The Planning Inspectorate
Yr Arolygiaeth Gynllunio

SCOPING OPINION:

Proposed A47 North Tuddenham to Easton

Case Reference: TR010038

Adopted by the Planning Inspectorate (on behalf of the Secretary of State) pursuant to Regulation 10 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

November 2019

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1. INTRODUCTION

1.1 Background

1.1.1 On 23 September 2019, the Planning Inspectorate (the Inspectorate) on behalf of the Secretary of State (SoS) received a scoping request from Highways England (the Applicant) under Regulation 10 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) for the proposed A47 North Tuddenham to Easton (the Proposed Development).

1.1.2 In accordance with Regulation 10 of the EIA Regulations, an Applicant may ask the SoS to state in writing its opinion *'as to the scope, and level of detail, of the information to be provided in the environmental statement'.*

1.1.3 This document is the Scoping Opinion (the Opinion) provided by the Inspectorate on behalf of the SoS in respect of the Proposed Development. It is made on the basis of the information provided in the Applicant's report entitled A47 North Tuddenham to Easton EIA Scoping Report (the Scoping Report). This Opinion can only reflect the proposals as currently described by the Applicant. The Scoping Opinion should be read in conjunction with the Applicant's Scoping Report.

1.1.4 The Applicant has notified the SoS under Regulation 8(1)(b) of the EIA Regulations that they propose to provide an Environmental Statement (ES) in respect of the Proposed Development. Therefore, in accordance with Regulation 6(2)(a) of the EIA Regulations, the Proposed Development is EIA development.

1.1.5 Regulation 10(9) of the EIA Regulations requires that before adopting a scoping opinion the Inspectorate must take into account:

(a) any information provided about the proposed development;

(b) the specific characteristics of the development;

(c) the likely significant effects of the development on the environment; and

(d) in the case of a subsequent application, the environmental statement submitted with the original application.

1.1.6 This Opinion has taken into account the requirements of the EIA Regulations as well as current best practice towards preparation of an ES.

1.1.7 The Inspectorate has consulted on the Applicant's Scoping Report and the responses received from the consultation bodies have been taken into account in adopting this Opinion (see Appendix 2).

1.1.8 The points addressed by the Applicant in the Scoping Report have been carefully considered and use has been made of professional judgement and experience in order to adopt this Opinion. It should be noted that when it comes to consider the ES, the Inspectorate will take account of relevant legislation and guidelines. The Inspectorate will not be precluded from requiring additional information if it is considered necessary in connection with the ES submitted with the application for a Development Consent Order (DCO).

1.1.9 This Opinion should not be construed as implying that the Inspectorate agrees with the information or comments provided by the Applicant in their request for an opinion from the Inspectorate. In particular, comments from the Inspectorate in this Opinion are without prejudice to any later decisions taken (eg on submission of the application) that any development identified by the Applicant is necessarily to be treated as part of a Nationally Significant Infrastructure Project (NSIP) or Associated Development or development that does not require development consent.

1.1.10 Regulation 10(3) of the EIA Regulations states that a request for a scoping opinion must include:

(a) a plan sufficient to identify the land;

(b) a description of the proposed development, including its location and technical capacity;

(c) an explanation of the likely significant effects of the development on the environment; and

(d) such other information or representations as the person making the request may wish to provide or make.

1.1.11 The Inspectorate considers that this has been provided in the Applicant's Scoping Report. The Inspectorate is satisfied that the Scoping Report encompasses the relevant aspects identified in the EIA Regulations.

1.1.12 In accordance with Regulation 14(3)(a), where a scoping opinion has been issued in accordance with Regulation 10 an ES accompanying an application for an order granting development consent should be based on '*the most recent scoping opinion adopted (so far as the proposed development remains materially the same as the proposed development which was subject to that opinion)*'.

1.2 The Planning Inspectorate's Consultation

1.2.1 In accordance with Regulation 10(6) of the EIA Regulations the Inspectorate has consulted the consultation bodies before adopting a scoping opinion. A list of the consultation bodies formally consulted by the Inspectorate is provided at Appendix 1. The consultation bodies have been notified under Regulation 11(1)(a) of the duty imposed on them by Regulation 11(3) of the EIA Regulations to make information available to the Applicant relevant to the preparation of the ES. The Applicant should note that whilst the list can inform their consultation, it should not be relied upon for that purpose.

1.2.2 The list of respondents who replied within the statutory timeframe and whose comments have been taken into account in the preparation of this Opinion is provided, along with copies of their comments, at Appendix 2, to which the Applicant should refer in preparing their ES.

1.2.3 The ES submitted by the Applicant should demonstrate consideration of the points raised by the consultation bodies. It is recommended that a table is

provided in the ES summarising the scoping responses from the consultation bodies and how they are, or are not, addressed in the ES.

1.2.4 Any consultation responses received after the statutory deadline for receipt of comments will not be taken into account within this Opinion. Late responses will be forwarded to the Applicant and will be made available on the Inspectorate's website. The Applicant should also give due consideration to those comments in preparing their ES.

1.3 Article 50 of the Treaty on European Union

1.3.1 The European Union (Withdrawal) Act 2018 came in to force on 26 June 2018. This provides that existing EU law will be retained in accordance with s5(2) and s(6) from the point of exit and this opinion is provided on that basis. Relevant EU Directives have been transposed into UK law and those are unchanged until amended by Parliament.

2. THE PROPOSED DEVELOPMENT

2.1 Introduction

2.1.1 The following is a summary of the information on the Proposed Development and its site and surroundings prepared by the Applicant and included in their Scoping Report. The information has not been verified and it has been assumed that the information provided reflects the existing knowledge of the Proposed Development and the potential receptors/ resources.

2.2 Description of the Proposed Development

2.2.1 The Applicant provides a high level description of the Proposed Development, its location and technical capacity (where relevant) in Scoping Report Section 2.

2.2.2 The Proposed Development is for the upgrade of approximately 8km of the existing A47 between North Tuddenham and Easton, from a single carriageway to a dual carriageway, as stated in Paragraph 1.3.1.

2.2.3 The Proposed Development deviates slightly from the existing A47 which is located between the settlements of North Tuddenham and Easton approximately 8km west of Norwich City centre within the jurisdiction of Norfolk County Council. The Proposed Development would commence at the A47/ Fox Lane Junction, near Oak Farm at National Grid Reference (NGR): TG06067, 13529, and extend south eastwards passing south of the village of Hockering, north of Honingham village. The Proposed Development concludes north of Easton village after the A47/ Dereham Road/ Church Lane Roundabout, known as the Easton roundabout, where the existing A47 is already a dual carriageway. The location of the Proposed Development is depicted on Figure 1-1 and the Proposed Development's Red Line Boundary (RLB) is presented on Figure A – Scoping boundary overview.

2.2.4 The land within the Proposed Development's RLB consists of mainly agricultural land, with the land around Honingham consisting of woodland, the River Tud and adjoining open space, Public Rights of Way (PRoW) and a restricted byway. The surrounding land uses includes a mixture of rural settlements, the River Tud, agricultural land, and woodland which include ancient woodland. A sewage plant and residencies on Mattishall Lane are located adjacent to but not included within the Proposed Development's RLB.

2.2.5 The Proposed Development is in proximity to three Noise Action Planning Important Areas (NAPIA); one immediately south of Hockering village, the second around the A47/ Blind Lane roundabout between Honingham and Easton and the third is located at the A47 immediately north of Easton. The NAPIA are illustrated on Figure B.1 – Environmental Constraints Site Level.

2.2.6 Scoping Report Figure B.1 depicts the locations of listed buildings. No listed buildings are located within the RLB, but two Grade I, one Grade II* and ten Grade II listed buildings are located in close proximity to the Proposed Development.

2.2.7 Scoping Report Table 8-2 lists the designated ecological sites in proximity to the Proposed Development. The Scoping Report identifies one internationally designated ecological site, three nationally designated sites, and 21 locally designated sites. The internationally designated site identified includes the River Wensum Special Area of Conservation (SAC) located approximately 1.6km northeast of the Proposed Development. The following nationally designated sites have been identified: Hockering Wood Site of Special Scientific Interest (SSSI), located approximately 0.5km north, River Wensum SSSI approximately 1.6km northeast and Rosie Curston's Meadows SSSI located 1.7km southwest of the Proposed Development. The location of the 21 locally designated sites are stated in Table 8-2 of the Scoping Report.

2.2.8 The majority of the Proposed Development is within Flood Zone 1. Where the Proposed Development is located in proximity to the River Tud, the Proposed Development is situated within Flood Zones 2 and 3 as depicted in Scoping Report Figure 13.1 – Surface water features.

2.3 The Planning Inspectorate's Comments

Description of the Proposed Development

2.3.1 The Scoping Report does not include a complete or consistent description of the Proposed Development.

2.3.2 Section 2 of the Scoping Report includes a description of the Proposed Development, however, further detail, absent from the overall description, is interspersed throughout the report. The description being presented in this way detracts from the overall understanding of the Proposed Development. The ES should include a clear and detailed description of the Proposed Development and form a single point of reference for all relevant aspect chapters. The details absent from Section 2 but embedded within different chapters of the Scoping Report include:

- The construction of 3 new junctions as illustrated on Figure 1-1.
- The creation and usage of bunds, drainage, landscaping, compounds, haul roads and planting as stated in Paragraph 6.7.3.
- The removal of existing vegetation as stated in Paragraph 7.7.1.
- The construction of Sustainable Drainage System (SuDS) as stated in the Scoping Report Biodiversity and Road Drainage and Water Environment chapters.
- During construction earthworks, culverting, link roads, embankment ramps, piled foundations and reinforced concrete abutments are stated to be required in Paragraph 10.7.3.
- The Scoping Report Road Drainage and Water Environment chapter states that the Proposed Development may consist of:
    - In-channel workings and diversions of the River Tud;

- A proposed bridge over the River Tud east of Honingham;
- A crossing over an Ordinary Watercourse south of Hockering;
- Demolition of the existing bridge across the River Tud;
- Removal of the side roads that are to be severed; and
- Removal of the main carriageway.

2.3.3 It would be useful for the description of the Proposed Development to include details relating to:

- Land-use requirements during the construction phase, including the location of any access roads, haul roads, storage bunds and construction compounds;
- The dimensions of the junctions, river and road crossings, construction structures and construction bunds;
- A detailed description of the removal/ demolition process of the Easton roundabout, and any other structures that require removal/ demolition;
- A detailed description of the construction of the 3 new junctions including land plans, traffic management measures and the locations of any construction compounds and storage bunds;
- A detailed description of the works required to the existing A47 including those necessary for its removal or de-trunking;
- A detailed description of construction works required for bridge and road crossings, junction works, link roads, traffic management measures and other alterations to the highway network; and
- A detailed description of any in-channel workings within the River Tud, including further water management and river diversion measures.

Alternatives

2.3.4 The EIA Regulations require that the Applicant provides 'A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects'.

2.3.5 The Inspectorate acknowledges the Applicant's intention to consider alternatives within the ES. The Inspectorate would expect to see a discrete section in the ES that provides details of the reasonable alternatives studied and the reasoning for the selection of the chosen option(s), including a comparison of the environmental effects.

2.3.6 Chapter 3 of the Scoping Report sets out the assessment of alternatives. Paragraph 3.1.1 states that fourteen original options were developed with four options being taken forward to the consultation stage. The four options are illustrated in Scoping Report Figures 3-1 to 3-4. Route 2 was selected as the

preferred option and the Proposed Development is a variation of the Route 2 design.

Flexibility

2.3.7 The Applicant's attention is drawn to the Inspectorate's Advice Note Nine 'Using the 'Rochdale Envelope'[1], which provides details on the recommended approach to follow when incorporating flexibility into a draft DCO (dDCO).

2.3.8 The Applicant should make every attempt to narrow the range of options and explain clearly in the ES which elements of the Proposed Development have yet to be finalised and provide the reasons. At the time of application, any Proposed Development parameters should not be so wide-ranging as to represent effectively different developments. The development parameters will need to be clearly defined in the dDCO and in the accompanying ES. It is a matter for the Applicant, in preparing an ES, to consider whether it is possible to robustly assess a range of impacts resulting from a large number of undecided parameters. The description of the Proposed Development in the ES must not be so wide that it is insufficiently certain to comply with the requirements of Regulation 14 of the EIA Regulations.

2.3.9 It should be noted that if the Proposed Development materially changes prior to submission of the DCO application, the Applicant may wish to consider requesting a new scoping opinion.

[1] Advice Note nine: Using the Rochdale Envelope. 2012. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/

3. ES APPROACH

3.1 Introduction

3.1.1 This section contains the Inspectorate's specific comments on the scope and level of detail of information to be provided in the Applicant's ES. General advice on the presentation of an ES is provided in the Inspectorate's Advice Note Seven 'Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements'[2] and associated appendices.

3.1.2 Aspects/ matters (as defined in Advice Note Seven) are not scoped out unless specifically addressed and justified by the Applicant, and confirmed as being scoped out by the Inspectorate. The ES should be based on the Scoping Opinion in so far as the Proposed Development remains materially the same as the Proposed Development described in the Applicant's Scoping Report.

3.1.3 The Inspectorate has set out in this Opinion where it has/ has not agreed to scope out certain aspects/ matters on the basis of the information available at this time. The Inspectorate is content that the receipt of a Scoping Opinion should not prevent the Applicant from subsequently agreeing with the relevant consultees to scope such aspects/ matters out of the ES, where further evidence has been provided to justify this approach. However, in order to demonstrate that the aspects/ matters have been appropriately addressed, the ES should explain the reasoning for scoping them out and justify the approach taken.

3.1.4 Where relevant, the ES should provide reference to how the delivery of measures proposed to prevent/ minimise adverse effects is secured through DCO requirements (or other suitably robust methods) and whether relevant consultees agree on the adequacy of the measures proposed.

3.2 Relevant National Policy Statements (NPSs)

3.2.1 Sector-specific NPSs are produced by the relevant Government Departments and set out national policy for NSIPs. They provide the framework within which the Examining Authority (ExA) will make their recommendation to the SoS and include the Government's objectives for the development of NSIPs. The NPSs may include environmental requirements for NSIPs, which Applicants should address within their ES.

3.2.2 The designated NPS relevant to the Proposed Development is the NPS for National Networks (NPSNN).

[2] Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements and annex. Available from: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/

3.3 Scope of Assessment

General

3.3.1 The Inspectorate recommends that in order to assist the decision-making process, the Applicant uses tables:

- to demonstrate how the assessment has taken account of this Opinion;
- to identify and collate the residual effects after mitigation for each of the aspect chapters, including the relevant interrelationships and cumulative effects;
- to set out the proposed mitigation and/ or monitoring measures including cross-reference to the means of securing such measures (eg a dDCO requirement);
- to describe any remedial measures that are identified as being necessary following monitoring; and
- to identify where details are contained in the Habitats Regulations Assessment (HRA report) (where relevant), such as descriptions of European sites and their locations, together with any mitigation or compensation measures, are to be found in the ES.

3.3.2 The Inspectorate considers that where a DCO application includes works described as 'Associated Development', that could themselves be defined as an improvement of a highway, the Applicant should ensure that the ES accompanying that application distinguishes between; effects that primarily derive from the integral works which form the proposed (or part of the proposed) NSIP and those that primarily derive from the works described as Associated Development. This could be presented in a suitably compiled summary table. This will have the benefit of giving greater confidence to the Inspectorate that what is proposed is not in fact an additional NSIP defined in accordance with s22 of the PA2008.

3.3.3 Figures within the ES should be clear, legible, avoid using similar patterns and colours to identify key aspects, and depict all receptors/ sensitive locations stated within the EIA aspect chapters.

3.3.4 The ES should ensure that any data used is correctly referenced.

3.3.5 Accurate geographic locations should be used when referring to the Proposed Development.

3.3.6 If the baselines within the ES are to rely on previous surveys/ investigations/ assessments, then those surveys/ investigations/ assessments should be included within the ES.

3.3.7 The ES should expand on the timeline set out in Section 2.5 of the Scoping Report by stating whether a phased approach would be implemented, the order and timings of the removal and construction of new junctions, road crossings, river crossings and how long the storage bunds and construction compounds would be required.

3.3.8 It should be made clear in the ES how the traffic and transport assessment undertaken to demonstrate the need for the Proposed Development relates to the assessments within the ES aspect chapters such as, air quality, noise and people and communities.

Baseline Scenario

3.3.9 The ES should include a description of the baseline scenario with and without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.

3.3.10 In light of the number of ongoing developments within the vicinity of the Proposed Development application site, the Applicant should clearly state which developments will be assumed to be under construction or operational as part of the future baseline.

Forecasting Methods or Evidence

3.3.11 The ES should contain the timescales upon which the surveys which underpin the technical assessments have been based. For clarity, this information should be provided either in the introductory chapters of the ES (with confirmation that these timescales apply to all chapters), or in each aspect chapter.

3.3.12 The Inspectorate expects the ES to include a chapter setting out the overarching methodology for the assessment, which clearly distinguishes effects that are 'significant' from 'non-significant' effects. Any departure from that methodology should be described in individual aspect assessment chapters.

3.3.13 The ES should include details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.

Residues and Emissions

3.3.14 The EIA Regulations require an estimate, by type and quantity, of expected residues and emissions. Specific reference should be made to water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases, where relevant. This information should be provided in a clear and consistent fashion and may be integrated into the relevant aspect assessments.

Mitigation

3.3.15 Any mitigation relied upon for the purposes of the assessment should be explained in detail within the ES. The likely efficacy of the mitigation proposed should be explained with reference to residual effects. The ES should also address how any mitigation proposed is secured, with reference to specific DCO requirements or other legally binding agreements.

Risks of Major Accidents and/or Disasters

3.3.16 The ES should include a description and assessment (where relevant) of the likely significant effects resulting from accidents and disasters applicable to the Proposed Development. The Applicant should make use of appropriate guidance (e.g. that referenced in the Health and Safety Executives (HSE) Annex to Advice Note 11) to better understand the likelihood of an occurrence and the Proposed Development's susceptibility to potential major accidents and hazards. The description and assessment should consider the vulnerability of the Proposed Development to a potential accident or disaster and also the Proposed Development's potential to cause an accident or disaster. The assessment should specifically assess significant effects resulting from the risks to human health, cultural heritage or the environment. Any measures that will be employed to prevent and control significant effects should be presented in the ES.

3.3.17 Relevant information available and obtained through risk assessments pursuant to European Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.

Climate and Climate Change

3.3.18 The ES should include a description and assessment (where relevant) of the likely significant effects the Proposed Development has on climate (for example having regard to the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change. Where relevant, the ES should describe and assess the adaptive capacity that has been incorporated into the design of the Proposed Development. This may include, for example, alternative measures such as changes in the use of materials or construction and design techniques that will be more resilient to risks from climate change.

Transboundary Effects

3.3.19 Schedule 4 Part 5 of the EIA Regulations requires a description of the likely significant transboundary effects to be provided in an ES.

3.3.20 The Scoping Report concludes that the Proposed Development is not likely to have significant effects on another European Economic Area (EEA) State and proposes that transboundary effects do not need to be considered within the ES.

A Reference List

3.3.21 A reference list detailing the sources used for the descriptions and assessments must be included in the ES.

3.4 Confidential Information

3.4.1 In some circumstances it will be appropriate for information to be kept confidential. In particular, this may relate to information about the presence and locations of rare or sensitive species such as badgers, rare birds and plants where disturbance, damage, persecution or commercial exploitation may result from publication of the information. Where documents are intended to remain confidential the Applicant should provide these as separate paper and electronic documents with their confidential nature clearly indicated in the title, and watermarked as such on each page. The information should not be incorporated within other documents that are intended for publication or which the Inspectorate would be required to disclose under the Environmental Information Regulations 2004.

4. ASPECT BASED SCOPING TABLES

4.1 Air Quality

(Scoping Report section 5)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.1.1	5.7.6	An assessment for all pollutants/ emissions except: • NO_x (including NO_2); • PM_{10}; and • CO_2	The Scoping Report states that only NO_x (including NO_2), PM_{10} and CO_2 will be scoped into the assessment of air quality. The Inspectorate does not agree that sufficient information has been provided to demonstrate that there will not be significant effects from increases in other pollutants/ emissions. The ES should assess impacts from increases in all relevant pollutants identified under the EU ambient air quality directive including changes in $PM_{2.5}$ concentrations resulting from the Proposed Development, where likely significant effects can occur.
4.1.2	5.3.2; and 5.3.5	An assessment of the Air Quality Management Areas (AQMA) in Swaffham and Central Norwich.	The Scoping Report has not provided sufficient evidence that the Proposed Development in conjunction with other proposed highway schemes, such as the A47 Blofield to North Burlingham and Norwich Western Link schemes, will not result in significant effects to the Swaffham and Central Norwich AQMAs. Therefore, the Inspectorate does not agree that this matter can be scoped out of the ES.

ID	Ref	Other points	Inspectorate's comments
4.1.3	5.1.2	DMRB HA207/07 for construction effects	The Applicant proposes to use the DMRB HA207/07 methodology to assess effects from changes to air quality during construction. The Inspectorate is aware of more recent guidance produced by the Institute of Air Quality Management (IAQM) *Guidance on the assessment of dust from demolition and construction* (2014). The

ID	Ref	Other points	Inspectorate's comments
			Applicant should have regard to this guidance in conducting their air quality assessment.
4.1.4	5.2.2	Study Area	The ES should include a map/ figure that depicts the air quality study area used for the assessment as described at Paragraph 5.2.3 and 5.2.5 of the Scoping Report.
4.1.5	5.3.1	Baseline data	The ES air quality assessment should be informed by relevant and recent data. The Applicant should make effort to agree the baseline data with the appropriate consultation bodies.
4.1.6	5.3.7; and Table 5-1	Scheme specific monitoring	The Inspectorate notes that of the four proposed monitoring site locations listed in Table 5-1 of the Scoping Report, none are located within proximity to North Tuddenham and the westernmost section of the Proposed Development. The monitoring used to inform the assessment and relied upon in the ES should be fully representative of the study area and include sufficient geographical coverage. Any deviation from this approach should be explained and justified within the ES.
4.1.7	5.4.1	Assumptions and uncertainties	Any assumptions and uncertainties that apply to the air quality assessment should be presented and explained within the ES.
4.1.8	5.8.2	Previous survey	Paragraph 5.8.2 of the Scoping Report states that a "*previous survey*" indicates that the potential impacts are not likely to be significant, however the Scoping Report does not include any further information regarding the previous survey. All relevant baseline data, necessary to inform the assessment of significant effects, should be included in the ES.
4.1.9	5.9.2	Traffic management measures	The ES should include a full description of the traffic management measures that will be used and state how these measures will be secured through the DCO or other legal mechanism.

ID	Ref	Other points	Inspectorate's comments
4.1.10	5.10.1	Construction Environmental Management Plan (CEMP)	A full description of the "*relevant measures to minimise the air quality impact of construction activities*" as stated in the Scoping Report Paragraph 5.10.1 should be included in the CEMP and the ES should state how the CEMP will be secured through the DCO or other legal mechanism.
4.1.11	N/A	Cumulative assessment	The air quality assessment within the ES should take into account the cumulative effect of the Proposed Development and the proposed Norwich Western Link having regard to the proximity of the two proposals and the potential for overlapping construction periods.

4.2 Cultural Heritage

(Scoping Report section 6)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.2.1	N/A	N/A	No matters have been proposed to be scoped out of the assessment.

ID	Ref	Other points	Inspectorate's comments
4.2.2	6.2.1; and 6.4.1	Study Area	A study area of 1km has been defined by the Applicant to identify designated and non-designated cultural heritage assets. The Applicant should make effort to agree with Historic England and relevant local authorities if there are any heritage assets located beyond the 1km study area which could be affected by the Proposed Development.
4.2.3	6.2.3	Zone of Influence (ZoI)	The Scoping Report states that a ZoI will be produced as part of the Landscape and Visual Impact Assessment but will also be used within the Cultural Heritage assessment. The Applicant should make effort to agree the extent of the ZoI with Historic England and relevant local planning authorities. The ZoI used to inform the assessment should be clearly stated within the ES Cultural Heritage chapter.
4.2.4	6.4.2	Buildings of local importance	The Applicant should make effort to agree with relevant consultation bodies which buildings of local importance should be assessed within the ES. A figure that depicts the buildings of local importance relative to the Proposed Development should be included in the ES.
4.2.5	6.4.6; and 6.4.7	Further investigations	The Scoping Report Paragraph 6.4.6 states that the interpretation of archaeological sites may be revised in the light of further investigation. The ES should include details of the archaeological investigations which have been undertaken and provide an

ID	Ref	Other points	Inspectorate's comments
			explanation of how the findings have been taken into account in refining any survey parameters during production of the ES.
4.2.6	6.7.2	Historic park	The location of the Historic Park as stated in Scoping Report Paragraph 6.7.2 should be included on the figures provided within the ES.
4.2.7	6.7.3; and 6.7.5	Mitigation – construction and operation	The Scoping Report states that best practice measures to limit impacts on heritage assets would be employed during construction through the implementation of a CEMP. The Applicant should explain the mitigation techniques which are to be employed and effort should be made to agree them with relevant consultation bodies. The ES should contain details of how the mitigation measures set out in the CEMP would be secured.
4.2.8	Table 6-2	Indirect effects on heritage assets	The ES should assess indirect impacts on heritage assets during the construction and operation of the Proposed Development ES.

4.3 Landscape

(Scoping Report section 7)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.3.1	N/A	N/A	No matters have been proposed to be scoped out of the assessment.

ID	Ref	Other points	Inspectorate's comments
4.3.2	7.2.1	Study Area	The Scoping Report suggests that the study area may be extended to include receptors located outside of the 1km study area. The ES should assess impacts on receptors likely to result in significant effects and clearly describe why receptors were chosen. The sensitive receptors identified should be depicted on a plan/ figure to be included in the ES.
4.3.3	7.6.2	Viewpoints	The Applicant should make effort to agree the viewpoints with the relevant consultation bodies. The viewpoints used in the assessment should be depicted on supporting plans/ figures in the ES.
4.3.4	7.6.2	Mitigation	The measures to be included in the landscape design and mitigation strategy referred to in the Scoping Report should be described within the ES and appropriately secured through the DCO.
4.3.5	7.6.2; and Section 7.7	Mitigation	The ES should describe the mitigation methods relied upon in the assessment. The Scoping Report suggests that planting is the only mitigation method that will be applied in the Proposed Development. The ES should explain what level of consideration has been given to other methods of mitigation.
4.3.6	7.7.1	Removal of vegetation	The ES should describe the areas where temporary and permanent vegetation and tree loss will take place. Any such vegetation and tree

ID	Ref	Other points	Inspectorate's comments
			loss should be accounted for in the landscape and visual impact assessment.
4.3.7	7.7.1; and Appendix C	Lighting	The assessment of lighting impacts in the ES should describe the night time lighting required during the construction and operational phases. The assessment should assess impacts from lighting on sensitive receptors and include night-time photomontages where appropriate.
4.3.8	N/A	Structures – construction and operation	An assessment of the potential landscape and visual impacts arising from construction compounds and other structures that will be incorporated into the final design of the Proposed Development should be included in the ES. The ES should also describe the parameters applicable to the assessment, such as the elevations of all structures required during construction and operation.

4.4 Biodiversity

(Scoping Report section 8)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.4.1	N/A	N/A	No matters have been proposed to be scoped out of the assessment.

ID	Ref	Other points	Inspectorate's comments
4.4.2	Table 8-1;	Designated sites - functionally-linked habitat	The ES should assess indirect effects on European designated sites from impacts to functionally linked habitats. The study area for the assessment should be based on the extent of impacts (direct and indirect).
4.4.3	8.4.4; and 8.7.6	Construction activities	The Scoping Report Paragraphs 8.4.4 and 8.7.6 states that the Proposed Development will involve significant in-channel works and potential river diversions, as well as a bridge and an Ordinary Watercourse (drain) crossing but no further information is provided. The ES should describe all construction works in sufficient detail in order to inform a meaningful assessment of likely significant effects on watercourse hydraulics and ecology.
4.4.4	8.3.23; and 8.7.6	Migratory fish species	The Applicant states that they are not proposing to undertake any fish surveys as stated in Paragraph 8.3.23. Given the proposed extent of in-channel works and structures, the Inspectorate considers that there is potential for the Proposed Development to impede/ obstruct the movements of migratory fish, including European eel. The Applicant should therefore undertake fish surveys where significant effects are likely to occur. The Applicant should make effort to agree the need for and approach to such surveys with relevant consultation bodies, including Natural

ID	Ref	Other points	Inspectorate's comments
			England (NE) and the Environment Agency (EA). Any reliance placed on data available from alternative sources, as stated in Paragraph 8.3.23, should be explained in the ES and effort should be made to agree the approach with relevant consultation bodies. The ES should assess any impacts on European eels, and have regard to the requirements specified in The Eels (England and Wales) Regulations 2009.
4.4.5	8.3.24; and 8.3.5	Invasive non-native species (INNS)	Scoping Report Paragraph 8.3.24 states that "*specific surveys will not be undertaken for non-native invasive species, although their presence will be recorded if any non-native invasive species are found during surveys and recommendations will be made for appropriate mitigation*". The Inspectorate notes the potential for hydrological/ ecological-connectivity from the Proposed Development to protected sensitive habitats and species. The Applicant should undertake surveys for INNS where significant effects are likely to occur. The Scoping Report identifies the presence of native white-clawed crayfish, as well as non-native signal crayfish, within the study area in the River Tud. The Scoping Report does not, however, specifically consider the potential for the Proposed Development to facilitate the spread of non-native crayfish and crayfish plague, which could impact native crayfish and their habitats. The Inspectorate notes that the Scoping Report does not assess the potential of the Proposed Development to facilitate the spread of invasive species of freshwater mussel. The ES should assess impacts in this regard and describe any necessary mitigation and/ or biosecurity precautions required to prevent the spread of INNS. Any measures relied upon in the ES should be discussed with relevant consultation bodies, including NE and the EA, in effort to agree the approach. Measures relied upon in

ID	Ref	Other points	Inspectorate's comments
			the ES should be adequately secured eg through a Construction Environmental Management Plan (CEMP).
4.4.6	8.3.27	Desmoulin's whorl snail	The Scoping Report Paragraph 8.3.27 states that no Desmoulin's whorl snail were found during the autumn 2017 survey. The Inspectorate notes that according to recognised guidance (*Monitoring Desmoulin's Whorl Snail Conserving Natura 2000 River Monitoring Series No.6)* these surveys should be undertaken in mid to late summer. Furthermore, Paragraph 8.3.27 of the Scoping Report acknowledges that the species is "*relatively mobile*" and therefore there is potential for the species to have migrated into the River Tud since the 2017 survey was undertaken. The Applicant should make effort to agree the need for further surveys with relevant consultation bodies.
4.4.7	8.4.5; 8.7.19	Design, Mitigation and Enhancement Measures	The Scoping Report Paragraphs 8.4.5 and 8.7.19 indicate that Sustainable Drainage Systems (SuDS) and attenuation ponds may be used to provide habitat for wetland birds and to compensate for the potential loss of any reedbed or marshy grassland habitats, respectively. Details of the location and design parameters of SuDS and attenuation ponds should be presented on a figure(s) in the ES. The ES should describe the proposed methods for habitat creation utilising the aforementioned drainage components, highlighting any susceptibility/ sensitivity of these habitats to pollution events. The ES should clearly describe any mitigation measures relied upon for the assessment of likely significant effects and set out how the delivery of such mitigation measures, including SuDS and attenuation ponds, will be secured through the DCO or other legal mechanism.
4.4.8	8.7.3; and 8.7.13	Mitigation measure - fish spawning season	Paragraphs 8.7.3 and 8.7.12 of the Scoping Report states that an important mitigation measure will be timing the construction work to avoid key and sensitive periods to species. This should extend to

ID	Ref	Other points	Inspectorate's comments
			avoiding the spawning season of important fish species within the River Tud.
4.4.9	8.7.13	Culvert	The ES should assess and state the potential effects on aquatic/ semi-aquatic species if the proposed culvert in the River Tud will result in a barrier to movement or migration. The ES should also state whether alternative designs, other than a culvert, was assessed and if so, the reasons why a culvert was chosen over the alternatives.
4.4.10	8.7.20	Potential impacts – habitat loss	The Scoping Report Paragraph 8.7.20 states that vegetation clearance (including tree and hedgerow removal) and earthworks will be required to facilitate the Proposed Development. The ES should demonstrate the effort made (including all permanent and temporary land-take) to avoid direct and indirect impacts on existing species and habitats. Any habitat lost as a result of the Proposed Development should be described and quantified according to type and the area of loss, which should include the extent of any anticipated vegetation/ tree clearance. The location of any affected hedgerows and/ or ancient/ veteran trees should be depicted on a supporting plan. Any avoidance or mitigation measures proposed should be described in the ES and details provided to explain how such measures will be secured.
4.4.11	N/A	Potential impacts – road mortality	The Scoping Report does not reference the potential for the Proposed Development to cause an increase species mortality due to traffic collisions. An assessment to determine whether an increase in species mortality due to traffic collisions may occur should be included in the ES, and if mitigation measures are required, the ES should describe the measures and state how they will be secured though the DCO.

4.5 Geology and Soils

(Scoping Report section 9)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.5.1	9.1.2	Effect on agricultural land	The Inspectorate agrees that an assessment of agricultural land can be scoped out of the Geology and Soils aspect chapter as the assessment will instead be included within the People and Communities aspect chapter. Where relevant, the ES should cross reference between the two aspects chapters.
4.5.2	9.7.7	Effect on geology and soils during operation of the Proposed Development	The Inspectorate agrees that significant effects to geology and soils are unlikely to occur during the operation of the Proposed Development and therefore this matter can be scoped out of the ES.
4.5.3	9.8.1	Effect on groundwater	The Inspectorate agrees that an assessment of the effect on groundwater can be scoped out of the Geology and Soils aspect chapter as the assessment is to be included within the Road Drainage and Water Environment aspect chapter. Where relevant, the ES should cross reference between the two aspects chapters.

ID	Ref	Other points	Inspectorate's comments
4.5.4	Table 9-1	Baseline data	To aid the reader's understanding of the baseline information relating to geology and soils within and surrounding the Proposed Development, the ES should include a plan/ figure depicting the locations of the: • Disused marl, sand and gravel and brick pits; and • Areas of potential contamination risks.

ID	Ref	Other points	Inspectorate's comments
4.5.5	Table 9-1	Water abstraction and Source Protection Zone (SPZ)	A new water abstraction in East Tuddenham has been constructed and subsequently a further SPZ has been created. The location of the SPZ should be incorporated into the ES baseline assessment for Geology and Soils. The ES should also include this new water abstraction and SPZs on a figure. The Applicant should make effort to consult with the EA to confirm the location and extent of the SPZ.
4.5.6	Table 9-1	Potential risk to groundwater	The ES should justify the risk classification to groundwater, abstractions, and surface water courses as moderate/ low considering the close proximity of construction works to the River Tud and the permeability and hydraulic connectivity of the Principal Aquifer, Superficial Aquifer, bedrock and superficial deposits.
4.5.7	Table 9-1	Unexploded ordinance (UXO)	The Scoping Report identifies a moderate risk of UXO within the study area. The ES should include measures that outline the activities that will take place in the situation where UXOs are discovered; and effort should be made to agree the approach with relevant consultation bodies and secure the required measures through the DCO or other legal mechanism.
4.5.8	9.6.2	Consultation – mineral sterilisation	The ES should assess impacts to known mineral deposits and the potential for sterilisation. The Applicant should make effort to agree the approach to the assessment with relevant consultation bodies.
4.5.9	N/A	Piling	If piling is required for the construction of the Proposed Development, the ES should include a map/ figure depicting where piling would take place.
4.5.10	N/A	Cumulative Impacts	The ES should assess cumulative impacts associated with the installation of underground cables for nearby windfarm developments where significant effects are likely to occur.

4.6 Materials

(Scoping Report section 10)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.6.1	10.8.2	An assessment of materials and waste during the operational phase of the Proposed Development	The Inspectorate agrees that this matter can be scoped out of the ES as it is unlikely for significant effects to arise from the use of materials or generation of waste during the operational phase of the Proposed Development.

ID	Ref	Other points	Inspectorate's comments
4.6.2	10.3.3; and 10.3.4	Baseline	The baseline information in the ES should contain the location of the proposed waste facilities where construction waste is likely to be disposed of, the capacity of the waste facilities and their ability to receive the waste generated by the Proposed Development.
4.6.3	10.6.1	Consultation	The Applicant should make effort to consult with relevant consultation bodies to attain relevant and up to date waste capacity baseline information to inform the assessment.
4.6.4	Table 10-1	Demolition	Table 10-1 makes no mention of the removal of the Easton roundabout as stated in Paragraph 2.3.6 of the Scoping Report. The ES assessment of materials should include the anticipated waste generated from the removal of the Easton roundabout and any other demolition/ removal associated with the Proposed Development.

4.7 Noise and Vibration

(Scoping Report section 11)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.7.1	N/A	N/A	No matters have been proposed to be scoped out of the assessment

ID	Ref	Other points	Inspectorate's comments
4.7.2	11.2.2	Operational study	The Scoping Report states that the long term operational study area includes receptors within 600m of the Proposed Development that incur a 3dB $L_{A10,18h}$ change in noise level but does not state what constitutes 'long term'. A definition of long term should be included in the ES.
4.7.3	11.2.4	Diversion Routes	The ES should describe the assumed diversion routes during construction, and to aid the readers understanding, include a map/ figure of the potential diversion routes.
4.7.4	Table 11-1	Receptors – graveyards	The Scoping Report Chapter 9 Geology and Soils states that the Proposed Development passes close to two graveyards [Paragraph 9.7.2] but no reference to these graveyards have been included in the noise assessment. The ES noise assessment should consider the two graveyards as 'Community facilities' as stated in Table 11-1, and state any significant effects that may arise and if required, mitigation measures including how they will be secured through the DCO.
4.7.5	11.4.1	Assumptions and limitations	The ES should describe the limitations encountered and assumptions used when undertaking the noise assessment, and the effect the limitations and assumptions have on the results of the noise assessments.

ID	Ref	Other points	Inspectorate's comments
4.7.6	11.5.1	Guidance and best practice	The Scoping Report identifies 4 Noise Important Areas (NIA) within the study area, the Applicant should consider the guidance *Noise Action Plan: Roads* when undertaking the noise assessment due to this guidance setting out the roles and responsibilities associated with NIA.
4.7.7	11.9.1	Magnitude of impact	The Scoping Report Paragraph 11.9.1 states the "*mitigation strategy will depend upon the magnitude of impact*" but no criteria for defining the magnitude has been provided. The ES should clearly state the criteria used for determining impact magnitude.
4.7.8	11.9.3	Construction noise – Significant Observed Adverse Effect Level (SOAEL)	The Scoping Report does not provide baseline noise levels. The ES should justify the use of SOAEL levels of 75dB and 70dB as stated in Paragraph 11.9.3 instead of using SOAEL levels that are derived from the ambient noise level. The ES should also explain the regard given to the World Health Organisation (WHO) Environmental Noise Guidelines for the European Region when setting the SOAEL noise level.
4.7.9	11.9.7	Potential vulnerable buildings to vibration	A plan/ figure presenting the location of the vulnerable buildings to vibrations should be included in the ES.
4.7.10	N/A	Piling	If piling is required, the noise and vibrational effects relating to piling should be assessed in the ES where significant effects are likely to occur.

4.8 People and Communities

(Scoping Report section 12)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.8.1	N/A	N/A	No matters have been proposed to be scoped out of the assessment.

ID	Ref	Other points	Inspectorate's comments
4.8.2	12.2.2	Community facilities	The ES should include religious buildings and cemeteries in the assessment of impacts on community land and community facilities.
4.8.3	12.3.5; and Table 12-2	Local economy baseline	The ES should justify using data for Great Yarmouth to inform the local economy baseline data and explain how the data accurately represents the local economy relevant to the Proposed Development and the wider economic area. The Scoping Report does not explain why in Table 12-2 the population in employment is greater than the population of persons of working age. Paragraph 12.3.5 also states that the data is relevant to Great Yarmouth but the Table states Norfolk. The ES should ensure data is clearly explained and accurate.
4.8.4	12.4.2	Sources	Paragraph 12.4.2 of the Scoping Report states that the "*baseline social and community conditions has been compiled from existing published sources*" but does not state the sources used. Where data has been used to inform the assessment in the ES, the source of the data should be accurate and clearly stated.
4.8.5	12.7.11	Community land and community facilities	Scoping Report Paragraph 12.7.11 states that no impact to community land or community facilities within the study area are anticipated. However, it is unclear how this conclusion has been

			reached. The Inspectorate notes that there are community land and facilities within the stated 250m study area and therefore could be affected by the Proposed Development. The ES should provide justification to support any conclusions reached with regard to impacts on community land and facilities within the study area.
4.8.6	12.7.13; and 12.7.14	Demolition of private property.	The ES should clearly describe any buildings required to be demolished and depict these on a supporting plan/ figure. The ESs should also state any mitigation measures required and how the measures will be secured through the DCO or other legal mechanism.
4.8.7	12.7.19; and 12.7.20	Severance impacts on farmland	The ES should assess effects associated with the provision of new agricultural land to be provided as mitigation measures for the loss of existing farmland.
4.8.8	12.7.21	Land take	Temporary and permanent land take should be documented in the ES along with an explanation as to why the land take is required.
4.8.9	12.7.22; and 2.7.23	Impact on restricted byway and footpath	The ES should assess impacts to the restricted byway (Honingham RB1) and footpath (Hockering FP7) where significant effects are likely to occur.
4.8.10	12.7.24	Side roads	The ES should describe the number of side roads which will be stopped up, including whether this will be on a permanent or temporary basis. Any significant effects associated on road users should be assessed and reported in the ES. If the effect on sideroads could result in permanent severance, this should be stated in the ES and assessed.
4.8.11	12.7.26	New road junctions	The ES should include the number and location of new road junctions and state whether there will be access points for non motorised users.
4.8.12	12.7.28	Severance	The Scoping Report Paragraph 12.7.28 states that "*The Proposed Scheme could cause permanent severance for local communities due to some villages and facilities being cut off from one another*". The ES

			should assess alternative designs that prevent or limit severance where possible. The ES should also take into account the need for continued access to Hockering Nursey from the village of Hockering. The Applicant should make effort to engage with relevant consultation bodies to ensure that the importance of local facilities to local communities are accurately accounted for in the assessment.
4.8.13	12.7.33	Cumulative effect on local business	The ES should present an assessment of the impact which the Proposed Development, along with the other proposed schemes on the A47, could have on the local economy.
4.8.14	Table 12-5; and Table 12 -6	Significance of effect on walkers	The ES should take into account persons of reduced or limited mobility as well as total change in journey length when determining the significance of effect on walkers.
4.8.15	N/A	Rat-running	The ES should include an assessment to determine the potential significant effects that may occur in the local area due to rat-running.
4.8.16	N/A	Local businesses	The ES should include an assessment of the potential effects the Proposed Development will have on local businesses, with particular focus on the effects likely to arise from changes to the local road network including severance.

4.9 Road Drainage and the Water Environment

(Scoping Report section 13)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.9.1	N/A	N/A	No matters have been proposed to be scoped out of the assessment.

ID	Ref	Other points	Inspectorate's comments
4.9.2	13.2.1	Study area	Where features have been identified down-gradient of the Proposed Development and included in the assessment study area, these features should be described in the ES and included on a plan/ figure.
4.9.3	Table 13-1	Licenced abstractions and private water supplies	The assessment of potential impacts to licenced abstractions and water supplies should be accompanied by a plan/ figure that presents the locations of these features. This figure should also include the new water abstraction in proximity to East Tuddenham. See the EA's response in Appendix 2 for further information.
4.9.4	Table 13-1	Groundwater flood risk	The groundwater flood risk locations are described by reference to the Proposed Development's chainage, but a map/ figure with the chainage lengths has not been provided. If chainages are to be used in the ES then a map/ figure with the chainage lengths should be included.
4.9.5	13.4.4; and 13.4.5	Water crossings and diversions	The ES should include sufficient detail to enable a robust assessment and understanding of the proposed water crossings and watercourse diversions. The detail should include but not be limited to the: • Location; • Timeframe of the work;

			• Significant effects; and • Mitigation measures and how they will be secured, if required.
4.9.6	13.7.3	Nitrate management	The ES should provide sufficient detail to describe the mitigation measures required to address the potential for increased levels of nitrates to enter the River Tud as a result of the Proposed Development. The anticipated efficacy of the mitigation measures proposed should also be described. The Applicant should make effort to agree the mitigation measures with the relevant consultation bodies.
4.9.7	13.7.9; and 13.7.12	Pollution incidents	The Scoping Report provides limited information to support the conclusion that the risk of pollution incidents effecting the drainage and water environment is minimal. The ES should include an assessment of the potential effects that may arise from pollution events, and describe in sufficient detail the mitigation measures proposed and how such measures will be secured through the DCO or other legal mechanism.
4.9.8	13.7.10	Sustainable Drainage System (SuDS)	The ES should include a plan/ figure depicting the location and dimensions of the proposed SuDS. The effects of the SuDS on potential flood risk and the drainage regime should also be included in the ES.
4.9.9	13.7.11	Downstream effects	The ES should describe the mitigation measures required for preventing significant effects occurring downstream of the Proposed Development and outside of the order limits. The ES should also state the efficacy of the mitigation measures used and how the measures will be secured through the DCO.
4.9.10	13.7.12	Aquatic ecology	The ES should ensure the assessment of aquatic ecology includes appropriate cross references between the Road Drainage and Water Environment and the Biodiversity aspect chapters.

4.9.11	13.7.15	Demolition	The ES should include a full assessment of the potential significant effects that may arise from removal of the existing bridge across the River Tud, and state any proposed mitigation measures, the efficacy of the mitigation measures, and how the measures will be secured through the DCO or other legal mechanism.
4.9.12	13.7.19	Compensatory flood zone	The ES should include a map/ figure depicting the location of the compensatory flood storage area and include justification for the chosen location of the compensatory flood storage area.
4.9.13	13.7.20	Underground structures	The ES should assess significant effects associated with the construction and implementation of underground structures. If measures are required to mitigate significant effects, then the mitigation measure, their efficacy and how they will be secured should be included. If an underpass is proposed as part of the Proposed Development, the ES should include a full description of the underpass and a map/ figure depicting its location and dimensions.
4.9.14	13.8.7	Drinking Water Protection Area (DrWPA)	The Scoping Report infers that mitigation measures will be in place for DrWPA but no specific measures have been presented. The ES should describe mitigation measures in sufficient detail and describe how they address significant effects within the DrWPA.
4.9.15	N/A	Agricultural drainage regimes	The ES should include an assessment to determine whether the Proposed Development will significantly affect agricultural field drainage regimes. If significant effects to agricultural field drainage regimes are likely to occur, then a full description of the mitigation measures, their efficacy, and how they will be secured through the DCO or other legal mechanism should be included in the ES.
4.9.16	N/A	Sequential and exception test	As the Proposed Development is situated within Flood Zones 2, 3a and 3b, sequential and exception tests should be undertaken and be

			submitted with the application documents, either within the ES or the Flood Risk Assessment (FRA).

4.10 Climate

(Scoping Report section 14)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.10.1	14.7.5	Climate change effects on construction of the Proposed Development	The Inspectorate agrees that climate change effects on the construction of the Proposed Development can be scoped out of the ES due to the construction phase being relatively short term and unlikely to be significantly affected by climate change.

4.11 Combined and Cumulative Effects

(Scoping Report section 15)

ID	Ref	Applicant's proposed matters to scope out	Inspectorate's comments
4.11.1	N/A	N/A	No matters have been proposed to be scoped out of the assessment

ID	Ref	Other points	Inspectorate's comments
4.11.2	15.3.2; and 15.6.1	Consultation	To inform the cumulative assessment, consultation with all relevant local authorities within the study area should be undertaken.
4.11.3	N/A	Cumulative assessment	The cumulative assessment should include the other developments identified within the People and Communities chapter of the Scoping Report.
4.11.4	N/A	Cumulative assessment	The cumulative assessment should include the Norwich Link Road which is proposed to be built in proximity to the Proposed Development and may have an overlapping construction period with the Proposed Development.

4.12 Other aspects to be scoped out

(Scoping Report section 1)

ID	Ref	Applicant's proposed aspects to scope out	Inspectorate's comments
4.12.1	1.8.2	Major accidents and disasters	The Inspectorate agrees that a separate assessment for major accidents and disasters can be scoped out of the ES. This is due to the information within Scoping Report Paragraph 1.8.2 and 1.8.4 that state the legal requirements, codes and standards the Proposed Development will adhere to, and that assessments of accidents will be embedded with other ES aspect chapters within the ES.
4.12.2	1.9.2	Heat and radiation	The Inspectorate agrees that an assessment of heat and radiation can be scoped out of the ES as the Proposed Development is unlikely to cause significant heat and radiation effects to the surrounding environment.

5. INFORMATION SOURCES

5.0.1 The Inspectorate's National Infrastructure Planning website includes links to a range of advice regarding the making of applications and environmental procedures, these include:

- Pre-application prospectus[3]
- Planning Inspectorate advice notes[4]:
  - Advice Note Three: EIA Notification and Consultation;
  - Advice Note Four: Section 52: Obtaining information about interests in land (Planning Act 2008);
  - Advice Note Five: Section 53: Rights of Entry (Planning Act 2008);
  - Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements;
  - Advice Note Nine: Using the 'Rochdale Envelope';
  - Advice Note Ten: Habitat Regulations Assessment relevant to nationally significant infrastructure projects (includes discussion of Evidence Plan process);
  - Advice Note Twelve: Transboundary Impacts;
  - Advice Note Seventeen: Cumulative Effects Assessment; and
  - Advice Note Eighteen: The Water Framework Directive.

5.0.2 Applicants are also advised to review the list of information required to be submitted within an application for Development as set out in The Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009.

[3] The Planning Inspectorate's pre-application services for applicants. Available from: https://infrastructure.planninginspectorate.gov.uk/application-process/pre-application-service-for-applicants/

[4] The Planning Inspectorate's series of advice notes in relation to the Planning Act 2008 process. Available from: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/

APPENDIX 1: CONSULTATION BODIES FORMALLY CONSULTED

TABLE A1: PRESCRIBED CONSULTATION BODIES[5]

SCHEDULE 1 DESCRIPTION	ORGANISATION
The Health and Safety Executive	Health and Safety Executive
The National Health Service Commissioning Board	NHS England
The relevant Clinical Commissioning Group	NHS North Norfolk Clinical Commissioning Group
	NHS Norwich Clinical Commissioning Group
	NHS South Norfolk Clinical Commissioning Group
Natural England	Natural England
The Historic Buildings and Monuments Commission for England	Historic England
The relevant fire and rescue authority	Norfolk Fire and Rescue Service
The relevant police and crime commissioner	The Police and Crime Commissioner for Norfolk
The relevant parish council(s) or, where the application relates to land [in] Wales or Scotland, the relevant community council	North Tuddenham Parish Council
	Hockering Parish Council
	Honingham Parish Council
	Easton Parish Council
	Mattishall Parish Council
	East Tuddenham Parish Council
The Environment Agency	The Environment Agency

[5] Schedule 1 of The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the 'APFP Regulations')

SCHEDULE 1 DESCRIPTION	ORGANISATION
The Relevant Highways Authority	Norfolk County Council Highways Authority
The relevant strategic highways company	Highways England
The relevant internal drainage board	Norfolk Rivers Internal Drainage Board
Public Health England, an executive agency of the Department of Health	Public Health England
The Crown Estate Commissioners	The Crown Estate
The Forestry Commission	Forestry Commission

TABLE A2: RELEVANT STATUTORY UNDERTAKERS[6]

STATUTORY UNDERTAKER	ORGANISATION
The relevant Clinical Commissioning Group	NHS North Norfolk Clinical Commissioning Group
	NHS Norwich Clinical Commissioning Group
	NHS South Norfolk Clinical Commissioning Group
The National Health Service Commissioning Board	NHS England
The relevant NHS Trust	East of England Ambulance Service NHS Trust
Universal Service Provider	Royal Mail Group
Homes and Communities Agency	Homes England
The relevant Environment Agency	The Environment Agency
The relevant water and sewage undertaker	Anglian Water

[6] 'Statutory Undertaker' is defined in the APFP Regulations as having the same meaning as in Section 127 of the Planning Act 2008 (PA2008)

STATUTORY UNDERTAKER	ORGANISATION
The relevant public gas transporter	Cadent Gas Limited
	Energetics Gas Limited
	Energy Assets Pipelines Limited
	ES Pipelines Ltd
	ESP Networks Ltd
	ESP Pipelines Ltd
	ESP Connections Ltd
	Fulcrum Pipelines Limited
	Harlaxton Gas Networks Limited
	GTC Pipelines Limited
	Independent Pipelines Limited
	Indigo Pipelines Limited
	Murphy Gas Networks limited
	Quadrant Pipelines Limited
	National Grid Gas Plc
	Scotland Gas Networks Plc
	Southern Gas Networks Plc
The relevant electricity generator with CPO Powers	Heron Wind Limited
	Njord Limited
	Orstead Hornsea Project Three (UK) Limited
	DONG Energy Hornsea Project Three (UK) Limited
The relevant electricity distributor with CPO Powers	Eclipse Power Network Limited
	Energetics Electricity Limited
	Energy Assets Networks Limited

STATUTORY UNDERTAKER	ORGANISATION
	ESP Electricity Limited
	Fulcrum Electricity Assets Limited
	Harlaxton Energy Networks Limited
	Independent Power Networks Limited
	Leep Electricity Networks Limited
	Murphy Power Distribution Limited
	The Electricity Network Company Limited
	UK Power Distribution Limited
	Utility Assets Limited
	Vattenfall Networks Limited
	UK Power Networks Limited
The relevant electricity transmitter with CPO Powers	National Grid Electricity Transmission Plc

TABLE A3: SECTION 43 CONSULTEES (FOR THE PURPOSES OF SECTION 42(1)(B))[7]

LOCAL AUTHORITY[8]
Broadland District Council
South Norfolk Council
Breckland Council
Mid Suffolk District Council
North Norfolk District Council
West Suffolk Council
East Suffolk Council

[7] Sections 43 and 42(B) of the PA2008

[8] As defined in Section 43(3) of the PA2008

LOCAL AUTHORITY[8]
Great Yarmouth Borough Council
King's Lynn and West Norfolk Borough Council
Norwich City Council
The Broads Authority
Norfolk County Council
Lincolnshire County Council
Cambridgeshire County Council
Suffolk County Council

APPENDIX 2: RESPONDENTS TO CONSULTATION AND COPIES OF REPLIES

CONSULTATION BODIES WHO REPLIED BY THE STATUTORY DEADLINE:
Anglian Water
Broads Authority
Broadland District Council (joint responses with South Norfolk Council)
East Suffolk Council
East Tuddenham Parish Council
Environment Agency
Harlaxton Energy Network
Harlaxton Gas Network
Health and Safety Executive
Highways England
Historic England
Hockering Parish Council
National Grid
Natural England
Norfolk County Council
Norwich City Council
South Norfolk Council (joint response with Broadland District Council)
Suffolk County Council
Water Management Alliance (on behalf of Norfolk Rivers Internal Drainage Board)

Strategic Growth and Public Policy
Anglian Water Services Ltd
Thorpe Wood House,
Thorpe Wood,
Peterborough
PE3 6WT

Tel [redacted]
www.anglianwater.co.uk

Your ref TR010038-000026

Michael Berslaw
EIA and Land Rights Advisor
The Planning Inspectorate
Major Casework Directorate
Temple Quay House
2 The Square
Bristol, BS1 6PN

18 October 2019

Dear Mr Berslaw,

A47 to North Tuddenham to Easton: Environmental Statement Scoping Report

Thank you for the opportunity to comment on the scoping report for the above project. Anglian Water is the water and sewerage undertaker for the above site. The following response is submitted on behalf of Anglian Water.

General comments

Anglian Water would welcome further discussions with Highways England prior to the submission of the Draft DCO for examination.

In particular it would be helpful if we could discuss the following issues:

- Wording of the Draft DCO including protective provisions specifically for the benefit of Anglian Water.
- Requirement for water and wastewater services.
- Impact of development on Anglian Water's assets including the new water source and the need for mitigation.
- Pre-construction surveys.

Registered Office
Anglian Water Services Ltd
Lancaster House, Lancaster Way,
Ermine Business Park, Huntingdon,
Cambridgeshire. PE29 6YJ
Registered in England
No. 2366656.

an AWG Company

13 Road Drainage and the Water Environment

Reference is made to principal risks of flooding from the above project being fluvial and surface water flooding as part of the construction phase. We welcome the intention to agree the work involved in the Flood Risk Assessment with (flood) risk management authorities including Anglian Water.

Anglian Water is responsible for managing the risks of flooding from surface water, foul water or combined water sewer systems. Consideration should be given to all potential sources of flooding including sewer flooding as part of the Environmental Statement and related Flood Risk Assessment (FRA).

The report states that there is no information from Anglian Water regarding sewer flooding. It would be helpful to clarify in the FRA whether there any records of sewer flooding in the vicinity of the above project.

At this stage it is unclear whether there is a requirement for wastewater services for the above site. It is suggested that the Environmental Statement and related should include reference to the foul sewerage network and sewage treatment.

Reference is made to the proposed route crossing a Source Protection Zone 3 relating to major strategic water abstractions at Costessey. In addition to these water abstractions there is a new source for public water supply at East Tuddenham which is not referred to in the report. The new borehole is located just to the south of the River Tud and the hamlet of Rotten Row on land adjacent to Church Lane, East Tuddenham. It was drilled in 2015-16 and is currently being commissioned by Anglian Water. The borehole will be licensed by the Environment Agency once the final derogation work has been completed.

Currently the Environment Agency's Source Protection Zones map have not been updated to take account of the new water source. However our consultants have modelled the catchment and the results indicate that the capture zone extends across the A47. The Environment Statement should refer to the new abstraction as well as the existing water abstractions.

Should you have any queries relating to this response please let me know.

Yours sincerely

Stewart Patience

Spatial Planning Manager

Broads Authority

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Mr Michael Breslaw
EIA and Land Rights Advisor
Major Applications and Plans
The Planning Inspectorate
Temple Quay House
Temple Quay
Bristol
BS1 6PN

Ms Cally Smith
Head of Planning
01603 756029
cally.smith@broads-authority.gov.uk

Date 8 October 2019 Our ref BA/2019/0324/SCOCON Your ref TR010038-000026

Dear Mr Breslaw

Application No : **BA/2019/0324/SCOCON**
Proposal : **Request of a Scoping Opinion for proposed development consent for the A47 North Tuddenham to Easton.**
Address : **Land Including And Adjacent To, A47 North Tuddenham To Easton, ,**
Applicant : **Mr James Powis**

I write further to the above request. I can confirm that the Broads Authority does not have any comments to make regarding this consultation.

Yours sincerely

Ms Cally Smith
Head of Planning

From: John Walchester
To: A47 NorthTuddenham to Easton
Subject: TR010038-000026 A47 North Tuddenham to Easton EIA Scoping
Date: 16 October 2019 14:28:50

Dear sirs

Re letter requesting comments on proposed Scoping Opinion on the EIA for A47 North Tuddenham to Easton scheme, dated 23 September 2019
Your ref: TR010038-000026

Broadland District Council and South Norfolk Council jointly submit the following comments.

The Environmental Statement should include detailed information and consideration of potential effects on:

Climate;
Air Quality;
Water quality (particularly having regard to the River Wensum SAC and issues such as road drainage);
Historic environment (including cultural heritage, listed building and archaeology);
Landscape (including important views, trees, historic hedgerows) and have regard to the district landscape character assessment;
Biodiversity;
Geology & Soils;
Noise & Vibration;
People and Communities.

In considering the above, regard should be had to the different land uses in the area and how they might be impacted (including residential areas, agriculture and tourism) and to the interlinkages between the environmental topics.

In addition to the above general comments, it is requested that the following specific points made on the Highways England EIA Scoping Report September 2019 are also taken into consideration:

Para 1.4.1 lays out the main aims of the scoping report. Bullet point 4 states that one of the main aims is "To identify if there are opportunities for environmental enhancement" and we suggest that the reduction of traffic noise levels by the use of low noise surfacing and screening would obviously be a very worthwhile enhancement. We look forward to reviewing the existing and proposed noise map modelling.

-

5. Air Quality

Construction 5.7.1

It is agreed that coarse dust emissions are the most likely concern during the construction phase.
Modern, well maintained mobile plant and machinery should not give rise to harmful emissions but it is felt that the report should consider the possibility, especially, if for example, pumps or generators will be used for long periods close to sensitive receptors.

Operation 5.7.4

It is suggested that PM 2.5 should be added to the key pollutants

5.7.5

CO2 emissions are identified as a key pollutant for the operational phase and it suggested that the same should apply to the constructional phase

11 Noise and Vibration

11.9.3

The proposed (day time ?) fixed levels seem higher than what is reasonably achievable in all but the most challenging circumstances. It is suggested that "noise change" based assessments as detailed in BS5228 would be more appropriate.

Table 11-2

The table summarises LOAEL and SOAEL values. Please could an explanation be provided of how these figures are derived and comment on whether the recommendations of the WHO Environmental Noise Guidelines 2018 have been taken into account.

Yours faithfully

John Walchester
Spatial Planning Manager
t 01603 430622 e john.walchester@broadland.gov.uk

Two Councils One Team

Broadland District Council
Community at heart

South Norfolk COUNCIL

Michael Breslaw
The Planning Inspectorate
Temple Quay House
Temple Quay
Bristol
BS1 6PN

Your ref:
Our ref: DC/19/3758/CON
Date: 10 October 2019
Please ask for: Joe Blackmore
Direct dial: 01394 444733
Email: planning@eastsuffolk.gov.uk

Dear Breslaw,

Our reference	DC/19/3758/CON
Site	A47 North Tuddenham To Easton, Norfolk,
Parish	Melton
Proposal	Application by Highways England (the Applicant) for an Order granting Development Consent for the A47 North Tuddenham to Easton (the Proposed Development)

East Suffolk Council has no objection to the above proposal subject to the following comments:

1. The A47 improvements are strategically significant for the north of ES given that the A47 is part of the strategic road network (from the bascule bridge north via GYBC and then west) for accessing the rest of the country. Whenever possible the Council supports these improvements as taken as a whole as they enhance accessibility and reduce remoteness, with economic benefits etc. The main issue for East Suffolk is that the district has few roads included in the SRN (just a short section of the A47 in Lowestoft and a section of the A14 into Felixstowe). Trunk roads just beyond our borders are crucial to our aims and ambitions for Economic Growth. The A11, A14 and the A47 create a ring around us and our communities are left in the desert in the middle. Our local roads have suffered from long term under investment.

   On that basis, the Council would support the progress being made on the A47 improvements. However, it is considered that this road-widening proposal is not likely to have significant environmental effects on the East Suffolk district and thus the Council has no comments to offer on this Scoping Opinion submission.

Yours sincerely,

Philip Ridley BSc (Hons) MRTPI | Head of Planning & Coastal Management
East Suffolk Council

Date: 10 October 2019

From: paytes@brackenwood.biz
To: A47 NorthTuddenham to Easton
Subject: RE: EIA Scoping Notification and Consultation - reply from East Tuddenham Parish Council
Date: 21 October 2019 19:21:19
Importance: High

Dear Mr Breslow

Our emails earlier today refer and I now send an updated email as you requested.

I have just received notification of recent communications and now detail below my initial comments. Please note the dual carriageway actually cuts our village in two !

We have been party to Group Parish meetings which HE are aware of and in fact we are awaiting a promised visit from James Powis (HE).

I have therefore only one day to meet your deadline so I would like to comment as follows :-

- In the short time to reply I would like to agree on comments from Richard Hawker, Hockering and David Hooker, Honingham and add :-
- Really, the best option would be to dual the existing road and keep North of the River Tud. There is plenty room for this without destroying land and properties.
- Tud Valley – Whitford Bridge to Church lane – this is a flood plain and also suffers from localised mist and fog – additional levels of pollutants will be “trapped” and concentrated.
- Church Lane – the residents in Rotten Row and Church Lane will only have one way into and out of the village. Church Lane is not a good road and is often impassable in winter – this therefore needs great improvements.
- The properties in Rotten Row and Church Lane will lose substantial value – the last property in Church lane near the existing A47 owned by Mr & Mrs Taylor will become unsaleable and worthless.
- Berrys Lane is unsuitable for HGVs and needs improving or 7.5t restriction – this will be the main route for our villagers to join the new dual carriageway.
- Food Hub – initially HE denied any knowledge of the Food Hub but it is now being constructed. There should not be a roundabout at Blind Lane/Taverham Road junction. The Food Hub should have it’s own access road and they should also meet the cost for this.
- I would also like to add that we need to keep some easier access to Hockering as our primary School children go to Hockering school and a few local businesses use the garage in Hockering (private users probably go to the Supermarkets).

Roundabouts are the cause of traffic build up in this area. As soon as vehicles go onto the Southern By-pass there are no traffic jams until they hit the Blofield roundabout. You are proposing to do away with the Easton and Mattishall Road roundabouts but then building two new roundabouts at Wood lane and Blind Lane within a short distance between each – what is the sense in that ? There should be no roundabout at Blind Lane – the Food Hub should have it’s own access road .

We have more detailed information on environment, species, weather in Tud Valley etc but I needed to reply quickly to you.

We would like to have more say and consultation on this and a reply would be very welcome.

Yours sincerely

Ian Payter
Chairman, East Tuddenham Parish Council

Mr. Michael Breslaw
EIA and Land Rights Advisor
The Planning Inspectorate

Via email only:
A47NorthTuddenhamtoEaston@planninginspectorate.gov.uk

Our ref: AE/2019/124522/01-L01
Your ref: TR010038-000028

Date: 17 October 2019

Dear Mr. Breslaw

PLANNING ACT 2008 (AS AMENDED) AND THE INFRASTRUCTURE PLANNING (ENVIRONMENTAL IMPACT ASSESSMENT) REGULATIONS 2017(THE EIA REGULATIONS) – REGULATIONS 10 AND 11

APPLICATION BY HIGHWAYS ENGLAND (THE APPLICANT) FOR AN ORDER GRANTING DEVELOPMENT CONSENT FOR THE A47 NORTH TUDDENHAM TO EASTON (THE PROPOSED DEVELOPMENT)

SCOPING CONSULTATION AND NOTIFICATION OF THE APPLICANT'S CONTACT DETAILS AND DUTY TO MAKE AVAILABLE INFORMATION TO THE APPLICANT IF REQUESTED

Thank you for consulting us on the A47 North Tuddenham to Easton EIA Scoping Report, dated September 2019. We have reviewed the submitted document and have the following comments:

Chapter 8 Biodiversity

We are satisfied that the Scoping Report has adequately addressed the key environmentally sensitive receptors, priority habitats and species within the study area. The River Tud and its floodplain supports a number of priority species and habitats as defined in Section 41 of the Natural Environment and Rural Communities Act 2006. This includes species such as water vole, otter, brown trout, bullhead, white-clawed crayfish and brook lamprey; and habitats such as, floodplain grazing marsh, lowland fen, and deciduous woodland. The River Tud is identified as a chalk river in the report 'The State of England's Chalk Streams' (WWF-UK 2014). It retains many classic chalk river characteristics, including relict gravels and associated flora, fauna and water quality. It is essential that at every stage of planning and construction, there are measures in place to protect the ecology of the watercourse.

8.3.23. The Tud is a salmonid river, designated by the Environment Agency as a principal core fishery for its naturally present brown trout populations. The fishery also supports dace, roach, perch, pike, bullhead, brook lamprey and native white-

clawed crayfish. As such the River Tud is one of the best examples in Norfolk of a natural system that supports both a salmonid and coarse fishery. It is especially important that work is timed to avoid key fish spawning seasons; the timing of works will be an important method of construction mitigation (as referenced in **8.7.13**).

Please note the Environment Agency hold data on fish, macrophytes, invertebrates, mammal species, invasive species, as well as water quality for the River Tud and River Wensum. These are available on request via: enquiries_eastanglia@environment-agency.gov.uk.

8.4.4 & 8.7.6. Significant in channel works and diversions are assumed and are scoped in at this stage. We would strongly recommend that this type of work be avoided as it is likely to have permanent impact on the geomorphology and ecology of the river, which cannot be adequately mitigated for. See further comments on this in the Environmental Permit for Flood Risk Activities section under 'Flood Risk' below.

8.7.7. The presence of white-clawed crayfish makes the River Tud an 'Ark' site for the species. Biosecurity is essential in order to protect the native population for as long as possible. Signal crayfish are present in the River Wensum at the confluence of the River Tud. It is unclear as to the presence of signal crayfish in the lower Tud. Signal crayfish plague spores can remain viable on damp clothing/ equipment and machinery which must be sprayed with Virkon or thoroughly air-dried before use.

8.7.29. This section highlights that measures are to be incorporated into the scheme design to ensure "no net loss of biodiversity". Even at this stage, we would encourage the applicant to look for ways to achieve a 'net gain' in habitat quantity, quality, connectivity and integrity of the river and floodplain. This would be in accordance with the National Planning Policy Framework and the government's 25 Year Environment Plan. The applicant should assess options for river restoration and enhancement within the application boundary, as well considering opportunities (including working with partners) within the broader study area.

8.8.13. As highlighted above, data on fish, macrophytes, invertebrates, mammal species, invasive species; and water quality data for the Tud and Wensum is available via: enquiries_eastanglia@environment-agency.gov.uk.

Chapter 9 Geology & Soils

Table 9-1 Baseline data
Hydrogeology – the text in the table concerning groundwater vulnerability refers to the old Environment Agency nomenclature and therefore possibly the old mapping; all future reports should refer to the classifications found within the Aquifer Typology mapping.
Water abstraction and Source Protection Zones – there will be a new SPZ delineated around a new public water supply at East Tuddenham centred on TG 08629 11950. The extent of the SPZ1 for the source is likely to extend into the area of this proposal. For assessment purposes it should be assumed that a 1 km stretch to the north of the above grid reference requires more detailed assessment and protection. All de minimis abstractions must be included in any assessment, especially those used for potable water supply.

Chapter 10 Materials

10.5.1. We recommend that to ensure the regulation of waste is adhered to during the project, the following guidance is added for this section:

- DEFRA guidance on the legal definition of waste and its application
- The Environment Agency Waste Classification - Guidance on the classification and assessment of waste, currently Technical Guidance WM3.

Chapter 13 Road Drainage & the Water Environment

13.3.1. The Environment Agency data referenced in this section appears to be from 2017. This should be reviewed to ensure that the most up-to-date data regarding abstraction licenses, discharge consents/permits etc., is used. We also note that reference is made to the Environmental Permitting Regulations 2010; the 2016 regulations should be used.

Table 13-1 Level of assessment required
Groundwater – please see comments above in respect of **Table 9-1** regarding the forthcoming Source Protection Zone at East Tuddenham.

13.7.3. It will be necessary to assess all groundwater abstractions including de minimis installations and the public water supply (PWS) source at TG 08629 11950 (as mentioned above in respect of Table 9-1) with regards to the potential for contamination.

13.7.7. Any piling will require a risk assessment; works should be done in a manner that does not change the current degree of hydraulic continuity between strata.

13.7.9. Despite the temporary nature, the proposed works and in particular the River Tud bridge works will need to implement best practice mitigation to avoid any potentially polluting materials such as sediment and hydrocarbons from escaping to the wider environment, as noted in the Scoping Report. Full assessment of the detailed drainage system and construction pollution mitigation methodology will be needed as part of the pre-application considerations.

13.7.13. When constructing cuttings the potential for changes to groundwater flow should be assessed with particular reference to impacts on surface water features and surface and groundwater abstractions.

13.7.11. We acknowledge the reference to potential impacts arising from the bridge works. We would take this opportunity to outline some of our key requirements which design options should demonstrate (further comments are also included in the Environmental Permit for Flood Risk Activities section below):

- Minimal impact on the river corridor and floodplain, with no physical impact on the river banks/margins.
- No interference with natural river processes or river-floodplain connectivity.
- Provision of space for hydro-morphological change over time.
- No adverse impact on European interest features or SSSI features. Any impacts on County Wildlife Sites, protected species and priority habitats/species will require comprehensive mitigation measures.
- Compliance with the Water Framework Directive (WFD). A WFD assessment will be required to demonstrate that the proposals do not lead to a deterioration in WFD status of affected waterbodies or prevent the attainment

of Good Ecological Potential/Status.

For information we have attached EA and SEPA guidance on river crossings. Although the EA guidance is a little outdated in terms of its references, the principles remain applicable.

13.7. 17 & 25. We welcome the reference to the use of SUDS and the reference to the use of the CIRIA SuDS Manual (2015) as the key guidance on this issue. We would add that pollution control measures, to prevent escapes into the environment following accidents, must also be incorporated as appropriate. We would also suggest that ground conditions can influence the *type* of SuDS used, rather than *whether* they are used.

13.7.27. We would highlight that any proposals for baseline groundwater monitoring should be submitted to the Environment Agency for consideration.

13.8.3. We are pleased note the need to assess potential changes in groundwater level and flow as a result of the proposed works.

13.8.5-10 WFD and water quality
The WFD considerations included in this section and elsewhere in Chapter 13 are fairly comprehensive for this stage of the EIA; acknowledging both surface and groundwater bodies and potential impacts. The correct baseline information has been used and various objectives up to 2027 have been referenced which is welcomed. The two key objectives of the WFD could be further emphasized and referenced through further works: no deterioration in waterbody status and the ultimate objective of improving all waterbodies to Good status.

The River Tud is currently achieving good or high status for all elements excluding phosphate. Phosphate levels are currently classified as moderate and this remains the objective, with an unfavourable cost benefit ratio of addressing phosphate levels in the watercourse. This should be taken into account when carrying out the WFD assessment. There should be no deterioration in the status of any of the quality elements.

As mentioned below, an Environmental Permit will be required for any works within 16m of the River Tud. It should be noted that we cannot issue an Environmental Permit for a scheme if it risks, for example, causing a deterioration of the fish status baseline or if it risks prevention of achievement of the fish status objective.

13.8.11. We are pleased to note that all groundwater abstractions will be considered in the assessment of impacts on groundwater flow and quality; please consult the Environment Agency regarding the provision of our records on local abstractors. The potential for impacts on all local designated water feature sites – including county wildlife sites and SSSIs – must also be considered.

<u>Assessment of magnitude of impacts and significance of effects</u>
Table 13-2 Criteria for estimating the importance of water environment attributes
Table 13-3 Estimating the magnitude of an impact on an attribute
Table 13-4 Definitions of overall significance of effect

These tables appear to relate the value/importance of surface waterbodies to WFD status, which in our view is not appropriate. It is important that Water Framework Directive Classification is not used as a proxy for ecological value or sensitivity to

impacts. The basic overarching requirements of the Directive are that there will be no deterioration from the class status as defined in the River Basin Management Plan, whatever that status is; and that there should be improvement where required to 'Good' ecological status or potential by 2027.

Given that those requirements apply to all water bodies, it is not appropriate to suggest that magnitude of impacts will vary with status. Additionally, status classification is defined by the lowest of up to 37 elements, meaning that sensitivity to particular impacts and the resulting effect on status can vary between water bodies depending on their particular characteristics, irrespective of status.

Considering specifically **Tables 13-2 and 13-4**. Any groundwater abstraction used to potable supply – especially where it is used a sole supply – should be considered as being of 'very high value'; the works must not derogate a potable supply source without the prior permission of the owner and under consultation with the Environment Agency. Please update the tables to reflect this requirement.

13.10.1. In addition to the identified water receptors, you may also want to consider including here specific reference to the following, already previously identified in Table 13-1:

- Large water body south east of Hockering used recreationally for fishing, this holds an abstraction licence for domestic and agriculture purposes.
- Cluster of four drainage ponds to the north east of Hockering, part of Park Farm Lakes which is a local commercial fishery.

Flood Risk

As stated in **Table 13-1**, parts of the site lies within fluvial Flood Zone 3b, 3a and 2 defined by the 'Planning Practice Guidance: Flood Risk and Coastal Change' respectively as the functional floodplain, having a high probability of flooding and having a medium probability of flooding. Although flood risk is considered as part of Chapter 13, we have provided comments on this aspect separately, below.

To comply with national policy the application is required to provide the evidence for the Secretary of State to apply the Sequential and Exception Tests, and be supported by a site specific Flood Risk Assessment (FRA).

We have identified the following key points from the EIA scoping report:

The flood risk section of **Table 13-1**, correctly identifies that parts of the proposed scheme are in areas of Flood Zone 3b and Flood Zone 3a; and states that the flood risk vulnerability classification is 'essential infrastructure'.

The flood risk and climate change sections of Table 13-1, also correctly identify that the upper end 65% fluvial climate change allowance must be applied. This section also states that climate change will be applied up to 2080s. It is recommended that you look into the lifetime of the development in more detail, as it is likely that this development has longer lifetime than 60 years. Other similar schemes have development lifetimes of at least 100 years. H climate change scenarios should be considered if the proposed scheme has safety critical elements. Please see the climate change section below for more detail on climate change.

13.7.11. Confirms that the flood risk impacts from both the construction works will also be assessed along with the post-scheme design.

The EIA scoping report correctly identifies that the scheme crosses an unnamed ordinary watercourse that has Flood Zones as well as the Main River Tud and will need to assess flood risk impacts from these watercourses.

With regards to scoping the bridge design we have provided comments below on the requirements for planning as well as requirement for flood risk activity permits from the Environment Agency. These comments will help ensure that any proposed bridge design would be able to gain not just planning permission, but also the necessary flood risk activity permits from the Environment Agency.

The Environment Agency have an anti-culvert policy and would not look favourably on any proposal for culverts where other alternatives such as a bridge could reasonably be constructed.

From a flood risk planning perspective, the soffit level of the proposed bridge crossings over the Main River Tud and over the ordinary watercourse by Gipsy Lane, Hockering will at a minimum be required to be 300mm above the 1% (1 in 100) annual probability flood level including an allowance for climate change. We would recommend a clear span bridge with none of the bridge structure (piers or abutments) within future Flood Zone 3a or future Flood Zone 2, where this can be achieved (e.g. narrow floodplain).

The soffit level on the Main River Tud will need to take account of other requirements including access (by boat) for the Environment Agency to undertake our statutory flood risk function.

If the bridge structure is within the 1% (1 in 100) annual probability flood level including a 35% allowance for climate change, compensatory storage will be required. Please see section below for more details on compensatory storage.

If the bridge structure is within the 0.1% (1 in 1000) annual probability flood level including an allowance for climate change, fluvial hydraulic modelling of the post scheme will have to assess the offsite flood risk impacts and provide appropriate mitigation.

If Environmental Permits are sought to be dis-applied, all the necessary information to determine the flood risk activity permits will need to be considered through the development consent order application.

Please see the flood risk activity permits section below for comments on bridge design.

Any permitting or consenting requirements for the ordinary watercourse by Gipsy Lane, Hockering should be directed to the relevant authority (Norfolk Rivers IDB or Norfolk County Council).

<u>Compensatory Storage</u>
It will need to be shown that any increase in built footprint within the 1% (1 in 100) annual probability flood extent, including allowances for climate change, can be directly compensated for on a volume-for-volume and level-for-level basis to prevent a loss of floodplain storage. If there are no available areas for compensation above the design flood level and compensation will not be possible then a calculation of the offsite flood risk impacts will need to be undertaken. If this shows significant offsite

impacts then no increases in built footprint will be allowed. Further guidance on the provision of compensatory flood storage is provided in section A3.3.10 of the CIRIA document C624.

Climate Change

Please be aware that the next set of climate change projections (UKCP18) replacing UKCP09 came out at the end of 2018. The Environment Agency are currently assessing UKCP18 and will be updating our guidance to reflect the new climate change projections. If this guidance is published before the FRA is finalised you must take note of this updated guidance and discuss with the Environment Agency whether you need to change the climate change scenarios used to follow the new guidance. We have attached a brief note with more detail on UKCP18 and how the planning process needs to take account of this. For the majority of planning applications our existing guidance detailed below still applies. You must assess and determine which climate change projections you need to work to.

As the proposals will be considered as a Nationally Significant Infrastructure Project you should refer to the National Policy Statement for National Networks paragraphs 4.41 – 4.44. It is important that the impact of and resilience to future flooding is considered and mitigation against future flood risk elsewhere is implemented where necessary. Section 4.41 of the NPS states that if transport infrastructure has safety-critical elements and the design life of the asset is 60 years or greater, the applicant should apply the UK Climate Projections 2009 (UKCP09) high emissions scenario against the 2080's projections at the 50% probability level.

The Flood Risk Assessment must assess fluvial climate change in accordance with our Flood risk assessment: climate change allowances. This guidance states that essential infrastructure in Flood Zone 3b and 3a must use the Upper End climate change allowance, which for the Anglian river basin district is 65% for development with a lifetime up to 2115. Climate change will need to be considered for the impacts post scheme, however impacts from the construction phase can be assessed against the current day flood risk only if deemed appropriate.

As highlighted above, the lifetime of the proposal must be determined. If the lifetime is significantly beyond 2115 we recommend that mean sea level rise projections are extrapolated out to 2200 using a linear approach, based on the rate of rise between 2105 and 2115.

Safety critical elements of the design should be assessed against the H estimates (high risk, low probability scenario) for river flood flow scenarios to assess a credible maximum scenario. We would not normally expect the design or mitigation to be provided to this level but the crossing should be assessed against this scenario to understand the picture of risk. This data is also available on the UKCP09 website.

We are happy to be consulted throughout the production of the FRA and fluvial hydraulic model to provide advice and guidance. We would ask that the model is submitted for review once complete along with the FRA and modelling technical note.

Environmental Permit for Flood Risk Activities

An environmental permit for flood risk activities is required for work in, under, over or within 8 metres (m) from a fluvial main river and from any flood defence structure or culvert or 16m from a tidal main river and from any flood defence structure or culvert. The River Tud, is designated a 'main river'.

Application forms and further information can be found at: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits. Anyone carrying out these activities without a permit where one is required, is breaking the law.

We note that in the assumptions and limitations section, paragraph **13.4.4**. states the following “It is assumed that significant in-channel works and potential river diversions will be necessary on the River Tud, east of Honingham, where a proposed bridge is required as part of the realignment”.

1. Due to the WFD status of the Main River Tud it is highly unlikely that the Environment Agency would grant a flood risk activity permit for significant in-channel works and river diversions, as this could adversely impact the status of the River Tud. Any such permit application would have to sufficiently assess WFD and would likely have to show betterment.

2. In terms of permitting bridges, the Environment Agency have a anti culverting policy and so it is highly unlikely that the Environment Agency would grant a flood risk activity permit for any bridge design using culverts.
   From a permitting perspective we recommend that the bridge design is a clear span bridge with none of the structure (piers or abutments) within future Flood Zone 3a and if achievable future Flood Zone 2.

3. When determining the soffit level of the bridge design, as a minimum it must be 300mm above the 1% (1 in 100) annual probability flood level including an allowance for climate change to ensure that the proposed scheme does not obstruct flood water. A bridge soffit lower than this is unlikely to have a permit granted. Please note that the bridge soffit level may need to take account of access for boat users. If the Environment Agency requires boat access to undertake its statutory flood risk functions the soffit level will have to be designed to take account of this or a permit is unlikely to be granted.

We trust that this advice is useful.

Yours sincerely

MR MARTIN BARRELL
Sustainable Places - Planning Specialist

Direct dial 020 302 58450
Direct e-mail martin.barrell@environment-agency.gov.uk

J11 Scoping the environmental impacts of bridges and culverts

Explanatory note

For projects which require Environmental Impact Assessment (EIA), a scoping exercise should be undertaken early in the planning stages of the project. This enables the project to be designed to avoid or minimise negative environmental impacts and provides an opportunity to incorporate positive environmental enhancements into the project. Early consultation with all interested parties, including the Environment Agency, is an essential part of scoping. Even if a project does not require EIA under EIA legislation, it may be advisable (and in some cases necessary) to undertake a scoping exercise in any case (e.g. to support applications for other relevant consents and authorisations needed to carry out the project).

This guidance note aims to promote a good practice approach to scoping as part of the EIA process which in some respects goes beyond the statutory EIA requirements. When scoping a project, developers, or their consultants, should satisfy themselves that they have addressed all the potential impacts and the concerns of all organisations and individuals with an interest in the project.

This guidance note provides information on the most likely potential environmental impacts of interbasin transfer of water. However, each project must be considered on a case-by-case basis as the detailed characteristics of the proposal and the site will determine the potential impacts.

This guidance is based on the main legal requirements on EIA stemming from the EC Directive and the UK Regulations. However, developers should seek independent legal advice to ensure that the proposed development is carried out in compliance with the requirements of this and any other relevant legislation relating to planning as well as to pollution control.

This guidance note must be read in conjunction with the *Scoping Handbook*, which provides general guidance on the EIA process and the scoping of projects.

ENVIRONMENT AGENCY

This guidance note must be read in conjunction with the *Scoping Handbook*, which provides general guidance on the EIA process and the scoping of projects.

In addition, the following scoping guidance notes are relevant to *all* bridge and culvert projects:

- A1 Construction work
- A2 Demolition and decommissioning works
- A4 Vegetation management and conservation enhancements
- J1 River channel works and bank protection
- J3 Flood diversion channels
- J8 Restoration and enhancement of river channels

The following scoping guidance notes *may* be relevant in certain circumstances:

- F6 Water-based recreation
- F7 Angling and sport fishing, including fish stocking
- J4 Flood storage areas and flood embankments
- J6 Navigation works and canal restoration

Contents

1 Introduction

1.1 This guidance note, in conjunction with the *Scoping Handbook* and the notes listed on the previous page, seeks to help developers and other interested parties identify the potential impacts of bridge and culvert developments on the environment as a whole. It should be emphasised that the list of impacts is by no means exhaustive and that a full investigation into positive and negative impacts should be undertaken. Early consultation with the Environment Agency and other relevant organisations will enable the identification of environmental issues and constraints and the avoidance of sensitive areas, thus reducing the need for redesigning and mitigating avoidable impacts at a later stage.

1.2 Following this brief introduction, an overview of the legal requirements for EIA in relation to bridge and culvert projects is provided. The potential environmental impacts of such projects are identified in Section 3. The text and summary table in this section will enable the reader to begin to identify the likely impacts arising from the particular proposal under consideration. The subsequent sections present the mitigation measures that may be relevant to bridge and culvert developments, followed by key references and further reading.

Background to development type

1.3 Bridge and culvert activities involve the construction of permanent engineering structures across watercourses and larger rivers. The construction of bridges may impact upon the local environment and river dynamics particularly where instream span supports are required. The construction of culverts may be required to contain the flow of a watercourse and to channel it below or around man-made structures. The type of culvert used will depend upon the engineering requirements of the site. Culvert designs may range from steel or concrete slab arranged at the sides of a watercourse, which may or may not be covered, to cylindrical four sided pipes where the stream bed is replaced. In the first instance some element of a natural watercourse is retained, the latter are examples of artificial water channels. The construction of bridges and culverts and their associated activities may have significant effects on the surrounding environment. A thorough scoping exercise and careful consideration of alternatives are, therefore, of prime importance.

2 Development control and EIA

Development control

2.1 Many activities associated with culverting do not fall under the town and country planning system. However, where such works are an integral part of a larger development that falls under these regulations, then the impact of any culverting should be addressed in an EA of the development proposal. Where proposed culverting does not require a formal environmental assessment as part of a larger development, it may nevertheless be worthwhile to undertake some form of assessment. With regard to bridges that are included as part of a proposed local authority highway development, these will fall under the town and country planning system and will require consent from a local planning authority. Bridges associated with highways and trunk roads promoted by the highways agency or by the National Assembly for Wales do not go through the local planning process but are subject to public consultation, draft orders and Public Enquiry.

Environmental Impact Assessment

2.2 The construction of bridges and culverts are not included as separate development types in the Town and Country Planning (Environmental Impact Assessment) (England and Wales) 1999 (SI 1999 No. 293). However, where these form part of a larger development, of a type included in these Regulations, then an EIA would be required of all aspects of that development. Several development types in particular are likely to require the construction of bridges or culverts, for example highway developments, railways and inland waterways. Developers should therefore consult these Regulations for further information on the thresholds applicable to their particular development type, to determine whether a full EIA might be required. Where EIA is required for a particular project, the construction of bridges and culverts must be included in the scoping phase and assessed and discussed in the environmental impact statement. EIA may also be required for any change to or extension of bridge and culvert activities, where the change or extension may have significant adverse effects on the environment. Responsibility for determining whether an EIA is required lies initially with the local planning authority.

2.3 Whether or not a formal EIA for a proposed bridge and culvert development is required, the Environment Agency and other statutory consultees and regulators may request environmental information concerning the proposal. An EIA may provide the most appropriate method for a developer to collate the necessary information.

Other licenses, consents and authorisations

2.4 Certain aspects of bridge and culvert construction projects may require prior permissions from the Environment Agency. These may include, for example, land drainage consents, abstraction licences, impounding licences and discharge consents. It is recommended that the developer seek independent legal advice and liaise with the Environment Agency during project design and subsequent stages to identify and confirm the consents, licences and authorisations that will be required.

3 Potentially significant environmental effects

3.1 The EIA Directive requires the EIA to "identify, describe and assess the direct and indirect effects of a project on the following factors: human beings, fauna and flora; soil, water, air, climate and the landscape; material assets and the cultural heritage; [and] the interaction between the factors." Socio-economic issues, health and safety in the workplace, material assets and cultural heritage are all considered in EU *Guidance on Scoping* (ERM, 2001a) but are not impact categories for which the Environment Agency is the principal competent authority. Advice on these issues is presented in this guidance note without prejudice to the advice of the relevant competent authority, but the relevant competent authority should be consulted for each of these categories in all cases (further advice on the appropriate competent authority to contact is given in the *Scoping Handbook*).

3.2 The construction of bridges and culverts have the potential to affect the environment in many ways. They can differ widely in terms of their mode of operation and location, and key issues are likely to vary from site to site. Therefore, it is recommended that expert advice on detailed technical issues be obtained. The issues arising for all environmental receptors will change over time as the site is prepared and managed and following the end of operations. Developers and site operators should therefore consider the impacts arising from both construction activities and operational practices, and following the end of on-site activities.

3.3 Potential impacts are discussed here in broad terms only as their nature and intensity will depend on the physical characteristics of the project and the composition of any polluting materials. An EIA of proposed bridge and culvert construction activities should take these factors into account in assessing potential impacts on the environment.

3.4 The following paragraphs should be read in conjunction with Table J11. This details the activities involved in the construction, daily running and decommissioning of bridge and culvert developments, and the impacts arising from them.

Water environment

3.5 Surface water hydrology can be affected during all phases of bridge and culvert activities. Construction activities can result in compaction of soils and an increase in impermeable (or slowly permeable) surfaces. The subsequent increase in surface runoff may, in turn, increase the risk of flooding. Bridges and culverts can potentially alter the flow regimes of the river thereby affecting water velocity, depth, depositional patterns and channel morphology. Theses changes in turn may increase the risk of flooding and erosion.

3.6 Surface water quality could be affected by a number of factors during operations on site. Construction activities may encourage soil erosion and increase the sediment loads of nearby streams, while accidental leaks/spills of oil/fuel from storage tanks or construction, maintenance and decommissioning vehicles can also pollute surface waters.

3.7 Construction activities may also have significant impacts on groundwater hydrology and quality. The site may need to be drained to provide suitable conditions for the engineering works to occur, resulting in temporary changes to ground flow. Also, soil contaminated from a

previous land use may be disturbed during construction works, causing pollutants such as heavy metals to enter ground and surface waters.

3.8 In order to protect vulnerable groundwater resources it is the policy of the Environment Agency to encourage new developments to locate in areas of low vulnerability to groundwater pollution. However, this policy does not imply an automatic prohibition on such projects within source protection zones.

Land

3.9 Bridge and culvert projects will have implications for land-take, the physical characteristics and land use of the site. Issues to consider include the effect on landscape character from change in land use, soil erosion and compaction resulting from the construction and decommissioning phases of the development. The potential for contamination via runoff from roads and hardstandings must be addressed.

Air and climatic factors

3.10 The construction and decommissioning phases of bridge and culvert developments have the potential to affect local air quality and climate. During these activities, local air quality may decline as a result of gaseous and particulate emissions from vehicle movements on and off site.

Ecology

3.11 The removal of native vegetation and its replacement with bridge and culvert engineering structures can cause direct damage, disturbances, fragmentation or loss of terrestrial and aquatic habitats and ecology. Construction and decommissioning activities could also result in the increased sediment loading of streams and changes in turbidity may impact adversely upon aquatic populations. In addition to this, local ecological populations may be adversely affected by pollution incidents attributed to fuel leaks and oil spills associated with construction, maintenance and decommissioning operations on site. The physical presence of both bridge and culvert engineering structures may affect ecological populations in a number of ways. The local ecology may be disrupted as habitat corridors become severed. In addition, culverts may act as barriers to the migration of fish and small mammals. Bridges in particular will cause some shading of the river bank and bed thereby potentially altering the aquatic flora present in the river bed. Ecological impacts may operate over a longer time-scale, as populations take time to respond to environmental changes (time lag).

Human environment

3.12 The potential impacts of a development for bridges and culverts on the human environment may take a variety of forms. They are divided here into sections covering socio-economic and health issues; amenity, visual impact and nuisance issues; and culture, heritage and archaeology.

3.13 The potential for socio-economic and health impacts (real and perceived) arising from bridge and culvert developments is likely to be small. Such operations usually require comparatively small staffing levels and, as a result, employees are not likely to have a significant effect on local socio-economic issues. However, such social issues should be considered when scoping an EIA.

3.14 The identification of which of these issues are significant or are perceived to be significant is an important function of public involvement during the scoping exercise. Understanding likely public concerns is a key issue and reference to experiences from other similar developments and any public representations to the local planning authority should be made.

3.15 Other issues that commonly need to be addressed are the visual impact of the engineering structures and any additional buildings associated with it. Any restrictions to access that may arise as a result of the development should also be considered, as should the creation of nuisances such as noise and vibration from traffic during the construction and decommissioning phases, dust in the air, and mud and slow vehicles on public roads. Also, the amenity use of nearby streams or lakes may be affected if reduced water quality causes harm to fish.

3.16 Impacts on architectural and archaeological heritage may arise from site preparation and construction, as features may be removed or disturbed. The likelihood of there being any unrecorded sites and their potential for discovery should also be examined.

Table J11

3.17 The impact identification table highlights:

- sources of impact (development activities);
- potential impacts;
- receptors for these impacts.

3.18 It is recommended that the table is annotated and used during consultations with other interested parties. Reference should also be made to the prompt lists detailing impacts and sources of impacts in the *Scoping Handbook*.

Table J11 Summary of key potential impacts of bridge and culvert developments

Potential receptors of impact		Activities and potential impacts		
		Construction phase	**Operation phase/ongoing site maintenance**	**Decommissioning/post-operation**
WATER	Surface water hydrology and channel morphology	**Use of vehicles and machinery** • Increase in surface runoff from soil compaction **Works next to or near watercourses** • Change in flow velocities • Increased erosion and subsequent changes in bed and bank stability • Increased flood risk **Earthworks** • Increased sedimentation of watercourses	**Physical presence of bridge** • Upstream potential impediment to flow, decreased water velocity and increased depth – increased flood risk • Change in deposition regime upstream, caused by changes in flow and potential flood risk and changes to riffle/pools • Downstream potential increased water velocity, and turbulence and erosion **Physical presence of culvert** • Loss of pools/riffles, alteration of natural bed slope, decreased water turbulence and oxygenation, increased bank erosion downstream.	**Site drainage** • Increase in surface runoff from bank areas during decommissioning due to soil compaction • Possible increased flood risk
	Surface water quality	**Earthworks** • Pollution from suspended material • Disturbance of contaminated soil and subsequent pollution of watercourses **Materials management** • Pollution from spills or leaks of fuel, oil and construction materials	**Physical presence of bridge** • Upstream impounded waters will reduce oxygenation • Downstream water quality may be reduced by increased turbidity.	**Materials management** • Pollution of surface water by fuel and oil spillages from vehicular activities
	Groundwater hydrology	**Earthworks and site drainage** • Reduction in water table • Changes to groundwater distribution and flow	**Physical presence bridge/culvert** • No significant impacts	

Potential receptors of impact		Activities and potential impacts		
		Construction phase	**Operation phase/ongoing site maintenance**	**Decommissioning/post-operation**
WATER *continued*	Groundwater quality	**Earthworks** • Disturbance of contaminated soil and subsequent groundwater pollution **Materials management** • Pollution from spills or leaks of fuel, oil and building materials	**Physical presence of bridge/culvert** • No significant impacts **Maintenance work and materials management** • Contamination from spills or leaks of fuel and oil from routine maintenance work	**Materials management** • Pollution of groundwater by fuel and oil spillages from the decommissioning vehicular activities
LAND	Landscape	**Excavations and earthworks** • Creation of a new landform	**Physical presence of bridge/culvert** • Change in character of landscape	**Decommissioning** • Temporary visual impacts from work being carried out on site
	Soils	**Use of vehicles and machinery on site** • Compaction • Erosion **Earthworks** • Further erosion of exposed soil • Removal or alteration of soils on site for bridge/culvert construction	**Use of vehicles and machinery for on site maintenance** • Soil compaction • Soil erosion **Physical presence of bridge/culvert** • No significant impact	**Use of vehicles and machinery on site** • Compaction • Erosion **Decommissioning earthworks** • Further erosion of exposed soil • Removal or alteration of soils on site for bridge / culvert removal
	Geology	**Excavations** • Removal of rock by excavation works		
AIR	Local air quality	**Use of vehicles and machinery** • Emissions from construction site traffic • Dust generation	**Use of vehicles and machinery for on site maintenance** • Short-term exhaust emissions no significant impact	**Decommissioning activities** • Temporary vehicular emissions associated with site remediation
	Regional/ global air			

Potential receptors of impact		Activities and potential impacts		
		Construction phase	Operation phase/ongoing site maintenance	Decommissioning/post-operation
FLORA AND FAUNA	Aquatic ecology	**Drainage works and use of vehicles** • Negative impact on flora and fauna from increased sediment loading of streams **Materials management** • Harm to aquatic flora and fauna from oil, fuel, cement or other substances entering watercourses	**Physical presence of culvert** • Interruption of river corridor isolating habitats with potential decrease in species numbers and local biodiversity • Potential barrier created to the upstream migration of wildlife • Reduced daylight in enclosed culvert tunnel inhibit plant life • Increased water velocities in culvert may impede fish migration and spawning upstream **Physical presence of the bridge** • Changes to deposition, depth and water velocities may result in the loss of sensitive plant, invertebrate and fish species • Turbidity may contribute to reduced ecological diversity • Potential downstream changes to the aquatic community • Shading of the watercourse may reduce aquatic flora in the vicinity of the bridge • Potential barrier to fish migration and the movement of aquatic mammals along the river corridor **Materials management from ongoing site maintenance** • Direct and indirect effects from oil, fuel or other substances entering the aquatic environment	**Decommissioning activities** • Negative impact on aquatic flora and fauna from increased sediment loading of streams **Materials management** • Harm to aquatic flora and fauna from oil, fuel, cement or other substances entering watercourses **Restoration design** • Opportunity for enhancement of nature conservation value

Potential receptors of impact		Activities and potential impacts		
		Construction phase	Operation phase/ongoing site maintenance	Decommissioning/post-operation
FLORA AND FAUNA *continued*	Terrestrial ecology	**Earthworks and excavations** • Habitat removal, fragmentation or severance • Disturbance to, or loss of, species (including rare and sensitive species)	**Physical presence of culvert** • Alteration or loss of terrestrial habitats • Creation of barriers to mammals • Alteration of the channel bank habitat **Physical presence of bridge** • Loss of riparian habitat by virtue of land use adjacent to a watercourse for development • Upstream impoundment may cause an inundation of terrestrial and riparian habitats • Destabilisation of nearby wetlands - potential waterlogging of riparian areas – death of mature trees, shrubs and flowers	**Decommissioning activities** • Negative impact on terrestrial flora and fauna from vehicular activities, disturbance and habitat severance. **Materials management** • Harm to terrestrial flora and fauna from oil, fuel, cement or other substances entering watercourses **Restoration design** • Opportunity for enhancement of nature conservation value
HUMAN ENVIRONMENT	Socio-economic[1]	**Earthworks and excavations** • Disruption of services and roads where construction activities occur near to highways • Construction-related employment	**Physical presence of bridge** • Potential for disruption to commercial and recreational navigation • Changes to the angling quality	**Restoration design and after-use** • Public perception of the area may improve following sensitive restoration plans
	Health and safety[1]	**Earthworks and excavations** • Risk of injury on construction site • Risk of injury through construction traffic **Negative publicity** • Adverse reaction to perceived health issues	**Physical presence of bridge/culvert structures** • Risk of harm to humans falling from the structure into the watercourse	**Decommissioning activities** • Risk of accident or injury to authorised and unauthorised persons on site

[1] The Agency considers that key impacts to be identified and assessed are likely to include the following, but further advice and guidance should be sought from the relevant competent authority, as indicated in the *Scoping Handbook*.

Potential receptors of impact		Activities and potential impacts		
		Construction phase	**Operation phase/ongoing site maintenance**	**Decommissioning/post-operation**
HUMAN ENVIRONMENT *continued*	Amenity	**Earthworks and excavations** • Temporary loss of amenity during construction phase	**Physical presence of bridge/culvert structures** • Possible alteration of rights of way or reduction in access to riparian habitats • Reduced recreation opportunities e.g. angling and boating • Loss of visual amenity	**Restoration design** • Provision of amenity/recreational area
	Nuisance	**Use of vehicles and machinery** • Noise from construction traffic and operations • Mud on roads	**Use site maintenance vehicles and machinery** • Noise **Physical presence of bridge / culvert structures** • Collection of unsightly litter behind the structures	**Decommissioning activities** • Temporary noise nuisance caused to communities proximal to the decommissioning activities • Temporary visual intrusion
	Architectural and archaeological heritage[1]	• Damage to known or unknown features of archaeological or cultural importance	• Bridges of archaeological or architectural importance may have restrictions on certain types of use/maintenance.	• Damage to known or unknown features of archaeological or cultural importance.

[1] The Agency considers that key impacts to be identified and assessed are likely to include the following, but further advice and guidance should be sought from the relevant competent authority, as indicated in the *Scoping Handbook*.

Additional site-specific issues:

4 Mitigation measures

4.1 Following the scoping exercise and the identification of potential environmental effects, mitigation measures should be proposed to avoid or reduce potential negative impacts to air, water, land, ecology and humans, or to introduce positive aspects to the development. Guidance has been provided by the Environment Agency to assist developers on a range of relevant subjects in the form of Pollution Prevention Guidelines (see the *Scoping Handbook*. Other relevant publications are listed in Section 5).

4.2 A primary consideration in impact mitigation must be the siting of bridge and culvert engineering operations. These should avoid damage to important ecological sites and high quality landscapes. Also, it is Environment Agency policy to seek the preferential location of developments in areas which are not vulnerable to groundwater pollution. It is strongly recommended therefore that developers undertake an assessment of alternative sites.

Mitigating the impacts of construction activities

4.3 Construction and site preparation activities have the potential to affect all environmental receptors. However, the following list summarises the mitigation measures of most relevance for these types of engineering structures:

- phasing of construction work to minimise disturbance to wildlife at sensitive times of year, such as during the breeding season or when young are being raised;
- use of techniques to minimise compaction of soil, such as restricting access during wet conditions, and using protective boarding and low ground pressure machinery. If necessary, soil should be carefully removed and stored for subsequent reinstatement;
- use of dust control strategies;
- storage of fuel, equipment and construction materials so as to minimise the risk of soil contamination or water pollution (see Environment Agency Pollution Prevention Guideline 1, *General Guide to the Prevention of Water Pollution*);
- setting the route and timing of construction traffic so as to avoid residential areas or other sensitive human receptors (e.g. schools, hospitals, nursing homes);
- access roads should avoid riparian zones and should be built using appropriate construction materials.

Mitigating the impacts of the operational phase

4.4 Although sensitive siting and design of a development for bridges and culverts are the primary means for avoiding or reducing its environmental impacts, further measures can be introduced to minimise impacts occurring from the ongoing management of the site. An overall consideration is that the design and operation of the development are in accordance with planning conditions, the Environmental Protection (Duty of Care) Regulations (SI 2839) and other relevant legislation. Developers should seek independent legal advice to ensure that all legal requirements are identified and complied with.

4.5 The measures have been arranged according to their primary receptor, however it should be noted that many of the following mitigation

measures are interrelated. For example, correct storage, use and disposal of chemicals used for site maintenance would reduce the risk of soil contamination, pollution of surface and groundwaters, and harm to terrestrial and aquatic ecology.

Protecting the water environment

4.6 In order to minimise potential impacts on the water environment in the design and running of bridge and culverting operations, the project proponent must ensure that:

- culverts should be inserted below an existing river bed level to allow for bed formation within the culvert;
- culverts should incorporate a low flow channel within its base to retain sufficient water depth for aquatic life at such times;
- watercourses should not be deepened or widened up or downstream of culverts;
- artificial bank reinforcement should be avoided if possible;
- with regard to bridges, open parapets should be used to allow some over-deck flow in the event of the bridge opening becoming blocked in a major flood event;
- bridge soffit levels and flood spans should be at least 1 metre above the maximum known flood level to allow floating debris to pass freely through the structure;
- an appropriate water management system is used during the construction period, including, for example, efficient land drainage and the use of constructed ponds for receiving site runoff to reduce the impact of runoff on nearby watercourses;
- oil interceptors or drip trays are used in vehicle parking areas, and are inspected and cleaned regularly;
- a risk assessment is carried out for each substance to be used or stored on site, and the appropriate containment measures installed.

Protecting the land environment

4.7 Impacts on soils and landscape may be mitigated by the following:

- appropriate designs for buildings/structures on site;
- appropriate screening for visual impacts;
- effective stabilisation of altered landforms so as to minimise soil erosion and the potential for water pollution from suspended solids;
- with regard to bridge construction, where the substratum of a watercourse is disturbed by construction, this should be replaced.

Protecting the air environment

4.8 Developers should consider the aspects of the development that are likely to lead to air emissions.

Protecting ecology

4.9 Measures designed to prevent or reduce impacts to water or land will also help to prevent adverse impacts on ecology. The following list identifies further measures to reduce or avoid impacts to terrestrial and aquatic species and their habitats:

- existing habitat features should be incorporated into site design and protected from change;

- further habitats should be created to compensate for habitat losses and to improve the landscape and ecological potential for the site;
- culverts should be wide enough to allow for ledges approximately 500mm wide and 300mm above the normal water level for the passage of mammals and should link to the banks up and downstream of the culvert;
- baffles should be incorporated into the design of the culvert base to provide shelter for fish as they pass through the culvert;
- holes and ledges should be incorporated onto the design of culverts for use as nesting sites;
- bat and bird boxes should be provided within the riparian areas;
- where clear span bridges are not a feasible design then a ledge, either in the form of a concrete shelf or gravel side bar, or mammal tunnels should be provided;
- consideration should be given to the provision of features within the bridge design to encourage nesting birds and bats.

Protecting the human environment

4.10 Some of the measures noted above can also reduce possible impacts on humans. Mitigation measures more specific to the human environment are listed below:

- management operations should aim to minimise disturbance to adjacent residential and recreational uses;
- where access restrictions result, arrangements for alternative access should be made with the provision of gates, bridges or stiles;
- safety concerns should be addressed by such measures as implementing strict health and safety procedures, and the installation of adequate fencing and other site security to prevent trespass and vandalism;
- sites of archaeological or cultural interest should be preserved in situ where possible, as relocation is rarely possible, thorough archaeological investigations should be carried out where damage is unavoidable.

5 References and further reading

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Engineering in the water environment: good practice guide

River crossings

Second edition, November 2010

Contents

1 Introduction

This document is one of a series of good practice guides produced by SEPA to help people select sustainable engineering solutions that minimise harm to the water environment. The guide is intended for anyone considering engineering activities in rivers or lochs and for SEPA staff who provide advice on, and regulate, engineering in the water environment.

It is important to recognise that any engineering works must be designed to suit site-specific conditions. This document addresses the aspects of the water environment that should be considered when undertaking a project. It is not intended to be a technical design manual.

New engineering activities (such as bridges and culverts) in Scotland's rivers, lochs and wetlands require an authorisation under the Controlled Activities Regulations (CAR) (see box below).

SEPA expect new engineering activities authorised under CAR to be carried out in accordance with good practice, as well as complying with environmental standards.

Regulations

New engineering activities (such as bridges and culverts) in Scotland's rivers, lochs and wetlands require an authorisation under the Water Environment (Controlled Activities) (Scotland) Regulations 2005 (also known as the Controlled Activities Regulations or CAR).

There are three different levels of authorisation under CAR, based on the risk an activity poses to the water environment:

General Binding Rules (GBRs) have been specified for certain low risk activities in CAR. Provided an activity can comply with these rules no application to SEPA is required.

Registrations are required for medium risk activities. Operators must apply to SEPA to register an activity.

Licences are required for high risk activities. Operators must apply to SEPA for a licence.

Details of what level of authorisation an activity requires can be found in the *CAR Practical Guide* on our website at www.sepa.org.uk/water/water_publications.aspx

SEPA has a position statement which sets out our regulatory approach to culverting of watercourses. This position statement is available from the SEPA website at: www.sepa.org.uk/water/water_regulation/guidance/engineering.aspx

SEPA defines good practice as: "...the course of action which serves a demonstrated need, while minimising ecological harm, at a cost that is not disproportionately expensive."

Following the basic principles of good practice shown in the box below will to help to ensure that the impact on the water environment is minimised and will also help applicants obtain an authorisation under, and comply with, the Controlled Activities Regulations. The sections in this guide are based around these basic principles.

Basic principles of good practice

Demonstrate need	The first step in identifying a sustainable engineering solution is to determine whether new engineering work is necessary.
Consider a range of options	Most engineering requirements can be addressed in a number of ways so a range of options to address any problem or need should be considered. The cause of any problem should be identified and options that address the cause, not the symptoms, should be considered. Without considering a range of options it is not possible to determine if the chosen approach represents the most suitable option – ie the option that minimises ecological harm at a cost that is not disproportionately expensive.
Include mitigation	All reasonable mitigation should be identified and implemented eg ensure measures are taken to reduce the risk of pollution during the construction phase.

2 Impacts of crossings

Poorly designed river crossings can:

- lead to the loss or damage of plants, animals and their habitats;
- create a barrier to the movement of fish and other wildlife;
- prevent sediment and woody debris being moved downstream
- prevent natural river movement;
- increase flood risk.

Following the good practice in this guide will help reduce the risk of these impacts.

2.1 Construction phase impacts

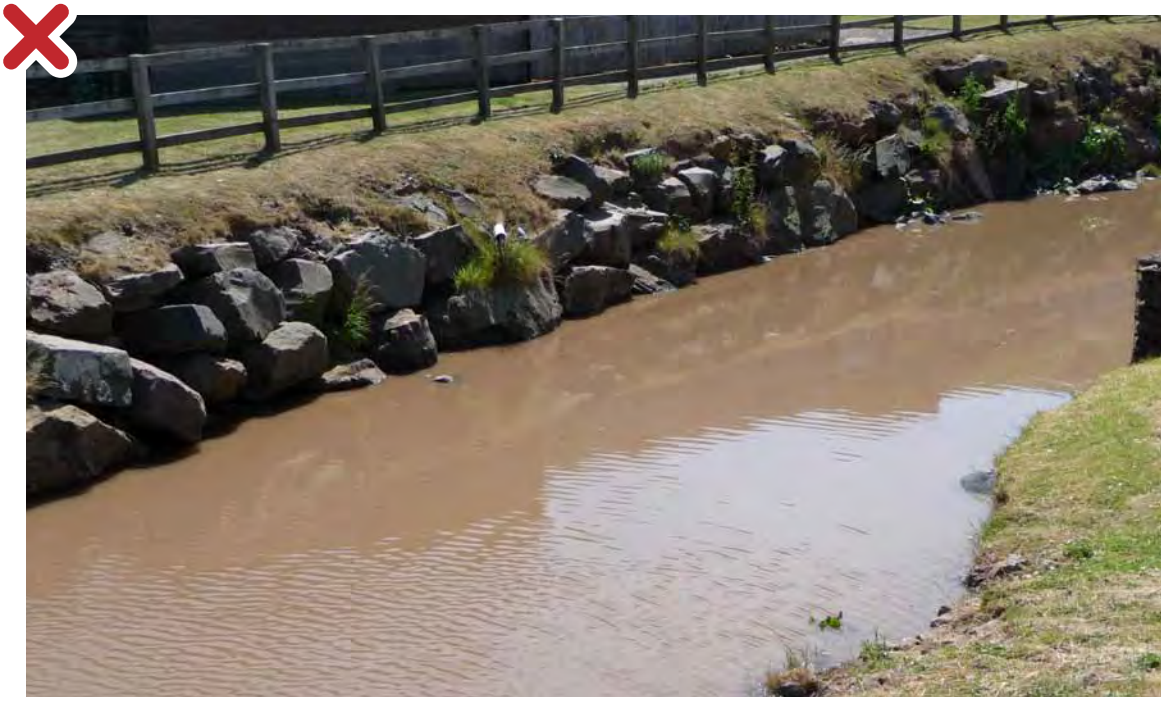
Construction on and disturbance of the river bed and banks can lead to the loss of or damage to important plants, animals and habitats such as fresh water pearl mussel (see Figure 1), river jelly lichen, water voles, salmon and lamprey eggs and juveniles as well as spawning gravels and nursery habitats.

Fresh water pearl mussels and river jelly lichen are protected species under the Wildlife and Countryside Act 1981. It is an offence to kill, injure or disturb any fresh water pearl mussels or river jelly lichen or to damage their habitat. It is the responsibility of the operator to ensure that no protected species will be killed or disturbed. For further information contact Scottish Natural Heritage.

Figure 1: Protected species such as fresh water pearl mussels can be killed or disturbed during the construction phase. ©Sue Scott/Scottish Natural Heritage

If proper care is not taken during the construction phase, fine sediments and other pollutants can be released into the river smothering or poisoning plants and animals directly or smothering the habitats they depend on. For example fine sediment pollution can smother fresh water pearl mussels and river gravels which are important fish spawning habitats (see Figure 2).

Figure 2: Poor practice. Release of fine sediments during the construction phase can pollute watercourses leading to loss of, or damage to, protected species and habitats such as fish spawning areas.



2.2 Barrier to fish passage and other wildlife

Migration and movement throughout the river catchment is essential to the survival of many animal species including salmon, trout, lamprey, otter and watervoles. Poorly designed river crossings such as bridges and culverts can prevent fish and mammals moving up and down river catchments. This prevents animals reaching essential areas in the catchment, such as breeding and feeding habitats, leading to a reduction in or loss of populations.

Salmon travel as adults from the sea up river to spawn and then, as juveniles, migrate back downstream to the sea. Other fish such as brown trout use different parts of the river catchment throughout their life cycle, migrating upstream to smaller headwaters to spawn and moving downstream to feed and grow in lochs or larger rivers where more food may be available. Sea trout, eels, sea lamprey and river lamprey also make significant migrations.

Other fish species may be involved in shorter migrations within the catchment and can be affected if a crossing creates a barrier and prevents access to a key area of habitat. For example Artic charr can make limited migrations from lochs to rivers and brook lamprey can also make smaller migrations, associated with spawning, within a catchment.

Poorly designed river crossings can be a significant barrier to fish passage. Some of the main problems than can result in barriers include:

- perched inverts (bridge aprons, weirs or culvert outfalls that create a drop from the structure to the down stream river bed). This can be the result of poor initial design (Figure 3) or may arise if the invert is placed at bed level which leads to subsequent erosion downstream due to scour (Figure 4). In some cases erosion may be triggered elsewhere in the river and move up or downstream to the structure, creating a drop.

- undersized crossings that are too small for fish to pass through and may also increase the speed of water flowing through the structure leading to flows that are too fast for fish to swim against (see Figures 5 and 6);
- excessively wide crossings which create flows that are too shallow for fish to swim through (see Figure 7);
- a lack of resting places and pools. Some species of fish can jump up some obstructions if there are adequate pools downstream. If a crossing is difficult for fish to swim through or is very long and there are no resting places then fish can get exhausted and be washed downstream.

Figure 3: Poor practice. Culvert installed with a drop from the culvert outfall to the downstream riverbed (perched culvert) creating a barrier to fish passage.

Figure 4: Poor practice. A bridge invert may be level with the riverbed at the time of construction but subsequent erosion downstream due to scour can led to a drop forming (perched invert) that can create a barrier to fish passage, it can also lead to flows that are too shallow for fish to swim through.

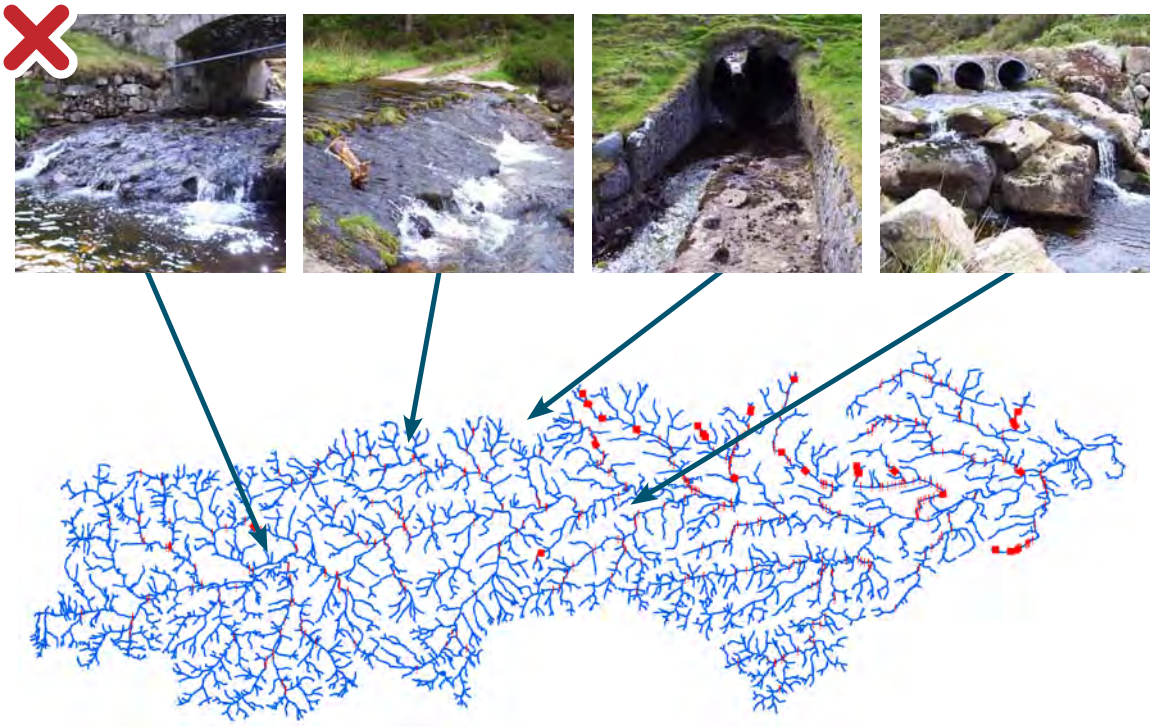
Figure 5: Poor practice. Pipe bridges create undersized crossings that are too small and dark for fish to enter. In high flows water may be too fast for fish to swim against.

Figure 6: Poor practice. Pipe bridge creating a barrier to fish passage, showing a drop from the invert to the riverbed (perched). Undersized pipes are too small and dark for fish to enter and in high flows water may be too fast for fish to swim against.

Figure 7: Poor practice. This ford has widened the river, leading to flows that are too shallow for fish to swim through. Photograph courtesy of the River Dee Trust.

A single crossing can be a complete barrier to fish passage (ie it prevents all fish passage all of the time), leading to the loss of certain fish populations such as salmon upstream of the structure. Some crossings however may form partial barriers to fish passage (ie some fish can get past under certain conditions). Even if crossings form partial barriers the cumulative impact of these over a whole catchment can have a significant impact on fish populations. The River Dee catchment in Aberdeenshire is largely rural yet still has more than 500 crossings (Figure 8). Some of these crossings pose a complete or partial barrier to fish passage, which can prevent or reduce fish species such as salmon reaching parts of the catchment.

Figure 8: Crossings in the River Dee catchment. Some of these pose a complete or partial barrier to fish passage and can negatively affect fish populations throughout the catchment. Photographs courtesy of the River Dee Trust.



Being able to move up and down a river is also essential for other wildlife such as otters and water voles. These species not only depend on a healthy river ecology (fish and invertebrates), but also on good bank-side (riparian) habitat where they live and feed. This habitat is important in small burns and ditches as well as larger rivers eg water voles in particular often use small watercourses including ditches and upland burns. Culverts and other crossings that do not maintain the riparian corridor can create barriers for these mammals as well, preventing them from reaching feeding grounds and establishing populations elsewhere. In more urban environments, the riparian habitat may be one of the few corridors they have left in which to move around. Ensuring mammal passage under river crossings may also help prevent animals such as otters crossing roads, reducing their risk of being hit by road vehicles.

Figure 9: Mammals such as otter also need to move up and down the river corridor and can be adversely affected by river crossings that do not allow mammal passage. Photograph © Scottish Natural Heritage.

2.3 Barriers to sediment and wood transport

Rivers also carry a significant amount of sediment as well as water. River sediment covers all natural river bed load including silts, sands, gravels, cobbles and boulders. This is stored and transported throughout the river creating habitats for many species such as spawning gravels for fish and gravel bars and islands essential for many invertebrates.

Where crossings are poorly designed, sediment can deposit at bridges and culverts which can reduce flow capacity and increase flood risk (Figure 10). This may lead to the need for regular dredging at the structure. Dredging increases long term maintenance costs and can lead to the loss of important species and habitats such as fresh water pearl mussels and fish spawning gravels and may also pollute the river with the release of finer sediments that can smother habitats and species downstream. See the SEPA good practice guide: *Sediment Management* for more information on sediment removal and its impacts available from the SEPA website www.sepa.org.uk/water/water_publications.aspx

Figure 10: Increased sediment deposition at a bridge can increase flood risk

Large woody debris is important to river ecosystems, and should be retained in the river channel where possible. It provides food for organisms and its presence increases the physical diversity of the channel. Woody debris can be trapped at bridges (Figure 11), which can increase flood risk and the risk of the bridge collapsing in high flows. This woody debris is often removed from bridges and culverts to stop such potential impacts.

Figure 11: Large woody debris trapped at a bridge. Photograph courtesy of the City of Edinburgh Council.

2.4 Preventing the lateral migration of rivers

Many rivers move naturally across their floodplain through the process of erosion and deposition. This process is called lateral migration (Figure 12). The area within which a river channel is likely to move over a period of time is referred to as the channel migration zone. This movement or migration creates new habitats and re-works older habitats providing different habitat types and ages, important for maintaining a diverse range of plants and animals. For example rare species of plants and insects such as river shingle beetles, a UK Biodiversity Action Plan group, live on bare river gravels created by this movement.

If a structure is located poorly, it may prevent lateral movement (Figure 13) of the river. This may interrupt the natural processes of erosion and deposition, therefore damaging habitats and it may also lead to damage to or loss of the crossing structure itself (Figure 14). This can result in the need for further engineering works to stabilise the structure or stabilise the river, increasing costs. Trying to stabilise a naturally dynamic river is likely to result in long term maintenance issues and may cause further impacts such as increased erosion upstream or downstream.

Figure 12: Movement of the River Clyde and River Medwin between 1848 and 1977. Illustration modified from Werritty and McEwen in Gregory (ed), Fluvial Geomorphology of Great Britain 1997, after Brazier et al.

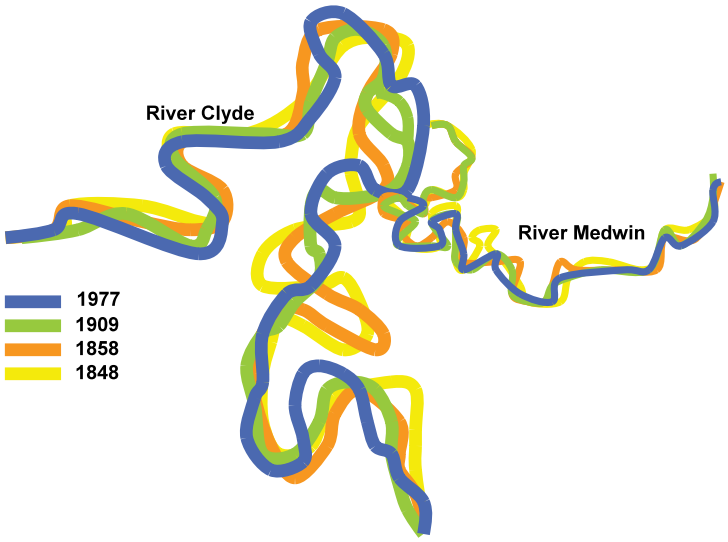


Figure 13: River migration affected by roads and river crossings. Photograph courtesy of Aberdeenshire Council.

Figure 14: Bridge structure at risk of failing due to erosion from inappropriate location on an active river.

2.5 Flooding and floodplain connectivity

Floodplains are an important part of the river system; they provide storage for water during high flows and, under natural conditions, can act as storage areas for sediment and nutrients. They also provide important food sources and nursery areas for fish and other aquatic plants and animals.

Poorly designed structures can increase flood risk upstream due to a lack of capacity beneath the structure. Other structures may have sufficient capacity to take even the highest flows but, if they block the floodplain (eg by road embankments, see Figure 15), an increase in upstream flooding can still occur. Disconnecting the floodplain from the river can also lead to the loss of floodplain habitats.

Crossings can constrict flood flows, forcing flood flows through a relatively narrow opening at a crossing point (see Figure 16). This can increase bed and bank erosion, and alter sediment deposition damaging river habitats and crossing structures.

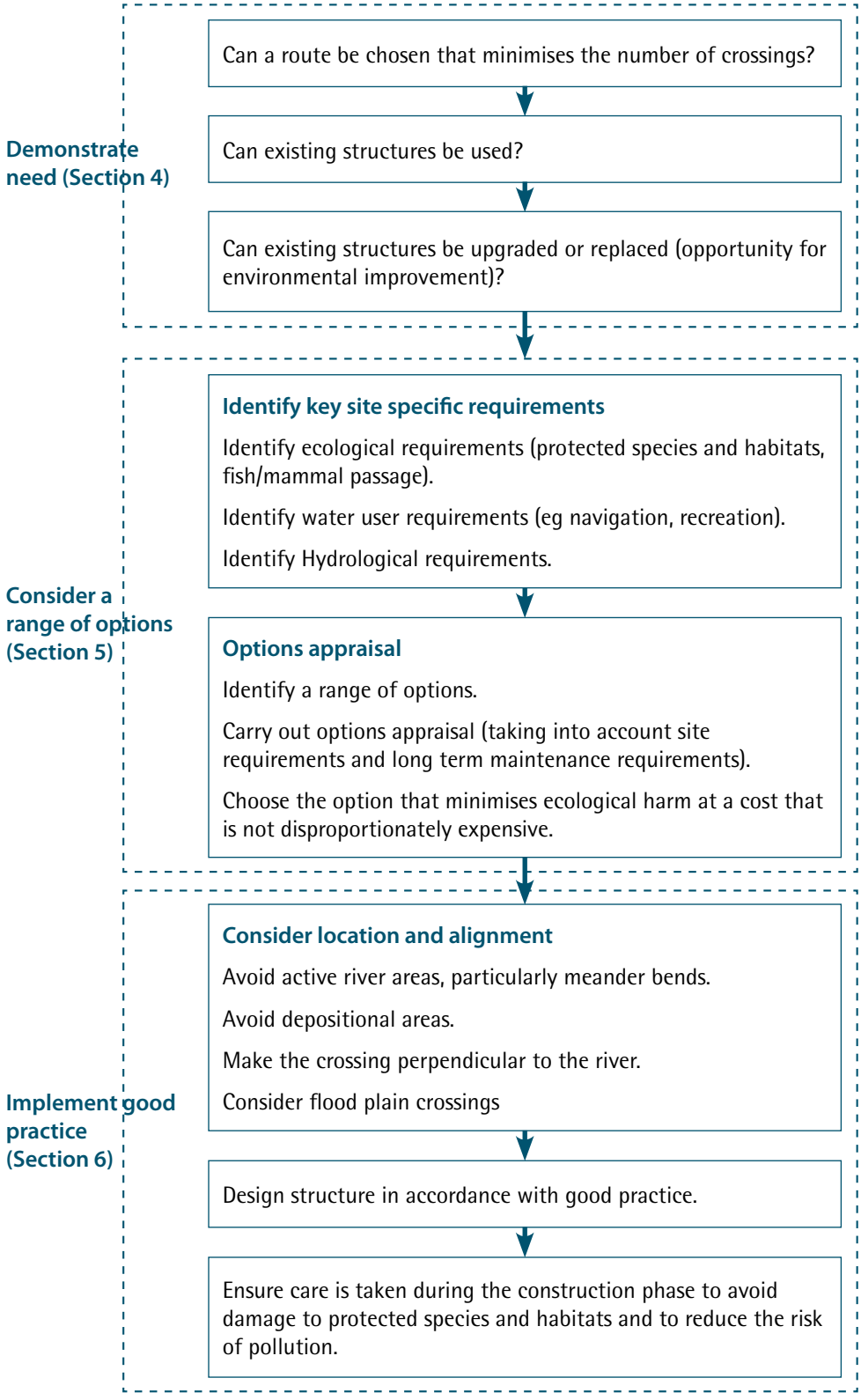
Figure 15: Road embankment crossing a floodplain. Photograph courtesy of Aberdeenshire Council.

Figure 16: Crossings can constrict flood flows which can increase bank and bed erosion and alter sediment deposition, damaging river habitats and crossing structures.

3 The good practice process

These steps should be followed to ensure good practice is carried out.

Figure 17: River crossings good practice process



4 Demonstrating need

Key points

- Can a route be chosen that minimises the number of crossings?
- Can existing structures be used?
- Can existing structures be upgraded or replaced? (opportunity for environmental improvement).

The first step in identifying a sustainable engineering solution is to determine whether new engineering work is necessary.

4.1 Is there a demonstrated need?

The following considerations should be taken into account before deciding if a new crossing structure is required. It is essential that these considerations are taken into account in the early stages of the planning and design process.

- Can a route be chosen that minimises the number of crossings?
- Can existing structures be used?
- Can existing structures be upgraded or replaced (opportunity for environmental improvement).

Upgrading or replacing existing crossings

When upgrading or replacing an existing crossing the opportunity should be taken to improve any environmental impact the existing crossing may have. For example fish and mammal passage can be provided if the existing crossing creates a barrier. If improving fish passage the local district salmon fishery board (www.asfb.org.uk) and local fisheries trusts (www.rafts.org.uk) can be contacted for advice. They can advise on fish populations present (native as well as non-native) and any potential impacts of removing a barrier.

If an old structure is being replaced, the old structure should be removed rather than leaving it in place and building a new structure next to it. However, there may be exceptions to this, such as if structures need to be retained for access purposes, or if they have some historical or local significance. In such instances, Historic Scotland (www.historic-scotland.gov.uk) and the local authority planning department should be consulted.

See section 6.4 for further information on maintenance and improvement of existing structures.

5 Considering the options

As stated in Section 1, most engineering requirements can be addressed in a number of ways. It is a basic principle of good practice to consider a range of options to address any river engineering problem or need and to carry out an options appraisal. Without considering a range of options it is not possible to determine if the chosen approach represents the most suitable option ie the option that minimises ecological harm at a cost that is not disproportionately expensive.

Proportionate cost

The most cost-effective solution is the one that minimises environmental harm or maximises environmental benefit at a proportionate cost. Large absolute cost, in itself, does not constitute disproportionate cost. For example, incurring significant costs to prevent significant environmental harm or achieve significant environmental benefits eg safeguarding protected species and designated sites, would be considered proportionate. But incurring significant costs for minor environmental benefits would be considered disproportionate.

This section describes possible crossing options and provides guidance to help applicants select the most suitable and sustainable type of crossing.

5.1 Identify key site specific requirements

In order to carry out a thorough options appraisal it is essential that the key requirements for a site are identified. It is essential to ensure that the key requirements are met when assessing the options.

Key requirements that should be identified for each site include:

Ecological

- Identify sites that have been designated for nature conservation (SSSI, SAC, SPA) and ensure the conservation requirements for any designated site are met. Contact Scottish Natural Heritage for further information (www.snh.org.uk).
- Identify protected species nearby that could be affected (eg freshwater pearl mussel, lamprey, river jelly lichen, otters) Contact Scottish Natural Heritage for further information (www.snh.org.uk).
- Identify important habitats (eg fish spawning and rearing areas) and ensure they are not damaged.
- Identify fish species present up stream and down stream if there is a risk that fish passage may be affected. The local district salmon fishery board (www.asfb.org.uk or local fisheries trust www.rafts.org.uk) should be contacted if you are unsure what fish species are present. A suitably qualified ecologist should be consulted to ensure that fish surveys are carried out appropriately and to ensure that fish passage is not affected.
- Identify mammals present in the area.

Other users of the river

- Identify other users of the river and ensure the use is not affected (eg is the river used for navigation, recreation canoeing/rafting).

Size and capacity of crossing

- What hydraulic capacity is required (see box below)? Contact the relevant roads authority for further information (this will be the Local Authority or Transport Scotland if the crossing is likely to affect a trunk road.
- Consider allowance for sediment transport through the crossing (not just hydraulic capacity).
- Freeboard, consider the amount of freeboard that is required eg to aide passage of large woody debris and other water uses eg navigation and recreation.

Hydraulic capacity

The hydraulic capacity of crossing structures will vary depending on the location of the crossing and the purpose the crossing infrastructure serves. Requirements must be discussed with the relevant organisations.

If crossing structures require planning permission they should conform to the Scottish Planning Policy. This states that no new development should increase the probability of flooding elsewhere.
The Scottish Planning Policy is available from the Scottish Government website at www.scotland.gov.uk/Publications/2010/02/03132605/0

Further information on flooding and the different responsibilities in relation to flooding can be found on the SEPA website at: www.sepa.org.uk/flooding

If a crossing is in an urban area, close to other development, close to or will effect a trunk road or will be adopted by the roads authority (this will be the Local Authority or Transport Scotland for trunk roads) then the relevant roads authority must be contacted to advise on hydraulic capacity and other requirements.

The hydraulic capacity of crossing structures will vary depending on the location of the crossing and the purpose the crossing infrastructure serves. Requirements must be discussed with the relevant organisations.

These considerations must be taken into account in the early stages of the planning and design process.

Remember sediment moves down rivers as well as water, especially during high flows. Allowance for sediment should be taken into account when assessing capacity and the required size of structure.

For further information on hydraulic capacity of structures see:

- *CIRIA Culvert design and operation guide* (C684) www.ciria.org
- Highways Agency *Design Manual for Roads and Bridges*, Volume 4 Section 2 Design of outfall and culvert details www.standardsforhighways.co.uk/dmrb/index.htm

5.2 Options appraisal

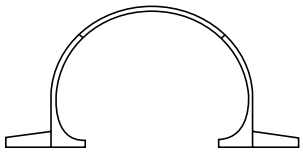
This good practice guide identifies five generic types of crossing including pipeline and cable crossings; these can be seen in Figure 18 below and are described in Table 1. The flow chart in Figure 19 will help to determine what range of crossing types may be suitable for your circumstances, and should be considered in an options appraisal. Guidance on selecting the most suitable option is provided in Section 5.3 of this document.

Figure 18: Types of river crossing

General increase in impact

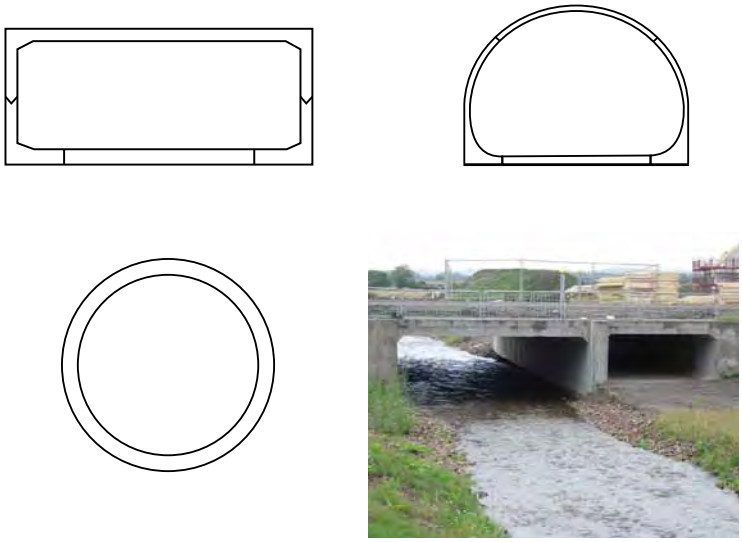
I. Single span structures (bridge or pre cast structures with natural bed - no artificial invert)	V. Pipe or cables under watercourse
II. Span structures with in-stream supports (bridge or pre cast structures with natural bed - no artificial invert)	
III. Closed culverts (structures with artificial invert)	
IV. Fords	

Table 1: Different types of river crossing

I. Single span structures Structures that span the width of the channel with no in-stream support and do not affect the bed of the river, ie they have no artificial invert and a natural bed is maintained. Bank habitat can be maintained under the crossing if abutments are set back. They can come in a variety of forms from pre-cast concrete structures (arch or portal [rectangular]), panel bridges that come in pre-fabricated sections to bridges designed for site specific requirements. Some prefabricated structures require foundations to be constructed at the site and others can have prefabricated foundations.	Photograph courtesy of the Highland Council    
II. Span structures with in-stream supports In-stream supports (piers) can be used to increase the crossing width where single span is not possible or prohibitively expensive. Bank habitat can be maintained under the crossing if abutments are set back. They can come in a variety of forms, from bridges designed for site specific requirements to panel bridges that come in pre-fabricated sections with supports.	 

III. Closed culverts

Closed culverts have an artificial invert (floor) and so have a greater impact on the bed and banks of the river. Closed culverts can be made from a variety of materials and come in a range of shapes (eg pipe, box, closed arch) and sizes. Installation of a closed culvert causes significant disruption to the river bed and, if not designed correctly, can cause a barrier to fish migration.



IV. Fords

Fords are river crossings built at the level of the river bed. They can be made of natural materials (natural bed and bank material maintained) or they can be reinforced with artificial material (bed and/or banks).

V. Pipe or cable crossings under a watercourse

If pipelines or cables have to cross river they should be buried underneath the river bed. They can also be spanned above a river using a span structure or span structure with in-stream supports.

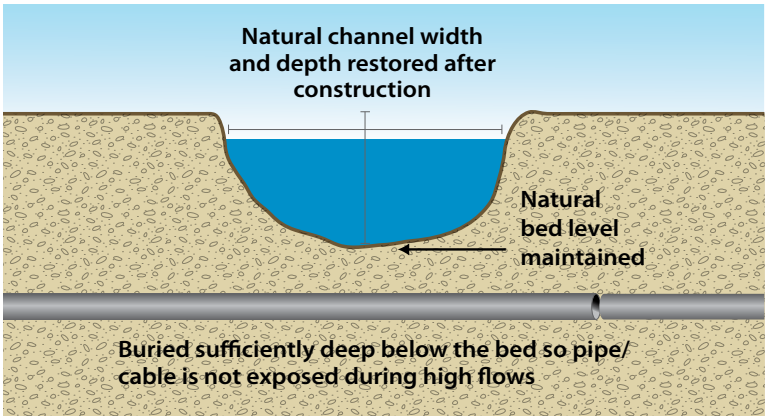
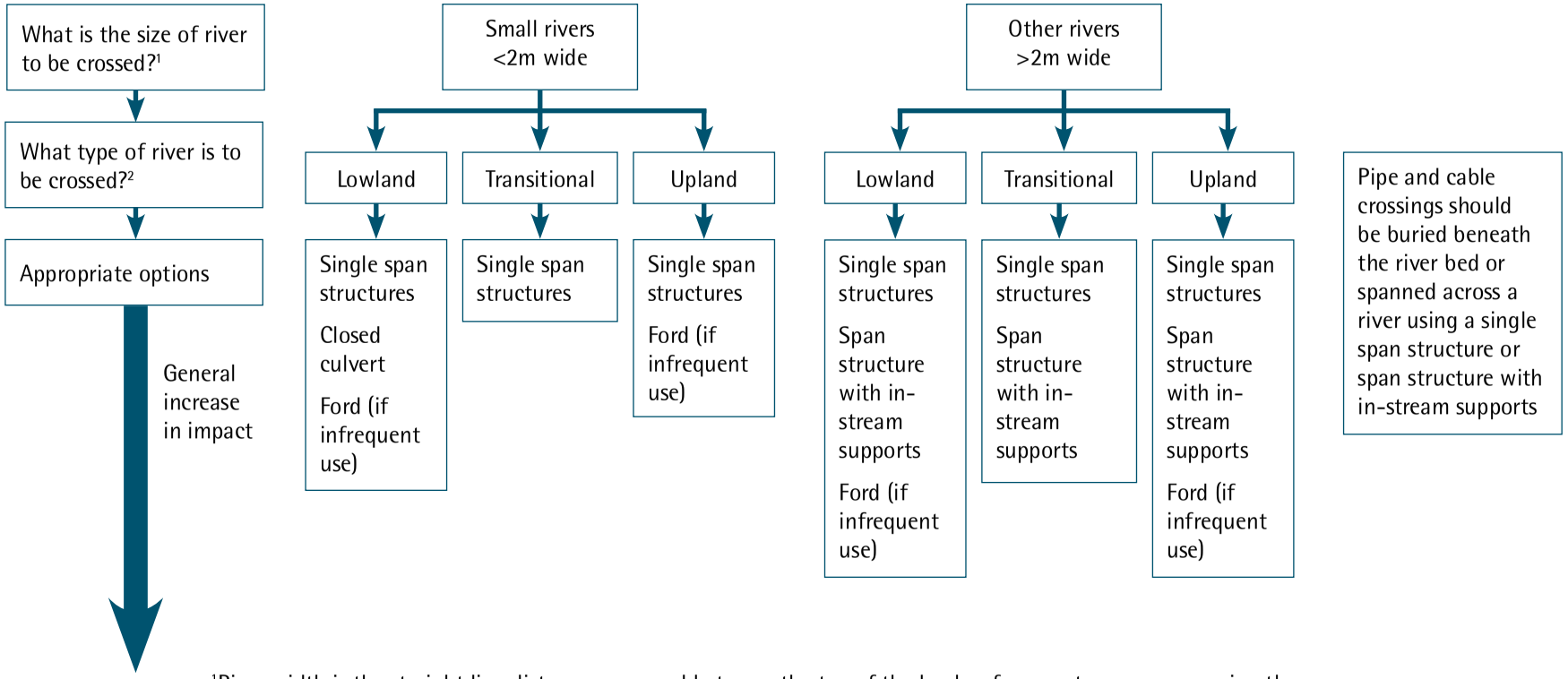


Figure 19: Identifying suitable options



[1]River width is the straight line distance measured between the toe of the banks of any watercourse, spanning the bed of the watercourse, including any exposed bars and vegetated islands.

[2]See Appendix 1 to help determine your river type.

5.3 Selecting the most suitable option

Table 2 provides some key points to help choose the most suitable option. Remember the option chosen should meet all the key site specific requirements identified (see Section 5.1).

Table 2: Considerations for different types of crossing

Type of crossing	Impact	Considerations
I. Single span structures	Least impact	• Preferred type of crossing. • Has minimal impact on the river system if designed appropriately. • May not be suitable for very wide rivers. • Bank habitat can be maintained under the crossing if abutments are set back. • Minimal disturbance to the river during the construction phase if abutments are set back. • Low risk of causing a barrier to fish and other wildlife if designed appropriately. • Lower risk of disrupting navigation or recreation if designed appropriately. • Pre-fabricated structures are generally cheaper than a site specific design. • Span structures can take longer to install and may be more expensive than other crossing types as specialist construction techniques may be required. • Can be used to carry pipe or cables across watercourses.
II. Span structures with in-stream supports	Moderate Impact	• Only appropriate where in-stream support is necessary to ensure structural integrity (ie very wide rivers). • Bank habitat can be maintained under the crossing if abutments are set back. • Low risk of causing a barrier to fish and other wildlife if designed appropriately. • Careful consideration required if river is used for navigation or recreation. • Higher risk of causing damage to the river during the construction phase (requires work in the river bed). • In-stream supports can significantly affect local channel hydraulics, increasing the risk of erosion and sediment deposition. • Higher risk of blockage by debris. • Span structures with in-stream supports can take longer to install and may be more expensive than other crossing types as specialist construction techniques may be required. • Can be used to carry pipe or cables across watercourses.

III. Closed culverts	High Impact	• Only suitable for small streams in lowland rivers. • Higher risk of causing a barrier to fish and other wildlife passage. • Higher risk of causing damage to the river during the construction phase (requires work in the river bed). • May not be suitable if river is used for navigation or recreation • Higher risk of blockage by debris. • Culverts are generally cheaper than span structures because the design and construction process is generally less complex than for spanning structures. • Not suitable for carrying pipelines or cables across rivers.
IV. Fords	High Impact	• Only suitable if infrequent crossing is expected. • Should not be used where there is a high risk of pollution eg at construction sites. • Higher risk of pollution from surface water runoff and increased bed and bank erosion. • Moderate risk of creating a barrier to fish passage. • Risk of damaging fish spawning habitat. • A low cost solution.
V. Pipeline or cables under watercourse	Minimal impact	• Pipelines or cables can be carried above rivers using a single span bridging structure or span structure with in-steam supports. • If they are not bridged over a river, they should be buried below the bed of the river and should not be laid in the channel. • Depending on the construction technique there may be a high risk of causing damage to the water environment during the construction phase. • Burying below the channel should be suitable for all types of river but may depend on ground conditions.

6 Design and implementation

Successful adoption of good practice requires selection of a suitable option followed by appropriate design and implementation. This section provides guidance on design and implementation. Many of the considerations highlighted in this good practice guide need to be taken into account in the early stages of the planning and design process. For larger scale projects, this includes consideration of the whole transport route as well as the crossing structures themselves.

6.1 Location and alignment

Key points

- Avoid crossings over active areas, particularly at meander bends.
- Avoid crossing rivers at depositional areas.
- Ensure the crossing is perpendicular to the river.

Selecting an appropriate location, or taking into account the characteristics of the location, is the first step in reducing:

- the impact of the river crossing on the water environment;
- the risk of damage to the crossing structure itself;
- future maintenance costs.

Channel migration/active zones

As stated in Section 2.5 the area within which a river channel is likely to move over a period of time is referred to as the channel migration zone. Failing to recognise this natural process may lead to the damage of habitats and damage to or loss of the crossing structure.

Locate crossings on straight/stable sections of the river (Figures 20 and 21). Avoid crossings over active areas, particularly on the outside of meander bends, because there is a high risk that the structure will be damaged or fail due to river migration or localised scour (Figure 22). Extensive maintenance works to stabilise the structure and river may then be required, which will increase costs. Trying to stabilise a naturally dynamic river will result in long term, potentially significant, maintenance issues and may cause further impacts such as increased erosion upstream or downstream.

Active channels can be found in a variety of settings and are often found in transitional type rivers (see Appendix 1 to help determine if your river is a transitional type). Indications of an active river include:

- signs of erosion especially on the outside of meander bends (Figure 22);
- depositions of unvegetated larger sediment sizes – gravel, pebble, cobble (Figure 23);
- steeper river gradients (0.1–3% and above).

It is difficult to predict how a river might migrate over time and there are many different ways in which a river may move. If there are concerns that the river to be crossed has the potential to migrate significantly over time then a suitably qualified geomorphologist should be consulted to assess the site to estimate rates of migration and suggest mitigation measures.

For information on suitable assessment techniques see:

Review of River Geomorphology Impact Assessment Tools and Post Project Monitoring Guidance for Engineering Activities (WAT-SG-30) available from the SEPA website at: www.sepa.org.uk/water/water_regulation/guidance/engineering.aspx

Figure 20: Good practice, locate crossings on stable sections of a river to avoid erosion. This is an example of a straight, stable section of river – note no evidence of active erosion.

Figure 21: Good practice, locate crossings on stable sections of a river to avoid erosion. This is an example of a straight, stable section of river – note no evidence of active erosion.

Figure 22: Poor practice, do not locate crossings on actively eroding areas. Indicators of an active river include bank erosion on the outside of meander bends.

Figure 23: Poor practice, do not locate crossings on actively eroding areas. Indicators of an active river include the presence of unvegetated sediment deposition.

Depositional areas

As stated in Section 2.3, rivers carry a significant amount of sediment as well as water.

Avoid crossing rivers at locations where sediment is depositing, as there is a risk that sediment will accumulate at the structure, reducing flow capacity and increasing flood risk. Any modifications to the channel could also lead to increased sediment deposition reducing flow capacity and increasing flood risk. This could lead to a need for regular dredging, which increases maintenance costs and damages the ecology of the river.

Depositional areas are widely found in lowland and transitional types of rivers (see Appendix 1 to determine your river type). Depositional areas are the result of various factors including valley gradient, geology and sediment supply.

In many rivers, deposition occurs where there is a reduction in valley gradient. If the slope is lower, the river has less energy and sediment is deposited. This may occur where relatively steep tributaries with high sediment loads join the main river to form large areas of deposition at river confluences (alluvial fans). Deposition also occurs downstream of areas that supply large volumes of sediment. Avoid such locations if possible. Indicators of depositional areas include:

- sediment depositions in rivers such as gravel bars and islands present (Figures 24 and 25);
- smaller sediment sizes of gravel, sand or silt;
- low river gradients or where the gradient changes quickly from high to low.

If it is necessary to cross a river in a depositional zone, ask a suitably qualified geomorphologist to assess the site and suggest mitigation measures.

For information on suitable assessment techniques see:

SEPA 2005 Review of River Geomorphology Impact Assessment Tools and Post Project Monitoring Guidance for Engineering Activities (WAT-SG-30) available from the SEPA website www.sepa.org.uk/water/water_regulation/guidance/engineering.aspx

Figure 24: Poor practice, do not locate crossings on depositional areas. Indicators of a depositional area include gravel islands.

Figure 25: Poor practice, do not locate crossings on depositional areas. Indicators of a depositional area include gravel bars.

Alignment

Crossings should be perpendicular to the river (Figures 26 and 27). This ensures that the crossing is as short as possible – reducing impact and, in some instances, cost. This also reduces the risk of localised scour at the structure.

Figure 26: Good practice, ensure the crossing is perpendicular to river.

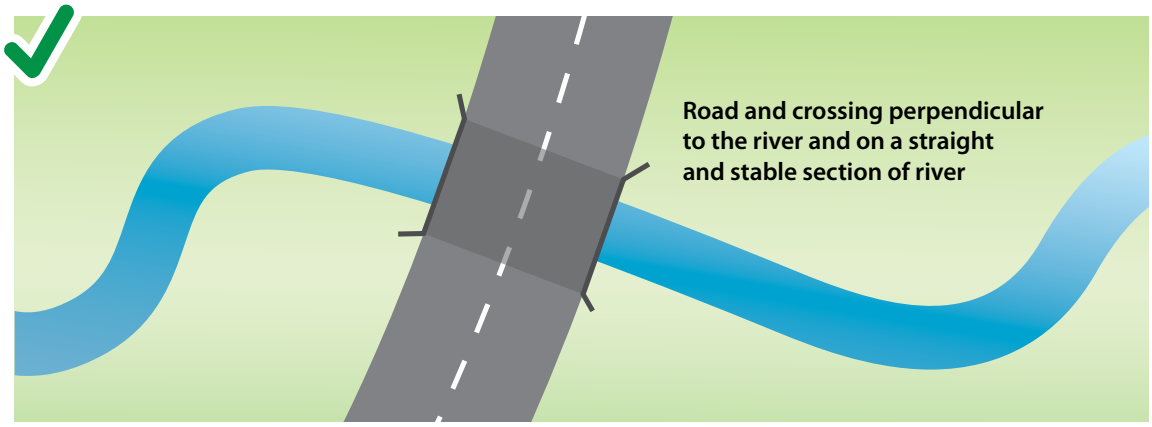
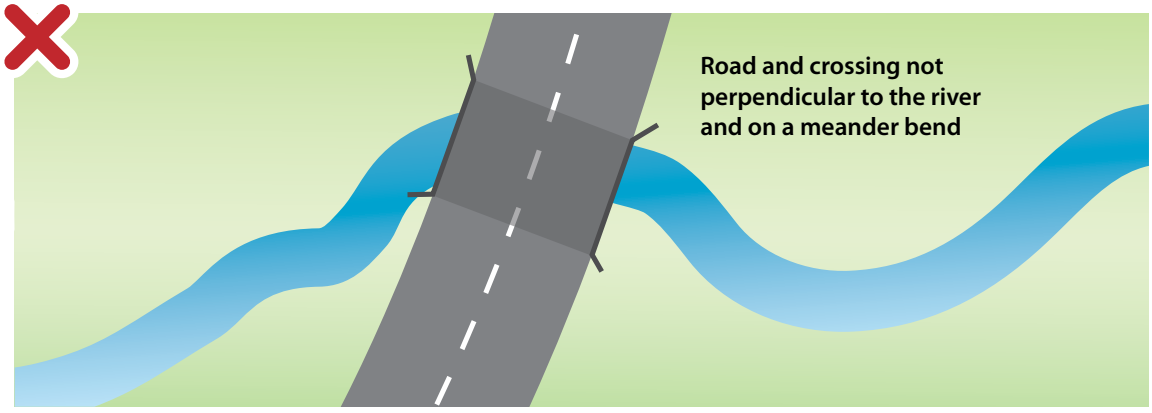


Figure 27: Poor practice, crossing not perpendicular to river and on a meander bend.



Buried pipe or cable crossings should also be perpendicular to the river (Figure 28). Do not use rivers as conduits for pipes or cables (Figure 29). This can increase the risk of the pipe or cable being damaged which may lead to pollution of the watercourse and may also increase bed and bank erosion.

Figure 28: Good practice, the pipe or cable should cross perpendicular to the river and should be buried below the river bed.

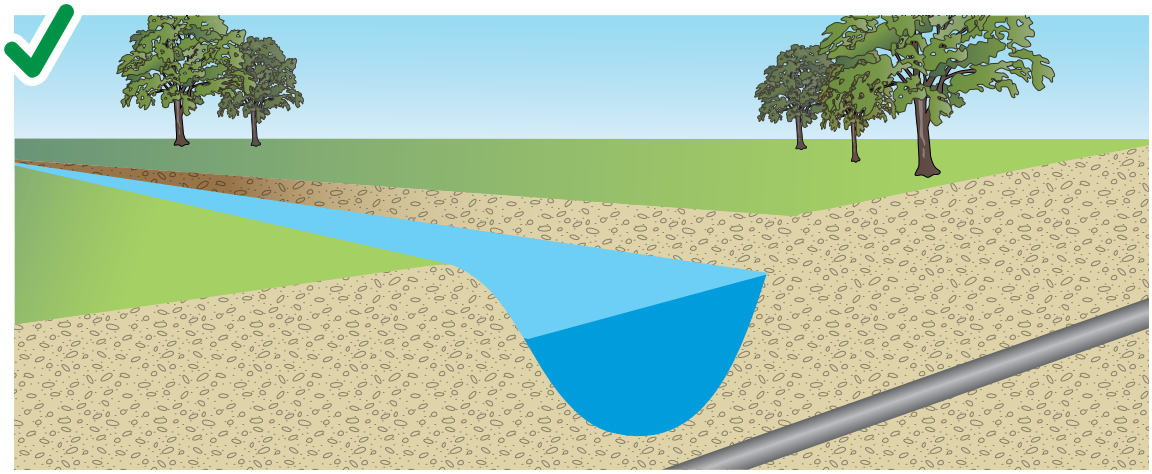
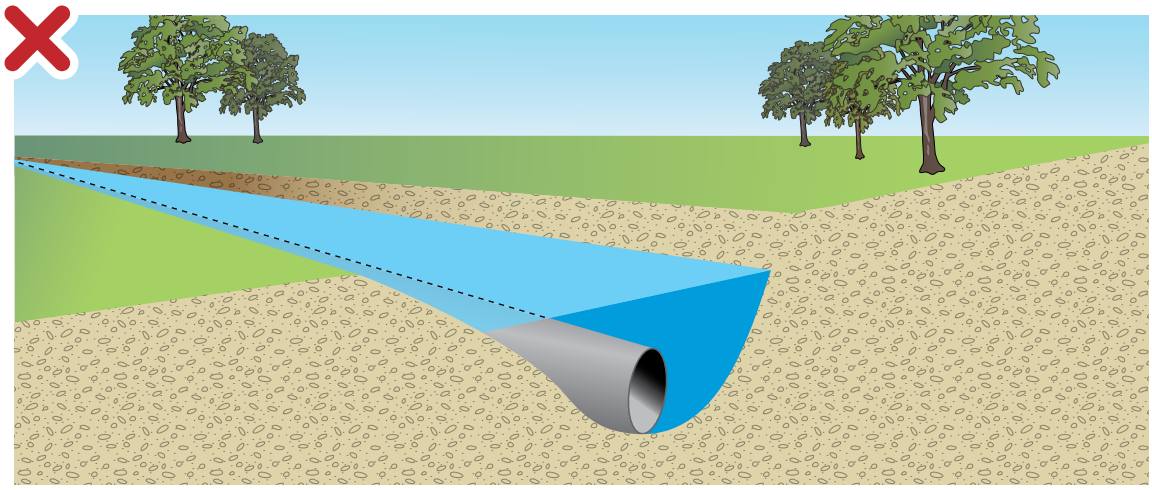


Figure 29: Poor practice, do not lay pipes or cables on the river bed or use rivers as conduits for pipes and cables.



If it is not possible to align the crossing perpendicular to the river then mitigation measures should be considered, including:

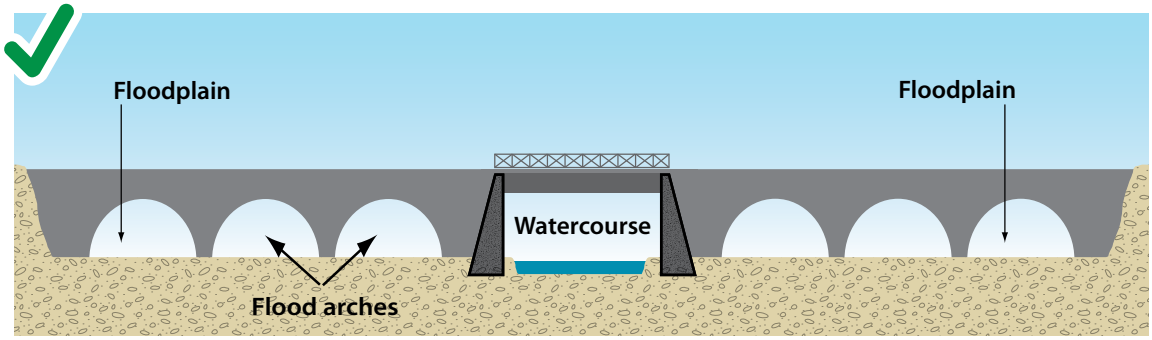
- design a structure that can cope with channel migration (eg larger single span, additional spans with piers or viaduct structure);
- realignment of the river should only be considered if other options are not possible. Careful consideration of the design of the new river channel is essential to ensure that it is geomorphically stable (ie the design does not result in increased erosion or deposition). If realignment of the watercourse is necessary then a suitably qualified geomorphologist should be consulted to ensure the new river channel is designed appropriately.

6.2 Crossing a floodplain

As stated in Section 2.5, floodplains are an important part of the river system. Viaducts (a road deck spanning between piers) should be used to cross floodplains rather than embankments (Figure 30). This option greatly reduces the impact on the floodplain, but can have cost implications.

Where embankments are unavoidable, 'normally dry culverts' in embankments can be used to connect the floodplain. There may be hydraulic design issues to overcome, which can result in reinforcement around the culverts to prevent scour and embankment failure during high flow events.

Figure 30: Good practice, viaducts should be used to cross floodplains.



6.3 Design of structure

Once the most suitable type of crossing has been selected implement the design details necessary to minimise the impact on the water environment. This section provides information on the design features that can help minimise the impact on the water environment.

Remember this document is not intended to be a technical design manual. It is important to recognise that any engineering works must be designed to suit site specific conditions. This document addresses the aspects of the water environment that should be considered when undertaking a project.

Good practice design: I and II single span structures and span structures with in-stream supports

The principles below should be followed for all types of single span structures and span structures with in-stream supports.

- Minimise the potential for localised bed and bank erosion (scour) or excessive sediment deposition at the crossing structure through careful consideration of the location and alignment as discussed in Section 6.1.
- Set abutments back from the river channel and banks to allow the continuation of the riparian corridor underneath the structure. This helps to minimise or prevent the need for bed and bank reinforcement, reduces the risk of creating a barrier to fish passage and allows mammal passage under the structure (see Figures 31, 32 and 33).
- Make the distance between the bridge abutments as wide as possible and maintain the bank habitat, maximising the riparian corridor and allowing the river some space to move.
- Ensure the natural channel width is maintained and provide mammal passage if bank habitat cannot be retained and abutments cannot be set back.
- Bury foundations (of abutments and in-stream piers) deep enough to minimise or prevent the need for bed or bank reinforcement or bridge weirs or aprons. This maintains the natural bed material and bed levels, protecting habitat and allowing fish passage (Figures 31 and 33). The foundations should be buried deep enough to allow for scour during high flows. A suitably qualified engineer or geomorpholgist should be consulted to advise on an appropriate depth.
- Design the structure including in-stream piers to facilitate the passage of woody debris.
- Consider requirements for bed and bank reinforcement only if the risk of erosion cannot reasonably be eliminated through the above measures.

Figure 31: Good practice, pre-cast span structure showing set back abutments and deep foundations

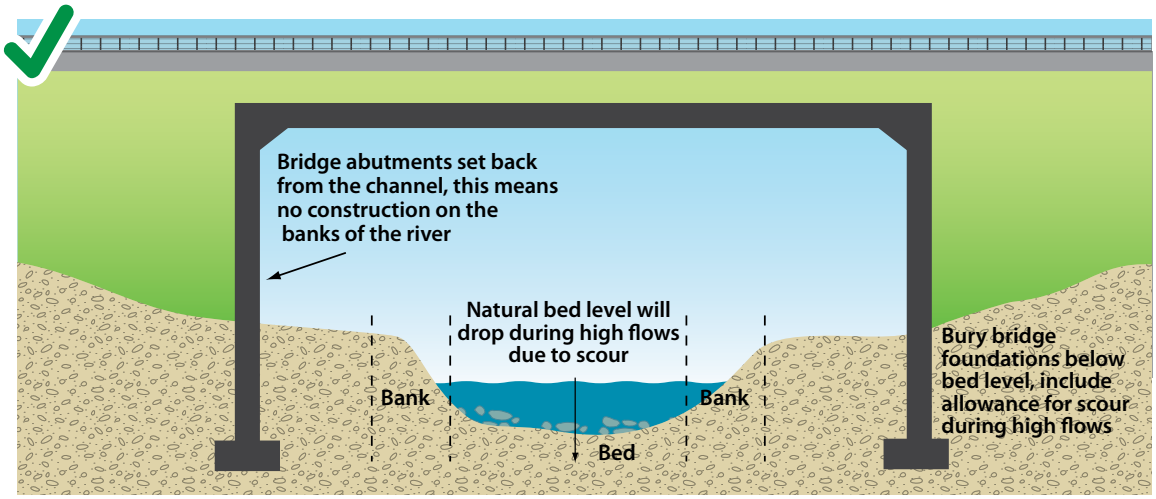
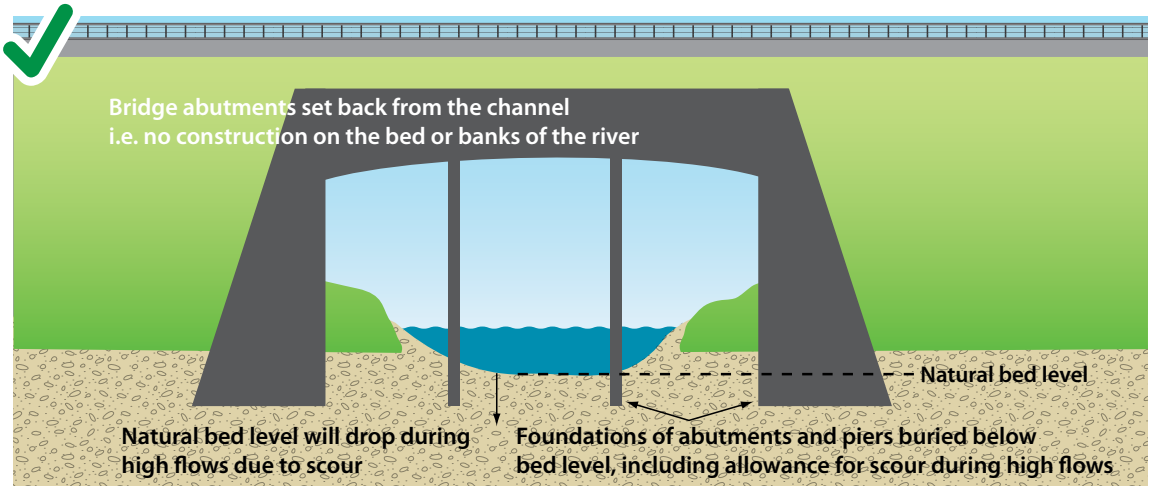


Figure 32: Good practice, span bridge showing set back abutments and bank habitat maintained through the structure allowing mammal passage and no risk to fish passage. Photograph courtesy of the Highland Council.

Figure 33: Good practice, bridge with piers showing set back abutments and deep foundations.



Piers increase the risk of large woody debris becoming trapped which in turn can increase localised flooding and put the structure at risk of failing. Passage of large woody debris through the structure should be considered, eg design piers to facilitate the passage of large woody debris by streamlining the upstream facing side (Figure 34).

Figure 34: Good practice, streamlined pier to facilitate passage of large woody debris.

Maintain natural channel width

Maintain the natural channel width if bank habitat cannot be retained under the bridge (Figure 35 and 36) (width of river measured between the toe of the banks see glossary). This will help ensure adequate water depth and velocity for fish passage. If the channel under the bridge is too wide this will increase the risk of creating slow and shallow flows. This can prevent fish from swimming through the bridge and may lead to sediment deposition, reducing the flow capacity at the structure which could increase flood risk. If the channel under the bridge is too narrow it may lead to faster flows that fish are unable to swim against and may increase erosion which could damage the structure. If necessary a two-stage channel can be created under the bridge to maintain adequate water depth in low flows.

Mammal passage

Provide mammal passage if bank habitat cannot be retained under the bridge. In general mammal passes should be designed with otters in mind, although if larger mammals such as badgers are present then larger passes may be required.

Passage can be provided by constructing a ledge under the bridge (Figure 35) or providing a tunnel adjacent to the bridge (Figure 36).

Minimum headroom of 60 cm should be provided. The width of the ledge or tunnel will depend on the length of the crossing (see SNH guidance) but should be a minimum of 60 cm for tunnels and 45–60 cm for ledges, but may need to be wider for larger mammals.

For information on the height of ledges and tunnels see the Scottish Natural Heritage guidance and the Design Manual for Roads and Bridges.

Both tunnels and ledges which are above the natural bank height should have access ramps leading up to them from ground level. Fencing may be required in order to guide mammals to the crossing areas if they are to be effective (see Scottish Natural Heritage guidance for further information).

For further information see:

- Scottish Natural Heritage Guidance on mitigation for otters available from: www.snh.org.uk/publications/on-line/wildlife/otters/mitigation.asp
- Design Manual for Roads and Bridges, Volume 10 Section 4 Nature Conservation. Available from: www.standardsforhighways.co.uk/dmrb/index.htm

Figure 35: Good practice, natural channel width maintained and mammal passage provided by a ledge where bank habitat cannot be retained.

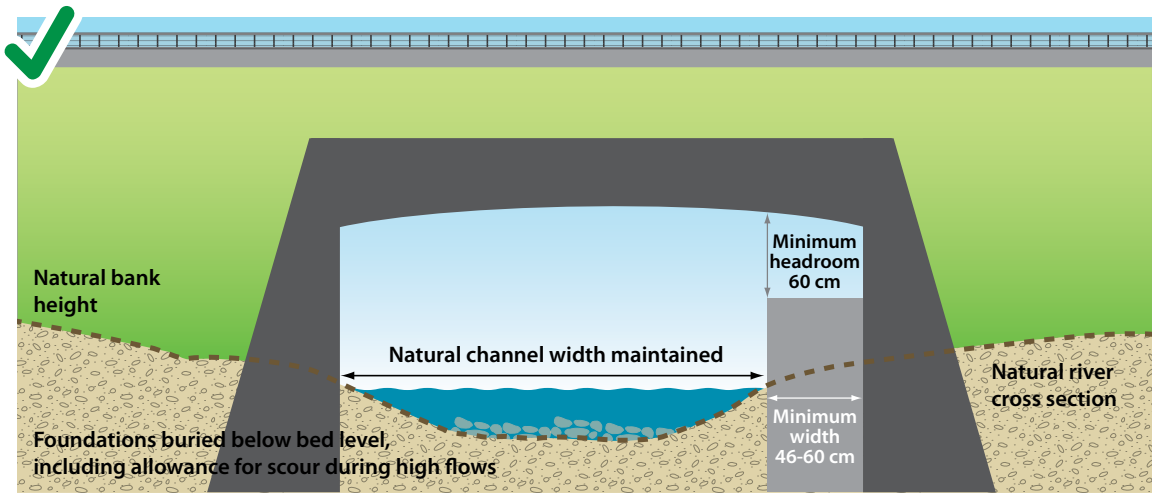
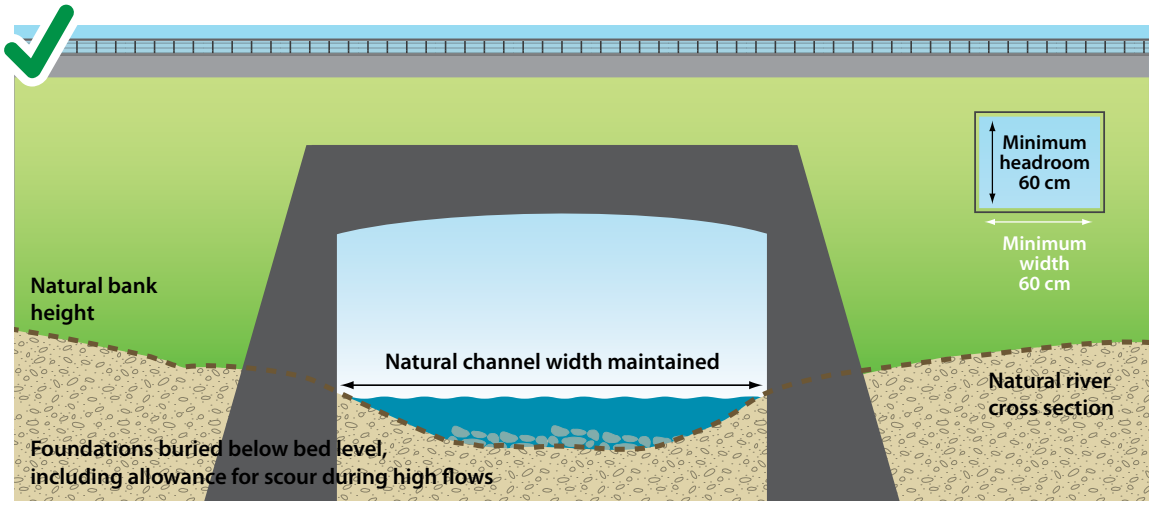


Figure 36: Good practice, natural channel width maintained and mammal passage provided by a tunnel where bank habitat cannot be retained.



Other mitigation

Where a crossing affects a longer length of river, consider light penetration and soil moisture deficit. Lack of light and moisture can prevent the establishment of vegetation under the crossing and weaken the banks (Figure 37). This can result in increased erosion under the crossing and potential exposure of the structure foundations. This may result in the requirement for bank reinforcement however the natural bed should still be maintained.

In general the need for bank reinforcement should be minimised through careful consideration of the location and alignment as discussed in Section 6.1 and following the guidance above. However where bank reinforcement is necessary, 'softer' measures should be considered in lower energy lowland environments (see Appendix 1). 'Harder' techniques may be needed if the crossing is located in a higher energy upland or transitional environment (see Appendix 1) where there is high risk of erosion. For more information on bank reinforcement please see the SEPA good practice guide: *Bank Erosion Management* www.sepa.org.uk/water/water_publications.aspx

Bed reinforcement should not be placed under a span structure. However if bed reinforcement is deemed necessary it should be buried below the natural bed level, deep enough to allow for scour during high flows. This will allow the natural bed level and bed material to be maintained.

Figure 37: Longer crossings may lack light and moisture which can prevent the establishment of vegetation under the crossing and weaken the banks. This may result in the requirement for bank reinforcement however the natural bed should still be maintained.

Good practice design: III closed culverts

Poorly designed closed culverts have a high risk of creating a barrier to fish passage and mammal movement throughout the river corridor.

Following the principles below for all types of closed culverts will reduce the risk of creating a barrier to fish and mammals.

- Minimise the potential for localised bed and bank erosion (scour) or excessive sediment deposition at the crossing structure through careful consideration of the location and alignment as discussed in Section 6.1.
- Design culverts so that they are passable to all fish species, even if some fish species are not present as the culvert could affect future measures to improve passage in the catchment.
- Maintain natural river bed level and slope, bury the culvert invert below the natural bed level.
- Maintain natural channel width.
- Ensure there are no physical obstructions to fish passage. Avoid 'perching' –when there is a drop at the culvert outlet to the river bed (ie at the downstream end). This can happen due to poor initial design or to subsequent erosion of the river bed downstream, if poorly designed.
- Ensure adequate water depth (maintaining natural bed level, slope and channel width contributes to this).
- Ensure appropriate water velocity (maintaining natural bed level, slope and channel width contributes to this).
- Ensure adequate fish resting places (pools or slower water) above and below the structure especially for longer culverts. Longer culverts may also require resting places within the structure.
- Provide mammal passage.
- Specific fish passage requirements will depend on the species of fish. For more detailed information on this see the Scottish Government's *River Crossings and Migratory Fish: Design Guidance* at: (www.scotland.gov.uk/consultations/transport/rcmf-00.asp).

Further information on culvert design can be found in CIRIA's Culvert design and operation guide at: www.ciria.org

Figure 38: Good practice, culvert maintaining natural channel width, bed level and slope ensuring adequate water depth and water velocity for fish passage.

Maintain natural bed level and slope

Bury the culvert invert below the natural bed level. This allows the natural bed level, slope and bed material to be maintained (Figures 39 and 40). The invert should be buried sufficiently deep to ensure it is not exposed during high flows. The culvert should be sized to carry both flood flows and river bed sediment.

Maintaining the natural bed level and slope will help ensure adequate water velocity (and water depth) for fish passage. It will ensure the slope of the culvert is not too steep, increasing risk of fast flows, erosion and 'perching', or too shallow, increasing the risk of deposition which may reduce flow capacity, and increasing flood risk.

The values below can be used as a general guideline as to how deep a culvert invert should be buried below the natural bed level (Figure 40). However it some circumstances it may need to be deeper to suit site specific conditions and a suitably qualified engineer or geomorphologist should be consulted. For further information see CIRIA C689 Culvert design and operation guide.

For culverts less than 1.2 m diameter or height (internal height) the invert should be buried at least 15 cm below the natural bed level.

For culverts 1.2 - 1.8 m diameter or height (internal height) the invert should be buried at least 20 cm below the natural bed level.

For culverts greater than 1.8 m diameter or height (internal height) the invert should be buried at least 30 cm below the natural bed level.

Figure 39: Good practice, longitudinal section of a culvert showing invert buried below bed level allowing the natural bed level, slope and material to be maintained.

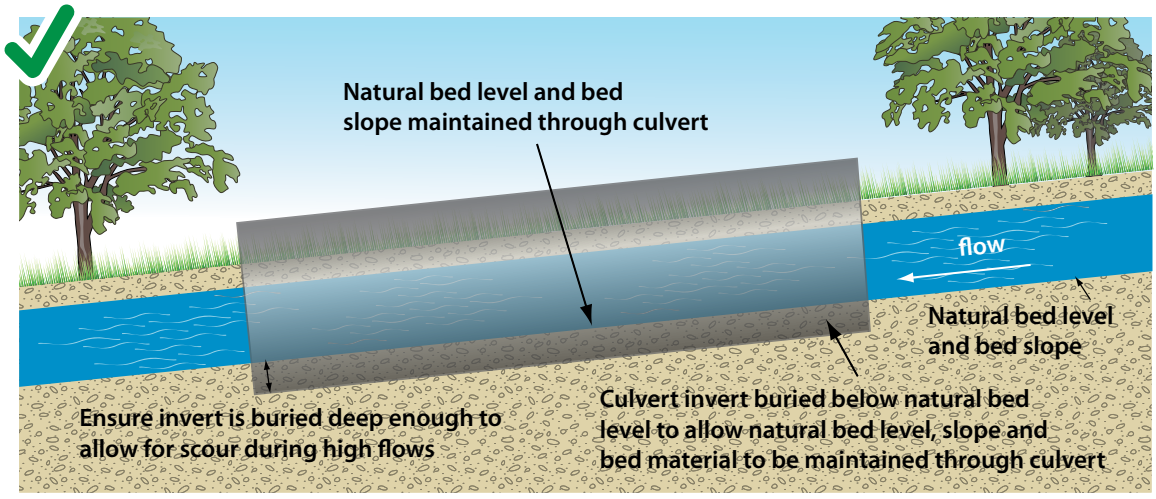
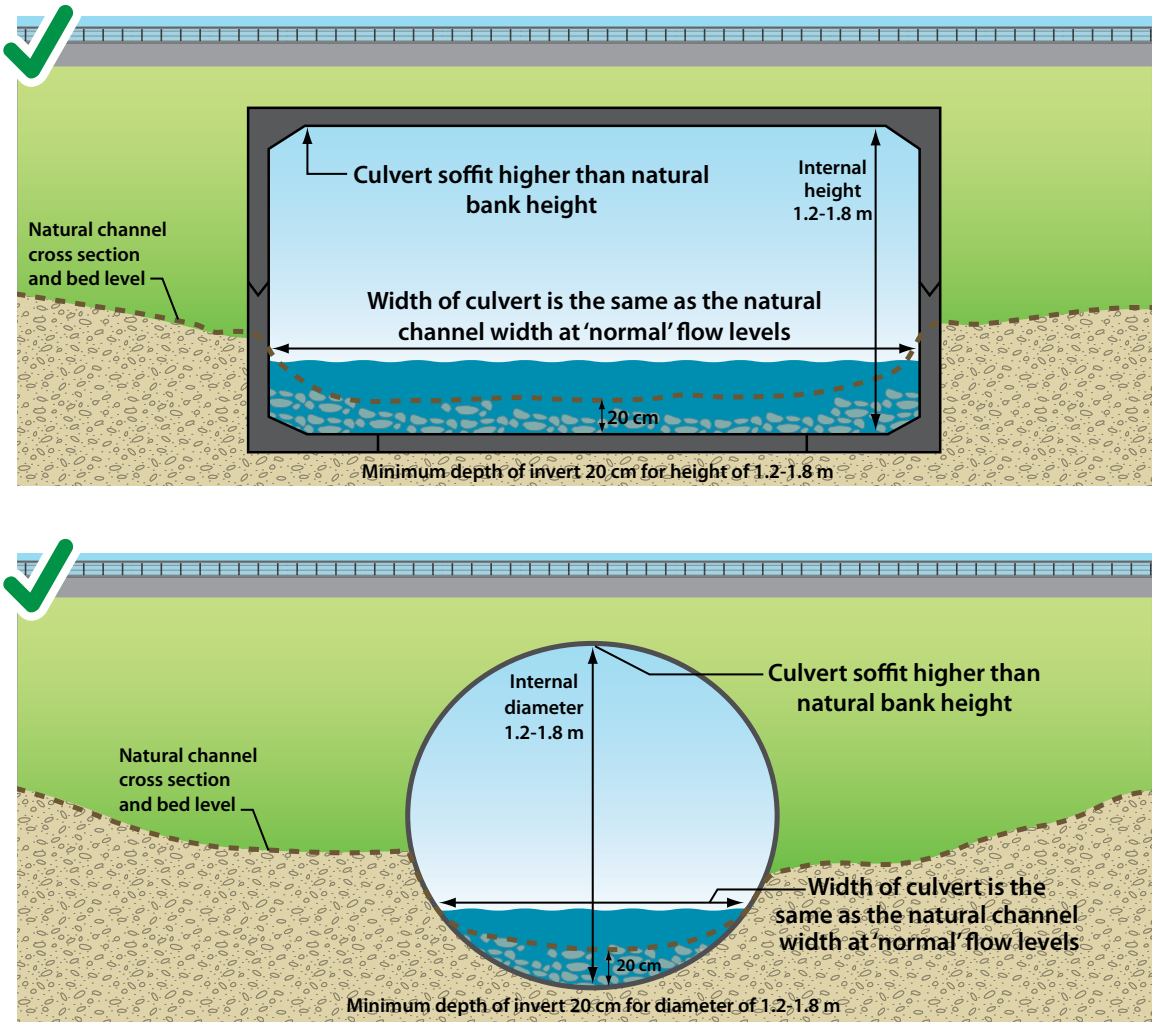


Figure 40: Good practice, culverts showing invert buried below bed level allowing the natural bed level, slope and material to be maintained. Culvert also maintains natural channel width.



Maintain natural channel width

The culvert should maintain the natural channel width (Figures 38 and 40) (width of river measured between the toe of the banks see glossary).

Maintaining the natural channel width will help ensure adequate water depth and velocity for fish passage. Culverts that are too wide will increase the risk of creating slow and shallow flows. This can prevent fish from swimming up or down the culvert and may lead to sediment deposition, reducing the flow capacity at the structure which could increase flood risk. If the culvert is too narrow it may lead to faster flows that fish are unable to swim against and may increase erosion and could lead to a drop forming downstream, creating a barrier to fish passage. Water velocities and depths in the culvert under different flow conditions can be checked to ensure they are adequate for fish passage. For more information on this see the Scottish Government's *River Crossings and Migratory Fish: Design Guidance* at: (www.scotland.gov.uk/consultations/transport/rcmf-00.asp).

Use larger single culverts (Figure 41) rather than multiple smaller culverts or pipes as fish prefer larger barrel sizes and can be discouraged from entering smaller pipes. Smaller diameters also increase the speed of water during high flows that fish are unable to swim against (Figure 42). Multiple smaller pipes may trap sediment that could increase flood risk and may stop river sediments moving downstream.

Twin barrels should only be used where a single span structure or single barrel culvert is not possible (Figure 43). If a twin barrel is used the natural channel width should still be maintained.

Figure 41: Good practice, use a single large culvert for crossings that maintains the natural channel width.

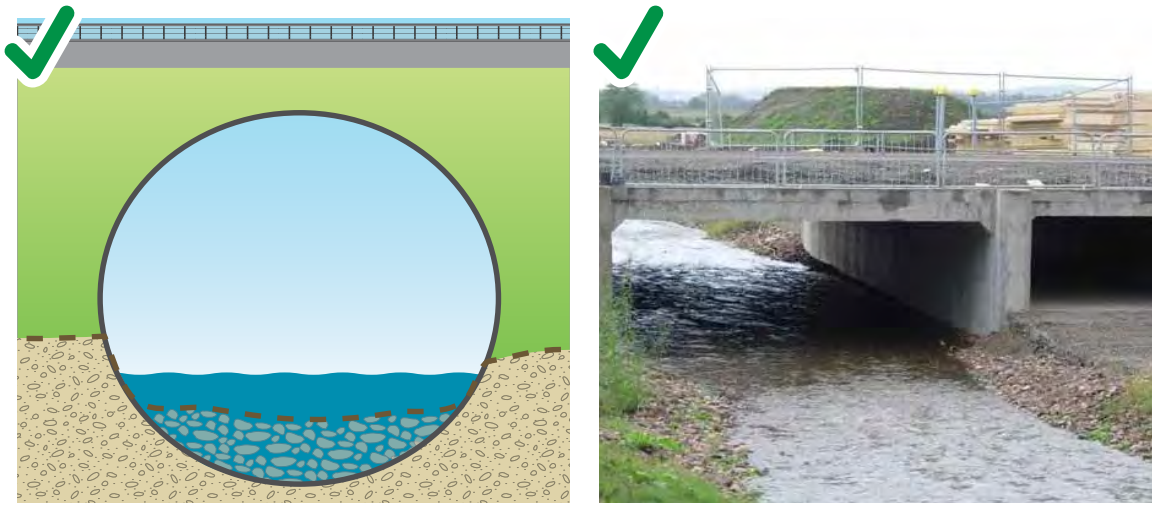


Figure 42: Poor practice, do not use smaller multiple pipes; they can create a barrier to fish passage.

Figure 43: Twin barrel culvert that maintains natural channel width and invert buried below the natural bed level. Should only be used where single span structure or single barrel culvert is not possible.

Mammal passage

Mammal passage should be provided. In general mammal passes should be designed with otters in mind, although if larger mammals such as badgers are present then larger passes may be required.

Passage can be provided by constructing a ledge under the culvert (Figure 44) or providing a tunnel adjacent to the culvert (Figure 45).

Minimum headroom of 60 cm should be provided. The width of the ledge or tunnel will depend on the length of the crossing (see SNH guidance) but should be a minimum of 60 cm for tunnels and 45–60 cm for ledges, but may need to be wider for larger mammals.

For information on the height of ledges and tunnels see the Scottish Natural Heritage guidance and the Design Manual for Roads and Bridges.

Both tunnels and ledges which are above the natural bank height should have access ramps leading up to them from ground level. Fencing may be required in order to guide mammals to the crossing areas if they are to be effective (see Scottish Natural Heritage Guidance for further information).

For further information see:

- Scottish Natural Heritage Guidance on mitigation for otters available from: www.snh.org.uk/publications/on-line/wildlife/otters/mitigation.asp
- *Design Manual for Roads and Bridges*, Volume 10 Section 4 Nature Conservation. Available from: www.standardsforhighways.co.uk/dmrb/index.htm

Figure 44: Good practice, mammal passage provided by constructing a ledge in the culvert.

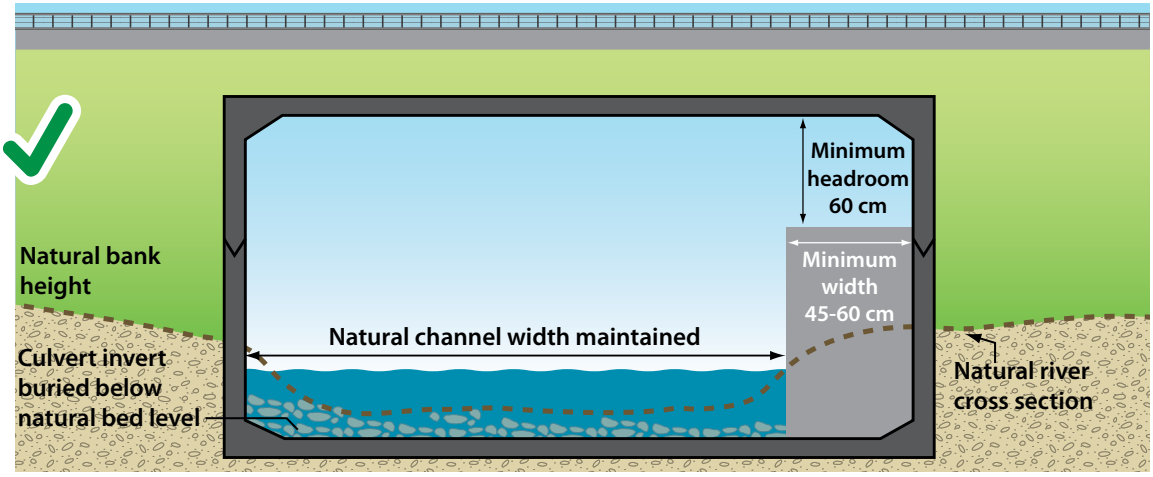
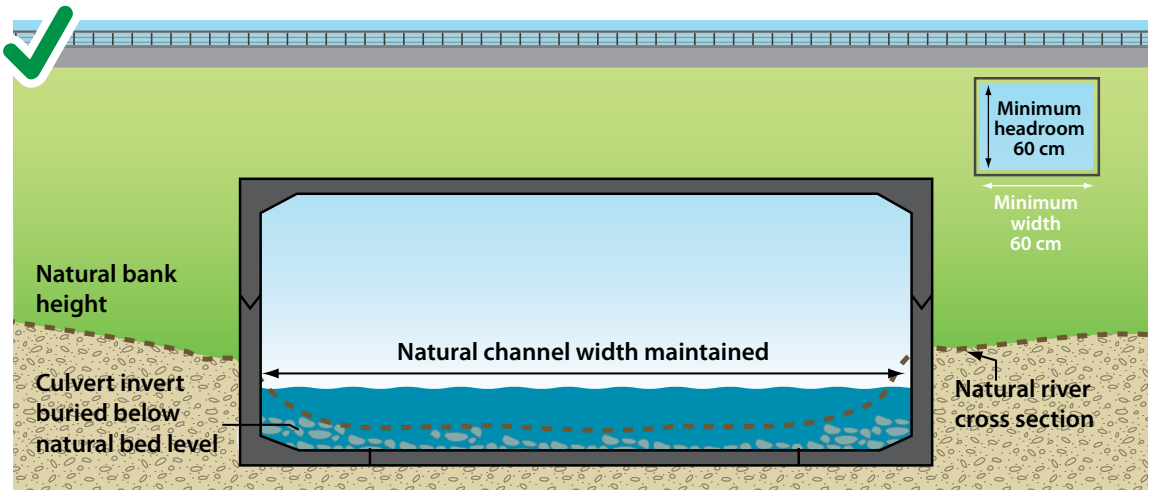


Figure 45: Good practice, mammal passage provided by constructing an additional tunnel.



Other mitigation measures

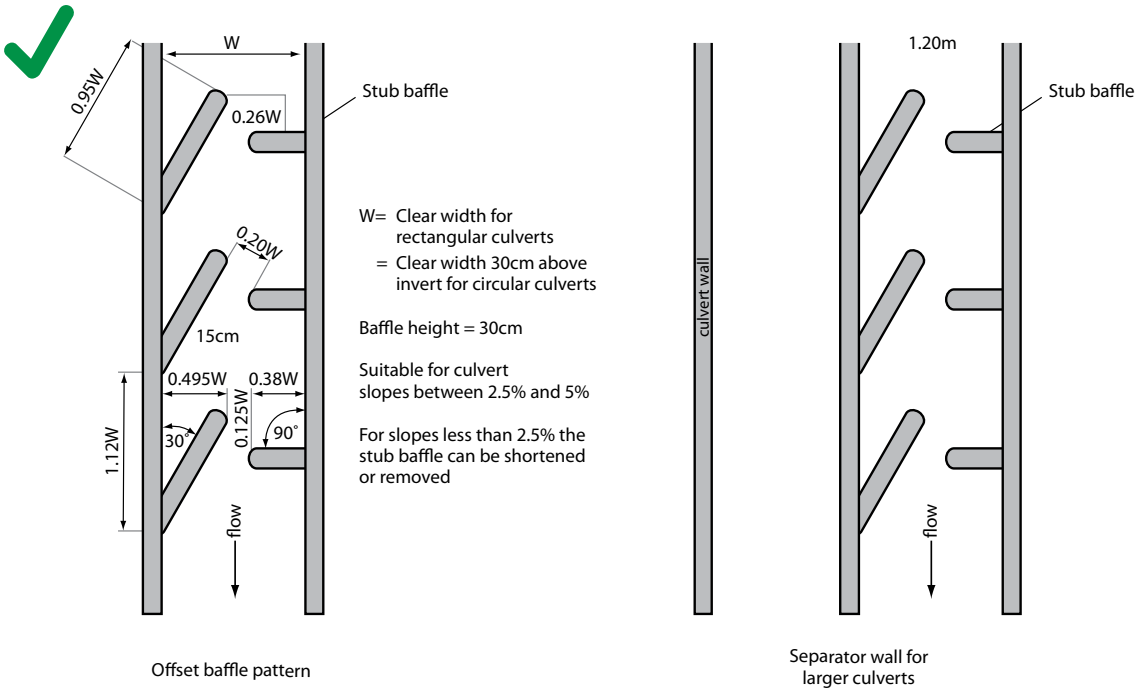
The culvert soffit (top) should be higher than the natural bank height (Figure 38 and 40).

For longer culverts or culverts where depth or velocity is an issue, resting places within the culvert may be required. Baffles in a culvert can provide resting areas for fish (Figure 46). Further information on the design of baffles can be found in the Scottish Government's *River Crossings and Migratory Fish: Design Guidance* (www.scotland.gov.uk/consultations/transport/rcmf-00.asp).

Where culverts are required, identify practical enhancement measures along the affected reach or elsewhere on-site in order to offset some of the impacts caused by the culvert. For example:

- re-establish riparian vegetation where it has been lost;
- remove existing unnecessary man-made structures.

Figure 46: Good practice, longer culverts may require baffles to aide fish passage. Illustration modified from Scottish Government, River Crossings and Migratory Fish: Design Guidance.



Offset baffle pattern

Separator wall for larger culverts

An assessment should be carried out to determine if trash screens are necessary. If trash screens are required bar spacing should be as large as possible to only trap larger debris that risks blocking the culvert. Smaller bar spacing could act as a barrier to fish passage, at least 230 mm spacing between each bar should be ensured. Smaller bar spacing can also trap a lot of smaller debris that can create a barrier to fish passage and may in itself cause some 'blocking' of the culvert and increase the risk of flooding if not cleared regularly (Figure 47).

For further information, see:

- CIRIA 2010 *Culvert design and operation guide* www.ciria.org;
- Environment Agency 2009 *Trash and security screen guide* http://publications.environment-agency.gov.uk/pdf/SCHO1109BRHF-e-e.pdf

Figure 47: Trash screen bar spacing should be as large as possible (see photo on left). Smaller bar spacing can create a barrier to fish passage (see photo on right).

Minimise the potential for localised erosion (scour) around the culvert through careful consideration of the location and alignment as discussed in Section 6.1 and following the guidance above.

If bed reinforcement downstream of the culvert is deemed necessary, lay it below the natural river bed level so that the natural bed level can be maintained.

Where bank reinforcement is necessary, consider 'softer' measures in lower energy, lowland environments (see Appendix 1). 'Harder' techniques may be required if the culvert is located in a higher energy upland or transitional environment where there is high risk of erosion. For further information see the SEPA good practice guide: *Bank Erosion Management* at: www.sepa.org.uk/water/water_publications.aspx

Good practice design: IV fords

Fords have the potential to cause pollution through erosion and the release of fine sediments. They can also create a barrier to fish passage where erosion leads to widening of the river and lowering of water depth (Figure 48), or where bed reinforcement leads to erosion downstream and a drop forms and the ford becomes 'perched' (Figure 49 and 51). It is important to ensure that an adequate water depth is maintained to allow fish passage.

The principles below should be followed to reduce the impact of fords:

- Only use a ford when infrequent vehicle use is planned. Fords should not be used between fish spawning and fish emergence times. Key fish species to consider include salmon and trout (normally October – May) and Lamprey species (normally March – July). However these times can vary and you should contact your local district salmon fishery board if you are unsure what fish species are present and what times should be avoided.
- Do not use fords where there is a high risk of pollution eg at construction sites.
- Ensure designated sites (SSSIs, SACs, SPAs) or protected species (eg fresh water pearl mussels) are not harmed. Contact SNH for further information www.snh.org.uk
- Avoid constructing fords where they may damage other important habitats such as fish spawning areas (eg riffles) and areas of aquatic plants.
- Minimise erosion and maintain natural channel width. Bank reinforcement may be required to minimise erosion (Figure 50). This will reduce the risk of sediment pollution and prevent the river from widening, helping to maintain adequate water depth for fish passage. For further information see SEPA's good practice guide on *Bank Erosion Management* at: www.sepa.org.uk/water/water_publications.aspx
- Bed reinforcement should be avoided; if erosion is excessive then provision of a span structure or culvert should be considered. If bed reinforcement is constructed it is likely that a drop will form between the reinforcement and the downstream river bed which can cause a barrier to fish passage (Figure 49 and 51).

Figure 48: Poor practice, ford crossing has lead to bank erosion and over-widened river. This leads to fine sediment pollution and lower water depths which are too shallow for fish to swim through, creating a barrier to fish passage.

Figure 49: Poor practice, bed reinforcement can lead to erosion downstream during high flows, this leads to a drop forming that can create a barrier to fish passage.

Figure 50: Good practice, natural bed maintained and bank reinforcement constructed to minimise erosion, sediment pollution and to maintain the natural channel width and depth to ensure adequate water depth for fish passage.

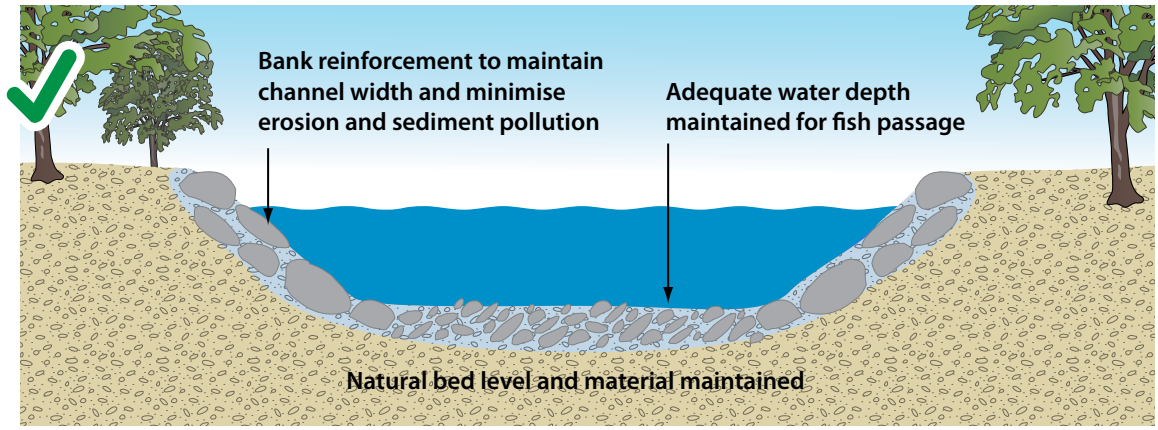


Figure 51: Poor practice, this is not a ford! Fords should not be above the river bed level and multiple pipes should not be used. This creates a barrier to fish passage and can prevent sediment being transported downstream. Raising the ford above bed level increases the risk of bed erosion downstream during high flows this can lead to a drop forming which creates further problems for fish passage and may lead to the need for further engineering.

Good practice design: V pipelines and cables buried below the river bed

If pipelines or cables are to be carried over a watercourse then the guidance for span structures should be followed. Where pipelines or cables are not carried over a watercourse by a single span structure or span structure with in-stream supports, they should be buried below the natural bed level of the watercourse.

The principles below should be followed to reduce the impact of pipeline and cable crossings:

- Remember location and alignment in section 6.1, ensure the pipe crossing is perpendicular to the river and do not use rivers as conduits for pipes or cables.
- Maintain natural bed level and bed material. Bury the pipeline or cable below the natural bed level to allow the natural bed level to be maintained (Figure 52). It should be buried deep enough so that it is not exposed during high flows.
- Do not lay the pipeline or cable on the river bed or in the channel or where it could obstruct high flows (Figures 53, 54 and 55). This increases the risk of the pipeline or cable being damaged and erosion of the bed and banks of the river. It may also increase flood risk.
- Minimise risk of pollution when laying pipe or cable below the river bed. Careful consideration should be given to the technique used to bury the pipe below the bed of the river. Boring underneath the river has the least impact as it does not affect the bed and banks if proper care is taken. If laying the pipe of cable in a trench then the area to be crossed should be isolated and kept dry. For further information see SEPA, 2007 good practice guide: *Construction Methods* www.sepa.org.uk/water/water_publications.aspx
- After construction restore the natural width, depth and bed material of the river and re-establish the banks with native riparian vegetation (Figure 53). If necessary bed material should be stored during construction and replaced. For further information see SEPA 2009 good practice guide: Riparian vegetation management available from www.sepa.org.uk/water/water_publications.aspx

Figure 52: Good practice, pipeline or cable buried below the river bed deep enough to ensure it is not exposed due to scour during high flows.

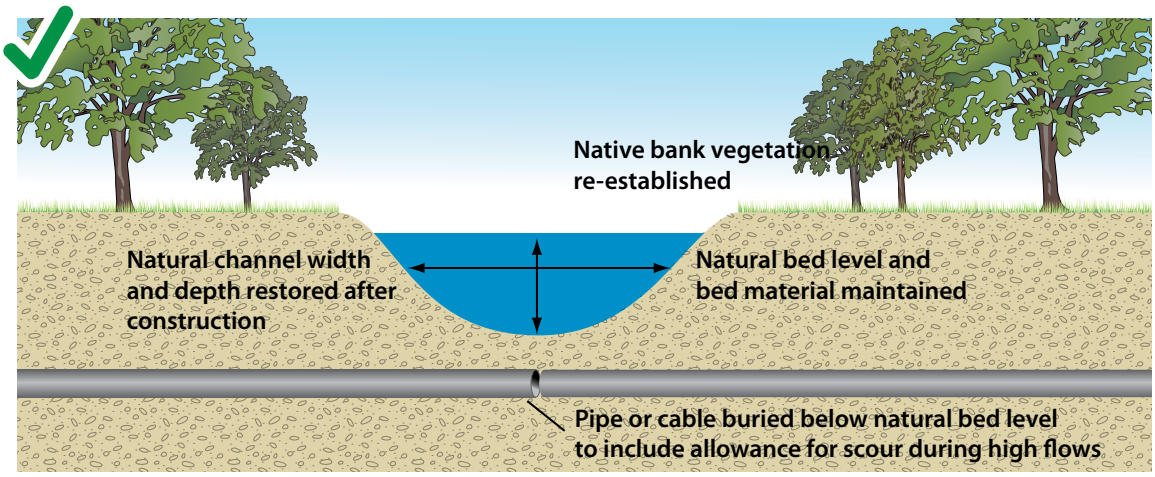


Figure 53: Poor practice, pipeline or cable laid on the river bed. Can cause scour around the structure and pipe is at risk of damage during high flows.

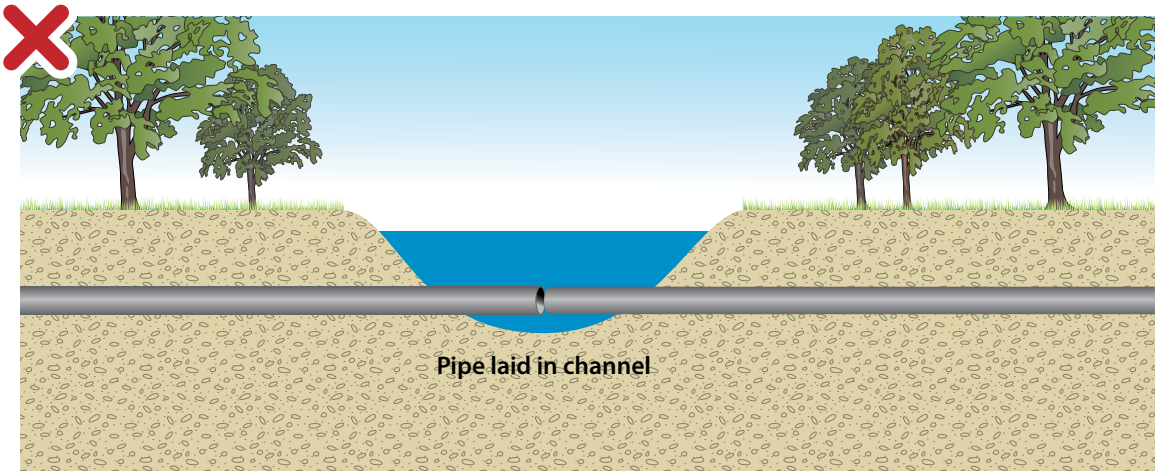


Figure 54: Poor practice, pipeline laid on the river bed. Can cause erosion of the bed and banks and scour around the structure which may damage the pipe during high flows.

Figure 55: Poor practice, pipeline laid in the river channel. Can cause scour around the structure and pipe is at risk of damage during high flows.

6.4 Maintenance of existing structures

The general design principles in Section 6 should be followed when maintaining existing structures.

If erosion of the bed and banks at a structure is exposing bridge foundations or leading to a drop forming at a bridge or culvert, the cause of the erosion should be identified and if possible addressed to ensure no further erosion takes place.

Erosion may be caused during high flows due to scour around the structure but it may also be due to erosion that has been triggered elsewhere in the river that has propagated upstream or downstream. For example 'knick points' can be created in river beds and during high flows the knick point can move upstream. This can result in significant bank erosion and bed incision (erosion and lowering of bed level), which can damage crossing structures. If bed incision is occurring then a suitably qualified geomorphologist should be consulted to help identify the cause and determine sustainable solutions.

If the foundations of bridge abutments or piers are being exposed due to scour around the structure then you should consider making the foundations deeper, new bed reinforcement should be avoided.

If bed reinforcement needs maintained or replaced then consideration should be given to removing the bed reinforcement and modifying the foundations so that bed reinforcement is not required eg consider making the foundations deeper. If this is not possible then replace bed reinforcement with new bed reinforcement buried below the natural bed level, deep enough to allow for scour during high flows. This allows the natural bed level and material to be maintained.

If bridge or culvert inverts are at bed level and a drop has formed due to scour around the structure then you should consider replacing the crossing with a span structure allowing a natural bed or a structure with a buried invert below bed level. If this is not feasible then where possible the invert should be replaced below bed level so that the natural bed level and material can be maintained.

If crossings are posing a barrier to fish passage then you should consider replacing the crossing with a structure that allows fish passage. If this is not feasible then you should consider modifying the structure to allow fish passage (eg baffles can be constructed in a culvert) or construct a fish pass. A suitably qualified ecologist should be consulted to ensure that any modification or fish pass is effective in providing fish passage.

6.5 Construction phase

An important part of good practice is to ensure that all practical steps are taken during the construction phase to minimise damage to important habitats and species and reduce the risk of pollution.

Separate guidance is available from SEPA on construction methods, including guidance on temporary crossings for construction (see below for details). However the following key points should be considered.

- Identify any sites that have been designated for nature conservation (eg SSSI, SAC, SPA) and ensure the conservation requirements are met (contact Scottish Natural Heritage for further information www.snh.org.uk).
- Identify any protected species (eg fresh water pearl mussels) and ensure they are not harmed or disturbed (contact Scottish Natural Heritage for further information).
- Timing – If there is disturbance to the river bed then work should not be carried out during fish spawning times and fish emergence times. Key fish species to consider include salmon and trout (normally October–May) and Lamprey species (normally March–July). However these times can vary and you should contact the local district salmon fishery board (www.asfb.org.uk or local fisheries trust www.rafts.org.uk) if you are unsure what fish species are present and what times should be avoided.
- If construction requires working in the bed of the river then the works area should be isolated and kept dry (see Figure 56).
- If required, store the natural river bed material during the construction phase and keep it clean. When construction is complete use the stored bed material to restore the river bed.
- Restore any affected banks by re-establishing native riparian vegetation.

Figure 56: Good practice, works area has been isolated and kept dry by a temporary diversion (left) to allow installation of a culvert (right) that requires working in the river bed.

For further information, see:

- CIRIA *Control of Water Pollution from Linear Construction Projects* www.ciria.org
- SEPA good practice guide: *Construction Methods* www.sepa.org.uk/water/water_publications.aspx
- Pollution Prevention Guidelines (PPG) www.sepa.org.uk/about_us/publications/guidance/ppgs.aspx
  Specifically:
  PPG 1 General guide to the prevention of pollution
  PPG 5 Works and maintenance in or near water
  PPG 6 Working at construction and demolition sites

7 Sources of further information

7.1 Publications

Culvert design and operation guide
CIRIA (C689)
www.ciria.org

Manual on Scour at Bridges and Other Hydraulic Structures
CIRIA
www.ciria.org

Control of Water Pollution from Linear Construction Projects. Technical guidance
CIRIA (C648)
www.ciria.org

Trash and security screen guide 2009
Environment Agency
http://publications.environment-agency.gov.uk/pdf/SCHO1109BRHF-e-e.pdf

Design Manual for Roads and Bridges
Volume 4 Section 2 Design of outfall and culvert details
Volume 10 Section 4 Nature conservation advice in relation to otters
Highways Agency
www.standardsforhighways.co.uk/dmrb/index.htm

Manual of River Restoration Techniques
River Restoration Centre
www.therrc.co.uk/manual.php

River Crossings and Migratory Fish: Design Guidance
Scottish Government
www.scotland.gov.uk/consultations/transport/rcmf-00.asp

Good practice guide: Bank Erosion Management
SEPA
www.sepa.org.uk/water/water_publications.aspx

Good practice guide: Construction Methods
SEPA
www.sepa.org.uk/water/water_publications.aspx

Good practice guide: Sediment Management
SEPA
www.sepa.org.uk/water/water_publications.aspx

Special Requirements for Civil Engineering Contracts for the Prevention of Pollution
SEPA
www.sepa.org.uk/water/water_regulation/guidance/engineering.aspx

Guidance on Special Requirements for Civil Engineering Contracts
SEPA
www.sepa.org.uk/water/water_regulation/guidance/engineering.aspx

Werritty A., and McEwen L.J. in Gregory, K. J. (ed) 1997 *Fluvial Geomorphology of Great Britain*, JNCC Peterborough

Brazier, V.B., Kirkbride, M. and Werritty, A. (1993) Scottish Landform examples: The river Clyde-Medwin meanders. *Scottish Geographical Magazine*, 109, 45–9.

7.2 Websites

Construction Industry Research and Information Association (CIRIA): www.ciria.org

Environment Agency (EA): www.environment-agency.gov.uk

Highways Agency: www.highways.gov.uk

River Restoration Centre (RRC): www.therrc.co.uk

Scottish Environment Protection Agency (SEPA): www.sepa.org.uk

Scottish Government: www.scotland.gov.uk/Home

Scottish Natural Heritage (SNH): www.snh.org.uk

8 Glossary

Abutment	Support of a bridge at the banks of a river.
Aggradation	Rising of the river bed level due to depositional processes.
Alluvial fans	Large areas of sediment deposition at river confluences, often cone shaped.
Baffles	Structure placed inside a culvert to deflect the flow of water, can provide resting areas for fish, helping fish passage.
Bed armour	Top layer of river bed sediment that has been compacted and held together by finer sediments.
Bridge apron/ weir	Structure than impounds water and raises bed level upstream, to prevent bed erosion at bridges.
Catchment	Total area of land that drains into any given river.
Channel migration zone (CMZ)	Area where a river naturally moves across a floodplain.
Closed culvert	Bridging culverts with artificial floor (invert) where a transport route (eg foot path, cycle path, road) crosses a watercourse, not for land gain. Affects the bed and banks of watercourses.
Deck	Component of bridge forming the surface of road.
Embankment	Earth, gravel or similar material raised above the channel or floodplain to form a bank, stop flood waters from leaving the channel, or retain flood waters within a specified area.
Incision	Deepening of a river channel due to erosion of the bed.
Invert	Lowest internal point of a culvert (floor of culvert).
Knick point	Where a step has formed in the river channel and there is a sudden change in bed level. It can often lead to high rates of erosion as water flows over the knick point and it erodes upstream.
Large woody debris (LWD)	Accumulations of trees and branches that have fallen naturally into the river system.
Meander Bend	Bend in the river formed by natural river processes (erosion and deposition).
Perched culvert	Culvert that has a drop from the culvert base to the downstream river bed forming a 'step'.
Pier	In-channel supports of a multi-span bridge.
Riffle	Fast-flowing shallow water with distinctly broken or disturbed surface over gravel/ pebble or cobble substrate.
Riparian	The area of land adjoining a river channel (including the river bank) capable of exerting physical, hydrological and ecological impacts on the aquatic ecosystem (eg shading, leaf litter input). In this standard, the term 'riparian zone' does not include the wider floodplain.
Rip rap	Large angular stone placed to protect eroding banks.

Scour	Erosion of river banks or bed, often due to the presence of a structure.
Soffit	Underside of bridge deck or highest internal point of a culvert.
Sustainable engineering solution	A river engineering solution that minimises harm to the water environment and is effective both in the short term and the long term.
Viaducts	Road spanning a floodplain between raised supports.
Width of river	The width of a river is defined as the straight line distance measured between the toe of the banks of any watercourse, spanning the bed of the watercourse, including any exposed bars and vegetated islands.

Appendix 1 - River types

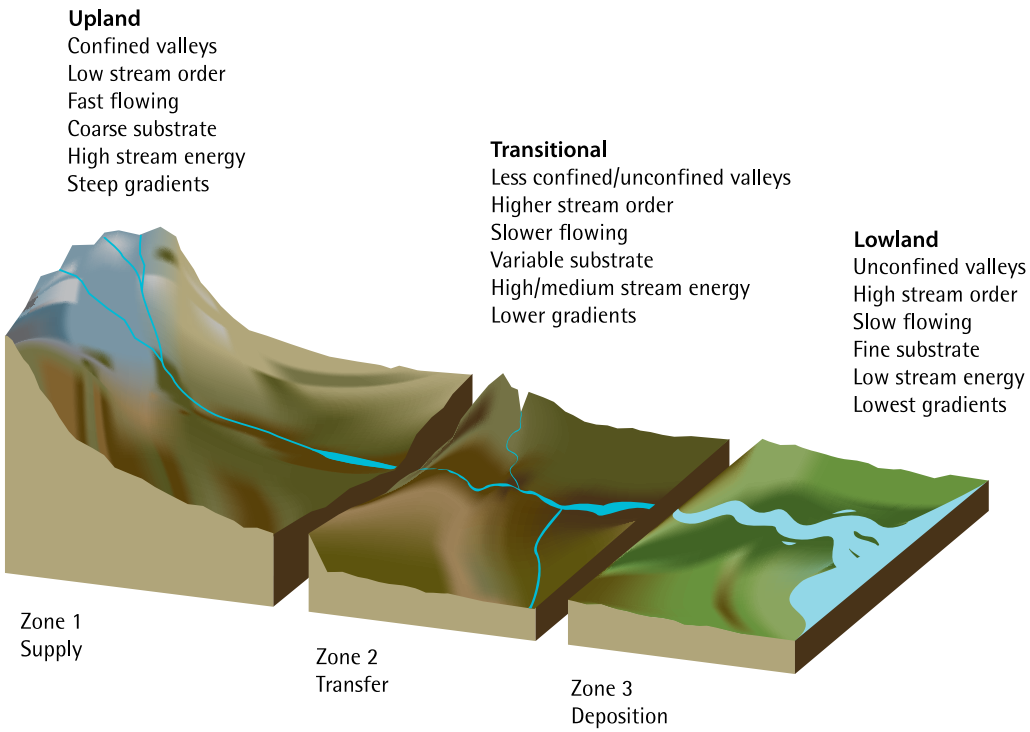
River typologies can be a valuable tool for identifying and interpreting river characteristics.

Different rivers (or sections of channel within a river) display distinct characteristics that can influence the considerations that need to be taken into account when constructing a river crossing.

For the purposes of this guidance rivers have been divided into three categories as shown in Figure A1 and outlined below:

- upland;
- transitional;
- lowland.

Figure A1: Generalised diagram of different types of environment within the river catchment.



River slope

One of the most important factors influencing river type is slope. If you do not know the slope, it can be determined by looking at the contour lines on an Ordnance Survey map.

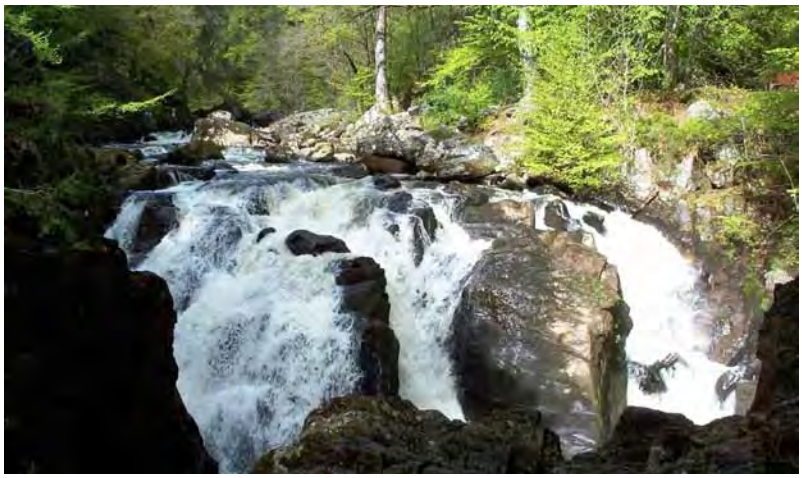
Look at how many metres a river falls over a kilometre (eg a river falls 5 metres over 1 kilometre); to convert this to a percentage, divide the number of metres fallen over the distance and multiply by 100 eg in the example above, the slope percentage is calculated as follows Slope = 5 /1000 x 100 = 0.5%

Upland

Upland rivers (Figure A2) are generally fast and shallow. They typically have a slope greater than 1%. They are formed in steep high energy environments capable of mobilising and carrying cobbles or boulders during flood events.

The sides of the channel tend to be steep with little, if any, floodplain and relatively stable ie they do not tend to migrate across the floodplain. For the purposes of this guidance, relatively straight channels with coarse (pebble/cobble) sediment and erratically placed larger boulders should also be considered as upland type channels.

Figure A2: Examples of upland rivers.



Transitional

Transitional rivers (Figure A3) are typically characterised by wide floodplains and meandering channel patterns. They typically have a slope from 0.1 to 3%.

Pool–riffle sequences, braided sections and meandering are common features of transitional rivers.

Figure A3: Examples of transitional rivers.

Lowland

Lowland rivers (Figure A4) are lower energy environments where sediment sizes are generally a lot smaller than those in upland and transitional rivers (eg pebble, gravel and sand). Lowland rivers typically have a slope less than 0.1%. Meandering is a common feature. Man-made or modified (eg straightened) rivers are also included in this category.

Figure A4: Examples of lowland rivers.

0652_KT 04/11

First published 28 November 2018, updated 1st March 2019

Using ‘Flood risk assessments: climate change allowances’ following publication of new climate projections in UKCP18

Who are these messages for?

These messages are for local planning authorities and developers preparing Strategic Flood Risk Assessments (SFRAs) and site specific flood risk assessments (FRAs).

How to use these messages

These messages advise developers who need to prepare site specific flood risk assessments and all local planning authorities how to use ‘Flood risk assessments: climate change allowances’ (published 2016) to account for the impact of climate change on flood risk now UKCP18 has been published.

Main messages

- UKCP18 was published on 26th November 2018.
- UKCP18 is the official source of information on how the climate of the UK may change over the rest of this century. The UKCP18 projections replace the UKCP09 projections.
- The allowances in ‘Flood risk assessments: climate change allowances’ (published Feb 2016) are still the best national representation of how climate change is likely to affect flood risk for:
    - peak river flow
    - peak rainfall intensity
- Research that is due to be published in 2019 may result in changes to these allowances[1]. We will provide customers with more information regarding the need to update peak river flow and peak rainfall intensity allowances in due course.
- The climate change allowances for sea level rise in ‘Flood risk assessments: climate change allowances’ will be updated and published as early as possible in 2019. Until then, it is reasonable to continue to use the sea level rise allowances in ‘Flood risk assessments: climate change allowances’ (published in 2016) for planning decision making, because the allowances that have been used to date represent the high end of the range of sea level rise projected by UKCP18.

[1] High resolution mapping providing peak river flow allowances at 1km grid resolution due to be published late 2019. We do not expect the peak river flow allowances provided at a regional scale in ‘Flood risk assessments: climate change allowances’ to change as a result of this information, however, planners and developers may need to take account of this information where it shows a significant difference to the regional allowances. High resolution (daily and sub daily) rainfall projections is due to be published in late 2019. These are used to understand the impact of climate change on peak rainfall. Following this, the peak rainfall allowances in ‘Flood risk assessments: climate change allowances’ may need to be updated, but this will not be until 2020 at the earliest.

- However, in exceptional cases where developments are very sensitive to flood risk and have a lifetime of at least 100 years[2], we recommend you assess the impact of both the current allowance in 'Flood risk assessments: climate change allowances' and the 95th percentile of UKCP18 'RCP 8.5' scenario (high emissions scenario) **standard method** sea level rise projections of UKCP18, and plan according to this assessed risk. You will need to calculate sea level rise allowances beyond 2100 by extrapolating the UKCP18 dataset. The Environment Agency will check your extrapolation methodology and provide advice.
- UKCP18 provides sea level rise projections for 2100 – 2300. The update of 'Flood risk assessments: climate change allowances' will include advice on using these projections. In the meantime, for development with a longer than 100 year lifetime e.g. large urban extensions, new settlements, major infrastructure, you should contact your local the Environment Agency office for advice on how to calculate such allowances.
- Where it is appropriate to use the sea level rise information in UKCP18 as described in this briefing note, planning decisions should do so from now onwards, in order to ensure planning decisions are in line with policies in the National Planning Policy Framework. However, where local plans or development proposals and associated flood risk assessments are well advanced, it will usually be acceptable to make decisions based on the allowances and advice in 'Flood risk assessments: climate change allowances' (published Feb 2016) in the following circumstances:
    - local plan has been submitted for examination (before or on the day UKCP18 is published); or
    - development proposals are well advanced or where a valid planning application has already been submitted to the local planning authority (before or on the day UKCP18 is published).
- When the climate change allowances are updated, the supporting guidance will be updated at the same time to address user feedback collated since Feb 2016.
- Once 'Flood risk assessments: climate change allowances' has been updated, over time we will update our flood risk modelling to reflect the revised climate change projections. This modelling work is principally done to inform our flood risk management activities, but we will continue to share this work with planners (for SFRAs) and developers (for site-specific FRAs) when it becomes available. Where the modelling needed by planners and developers has not yet been undertaken, we may be able to work together to do this work more quickly and to share the costs. Where this is not possible, the onus will be on planners and developers to undertake the necessary work at their own cost. Contact your local Environment Agency office to find out when they plan to update their flood risk modelling and to discuss working together.

[2] Such as infrastructure projects or developments that significantly change existing settlement patterns including urban extensions and new settlements

From:	Karen Thorpe
To:	A47 NorthTuddenham to Easton
Subject:	A47 North Tuddenham to Easton - TR010038-000026
Date:	27 September 2019 16:05:54
Attachments:	image001.png image003.png image008.png image010.png image011.png image012.png

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Good afternoon,

Thank you for sending the relevant information and material regarding the A47 North Tuddenham to Easton.

Harlaxton Energy Networks Ltd. at this time has no assets in the area, and will not be implementing any in the near future, therefore Harlaxton has no comment to make on this scheme.

Kind Regards

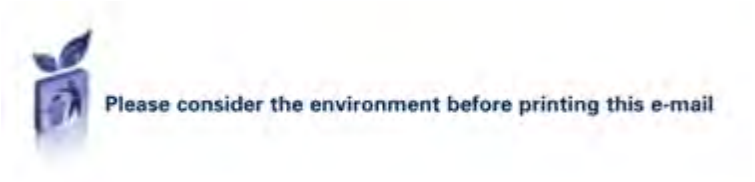
Karen Thorpe
Distribution Administrator
0844 800 1813

For any electricity power issues please call our Emergency Line 0800 055 6288.
For any gas issues please call the National Gas Emergency Line 0800 111 999.

Visit our website harlaxtonenergynetworks.co.uk and explore at your leisure

Harlaxton
Energy Networks Limited

Toll Bar Road, Marston, Grantham, Lincolnshire, NG32 2HT
Registered Company Number : 7330883



From:	Karen Thorpe
To:	A47 NorthTuddenham to Easton
Subject:	A47 North Tuddenham to Easton - TR010038-000026
Date:	27 September 2019 16:05:51
Attachments:	image002.png

Good afternoon,

Thank you for sending the relevant information and material regarding the A47 North Tuddenham to Easton.

Harlaxton Gas Networks Ltd. at this time has no assets in the area, and will not be implementing any in the near future, therefore Harlaxton has no comment to make on this scheme.

Kind Regards

Karen Thorpe

For any electricity power issues please call Harlaxton Energy Networks 0800 055 6288.

For any gas issues please call the National Gas Emergency Line 0800 111 999.

Harlaxton
Gas Networks Limited
Toll Bar Road, Marston, Grantham, Lincs, NG32 2HT

HSE

Health and Safety Executive

CEMHD Policy - Land Use Planning
NSIP Consultations
Building 1.2, Redgrave Court
Merton Road, Bootle
Merseyside, L20 7HS

Your ref: TR010038
Our ref: 4.2.1.6647

HSE email: NSIP.applications@hse.gov.uk

FAO Michael Breslaw
The Planning Inspectorate
Temple Quay House
Temple Quay,
Bristol
BS1 6PN

Dear Michael

10 October 2019

PROPOSED A47 NORTH TUDDENHAM TO EASTON (the project)
PROPOSAL BY HIGHWAYS ENGLAND (the applicant)
INFRASTRUCTURE PLANNING (ENVIRONMENTAL IMPACT ASSESSMENT) REGULATIONS 2017 (as amended) – Regulations 10 and 11

Thank you for your letter of 23rd September 2019 regarding the information to be provided in an environmental statement relating to the above project. HSE does not comment on EIA Scoping Reports but the following information is likely to be useful to the applicant.

HSE's land use planning advice

Will the proposed development fall within any of HSE's consultation distances?

According to HSE's records there is one major accident pipeline within the indicated proposed scheme (including options 1 to 4) for this nationally significant infrastructure project; as illustrated in, the document: 'A47 North Tuddenham to Easton – Scoping Report HE551489-GTY-EGN-000-RP-LX-001 September 2019'.

The major accident pipeline is:

1) HSE ref 7450, Transco index 1709, 3 Feeder Bacton / Roudham Heath; operated by National Grid Gas PLC

When we are consulted by the Applicant with further information, under Section 42 of the Planning Act 2008, we will provide full advice.

Hazardous Substance Consent

The presence of hazardous substances on, over or under land at or above set threshold quantities (Controlled Quantities) will probably require Hazardous Substances Consent (HSC) under the Planning (Hazardous Substances) Act 1990 as amended.

The substances, alone or when aggregated with others for which HSC is required, and the associated Controlled Quantities, are set out in The Planning (Hazardous Substances) Regulations 2015 as amended.

HSC would be required to store or use any of the Named Hazardous Substances or Categories of Substances at or above the Controlled Quantities set out in Schedule 1 of these Regulations.

Further information on HSC should be sought from the relevant Hazardous Substances Authority.

Consideration of risk assessments

Regulation 5(4) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires the assessment of significant effects to include, where relevant, the expected significant effects arising from the proposed development's vulnerability to major accidents. HSE's role on NSIPs is summarised in the following Advice Note 11 An Annex on the Planning Inspectorate's website - Annex G – The Health and Safety Executive . This document includes consideration of risk assessments on page 3.

Explosives sites

HSE has no comment to make in this regard, as there are no licensed explosive sites in the vicinity.

Electrical Safety

No comment, from a planning perspective.

Please send any further electronic communication on this project directly to the HSE's designated e-mail account for NSIP applications. Alternatively, any hard copy correspondence should be sent to:

Mr Dave Adams (MHPD)
NSIP Consultations
1.2 Redgrave Court
Merton Road
Bootle, Merseyside
L20 7HS

Yours sincerely,

[redacted]

Dave Adams
CEMHD4 Policy

From:	Adkins, Connor
To:	A47 NorthTuddenham to Easton
Cc:	growthandplanning
Subject:	planning application TR010038-000026
Date:	24 September 2019 15:12:34
Importance:	High

Dear Sir/Madam

Thank you for your consultation dated 23 September 2019. It would be inappropriate for us to provide comment in this case as we are the consultee.

Yours faithfully
Connor Adkins

Connor Adkins
Highways England | Woodlands | Manton Lane | Bedford | MK41 7LW
Tel: +44 (0) 300 4704744
Web: http://www.highways.gov.uk
GTN: 0300 470 4744

Historic England

Mr Michael Breslaw
The Planning Inspectorate
3D, Temple Quay House
Temple Quay
Bristol
BS1 6PN

Direct Dial: 01223 582738

Our ref: PL00622902

15 October 2019

Dear Mr Breslaw

A47 NORTH TUDDENHAM TO EASTON
ENVIRONMENTAL ASSESSMENT (EIA)
SCOPING CONSULTATION AND NOTIFICATION

Thank you for your email of 23rd September 2019 notifying Historic England of the Environmental Impact Assessment (EIA) Scoping Opinion for the proposed works associated with improving the A47 between North Tuddenham and Easton.

The historic environment is a finite and non-renewable environmental resource which includes designated heritage assets, non-designated archaeology and built heritage, historic landscapes and unidentified sites of historic and / or archaeological interest. It is a rich and diverse part of England's cultural heritage and makes a valuable contribution to our cultural, social and economic life. A scoping report should establish if the proposed development has the potential for effects on cultural heritage. This should be dealt with in a specific Archaeology and Built Heritage chapter within an Environmental Statement. We advise that all supporting technical information (desk-based assessments, evaluation and post-excavation reports etc.) are included as appendices. Where relevant, the cultural heritage should be cross-referenced to other chapters or technical appendices; for example noise, light, traffic and landscape.

The EIA should consider the impact upon both designated and non-designated heritage assets. This should include the impact upon the setting of the heritage assets within the surrounding area. Archaeological evidence within the surrounding vicinity should be assessed and further consultation and advice should be sought from the Development Management Archaeologists and Historic Environment Record at Norfolk County Council.

There are no designated assets within the boundaries of the proposed development. The designated assets which might fall within the remit of Historic England to advise are the grade I listed parish church at Easton and grade II* listed house to the west of Church Farm Honnington as well as the grade I listed parish church at Hockering. The development has the potential to have an impact on these heritage assets, either through visual impact on increased noise or, in the case of illuminated roundabouts,

lighting. Other grade II listed buildings are in the vicinity and there may be other designated and non-designated heritage assets which are affected by the development. The document should identify these and assess the impact of the proposals upon their significance.

The assessment of the impact upon setting should include views from and towards any nearby heritage assets. Photomontages, wireframe models and/or similar techniques can be used to illustrate and assess the potential visual impact. The assessment of setting should not be solely be restricted to visual impact, and should also consider the impact from other environmental factors such as noise, traffic and lighting, where relevant. Cumulative impact upon the setting of the designated and non-designated heritage assets should also be considered.

The assessment should also take account of the potential impact which associated activities (such as construction, servicing and maintenance, and associated traffic) might have upon perceptions, understanding and appreciation of the heritage assets in the area. The assessment should also consider, where appropriate, the likelihood of alterations to drainage patterns that might lead to in situ decomposition or destruction of below ground archaeological remains and deposits, and can also lead to subsidence of buildings and monuments.

The assessment should be carried out in accordance with established policy and guidance, including the National Planning Policy Framework. Historic England also produced further guidance on setting entitled The Setting of Heritage Assets. Our guidance provides a thorough discussion of setting and methods for considering the impact of development on setting, such as the use of matrices.

Whilst standardised EIA matrices are useful tools, we consider the analysis of setting (and the impact upon it) as a matter of qualitative and expert judgement which cannot be achieved solely by use of systematic matrices or scoring systems. Historic England therefore recommends that these should be seen primarily as material supporting a clearly expressed and non-technical narrative argument within the cultural heritage chapter. The EIA should use the ideas of benefit, harm and loss (as described in NPPF) to set out ‘what matters and why’ in terms of the heritage assets’ significance and setting, together with the effects of the development upon them.

We would strongly recommend that you involve the Conservation Officer of Babergh District Council and the archaeological staff at Suffolk County Council in the development of this assessment. They are best placed to advise on: local historic environment issues and priorities; how the proposal can be tailored to avoid and minimise potential adverse impact on the historic environment; the nature and design of any required mitigation measures; and opportunities for securing wider benefits for the future conservation and management of heritage assets.

Historic England

Given the extent and nature of the proposed development there is potential for it to have a harmful effect on the significance of designated heritage assets which fall within the remit of Historic England to advise. Please do contact us if you would like to further advice.

Yours sincerely,

[redacted]

David Eve
Inspector of Historic Buildings and Areas
david.eve@HistoricEngland.org.uk

Response to A47 Dualling Environmental Impact Assessment Scoping report – from Hockering Parish Council

General

The report uses many initialled abbreviations, which are only defined within the text. A glossary of such abbreviations would have made reading this very long (200-page) report easier, as would correcting the several spelling and grammatical errors. I did not find the meaning of LIA, CEMP, NVZ ARN, WFD or WIA.

In section 2.1, The need for the proposed scheme, it is stated that the 8km of single carriageway acts as a bottleneck, resulting in congestion. There is indeed regular congestion, but only in the morning and evening rush-hours, and this is caused by the two roundabouts at Mattishall Road and At the start of the Easton by-pass. Before the former was built (against local advice) the rush-hour congestion was much less. Being a single carriageway certainly limits the maximum speed of traffic, but it is a very minor cause of congestion; outside the rush hours the road runs very well, and figures would show this.

I note that Mr Hooker, of Honingham, has submitted a response on behalf of Honingham Parish Council, and I support all his statements.

In addition, using his numbering:

2) My enquiries indicate that several landowners in the Hockering area whose land could be affected by the road have had no contact from Highways England. Can HE confirm that owners of all the land potentially affected have been successfully contacted ?

3) Nowhere in the report is it stated on what basis the scoping boundary has been determined, other than 'professional judgment'. It is bizarre that all areas of habitation appear to be excluded, yet the report addresses impact on humans, who will spend much of their lives near their habitation. Not only that, much wildlife is also centred around domestic gardens, and so there is every reason to include them within the scoping boundary.

The southern boundary appears to be defined by the River Tud for much of its length; surely the area EACH SIDE of the river Tud is potentially affected by the road, especially south of Hockering, where the road is planned to run dangerously-near the river.

4) The 'Farm Hub' referred to by Mr Hooker here is generally known as the Food Hub, and referred to in the report as FEZ.

The report states that the consultation strategy is available on-line. I have checked the HE website, but can find no such definition of a strategy. Please can you advise.

There is no reference to the concerns of local parishes, which includes Hockering as well as Honingham.

5) Please can you define the particular 'historic park'.

7) In construction, no mention is made of the detrimental effect of the transportation of materials and spoil to and from the site. There is no consideration of the routes such transportation would take, and the effect on the local road network, which is mostly inadequate for heavy goods vehicles. During construction of the Northern Distributor Route (NDR/Broadland Northway) there were huge numbers of lorry movements which affected the local area badly.

8) The Existing and Baseline knowledge is considerably out of date, regarding not only the FEZ (Food Hub), which is now well under construction, and the proposed housing development at Honingham, and less major housing developments in Hockering.

9) Combined and cumulative effects must surely consider not only the existing NDR (Broadland Northway) and the FEZ, but proposed housing in Honingham, proposed Norwich Western Link, and the Vattenfall and Orsted cable projects, and more recently Equinor. all of which are planned to impact on this area.

I could find no specific mention of the effect of the elevation of the road at various places. I note that the map Drg No HE551489-AMY-HGN-TE_STG2-DR-HE-23 (undated) contains detail of levels along the route. Clearly this will have an effect on noise, disturbance to ground, etc..

Referring to Table 16.2 Summary of Potential effects and further assessment requirements

Air quality I understand that it has been found recently that the effect of PM_5 particles and smaller is significant, and measurement of these should be included.

(in Cultural Heritage, remove unnecessary extra 'required' in text)

Landscape Depending on the built levels of the road, the landscape will be affected, not only during construction and at year 1, but for all time, especially if embankments are used, and especially near the River Tud.

Visual Even 15 years after mitigation measures are enacted (presumably planting of trees, unless very large bunds), visual intrusion is likely to be considerable, especially in winter.

Biodiversity (Wildlife Trusts of Bedfordshire and Northamptonshire are likely to refer you to the Norfolk Wildlife Trust). I suggest that Council for Protection of Rural England (CPRE) should also be consulted. Nightime works may also affect hedgehogs and owls, as well as badgers and bats.

Geology and Soils The two graveyards referred-to should be defined. As this scheme is proposed to be so close to the River Tud, the potential for severe disturbance is great. The building reclamation yard has been there for many decades, and it is surely not certain what materials have been deposited which may affect the soils and cause leaching into the river. This should surely be assessed to a **detailed level.**

(Materials – Environment**al** Agency should be Environment Agency)

Noise and Vibration The temporary period mentioned could easily be over one or more breeding seasons. This could indeed have **direct significant** effects.

What would the mitigation measures be against noise and vibration in operation?

People and communities PROW 4 and 5 are mentioned, but only after considerable searching did I find (on p106) which paths these refer to, viz PROW 4 is Honingham RB1, PROW5 is Hockering FP7. But FP7 is described as running from Whitford Bridge; in fact this is FP8 until it joins FP7, which runs north along Gypsy Lane. I cannot find a Fig 12.1 referred-to in the text (it is not listed in the contents), so I cannot see a map detailing these routes.

I dispute vehemently the assessment made of the amenity value of PROW4. From the existing A47 It passes through a small brake of trees, then an attractive old track, beside which is a pond full of

wildlife and vegetation. There is then a variety of views, first to the right, then to the left, past some ancient oaks, an interesting pit, then past an attractive wood, where deer can often be seen, and thence to Mousewood Farm (incorrectly named Wood Farm on maps). This route has been severed by the existing A47, and no longer provides a safe route to Honingham, but this remains a right of way, and can be restored to increase its amenity value to residents.

Regarding PROW5, the path is indeed faint in places, but the usual route is to one of higher ground, where a view over the river is gained. The path then follows a hedge line to get to FP7. Going may be difficult in places, but that is mainly due to lack of maintenance by Norfolk County Council, not the route itself, which offers a delightful walk through an area of great natural interest. (tree **routes** should be tree roots).

It is stated that much of the PROWs would remain usable, but this ignores the fact that PROWs were only ever created if they joined to another route; 'dead ends' were not allowed, and both these routes would effectively be made dead ends, and so amenity WOULD be severely affected.

Community land in Hockering does include a play area at the end of Manor Close.

Businesses in Hockering not mentioned are the Victoria Public House, and Hockering Shop and Post office. Kerrie Woollen Cakes and Claxtons are businesses operating from homes and do not employ persons, to my knowledge.

Access: I think that this section requires a detailed assessment.

Community severance: residences in Mattishall Lane could be severed from the village of Hockering, depending on precise routeing of road, and Mattishall itself could become difficult to access from Hockering if Mattishall Lane were severed. Mattishall contains the doctor's surgery serving Hockering. If Church Lane were severed East Tuddenham would be similarly cut off from Hockering. A detailed, rather than simple, assessment is required here.

Agricultural land. It is difficult to understand why not all potentially-affected landowners have yet to be contacted.

MTs' view from the road: I suspect this should read 'there would be open VIEWS FROM THE A47'.

Road Drainage and the Water Environment The river Tud is extremely important for wildlife in this area. The potential effect of contaminated run-off during construction and operation, particularly at the river crossing, should be subjectd to DETAILED assessment, rather than simple. Several properties also rely on wells and bores for drinking water, and any possible effect on the principal (*not principle*) aquifer should be assessed carefully.

Richard Hawker on Behalf of Hockering Parish Council

18 October 2019

National Grid house
Warwick Technology Park
Gallows Hill, Warwick
CV34 6DA

Land and Acquisitions
Anne Holdsworth
DCO Liaison Officer
Network Management
anne.holdsworth@nationalgrid.com
Direct tel: [redacted]

www.nationalgrid.com

SUBMITTED ELECTRONICALLY:
A47NorthTuddenhamtoEaston@planninginspectorate.gov.uk

17 October 2019

Dear Sir/Madam

APPLICATION BY HIGHWAYS ENGLAND FOR AN ORDER GRANTING DEVELOPMENT CONSENT FOR THE A47 NORTH TUDENHAM TO EASTON
SCOPING CONSULTATION

This is a response on behalf of National Grid Electricity Transmission PLC (NGET) and National Grid Gas PLC (NGG).

I refer to your letter dated 23rd September 2019 in relation to the above proposed application. Having reviewed the scoping report, I would like to make the following comments:

National Grid infrastructure within / in close proximity to the order boundary

Electricity Transmission

National Grid Electricity Transmission has no apparatus within or in close proximity to the proposed order limits.

Gas Transmission Infrastructure:

National Grid Gas has a high pressure gas transmission pipeline located within or in close proximity to the proposed order limits. The transmission pipeline forms an essential part of the gas transmission network in England, Wales and Scotland:

- Feeder Main 3 Felthorpe to Hardingham.

I enclose a plan showing the route of the National Grid Gas transmission pipeline and associated gas apparatus.

National Grid house
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CV34 6DA

Gas Infrastructure

The following points should be taken into consideration:

- National Grid has a Deed of Grant of Easement for each pipeline, which prevents the erection of permanent / temporary buildings, or structures, change to existing ground levels, storage of materials etc.

Pipeline Crossings:

- Where existing roads cannot be used, construction traffic should ONLY cross the pipeline at previously agreed locations.
- The pipeline shall be protected, at the crossing points, by temporary rafts constructed at ground level. The third party shall review ground conditions, vehicle types and crossing frequencies to determine the type and construction of the raft required.
- The type of raft shall be agreed with National Grid prior to installation.
- No protective measures including the installation of concrete slab protection shall be installed over or near to the National Grid pipeline without the prior permission of National Grid.
- National Grid will need to agree the material, the dimensions and method of installation of the proposed protective measure.
- The method of installation shall be confirmed through the submission of a formal written method statement from the contractor to National Grid.
- Please be aware that written permission is required before any works commence within the National Grid easement strip.
- A National Grid representative shall monitor any works within close proximity to the pipeline to comply with National Grid specification T/SP/SSW22.
- A Deed of Consent is required for any crossing of the easement

Cable Crossings:

- Cables may cross the pipeline at perpendicular angle to the pipeline i.e. 90 degrees.
- A National Grid representative shall supervise any cable crossing of a pipeline.
- Clearance must be at least 600mm above or below the pipeline.
- Impact protection slab should be laid between the cable and pipeline if cable crossing is above the pipeline.
- A Deed of Consent is required for any cable crossing the easement.

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CV34 6DA

- Where a new service is to cross over the pipeline a clearance distance of 0.6 metres between the crown of the pipeline and underside of the service should be maintained. If this cannot be achieved the service shall cross below the pipeline with a clearance distance of 0.6 metres.

General Notes on Pipeline Safety:

- You should be aware of the Health and Safety Executives guidance document HS(G) 47 "Avoiding Danger from Underground Services", and National Grid's specification for Safe Working in the Vicinity of National Grid High Pressure gas pipelines and associated installations - requirements for third parties T/SP/SSW22.
- National Grid will also need to ensure that our pipelines access is maintained during and after construction.
- Our pipelines are normally buried to a depth cover of 1.1 metres however; actual depth and position must be confirmed on site by trial hole investigation under the supervision of a National Grid representative. Ground cover above our pipelines should not be reduced or increased.
- If any excavations are planned within 3 metres of National Grid High Pressure Pipeline or, within 10 metres of an AGI (Above Ground Installation), or if any embankment or dredging works are proposed then the actual position and depth of the pipeline must be established on site in the presence of a National Grid representative. A safe working method agreed prior to any work taking place in order to minimise the risk of damage and ensure the final depth of cover does not affect the integrity of the pipeline.
- Excavation works may take place unsupervised no closer than 3 metres from the pipeline once the actual depth and position has been has been confirmed on site under the supervision of a National Grid representative. Similarly, excavation with hand held power tools is not permitted within 1.5 metres from our apparatus and the work is undertaken with NG supervision and guidance.

To view the SSW22 Document, please use the link below:
http://www.nationalgrid.com/uk/LandandDevelopment/DDC/GasElectricNW/safeworking.htm

To download a copy of the HSE Guidance HS(G)47, please use the following link:
http://www.hse.gov.uk/pubns/books/hsg47.htm

Further Advice

We would request that the potential impact of the proposed scheme on National Grid's existing assets as set out above and including any proposed diversions is considered in any subsequent reports, including in the Environmental Statement, and as part of any subsequent application.

Where any diversion of apparatus may be required to facilitate a scheme, National Grid is unable to give any certainty with the regard to diversions until such time as adequate conceptual design studies have been undertaken by National Grid. Further information relating to this can be obtained by contacting the email address below.

National Grid house
Warwick Technology Park
Gallows Hill, Warwick
CV34 6DA

Where the promoter intends to acquire land, extinguish rights, or interfere with any of National Grid apparatus, protective provisions will be required in a form acceptable to it to be included within the DCO.

National Grid requests to be consulted at the earliest stages to ensure that the most appropriate protective provisions are included within the DCO application to safeguard the integrity of our apparatus and to remove the requirement for objection. All consultations should be sent to the following email address: **box.landandacquisitions@nationalgrid.com**

I hope the above information is useful. If you require any further information please do not hesitate to contact me.

The information in this letter is provided not withstanding any discussions taking place in relation to connections with electricity or gas customer services.

Yours faithfully

[redacted]

Anne Holdsworth
DCO Liaison Officer, Land and Acquisitions

nationalgrid

NG Assets A47 North Tuddenham to Easton Scope

Legend:

- Substations Commissioned
- Circuits
  - Commissioned
  - Decommissioned Group
  - Planned and Spares
- OHL 400Kv Commissioned
- OHL 275Kv Commissioned
- OHL 132Kv & Below Commissioned
- Towers Commissioned
- Buried Cable Commissioned
- Fibre Cable Commissioned
- Pilot Cable
- Oil Pipe
- Cooling Pipe
- Cooling Station
- RAMM
- Cable Tunnel
- Gas Operational Boundary
- Gas Site Boundary
- Trial Hole
- Vantage Point
- Aerial Marker Post
- Pipe Crossing Point
- CP Test Post
- Transformer Rectifier
- Pipeline Crossing Sleeve
  - Nitrogen Sleeve
  - Other Sleeves
- Pipe Line Control Point
- Named Pipeline Section
- River Crossings

Notes:

NG Assets A47 North Tuddenham to Easton Scope

0 0.51 1.0 Kilometers

Date: 14/10/2019
Time: 15:32:59

Page size: A3 Landscape Scale: 1: 20,000
Print by: **Holdsworth, Anne**

Date: 18 October 2019
Our ref: 14593/295632
Your ref: TR010038-000026

Customer Services
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Major Casework Directorate
The Planning Inspectorate
3D Eagle Wing
Temple Quay House
2 The Square
Bristol, BS1 6PN

BY EMAIL ONLY

Dear Sir/Madam

Environmental Impact Assessment Scoping consultation (Regulation 15 (4) of the EIA Regulations 2017):

Proposal: Application by Highways England (the Applicant) for an Order granting Development Consent for the A47 North Tuddenham to Easton Roundabout (the Proposed Development)
Location: A47 North Tuddenham to Easton, Norfolk

Thank you for seeking our advice on the scope of the Environmental Statement (ES) in your consultation dated 23 September 2019 which we received on the same date.

Natural England is a non-departmental public body. Our statutory purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development.

Case law[1] and guidance[2] has stressed the need for a full set of environmental information to be available for consideration prior to a decision being taken on whether or not to grant planning permission. Annex A to this letter provides Natural England's advice on the scope of the Environmental Impact Assessment (EIA) for this development.

Should the proposal be amended in a way which significantly affects its impact on the natural environment then, in accordance with Section 4 of the Natural Environment and Rural Communities Act 2006, Natural England should be consulted again.

We would be happy to comment further should the need arise but if in the meantime you have any queries please do not hesitate to contact us. For any queries relating to the specific advice in this letter only please contact Louise Oliver on 020802 64893. For any new consultations, or to provide further information on this consultation please send your correspondences to consultations@naturalengland.org.uk.

Yours faithfully

Louise Oliver
Norfolk and Suffolk Area Team

[1] Harrison, J in *R. v. Cornwall County Council ex parte Hardy* (2001)
[2] *Note on Environmental Impact Assessment Directive for Local Planning* Authorities Office of the Deputy Prime Minister (April 2004) available from http://webarchive.nationalarchives.gov.uk/+/http://www.communities.gov.uk/planningandbuilding/planning/sustainabilityenvironmental/environmentalimpactassessment/noteenvironmental/

Annex A – Advice related to EIA Scoping Requirements

NB The numbering referred to in the body of our comments below is that used in the document entitled *A47 North Tuddenham to Easton EIA Scoping Report dated September 2019*

1. General Principles

Schedule 4 of the Town & Country Planning (Environmental Impact Assessment) Regulations 2017, sets out the necessary information to assess impacts on the natural environment to be included in an ES, specifically:

- A description of the development – including physical characteristics and the full land use requirements of the site during construction and operational phases.
- Expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed development.
- An assessment of alternatives and clear reasoning as to why the preferred option has been chosen.
- A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors.
- A description of the likely significant effects of the development on the environment – this should cover direct effects but also any indirect, secondary, cumulative, short, medium and long term, permanent and temporary, positive and negative effects. Effects should relate to the existence of the development, the use of natural resources and the emissions from pollutants. This should also include a description of the forecasting methods to predict the likely effects on the environment.
- A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.
- A non-technical summary of the information.
- An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information.

It will be important for any assessment to consider the potential cumulative effects of this proposal, including all supporting infrastructure, with other similar proposals **(in particular the proposed Norwich Western Link road)** and a thorough assessment of the 'in combination' effects of the proposed development with any existing developments and current applications. A full consideration of the implications of the whole scheme should be included in the ES. All supporting infrastructure should be included within the assessment.

2. Biodiversity and Geology

2.1 Ecological Aspects of an Environmental Statement

Natural England advises that the potential impact of the proposal upon features of nature conservation interest and opportunities for habitat creation/enhancement should be included within this assessment in accordance with appropriate guidance on such matters. Guidelines for Ecological Impact Assessment (EcIA) have been developed by the Chartered Institute of Ecology and Environmental Management (CIEEM) and are available on their website.

EcIA is the process of identifying, quantifying and evaluating the potential impacts of defined actions on ecosystems or their components. EcIA may be carried out as part of the EIA process or to support other forms of environmental assessment or appraisal.

The National Planning Policy Framework sets out guidance in S.174 - 177 on how to take account of biodiversity interests in planning decisions and the framework that local authorities should provide to assist developers.

2.2 Internationally and Nationally Designated Sites
The ES should thoroughly assess the potential for the proposal to affect designated sites. European sites (e.g. designated Special Areas of Conservation and Special Protection Areas) fall within the scope of the Conservation of Habitats and Species Regulations 2017. In addition paragraph 176 of the National Planning Policy Framework requires that potential Special Protection Areas, possible Special Areas of Conservation, listed or proposed Ramsar sites, and any site identified as being necessary to compensate for adverse impacts on classified, potential or possible SPAs, SACs and Ramsar sites be treated in the same way as classified sites.

Under Regulation 63 of the Conservation of Habitats and Species Regulations 2017 an appropriate assessment needs to be undertaken in respect of any plan or project which is (a) likely to have a significant effect on a European site (either alone or in combination with other plans or projects) and (b) not directly connected with or necessary to the management of the site.

Please note in the scoping report that there is a repeated typo that refers to '*Habitats Regulation Report*' rather than '*Habitats Regulation**s** Report*' which needs to be corrected (eg under 1.10.5).

Should a Likely Significant Effect on a European/Internationally designated site be identified or be uncertain, the competent authority (in this case the Local Planning Authority) may need to prepare an Appropriate Assessment, in addition to consideration of impacts through the EIA process.

Sites of Special Scientific Interest (SSSIs) and sites of European or international importance (Special Areas of Conservation, Special Protection Areas and Ramsar sites)
The development site is close to the following designated nature conservation site(s):

- River Wensum Special Area of Conservation (SAC)
- River Wensum Site of Special Scientific Interest (SSSI)
- Hockering Woods SSSI
- Rosie Curston's Meadow, Mattishall SSSI

- Further information on the SSSIs and their special interest features can be found at www.magic.gov. The Environmental Statement should include a full assessment of the direct and indirect effects of the development on the features of special interest within these sites these sites and should identify such mitigation measures as may be required in order to avoid, minimise or reduce any adverse significant effects.

- Natura 2000 network site conservation objectives are available on our internet site http://publications.naturalengland.org.uk/category/6490068894089216

2.3 Regionally and Locally Important Sites
The EIA will need to consider any impacts upon local wildlife and geological sites. Local Sites (known as County Wildlife Sites (CWS) in Norfolk) are identified by the local wildlife trust, geoconservation group or a local forum established for the purposes of identifying and selecting local sites. They are of county importance for wildlife or geodiversity. The Environmental Statement should therefore include an assessment of the likely impacts on the wildlife and geodiversity interests of such sites. The assessment should include proposals for mitigation of any impacts and if appropriate, compensation measures. Contact Norfolk Wildlife Trust for further information.

Under 8.7.12 it states "The Proposed Scheme will not directly impact a number of CWS. However, some areas of land categorised as suitable for CWS designation will be significantly impacted through habitat loss." If land identified as 'Habitat Suitable of CWS Designation' in the scoping report is designated as CWS in the intervening period then there will be a direct impact.

It is hard to comment on potential impacts on either CWS or Habitat Suitable of CWS Designation when both have been omitted entirely from Figure B.1 (in Appendix B). This plan is meant to show **all** the environmental constraints affected by the scheme. Fig. B.1 and B.2 need to be revised:

- to show these two designation types; and
- the SSSI and SAC boxes in the legend removed since none of the River Wensum SSSI or the River Wensum SAC are shown on the maps.

2.4 Protected Species - Species protected by the Wildlife and Countryside Act 1981 (as amended) and by the Conservation of Habitats and Species Regulations 2017
The ES should assess the impact of all phases of the proposal on protected species (including, for example, great crested newts, reptiles, birds, water voles, badgers and bats). Natural England does not hold comprehensive information regarding the locations of species protected by law, but advises on the procedures and legislation relevant to such species. Records of protected species should be sought from appropriate local biological record centres, nature conservation organisations, groups and individuals; and consideration should be given to the wider context of the site for example in terms of habitat linkages and protected species populations in the wider area, to assist in the impact assessment.

The conservation of species protected by law is explained in Part IV and Annex A of Government Circular 06/2005 *Biodiversity and Geological Conservation: Statutory Obligations and their Impact within the Planning System*. The area likely to be affected by the proposal should be thoroughly surveyed by competent ecologists at appropriate times of year for relevant species and the survey results, impact assessments and appropriate accompanying mitigation strategies included as part of the ES.

In order to provide this information there may be a requirement for a survey at a particular time of year. Surveys should always be carried out in optimal survey time periods and to current guidance by suitably qualified and where necessary, licensed, consultants. Natural England has adopted standing advice for protected species which includes links to guidance on survey and mitigation.

2.4.1 Bats: With regard to barbastelle bats, **we strongly recommend that the applicant contacts Norfolk County Council** (if they have not already done so) regarding the proposed Norwich Western Link road (which will connect this current scheme with the A1065 which lies the north of the A47). The Council has commissioned various bat surveys in relation to the proposed link road, some of which encompass land covered by this scheme. It also holds barbastelle records for surveys undertaken in relation to the now completed Norwich Northern Distributor Road which cover areas of land to the north of this scheme. **It may be necessary for additional bat surveys to be undertaken in order to assess potential impacts from the scheme on bats that cross the current single carriageway A47.**

2.4.2 Fish Surveys: Please note that in response to comments made under 8.3.23 and 8.8.13 of the scoping report, Natural England does not hold data on fish in the River Tud.

2.5 Habitats and Species of Principal Importance
The ES should thoroughly assess the impact of the proposals on habitats and/or species listed as 'Habitats and Species of Principal Importance' within the England Biodiversity List, published under the requirements of S41 of the Natural Environment and Rural Communities (NERC) Act 2006. Section 40 of the NERC Act 2006 places a general duty on all public authorities, including local planning authorities, to conserve and enhance biodiversity. Further information on this duty is available here https://www.gov.uk/guidance/biodiversity-duty-public-authority-duty-to-have-regard-to-conserving-biodiversity.

Government Circular 06/2005 states that Biodiversity Action Plan (BAP) species and habitats, 'are capable of being a material consideration…in the making of planning decisions'. Natural England therefore advises that survey, impact assessment and mitigation proposals for Habitats and Species of Principal Importance should be included in the ES. Consideration should also be given to those species and habitats included in the relevant Local BAP.

Natural England advises that a habitat survey (equivalent to Phase 2) is carried out on the site, in order to identify any important habitats present. In addition, ornithological, botanical and invertebrate

surveys should be carried out at appropriate times in the year, to establish whether any scarce or priority species are present. The Environmental Statement should include details of:

- Any historical data for the site affected by the proposal (e.g. from previous surveys);
- Additional surveys carried out as part of this proposal;
- The habitats and species present;
- The status of these habitats and species (e.g. whether priority species or habitat);
- The direct and indirect effects of the development upon those habitats and species;
- Full details of any mitigation or compensation that might be required.

The development should seek if possible to avoid adverse impact on sensitive areas for wildlife within the site, and if possible provide opportunities for overall wildlife gain.

The record centre for the relevant Local Authorities should be able to provide the relevant information on the location and type of priority habitat for the area under consideration.

2.6 Contacts for Local Records
Natural England does not hold local information on local sites, local landscape character and local or national biodiversity priority habitats and species. We recommend that you seek further information from the appropriate bodies (which may include the local records centre, the local wildlife trust, local geoconservation group or other recording society and a local landscape characterisation document).

Local Record Centre (LRC) in Norfolk please contact:

Norfolk Biodiversity Information Service (NBIS), (hosted by Norfolk County Council)
Community and Environmental Services
6th Floor, County Hall
Martineau Lane
NORWICH, NR1 2DH

Telephone: 01603 638027 Email: nbis@norfolk.gov.uk

3. Designated Landscapes and Landscape Character

Landscape and visual impacts
Natural England would wish to see details of local landscape character areas mapped at a scale appropriate to the development site as well as any relevant management plans or strategies pertaining to the area. The EIA should include assessments of visual effects on the surrounding area and landscape together with any physical effects of the development, such as changes in topography. The European Landscape Convention places a duty on Local Planning Authorities to consider the impacts of landscape when exercising their functions.

The EIA should include a full assessment of the potential impacts of the development on local landscape character using landscape assessment methodologies. We encourage the use of Landscape Character Assessment (LCA), based on the good practice guidelines produced jointly by the Landscape Institute and Institute of Environmental Assessment in 2013. LCA provides a sound basis for guiding, informing and understanding the ability of any location to accommodate change and to make positive proposals for conserving, enhancing or regenerating character, as detailed proposals are developed.

Natural England supports the publication *Guidelines for Landscape and Visual Impact Assessment*, produced by the Landscape Institute and the Institute of Environmental Assessment and Management in 2013 (3rd edition). The methodology set out is almost universally used for landscape and visual impact assessment.

In order to foster high quality development that respects, maintains, or enhances, local landscape

character and distinctiveness, Natural England encourages all new development to consider the character and distinctiveness of the area, with the siting and design of the proposed development reflecting local design characteristics and, wherever possible, using local materials. The Environmental Impact Assessment process should detail the measures to be taken to ensure the building design will be of a high standard, as well as detail of layout alternatives together with justification of the selected option in terms of landscape impact and benefit.

The assessment should also include the cumulative effect of the development with other relevant existing or proposed developments in the area. In this context Natural England advises that the cumulative impact assessment should include other proposals currently at Scoping stage. Due to the overlapping timescale of their progress through the planning system, cumulative impact of the proposed development with those proposals currently at Scoping stage would be likely to be a material consideration at the time of determination of the planning application.

The assessment should refer to the relevant National Character Areas which can be found on our website. Links for Landscape Character Assessment at a local level are also available on the same page.

Heritage Landscapes
You should consider whether there is land in the area affected by the development which qualifies for conditional exemption from capital taxes on the grounds of outstanding scenic, scientific or historic interest. An up-to-date list may be obtained at www.hmrc.gov.uk/heritage/lbsearch.htm.

4. Access and Recreation
Natural England encourages any proposal to incorporate measures to help encourage people to access the countryside for quiet enjoyment. Measures such as reinstating existing footpaths together with the creation of new footpaths and bridleways are to be encouraged. Links to other green networks and, where appropriate, urban fringe areas should also be explored to help promote the creation of wider green infrastructure. Relevant aspects of local authority green infrastructure strategies should be incorporated where appropriate.

Rights of Way, Access Land, and National Trails
The EIA should consider potential impacts on access land, public open land and rights of way routes in the vicinity of the development. Appropriate mitigation measures should be incorporated for any adverse impacts. We also recommend reference to the relevant Right of Way Improvement Plans (ROWIP) to identify public rights of way within or adjacent to the proposed site that should be maintained or enhanced.

5. Soil and Agricultural Land Quality
Impacts from the development should be considered in light of the Government's policy for the protection of the best and most versatile (BMV) agricultural land as set out in paragraph 170 of the NPPF. We also recommend that soils should be considered in the context of the sustainable use of land and the ecosystem services they provide as a natural resource, as also highlighted in paragraph 170 of the NPPF.

Soil and Agricultural Land Quality
Soil is a finite resource that fulfils many important functions and services (ecosystem services) for society, for example as a growing medium for food, timber and other crops, as a store for carbon and water, as a reservoir of biodiversity and as a buffer against pollution. It is therefore important that the soil resources are protected and used sustainably.

The applicant should consider the following issues as part of the Environmental Statement:

1. The degree to which soils are going to be disturbed/harmed as part of this development and whether ‘best and most versatile’ agricultural land is involved.

   This may require a detailed survey if one is not already available. For further information on the availability of existing agricultural land classification (ALC) information see www.magic.gov.uk.

Natural England Technical Information Note 049 - *Agricultural Land Classification: protecting the best and most versatile agricultural land* also contains useful background information.

2. If required, an agricultural land classification and soil survey of the land should be undertaken. This should normally be at a detailed level, eg one auger boring per hectare, (or more detailed for a small site) supported by pits dug in each main soil type to confirm the physical characteristics of the full depth of the soil resource, ie 1.2 metres.

3. The Environmental Statement should provide details of how any adverse impacts on soils can be minimised. Further guidance is contained in the *Defra Construction Code of Practice for the Sustainable Use of Soil on Development Sites*.

As identified in the NPPF new sites or extensions to new sites for peat extraction should not be granted permission by Local Planning Authorities or proposed in development plans.

6. Air Quality

Air quality in the UK has improved over recent decades but air pollution remains a significant issue; for example over 97% of sensitive habitat area in England is predicted to exceed the critical loads for ecosystem protection from atmospheric nitrogen deposition (England Biodiversity Strategy, Defra 2011). A priority action in the England Biodiversity Strategy is to reduce air pollution impacts on biodiversity. The planning system plays a key role in determining the location of developments which may give rise to pollution, either directly or from traffic generation, and hence planning decisions can have a significant impact on the quality of air, water and land. The assessment should take account of the risks of air pollution and how these can be managed or reduced. Further information on air pollution impacts and the sensitivity of different habitats/designated sites can be found on the Air Pollution Information System (www.apis.ac.uk). Further information on air pollution modelling and assessment can be found on the Environment Agency website.

7. Climate Change Adaptation

The England Biodiversity Strategy published by Defra establishes principles for the consideration of biodiversity and the effects of climate change. The ES should reflect these principles and identify how the development's effects on the natural environment will be influenced by climate change, and how ecological networks will be maintained. The NPPF requires that the planning system should contribute to the enhancement of the natural environment 'by establishing coherent ecological networks that are more resilient to current and future pressures' (NPPF Para 174), which should be demonstrated through the ES.

8. Cumulative and in-combination effects

A full consideration of the implications of the whole scheme should be included in the ES. All supporting infrastructure should be included within the assessment.

The ES should include an impact assessment to identify, describe and evaluate the effects that are likely to result from the project in combination with other projects and activities that are being, have been or will be carried out. **Note the 2 km Zone of Influence proposed under 15.2.22 may need to be extended in relation to bats, depending on the findings of the bat surveys for this scheme and the Norwich Western Link road.** The following types of projects should be included in such an assessment, (subject to available information):

a. existing completed projects **(eg Norwich Northern Distributor Road with regards to bats)**;
b. approved but uncompleted projects;
c. ongoing activities;
d. plans or projects for which an application has been made and which are under consideration by the consenting authorities; and
e. plans and projects which are reasonably foreseeable, i.e. projects for which an application has not yet been submitted, but which are likely to progress before completion of the development and for which sufficient information is available to assess the likelihood of

cumulative and in-combination effects. **In this context we would expect the proposed Norwich Western Link road**.

Norfolk County Council Comments on the:
A47 North Tuddenham to Easton – EIA Scoping Report

21 October 2019

1. General Comments

1.1. The County Council (CC) welcomes the opportunity to comment on the above Scoping Report. The comments below are made on a without prejudice basis and the County Council reserves the right to make further additional comments on the Development Consent Order (DCO) application during the statutory consultation periods and at the Public Examination stage.

1.2. The Environmental Impact Assessment (EIA) / Preliminary Environmental Information Report (PEIR) will need to assess the wider economic benefits arising from the above Road Improvement scheme both in terms of the scheme coming forward on its own and in combination with the other proposed A47 road schemes.

1.3. The remainder of this note sets out more detailed comments in relation to the County Council's statutory roles and responsibilities:

2. Transport Comments

2.1. Norfolk County Council supports the scheme objectives set out in Section 2.2.1.

2.2. The section at 2.4 is titled 'Proposed scheme description' and comprises a section of bullet points at 2.4.1, headed 'the proposed scheme is intended to…' These bullet points comprise a series of detailed points relating to some of the issues that have been considered in devising the scheme proposals. It is not considered that this section is either a scheme description or the objectives that the scheme is intended to address or achieve. Whilst the county council does not disagree with the statements in the bullet points, they are considered to be detailed considerations neither forming a scheme description nor a list of the important objectives or issues the scheme is designed to meet or address.

2.3. The timescales set out in 2.5 could benefit from being more specific.

2.4. The description of the project in Section 2.4 does not make it clear exactly what the proposals are (eg NMU provision, junction arrangements, proposals for changes to local road network). Because of this, it is also difficult to assess proposals to deal with impacts, such as those caused by diversions of traffic, not necessarily in the immediate vicinity of the proposed dualling scheme. Some of these impacts might affect areas outside of the area set out in Appendix A and B of the scoping report.

2.5. Without knowing the broader likely impacts of the proposal, including the diversion of traffic onto other roads during both construction and operation phases of the new asset, it is difficult to know whether the proposed areas to be assessed are correct. This comment applies to most if not all of the aspects proposed to be assessed including, but not necessarily limited to, air quality, cultural heritage, landscape, biodiversity, noise and vibration, and people and communities. If there is significant diversion of traffic during either operation or construction it could affect the assessment topics, particularly those listed above, some distance from the proposal and therefore outside of the areas proposed to be assessed.

2.6. Section 15.6.1, on cumulative effects, should also refer to the county council alongside the local planning authorities. The report should refer to the local planning authorities and not the local planning authority in the singular.

2.7. Should you have any queries with the above comments please call or email David Cumming (Strategic Transport Team Manager) on 01603 224225 or email david.cumming@norfolk.gov.uk.

3. Historic Environment Comments

3.1. The Scoping Report indicates that the chapter will incorporate an archaeological desk-based assessment and assessment of the setting impacts of the proposals. Whilst the Report highlights the potential for archaeologically significant peat deposits to be present within the valley of the River Tud, the assessment will need to consider all alluvial deposits with the Tud valley as any sand and gravel deposits present may have potential to contain important Palaeolithic artefactual and ecofactual remains. Aside from this, the proposed methodology for archaeological desk-based and setting assessments are satisfactory. However, no provision is made in the Scoping Report for any preapplication archaeological evaluation on any part of the proposed scheme area.

3.2. Section 6.10 of the Scoping Report concludes, the construction phases of the proposed scheme have potential to have, “direct impacts to palaeoenvironmental and archaeological remains”. The Report also acknowledges that the baseline archaeological data available in the Historic Environment Record does not represent a complete record of all heritage assets that may be present, only a record of those that have previously been identified and recorded. Consequently, potential exists for previously unidentified heritage assets of as yet unquantified significance to be present.

In view of this, further information about the presence and nature of heritage assets with archaeological interest within the scheme area will be required to support the DCO application. Norfolk County Councils Historic Environment Team requests that the area of the proposed scheme is initially subject to a geophysical (magnetometry) survey to establish a higher level of baseline evidence and allow a fully informed strategy for mitigating the harm to the historic environment to be formed prior to the determination of the application. The results of the geophysical survey should be fully integrated into the Cultural Heritage chapter of the environmental statement. It should be noted that the results of the geophysical survey may indicate a need for further intrusive investigations (evaluation trenching) prior to the DCO submission if

further clarification about the nature and significance of heritage assets is required.

3.3. Should you have any queries with the above comments please call or email Dr James Albone (Acting Historic Environment Team Leader) on 01362 869279 or email james.albone@norfolk.gov.uk.

4. Lead Local Flood Authority (LLFA) Comments

4.1 The LLFA have reviewed the Scoping Report and consider that the following issues should be considered and addressed:

4.2 The LLFA have had previous pre application discussions with Highways England and their consultants (SWECO) on 23 January 2018 to discuss three upgrades of the A47, this was followed up with another meeting between the consultants (SWECO), Lead Local Flood Authority (LLFA) and the Environment Agency (EA) on 24 May 2018 regarding the other schemes but not this scheme in particular. Several basic design standards, baseline data, historical data and how the LLFA and EA would work together were discussed. At the 24 May 2018, the LLFA and EA agreed that where a flood risk assessment would cover a ordinary watercourse where the EA would review the flood risk, the LLFA would input to ensure that any consent required on that watercourse (within the LLFA remit) would minimise the need for duplication of assessments. As there are several options of the road the scope of the need of collaboration of risk management authorities is currently unclear.

4.3 Whether or not an EIA/ES is required we consider that the following issues should be considered and addressed in appropriate detail and mitigation agreed at an early stage prior to preliminary design. This would be in conjunction with the Lead Local Flood Authority (LLFA) and other appropriate authorities prior to applying for a Development Management Order (DCO) and/or commencement of the scheme. We would welcome further opportunities for pre-application meeting or consultation with Highways England and their consultants.

4.4 The LLFA are aware of 3 reports of flooding in the media on the A47 between the roundabouts of Easton and Honingham (close to the junction of the C174 Taverham Road). These are in July 2014, Jan 2016 and 6 October 2019. Whilst the dualling scheme intends to upgrade the A47, it is likely to be sensitive to changes in local drainage and flood risk at certain locations. Any Flood Risk Assessment and Drainage Strategy should consider all historical information and Standards of design for all sources of flooding. This may influence the area of land needed for mitigation e.g. compensation or SuDS drainage features. The relative responsibilities between the flood risk management authorities should also be recognised i.e EA (main rivers) Lead Local Flood Authority (Ordinary Watercourses, Surface Water flooding, groundwater flooding and precipitation induced sewer flooding), Internal Drainage Board District – Norfolk Rivers IDB (watercourses and infrastructure within the boundary of their District) and Anglian Water (sewer flooding and Statutory Sewer Networks).

4.5 The LLFA strongly recommend that the EIA includes a flood risk assessment (FRA) / surface water drainage strategy to address the following.

- all sources of flood risk, including those from ordinary watercourses, surface water and groundwater to the development and how the development could influence changes in flood risk elsewhere.
- how surface water drainage from the development will be managed on-site and show compliance with National Standards by ensuring that Sustainable Drainage Systems (SuDS) are put in place and showing how close to greenfield runoff rates / volumes can be achieved for brownfield development.
- how any phasing of the development will affect the overall drainage strategy and what arrangements, temporary or otherwise, will need to be in place at each stage of the development in order to ensure the satisfactory performance of the overall surface water drainage system for the entirety of the development.

4.6 This supporting information would assess the potential for the development to increase the risk of flooding from the proposal or how surface water runoff through the addition of hard surfaces will be managed. It will show how this will be managed to ensure that the development does not increase flood risk on the site or elsewhere, in line with National Policy Statement for National Networks 2014 (particularly section 5.90 to 5.115). These policies are aligned with the new National Planning Policy Framework (NPPF) when considering all sources of flooding (section 5.92, 5.93, 5.97, 5.102 to 5.104) and technical standards for SuDS (section 5.100, 5.110 to 5.115). The LLFA expect that options for improvement to local flood risk and existing runoff rates can be made. The LLFA would expect to be consulted on these options.

4.7 In this particular case we would request evidence, commentary and appropriate information on:

- Assessment and mitigation of sources of fluvial (ordinary watercourse) flooding / surface water flooding originating from offsite that may affect the development / groundwater flooding.
    - Several of the options for the road cross Main Rivers and Ordinary watercourses and may require compensatory storage adjacent to the development. Land for any compensation should be scoped early to ensure it can be achieved by the development.
    - Several of the options for the road cross the EA Surface Water Risk of Flooding Map and design of the road should avoid these by e.g. creating dry culverts, mitigating any increase risk of flooding by the road or manage the water that may enter the road drainage scheme offsite by including additional catchment area into the road drainage scheme calculations. This may include additional land to provide this mitigation e.g. by reprofiling landscapes or provision or large SuDS features.
    - The risk of groundwater flooding will have to be appropriately assessed and mitigation provided e.g. avoid deep pilling that would effect groundwater flow paths or create new springs through the works (infiltration features or creating of long cuttings / embankments). The

SuDS scheme may have to consider where there is evidence of shallow groundwater (testing to be undertaken prior to applying for a DCO or preliminary design) infiltration may not be possible and lining of some drainage features may be required.
    - The maintenance of any agricultural or minor drainage features be maintained across the line of the A47.

- Sustainable Drainage Systems (SuDS) proposals in accordance with appropriate guidance including "Non-statutory technical standards for sustainable drainage systems" March 2015 by Department for Environment, Food and Rural Affairs. This will account for the development to increase the risk of flooding in nearby areas, the management of this risk and any additional surface water runoff caused by the addition of hard surfaces to ensure that the development does not increase flood risk on the site or elsewhere. We note that the Scoping Report by Highways England indicates that existing drainage would discharge to the same location at the same rates and volumes as existing, however the **LLFA expect that an assessment be made as part of this major scheme to return runoff rates and volumes as close to greenfield as possible (as per the National Standards S3,S5 and S6). Upgrades to water quality runoff through the provision of SuDS should also be considered as the LLFA understand that the River Tud and tributaries would be classed as sensitive and requiring additional treatment (as per the SuDS Manual National Guidance).** This may require additional land than scoped. We highlight that any drainage scheme should consider storing all flood events equivalent to and up to the 1% AEP flood plus 40% climate change (whilst 20% climate change may be stored in features, the 40% climate change scenario should also be run and any additional mitigation provided to prevent it leaving the development boundary).

- At least one feasible proposal for the disposal of surface water drainage should be demonstrated and supported by the inclusion of appropriate information. It is important that the SuDS principles and hierarchies have been followed in terms of:
    - surface water disposal location, prioritised in the following order: disposal of water to shallow infiltration, to a watercourse, to a surface water sewer, combined sewer / deep infiltration (generally greater than 2m below ground level),
    - the SuDS components used within the management train (source, site and regional control) in relation to water quality and quantity.
    - identifying multifunctional benefits including amenity and biodiversity

- The drainage strategy should also contain a maintenance and management plan detailing the activities required and details of who will adopt and maintain all the surface water drainage features for the lifetime of the development.

- We suggest that an assessment of the current standard of design and condition of the current drainage scheme is undertaken to inform the above

assessments.

4.8 Whilst the Scoping report highlights that the Design Manual for Roads and Bridges (DMRB – Highways Agency 2009) will be considered including for water quality assessment, we would request that consideration for the CIRIA SuDS Manual (C753 – 2015) is given. There is also a helpful document with practical design of drainage schemes during construction from CIRIA titled C768 - Guidance on the construction of SuDS (2017) and LLFA Guidance Document Version 3, April 2017.

4.9 Please note, if there are any works proposed as part of this application that are likely to affect flows in an ordinary watercourse outside the Internal Drainage Board area, then the applicant is likely to need the approval of the County Council. In line with good practice, the Council seeks to avoid culverting, and its consent for such works will not normally be granted except as a means of access. It should be noted that this approval is separate from planning.

4.10 Further guidance for developers can be found on our website at https://www.norfolk.gov.uk/rubbish-recycling-and-planning/flood-and-water-management/information-for-developers

4.11 Should you have any queries with the above comments please contact Elaine Simpson (Senior Flood Risk Officer) on 01603 638082 or email elaine.simpson@norfolk.gov.uk

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5. Minerals and Waste Comments

5.1 There are only small isolated areas of safeguarded mineral resources (sand and Gravel) occurring within the scoping boundary. It is considered that if the proposed route outline crosses any of these areas, normal highway construction methods would be capable of reusing any suitable material as part of any 'cut and fill' strategy.

As such the EIA needs to consider how the application will address potential mineral sterilisation in accordance with Policy CS.16 of the Norfolk Minerals and Waste Core strategy.

5.2 Should you have any queries with the above comments please contact Richard Drake (Senior Planner Minerals and Waste Policy) on 01603 222349 or email on richard.drake@norfolk.gov.uk

6. Environmental Comments

6.1 Ecology

6.2 The County Council considers that the environmental baseline data that is presented is broadly appropriate. Some preliminary ecology surveys have been completed to date (phase 1, water voles and bats). We consider the data collected to date is appropriate and we support the surveys that have been proposed for

2019. With the additional ecological work that is proposed, robust assessments of potential impacts will be able to be made. We have the following comments on the proposed contents of the biodiversity section (section 8) of the scoping report:

6.3 Methodology

- No justification of the chosen study areas (Zone of Influence) for each species has been provided. The study area boundary from the proposed scheme for bat activity is described as 100m. It should be noted that the Core Sustenance Zones for Barbastelle bats is 6km away and their moderate confidence in zone size. There is a known colony of bats known at Morton-on-the-Hill which is less than 6km from the site. Surveys undertaken in 2019 on behalf of Norfolk Council in relation to another potential highways scheme, have identified additional roosts for barbastelle in closer proximity to the proposed scheme. The scoping report also identifies 'the open arable landscape offers habitat for species such as noctules Nyctalus noctula and possibly common pipistrelles Pipistrellus pipistrellus to forage. Bat activity surveys have identified extensive noctule activity indicating that there may be a roost nearby. The woodland areas have potential to support species such as brown long-eared bats and barbastelle bats Barbastella barbastellus.'

6.4 Bats

- Transects only have been carried out in 2016 and 2017. We support the addition of static surveys in combination with the transect surveys in 2019. Best practice (Collins; 2016) recommends a combination of transects and static surveys.
- We recommend the use of infra-red/thermal imaging equipment when undertaking emergence surveys of the trees to obtain more accurate population counts, and the use of IR/TI is also important for identifying the height that bats cross the landscape and collision risk modelling.
- No collision surveys have been undertaken to-date. These surveys could be undertaken to provide a baseline against which changes post -construction can be measured. We would recommend the use of detector dogs, as these have been shown to be significantly more effective at searching for animals than human surveyors.

6.5 River Wensum Annex 11 species

The scoping report highlights 'Changes in water quality or hydrology have the potential to impact other qualifying features of the SAC, including brook lamprey and bullhead. Specific surveys are not proposed for these species, but the impact will be assessed within the HRA using the results of the hydrology assessment and implementation of appropriate mitigation. No sites suitable for brook lamprey spawning have been identified.' It is not clear how this assessment of suitable spawning sites was carried out.

6.6 The scoping report highlights 'The River Wensum SAC/SSSI is designated for the presence of the Annex II species; Desmoulin's whorl snail Vertigo moulinsiana. There was one record included within the study area (located in the River Wensum

SAC). This species may be relatively mobile and any within the area of the Proposed Scheme may be connected to the River Wensum population via the closest route (1.6km across land). There are a number of areas within the study area which may provide suitable habitat for Desmoulin's whorl snails and these were surveyed in the autumn of 2017. None were found.' These surveys were undertaken two years ago, update surveys will likely be necessary.

Terrestrial surveys were undertaken in 2017 and were proposed in 2019. Numbers vary between years and therefore they may not have been picked up in 2017 surveys. The scoping report states 'the study area for terrestrial invertebrates is within scoping boundary and targeted areas. The surveys must be carried out where there is suitable habitat and not just within the proposed scheme boundary.

6.7 Habitats Regulations Assessment

The scoping report highlights 'Design mitigation for International and European designated sites (River Wensum SAC) is outlined in the Habitats Regulations Assessment (HRA).'

The HRA needs to assess the road scheme in isolation and in-combination with other developments including road schemes proposed currently or in the future.

Biodiversity data collected needs to be suitable for use in biodiversity metrics for assessment of 'net gain' of biodiversity. A 'net gain' for biodiversity should be demonstrated using the Defra Metric.

We recognise that EcIA is an iterative process; the initial proposed scope of the EcIA may be modified following further ecological survey/research and during impact assessment.

6.8 **Landscape**

6.9 The baseline data which is provided in respect of landscape is broadly appropriate. The study area selected is considered suitable for both the content of the application and the context in which it sits, however it will be important for this to be flexible as receptors are identified throughout the process.

The data collected in relation to National Character Areas and Local Character Areas is appropriate and we note the recognition that the proposed scheme crosses district boundaries so is included in several Landscape Character Assessments. It will be important to acknowledge this change in landscape context throughout the assessment and for this to directly inform the landscape proposals along the route.

The potential for views of the scheme is extensive and that various residential properties and publicly accessible routes will be impacted on a visual scale. The assessment should fully consider these views and the impact they will have on visual amenity – and findings should inform decisions regarding design from the outset.

6.10 Suitable guidance and best practise has been referred to in terms of methodology including:

- DMRB Volume 11 Section 3 Part 5 Landscape Effects
- Interim Advice Note 135/10 (IAN 135/10) Landscape and Visual Effects Assessment
- Guidelines for Landscape and Visual Impact Assessment, Third Edition (Landscape Institute & IEMA, 2013)
- An Approach to Landscape Character Assessment (Natural England, 2014).

6.11 The proposed approach to undertake further consultation during the next stage of the process is appropriate. It will be important that the key viewpoints reflect all users which may be impacted visually by the scheme and that designs proposals are informed directly by the Landscape assessment.

We understand the ES assessment work will involve a ZTV, the methodology provided for undertaking this appear appropriate – it will be important for this to be verified on site.

The potential construction and operation effects suggested appear to come from robust investigation and reflect concerns we would share for effects on both the landscape and visual amenity and we agree that the scheme is likely to require a 'Detailed' level of assessment.

6.12 Should you have any queries on the above environmental comments please contact Emily Smith Green Infrastructure and Landscape Officer on 01603 224492 or email emily.smith2@norfolk.gov.uk

7. Emergency Vehicle Access

7.1 The EIA will need to consider the implications both during and after construction on emergency vehicle response times. Through the DCO application process the applicant will need to demonstrate that they have engaged thoroughly with all emergency service providers to ensure that the above proposal both during and after construction does not adversely affect emergency response times.

8 Socio-Economic

8.1 It would be helpful if the EIA/PEIR could provide accurate figures of those likely to be employed during construction of the road scheme. There should also be a statement as to whether the labour would be sourced from local firms or from further afield.

8.2 While Norfolk County Council recognises the likely economic benefits arising from the proposed road scheme once completed, it is felt that the EIA should consider the wider education, skills and employment opportunities during construction of the scheme. The County Council would therefore suggest that the applicant develops an Education; Skills and Employment Strategy which will form part of the DCO application to address the above issues. Such strategies have been taken forward with other NSIPs covering, for example, the offshore wind energy sector developments.

8.3 Should you have any queries with the above comments please contact the Norfolk County Council's Economic Development Manager - Dukes, David david.dukes@norfolk.gov.uk and/or the Employment and Skills Manager - Feeney, Jan jan.feeney@norfolk.gov.uk

From: Brown, Mark
To: A47 NorthTuddenham to Easton
Subject: TR010038- A47 North Tuddenham to Easton - EIA Scoping Notification and Consultation
Date: 25 September 2019 10:57:26

Dear Michael,

A47 North Tuddenham to Easton

Thank you for consulting Norwich City Council on the scooping opinion for the above scheme.

I can confirm that Norwich City Council do not wish to comment at this stage.

Kind regards

Mark

Mark Brown
Development Manager
Planning Services
Norwich City Council
t 01603 212542
m [redacted]
e markbrown@norwich.gov.uk

From: A47 NorthTuddenham to Easton [mailto:A47NorthTuddenhamtoEaston@planninginspectorate.gov.uk]
Sent: 23 September 2019 11:27
Subject: TR010038- A47 North Tuddenham to Easton - EIA Scoping Notification and Consultation

FAO: Head of Planning

Dear Sir/ Madam,

Please see attached correspondence on the proposed A47 North Tuddenham to Easton.

Please note the deadline for consultation responses is **21 October 2019**, and is a statutory requirement that cannot be extended

Kind Regards

Michael Breslaw
EIA and Land Rights Advisor

Major Applications & Plans

The Planning Inspectorate, Temple Quay House, Temple Quay, Bristol, BS1 6PN
Direct line: 0303 444 5092
Helpline: 0303 444 5000
Email: Michael.Breslaw@planninginspectorate.gov.uk

Web: infrastructure.planninginspectorate.gov.uk (National Infrastructure Planning)
Web: www.gov.uk/government/organisations/planning-inspectorate (The Planning Inspectorate)

Twitter: @PINSgov

From: John Walchester
To: A47 NorthTuddenham to Easton
Subject: TR010038-000026 A47 North Tuddenham to Easton EIA Scoping
Date: 16 October 2019 14:28:50

Dear sirs

Re letter requesting comments on proposed Scoping Opinion on the EIA for A47 North Tuddenham to Easton scheme, dated 23 September 2019
Your ref: TR010038-000026

Broadland District Council and South Norfolk Council jointly submit the following comments.

The Environmental Statement should include detailed information and consideration of potential effects on:

Climate;
Air Quality;
Water quality (particularly having regard to the River Wensum SAC and issues such as road drainage);
Historic environment (including cultural heritage, listed building and archaeology);
Landscape (including important views, trees, historic hedgerows) and have regard to the district landscape character assessment;
Biodiversity;
Geology & Soils;
Noise & Vibration;
People and Communities.

In considering the above, regard should be had to the different land uses in the area and how they might be impacted (including residential areas, agriculture and tourism) and to the interlinkages between the environmental topics.

In addition to the above general comments, it is requested that the following specific points made on the Highways England EIA Scoping Report September 2019 are also taken into consideration:

Para 1.4.1 lays out the main aims of the scoping report. Bullet point 4 states that one of the main aims is "To identify if there are opportunities for environmental enhancement" and we suggest that the reduction of traffic noise levels by the use of low noise surfacing and screening would obviously be a very worthwhile enhancement. We look forward to reviewing the existing and proposed noise map modelling.

-

5. Air Quality

Construction 5.7.1

It is agreed that coarse dust emissions are the most likely concern during the construction phase.
Modern, well maintained mobile plant and machinery should not give rise to harmful emissions but it is felt that the report should consider the possibility, especially, if for example, pumps or generators will be used for long periods close to sensitive receptors.

Operation 5.7.4

It is suggested that PM 2.5 should be added to the key pollutants

5.7.5

CO2 emissions are identified as a key pollutant for the operational phase and it suggested that the same should apply to the constructional phase

11 Noise and Vibration

11.9.3

The proposed (day time ?) fixed levels seem higher than what is reasonably achievable in all but the most challenging circumstances. It is suggested that "noise change" based assessments as detailed in BS5228 would be more appropriate.

Table 11-2

The table summarises LOAEL and SOAEL values. Please could an explanation be provided of how these figures are derived and comment on whether the recommendations of the WHO Environmental Noise Guidelines 2018 have been taken into account.

Yours faithfully

John Walchester
Spatial Planning Manager
t 01603 430622 e john.walchester@broadland.gov.uk

Two Councils One Team

Broadland District Council
Community at heart

South Norfolk COUNCIL

Suffolk County Council

Date: 21 October 2019
Enquiries to: Andy Rutter
Tel: 01473 263766
Email: andrew.rutter@suffolk.gov.uk

Michael Breslaw
The Planning Inspectorate
Temple Quay House
Temple Quay
Bristol
BS1 6PN

Dear Michael,

Application No: TR010038
Proposal: EIA Scoping Notification and Consultation.
Location: A47 North Tuddenham to Easton.

Thank you for consulting Suffolk County Council on the above application. The County Council raise **no objection** to the proposals but wish to make the following comments.

Following consultation with my Highways colleagues, Suffolk County Council support Highways England's planned improvements of the strategic road network. We also hope that similar levels of funding will be allocated to solve problems on the A11, A12 and A14 in Suffolk in the future.

Yours sincerely,

[redacted]

Andy Rutter
Planning Officer
Strategic Development

From:	Planning Department
To:	A47 NorthTuddenham to Easton
Subject:	A47 North Tuddenham to Easton - Scoping Consultation - WMA Response
Date:	02 October 2019 14:40:15

WMA Ref: 19_01859_Q
Your Ref: TR010038-000026

Dear Sir / Madam

Thank you for your consultation on the above. We have reviewed the available information and wish to make the following comments.

As acknowledged by the applicant, please be aware that the site is partially within the Internal Drainage District (IDD) of the Norfolk Rivers Internal Drainage Board (IDB) and so please be aware of the Board's Byelaws. The Byelaws for the Board are available on the development pages of our website (https://www.wlma.org.uk/uploads/NRIDB_Byelaws.pdf). Maps of the Board's IDD are also available online (https://www.wlma.org.uk/uploads/179-NRIDB_Index.pdf). These maps also show which watercourses have been designated as 'Adopted Watercourses' by the Board. The adoption of a watercourse is an acknowledgement by the Board (under permissive powers) that the watercourse is of arterial importance to the IDD and as such will normally receive maintenance from the Board. This maintenance is not necessarily carried out on an annual basis but on a recurrence deemed necessary to meet water level management requirements.

We recommend that any Environmental Statement includes a flood risk assessment (FRA) which considers not only the how surface water drainage will be managed on site but also the impact of any positive discharge of surface water resulting from the proposed development (if a strategy wholly reliant on infiltration does not prove viable). This assessment should include a consideration of the volume of the proposed discharge as well as the discharge rate.

Please also be aware that if a surface water (or treated foul water) discharge is proposed to a watercourse within the IDD (either directly or indirectly), then the proposed works may require a land drainage consent in line with the Board's Byelaws (specifically byelaw 3). Any consent granted may be conditional, pending the payment a surface water development contribution fee, calculated in line with the Board's charging policy (https://www.wlma.org.uk/uploads/WMA_Table_of_Charges_and_Fees.pdf).

Kind Regards,

Cathryn

Cathryn Brady

Flood and Water Officer (Planning / Enforcement)
t: [redacted] | **e:** cathryn.brady@wlma.org.uk | **e:** planning@wlma.org.uk

Water Management Alliance
Kettlewell House, Austin Fields Industrial Estate, King's Lynn, Norfolk, PE30 1PH, UK
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www.wlma.org.uk

Consisting of Broads Drainage Board, East Suffolk Drainage Board, King's Lynn Drainage Board, Norfolk Rivers Drainage Board and South Holland Drainage Board in association with Pevensey and Cuckmere Water Level Management Board