within the post-construction BNG assessment using the SBM (**Table 5.2**). **Table 5.1** highlights any changes in condition scores resulting from the proposed works.

5.3.2 Watercourses targeted for enhancement:

5a. Hempnall Beck – Ephemeral Tributary (The Street);

6. Saxlingham Nethergate – Tributary of the River Tas;

7. Brome Beck Headwaters;

8. River Tas – Ephemeral Headwater;

Enhancement indices targeted:

B1: Bank top vegetation structure;

B2: Bank top tree feature richness; and

B5: Bank top managed ground cover.

Enhancement Measures

5a Hempnall Beck – Ephemeral Tributary (The Street)

- Grassland arable field margins will extend to 12m from the bank tops removing the arable crop that was previously present within 10m along the western bank within the Sites, removing riparian encroachment. On the eastern bank the country lane situated outside of the Sites restricts enhancements. Therefore, encroachment will remain as major on one bank;
- The enhancement measures to the west bank will stabilise soil and provide vegetation continuity, contributing to LNRS objectives and therefore increasing the strategic significance from low to high; and
- Indices remain unchanged due to limited diversity in vegetation and restricted uplift on the uncontrolled bank where the country lane occupies most of the eastern floodplain/bank top.

6 Saxlingham Nethergate – Tributary of the River Tas

- Both banks lie within the Sites, allowing full removal of riparian encroachment; the riparian zone (10m either side of the bank top) will not be grazed within the management regime;
- The western bank is proposed to have tussocky grassland established, trees and scrub along the bank face are to be retained. The management of this should be minimal allowing trees to reach full maturity where possible whilst ensuring that there are gaps in the canopy to allow some light to reach the channel bed;
- The eastern bank is proposed to have a wildflower meadow and scrub; no glyphosate will be used in the creation of this;
- Measures meet some of the LNRS objectives, these include vegetation cover, soil structure, and the watercourse has been reclassified from Low to High Strategic Significance.

Enhancement indices improved:

- **B1**: 1 → 2 (vegetation structure);
- **B2**: 1 → 2 (scrub and trees); and
- **B5**: -2 → 0 (managed ground cover).

7 Brome Beck Headwaters

- Enhancement limited to one bank for 144m due to a track situated outside of the Sites boundary; encroachment removed via the creation tussocky grassland from land that was being managed as arable within the Sites boundary;
- Remaining 202m falls around 9m from the Sites restricting the enhancements. Therefore the encroachment remains major on both banks;
- Area not included in LNRS; strategic significance remains Low; and
- Indices improvement limited: **B5**: -3 → -2 on the 144m of enhanced section with the removal of managed arable land to tussocky grassland.

8 River Tas – Ephemeral Headwater

- Where both banks fall within the Sites for 187m, the bank top enhancement will consist of the removal of arable land through the creation of areas of neutral grassland on the northern bank top and long tussocky grassland on the southern bank top, retaining the existing hedgerow with trees, removing the riparian encroachment completely. Retained hedgerow should have minimal management allowing trees to reach full maturity where possible whilst maintaining gaps within the canopy to allow some light to reach the channel bed;
- It is recommended that fallen branches, large wood, organic matter is left on the bank tops to decompose naturally. Log piles can also be created;
- For 427m only one bank falls within the Sites restricting the enhancements to one bank with the creation of tussocky grassland and the restoration of historical ponds that were lost over time due to agriculture, otherwise known as ‘ghost ponds’, the opposite bank remains arable/pasture. Encroachment reduced on controlled bank only; and
- Strategic significance reclassified from Low to High, due to meeting some of the goals outlined in the LNRS, including the restoration of the ghost ponds, soil stabilisation – indirectly improving water quality through reduction in surface run off.

Indices improvements:

- **B1**: unchanged due to vegetation homogeneity on each bank top;
- **B2**: (tree feature richness): 0 → 2; and
- **B5**: (managed ground cover): -3/-4 → 0.

5.4 Enhancement Summary

5.4.1 Overall, the proposed enhancements target riparian and bank-top habitats across four key watercourses. While improvements were made to some indices, these changes were not sufficient to elevate any watercourse to the next condition class. Although condition thresholds remain unchanged, the measures deliver long-term benefits for:

- Soil stabilization and erosion control;
- Water quality improvement;
- Floodplain connectivity; and
- Strategic alignment with LNRS objectives.

Table 5.1: Changes to Condition Score following Bank Top Enhancements to the Watercourses within or adjacent to the Sites

Watercourse / Section	River Type	Preliminary Condition Score	River Shape Index*	Condition Class	Estimated proposed condition score	Condition Class
Ephemeral Tributary – "The Street" SR1	K	0.0081	1.00	Poor*	0.0081	Poor*
Ephemeral Tributary – "The Street" SR2	K	0.2267	0.826	Fairly Poor*	0.2267	Fairly Poor*
Tributary of the River Tas – Ephemeral SR1	K	0.4008	1.54	Fairly Poor*	**0.7368**	Fairly Poor*
Tributary of the River Tas – Ephemeral SR2	K	0.4008	1.154	Fairly Poor*	**0.7368**	Fairly Poor*
Tributary of the River Tas – Ephemeral SR3	K	−0.3684	1.50	Fairly Poor*	**-0.2388**	Fairly Poor*
Saxlingham Nethergate – River Tas Tributary SR1	K	0.3198	1.50	Fairly Poor*	**0.6315**	Fairly Poor*
Saxlingham Nethergate – River Tas Tributary SR2	K	0.3198	1.50	Fairly Poor*	**0.6315**	Fairly Poor*
Brome Beck – Pound Lane (Reach 1) SR1	K	0.2672	1.00	Fairly Poor*	0.2672	Fairly Poor*
Brome Beck – Pound Lane (Reach 2) SR1	K	0.9798	0.962	Fairly Poor*	0.9798	Fairly Poor*
Brome Beck – Pound Lane (Reach 2) SR2	K	0.6640	0.938	Fairly Poor*	**0.7408**	Fairly Poor*

Full reach-level data including baseline units, strategic significance, and encroachment scores are provided in **Appendix D and **E.***

5.5 Proposed Units

Overview

5.5.1 The SBM was used to calculate baseline watercourse units for eight surveyed watercourses within the Order Limits. In total, approximately 17.70 baseline watercourse units were recorded across 2.51km of watercourse situated within the Order Limits.

Retained Watercourses

5.5.2 A total of 0.948km of watercourse are to be retained within the Order Limits retaining a total of 7.70 watercourse units.

CRC and Highway Works Area

5.5.3 0.519 km of this fall within the CRC and areas of Highway Works equal to 4.63 watercourse units. All watercourses within the CRC and areas of Highway Works are being retained as detailed in Section 7.1.2.

5.5.4 Watercourses that fall within the CRC:

1. SR2 of the Ephemeral Stream connected to Hempnall Beck;

2. Hempnall Beck;

3. Hempnall Beck East;

4. Southern Tributary of Hempnall Beck;

4a. Continuation of Southern Tributary of Hempnall Beck Pulham Pumpkins; and

5. Ephemeral Tributary to Hempnall Beck (South).

5.5.5 Of the watercourses that fall within the CRC and areas of Highway Works, 0.184km were entered into the metric in Poor condition retaining 1.35 units. 0.335km was entered into the metric as Moderate condition retaining 3.28 units.

Sites

5.5.6 A total of 0.429km of watercourse were retained within the metric, encompassing a total of 3.10 watercourse units.

5.5.7 A total of 0.406km of watercourses were entered into the metric as Other Rivers and Streams in Fairly Poor condition retaining a total of 3.07 watercourse units. 0.023km of watercourse were entered into the metric as Culverts with the automatic Poor condition retaining a total of 0.03 units.

Enhanced Watercourses

5.5.8 A total of 1.558km of watercourses within, or partially within the Sites are to be enhanced, achieving a total of 13.93 watercourse units.

5.5.9 This comprises 1.314km of watercourse entered into the metric as Other Rivers and Streams in Fairly Poor condition, achieving 12.46 units. A further 0.244 km of watercourse has been entered into the metric as Other Rivers and Streams in Poor condition, achieving a total of 1.46 watercourse units.

Table 5.2: Baseline and Post-enhancement Condition Scores, Strategic Significance, Riparian Encroachment and Watercourse Units

Reach	Watercourse type	Length (km)	Condition	Strategic Significance	Encroachment Watercourse	Encroachment Riparian	Baseline units	Proposed Condition	Strategic significance	Riparian Encroachment	Proposed Units
5a. Hempnall Beck Southern Tributary – The Street SR1	Other rivers and streams	0.147	Fairly Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Major	0.99225	**Fairly Poor***	**High – formally identified in local strategy**	**No Encroachment/Major**	**1.32**
5a. Hempnall Beck Southern Tributary – The Street SR2	Other rivers and streams	0.244	Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Major	1.098	**Poor***	**High – formally identified in local strategy**	**No Encroachment/Major**	**1.46**
6. Saxlingham Green – Tributary of the River Tas	Other rivers and streams	0.409	Fairly Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Major	2.76075	**Fairly Poor***	**High formally identified in local strategy**	**No Encroachment/No Encroachment**	**4.23**
7. Brome Beck – Pound Lane R2	Other rivers and streams	0.144	Fairly Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Major	0.972	**Fairly Poor***	**Low- Area/compensation not in local strategy/ no local strategy**	**Major/No Encroachment**	**1.13**
8 Tributary of River Tas - Ephemeral	Other rivers and streams	0.427	Fairly Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Major	2.88225	**Fairly Poor***	**High formally identified in local strategy**	**Major/No Encroachment**	**3.84**
8 Tributary of River Tas - Ephemeral	Other rivers and streams	0.187	Fairly Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Major	1.26225	**Fairly Poor***	**High formally identified in local strategy**	**No Encroachment/No Encroachment**	**1.93**

**condition score following shape index review*

6 Summary

6.1.1 The SBM was used to calculate baseline watercourse units for eight surveyed watercourses within the Order Limits. In total, approximately 17.70 baseline watercourse units were recorded across 2.51km of watercourse.

6.1.2 Strategic significance was low across all sub-reaches mostly due to inclusion in LNRS as outlined in the SBM user guide, except for Brome Beck and East Hempnall Beck, which scored low as they were not included in any local plans or under any catchment management programmes. Watercourse encroachment was rare, but riparian encroachment was frequently Major, driven by intensive arable farming and livestock grazing.

6.1.3 A total of 0.950km of watercourse is to be retained within the Order Limits retaining a total of 7.70 watercourse units. 0.519km of this fall within the CRC and areas of Highway Works, equal to 4.63 watercourse units. All watercourses within the CRC and areas of Highway Works are being retained.

6.1.4 A total of 1.56km of Other Rivers and Streams at baseline achieved 9.97 watercourse units these watercourses has been enhanced within the Sites achieving a total of 13.18 watercourse units. Though none of the condition scores have increased, encroachment has either improved or been removed for most waterbodies and the terrestrial enhancements have led to some targets from the LNRS being met, therefore have increased the strategic significance level in the enhancement tab of the SBM.

6.1.5 In addition to the watercourses detailed in this report that were subject to a River Condition Assessment, ditches present within the Order Limits were also included within the watercourses metric and are assessed separately with assumptions outlined within the BNG assessment.

7 References

Cartographer Studios Ltd. (2025) *Cartographer Version 7.29.6.*

Department for Communities and Local Government (2024) *National Planning Policy Framework*.

Department for Environment, Food and Rural Affairs (2024) *The Statutory Biodiversity Metric User Guide*. Department for Environment, Food and Rural Affairs (Defra).

Environment Agency (2025) *Statutory River Map – England* [online map]. Available at: https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386 (Accessed: 10 December 2025).

Environment Agency (2025) *Operational Catchment 3553*. Catchment Data Explorer. Available at: https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3553 (Accessed: 10 December 2025).

Gurnell, A.M., England, J., Scott, S.J. & Shuker, L.J. (2024) *A Guide to Assessing River Condition: Part of the Rivers and Streams Component of the Biodiversity Metric Watercourse Module for calculating Biodiversity Net Gain*. Modular River Survey. Available at: https://modularriversurvey.org/ (Accessed: *10.02.2026*).

HM Government (2006) *Natural Environment and Rural Communities Act 2006*.

Norfolk County Council (2025) *Norfolk's Local Nature Recovery Strategy interactive map*. ArcGIS Experience. Available at: https://experience.arcgis.com/experience/3425559ce5b94929b6865d0ba7e34f50 (Accessed: 10.02.26).

Appendix A Condition Class Thresholds of Preliminary Condition Scores for each River Type

	Canals/ navigable river	Large rivers	A	B	C	D	E	F	G	H	I	J	K	L	M
Likely best average condition score	1.8	2.5	2.4	2.7	2.7	2.7	2.7	2.8	3	2.9	3.1	2.8	2.4	2.4	2.4
Lower threshold for Good	>1.4	>2.0	>1.9	>2.2	>2.2	>2.2	>2.2	>2.3	>2.5	>2.4	>2.5	>2.3	>1.9	>1.9	>1.9
Lower threshold for Fairly Good	>0.7	>1.3	>1.2	>1.4	>1.4	>1.4	>1.4	>1.5	>1.6	>1.6	>1.7	>1.5	>1.2	>1.2	>1.2
Lower threshold for Moderate	>-0.1	>0.3	>0.2	>0.2	>0.2	>0.2	>0.2	>0.4	>0.5	>0.5	>0.6	>0.4	>0.2	>0.2	>0.2
Lower threshold for Fairly Poor	>-1.2	>-1.0	>-1.0	>-0.9	>-0.9	>-0.9	>-0.9	>-0.9	>-0.9	>-0.9	>-0.8	>-0.9	>-1.0	>-1.0	>-1.0
Likely worst average condition scores	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5

Appendix B Maps of Survey Sections

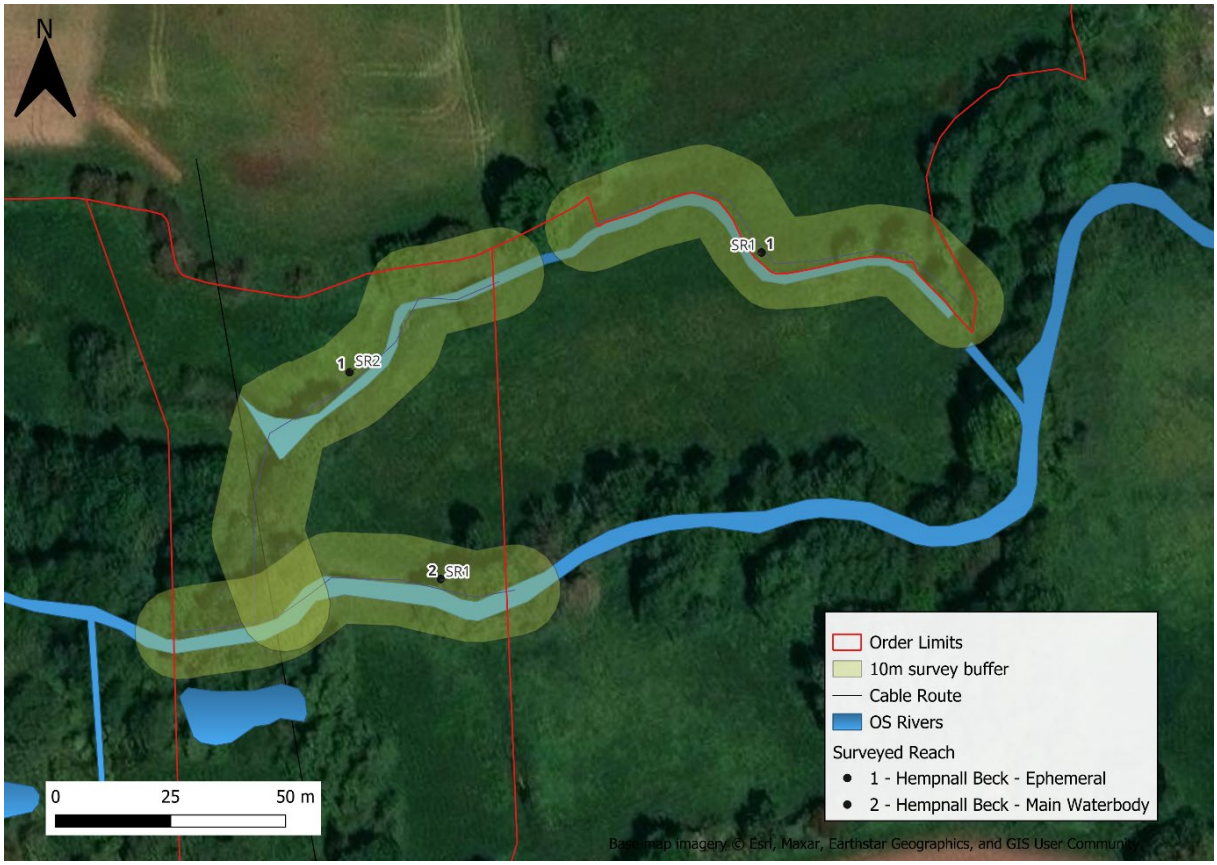

Figure 1: Illustrative Aerial Map Showing Hempnall Beck - Ephemeral and Main Waterbody Sections, Sub-reaches and Order Limits.

Figure B2: Illustrative Aerial Map of 3 - Hempnall Beck – East (TM 25289 94346) Showing the Surveyed Sub-Reach, Order Limits and Surrounding Landscape.

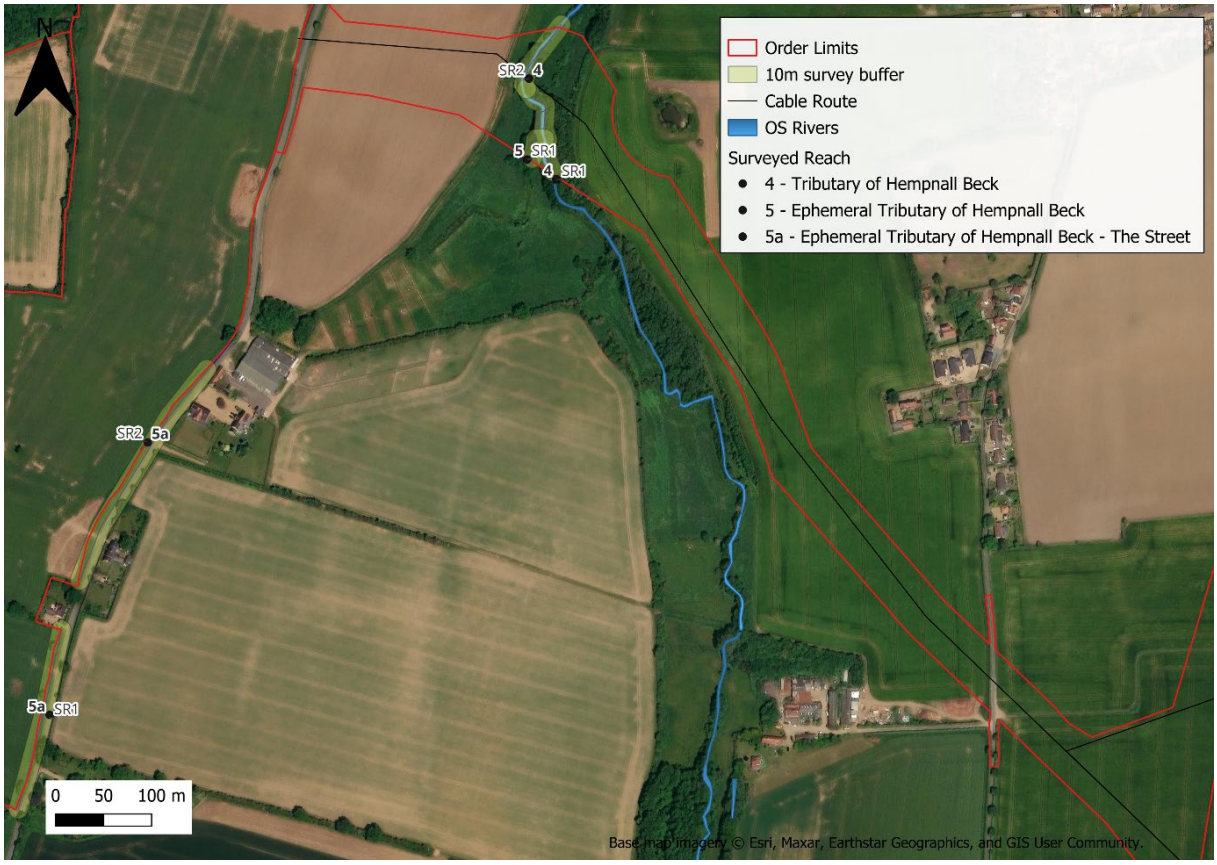

Figure B3: Illustrative Aerial Map of 4 - Tributary of Hempnall Beck (TM 23504 94050), 5 - Ephemeral Tributary (TM 23443 93932) and 5a - The Street (TM 22967 93399).

Showing historic channel alignment of the ephemeral tributary visible in adjacent field (watercourse 5). Stream resembles a straightened ditch and is culverted under the road; surrounding land includes horse-grazed pasture and arable crop.

Figure B4: 4a - Illustrative Aerial Map Showing the Tributary of Hempnall Beck located near Pulham Pumpkins / Long Stratton Bypass (TM 20070 90265) Showing Surveyed Sub-Reach and Surrounding Land Use.

Figure B5: Illustrative Aerial Map of 6 - Saxlingham Nethergate – River Tas Tributary (TM 24612 96057) Showing Surveyed Sub-Reaches and Surrounding Land Use.

Figure B6: Illustrative Aerial Map of 7 - Tributary of Brome Beck – Reach 1 to the North (SR1) and Reach 2 to the South-East (TM 29865 94958) Showing Surveyed Sub-Reaches and Surrounding Land Use.

Figure B7: Illustrative Aerial Map of 8 - Tributary of the River Tas – Ephemeral (TM 26053 97120) Showing Surveyed Sub-Reaches and Surrounding Landscape.

Appendix C Indices Scores

Table C1: River Condition Assessment Indices Scores for all sub-reaches (green and red text indicate positive and indicator scores, respectively

	Hempnall Beck Ephemeral Stream SR1	Hempnall Beck Ephemeral Stream SR2	Hempnall Beck Main SR1	Hempnall Beck - East SR1	Hempnall Beck Southern Tributary SR1	Hempnall Beck Southern Tributary SR2	hempnall Beck – Pulham Pumpkins SR1	Hempnall Beck – Ephemeral Tributary SR1	Hempnall Beck Ephemeral Tributary- The Street SR1	Hempnall Beck Ephemeral Tributary – The Street SR2	Saxlingham Nethergate - Tributary of the Tas SR1	Saxlingham Nethergate – Tributary of the Tas SR2	Tributary of Brome Beck R1 SR1	Tributary of Brome Beck R2 SR1	Tributary of Brome Beck R2 SR2	Tributary of the River Tas SR1	Tributary of the River Tas SR2	Tributary of the River Tas SR3
	SR1	SR2	SR1	SR1	SR1	SR2	SR1	SR1	SR1	SR2	SR1	SR2	R1: SR1	R2: SR1	R2: SR2	SR1	SR2	SR3
B1: Bank top vegetation structure	2	1	2	1	4	2	1	2	2	2	1	1	2	2	2	1	1	1
B2: Bank top tree feature richness	0	0	3	0	4	2	0	0	0	0	0	0	0	0	1	0	0	1
B3: Bank top water-related features	3	2	2	0	0	3	0	3	0	0	0	0	0	4	0	0	0	0
B4: Bank top NNIPS cover	-2	0	-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B5: Bank top managed ground cover	0	0	0	-2	-1	-2	-3	-3	-4	-4	-2	-2	-2	-3	-3	-3	-3	-4
C1: Bank face riparian vegetation structure	1	2	1	2	3	2	1	2	2	2	1	1	1	3	2	1	1	1
C2: Bank face tree feature richness	1	0	3	1	3	4	0	1	0	0	0	0	0	2	1	1	1	1

	Hempnall Beck Ephemeral Stream SR1	Hempnall Beck Ephemeral Stream SR2	Hempnall Beck Main SR1	Hempnall Beck - East SR1	Hempnall Beck Southern Tributary SR1	Hempnall Beck Southern Tributary SR2	hempnall Beck – Pulham Pumpkins SR1	Hempnall Beck – Ephemeral Tributary SR1	Hempnall Beck Ephemeral Tributary- The Street SR1	Hempnall Beck Ephemeral Tributary – The Street SR2	Saxlingham Nethergate - Tributary of the Tas SR1	Saxlingham Nethergate – Tributary of the Tas SR2	Tributary of Brome Beck R1 SR1	Tributary of Brome Beck R2 SR1	Tributary of Brome Beck R2 SR2	Tributary of the River Tas SR1	Tributary of the River Tas SR2	Tributary of the River Tas SR3
C3: Bank face natural bank profile extent	3	3	3	1	1	3	3	3	3	0	3	3	0	0	0	3	3	2
C4: Bank face natural bank profile richness	2	2	2	1	2	3	1	2	2	0	1	1	0	0	0	1	1	1
C5: Bank face natural bank material richness	1	1	1	1	2	1	1	1	1	1	0	0	1	1	1	1	1	1
C6: Bank face bare sediment extent	1	1	2	2	3	1	0	4	2	0	0	0	0	4	1	0	0	0
C7: Bank face artificial bank profile extent	0	0	-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2
C8: Bank face reinforcement extent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2
C9: Bank face reinforcement material severity	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	-2
C10: Bank face NNIPS cover	-2	0	-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D1: Channel margin aquatic vegetation extent	2	0	1	2	1	2	0	2	0	0	0	0	0	2	2	0	0	0
D2: Channel margin aquatic morphotype richness	2	0	1	2	1	3	0	2	0	0	0	0	0	1	1	0	0	0

	Hempnall Beck Ephemeral Stream SR1	Hempnall Beck Ephemeral Stream SR2	Hempnall Beck Main SR1	Hempnall Beck - East SR1	Hempnall Beck Southern Tributary SR1	Hempnall Beck Southern Tributary SR2	hempnall Beck – Pulham Pumpkins SR1	Hempnall Beck – Ephemeral Tributary SR1	Hempnall Beck Ephemeral Tributary- The Street SR1	Hempnall Beck Ephemeral Tributary – The Street SR2	Saxlingham Nethergate - Tributary of the Tas SR1	Saxlingham Nethergate – Tributary of the Tas SR2	Tributary of Brome Beck R1 SR1	Tributary of Brome Beck R2 SR1	Tributary of Brome Beck R2 SR2	Tributary of the River Tas SR1	Tributary of the River Tas SR2	Tributary of the River Tas SR3
D3: Channel margin physical feature extent	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0
D4: Channel margin physical feature richness	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0
D5: Channel margin artificial features	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E1: Channel aquatic morphotype richness	1	1	2	1	1	2	1	1	1	0	0	0	1	0	1	1	1	1
E2: Channel bed tree features richness	1	1	2	1	2	2	0	2	1	0	1	1	0	1	1	1	1	1
E3: Channel bed hydraulic features richness	0	0	2	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
E4: Channel bed natural features extent	0	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
E5: Channel bed natural features richness	0	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
E6: Channel bed material richness	2	1	3	3	4	2	1	3	1	1	2	2	3	3	4	2	2	2
E7: Channel bed siltation	-2	0	-4	0	0	-4	0	0	0	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	0	0	0	0	0

	Hempnall Beck Ephemeral Stream SR1	Hempnall Beck Ephemeral Stream SR2	Hempnall Beck Main SR1	Hempnall Beck - East SR1	Hempnall Beck Southern Tributary SR1	Hempnall Beck Southern Tributary SR2	hempnall Beck – Pulham Pumpkins SR1	Hempnall Beck – Ephemeral Tributary SR1	Hempnall Beck Ephemeral Tributary- The Street SR1	Hempnall Beck Ephemeral Tributary – The Street SR2	Saxlingham Nethergate - Tributary of the Tas SR1	Saxlingham Nethergate – Tributary of the Tas SR2	Tributary of Brome Beck R1 SR1	Tributary of Brome Beck R2 SR1	Tributary of Brome Beck R2 SR2	Tributary of the River Tas SR1	Tributary of the River Tas SR2	Tributary of the River Tas SR3
E9: Channel bed reinforcement severity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E10: Channel bed artificial features severity	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0	0	0	-4
E11: Channel bed NNIPS extent	0	0	0	-2	0	0	0	0		0	0	0	0	0	0	0	0	0
Is the watercourse over-deep?	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix D Baseline Habitat Descriptions

1. Hempnall Beck – Ephemeral Upper Stream

Hempnall Beck and its connected ephemeral stream, both statutory main rivers, flow through and adjacent to the Order Limits. The ephemeral stream runs north of the main watercourse, just outside field parcel 7B of the Solar PV Sites for approximately 93m, with a further 104m located within the CRC and Highways Improvement Area. The ephemeral stream is artificially connected to the main watercourse via a drainage ditch, as confirmed by topographic mapping and LiDAR analysis. The channel bed is composed primarily of gravel and pebble, with some sand and smaller gravel particles.

Reach description

Upstream, the channel is low-lying and obscured by fen habitat. In the mid-section, the right bank rises abruptly by approximately 0.5 m onto adjacent fields, where a line of trees shades the bank face, reducing vegetation cover within the channel bed and along the banks. Downstream, shallow, isolated pools of standing water accumulate, partially impeded by a large tree root, as the watercourse connects with the lower drainage ditch. Emergent broad-leaved macrophytes are present within these pools.

The surrounding floodplain comprises fen and wet grassland habitats dominated by sedges *Carex* spp., common nettle *Urtica dioica*, Yorkshire fog *Holcus lanatus*, hogweed *Heracleum sphondylium*, thistle *Cirsium* spp., small patches of bramble *Rubus fruticosus*, and wet woodland. Himalayan balsam *Impatiens glandulifera* is abundant along the edges of the main watercourse but occurs only in the upstream reach of the ephemeral stream. Adjacent fields to the north are arable and pasture, located just beyond 10 m from the bank tops on a slope, so the stream is likely affected by nutrient runoff.

Table D1: Hempnall Beck Ephemeral Stream baseline indices scores

Watercourse I.D		Hempnall Beck Ephemeral Stream	
River Section Length		93 (SR1) + 104m (SR2) total of 197m	
RCA River Type		H	
Condition Assessment Criteria		RCA index Values	
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score SR1	Baseline Score SR2
Bank Top			
B1	Bank top vegetation structure	2	1
B2	Bank top tree feature richness	0	0
B3	Bank top water-related features	3	2
B4	Bank top NNIPS cover	-2	0
B5	Bank top managed ground cover	0	0
Bank Face			
C1	Bank face riparian vegetation structure	1	2
C2	Bank face tree feature richness	1	0
C3	Bank face natural bank profile extent	3	3
C4	Bank face natural bank profile richness	2	2
C5	Bank face natural bank material richness	1	1
C6	Bank face bare sediment extent	1	1
C7	Bank face artificial bank profile extent	0	0
C8	Bank face reinforcement extent	0	0
C9	Bank face reinforcement material severity	0	0
C10	Bank face NNIPS cover	-2	0
Channel Margin			
D1	Channel margin aquatic vegetation extent	2	0
D2	Channel margin aquatic morphotype richness	2	0
D3	Channel margin physical feature extent	0	0
D4	Channel margin physical feature richness	0	0
D5	Channel margin artificial features	0	0
Channel Bed			
E1	Channel aquatic morphotype richness	1	1
E2	Channel bed tree features richness	1	1
E3	Channel bed hydraulic features richness	0	0
E4	Channel bed natural features extent	0	0
E5	Channel bed natural features richness	0	0
E6	Channel bed material richness	1	1
E7	Channel bed siltation	0	0
E8	Channel bed reinforcement extent	0	0
E9	Channel bed reinforcement severity	0	0
E10	Channel bed artificial features severity	0	0
E11	Channel bed NNIPS extent	0	0
E12	Channel bed filamentous algae extent	0	0
Is the watercourse over-deep?		**No**	**No**
Final Condition Class		**Fairly Poor**	**Moderate**

Summary of indices Scores

Positive indices scoring well:

- B3 Bank top water-related features, reflecting the presence of a diverse range of wetland habitats along the bank tops.
- C3 Bank face natural profile extent and C4 richness, consistent across both sub-reaches, with most of the banks gently sloping; only one bank adjacent to arable fields exhibits a steeper gradient.
- For sub-reach 1 E1 aquatic vegetation extent and D4 aquatic morphotype richness, Dense macrophyte cover, contributes positively to habitat complexity and ecological value in the upper ephemeral stream.

Positive indices scoring poorly:

- E1-E6 Channel bed features are largely absent across both sub-reaches, as the ephemeral stream was dry at the time of survey.
- Similarly, D3 and D4 physical features in the channel margin are minimal, reflecting the lack of flow and limited opportunity for frequent natural processes such as erosion and deposition to create structural diversity.

Negative indicators scoring below 0:

- Himalayan balsam in sub-reach 1 reduced bank top (B4) and bank face (C10) scores, lowering ecological quality locally and highlighting a key area for management attention.

Encroachment

- No encroachment was present throughout the surveyed areas due to the arable field being over 10m from the bank top, no livestock were seen grazing, and no artificial structures were present.

2. Hempnall Beck – Main Waterbody

Reach Description

The main channel of Hempnall Beck lies within the CRC and Highways Improvement Area for approximately 77 m. The southern bank comprises wet woodland, and the northern bank consists of wet grassland, similar to the adjacent ephemeral stream.

Large stands of Himalayan balsam were present along both banks. Upstream, the channel exhibits diverse flow conditions over a sandy–gravel–pebble bed, forming riffles and pools. Structural complexity is provided by large woody debris, fallen trees, and dense shading. Side bars support pendulous sedge, *Carex pendula*, and brooklime, *Veronica beccabunga*. Overhanging trees cause localized bank undercutting. Mid- to downstream, minor bank poaching is visible in very small sections, likely due to deer movement.

Downstream, reduced tree cover and increased Himalayan balsam correspond with greater siltation, slower flow, and deeper water. The final module forms a deeper pool beneath an overhanging tree, with a stand of starwort, *Callitriche palustris*, and water-plantain, *Alisma plantago-aquatica*.

Table D2: Hempnall Beck - Main baseline indices scores

Watercourse I.D		Hempnall Beck Main
River Section Length		77m
RCA River Type		H
Condition Assessment Criteria		RCA index Values
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score R1, SR1 Main waterbody
Bank Top		
B1	Bank top vegetation structure	2
B2	Bank top tree feature richness	3
B3	Bank top water-related features	2
B4	Bank top NNIPS cover	-3
B5	Bank top managed ground cover	0
Bank Face		
C1	Bank face riparian vegetation structure	1
C2	Bank face tree feature richness	3
C3	Bank face natural bank profile extent	3
C4	Bank face natural bank profile richness	2
C5	Bank face natural bank material richness	1
C6	Bank face bare sediment extent	2
C7	Bank face artificial bank profile extent	-3
C8	Bank face reinforcement extent	0
C9	Bank face reinforcement material severity	0
C10	Bank face NNIPS cover	-3
Channel Margin		
D1	Channel margin aquatic vegetation extent	1
D2	Channel margin aquatic morphotype richness	1
D3	Channel margin physical feature extent	1
D4	Channel margin physical feature richness	1
D5	Channel margin artificial features	0
Channel Bed		
E1	Channel aquatic morphotype richness	2
E2	Channel bed tree features richness	2
E3	Channel bed hydraulic features richness	2
E4	Channel bed natural features extent	1
E5	Channel bed natural features richness	1
E6	Channel bed material richness	3
E7	Channel bed siltation	-4
E8	Channel bed reinforcement extent	0
E9	Channel bed reinforcement severity	0
E10	Channel bed artificial features severity	0
E11	Channel bed NNIPS extent	0
E12	Channel bed filamentous algae extent	-1
Pre-liminary Condition Score		
Is the watercourse over-deep?		**No**
Final Condition Class		**Moderate**

Summary of indices Scores

Positive indices scoring well:

- B2 Bank top tree feature richness and B3 bank top water-related features scored well, reflecting the presence of wet woodland on the southern bank and wet grassland on the northern bank.
- C3 Bank face natural profile extent and C2 richness are also high, with varied but frequent gradients mostly consisting of gentle, steep slopes and undercut banks.
- Channel margin indices D1–D4 had low positive scores. Some marginal features were present, mostly in shallower upstream reaches, but they were not abundant or highly varied.
- Channel bed indices E1 aquatic morphotype richness, E2 tree feature richness, and E6 material richness scored well, corresponding to diverse flow conditions, riffles, pools, and substrate variation.

Negative indices scoring below 0:

- B4 Bank top and C10 Bank face NNIPS, specifically Himalayan balsam, were present along both banks in dens stands where there were gaps in tree cover.
- C7 Artificial bank profiles due to localised poaching were observed, affecting the natural channel structure.
- E7 Channel bed siltation scored poorly downstream, associated with reduced flow velocity, minor poaching from wildlife, and sediment input from Himalayan balsam colonisation.
- E12 Filamentous algae was present at low levels, indicating minor nutrient enrichment. No cattle were observed, but one patch of old faeces was found indicating grazing may occur at other times, however as the fields were relatively open (i.e. no barriers to keep them in) it is unlikely, no hoof prints were found, narrow poaching likely from deer.

Encroachment

- No encroachment was observed. Arable fields were over 10 m from the bank top, no livestock were present, and no artificial structures were recorded.

3. Hempnall Beck – Tributary East

Hempnall Beck East is a straight-sinuous channel flowing within the CRC and Highways Improvement Area for approximately 54 m. The bed material is primarily silt. The channel has been historically straightened and deepened, now resembling a field ditch, with shallow standing water at the time of survey. Historic mapping and LiDAR indicate this is a former natural stream, supporting its inclusion in the RCA. Surrounding land comprises arable fields with narrow, modified grassland margins.

The channel is confined by steep, uniform banks. In the upstream module, standing water persisted at approximately 5 cm, with sparse macrophytes and trailing hedgerow vegetation providing structural complexity. Modules 2 and 3, exposed to full sunlight due to a break in the hedgerow, supported dense fool's watercress, *Apium nodiflorum*, and other emergent vegetation. Bank faces are steep and dominated by long grass where hedgerow is absent. No trees were recorded along this sub-reach. The field margin consists of recently cut long grass, with cut material lying across the bank. A narrow footbridge is present in module 5.

Table D3: Hempnall Beck - East Tributary baseline indices scores

Watercourse I.D		Hempnall Beck – East Tributary
River Section Length		54m
RCA River Type		K
Condition Assessment Criteria		RCA index Values
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score
B1	Bank top vegetation structure	1
B2	Bank top tree feature richness	0
B3	Bank top water-related features	0
B4	Bank top NNIPS cover	0
B5	Bank top managed ground cover	-3
C1	Bank face riparian vegetation structure	1
C2	Bank face tree feature richness	1
C3	Bank face natural bank profile extent	3
C4	Bank face natural bank profile richness	2
C5	Bank face natural bank material richness	1
C6	Bank face bare sediment extent	1
C7	Bank face artificial bank profile extent	0
C8	Bank face reinforcement extent	0
C9	Bank face reinforcement material severity	0
C10	Bank face NNIPS cover	0
D1	Channel margin aquatic vegetation extent	0
D2	Channel margin aquatic morphotype richness	0
D3	Channel margin physical feature extent	0
D4	Channel margin physical feature richness	0
D5	Channel margin artificial features	0
E1	Channel aquatic morphotype richness	1
E2	Channel bed tree features richness	2
E3	Channel bed hydraulic features richness	0
E4	Channel bed natural features extent	0
E5	Channel bed natural features richness	0
E6	Channel bed material richness	2
E7	Channel bed siltation	-3
E8	Channel bed reinforcement extent	0
E9	Channel bed reinforcement severity	0
E10	Channel bed artificial features severity	0
E11	Channel bed NNIPS extent	0
E12	Channel bed filamentous algae extent	0
Is the watercourse over-deep?		**yes**
Final Condition Class		**Fairly Poor**

Summary of indices Scores

Positive indices scoring well:

- C1 Bank face riparian vegetation structure, reflecting the varied vegetation structure from trees and scrub to grass and herbaceous species.
- C3 Bank face natural profile extent and C4 richness, reflecting steep but uniform earth banks.
- E1 Channel aquatic morphotype richness scored low to moderate, consistent with sparse macrophyte cover in shaded modules.
- E2 Channel bed tree feature richness and E6 material richness scored positively, reflecting occasional trailing hedgerow vegetation and some substrate variation in shallow sections.

Positive indices scoring poorly:

- B1 Bank top vegetation structure, B2 bank top tree feature richness, and B3 bank top water-related features scored low due to the absence of trees and heavily modified grassland margins.
- D1–D4 Channel margin vegetation and physical features scored poorly, reflecting limited marginal habitat and structural diversity.

Negative indices scoring below 0:

- B5 Bank top managed ground cover scored minus three due to intensive arable management close to the bank top.
- E7 Channel bed siltation scored minus three, reflecting the narrow artificial channel form, limited flow diversity, lack of woody material, and sediment input from exposed banks and surrounding land management.

Encroachment

- Riparian encroachment is classified as major on both banks due to arable management covering approximately 90 percent or more of the riparian survey buffer within 10 m of the bank top. Small footbridges are present along the reach but do not encroach onto the bank face or channel.

4. Tributary of Hempnall Beck (Mill Road South)

This tributary of Hempnall Beck is straight to sinuous, with average bed material comprising sand and cobble as the coarsest substrate within the wider reach. A total length of 187 m lies within the Order Limits. The reach was surveyed as two MoRPh5 sub-reaches, which produced contrasting condition scores and encroachment bands and are therefore assessed separately.

Sub-reach 1

Sub-reach 1 comprises the upstream 93 m section and is bounded by woodland on both banks, resulting in dense shading and a footpath runs along the left bank. An ephemeral tributary enters from the west, and the channel bed contains organic material including fallen branches and large woody debris, creating varied flow conditions. Bank faces support woody nightshade *Solanum dulcamara*, common nettle, perennial ryegrass *Lolium perenne*, and bramble *Rubus fruticosus*, some of which trails into the channel. Banks are steep throughout, with exposed tree roots along the bank face and within the channel. A large plank of wood of anthropogenic origin is lodged against tree roots in the upper modules, trapping organic material. Remnants of a historic culvert remain on the bank face, with adjacent cobble and gravel deposits either side of the river.

Sub-reach 2

Sub-reach 2 covers the downstream 94 m section, where the footpath diverts away from the river and horses have direct access to the channel. The upstream section is shallow, with a silty gravel and pebble bed supporting small riffles, transitioning downstream into a deeper pool with silt and organic material. Tree cover becomes sparse, and the channel becomes increasingly choked with macrophytes including yellow flag iris *Iris pseudacorus*, water mint *Mentha aquatica*, and lesser willowherb *Epilobium parviflorum*. The right bank top supports wetland vegetation dominated by reeds and sedges. Bank poaching by horses is evident in unfenced areas, while protected sections retain a composite bank structure, indicating reduced but historic disturbance.

Table D4: Tributary of Hempnall Beck baseline indices scores

Watercourse I.D		Tributary of Hempnall Beck (South)	
River Section Length		187m	
RCA River Type		H	
Condition Assessment Criteria		RCA index Values	
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score SR2	Baseline Score SR1
Bank Top			
B1	Bank top vegetation structure	2	4
B2	Bank top tree feature richness	2	4
B3	Bank top water-related features	3	0
B4	Bank top NNIPS cover	0	0
B5	Bank top managed ground cover	-2	-1
Bank Face			
C1	Bank face riparian vegetation structure	2	3
C2	Bank face tree feature richness	4	3
C3	Bank face natural bank profile extent	3	1
C4	Bank face natural bank profile richness	3	2
C5	Bank face natural bank material richness	1	2
C6	Bank face bare sediment extent	1	3
C7	Bank face artificial bank profile extent	0	0
C8	Bank face reinforcement extent	0	0
C9	Bank face reinforcement material severity	0	-1
C10	Bank face NNIPS cover	0	0
Channel Margin			
D1	Channel margin aquatic vegetation extent	2	1
D2	Channel margin aquatic morphotype richness	3	1
D3	Channel margin physical feature extent	1	1
D4	Channel margin physical feature richness	1	1
D5	Channel margin artificial features	0	0
Channel Bed			
E1	Channel aquatic morphotype richness	2	1
E2	Channel bed tree features richness	2	3
E3	Channel bed hydraulic features richness	1	2
E4	Channel bed natural features extent	1	2
E5	Channel bed natural features richness	1	2
E6	Channel bed material richness	2	4
E7	Channel bed siltation	-4	0
E8	Channel bed reinforcement extent	0	0
E9	Channel bed reinforcement severity	0	0
E10	Channel bed artificial features severity	0	-2
E11	Channel bed NNIPS extent	0	0
E12	Channel bed filamentous algae extent	0	0
Pre-liminary Condition Score			
Is the watercourse over-deep?		**yes**	**yes**

Watercourse I.D		Tributary of Hempnall Beck (South)	
River Section Length		187m	
RCA River Type		H	
Condition Assessment Criteria		RCA index Values	
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score SR2	Baseline Score SR1
Final Condition Class		**Moderate**	**Fairly Poor**

Summary of indices Scores

Positive indices scoring well:

- B1 Bank top vegetation structure and B2 bank top tree feature richness, reflecting dense woodland and mature trees along both banks in Sub-reach 1.
- C1 Bank face riparian vegetation structure and C2 bank face tree feature richness, reflecting the presence of exposed roots, leaning trees, scrub, and large woody debris.
- C3 Bank face natural profile extent and C4 richness, reflecting predominantly natural earth banks with varied but consistent profiles.
- D1 Channel margin aquatic vegetation extent and D2 morphotype richness, particularly in Sub-reach 2, reflecting increased sunlight exposure and macrophyte development.
- E1 Channel aquatic morphotype richness and E6 channel bed material richness, reflecting cobble–gravel substrates, sediment deposition, and habitat variability in Sub-reach 2.

Positive indices scoring poorly:

- B3 Bank top water-related features, scoring poorly in Sub-reach 1 due to the absence of connected wetland habitats but higher in Sub-reach 2 where wetland vegetation was present.
- E3 Channel bed hydraulic features and E4–E5 natural features, reflecting reduced flow diversity and increasing macrophyte dominance in downstream sections.

Negative indices scoring below 0:

- B5 Bank top managed ground cover, reflecting horse-grazed pasture adjacent to the channel.
  E7 Channel bed siltation, reflecting sediment input from bank poaching and accumulation in deeper, slower-flowing sections.
- E10 Channel bed artificial features severity, reflecting the presence of a lodged wooden structure and remnants of a historic culvert in Sub-reach 1.

Encroachment

- Sub-reach 1 (SR1) exhibited major watercourse encroachment due to the presence of a large artificial wooden weir obstructing the channel and remnants of a removed culvert remaining on the right bank face. Minor encroachment was also recorded along one side of the riparian zone where horse-grazed pasture occurs; however, the majority of the floodplain is woodland, limiting the overall extent of grazing impacts.

- Sub-reach 2 (SR2) exhibited major encroachment on one side of the riparian zone, reflecting horse-grazed pasture occupying the entirety of the left bank top.

4b. Tributary of Hempnall Beck – Pulham Pumpkins

The main tributary of Hempnall Beck is a straight to sinuous channel flowing southwards towards the Long Stratton bypass at Pulham Pumpkins. The CRC and Highways Improvement Area intersect the watercourse for approximately 50 m; therefore, one 50 m MoRPh5 sub-reach was surveyed. Bed material consisted primarily of silt, and the channel appears to have been artificially straightened. Connectivity with Hempnall Beck, supported by historic Ordnance Survey mapping from 1885–1900, indicates that this watercourse represents a continuation of the main tributary.

The watercourse is bordered by arable land on both floodplains. The northern bank supports a modified grassland field margin of approximately 5 m, while the southern bank margin is less than 1 m wide. Water depth was less than 5 cm at the time of survey, with no observable flow, and the channel was heavily dominated by fool's watercress *Apium nodiflorum*, likely reflecting full sunlight exposure and the absence of riparian shading. Two footbridges span the watercourse, one of which falls within the surveyed sub-reach in the downstream section. Additional connecting ditches occur nearby but lie outside the surveyed reach. Banks are steep, homogenous, and uniformly vegetated with long grass throughout.

Table D5: Tributary of Hempnall Beck - Pulham Pumpkins baseline indices scores

Watercourse I.D		Tributary of Hempnall Beck – Pulham Pumpkins
River Section Length		50m
RCA River Type		K
Condition Assessment Criteria		RCA index Values
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score SR1
B1	Bank top vegetation structure	1
B2	Bank top tree feature richness	0
B3	Bank top water-related features	0
B4	Bank top NNIPS cover	0
B5	Bank top managed ground cover	-3
C1	Bank face riparian vegetation structure	1
C2	Bank face tree feature richness	0
C3	Bank face natural bank profile extent	3
C4	Bank face natural bank profile richness	1
C5	Bank face natural bank material richness	1
C6	Bank face bare sediment extent	0
C7	Bank face artificial bank profile extent	0
C8	Bank face reinforcement extent	0
C9	Bank face reinforcement material severity	0
C10	Bank face NNIPS cover	0
D1	Channel margin aquatic vegetation extent	0
D2	Channel margin aquatic morphotype richness	0
D3	Channel margin physical feature extent	0
D4	Channel margin physical feature richness	0
D5	Channel margin artificial features	0
E1	Channel aquatic morphotype richness	1
E2	Channel bed tree features richness	0
E3	Channel bed hydraulic features richness	0
E4	Channel bed natural features extent	0
E5	Channel bed natural features richness	0
E6	Channel bed material richness	1
E7	Channel bed siltation	0
E8	Channel bed reinforcement extent	0
E9	Channel bed reinforcement severity	0
E10	Channel bed artificial features severity	0
E11	Channel bed NNIPS extent	0
E12	Channel bed filamentous algae extent	0
Is the watercourse over-deep?		**Fairly Poor**
Final Condition Class		**yes**

Summary of indices Scores

Positive indices scoring well:

- C3 Bank face natural profile extent and C5 natural bank material richness, reflecting the homogenous steep but earth banks with no reinforcement.
- C4 Bank face natural profile richness, indicating limited but present variation in bank form along the reach.

Positive indices scoring poorly:

- B1 Bank top vegetation structure, reflecting arable land use and narrow, uniform grass margins.
- D1–D4 Channel margin vegetation and physical features, reflecting the narrow channel, absence of marginal features, and dominance of fool's watercress within the channel bed.
- E1 Channel aquatic morphotype richness and E6 material richness, which scored low due to uniform substrates, shallow standing water, and limited habitat diversity.
- E3 Channel bed hydraulic features and E4–E5 natural features, reflecting the absence of flow and limited opportunity for natural geomorphic processes.

Negative indices:

- B5 Bank top managed ground cover, which scored −3 due to intensive arable cultivation extending close to both bank tops with minimal buffering.

Encroachment

- No watercourse encroachment was recorded. A small footbridge within the sub-reach has piers extending into the bank face; however, at approximately 2 m wide within a 50 m reach, this falls below the encroachment threshold and represents an existing crossing point [5].
- Riparian encroachment was recorded as major on one bank, where arable cultivation extends directly to the right bank top. The left bank top also experiences arable influence; however, the presence of a wider grass margin of approximately 5 m results in moderate encroachment. This has been entered into the metric as Major and Moderate, respectively.

5. Tributary of Hempnall Beck – Ephemeral tributary

An ephemeral headwater tributary of Hempnall Beck flows north-eastwards into the CRC and Highways Improvement Area, with approximately 60 m within this area. One MoRPh5 sub-reach was surveyed. Historic modification is evident, with landscape scars visible on aerial imagery, supported by historic mapping and LiDAR, indicating that the channel formerly crossed the centre of the field but has since been straightened along the field boundary to form a managed ditch, with the headwaters now culverted along 'The Street'.

The upstream section is fully shaded by a continuous tree line, with leaf litter and organic debris present throughout. The narrow channel bed comprises gravel, pebble, twigs, and leaves, and was dry at the time of survey. Banks are steep and heavily shaded, limiting vegetation to occasional tall grasses and herbaceous species. Adjacent land comprises horse-grazed pasture within 10 m of the bank tops.

At the mid-point of the reach, a dry and silted ditch enters from the south. Downstream towards the confluence with the main tributary, the channel bed transitions to silt and sand. The left bank slopes gently and supports soft silt and emergent broad-leaved macrophytes at the channel margin, while the right bank top supports wetland vegetation including horsetail *Equisetum* sp. and sedges *Carex* sp. Both banks remain shaded by trees, and shallow standing pools were present near the confluence.

Table D6: Tributary of Hempnall Beck - Ephemeral Tributary baseline indices scores

Watercourse I.D		Tributary of Hempnall Beck – Ephemeral Tributary
River Section Length		60m
RCA River Type		K
Condition Assessment Criteria		RCA index Values
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score
B1	Bank top vegetation structure	2
B2	Bank top tree feature richness	0
B3	Bank top water-related features	3
B4	Bank top NNIPS cover	0
B5	Bank top managed ground cover	-3
C1	Bank face riparian vegetation structure	2
C2	Bank face tree feature richness	1
C3	Bank face natural bank profile extent	3
C4	Bank face natural bank profile richness	2
C5	Bank face natural bank material richness	1
C6	Bank face bare sediment extent	4
C7	Bank face artificial bank profile extent	0
C8	Bank face reinforcement extent	0
C9	Bank face reinforcement material severity	0
C10	Bank face NNIPS cover	0
D1	Channel margin aquatic vegetation extent	2
D2	Channel margin aquatic morphotype richness	2
D3	Channel margin physical feature extent	1
D4	Channel margin physical feature richness	1
D5	Channel margin artificial features	0
E1	Channel aquatic morphotype richness	1
E2	Channel bed tree features richness	2
E3	Channel bed hydraulic features richness	0
E4	Channel bed natural features extent	0
E5	Channel bed natural features richness	0
E6	Channel bed material richness	3
E7	Channel bed siltation	0
E8	Channel bed reinforcement extent	0
E9	Channel bed reinforcement severity	0
E10	Channel bed artificial features severity	0
E11	Channel bed NNIPS extent	0
E12	Channel bed filamentous algae extent	0
Is the watercourse over-deep?		**yes**
Final Condition Class		**Moderate**

Summary of indices Scores

Positive indices scoring well:

- B1 Bank top vegetation structure, reflecting continuous vegetated bank tops with varied structure including trees, scrub, wetland and grassland. B3 also scored well due to wetland species present and the side channels present.
- C1 Bank face riparian vegetation structure, reflecting a mix of grasses and herbaceous species along shaded bank faces.
- C3 Bank face natural profile extent and C4 richness, reflecting the varied but consistent natural earth banks throughout the reach.
- C6 Bank face bare sediment extent, reflecting exposed earth banks along the shaded channel.
- D1 Channel margin aquatic vegetation extent and D2 morphotype richness, reflecting emergent wetland vegetation in the lower reach.
- E6 Channel bed material richness, reflecting variation between gravel and pebble substrates upstream and sand and silt deposits downstream.

Positive indices scoring poorly:

- E1 Channel aquatic morphotype richness and E3 hydraulic features, reflecting the absence of flow at the time of survey and the ephemeral nature of the channel.
- E4–E5 Channel bed natural features, which were limited due to the lack of sustained flow and geomorphic activity.
- E2 Channel bed tree feature richness, which scored moderately but was constrained by low channel complexity in shaded upstream sections.

Negative indices scoring below 0:

- B5 Bank top managed ground cover, which scored −3 due to the proximity of horse-grazed pasture and a footpath within the riparian buffer.

Encroachment

- No watercourse encroachment was recorded. Riparian encroachment was assessed as major/moderate, reflecting horse-grazed pasture on one bank and a footpath on the opposite bank. Encroachment pressure increases downstream where the channel becomes constrained between these land uses.

5b. Tributary of Hempnall Beck – Ephemeral tributary - The Street

A 500 m section of an ephemeral headwater borders the Solar PV Sites adjacent to field parcel 5a, within which two MoRPh5 sub-reaches were surveyed. The headwater originates along “The Street,” flowing northeast before passing through a culvert beneath the road, reconnecting with the main tributary under wetter conditions. At the time of survey, the channel was dry, with the bed comprising silt and sand.

The watercourse is bordered by a country road to the east and arable land to the west, with a narrow (~1 m) field margin. The channel is straightened and over-deepened, exhibiting characteristics of an artificially modified ditch, though it remains mapped as a river on OS datasets. Two 6 m culverts were present within the 500 m reach, accounting for 12 m of culvert habitat included in the SBM.

Table D7: Tributary of Hempnall Beck - Ephemeral Tributary - The Street baseline indices scores

Watercourse I.D		Tributary of Hempnall Beck – Ephemeral Tributary The Street	
River Section Length		500m	
RCA River Type		K	
Condition Assessment Criteria		RCA index Values	
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score SR2	Baseline Score SR1
Bank Top			
B1	Bank top vegetation structure	2	2
B2	Bank top tree feature richness	0	0
B3	Bank top water-related features	0	4
B4	Bank top NNIPS cover	0	0
B5	Bank top managed ground cover	-4	-4
Bank Face			
C1	Bank face riparian vegetation structure	2	2
C2	Bank face tree feature richness	0	0
C3	Bank face natural bank profile extent	0	3
C4	Bank face natural bank profile richness	0	2
C5	Bank face natural bank material richness	1	1
C6	Bank face bare sediment extent	0	2
C7	Bank face artificial bank profile extent	0	0
C8	Bank face reinforcement extent	0	0
C9	Bank face reinforcement material severity	0	0
C10	Bank face NNIPS cover	0	0
Channel Margin			
D1	Channel margin aquatic vegetation extent	0	0
D2	Channel margin aquatic morphotype richness	0	0
D3	Channel margin physical feature extent	0	0
D4	Channel margin physical feature richness	0	0
D5	Channel margin artificial features	0	0
Channel Bed			
E1	Channel aquatic morphotype richness	0	1
E2	Channel bed tree features richness	0	1
E3	Channel bed hydraulic features richness	0	0
E4	Channel bed natural features extent	0	0
E5	Channel bed natural features richness	0	0
E6	Channel bed material richness	1	2
E7	Channel bed siltation	0	0
E8	Channel bed reinforcement extent	0	0
E9	Channel bed reinforcement severity	0	0
E10	Channel bed artificial features severity	0	-4
E11	Channel bed NNIPS extent	0	0
E12	Channel bed filamentous algae extent	0	0

Watercourse I.D		Tributary of Hempnall Beck – Ephemeral Tributary The Street	
River Section Length		500m	
RCA River Type		K	
Condition Assessment Criteria		RCA index Values	
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score SR2	Baseline Score SR1
Is the watercourse over-deep?		**yes**	**Yes**
Final Condition Class		**Poor**	**Fairly Poor**

Summary of Indices Scores

Positive indices scoring well:

- B1 Bank top vegetation structure, reflecting continuous cover of tall grasses and scrub along both bank tops.
- C1 Bank face riparian vegetation structure, reflecting grass and herbaceous vegetation along shaded bank faces.
- C3 Bank face natural profile extent and C4 richness, particularly in Sub-reach 1, reflecting sections of steep but natural earth banks.
- E6 Channel bed material richness, reflecting variation between sand and silt substrates along the reach.

Positive indices scoring poorly:

- E1 Channel aquatic morphotype richness and E3 channel bed hydraulic features, reflecting the dry conditions at the time of survey and the ephemeral nature of the watercourse.
- D1–D4 Channel margin vegetation and physical features, reflecting the narrow, over-deepened channel and absence of marginal habitat development.
- B3 Bank top water-related features, reflecting the artificial nature of the bank tops and bank structure.

Negative indices scoring below 0:

- B5 Bank top managed ground cover, which scored −4 in both sub-reaches, reflecting arable cultivation extending to the bank top.
- E10 Channel bed artificial features severity, which scored −4 in Sub-reach 1 due to the presence of culverts within the surveyed reach.

Encroachment

- Riparian encroachment was assessed as major on both banks throughout the reach, reflecting arable cultivation along the left bank and the presence of a road immediately adjacent to the right bank top.

6. Tributary of the River Tas – Saxlingham Nethergate

The Tributary of the River Tas flows through field parcel 7F for approximately 400 m within the Order Limits, comprising two MoRPh5 sub-reaches. The channel has been historically straightened and is included in the assessment due to its direct connection to the main tributary shown on OS maps. At the time of survey, the channel was dry, with the bed composed primarily of silt. Surrounding land is cattle-grazed pasture, with a barbed-wire fence within 2 m of the bank tops.

Upstream (Sub-reach 1)

Two narrow footbridges across the channel. The banks are steep and uniform in profile and are densely vegetated with bramble scrub and tall herb species, including common nettle, indicative of nutrient enrichment. Where scrub and tree cover is reduced, the banks are dominated by tall herbs.

Downstream (Sub-reach 2)

Bramble scrub persists along the channel, with two trees on the left bank (one of considerable size). Tall herbaceous vegetation extends along the right bank top and field margin. The channel bed is largely obscured by vegetation, reflecting historical modification and limited flow, though hydrological connectivity to the main tributary is maintained beyond the Order Limit.

Table D8: Tributary of the River Tas - Saxlingham Nethergate baseline indices scores

Watercourse I.D		Tributary of The River Tas – Saxlingham Nethergate	
River Section Length		400m	
RCA River Type		K	
Condition Assessment Criteria		RCA index Values	
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score SR1	Baseline Score SR2
Bank Top			
B1	Bank top vegetation structure	1	1
B2	Bank top tree feature richness	0	0
B3	Bank top water-related features	0	0
B4	Bank top NNIPS cover	0	0
B5	Bank top managed ground cover	-2	-2
Bank Face			
C1	Bank face riparian vegetation structure	1	1
C2	Bank face tree feature richness	0	0
C3	Bank face natural bank profile extent	3	3
C4	Bank face natural bank profile richness	1	1
C5	Bank face natural bank material richness	0	0
C6	Bank face bare sediment extent	0	0
C7	Bank face artificial bank profile extent	0	0
C8	Bank face reinforcement extent	0	0
C9	Bank face reinforcement material severity	0	0
C10	Bank face NNIPS cover	0	0
Channel Margin			
D1	Channel margin aquatic vegetation extent	0	0
D2	Channel margin aquatic morphotype richness	0	0
D3	Channel margin physical feature extent	0	0
D4	Channel margin physical feature richness	0	0
D5	Channel margin artificial features	0	0
Channel Bed			
E1	Channel aquatic morphotype richness	0	0
E2	Channel bed tree features richness	1	1
E3	Channel bed hydraulic features richness	0	0
E4	Channel bed natural features extent	0	0
E5	Channel bed natural features richness	0	0
E6	Channel bed material richness	2	2
E7	Channel bed siltation	0	0
E8	Channel bed reinforcement extent	0	0

Watercourse I.D		Tributary of The River Tas – Saxlingham Nethergate	
River Section Length		400m	
RCA River Type		K	
Condition Assessment Criteria		RCA index Values	
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score SR1	Baseline Score SR2
E9	Channel bed reinforcement severity	0	0
E10	Channel bed artificial features severity	0	0
E11	Channel bed NNIPS extent	0	0
E12	Channel bed filamentous algae extent	0	0
Is the watercourse over-deep?		**yes**	**yes**
Final Condition Class		**Fairly Poor**	**Fairly Poor**

Summary of indices Scores

Positive indices scoring well:

- C3 Bank face natural bank profile extent consistently scored 3, reflecting the steep, unreinforced banks.

- E6 Channel bed material richness scored 2, with a mix of silt and gravel.

Positive indices scoring poorly:

- B1 Bank top vegetation structure and C1 Bank face riparian vegetation structure low due to tall herbs dominating banks, limited scrub/trees

- C4 Bank face natural profile richness and C5 natural bank material richness low due to uniform, modified channel

- D1–D5 Channel margin and E1–E5 Channel bed indices scored 0 due to dry channel and dense shading

Negative indices:

- B5 Bank top managed ground cover –2, reflecting intensive grazing on both bank tops.

Encroachment

There is a fence running along both banks which may restrict movement of wildlife and the surrounding land within 10m of the bank top is currently used as cattle grazed pasture. Therefore, the riparian encroachment is Major/Major. No watercourse encroachment was identified during the survey.

Brome Beck – Pound Lane

Ephemeral headwaters of Brome Beck are divided into two reaches due to an obvious artificial diversion away from the Order Limits.

Reach 1 (upstream)

This straight-sinuous reach runs along the Solar PV Sites boundary for approximately 111 m before diverging to follow the field margins away from the footpath. One MoRPh5 sub-reach was surveyed here. The channel was dry at the time of survey and shaded by trees, with an average bed material of silt and sand as the coarsest fraction.

Reach 2 (downstream)

This reach begins at a pond immediately adjacent to the Solar PV Sites and follows the boundary for 346 m. The pond is densely vegetated with both linear-leaved and broad-leaved macrophytes and has a silty bed. The watercourse flows along a hedgerow, following the boundary until it crosses the footpath, where the channel appears to shift to the opposite side as shown on OS maps. No culvert, outfall, or other crossing structure was identified, although the concrete footpath displays a distinct linear depression consistent with channel alignment.

Table D9: Brome Beck Headwaters - Pound Lane baseline indices scores

Watercourse I.D		Brome Beck – Pound Lane		
River Section Length		457m		
RCA River Type		K		
Condition Assessment Criteria		RCA index Values		
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score SR1	Baseline Score SR2	Baseline Score SR3
Bank Top				
B1	Bank top vegetation structure	2	2	2
B2	Bank top tree feature richness	0	0	1
B3	Bank top water-related features	0	4	0
B4	Bank top NNIPS cover	0	0	0
B5	Bank top managed ground cover	-2	-3	-3
Bank Face				
C1	Bank face riparian vegetation structure	1	3	2
C2	Bank face tree feature richness	0	2	1
C3	Bank face natural bank profile extent	0	0	0
C4	Bank face natural bank profile richness	0	0	0
C5	Bank face natural bank material richness	1	1	1
C6	Bank face bare sediment extent	0	4	1
C7	Bank face artificial bank profile extent	0	0	0
C8	Bank face reinforcement extent	0	0	0
C9	Bank face reinforcement material severity	0	0	0
C10	Bank face NNIPS cover	0	0	0
Channel Margin				
D1	Channel margin aquatic vegetation extent	0	2	2
D2	Channel margin aquatic morphotype richness	0	1	1
D3	Channel margin physical feature extent	0	0	0
D4	Channel margin physical feature richness	0	0	0
D5	Channel margin artificial features	0	0	0
Channel Bed				
E1	Channel aquatic morphotype richness	1	0	1
E2	Channel bed tree features richness	0	1	1
E3	Channel bed hydraulic features richness	0	0	0
E4	Channel bed natural features extent	0	0	0
E5	Channel bed natural features richness	0	0	0
E6	Channel bed material richness	3	3	4
E7	Channel bed siltation	0	0	0
E8	Channel bed reinforcement extent	0	0	0
E9	Channel bed reinforcement severity	0	0	0
E10	Channel bed artificial features severity	0	0	0
E11	Channel bed NNIPS extent	0	0	0
E12	Channel bed filamentous algae extent	0	0	0
Is the watercourse over-deep?		**yes**	**yes**	**yes**
Final Condition Class		**Fairly Poor**	**Fairly Poor**	**Fairly Poor**

Summary of indices Scores

Positive indices scoring well:

- C1 Bank face riparian vegetation structure scored 2–3, reflecting structural variation on both banks with trees, scrub, and herbaceous layers.
- C2 Bank face tree feature richness scored 1–2, with trees leaning into the channel or trailing over the banks.
- E6 Channel bed material richness scored 3–4, reflecting a mix of silt, sand, cobble, and organic debris.
- C6 Bank face bare sediment extent scored 4 in SR2, providing localized habitat diversity.

Positive indices scoring poorly:

- B1 Bank top vegetation structure scored 2 or lower due to narrow grass verges or arable land with few trees.
- C3–C5 Bank face natural profile and material richness scored 0–1 due to uniform, historically modified channel.
- D1–D5 Channel margin indices scored 0–2 due to absence of marginal vegetation except in the pond.
- E1–E5 Channel bed indices scored 0–1 due to dry, shaded conditions and limited aquatic vegetation.

Negative indices:

- B5 Bank top managed ground cover scored –2 to –3 across sub-reaches, reflecting intensive arable management, narrow field margins, and adjacent footpaths or tracks.

Encroachment:

- Riparian encroachment is major across all sub-reaches due to arable cropping and tracks along the bank tops.

8.Tributary of the River Tas Ephemeral

An ephemeral headwater of the River Tas flows in a straight-sinuous course for approximately 600 m between and alongside field parcels 8A and 8B. The surrounding landscape is primarily arable farmland with narrow field margins. The channel was dry at the time of survey, confined by steep, uniform banks, and the bed material consisted mainly of silt.

Upstream (SR1–SR2):

The left bank is lined with trees and a mostly continuous hedgerow. Two connective ditches join the watercourse. Water mint occurs in dense patches along the channel bed, with common nettle and tall grasses dominating the banks and margins, indicating nutrient-enriched conditions.

Downstream (SR3):

One tree occurs on the right bank top, and a decaying log covered in brambles is present. The watercourse is culverted beneath a country lane, exiting the Order Limits. Beyond the road, the banks are reinforced with concrete. The reach is heavily modified, exhibiting straightened banks and dense tall herbaceous vegetation, predominantly grasses and nettles.

Table D10: Tributary of the River Tas - Ephemeral baseline indices scores

Watercourse I.D		Tributary of the River Tas - Ephemeral		
River Section Length		600m		
RCA River Type		K		
Condition Assessment Criteria		RCA index Values		
RCA index score	RCA index name Green = Positive scoring indices Red = Negative scoring indices	Baseline Score SR1	Baseline Score SR2	Baseline Score SR3
Bank Top				
B1	Bank top vegetation structure	1	1	1
B2	Bank top tree feature richness	0	0	1
B3	Bank top water-related features	0	0	0
B4	Bank top NNIPS cover	0	0	0
B5	Bank top managed ground cover	-3	-3	-4
Bank Face				
C1	Bank face riparian vegetation structure	1	1	1
C2	Bank face tree feature richness	1	1	1
C3	Bank face natural bank profile extent	3	3	2
C4	Bank face natural bank profile richness	1	1	1
C5	Bank face natural bank material richness	1	1	1
C6	Bank face bare sediment extent	0	0	0
C7	Bank face artificial bank profile extent	0	0	-2
C8	Bank face reinforcement extent	0	0	-2
C9	Bank face reinforcement material severity	0	0	-2
C10	Bank face NNIPS cover	0	0	0
Channel Margin				
D1	Channel margin aquatic vegetation extent	0	0	0
D2	Channel margin aquatic morphotype richness	0	0	0
D3	Channel margin physical feature extent	0	0	0
D4	Channel margin physical feature richness	0	0	0
D5	Channel margin artificial features	0	0	0
Channel Bed				
E1	Channel aquatic morphotype richness	1	1	1
E2	Channel bed tree features richness	1	1	1
E3	Channel bed hydraulic features richness	0	0	0
E4	Channel bed natural features extent	0	0	0
E5	Channel bed natural features richness	0	0	0
E6	Channel bed material richness	2	2	2
E7	Channel bed siltation	0	0	0
E8	Channel bed reinforcement extent	0	0	0
E9	Channel bed reinforcement severity	0	0	0
E10	Channel bed artificial features severity	0	0	-4
E11	Channel bed NNIPS extent	0	0	0
E12	Channel bed filamentous algae extent	0	0	0
Is the watercourse over-deep?		**yes**	**yes**	**yes**
Final Condition Class		**Fairly Poor**	**Fairly Poor**	**Fairly Poor**

Summary of indices Scores

Positive indices scoring well:

- C3 Bank face natural bank profile extent consistently scored 3, reflecting steep, unreinforced earth banks for the majority of the length.
- E6 Channel bed material richness scored 2, reflecting a mix of silt and sand that provides some material diversity.

Positive indices scoring poorly:

- B1 Bank top vegetation structure and C1 Bank face riparian vegetation structure scored low due to limited scrub/trees and dominance of tall herbs and grasses.
- C4 Bank face natural profile richness and C5 natural bank material richness scored low due to uniform, modified ditch-like morphology.
- D1–D5 Channel margin indices and E1–E5 Channel bed indices scored 0 due to dry channel and absence of aquatic/marginal vegetation, except for water mint.

Negative indices:

- B5 Bank top managed ground cover scored –3 to –4, reflecting intensive arable land use, narrow field margins, and presence of the road.
- C7–C9 Bank face and channel bed reinforcement indices scored negatively in SR3, reflecting concrete bank reinforcement and culverted sections.

Encroachment:

Major encroachment is present along both bank tops in all sub-reaches due to arable cropping. SR3 also includes the road, further reducing riparian habitat. The culvert is scored separately and not included in encroachment assessment.

D1. Strategic significance

Table D11: Summary of Strategic Significance Scores and Rationale across the Order Limits: the Sites and the CRC and Highway Works Area.

Area	Reach	Strategic Significance	Rationale
Sites			
Sites	1. Ephemeral Stream – Hempnall Beck Main. SR1	Low – area compensation not in local strategy/no local strategy	Identified as an area to restore Wet Grassland and Grazing Marshes and Lowland Fen. It is also currently managed under Broadlands River Management Catchment and Yare Operational Catchment[5]. Wet Grassland and Grazing Marshes Restoration
Sites	5b Ephemeral Tributary of Hempnall Beck – The Street SR1+SR2	Low – area compensation not in local strategy/no local strategy	Identified as an area to strengthen mosaic of wetland habitats along river channels.
Sites	5b. Hempnall Beck Southern Tributary – The Street SR1/SR2 Culvert	Low – area compensation not in local strategy/no local strategy	
Sites	6. Saxlingham Nethergate – Tributary of the River Tas SR1 + SR2	Low – area compensation not in local strategy/no local strategy	
Sites	7. Brome Beck – Pound Lane R1 + R2	Low – area compensation not in local strategy/no local strategy	Does not have mapped potential habitat measures within the LNRS and is not under any management catchment.
Sites	8. Tributary of the River Tas – Ephemeral SR1+SR2+SR3	Low – area compensation not in local strategy/no local strategy	Identified as an area to strengthen mosaic of wetland habitats along river channels and restore and enhance existing rivers and streams.
Cable Route Corridor			
CRC and Highway Works Area	1. Ephemeral Stream – Hempnall Beck Main. SR2	Low – area compensation not in local strategy/no local strategy	Identified as an area to strengthen mosaic of wetland habitats along river channels. It is also currently managed under Broadlands River Management Catchment and Yare Operational Catchment[6].
CRC and Highway Works Area	2. Hempnall Beck. SR1	Low – area compensation not in local strategy/no local strategy	Identified as an area to restore and enhance existing rivers and streams. It is also currently managed under Broadlands River Management Catchment and Yare Operational Catchment
CRC and Highway Works Area	3. Hempnall Beck – East. SR1	Low – area compensation not in local strategy/no local strategy	Does not have mapped potential habitat measures within the LNRS and is not under any management catchment.
CRC and Highway Works Area	4. Southern Tributary of Hempnall Beck. SR1	Low – area compensation not in local strategy/no local strategy	Identified as an area to strengthen mosaic of wetland habitats along river channels. The Southern tributary also comes under Hempnall Beck which is currently managed

[5] Environment Agency (2025) Broadland Rivers Management Catchment. Catchment Data Explorer. Available at: https://environment.data.gov.uk/catchment-planning/ManagementCatchment/3008 (Accessed 12 December 2025).

[6] Environment Agency (2025) Broadland Rivers Management Catchment. Catchment Data Explorer. Available at: https://environment.data.gov.uk/catchment-planning/ManagementCatchment/3008 (Accessed 12 December 2025).

Area	Reach	Strategic Significance	Rationale
			under Broadlands River Management Catchment and Yare Operational Catchment[1].
CRC and Highway Works Area	4. Southern Tributary of Hempnall Beck SR2	Low – area compensation not in local strategy/no local strategy	
CRC and Highway Works Area	4a. Tributary of Hempnall Beck – Pulham Pumpkins SR1	Low – area compensation not in local strategy/no local strategy	Identified as an area to strengthen mosaic of wetland habitats along river channels.
CRC and Highway Works Area	5. Ephemeral Tributary of Hempnall Beck SR1	Low – area compensation not in local strategy/no local strategy	Identified as an area to strengthen mosaic of wetland habitats along river channels.

D2. Encroachment

Table D12: Summary of Riparian Encroachment Across the Order Limits: the Sites and the CRC and Highway Works Area.

Riparian Encroachment Banding	Watercourse / Reach	Rationale
Sites		
No Encroachment / No Encroachment	Ephemeral Stream – Hempnall Beck Main (SR1)	Intact fen and wet grassland mosaic with unmanaged vegetation on both banks.
Major / Major	Ephemeral Tributary of Hempnall Beck – The Street (SR1 & SR2)	Arable cultivation to bank top on one bank and a country road on the opposite bank; field margins absent or <1 m.
	Saxlingham Nethergate – Tributary of the River Tas (SR1 & SR2)	Sheep and cattle grazing across the full riparian buffer on both banks.
	Brome Beck – Pound Lane (Reach 2, SR1 & SR2)	Tractor access track on one bank and arable field on the opposite bank.
	Tributary of the River Tas – Ephemeral (SR1–SR3)	Arable cropping within 10 m of both bank tops for the entire reach.
Major / No Encroachment	Brome Beck – Pound Lane (Reach 1, SR1)	Arable field on one bank; grassy track with limited disturbance on the opposite bank.
N/A – Culverted	Culvert on Tributary of River Tas (SR3)	Riparian encroachment not applicable due to culverting.
Cable Route Corridor		
No Encroachment / No Encroachment	Hempnall Beck – Main Waterbody (SR1)	Wet woodland and wet grassland buffers with no grazing or cultivation within 10 m of bank tops.
	Ephemeral Stream – Hempnall Beck Main (SR2)	Semi-natural wet grassland and fen habitats with intact riparian margins.
Major / Major	Hempnall Beck – East (SR1)	Arable farming extending to both bank tops; minimal field margins (<1 m).
Major / No Encroachment	Southern Tributary of Hempnall Beck (SR1)	Horse-grazed pasture extending to bank face on one bank; unmanaged scrub, wetland, and woodland on the opposite bank.
Minor / No Encroachment	Southern Tributary of Hempnall Beck (SR2)	Limited grazing pressure set back ~5 m from bank top over a short section before transitioning into woodland buffer.

Riparian Encroachment Banding	Watercourse / Reach	Rationale
Major / Moderate	Tributary of Hempnall Beck – Pulham Pumpkins (SR1)	Arable farming to bank top on one bank; ~5 m modified grassland margin on the opposite bank.
	Ephemeral Tributary of Hempnall Beck (SR1)	Horse-grazed pasture on both banks, with woodland and footpath restricting access along part of one bank.
N/A – Culverted	Hempnall Beck Southern Tributary – The Street (SR1/SR2 Culvert)	Riparian encroachment not applicable due to culverting.

Retained Watercourse Summary

Table D13: Baseline Retained Condition Scores, Strategic Significance, Riparian Encroachment and Watercourse Units *Condition Score following shape index review.

Reach	Watercourse type	Length (km)	Score	Strategic Significance	Watercourse encroachment	Riparian Encroachment	Baseline units
CRC and Highways Improvement Area							
1. Ephemeral Stream – Hempnall Beck Main SR2	Other rivers and streams	0.104	Moderate	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	No Encroachment/ No Encroachment	1.25
2. Hempnall Beck	Other rivers and streams	0.077	Moderate	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	No Encroachment/ No Encroachment	0.92
3. Hempnall Beck – East	Other rivers and streams	0.054	Fairly Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Major	0.36
4. Southern Tributary of Hempnall Beck SR1	Other rivers and streams	0.08	Fairly Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/No Encroachment	0.63
4. Southern Tributary of Hempnall Beck SR2	Other rivers and streams	0.099	Moderate*	Low- Area/compensation not in local strategy/ no local strategy	Major	No Encroachment/ No Encroachment	0.58
4a. Tributary of Hempnall Beck – Pulham Pumpkins	Other rivers and streams	0.05	Fairly Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Moderate	0.36
5. Ephemeral Tributary of Hempnall Beck	Other rivers and streams	0.055	Moderate*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Moderate	0.53
Solar PV Sites							
1. Ephemeral Stream – Hempnall Beck Main SR1	Other rivers and streams	0.093	Moderate	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	No Encroachment/ No Encroachment	0.84

Reach	Watercourse type	Length (km)	Score	Strategic Significance	Watercourse encroachment	Riparian Encroachment	Baseline units
5a. Hempnall Beck Southern Tributary – The Street	Culvert	0.012	Poor	Low- Area/compensation not in local strategy/ no local strategy	N/A - Culvert	N/A - Culvert	0.02
7. Brome Beck – Pound Lane R1	Other rivers and streams	0.111	Fairly Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Major	0.87
7. Brome Beck – Pound Lane R2	Other rivers and streams	0.202	Fairly Poor*	Low- Area/compensation not in local strategy/ no local strategy	No Encroachment	Major/Major	1.36
8. Culvert on Tributary of River Tas	Culvert	0.011	Poor	Low- Area/compensation not in local strategy/ no local strategy	N/A - Culvert	N/A - Culvert	0.01