A66 Northern Trans-Pennine Project

TR010062

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case)

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

CONTENTS

1. INTRODUCTION

1.1 This document summarises the oral submissions made by National Highways (the "**Applicant**") at Issue Specific Hearing 2 (**"ISH2"**) dealing with the Environmental Management Plan (the **"EMP"**), other environmental matters, the draft Development Consent Order (the **"DCO"**) and Brough Hill Fair, held on 1 December 2022 in relation to the Applicant's application for development consent for the A66 Northern Trans-Pennine Project (the "**Project**").

1.2 ISH2 was attended by the Examining Authority (the "**ExA**") and the Applicant, together with a number of other Interested Parties.

1.3 Where the ExA requested further information from the Applicant on particular matters, or the Applicant undertook to provide further information during ISH2, the Applicant's response is set out in or appended to this document.

1.4 This document does not purport to summarise the oral submissions of parties other than the Applicant, and summaries of submissions made by other parties are only included where necessary in order to give context to the Applicant's submissions in response.

1.5 The structure of this document follows the order of items as set out in the agenda for ISH2 dealing with matters relating to the Project (the "**Agenda**"), published by the ExA on 22 November 2022. Numbered items referred to are references to the numbered items in the Agenda.

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2. WRITTEN SUMMARY OF THE APPLICANT'S ORAL SUBMISSIONS

2.0 Environmental Management Plan (EMP) [APP-019]	
2.1 Justification of Approach	
Agenda Item	**The Applicant's Response[1]**
The ExA firstly ***wishes to understand whether the EMP should be secured by way of an Article having regard to s120 of the Planning Act 2008.***	In response to the **ExA's** initial query as to whether any other DCO had secured an Environmental Management Plan (or similar document) by way of an article in a DCO, rather than a requirement in a schedule to a DCO, **Robbie Owen, for the Applicant**, confirmed that the Project would be the first time such an approach had been taken. **Mr Owen** confirmed that whilst this approach is different in its form, the substance remains the same. Ultimately, where in a DCO compliance with the EMP (or indeed any other matter) is secured has no bearing from a legal, and therefore enforceability, perspective. Whilst the approach might 'look and feel' different, the result is the same – the whole of a DCO is enforceable in the same way.
The ExA wishes to better understand why the Applicant considers the EMP approach contained within a singular document is justified as opposed to the conventional way of securing matters by individual Requirements.	The **ExA** then queried why the Applicant's approach was better when compared to that which has been followed by DCOs before. In response, **Mr Owen** confirmed that the Applicant has considered ways in which project delivery could be streamlined and made easier for all parties/participants in the process, including in respect of post-consent determinations. He acknowledged that the use of requirements are 'the norm' for DCOs, but there is no legal requirement to follow this approach. **Mr Owen** explained that it is very common for a DCO to secure mitigation both via certified documents and by way of requirements on its face. He submitted that the consequence of this is that it is inevitably difficult for participants in the process (promoters, consultees and contractors) to navigate through the suite of documents that set the project controls, therefore hampering timely delivery of vital projects (and therefore their public benefits).
The ExA also wishes to better understand why, in the context of the following DCOs, the approval role of the Secretary of State (SoS), in terms of the scrutiny and regulation of actions carried out under the EMP, has been taken out	Having regard to this all of this, **Mr Owen** explained that the Applicant considered that there was merit in modifying the approach/framework for securing mitigation, whilst in no way altering the substance (i.e. the robustness of the measures and how they are secured). He confirmed that this gave rise to the approach taken in the drafting of the draft DCO [Document Reference 5.1, APP-285] and the first iteration EMP [APP-019], with a view to a second iteration EMP (approved post-consent) being the 'single source of truth' for all controls for the Project – in effect, a mitigation bible. It 'standardises', for example, the approach taken to consultation, determination and other matters to take place after the DCO has been granted, whilst in no way diluting the effectiveness of the mitigation secured. **Mr Owen** reiterated that this approach would aid project delivery, particularly having regard to the current position on DCOs, which can be unclear as a result of numerous requirements and commitments being contained within a

[1] It should be noted that this response is summarised in the order in which the points were made at ISH2. As such, it does not always match exactly with the agenda items in the first column (and it is for that reason, those agenda items have been grouped together to give an indication as to the broad topics explored).

of the end of the consultation processes between the undertaker and statutory environmental and other bodies. These other DCOs are: • ***the A47 Blofield to North Burlingham made DCO;*** • ***the M25 Junction 28 made DCO; and*** • ***the A12 Chelmsford to A120 Widening Scheme which is in the Pre-examination stage.*** ***The above made Orders and draft Order include separate Requirements related to protected species, surface water drainage, landscaping, trees, contaminated land and groundwater, archaeological remains and traffic management. The ExA wishes to know whether the Applicant is aware of any delays to projects that have resulted from any previous DCO***	schedule to a DCO. Each requirement necessitates various approvals and consultation processes and can relate to additional documents, resulting in complexity. Indeed, **Mr Owen** explained that the current 'standard approach' does also not provide an explanation as to *how* specific consultations ought to take place. He went to on to explain that whilst the concept of requirements has not been an outright barrier to the delivery of projects, it can be said to have impeded *timely* delivery. **Mr Owen** concluded by stating that the Applicant has not opted to depart from the standard approach lightly, but it is considered a distinct improvement in form (but not substance) by providing a singular codified regime to the securing of mitigation, applicable to all relevant parties. Following on from this, the **ExA** queried whether the Applicant had any examples of requirements impeding the timely delivery of a project. **Mr Owen** explained that the Applicant has promoted and implemented a number of DCOs and the main challenges it faces are in terms of receiving consultation responses related to the discharge of requirements in a timely manner. He explained that there are material contrasts across the Applicant's portfolio of projects. Some consultees provide responses within weeks, so discharge of these matters is timely, but others provide comments after several months. **Mr Owen** made the further point that delays can occur even when there is, effectively, only a single scheme being promoted, rather than the multiple schemes comprising the Project. He went on to explain that there is a risk that the complex context of the Project will heighten the likelihood of delay if there is no clear and consistent consultation framework. The **ExA** queried in this context how the consultation process set out in the first iteration EMP would help resolve these issues. In response, **Mr Owen** summarised the consultation process as follows: a) The Applicant must give prescribed consultees advance notice of being sent materials and they then have 20 working days in which to provide comments; b) The Applicant's principal contractor(s) ("**PC**") must take into account any comments and revise the consultation materials (and compile a report (Summary Report) setting out how the comments have been taken into account); c) The consultees are then given a second chance to provide comments on the revised consultation materials and Summary Report within a 10-working day period; and d) Those comments must then be again considered by the PC in making any further updates to the materials prior to submission for approval (such submission must also include an updated Summary Report). **Philip Carter, for the Environment Agency**[2], queried whether it would be possible to weave in a degree of informal engagement prior to the formal consultation provisions 'kicking in' under the first iteration EMP. **Mr Owen** confirmed that the Applicant would give that point further consideration.

[2] It is noted this point was made later in the agenda, but has been included here for ease of navigation.

mechanisms through the use of separate Requirements.	***Post hearing note:*** *As set out at ISH2, the Applicant considers one of the key advantages to its proposed approach to the EMP is for there to be a consistent and clear programme and process for dealing with consultation with prescribed bodies as part of post-consent determinations. It is considered that is to the advantage of both the Applicant and those prescribed bodies, in terms of clear understanding and expectations.* *However, it is also recognised by the Applicant that the proposed timescales for consultation could be challenging for consultees in certain circumstances. For that reason, the Applicant has been giving consideration to mechanisms that could be deployed to mitigate these challenges but which avoid diluting the purpose and advantages of the prescribed process and timescales. As such, the Applicant proposes to introduce the following two elements into the first iteration EMP in the next draft submitted to the examination:* *1. a formal commitment that the Applicant (and its principal contractors) will set up and run regular engagement meetings (or 'forums') with the prescribed consultees, with the aim of providing as much visibility on materials coming to those consultees for consultation as practicable; and* *2. amendments to the consultation process, such that the Applicant would be able to agree a longer consultation period with a consultee where circumstances justify it. Such circumstances would need to be considered on a case-by-case basis.* *Its acknowledged that the Applicant has previously indicated that a revised draft of the first iteration EMP would be submitted at Deadline 2. However, having now considered the Examination timetable published in the ExA's Rule 8 letter, dated 8 December 2022, the Applicant intends to submit a revised draft of the first iteration EMP at Deadline 3, to ensure it has sufficient time to consider and action (as appropriate) relevant comments made in any written representations, Local Impact Reports and as part of on-going engagement with various parties.* **Mr Owen** further explained that a DCO typically provides some detail of the discharge process within Part 2 of Schedule 2 (the usual schedule within which requirements are found), but this is usually in relation to the process applied to the discharge of matters by the Secretary of State (i.e. *after* details have been submitted for approval), rather than consultation *prior to* the submission of details for approval. As such, DCOs do not typically explain how this 'prior' consultation ought to take place in terms of process or timescales. In the case of the Project, the first iteration EMP would clearly set out this process and timescales, which can only be to the advantage of all parties. **Mr Owen** further stated that, as a result, the benefit of the Applicant's approach is therefore not limited to the EMP acting as a single source of truth for mitigation requirements, but in being clear as to how consultation must take place, and the obligations on various parties in ensuring that the Project is delivered in a timely manner. The **ExA** sought to further understand the legal difference between an article and a requirement within a DCO. **Mr Owen** explained that 'requirement' is a term given to a provision of a DCO that is akin to a planning condition under

	the conventional town and country planning regime – it often refers to paragraph numbers within a schedule to a DCO. Although DCOs are divided into a 'front end' (containing articles), and schedules, every provision is part of the DCO and has equivalent status, irrespective of whether it is contained within an article or in a schedule. To reiterate this point, **Mr Owen** quoted paragraph 16.1 of the Planning Inspectorate's Advice Note 15, which states: *"An application may have significant adverse environmental effects that require mitigation; such effects will be identified in the accompanying ES and/ or relevant environmental information. Any mitigation measures relied upon in the ES must be robustly secured and this **will generally** be achieved through Requirements in the draft DCO. Mitigation that is identified in the ES as being required must also be clearly capable of being delivered"* (emphasis added). **Mr Owen** explained that, as a result, it is clear that requirements are not the only way to secure and therefore ensure the implementation of mitigation. He further explained that given the proposed approach that the EMP acts as a single source of truth in terms of mitigation requirements, the Applicant took the view that it would be more appropriate for the relevant obligations to sit as an article in the main body of the DCO, rather than there being only a few requirements in a requirements schedule (the same rationale applies to articles 54 and 55, as well as article 53). **Mr Owen** stated that the Applicant considers this approach appropriate having regard to, for example, the *Office of the Parliamentary Counsel Drafting Guidance* (June 2020) which states that, in relation to Bills (but the principle of which applies to DCOs as Statutory Instruments, too): "*Schedules can assist clarity by providing a home for material that would otherwise interrupt and distract from the main story you are trying to tell*" but "*relegating text to the end of the Bill may not always help the reader. It may break up the story you are telling; or make the structure of the Bill more complicated than it needs to be. So don't dispatch material to Schedules without good reason…*" The Applicant submits that there is no good reason in this case, for the reasons mentioned above. **Mr Owen** again reiterated that whilst the approach the Applicant is taking on the Project is different to the usual approach taken on DCOs, the substance of it is the same, both in content and, importantly, legal effect. The **ExA** then made reference to the A12 Chelmsford to A120 Widening Scheme (currently in the pre-examination stage) and the approach taken in that project to the securing of mitigation. **Mr Owen** noted that the Project is much larger than the A12 scheme, so there is more justification for a novel approach being taken (particularly having regard to Project Speed which applies to the Project). He further explained that DCOs are constantly evolving and in the interests of making them widely accessible and more transparent, there could be a reduction in the use of requirements, in future.

	Mr Owen concluded by clarifying that the entirety of the DCO contains a mixture of powers and duties. Article 53 of the draft DCO [Document Reference 5.1, APP-285] contains clear duties which the Applicant must comply with. He emphasised that compliance with these duties is a statutory duty which, if disregarded, amounts to a criminal offence under the Planning Act 2008 and can thus be enforced. The **ExA** took comments from Interested Parties and some concerns were raised (including by **Louise Staples for the National Farmers Union** and **Dr Mary Clare Martin**) on the timescales provided for in the consultation process set out in the first iteration EMP (and whether those are now approved). **Mr Owen** and **Kerry Whalley, leading on EMP matters for the Applicant** confirmed that the timelines for consultation are contained within the current draft of the first iteration EMP. They explained that the Applicant is envisaging to submit at least one further version of the first iteration EMP during the examination. **Mr Owen** explained that the Applicant would consider the timescales in the consultation process but confirmed that the Applicant was not committing to amend them. ***Post hearing note:*** *The Applicant has provided a further explanation as to the legal basis for its approach in Appendix 1 of this document. That explanation also includes a link to the Office of the Parliamentary Counsel Drafting Guidance (June 2020) cited above.*
2.2 The Approvals Process	
Agenda Item	**The Applicant's Response[3]**
The ExA wishes to better understand the approvals process of the EMP. The ExA will ask the Applicant to take us through step by step how each part of the EMP will be approved. The ExA will wish to examine how subsequent changes to the EMP are to be made, and how these have the potential to	**Drafting points on article 53 of the draft DCO** Prior to exploring the approvals process under the EMP, the **ExA** sought to understand the rationale behind specific drafting points within article 53 of the draft DCO [Document Reference 5.1, APP-285]. In response to a query from the **ExA** as to whether article 53 should include definitions for the second iteration EMP and third iteration EMP **Robbie Owen, for the Applicant** stated that the Applicant would consider this further. ***Post hearing note:*** *The Applicant has considered the ExA's helpful suggestion as to whether article 53 of the draft DCO would benefit from new definitions being added for "a second iteration EMP" and "a third iteration EMP". The Applicant has concluded that whilst arguably not strictly necessary, it can see the merits in including such definitions for ease of interpretation. As such, these will be added to the next draft of the DCO submitted into the examination.*

[3] It should be noted that this response is summarised in the order in which the points were made at ISH2. As such, it does not always match exactly with the agenda items in the first column (and it is for that reason, those agenda items have been grouped together to give an indication as to the broad topics explored).

affect the need and conclusions of the HRA and the Appropriate Assessment having regard, for example, to EMP Commitment MW-BD-15. Questions are likely to follow. ***The ExA may also wish to examine the quantum of annex plans supporting the EMP and in particular the absence of a Code of Construction Practice plan.*** ***The ExA will seek the views of Interested Parties in particular the Environment Agency, Historic England and Natural England having regard to the respective PADSS submissions [AS-004, AS-005 and AS-006].***	In response to a query from the **ExA** as to whether article 53 should further define what a 'part' of the authorised development is, **Mr Owen** explained that article 53 of the DCO has been drafted to allow the Project approvals for a second iteration EMP to be sought on a scheme-by-scheme basis, but this is not yet confirmed. **Kerry Whalley, for the Applicant** further explained that the EMPs (all iterations) are intended to be a single source of truth for mitigation, to establish consistency across the Project in terms of the delivery of mitigation. The intention behind the first iteration EMP is to specify the intended environmental outcomes that need to be achieved for the Project. Where specific mitigation must be achieved in a certain way, that is identified within this first iteration EMP. **Ms Whalley** explained that a second iteration EMP would set out *how* these environmental outcomes will be achieved, with more detail on the specific measures to be implemented. The second iteration EMPs may be split on a scheme-by-scheme basis (as opposed to topic by topic, for example) – meaning one second iteration EMP would be produced and submitted for approval for each scheme, but this cannot yet be confirmed until the contractors have confirmed the favoured approach. **Ms Whalley** stated that some mitigation will only apply to certain geographical areas (so wouldn't necessarily be in all second iteration EMPs submitted for approval) but noted that if particular mitigation is not brought forward within a second iteration EMP, this will need to be robustly justified. Finally, Ms Whalley explained that a third iteration EMP is effectively an operational EMP, which will set out how the road will be operated to comply with the on-going mitigation required to be implemented. In response to a query from the **ExA** as to how sufficient regulation would be put in place to ensure justification *is* provided where certain mitigation is not considered to be necessary for inclusion in a second iteration EMP, **Mr Owen** confirmed that justification must be provided to the Secretary of State and would be considered as part of the approval process required by article 53 of the draft DCO. ***Post hearing note:*** *Having considered whether the references to 'part of the authorised development' in article 53 of the draft DCO should be amended to refer to 'scheme', the Applicant does not propose to make any revisions to the drafting.* *Whilst it may be the case that the relevant principal contractors will develop a second iteration Environmental Management Plan on a scheme-by-scheme basis, it could also be the case that it is considered more efficient to 'group' schemes together or, even, develop more than one second iteration Environmental Management Plan per scheme, depending on the complexities and approach taken. At present, this level of detail is simply not known, and a degree of flexibility is required within the DCO.* *For this reason, it is also difficult at this stage to provide further clarity on what a 'part of the authorised development' could be in practice. However, the key point to note in all of this is that regardless of how many 'parts' the authorised development is split into, works on any 'part' cannot commence until a second iteration Environmental Management Plan clearly relating to that part has been approved by the Secretary of State. In other words, no 'part' of the Project*

	can be started until a second iteration Environmental Management Plan that covers, and relates to, that 'part' can be commenced. Integral to this will be for the Applicant to ensure as part of any submission seeking approval of a second iteration Environmental Management Plan, that the Secretary of State will have sufficient certainty as to what 'part' such submission is seeking to cover (and therefore what 'parts' are not covered). *It should also be noted that including references to a 'part of the authorised development' is by no means unusual for DCOs and that formulation has been approved by the Secretary of State in a number of recently made DCOs. For example, The A57 Link Roads Development Consent Order 2022 (e.g. Paragraph 4 of Part 1 of Schedule 2), The A417 Missing Link Development Consent Order 2022 (e.g. Paragraph 3 of Part 1 of Schedule 2), The A428 Black Cat to Caxton Gibbet Development Consent Order 2022 (e.g. Paragraph 3 of Part 1 of Schedule 2), and The Manston Airport Development Consent Order 2022 (e.g. Paragraph 6 of Part 1 of Schedule 2). As such, the approach taken by the Applicant in respect of the draft DCO is well precedented.* In response to a query from the **ExA** as to why the second iteration EMP cannot be brought forward during the examination, **Mr Owen** clarified that the current draft of the first iteration EMP has been produced to reflect the level of detail, in respect of design and planning, that is currently available in respect of the Project. This will naturally evolve and develop over time post consent (should the DCO be granted). **Ms Whalley** explained that some of the management plans (contained in annexes to the EMP) draw heavily on the environmental assessment undertaken or surveys that have been completed to date (Annex B3 Detailed Heritage Mitigation Strategy [Document Reference 2.7, APP-023] is one example) and are developed in the DCO application to a relatively high level of detail based on the understanding of the baseline and the required mitigation. Other plans (for example, Annex B14 Site Establishment Plan [Document Reference 2.7, APP-034]) are heavily dependent on the detailed design, construction planning or specific construction methodologies that will be implemented by the contractors. These will need to be developed in detail by the contractor at a later date, to specify how the outcomes required by the EMP will be delivered. The **ExA** questioned why consultation with local authorities and statutory bodies had seemingly been omitted from article 53 of the draft DCO. **Mr Owen** explained that it is provided for within article 53(2)(b) which requires the second iteration EMP to be *"prepared in accordance with the consultation and determination provisions"*. These 'consultation and determination provisions' are defined in article 53(10) as the provisions contained in paragraphs 1.4.9 to 1.4.51 of the first iteration EMP. **Mr Owen** explained that they set out the matters on which consultation is required and the procedures that apply to the conduct of that consultation. He concluded that the Applicant is therefore under specific obligations to consult before submitting the second iteration EMP to the Secretary of State for approval. Moreover, **Mr Owen** pointed out that the Secretary of State is also able to consult with any relevant parties before making a determination, at their discretion.

	The **ExA** raised further drafting queries in relation to article 53, specifically around the use of: a) "substantially based"; b) "materially new or materially worse adverse environmental effects"; and c) "in comparison with". In response to (a) above, **Mr Owen** explained that "substantially based" provides the necessary flexibility required without 'loosening' the wording, given the current stage of project development. **Mr Owen** referenced paragraph 4(1) of Schedule 2 of the A57 Link Roads Development Consent Order 2022, which uses broadly similar wording – "*substantially in accordance with"* to demonstrate that a variety of wording has been used and accepted previously (albeit acknowledging this formulation was different to that contained in article 53). **Mr Owen** confirmed that the Applicant would reflect on the use of this wording. ***Post hearing note:*** *The Applicant has reflected on the use of this wording and acknowledges it is a departure from recently made DCOs. As a result, it proposes to amend 'substantially based' to 'substantially in accordance with', to reflect those DCOs. This change will be made in the next draft of the DCO submitted into the examination at deadline 2.* Turning to (b), **Mr Owen** stated this wording has been used throughout the draft DCO (articles 2(1) (in the definition of "maintain"), 7(6), 53(2)(a) and 53(5)(b), 54(2) and as a qualifier to the list of ancillary works within Schedule 1 to the draft DCO). He explained that the purpose of this phrase is to provide a limited degree of flexibility whilst ensuring the Project could not give rise to likely significant environmental effects that are worse (or in addition to) those reported in the Environmental Statement. The general principle of this degree of flexibility is very well precedented. **Mr Owen** acknowledged that the Applicant is aware that the Secretary of State's preferred formulation for this mechanism has been "materially new or materially different environmental effects…" to date. He further acknowledged that when alternative formulations, including the Applicant's preferred formulation included in the draft DCO, have come before the Secretary of State for determination, they have *generally* opted to revert to the preferred formulation. Despite this, **Mr Owen** explained that the Applicant remains of the view that the formulation "materially new or materially worse adverse environmental effects" is appropriate and has merit. He explained that ultimately, reverting to the 'standard' formulation would prohibit beneficial environmental effects being achieved. **Mr Owen** submitted that if a better environmental effect can be delivered by the detailed design, it should not be prohibited by the DCO. He also explained that in assessing what is "materially worse" versus "worse", environmental experts

	are well-placed to make this distinction, which ultimately provides an appropriate degree of flexibility to allow necessary amendments at the detailed design stage. However, again, **Mr Owen** confirmed that the Applicant would reflect on the use of this wording. ***Post hearing note:*** *The Applicant has reflected on both the use of 'worse' and 'adverse' in the wording used in the draft DCO.* *Turning first to the use of 'worse', whilst the Applicant acknowledges that made DCOs have in the past used 'different', the Secretary of State has recently approved the use of 'worse' in the A57 Link Roads Development Consent Order 2022. The intention of this provision in the draft DCO is to ensure that the Project does not give rise to any materially worse effects than those reported in the Environmental Statement. However, should the word 'different' be used instead, this puts the Applicant in a position, where, faced with an opportunity to produce a materially better environmental outcome it would have to weigh the benefit of delivering that better environmental outcome against the significant programme delay and cost of seeking an amendment to the DCO. Given that the project is proceeding under the Project Speed initiative, with a view to significantly reducing the construction phase, then it is highly likely that it would not be possible to accommodate the programme delay caused by the need to seek an amendment. As a result, unless the DCO contained the Applicant's preferred wording the opportunity to deliver the environmentally better outcome would be lost. Given the very sensitive environment in which the project is situated, the Applicant considers it cannot be in the public interest to place barriers in the way of delivering improved environmental outcomes – this would appear to be a perverse outcome.* *This same principle is also behind the Applicant utilising the word 'adverse' in the draft DCO. The reason for that is that simply precluding 'materially new' environmental effects could have the result of preventing materially new positive environmental effects arising out of detailed design. As such, the use of the word 'adverse' ensures that only 'materially new adverse' environmental effects would be precluded.* *Ultimately, the Applicant wishes to ensure that whilst the environmental effects of the Project cannot materially worsen the situation as reported in the Environmental Statement, there is scope for material improvements to be achieved if practicable, in a timely fashion.* In respect of (c), **Mr Owen** stated that the effect of the proposed formulation was to tie and compare the relevant 'revised' effects to those reported in the Environmental Statement, but committed the Applicant to considering this further.

	Post hearing note: *The Applicant has again re-considered the use of this wording in light of the ExA's comments but does not propose to amend it in the draft DCO.* *Having considered recent precedents to ensure the draft DCO is not inconsistent, it is apparent that the Applicant's formulation has recently been approved by the Secretary of State in the A57 Link Roads Development Consent Order 2022, illustrating that this drafting is acceptable in policy, as well as legal, terms (it has also been included in other DCOs made over the past year, such as the M54 to M6 Link Road Development Consent Order 2022 and the M25 Junction 28 Development Consent Order 2022).* **Construction methods** In response to a query from the ExA as to whether a second iteration EMP could and should include easily digestible information on construction methodology and management (similar to a document that covered those issues published as part of the Project's statutory consultation), **Ms Whalley** explained that the document presented at statutory consultation was illustrative, to provide examples of how certain aspects of the construction *could* be constructed. It therefore fulfilled a different purpose at that stage. She further stated that details on construction methods are not available at this stage but would be included as part of a 2nd iteration EMP, including within the various management plans, strategies and method statements. As such, the Applicant does not consider that a separate 'construction method statement' or similar is required to be included as part of a second iteration EMP, given it would be repeating information contained elsewhere. However, **Ms Whalley** confirmed the Applicant would consider this point further. ***Post hearing note:*** *The Construction Method and Management Statement (**CMMS**) referenced by the ExA was a document issued for the purposes of statutory consultation, produced to provide consultees with an illustration of what the construction might involve and how it might be experienced by the local communities. The Applicant has, since ISH2, reflected on the points raised by the ExA and particularly on what is already included in the first Iteration EMP and what the addition of such a statement might deliver in terms of benefits to the public and local communities.* *The core information that would be contained in a CMMS or similar is already included in the first Iteration EMP [Document Reference 2.7, APP-019] and will be built on and provided in more detail in the second Iteration EMP (that will be subject to approval by the Secretary of State) For example, the Site Establishment Plan (commitment ref D-GEN-08) will provide detail on the site compounds and storage areas, including access routes, the Construction Traffic Management Plan (commitment ref D-GEN-10) will provide detail on the proposed construction traffic routes and the traffic management proposed on the main A66 and local roads, and the Air Quality and Dust Management Plan (commitment ref D-AQ-01) will identify key risk areas for dust and set out detail of dust control measures that will be*

	implemented. In addition, the four method statements required at Annex C of the first iteration EMP (commitment ref D-GEN-07) will provide detailed construction methods at particularly sensitive locations. *The Applicant recognises the point raised by the ExA that some of this information will be highly technical and summary 'public facing' information could potentially make it more accessible to the public and local communities. However the Applicant is concerned that having such a document as an approval document sitting alongside or as part of the second iteration EMP creates the potential for repetition and, more concerningly, confusion or inconsistency.* *It is worth noting in this context that a further commitment within the first iteration EMP (at commitment ref D-PH-02) is that a Community Engagement Plan must be prepared as part of the second iteration EMP, which would set out the processes and forms of engagement that must take place during construction. Having regard to the points raised by the ExA, the Applicant proposes that this commitment is expanded to include specific commitments regarding the type of information that must be provided to local communities as part of this Plan to help communities understand construction methodologies to be employed in their area. The proposed addition to the list of bullet points (and thus which must be included in a Community Engagement Plan submitted for approval as part of a second iteration EMP) at commitment D-PH-02 is:* 1. *Details of the information that will be produced by the contractors and shared with members of the public through the engagement channels specified which shall, as a minimum, include public facing information about the construction planned in each local area such as working hours, details of any activities which would be expected to be particularly noisy, description of the types of construction activities the public would be expected to see in the local area and construction traffic routes.* **<u>Archaeological mitigation</u>** The ExA queried how, in practice, the 'carve out' in the definition of 'start' in relation to archaeological mitigation works would operate, given this does not appear to align with when an approved Detailed Heritage Mitigation Strategy would be in place. **Ms Whalley** confirmed that the intent is to allow some minor works relating to archaeological survey or investigations to take place in advance of start of the main works. However, **Ms Whalley** confirmed that the Applicant would consider this point further. ***Post hearing note:*** *The Applicant has, since the Hearing, reflected again on the wording of the carve out definition of start of works contained within the Environmental Management Plan (EMP). The Applicant recognises the overlap with commitment reference D-CH-01. In response to this issue, the Applicant proposes that the start of works definition is amended to remove the reference to an approved Detailed Heritage Mitigation Strategy (**HMS**). The amended definition would read:*

	"start" means beginning to carry out any material operation as defined in section 56(4) (time when development begun) of the Town and Country Planning Act 1990 that forms part of the authorised development other than archaeological investigations and mitigation works ~~carried out in accordance with an approved Detailed Heritage Mitigation Strategy (D-CH-01) for those works~~, ecological surveys and mitigation works, investigations for the purpose of assessing and monitoring ground conditions and levels, remedial work in respect of any contamination or other adverse ground conditions, erection of any temporary means of enclosure, receipt of construction plant and equipment, erection of construction plant and equipment and the temporary display of site notices or information. *This change will be incorporated into a revised first iteration EMP, which will be submitted to the Examination at Deadline 3.* *In making this change, the proposed wording in the first iteration EMP will align to the wording of similar provisions approved by the Secretary of State previously in numerous made DCOs. For example the A417 Missing Link Development Consent Order 2022 includes in the definition of "commence" a carve out for archaeological investigations, and enabling activities including soil stripping, but with the archaeology requirement (Schedule 2, para 9) stipulating that the requirement for an Archaeological Mitigation Strategy and Written Scheme of Investigation to be in place is only triggered on 'commencement' (meaning certain works could be undertaken prior to this being in place, under the 'carve out'). The same approach is used in the A1 Birtley to Coal House Development Consent Order 2021, the Portishead Branch Line (MetroWest Phase 1) Order 2022, the Manston Airport Development Consent Order 2022 and the draft DCO for the A12 Chelmsford to A120 Widening Scheme, to name a few.* *In relation to a query from the ExA as to how changes to the HMS would be managed, it is important to note that a HMS would be approved as part of a second iteration EMP. As such, the same provisions that apply to changes to the second iteration EMP would apply to a HMS. These are explained in detail below and are not considered further here, aside from making the point that any changes would require consultation with prescribed bodies, as set out in the first iteration EMP.* **Approval process** The **ExA** queried the extent to which the Applicant is required to obtain the Secretary of State's approval for an amendment to the second iteration EMP, pursuant to article 53(3) to (5) of the draft DCO, in comparison to when the Applicant can determine to approve such an amendment. **Mr Owen** explained that for changes to the second iteration EMP that are deemed material, Secretary of State approval is required under article 53(3). He further explained that the Applicant has reserved the ability to make minor changes to a second iteration EMP, within a limited scope, to allow for flexibility. **Mr Owen** further submitted that it would be disproportionate (and burdensome on all parties) should the Applicant need to seek Secretary of

	State approval for minor changes. This is particularly the case, given the first iteration EMP is clear that any 'self-determination' by the Applicant would be undertaken by a functionally separate person, that would take an independent approach. **Mr Owen** explained that the criteria governing major and minor changes to a second iteration EMP, and the overall control framework, is set out in article 53(2). This provides that the Secretary of State may approve an amendment to the second iteration EMP, provided that the Secretary of State is satisfied that it is substantially based on the first iteration EMP or would not give rise to any materially new or materially worse adverse environmental effects when compared to those reported in the Environmental Statement. In contrast, **Mr Owen** directed the ExA to article 53(5), which provides the mechanism for when the Applicant can approve an amendment to a second iteration EMP. It states that this can occur only where (a) such an amendment is substantially in accordance with the second iteration EMP, (b) the amendment would not give rise to any materially new or materially worse adverse environmental effects when compared to those reported in the Environmental Statement and (c) that amendment has been produced (and determined/approved) in accordance with the prescribed consultation and determination provisions contained in the first iteration EMP. In response to queries from some interested parties as to what mechanism would regulate any disputes in this context (i.e. as to the sort of amendment that can be approved by the Applicant rather than the Secretary of State), **Mr Owen** explained that aside from the general arbitration provisions contained within article 51 of the draft DCO [Document Reference 5.1, APP-285], there are no other dispute resolution mechanisms. He reiterated that the Applicant would only be able to approve changes to a second iteration EMP that would still be substantially in accordance with an approved second iteration EMP. In contrast, the Secretary of State, under article 53(3), would be able to approve more material changes. **Mr Owen** confirmed that, in light of the comments made at ISH2, the Applicant would give consideration as to whether any other mechanism or wording could be included in the DCO or EMP to provide further comfort to the interested parties. ***Post hearing note:*** *The Applicant has considered whether further clarification should be added to article 53 of the draft DCO as to when a proposed amendment to an approved second iteration Environmental Management Plan can be determined by either the Secretary of State or the Applicant.* *Presently, article 53 provides that:* • the Secretary of State can approve an amendment to a previously approved second iteration Environmental Management Plan provided that: ○ *the amendment would result in a second iteration Environmental Management Plan (a) still being substantially based on the first iteration Environmental Management Plan or (b) would not give rise to any materially new or*

	materially worse adverse environmental effects in comparison with those reported in the environmental statement; and ○ *the amendment has been prepared in accordance with the relevant consultation and determination provisions contained in the first iteration Environmental Management Plan; and* • the Applicant can approve an amendment to a previously approved second iteration Environmental Management Plan provided that: ○ *the amendment is substantially in accordance with the approved second iteration Environmental Management Plan;* ○ *the amendment does not give rise to any materially new or materially worse adverse environmental effects in comparison with those reported in the environmental statement; and* ○ *the amendment has been prepared in accordance with the relevant consultation and determination provisions contained in the first iteration Environmental Management Plan.* *As can be seen from this, the parameters set out in article 53 mean that the Applicant could only determine an amendment to a second iteration Environmental Management Plan in very limited circumstances (i.e. the change must be substantially based on the provisions of the already approved second iteration Environmental Management Plan, leaving limited scope for departure).* *That being said, given the very wide scope of matters that could be subject to amendment in a second iteration Environmental Management Plan, the Applicant considers that it would be difficult to further define the circumstances as to when either it or the Secretary of State could determine a change. An indicative, non-exhaustive list of examples could be given, but would have limited use in this context. Ultimately it will be a matter of judgement and evidence, applied on a case by case basis.* *However, taking on board both these difficulties and comments made at the Hearing, the Applicant proposes to instead include a mechanism in either the draft DCO or first iteration EMP (the appropriate 'home' for this is still to be confirmed, pending further consideration) whereby the Secretary of State is notified when the Applicant wishes to determine a change to the second iteration EMP itself. There would then be a prescribed period within which the Secretary of State could 'call-in' that decision, should they consider that the change is more properly determined by them, having regard to the parameters summarised above.* *This mechanism will be included in the next draft of the relevant document submitted into the examination.* In response to a further query on dispute resolution mechanics in the context of approvals, **Mr Owen** confirmed that the usual position is that persons with the benefit of a DCO can appeal for non-determination of an application to discharge a requirement, or to appeal against the refusal to discharge a requirement, where the requirement is to be

	discharged by a local planning authority, which is not relevant in relation to the Project. He clarified that the 'base' position is that DCOs never include the ability to appeal against a decision of the Secretary of State. Instead, the 'dispute resolution' mechanism is that context is by way of a judicial review. In relation to operation of the EMP mechanisms, the **ExA** sought the Applicant's view on whether the 'self-approval' process results in the Secretary of State's approval role only being at a 'high level', removing scrutiny of the detail. **Mr Owen** explained that the Applicant is keen to dispel the impression that the scope of the Secretary of State's approval of the second iteration EMP is limited in any way. The second iteration EMP needs to include the various management plans, strategies and method statements (as relevant), all of which would contain detailed proposals. He explained that whilst the first iteration EMP contains the outlines of the various management plans, strategies and method statements, it is clear from Table 3-2 of the first iteration EMP [Document Reference 2.7, APP-019] that these must be developed further as part of a second iteration EMP (**Ms Whalley** also made reference to commitment references in the EMP in this context, namely D-GEN-06 in relation to the management plans and D-GEN-07 in respect of method statements). **Mr Owen** made clear that the 'self-approval' process does not extend to the initial approval of any aspect of a detailed second iteration EMP – that falls to the Secretary of State. Instead, the scope of any subsequent self-approval process is in practice limited to certain operational, 'downstream' matters. To assist and provide some context, **Mr Owen** provided an indication of the sort of matters that the self-approval process would apply to: a) a second iteration EMP will contain a number of on-going obligations (that don't require any 'active' approvals from any party), such as ensuring designs are in accordance with certain standards or certain construction management measures are implemented. The Applicant would clearly monitor compliance with these as part of its contractual arrangements with its contractors; b) the approval of an environmental management system (REAC reference D-GEN-01), co-ordination systems (D-GEN-20), for example – ultimately 'administrative' matters; c) the approval of certain on-going matters or one-off events, such as those related to contaminated land; and d) the approval of certain detailed design matters (e.g. drainage – D-RDWE-02) where strict prescribed parameters are set out in the EMP (e.g. by reference to listed items/requirements, industry standards or other application documents, including the Environmental Statement or in the Project Design Principles). **Mr Owen** reiterated that given the breadth and detail of the approvals required by the Secretary of State as part of a second iteration EMP, the self-approvals are therefore not as broad-ranging as may be feared. In response to a request from the **ExA**, **Ms Whalley** confirmed that a list of the 'subsidiary plans' to be approved as part of the second iteration EMP, and the potential content/level of detail of those, could be provided.

Post hearing note: *The list of plans, strategies and method statements to be included in a second iteration EMP for Secretary of State approval (pursuant to article 53 of the draft DCO) as requested by the ExA is set out in the first iteration EMP in Table 1-2 Consultation requirements for specified commitments (repeated below for reference), and the content required for each is described in Table 3-2 Register of Environmental Actions and Commitments (REAC) at the references provided in Table 1-2 and expanded on in the outline plans contained at Annexes B and C as relevant.*

Table 1-2 Consultation requirements for specified commitments

REAC reference	Summary	Consultee(s)
Management plans, strategies and method statements		
D-BD-01	Landscape and Ecology Management Plan	Local Planning Authorities, Natural England, AONB Partnership (in relation to Temple Sowerby to Appleby and Bowes Bypass)
D-MAW-01	Site Waste Management Plan	Local Planning Authorities, Environment Agency
D-CH-01	Detailed Heritage Mitigation Strategy	Historic England, County Archaeologists, Local Planning Authorities
D-AQ-01	Air Quality and Dust Management Plan	Local Planning Authorities
D-NV-01	Noise and Vibration Management Plan	Local Planning Authorities
D-PH-01	Public Rights of Way Management Plan	Local Planning Authorities, Local Highway Authorities
D-RDWE-01	Ground and Surface Water management Plan	Environment Agency, Lead Local Flood Authorities, Local Planning Authorities
D-GS-01	Materials Management Plan	Environment Agency, Local Planning Authorities
D-GS-02	Soils Management Plan	Environment Agency, Local Planning Authorities

	D-GEN-09	Construction Worker Travel and Accommodation Plan	Local Planning Authorities, Local Highways Authorities
	D-PH-02	Community Engagement Plan	Local Planning Authorities
	D-PH-03	Skills and Employment Strategy	Local Planning Authorities
	D-GEN-10	Construction Traffic Management Plan	Local Planning Authorities, Local Highway Authorities, Appleby Horse Fair Multi-Agency Strategic Coordinating Group
	D-GEN-08	Site Establishment Plan	Local Planning Authorities
	D-BD-07	Invasive Non-Native Species Management Plan	Local Planning Authorities, Natural England, Environment Agency
	MW-BD-15	Working in and near an SAC Method Statement	Natural England, Environment Agency, Local Planning Authorities
	MW-BD-03	Working in watercourses Method Statement	Environment Agency, Lead Local Flood Agency, Local Planning Authorities
	MW-CH-03	Working in and near Scheduled Monuments Method Statement	Historic England, County Archaeologists, Local Planning Authorities
	MW-RDWE-04	Piling Method Statement	Environment Agency, Local Planning Authorities
	Detailed Design		
	D-LV-02	Landscaping scheme	Local Planning Authorities, Natural England, AONB Partnership (in relation to Temple Sowerby to Appleby and Bowes Bypass)
	D-RDWE-02	Surface water drainage	Environment Agency, Lead Local Flood Authorities, Local Planning Authorities

D-BD-05, D-BD-06, D-RDWE-08	Environmental mitigation design	Local Planning Authorities, Natural England, Environment Agency
MW-GS-01 and D-GS-04	Remediation Plans	Environment Agency, Local Planning Authorities

The Applicant has, since ISH2, reflected again on the process proposed to be implemented under article 53 and the first iteration EMP in terms of the various management plans, schemes, strategies and method statements that require post-consent approval. The Applicant wishes to reiterate that what is proposed for the Project is in substance no different to the processes approved under numerous made DCOs (and indeed is also an approach regularly seen in the conventional town and country planning regime). For example, paragraph 4(2)(d) of Part 1 of Schedule 2 to the A57 Link Roads Development Consent Order 2022 requires for a number of detailed plans to be submitted for approval as part of a second iteration EMP. Identical arrangements are included in the M25 Junction 28 Development Consent Order 2022 (albeit the relevant 'parent' document is called a 'CEMP') and the A417 Missing Link Development Consent Order 2022, and there are many other examples.

What is different in the case of the Project is that the commitment to produce these management plans and other documents is contained in the first iteration EMP, rather than on the face of the DCO in a requirement. However, the first iteration EMP, via the commitments contained in the REAC and annexes, contains a detailed 'outline' of the key requirements of each of the documents in question, informed by the Environmental Statement, leaving no doubt as to what each of the documents will (and must) contain.

Ultimately, the level of detail and content of the plans and other documents that go to the Secretary of State for approval will be no different to the myriad other documents the Secretary of State has approved for the purpose of numerous of DCOs over recent years.

Third iteration EMP

The ExA asked the Applicant to explain article 53(7) of the draft DCO, and the process for developing and approving a third iteration EMP. **Mr Owen** explained that article 53(7) regulates the preparation and approval of a third iteration EMP, which is often known as the 'operational' EMP. He explained that the drafting of the article provides that on completion of the construction of a part of the Project, the Applicant must prepare and decide whether to approve, in accordance with the consultation and determination provisions set out in the first iteration EMP, a third iteration EMP for that part which must reflect relevant operational provisions and commitments in an approved second iteration EMP.

	He further explained that there is a tie back to, where relevant, a second iteration EMP which would have been approved by the Secretary of State initially or subsequently (if amended). **Mr Owen** also pointed out that the DCO contains a provision, given that a third iteration EMP will be in effect over a long period of time, allowing the Applicant to approve amendments to that third iteration EMP. However, any amendments must still reflect what it is in a second iteration EMP, so far as it relates to operational matters. **Mr Owen** pointed out that it is worth noting that most of the conditions within a second iteration EMP would have been discharged as they relate to construction, but some will subsist to the extent they, for example, have ongoing maintenance and operational relevance. **Mr Owen** confirmed that it is the Applicant's view that a third iteration EMP does not need to be approved by the Secretary of State, given it will effectively be 'tied' to the content of a second iteration EMP that *would* have been approved. He further explained that should the terms of a third iteration EMP not be complied with, the relevant local planning authority would be able to take enforcement action under the Planning Act 2008. **Mr Owen** did acknowledge that to date on DCOs, approval from the Secretary of State has generally been required for third iteration EMPs and that the Applicant's approach is a departure from this 'norm', albeit there are safeguards in place (which are suitable in the Applicant's view). In response to questioning from the **ExA**, **Ms Whalley** confirmed that outline operational elements that would be included in a third iteration EMP are contained within the first iteration EMP. She explained that there are currently a number of commitments in the first iteration EMP relating to monitoring the effectiveness of mitigation. It was also confirmed that a third iteration EMP would not incorporate routine maintenance that the Applicant undertakes to all of its roads, but the third iteration EMP would be specific to the Project, linked to necessary mitigation identified in the Environmental Statement. The **ExA** asked further queries on the level of detail that would feature in a third iteration EMP. Taking maintenance of the landscape as an example, **Ms Whalley** explained that the detail on this would be contained within the second iteration EMP, as there is a requirement for a detailed landscape and ecological management plan to be submitted for approval as part of that second iteration EMP. She explained that the intention is that the details of the landscaping, including the required maintenance regime to ensure the effectiveness of the planting, would be finalised at that point. As such, the third iteration EMP in this example would require compliance with the on-going maintenance regime, post-construction, to ensure the planting remains in place. Given this, **Ms Whalley** explained that there will naturally be an overlap between a second iteration EMP and third iteration EMP, as they all tie in with one another. The ExA then queried whether the maintenance provisions relating to drainage ponds would overlap between the second iteration EMP and third iteration EMP. **Ms Whalley** confirmed that this would be the case. Within the second iteration EMP, the establishment of any planting around the drainage ponds would be secured. Following this initial phase, the maintenance of the ponds and the planting would be secured in the third iteration EMP.

In response to a general query from the **ExA** on the content of a third iteration EMP, **Ms Whalley** confirmed that, ultimately, it would capture anything that arises during the construction phase but which requires further maintenance or ongoing monitoring. **Ms Whalley** concluded by stating that in many ways, the third iteration EMP is used as a quality assurance compliance check against what is constructed.

Post hearing note: *The below provides further commentary on the role of a third iteration EMP.*

In terms of overarching context, as described by the Applicant at ISH2, Environmental Management Plans are intended to be the mechanism that links assessment assumptions and the mitigation identified in the Environmental Statement (ES) and obligations identified through the consenting process. It is intended to cover the construction, operation and maintenance of the project. The first iteration EMP (and the framework for the second and third iteration EMPs) for the A66 has been developed in line with the Standard for Highways, Design Manual for Road Building LA120 Environmental Management Plans (which is referenced in the first iteration EMP and has been appended to this note in Appendix 2 for the ExA's information).

Environmental Management Plans set out the control of environmental effects through all lifecycle stages from the design stage, as set out in Table 2.2 of LA120 reproduced here:

Table 2.2 Delivery schedule and updates to the EMP

Project Stage	***EMP iteration***	***Produced/refined***
Design	*First iteration of EMP (formerly outline EMP) produced during the design stage for the preferred option*	*Produced*
Construction (refined for the consented project)	*Second iteration of EMP (formerly construction EMP) refined during the construction stage for the consented project, in advance of construction.*	*Refined*
End of construction	*Third iteration of EMP (formerly handover EMP) building on the construction EMP refined at the end of the construction stage to support future management and operation.*	*Refined*

As set out in the table above, the later (second and third) iterations of the EMP are intended to further develop the detail of the first iteration EMP, refining the content to be up to date to the relevant stage of Project.

The key aspects included in the 3rd Iteration and how its content differs from the 2nd Iteration are summarised in LA 120 Table A.3 EMP content and structure – Third Iteration (end of construction stage). In summary, the key updates that would be anticipated at this stage of the Project are:

	• *Project team roles and responsibilities are refined, where applicable, to reflect the roles that are specifically related to handover and ongoing maintenance of the environmental mitigation elements of the Project that have been implemented and monitoring activities that are required to continue* • *Register of Environmental Actions and Commitments is refined to capture date and signature of completion of actions (updated on a continual basis during construction as commitments are signed off) and capturing any amendments to the commitments that have arisen through construction (e.g. if additional monitoring is required post-construction as a result of surveys undertaken during construction)* • *Consents and Permissions are updated to identify which are no longer relevant and which remain in place, and reflect any specific requirements of those consents/permissions* • *Environmental asset data and as built drawings – these are produced at this stage and handed over to the Applicant in accordance with the procedures set out in the 1st Iteration EMP.* • *Details of maintenance and monitoring activities – this section is refined in response to data gathered during the construction phase, any changes in the design and mitigation assumptions, physical characteristics of the project, changes to legislation or policy and stakeholder consultation during construction.* • *Induction, training and briefing procedures for staff is refined to focus on procedures for maintenance staff.* *Below, the Applicant has set out an illustration of how this would be expected to work in practice, with reference to the example that the ExA highlighted of the landscape scheme for the project.* 1. *The first iteration EMP sets the obligation for a landscaping scheme and the outcomes it must achieve (see Table 3.2 Register of Environmental Actions and Commitments, ref D-LV-02). The commitment specifically references that the landscaping scheme must comply with the Project Design Principles (APP-302) and describes further what it must include. It also defines the consultation that must be carried out on that landscaping scheme. The landscaping scheme sits alongside the environmental mitigation scheme (commitment D-BD-05), which itself must also be consulted upon. Commitment D-BD-01 also sets out the obligation to produce a Landscape and Ecological Management Plan (LEMP), which will sit alongside the landscaping scheme, and states that this will "identify what the landscape and ecology mitigation measures are, how they will be implemented, monitored, maintained and managed; and who will be responsible for ensuring they achieve their stated functions". Also relevant are commitments D-LV-03 (regarding the selection of native species and planting stock), and M-LV-01 (regarding the monitoring required of landscape elements post-construction) and M-BD-01/M-BD-03 (which set out the relevant ecological monitoring requirements). At Annex B1, there is an outline of the LEMP which includes as much information about the landscaping scheme as can be provided at the current preliminary design phase.*

	2. *A second iteration EMP will include, for each part, the detailed landscaping scheme and an updated LEMP for that part. The detailed landscaping scheme will show exactly how and where the planting will occur to meet the landscape commitments in the first Iteration EMP and PDP. The LEMP will be developed with reference to the detailed landscaping scheme, providing specific instructions regarding the planting, monitoring and management of each landscape area/habitat parcel. The second iteration EMP will include information to evidence how the landscaping scheme and the LEMP meet the outcomes specified in the first iteration EMP.* 3. *A third iteration EMP is not anticipated to provide any further detail to that contained in the second iteration EMP, as the monitoring and maintenance requirements for the landscape scheme will be specified in the that second iteration EMP (specifically in the LEMP). At this stage, the third iteration EMP (including the LEMP) will be refined to include the as-built landscaping design drawings and the LEMP will be amended if necessary to reflect the scheme that has been implemented (e.g. if planting is included for a specific screening purpose and the nature/location of that screening changes during construction in response to site conditions, the monitoring and maintenance required for that planting parcel will be updated to reflect what has actually been planted). This will include a record of any minor changes that occurred during the construction stage as reported through the Evaluation of Change Register, which forms Annex E of the 2nd Iteration and 3rd Iteration EMPs.* *As was set out at ISH2, and alluded to above, a third iteration of the EMP is produced at the end of the construction stage and its purpose is to inform the handover of the project to the operational arm of the Applicant, the ongoing monitoring and maintenance during operation and to provide the as-built information to be adopted into the Applicant's systems and procedures.* *As is provided for in article 53(7) of the draft DCO (Document Reference 5.1, APP-285), the Applicant proposes that a third iteration EMP is approved by it, in accordance with the consultation and determination provisions contained in the first iteration EMP. This would mean that various prescribed consultees are required to be consulted on a third iteration EMP prior to the Applicant determining to approve it.* *As was set out at the Hearing, the first iteration EMP provides that any determinations of matters carried out by the Applicant must be undertaken by a functionally separate person or persons, with the relevant 'handling arrangements' made publicly available for transparency. This is no different to, for example, a local planning authority considering a planning application it has made to itself.* *It is acknowledged that on other made highway DCOs, a third iteration EMP is subject to Secretary of State approval. However, given the 'Project Speed' context, the Applicant considers it to be appropriate for the third iteration EMP in this case to be subject to approval by it. This is because:*

	1. *There will be clear, transparent procedures for the Applicant approving matters itself, with decisions taken by functionally separate persons (which is absent on other DCOs);* 2. *There is a clear requirement for extensive consultation with prescribed consultees, whereby (under public law principles) any responses received would need to be taken into account by the Applicant;* 3. *Article 53(7) is clear that a third iteration EMP must reflect the measures "relevant to the operation and maintenance of the authorised development contained in the relevant second iteration EMP", which would have been subject to Secretary of State approval – as such, there is clarity as to what the third iteration EMP would have to include to be approved by the Applicant;* 4. *This approach would be consistent with the approval of other 'downstream' matters post-consent, after the initial approval of a second iteration EMP.* *Given all of this, the Applicant is of the view that the third iteration EMP should, in this case, be subject to approval by the Applicant, rather than being referred to the Secretary of State.* On an unrelated note, a query was raised by an Interested Party as to the extent to which Agenda Item 2.3 (Scheme 0405 (Temple Sowerby to Appleby)) from Issue Specific Hearing 1, adequately addressed the proximity of the route at Kirkby Thore to residential properties. In particular, **Emma Nicholson** queried whether a more detailed noise assessment ought to take place in respect of Kirkby Thore and whether the Applicant could provide a "heat-map", or equivalent, showing which properties are affected by noise. **Ms Whalley** confirmed that a detailed noise assessment has been undertaken for the whole Project and is reported in the Noise and Vibration Chapter of the Environmental Statement [APP-055], which includes details of noise on Kirkby Thore in particular. In relation to the heat-map, the Applicant agreed to provide Ms Nicholson with the specific reference to the noise contours / heatmaps for Kirkby Thore. ***Post hearing note:*** *The specific references to the noise contours/heatmaps for Kirkby Thore in response to Ms Nicholson are as follows (with links provided in the table below). Sheet 3 of Figure 12.2 [Document Reference 3.3, APP-113], Figure 12.3 [Document Reference 3.3, APP-114], Figure 12.4 [Document Reference 3.3, APP-115], Figure 12.5 [Document Reference 3.3, APP-116], Figure 12.6 [Document Reference 3.3, APP-117] and Figure 12.7 [Document Reference 3.3, APP-118] .* *The Applicant has also included the link to the technical appendices (ES Volume 3, Appendix 12.4 Operational Assessment Results). This lists each individual property predicted to experience a significant adverse or significant beneficial noise effect, and it includes the Do Minimum and Do Something noise levels for each property.*

Application ref.	ES Vol 3, reference	Title	Link
APP-214	Appendix 12.4	Operational Assessment Results	https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010062/TR010062-000463-3.4%20Environmental%20Statement%20Appendix%2012.4%20Operational%20Assessment%20Results.pdf
APP-113	Figure 12.2	Opening Year Do-Minimum Noise Level	https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010062/TR010062-000373-3.3%20Environmental%20Statement%20Figure%2012.2%20Opening%20Year%20Do-Minimum%20Noise%20Level.pdf
APP-114	Figure 12.3	Opening Year Do-Something Noise Level	https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010062/TR010062-000374-3.3%20Environmental%20Statement%20Figure%2012.3%20Opening%20Year%20Do-Something%20Noise%20Level.pdf
APP-115	Figure 12.4	Opening Year Alignment Noise Difference	https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010062/TR010062-000375-3.3%20Environmental%20Statement%20Figure%2012.4%20Opening%20Year%20Alignment%20Noise%20Difference.pdf
APP-116	Figure 12.5	Future Year Do-Minimum Noise Level	https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010062/TR010062-000376-3.3%20Environmental%20Statement%20Figure%2012.5%20Future%20Year%20Do-Minimum%20Noise%20Level.pdf
APP-117	Figure 12.6	Future Year Do-Something Noise Level	https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010062/TR010062-000367-3.3%20Environmental%20Statement%20Figure%2012.6%20Future%20Year%20Do-Something%20Noise%20Level.pdf
APP-118	Figure 12.7	Future Year Alignment Noise Difference	https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010062/TR010062-000368-3.3%20Environmental%20Statement%20Figure%2012.7%20Future%20Year%20Alignment%20Noise%20Difference.pdf

	Post hearing note: *The Applicant noted comments made at ISH2 regarding concerns related to construction working hours. As such, it has sought to provide further information below, recognising the concerns of local residents.*
	
	The first iteration Environmental Management Plan (Document Reference 2.7, APP-019) contains the following commitments in relation to construction phase working hours within Table 3-2 Register of Environmental Actions and Commitments:
	• *D-GEN-11 sets out the core working hours during construction, which are set at 07:30 – 18:00 Monday to Friday and 07:30 – 13:00 on Saturday. This commitment allows for a period of one hour before and after to be used for start up and close down activities, for preparation and maintenance activities. The commitment allows for standard operational activities within the existing highway, repairs or maintenance of construction equipment and work in response to an emergency outside of these hours.*
	• *D-GEN-11 also allows for the contractor to apply for consent under Section 61 of the Control of Pollution Act 1974 for work to be undertaken outside of the core working hours.*
	• *D-GEN-13 requires the contractor to sign up to and adhere to the Considerate Constructors Scheme (which itself requires, as part of their Code of Considerate Practice, that the contractor "provides a safer environment, preventing unnecessary disturbance and reducing nuisance for the community from their activities", and provides independent monitoring of the performance of the works against that standard)*
	• *D-NV-01 sets the requirement for a Noise and Vibration Management Plan to be approved as part of a second iteration EMP, and specifies that it must include:*
	  ○ *Details of any consents to be sought under Section 61 of the Control of Pollution Act 1974*
	  ○ *Details on proposed Site Working Hours (for that part)*
	  ○ *Details of sensitive Noise and Vibration receptors (such as local residents close to the construction works)*
	  ○ *Details on how local residents that may be affected by construction noise and vibration will be notified of activities that have the potential to cause a nuisance*
	  ○ *This commitment also requires that monitoring is carried out where sensitive receptors (such as local residents) are located particularly close to construction works and mitigation for such temporary noise or vibration shall be considered on a case by case basis (possibly including noise insulation for example).*
	• *D-PH-03 sets the commitment for a Community Engagement Plan for each part of the scheme, to include details of how engagement with local communities will occur.*

	A second iteration EMP will include a Noise and Vibration Management Plan. This document will include, for each part of the development, confirmation of working hours and any variations to (shortening of, as all working hours must be within those specified in the first iteration EMP unless agreed otherwise through a Section 61 consent) working hours to be implemented at any location on the basis of any further noise and vibration assessment as part of detailed design. It would also be expected to include results of any further modelling, details of noise monitoring and actions to minimise noise, and details of any Section 61 consents that may be applied for (for work outside core working hours). A second iteration EMP will also include a detailed Community Engagement Plan, setting out how the local community will be kept informed and providing information to the public about construction activities planned in each local area. As referenced under Agenda item 2.2 the first iteration EMP will be updated to expand the commitment relating to the Community Engagement Plan, requiring public facing information to be provided regarding planned construction activities. *The intention behind the development of a second iteration EMP (including the Noise and Vibration Management Plan) and subsequent Secretary of State approval is that it ensures the contractor reviews the proposed working practices, including working times, in relation to the detailed design by identifying particularly sensitive receptors close to the works, and developing bespoke measures to protect those receptors. The Secretary of State would need to be satisfied that these considerations have been taken into account before approving the second iteration EMP.*
3.0 Environmental Matters	
3.1 Design and Landscaping	
Agenda Item	**The Applicant's Response[4]**
The ExA will discuss the Applicant's design approach, with specific regard to the viaduct structures at: • ***Trout Beck (Scheme 0405)*** • ***Cringle Beck (Scheme 06)***	**Viewpoints and photomontages** Based on their site visit on 28 November 2022, the **ExA** requested additional viewpoints and photomontages to illustrate three key structures across Trout Beck, Cringle Beck and Moor Beck. **Jon Simmons, landscape lead for the Applicant** explained that the viewpoints used in the Environmental Statement were selected in accordance with established practice, including that given within the Design Manual for Roads and Bridges ("**DMRB**"). **Mr Simmons** referred the ExA specifically to references 3.32, 3.33 and 3.34.1 of DMRB LA 107 (Landscape and Visual Effects). He explained that viewpoints are determined primarily by site visits. A desk study of theoretical visibility is undertaken, followed by a site survey where viewpoints are checked and verified. Where there is a viewpoint, measured photos are taken. **Mr Simmons** noted that the proposed viewpoints were tabled at regular

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• ***Moor Beck (Scheme 06)*** ***The ExA wishes to examine the approach and selections of viewpoints and photomontages. It would assist if the Applicant could make available for display the ZTV 3km document [APP-105]; the General Arrangement Plans for Schemes 0405 [APP-013] and Scheme 06 [APP-014]; and Sheet 4 of the Engineering Section Drawing Plan for Scheme 0405 [APP-328] and Sheets 3 and 4 for Scheme 06 [APP-329]. The ExA may recommend additional viewpoints and photomontages specifically at the above structures, but also at Cross Lanes (Scheme 08).*** ***The ExA will also wish to discuss the Applicant's design approach to the structures and their architectural appearance and will seek additional***	focus group meetings with stakeholders, including the local planning authorities and additional viewpoints were added based on the input of those stakeholders. **Kate Wilshaw, for Friends of the Lake District** raised concerns that she did not receive invites for the focus group meetings, so did not have the opportunity to provide input into this process. **Robbie Owen, for the Applicant** confirmed that in line with established practice, the technical working group was made up of local planning authorities, Natural England and the North Pennines AONB Partnership, being statutory bodies with statutory responsibilities. **Mr Simmons** confirmed that the Applicant would consider the requested additional viewpoints and photomontages and confirm whether they could be provided and, if so, by when. ***Post hearing note:*** *The ExA requested additional Viewpoints and photomontages related to the major structures present on Scheme 0405 and Scheme 06, namely the crossings of* Trout Beck, Cringle Beck and Moor Beck *Specifically, the ExA requested confirmation of the Applicant's acceptance of the proposed viewpoint positions and to provide an expected programme to produce the new photomontages showing the structures (illustratively) in situ.* ***Viewpoints:*** *The proposed photo locations arising from ISH2 are set out below and presented on the attached Figures 1 and 2 at Appendix 3.* ***Viewpoint A*** *From existing Viewpoint taken from the gate at Sleastonhow Farm looking south (VP 4.9a).* ***Viewpoint B*** *View from the gated entrance to Sleastonhow Farm looking east/northeast. The Applicant has established that this will require permission to access private property. From initial assessment it looks like a clearer view might be available further along the lane at proposed Viewpoint C.* ***Viewpoint C*** *Viewpoint proposed to address requirement for a photomontage of the structure from this location looking east. The Applicant has established that this will require permission to access private property.* ***Viewpoint D***

supporting information including examples of designed structures used elsewhere. The ExA will explore the project-wise design principles on landscape integration as set out in the Project Design Principles [APP-302]. The ExA will also invite discussion on the cited effect of the proposed development on the AONB. ***The ExA may wish to discuss Article 54 (detailed design) of the draft DCO and the powers sought by the Article in particular to changes to the approved designs. We will also seek clarification on why the Project Design Report [APP-009] is not a certified document in Schedule 10.***	*Proposed photo location from the footpath to the rear of Sleastonhow Farm as requested by Ms Nicholson during the Hearing. Final location to be determined on site by the survey team confirming best available view of the structure along this section of footpath.* ***Viewpoint E*** *Viewpoint on the footpath south of Wheat Sheaf Farm, looking south to present the structure over the Cringle Beck.* ***Viewpoint F*** *Viewpoint from footpath 372/021 looking south to present the structure over Moor Beck.* ***Access onto private property*** *As set out above, the Applicant has established that a number of the above viewpoints require access onto private property for both personnel and potentially vehicle parking. As the Applicant does not have a right of access, it will engage with the relevant landowners to seek to secure this access for the required photography as soon as possible. However, where this access is not granted, the Applicant will seek to identify equivalent representative viewpoints from publicly accessible points, having regard to the project's health and safety requirements. The Applicant will report back to the ExA at Deadline 2 as to its progress with obtaining access and any proposed alternative viewpoints.* ***Approach to preparation of structure visualisations*** *The Applicant wishes to note that verified photomontages are a tool to aid impact assessment. Given that some of the locations requested by the ExA are very close (within 70m) of the relevant structure) the Applicant respectfully submits that photomontages are not an appropriate means to represent the design here. The Applicant has therefore devised what it considers to be an appropriate means of visualisation to show the preliminary designs of structures in their landscape context and to allow the ExA to better understand the design and appearance in context of the three structures; the proposed approach is summarised below.* *The Applicant considers its proposed approach will provide an appropriate degree of information and enable the proposed structures to be clearly understood in their landscape context. The approach proposed would also strike a proportionate balance between clearly translating the design principles and integration with the landscape context, whilst also reflecting the preliminary stage of design the Project is currently at.* *The Applicant proposes to undertake measured photographs from the agreed viewpoints (or alternative publicly accessible viewpoints – see above) and to construct simple wireframe overlays of the structures to conform with a Type 2 visualisation (Landscape Institute (LI) Type 2 Visualisations, as set out in* [redacted] *This would show the position, mass and scale of the structures. In order to provide more information as to how these could look and be experienced in context using the design principles defined in the PDP, an architectural illustrator will be commissioned to provide artists impressions from each viewpoint, using the above photographic material and wirelines as a basis for illustrative representations of*

	the structures and to show how the visual appearance / visual qualities and landscape integration could be implemented (again recognising the detailed design process has not yet commenced on the structures). The Applicant submits that this would provide the ExA with the information it is seeking, having regard to the stage of design the Project is at. ***Programme*** *As the viewpoint photography is both access and weather dependent it is proposed to submit the visualisations for Deadline 4* **Approach to design** By reference to paragraph 10.9.4 of Chapter 10 of the Environmental Statement [Document Reference 3.2, APP-053], the ExA queried what an "aesthetic review" included in respect of the design of the Project, having regard to the three structures that the ExA are particularly interested in (and as cited in the agenda). **Paul Carey, for the Applicant** confirmed that the structures have been, to a preliminary extent, structurally designed, with architectural considerations also taken into account. He stated that each structure has been subject to preliminary design as a result of collaborative efforts between multi-disciplinary teams, whereby structural and design engineers work with environmental teams to understand not only the structural form and function of the viaducts, but how they are set in the context of the landscape. **Mr Carey** stated that ultimately the preliminary design of the structures has sought to minimise the bulk of each structure and be complementary and not detract from the value of the landscape. He confirmed that their span arrangements have been given careful consideration, taking account of the need to cross the watercourse, the top of banks and the alignment of columns to support structures, amongst other considerations. The ExA noted that the structures are sizeable, and requested a design brief for the three viaducts, explaining how the Project Design Principles have been taken into account to date, relating this to engineering considerations, particularly in light of making them aesthetically beautiful, and how the next stage of design would be undertaken. **Mr Carey** confirmed that the Applicant would consider this request. ***Post hearing note:*** *The Applicant will submit commentary at Deadline 3 on the approach taken to date in respect of the design of Trout Beck, Cringle Beck and Moor Beck Structures. This will include consideration of site-specific constraints and sensitivities, the functional requirements of the structures as well as site context and design outcome objectives (including aesthetics). This commentary will include examples (images) of similar structures as well as a commentary on how the Project Design Principles, to be secured by the DCO, arose in relation to structures such as these, and how the Project Design Principles will be implemented during the detailed design process for these structures*.

	The ExA queried whether the Design Report [Document Reference 2.3, APP-009] ought to be a certified document under the DCO. **Andrew Tempany, landscape and design expert for the Applicant** explained that the Project Design Report [Document Reference 2.3, APP-009] explains the narrative behind the development of the reference (or preliminary) design, it explains the factors relevant to the development of that design and gives the reader a visually rich tour of the vision for the reference design and its key features. **Mr Tempany** confirmed that, in effect, the document summarises how the Applicant progressed from broad alignments for the Project to the reference design for which development consent is sought. He also explained how the document illustrates how, within the constraints of the parameters for which development consent is sought, the Project could come forward. It does this by reference to a selection of the Project Design Principles to illustrate how the application of those principles would secure good design. **Mr Tempany** further explained that the Project Design Principles [Document Reference 5.11, APP-302] is the key document intended to guide the hands of the detailed designers to develop the Project such that it meets the criteria for good design set out in the National Policy Statement for National Networks and the other relevant design guidance cited in the Project Design Report. It is also the vehicle for securing important aspects of the design that are relied upon for essential mitigation in the Environmental Statement. In this context, **Mr Tempany** submitted that certifying the Project Design Report would introduce a degree of ambiguity in relation to the importance of the Project Design Principles that was never intended. He continued, by stating that the Project Design Report only contains a selection, not all, of the Project Design Principles and only articulates those principles in summary form. This creates a significant risk of ambiguity in the interpretation of the Project Design Principles and defeats one of the key objectives of the document having the Project Design Principles (and therefore the Project's design obligations and parameters) encapsulated in a single document. **Robbie Owen, for the Applicant** further explained that the Project Design Report shows *one* way in which the DCO can be designed and delivered and is the illustrative articulation of themes, as well as the Project Design Principles. He submitted that is why only the latter ought to be secured and be a certified document. The **ExA** then sought to understand whether article 54 of the DCO necessitated third party regulatory approval of the designs of the three cited viaducts, or whether those fall into the self-approval process by the Applicant. The ExA then queried whether a Design Brief for those structures ought to be secured within article 54 of the DCO. **Mr Owen** explained that in the same way that many made DCOs are expressed, the detailed design is tied to a number of certified documents. In this respect, article 54 states that the Project must be designed in detail and constructed so that it is compatible with the Project Design Principles, Works Plans [Document 5.16, APP-318 to 325], Engineering Section Drawings: Plan and Profiles [Document 2.5, APP-011 to 018] and Engineering Section Drawings: Cross Sections [Documents 5.18, APP-334 to 341]. **Mr Owen** continued that is the well-established way that DCOs made for the Applicant's benefit have been drafted; there is very limited, if any, provision within other such DCOs for detailed

	design approvals. He concluded by stating that the safeguards in this respect are that the Applicant is tied back to the preliminary design shown on the documents referred to previously. In response to a request to speak from the ExA, **Emma Nicholson** commented that parish councils are being informed that trees will not be planted for screening purposes, due to on-going maintenance responsibilities. She enquired whether the Applicant will be planting trees around the village, road or viaduct. **Kerry Whalley**, **for the Applicant** explained that screening by planting trees is a technique used in landscape and design where appropriate, so a location-by-location approach is being taken. The Applicant agreed to liaise with the parish council on this point, to clarify what locations are being referred to. ***Post hearing note:*** *Paul Smith, representing the Applicant, will engage with the parish council to clarify whether trees are being proposed for screening purposes.*
3.2 Traffic and Access	
Agenda Item	**The Applicant's Response[5]**
The ExA wishes to understand the proposed access arrangements to the Countess Pillar, which appear to reduce its accessibility. While listed as an agenda item here, there is overlap with heritage issues on this matter. Reference will be made to General Arrangement Plan Sheet 1 [APP-012].	The **ExA** queried whether the footpath to the west of the Countess Pillar could be reinstated to provide pedestrian access. **Mr Paul Carey, design lead for the Applicant** confirmed that there is currently vehicular access to the Pillar via the B6262, as advertised on the English Heritage website. Mr Carey confirmed that pedestrian access will be provided as part of the Project, but the precise means of implementing this east-west connectivity is subject to detailed design. **Robbie Owen, for the Applicant** further confirmed that the first iteration EMP [Document Reference 2.7, APP- 019] REAC table, Reference MW-CH-02, secures the mitigation required for the relocation of, or in-situ protection of, medieval milestones and boundary stones which includes the Countess Pillar. This includes, in part, access to Countess Pillar. The Applicant agreed to review the precise wording of this commitment to ensure that access to the Countess Pillar is available from all directions, as proposed to be provided. ***Post hearing note:*** *Sheet 1 of General Arrangement Drawing [Document Reference 2.5, APP-012] includes notation that the 'Existing footpath to Countess Pillar to be made redundant and removed' which would remove access for pedestrians from the west. This has been re-considered following comments received and the Applicant intends to amend this proposal as currently shown on Sheet 1 of the Rights of Way and Access Plans [Document*

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	Reference 5.19, APP-343] to show the footpath being retained. This will be submitted to the examination at Deadline 3, as part of the Proposed Changes Application.
3.3 Flooding and Drainage	
Agenda Item	**The Applicant's Response[6]**
The ExA wishes to understand: • ***The current status of agreement with the Environment Agency, with particular reference to Flood Risk Assessment baseline conditions [AS-004, Annex 1]*** • ***The current status of any discussions and agreement with local authorities and any Lead Local Flood Authorities.***	**Kevin Crookes, flooding and drainage lead for the Applicant** confirmed that the baseline hydraulic modelling of the watercourses was undertaken based on methodology agreed with the Environment Agency (the "**EA**"). This modelling was issued to the EA for comment. **Mr Crookes** confirmed that comments were received from the EA and the Applicant addressed all the comments that had the potential to impact the flood depth/extent in the model output. These changes are included in the submitted Flood Risk Assessment [Document Reference 3.4, APP-221]. **Mr Crookes** concluded that following submission, the remainder of the comments were addressed by a written response and sensitivity testing of the baseline model. The testing concluded that the remaining minor comments from the EA did not result in any material changes and therefore the conclusion of the Flood Risk Assessment remains unchanged. **Philip Carter, for the Environment Agency** confirmed that the baseline hydraulic modelling was submitted to the EA and comments were provided to the Applicant. An updated version of the baseline hydraulic modelling has been received by the EA, which the EA is in process of reviewing. In respect of the current status of any discussions and agreement with the Lead Local Flood Authorities ("**LLFAs**"), **Mr Crookes** confirmed that the baseline hydraulic modelling of the watercourses was undertaken based on methodology issued to all LLFAs for comment (with comments considered and addressed where received) and that the Applicant is engaging with the local authorities and LLFAs at this stage. In response to comments made by the LLFAs, **Mr Crookes** confirmed that the Applicant would seek further engagement with the LLFAs as soon as possible on the flood modelling. In response to a query by the **ExA, Mr Crookes** confirmed that the Applicant would provide comments on the EA's Principal Areas of Disagreement Summary Statement, to demonstrate none of the issues raised are incapable of resolution by the end of the examination process.

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	Post Hearing Note: *The Applicant expects that the comments raised by the Environment Agency (EA) in its Principal Areas of Disagreement Summary Statement can be* resolved within the Examination and the Applicant does not consider that there are any issues incapable of resolution. *In order to address any outstanding matters, the Applicant has scheduled a regular fortnightly meeting with the EA to discuss issues and record the outcome of these meetings through the Statement of Common Ground. Additional meetings will be scheduled as required to address unresolved issues.* *A summary of the issues raised by the EA, and their current status, is set out below.* *A written response alongside sensitivity testing reports that address the comments from the EA regarding the baseline flood models, have been issued to the EA for their review.. The Applicant will continue to engage with the EA as they undertake their review of the hydraulic modelling.* *The Applicant and the EA are currently discussing the form of Protective Provisions in the draft DCO for the benefit of the EA, to allow the EA to agree to the disapplication of the Environmental Permitting (England and Wales) Regulations 2016 in relation to flood risk activity permits in the draft DCO.. The Applicant does not foresee any issues with this, and there is no reason to suspect that an agreement won't be reached before the end of Examination.* *Following the receipt of relevant representations, the Applicant has been meeting with the Statutory Environmental Bodies (SEBs) and Local Authorities to discuss the Environmental Management Plan (EMP). A meeting was held with the EA on 4 November 2022 to address the issues and further meetings are planned to continue dialogue. It is anticipated that these matters will be resolved within the Examination.* *The EA is currently reviewing the various parcels of land that the Applicant is seek*ing *to acquire that the EA have an interest in. The Applicant will continue to engage with the EA on this matter. There is no reason to suspect that an agreement won't be reached before the end of Examination.* *The Applicant notes the EA's comments in relation to the Project Design Principles (PDP) and Environmental Statement (ES). The Applicant will continue to liaise with the EA to understand in greater detail the concerns and seek to address the issues within the Examination. The outcome of these discussions will be recorded in the Statement of Common Ground.* *Sensitivity testing using the latest rainfall climate change allowances has been undertaken and it did not result in any changes to the outline drainage strategy or flood risk assessment. The Applicant intends to share these results with the EA as part of the on-going engagement between the parties.*

	In response to the comments made by the LLFA's regarding further engagement on flood modelling, *the Applicant has issued a request for a meeting on Monday 5 December 2022 to all Lead Local Flood Authorities (LLFA's) to discuss outstanding items from the Principal Areas of Disagreement Summary Statement (AS-004). A meeting has been arranged for 12 December 2022. The Applicant is continuing dialogue with the LLFA's on all unresolved issues, including flood modelling, which will be documented in the SoCGs.*
3.4 Climate Effects	
Agenda Item	**The Applicant's Response[7]**
The ExA wishes to understand: • ***How the significance thresholds for the calculated greenhouse gas (GHG) emissions arising from the project compared against the relevant carbon budgets have been used to inform the conclusion that 'the project's GHG emissions, in isolation, will not have a significant effect on climate or a material impact on the ability of the Government to meet its carbon reduction plan targets and Carbon Budgets' [ES Chapter 7, APP-***	**Approach to climate assessment** In response to a query from the **ExA**, **Keith Robertson, climate lead for the Applicant** explained that the Applicant's assessment of the significance thresholds for the calculated greenhouse gas emissions is based on the Design Manual for Roads and Bridges ("**DMRB**"), LA 114 guidance document which directs that the assessment of a project on climate change shall report significant effects only where increases in greenhouse gas emissions will have a material impact on the ability of the government in meeting its carbon targets. **Mr Robertson** confirmed that the wording within LA 114 reflects the overarching decision-making approach set out in the National Policy Statement for National Networks. **Mr Robertson** further confirmed that there is no confirmed guidance on a numerical threshold to be used when comparing and contextualising emissions. For the Project, emissions are being compared to the national carbon budget. The assessment of the impact of the Project on the relevant national carbon budgets is very small, in that construction accounts for 0.027% of the 4th carbon budget and 0.03% of the 5th carbon budget and net increases in emissions from users less than 0.1% in the 6th carbon budget period. **Mr Robertson** continued and stated that throughout the assessment and quantification of emissions, a conservative approach has been adopted to avoid under-estimating the total emissions arising from the Project. This still results in small total emission levels. **Mr Robertson** noted that there is potential for a reduction in the greenhouse gas emissions through further wider measures over time. Given the UK Government's legal target to meet net zero and in the context of wider commitments and the Applicant's own wider net-zero plan, it is unlikely that the emissions from the Project are so great that they will have a material impact on the government achieving carbon targets (in line with the LA 114 test). The **ExA** noted that Chapter 7 of the Environmental Statement [Document Reference 3.2, APP-050] talks about greenhouse gas emissions in isolation and does not take them forward into a cumulative impact. The Applicant was

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050, para 7.5.19 and 7.11.24]. • ***What, in the context of the change from 100% to 8%, has informed the 'updated assumption for ES' that 'the quantity of additional lime required for stabilisation is 8% of the proportion of excavation material identified as requiring stabilisation' [ES Chapter 7, APP-050, para 7.11.10]. Why is this said to be a 'conservative estimate'?*** • ***The current status and future development, in terms of its scope and timescales, of the project Carbon Strategy which is identified in the application [Statement of Reasons (SoR), APP-299, para 2.4.2].*** • ***Why some of the mitigation schedule source references to climate matters***	invited to elaborate on what the updated Institute of Environmental Management and Assessment ("**IEMA**") guidance instructs in relation to this. **Mr Robertson** explained that the intention of the updated IEMA guidance is to tackle various challenges identified as the topic of greenhouse gas assessments has become more important in recent years. He stated that the guidance addresses the discussion around the cumulative assessment of greenhouse gases, in that it acknowledges that there are specific challenges around the assessment of greenhouse gas emissions which makes it harder to undertake a cumulative assessment in the same way as it is for other environmental topics. **Mr Robertson** stated that the main challenge in this context is that the impacts of greenhouse gas emissions are not limited to where emissions take place, so it becomes almost impossible to define a zone of influence at any scale smaller than a national appraisal. This is because the proximity of another project has no direct relevance in terms of the greenhouse gas emissions produced by another project. IMEA guidance therefore notes that cumulative assessment is of limited value. **Mr Robertson** noted, however that the assessment undertaken of user emissions is based on traffic modelling for the Project and that strategic modelling is effectively a cumulative model, taking account of other consented projects which would have an impact on the road network. Therefore, when an output is received from strategic modelling for this assessment, this model includes other consented development that would have an effect on the road network. From this perspective, it does provide a cumulative assessment. In response to a query from the **ExA, Mr Robertson** confirmed that the Applicant would confirm how the costs included in Table 6-9 of the Combined Modelling and Appraisal Report [Document Reference 3.8, APP-237] had been arrived at. ***Post Hearing Note:*** *The IEMA Guide on 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' 2nd Edition dated February 2022 has been included in Appendix 10 of this document.* ***Post Hearing Note:*** *A note containing an explanation of the costs contained within Table 6-9 of the Combined Modelling and Appraisal Report [Document Reference 3.8, APP-237] is provided in Appendix 9 of this document.* **<u>Lime stabilisation</u>** In response to a query from the **ExA** around the change from 100% to 8% (between statutory consultation and the submission of the application) in terms of the lime being required for stabilisation, **Mr Robertson** clarified that a correction was made to the calculation process, as the Environmental Statement was prepared following the identification of an error within the materials published as part of statutory consultation.

[Mitigation Schedule, APP-042, table 2] refer to ES Section 7.10 [APP-050, Chapter 7] and not ES Section 7.9.	**Mr Robertson** explained that during the design and construction of highways projects, it is often found that there are soils which are insufficiently stable. Various methods are used to stabilise the soils to make them appropriate for construction. He went on to state that one method used is to add lime to the soil to make it more cohesive and therefore appropriate for construction. **Mr Robertson** explained that the calculation for embodied carbon used as part of the assessment process uses an industry standard calculation tool, requiring an estimate of the quantity of lime to be used. In error, in preparation for statutory consultation, the quantity of soil needing treatment was identified and the full volume equivalent of lime was entered into the calculator. This modelled a 100% replacement of inappropriate soil with lime, whereas the actual weight of lime used is significantly less than this. ***Post Hearing Note:*** *The Applicant was to asked provide justification for use of the 8% figure in modelling lime used for stabilisation.* *As noted in Paragraph 7.5.9 of Chapter 7 Climate Change [Document Reference 3.2, APP-050] within the Environmental Statement (ES) the calculation assumption made in the Preliminary Environmental Information Report (PEIR) was an error.* *For context, lime stabilisation is one of various methods used to stabilise soils prior to construction. It is used as a method for increasing the strength of soils with high clay content. By mixing lime into clay-heavy soils this can reduce the need for alternative strategies to provide strong soils for construction (which can include replacement or mechanical compaction). The need, or otherwise, for soil stabilisation is not yet fully understood for the route but it is not uncommon for soil stabilisation to be required.* *At the time of the PEIR, the project wanted to assess the impact of lime used for stabilisation. There is an industry carbon factor for lime, but the project needed to determine the quantity required. This is done by setting an assumption for the % ratio of lime to soil. At the time of the PEIR this was, in error, modelled as a 100% replacement of soil with lime i.e. the project was modelling all soil requiring stabilisation would be replaced at 100% ratio by lime.* *The error was corrected within the ES, and an 8% lime ratio was adopted.* *A main source for carbon factors is the ICE database of embodied carbon for materials produced by Circular Economy. This is an industry standard source for carbon factors. It provides data on lime stabilisation and sets out two stabilisation rates – 5% and 8%. The higher value was adopted as a conservative value. This value was then inputted into the National Highways embodied carbon calculator tool used for the main embodied carbon assessment.* *A review of a case study from Britpave ('Stabilised Soils – as subbase or base for roads and other pavements'), which is referred to as an industry source by the British Lime Association, suggests typical lime addition rates of between 1.5 and 4%. On this basis an 8% addition rate was considered conservative.*

	Carbon strategy The **ExA** then queried the current status and future development, in terms of its scope and timescales, of the Project's Carbon Strategy, identified within the Statement of Reasons [Document Reference 5.8, APP-299, para 2.4.2]. **Kerry Whalley, for the Applicant** confirmed that the Carbon Strategy referred to in the Statement of Reasons [Document Reference 5.8, APP-299] is referring to the same Strategy which is secured within the DCO via the first iteration EMP [Document Reference 2.7, APP-019], specifically within the Register of Environmental Actions and Commitments, at Table 3.2 of the EMP, at MW-CL-01. **Ms Whalley** confirmed that, in essence, the commitment is for a detailed Carbon Strategy to be worked up prior to the start of works, through stakeholder engagement. This will be a contractual commitment placed on the contractors. **Monica Corso-Griffiths, DCO lead for the Applicant** confirmed that the appointed contractors intend to have a form of Carbon Strategy completed by the end of the examination. ***Post hearing***: *The Applicant can confirm that an Outline Carbon Strategy will be submitted at Deadline 3 of the Examination Timetable (24 January 2023). The Applicant considers that the Carbon Strategy is identical in purpose to the other management plans, strategies and method statements that are currently in outline in the first iteration EMP but will be developed in detail alongside the detailed design (a general commentary on this is provided at the agenda items above). As such, a detailed Carbon Strategy will be developed and implemented prior to the start of works.* **Mitigation Schedule** In regard to the final agenda bullet point provided by the **ExA**, **Ms Whalley** noted the discrepancies within the Mitigation Schedule, explaining that the references are one section out due to a typographical error, which will be addressed by the Applicant. ***Post hearing note***: *A corrected version of the Mitigation Schedule (APP-042) Table 2 is provided in a revised version of the document at Deadline 1 [Document Reference 2.9, APP-042] in both clean and tracked versions.*

3.5 Trees	
Agenda Item	**The Applicant's Response[8]**
The ExA notes that the Applicant has not provided an Aboricultural Impact Assessment with the application. EMP REAC reference D-LV-01 states one would be provided at the detailed stage. REAC reference D-LV-04 states "Tree removal must be kept to a minimum as far as reasonably practicable… [and]…two trees will be planted to one lost". The ExA wishes to discuss the practicality of this Commitment and will be seeking the submission of the AIA within the Examination period to identify the areas of tree removal noting each tree to be removed, the maximum number of trees that would be removed, and the approximate location for replacement trees.	**Robbie Owen, for the Applicant** confirmed that the Applicant does not propose to provide an Aboricultural Impact Assessment ("**AIA**") at this stage as the proposal is to complete the AIA at the detailed design stage. **Jon Simmons, for the Applicant** explained that the landscape and visual assessment detailed within Chapter 10 of the Environmental Statement [Document Reference 3.2, APP-053] was undertaken using a reasonable worst-case scenario, allowing a degree of flexibility in the design without compromising the robustness of the assessment. **Mr Simmons** stated that in respect of tree removal there was an assumption that all trees located within the indicative site clearance boundary, as shown on Figure 2.2 of Chapter 2 of the Environmental Statement [Document Reference 3.3, APP-062], would potentially require removal. This was to ensure that a reasonable worst-case scenario was assessed. Tree and woodland cover was evaluated by looking at aerial photography and ratified by site surveys and site photography. **Mr Simmons** confirmed that on this basis and acknowledging the flexibility within the design provided by the Limits of Deviation secured in the DCO, it was considered that the completion of an AIA at the preliminary design stage would not further inform the reasonable worst-case landscape or visual assessment undertaken within the Environmental Statement or the associated mitigation requirements. He informed the ExA that tree surveys that form the basis of the AIA are usually considered out of date after 12 months and would require to be resurveyed. **Mr Simmons** explained that it was identified early in the assessment process that there are a number of important trees along the route of the Project, due to their age, visual prominence or ecological value. These notable and veteran trees have been identified by site survey and are noted within Chapter 6 Biodiversity of the Environmental Statement, specifically paragraph 6.7.8 [Document Reference 3.2, APP-049]. These are also represented on ES Document 3.3 Environmental Statement Figure 6.2 Ancient Woodland, Ancient Tree Inventory and Habitats of Priority Importance [Document Reference 3.3, APP-070]. **Mr Simmons** confirmed that the location of these notable and veteran trees has been used to inform the preliminary design of the Project, with those trees retained where possible. If retention is not possible, replacement planting of suitable species and stature would be included in the detailed design (see reference 03.04 in the Project Design Principles).

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	Mr Simmons then turned to the Applicant's commitment to complete an AIA during detailed design and why this is more appropriate. He explained that as the design develops, a targeted AIA would be more focused in scale and extent, giving a more accurate measurement of the trees to be removed, with the intention of retaining as many existing trees as practicable through the detailed design process. **Mr Simmons** referred the ExA to a Project Wide Design Principle for addressing/committing to tree protection at the detailed design stage states: "*The detailed design must minimise impacts on mature trees, root protection zones and mature tree canopy cover and so far, as is reasonably practicable carry out the detailed design so as to retain mature and established trees as valued landscape features*." (ref LC03). He then referenced commitment D-LV-01 contained in the first iteration EMP [Document Reference 2.7, APP-019], which secures the production of an AIA prior to the start of the construction of the main works. In addition, the EMP secures Tree Protection Plans to be prepared for the protection of trees retained in line with relevant British standards within and immediately adjacent to the Order limits. In response to a query from the ExA, the Applicant agreed to provide an estimate, on a worst-case basis, of the number of trees that could be lost in the development of the Project. In relation to the commitment in the first iteration EMP to replace trees on a 2:1 basis, **Mr Simmons** explained that the trees may not be replanted in the same location from which they are felled. The mitigation design (as presented illustratively in the Environmental Mitigation Maps, [Document Reference 2.8, APP-041]) considers the value of woodland blocks and green corridors and seeks to restore these if they are disturbed by the proposed scheme. He further explained that in all cases, the ecology and landscape teams worked (and will work) hand in hand to ensure the proposed replacement planting provides the right ecological balance and would not alter the landscape character, as there are places where trees can and cannot be planted in this context. With regard to the 'practicality' of this replacement ratio, **Mr Simmons** stated that while the exact number of trees which will be lost has not been reported (and does not need to be to understand the likely significant environmental effects), the change in woodland cover has, in terms of area of woodland which will be lost as a result of the Project (on a reasonable worst case basis). The area of woodland mitigation planting identified in the Environmental Mitigation Maps is based on habitat multipliers and variables prescribed by the Biodiversity Net Gain metric (based on the woodland cover lost), which lead to a replacement ratio that is typically greater than 2:1 for woodland habitats. **Mr Simmons** confirmed that the Applicant would provide further explanation as to how the 2:1 tree replacement ratio is to be achieved, with particular reference to the location within the Order limits where those trees can be replanted.

	***Post hearing note**: The Applicant intends to submit a Tree Loss and Compensation Planting Report into the examination by Deadline 4. The report will quantify the total number of trees which could be lost to the Project and subsequently determine and set out the total number of trees which could be required to be replanted as part of the mitigation.* Individual trees will be identified in the Report using the most recent BlueSky – National Tree Map™ (NTM) dataset. The root protection area (RPA) will be calculated with an offset multiplying the canopy radius three times and to a maximum radius of 15m (in accordance with British Standard BS5837:2012 – 'Trees in relation to design, demolition, and construction – Recommendations'). Where these intersect the site clearance boundary (refer Environmental Statement Figure 2.2 – Indicative site clearance boundary (DCO Document reference 3.3 / APP-062) the worst-case assumption will be taken that all the trees will be lost – as per Chapter 10 of the Environmental Statement (APP-053). The Bluesky data set will be supplemented with the dataset from the notable and veteran tree survey completed for the project (refer Figure 6.2 – Ancient Woodland, Ancient Tree Inventory and Habitats of Priority Importance, Document reference 3.3 / APP-070). The replacement planting set out in the Report will reflect the measures assessed and determined within the Environmental Statement. The replacement planting requirements are secured in the first iteration EMP (DCO Document reference 2.7 / APP-019) in various commitments. This includes the relevant replacement ratios. Commitment ref. D-LV-01 requires an Arboricultural Impact Assessment (AIA) to be undertaken prior to the start of the main works for the Project. The intention is this will proactively look to retain as many trees as possible, this could significantly reduce the number of trees lost and in turn the number of replacement trees required for mitigation, when compared to the worst case assumption adopted in the Environmental Assessment. An environmental mitigation scheme, as set out in commitment ref. D-BD-05, must be developed and form part of a second iteration EMP that is subject to approval by the Secretary of State pursuant to article 53 of the DCO. The first iteration EMP provides (at commitment ref. D-BD-05) that this mitigation scheme must consider the results of the AIA by referring back to commitment ref. D-LV-01. The environmental mitigation scheme approved by the Secretary of State must then be implemented. Replacement tree planting (species and density) included as part of the Project (and secured via the above mechanisms) will be determined having regard to the types of woodland habitat lost. The total area required for each type of habitat creation or replacement (based on the worst-case assumption) is outlined within Table 6-20 of the Chapter 6 Biodiversity within the Environmental Statement (Document Reference 3.2, APP-049). Replacement ratios are typically greater than 2:1 for woodland habitats and are based on habitat multipliers and variables prescribed by the Biodiversity Net Gain metric. The Order limits have been set having regard to the need to accommodate the environmental mitigation requirements, amongst other factors.

	The total number of trees that could be lost, in the worst case scenario, and the total amount of replacement tree planting required, will be presented in a table within the report which will also provide the replacement planting ratios that would be applied in that scenario. The location of the potential replacement tree planting will be shown illustratively on supporting figures. However, it is important to note that all of these aspects remain subject to detailed design, with elements approved by the Secretary of State as part of a second iteration EMP at the appropriate time.
3.6 Air Quality	
Agenda Item	**The Applicant's Response[9]**
The SoCG with Natural England indicates that discussions are taking place between the parties about the robustness of the air quality assessment undertaken using the methodology outlined in DMRB LA105. The ExA would like to understand how such discussions are progressing and the implications for the Examination.	In response to a query from the **ExA**, **James Bellinger, for the Applicant** confirmed that a meeting with Natural England is scheduled to take place on 8 December 2022 and engagement is on-going between the parties both at a project and strategic level. **Mr Bellinger** confirmed that in the Applicant's view, the assessments undertaken are robust and set out four key points accordingly: 1. The conservative assumption around the emissions factors used on the traffic data, allows the Applicant to be confident in the results of its assessment. 2. There was scheme specific air quality monitoring for ammonia, without which the Applicant would not have absolute certainty in the concentrations predicted within the modelling that has been undertaken for the air quality assessment. 3. The use of ammonia modelling is a key point that Natural England were previously concerned about. By taking Natural England's concerns into account in respect of the Applicant's modelling, the Applicant has been able to calculate a full view of the total concentration changes. 4. The Applicant has taken into account Natural England's concerns in terms of relying on the "loss of one species" metric. **Tom House, for the Applicant** provided more detail on the "loss of one species" metric. He stated that notwithstanding conversations between Natural England and the Applicant beyond Project level, Natural England has indicated it does not support the use of DMRB LA 105, specifically with reference to the "loss of one species" metric. Mr House clarified that the assessment is not based on this metric. The "loss of one species" metric was reported in line with DMRB and for consistency with other road schemes, however the metric does not form the basis upon which the assessment was made. It was made using other information including habitat mapping, to inform the presence of qualifying features within the potential zone of influence, data on current pressures and condition of the site,

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	professional judgement and robust ecological principles. The metric was not used to opine on the adverse effects on site integrity. Crucially, no designated sites were screened out of further assessment based on "loss of one species" metric at screening stage [Document Reference 3.5, APP-234] or through the assessment [Document Reference 3.6, APP-235]. ***Post hearing note:*** *The Applicant has provided the DMRB LAs LA105, LA107 and LA114 information in Appendix 11 of this document.* ***Post hearing note:*** *The purpose of the meeting with Natural England that took place on 8 December 2022 was to describe the methodology for the air quality assessment undertaken for the Project, both in terms of the modelling and the subsequent interpretation of potential biodiversity impacts. The outcome of this meeting (and any further engagement) will be recorded in the Statement of Common Ground between the parties*
3.7 Cultural Heritage	
Agenda Item	**The Applicant's Response[10]**
The ExA wishes to understand: • ***What sensitivity testing, if any, has been undertaken regarding the ZTV modelling, considering the Limits of Deviation (LoD). For context, Paragraph 8.5.5 of [APP-051] states "The [ZTV] modelling does not however allow impacts which might be introduced through design changes within***	In response to a query from the **ExA, Kerry Whalley, for the Applicant** confirmed that a ZTV was not prepared for the Limits of Deviation ("**LoD**"). She explained that the ZTV is formed using a variety of models and mapping data. This includes the Project itself, within an engineering model, digital terrain data and GIS mapping. An engineering model for the LoD does not exist – instead, it is based on the preliminary design shown on the Works Plans. Given the LoD are a flexibility tool, and the numerous variations a scheme could take within those LoDs, it is not possible to create a single engineering model taking into account the LoD. It is therefore not possible to produce a ZTV of the maximum LoD. **Ms Whalley** further explained that, instead, the ZTVs that the Applicant has developed are used, alongside site and desktop surveys, to undertake sensitivity tests. Those tests identify the sensitive receptors where the assessment conclusions could be affected by a change within the LoDs. Relevant sources of information, such as assessments of setting, photography and site visits, are then used to understand the potential impacts on those receptors should flexibility within the LoDs be used.

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the limits of deviation to be assessed. Preliminary sensitivity assessment has indicated that changes within the limits of deviation will not introduce elevated effects." • ***On the above basis, can the Applicant explain how the assessments presented in the ES (based on / informed by the ZTV) have presented a worst-case approach in assessment terms?*** • ***Whether the production of a Heritage Impact Assessment has been considered, with reference to the western portion of the route, given proximity to the Lake District WHS.***	

4.0 The draft Development Consent Order	
Agenda Item	**The Applicant's Response[11]**
This section will discuss matters concerning the draft DCO where they largely do not concern compulsory acquisition and/or temporary possession. Those matters will be discussed at the CAH1. ***Article 2 (and elsewhere): The phrase "materially new or materially worse"*** ***Article 3 (disapplication of legislation) and specifically subparagraph (1)(a)*** ***Article 15 (authority to survey land…): The ExA wishes to better understand the powers sought by subparagraph (1)(b) in respect to any land which is adjacent to, but outside the Order limits. In particular:*** • ***The ExA wishes to better understand specifically which land***	**Article 2** The **ExA** clarified that article 2 has already been discussed in ISH2, within Agenda Item 2.2, so was not discussed at this point during ISH2. **Article 3** Turning to the specific paragraph of article 3 mentioned in the agenda, **Robbie Owen, for the Applicant** explained that Section 28E of the Wildlife and Countryside Act 1981 requires owners and occupiers of land within a Site of Special Scientific Interest ("**SSSI**") to give notice to Natural England before carrying out an activity that is specified in the SSSI's notification. He further explained that section 28H of that Act imposes a duty on public bodies, such as the Applicant, to give notice to Natural England before carrying out activities likely to damage the features of scientific interest of a SSSI. **Mr Owen** further explained that as is set out in paragraphs 6.10 and 6.11 of the Explanatory Memorandum [APP-286], the Applicant considers that disapplication of these provisions is appropriate because, if development consent is granted, issues relating to the management of SSSIs potentially affected by the Project will have been thoroughly examined through the examination. He confirmed that appropriate measures required to safeguard and protect SSSI features of scientific interest have been included in the first iteration EMP and thus would be secured through the DCO. For example, measure D-GEN-07 provides for method statements for working in or near a Special Area of Conservation ("**SAC**") and measure D-BD-4 makes provision for the protection of the SAC crossing at Trout Beck. **Mr Owen** explained that the Applicant's rationale for the disapplication is wholly in line with the 'one stop shop' concept of DCOs in terms of consents. Ultimately, the Applicant wishes to ensure that there is a framework for securing the protection of SSSIs (and other features) through the EMP, which is not then duplicated through existing legislative processes that seek to achieve the same outcomes. **Mr Owen** confirmed that article 3 of the draft DCO would not prevent the designation of a SSSI but would simply mean that two of the effects of land being designated as a SSSI would not apply in respect of the Project due to the disapplication, being the obligation upon landowners and occupiers to notify before carrying out activities would not apply and the public body duty to provide notice for carrying out activities. Based on a query from the ExA, **Mr Owen** and **Kerry Whalley, for the Applicant**, clarified that the Applicant is not aware of Natural England having an intention to designate any of the land within the Project's limits as a SSSI.

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this would refer to, having regard to the term "adjacent to". • ***Explanatory Memorandum paragraph 7.42 final sentence in relation to this Article states "This is particularly relevant with respect to ecological receptors that are liable to move into and out of the Order limits". The ExA requests the Applicant to explain whether the power in the Article goes much further than the Explanatory Memorandum explanation and should be restricted to areas where there is known ecological sensitivity or linked to an assessment in the ES.*** • ***The Applicant is required to explain why this article is different to Article 23(1) in the A47 Blofield to North Burlingham DCO in respect of 'land shown within the Order limits***	The ExA queried where article 3(1)(f), relating to s80 of the Building Act 1984, sits in terms of whether the provision is within section 150 of the Planning Act 2008. **Mr Owen** confirmed that the Applicant would provide further information on this point. ***Post hearing note:*** *As is reported in the Applicant's Responses to the Examining Authority's Issue Specific Hearing 2 Additional Questions (Document Reference 7.1) DCO.ISH2.01, section 150 of the Planning Act 2008 confirms that an order granting development consent may include provision the effect of which is to remove a requirement for a prescribed consent or authorisation to be granted, only if the relevant body has consented to the inclusion of the provision.* *The consents that are prescribed for the purposes of section 150 of the Planning Act 2008, i.e. those in relation to which the consent of the relevant body is required for their consenting requirements to be removed, are listed in Schedule 2 to the Infrastructure Planning (Interested Parties and Miscellaneous Prescribed Provisions) Regulations 2015. The Building Act 1984, is not included in the list of prescribed consents to which Section 150 of the Planning Act 2008 applies, therefore the consent of the relevant body is not required for the consent requirement to be disapplied by the Order.* **<u>Miscellaneous</u>** The ExA sought to understand the Applicant's position in the event that the ExA or the Secretary of State was to find one scheme to be unacceptable in environmental terms. In other words, could one of the schemes be removed from the DCO and consent be granted for the remainder, or would one scheme being deemed unacceptable mean that the same applied to the entire Project. **Mr Owen** explained that the position is that the Secretary of State, under the provisions of the Planning Act 2008 which govern the role that the Secretary of State has within the process, has a number of options at their disposal. Ultimately the Secretary of State would need to "take a view" if one or more schemes were not acceptable. **Mr Owen** suggested that practically, the Applicant could be invited to reconsider the aspect of the particular scheme which is causing the unacceptable effect. He concluded that the key point is that the Project's objectives make it one Project comprising eight schemes. There may well be the need to balance the overall public benefit of the Project with the environmental impact of the one scheme in question. Ultimately, the overall Project needs to be considered alongside its individual components. *The **ExA** stated that article 15 was removed from the ISH2 agenda and was instead discussed within the CAH hearing, which took place on 2 December 2022, under agenda item 3.16.*

or which may be affected by the authorised development'. This should be explained in the context of the Explanatory Memorandum [APP-286, para 7.42] 'surveys can be conducted to assess the effects of the Project, or on the Project' and 'ecological receptors that are liable to move'.
• ***The Applicant will also be invited to comment on the possible use of:***
  ○ ***for the purposes of this Order' in draft DCO Article 15(1); and***
  ○ ***where reasonably necessary, any land which is adjacent to, but outside the Order limits which may be affected by or have an effect on the authorised development' in draft DCO Article 15(1)(b).***	

5.0 Brough Hill Fair	
Agenda Item	**The Applicant's Response[12]**
The ExA wishes to better understand the following: • ***The issues around the selection of the replacement Brough Hill Fair site. This will include confirmation from the Applicant as to which site is proposed to be the replacement site and the specific site concerns of both alternatives from the gypsies and travellers' representative.*** • ***The powers contained within Article 36 of the draft DCO. The ExA has a number of questions in respect to the wording of this Article and its intended purpose, and to better understand the stated "Brough Hill Fair Rights" including whether any local***	The ExA asked the Applicant to confirm the proposed replacement site for the Brough Hill Fair. Referring to a plan that was shown on screen at ISH2 (and which was requested to be submitted into the examination by the ExA), **Robbie Owen, for the Applicant** confirmed the existing site and proposed replacement site, the latter as defined in article 36 of the draft DCO. **Mr Owen** confirmed that in discussion with the Gypsy and Traveller Community, the Applicant has considered reasonable alternatives to the proposed replacement site and a supplementary consultation took place between 18 March and 3 April 2022 on this point, looking at a specific alternative (referred to as the "eastern site"). He went on to explain that following the supplementary consultation and consideration of responses to that consultation, the site that is now in the DCO application and referred to in article 36 is what was known as the "Bivvy site". He confirmed that this is ultimately what the Applicant is promoting as the replacement site. ***Post Hearing Note:*** *Visualisations of the Brough Hill Replacement Site shared with Mr Welch are included in Appendix 6 of this document.* However, it is acknowledged that further work is being undertaken by the Applicant to consider how a noise barrier fence and horse barrier can be accommodated within the site in response to comments made by Mr Welch at the Hearing. In response to comments made by **Billy Welch, for the Gypsy and Traveller Community**, **Mr Owen** confirmed that engagement has been ongoing for many months between the Applicant and the community. Visualisations of the proposed replacement site were sent to Mr Welch digitally on 8 April 2022, after the supplementary consultation which took place on 3 April, and a hard copy was provided on 30 November 2022 in A2 size. **Paul Carey, for the Applicant** clarified the bunding considerations on the proposed replacement site, explaining that the visualisation provided to Mr Welch includes two bunds. One runs adjacent to the carriageway along the northern edge and the other runs to the south. In respect of concerns raised by **Mr Welch** with respect to horses, **Mr Carey** explained that the detailed design stage would consider the specification of fencing to be provided. In terms of size, both the existing and replacement site are approximately 5 acres, with access to the proposed replacement site where the relevant plan states "Station Road". In terms of concerns raised by **Mr Welch** around noise at the proposed replacement site due to the proximity to the dual carriageway as proposed, **David Hiller, for the Applicant** confirmed that additional noise modelling has been undertaken for the proposed replacement site, which has bunding on the northern and southern perimeter (as stated

[12] It should be noted that this response is summarised in the order in which the points were made at ISH2. As such, it does not always match exactly with the agenda items in the first column (and it is for that reason, those agenda items have been grouped together to give an indication as to the broad topics explored).

legislation exists relating to Brough Hill Fair. • ***The intended mechanism and land ownership aspects of the transfer, the nature and impact of temporary suspension and the relationship of what is proposed with the Public Sector Equality Duty.*** • ***Why the land on which the Brough Hill Fair is currently held has not been identified by the applicant as special category land [SoR, APP-299, para 7.3.1]. The Applicant should also add this explanation to the Explanatory Memorandum***.	by Mr Carey), the former of which has the main objective of being a noise barrier. Mr Hiller explained that the existing site has been modelled with the traffic and noise exposure as it currently is and the proposed replacement site has been modelled with the new dual carriageway *and* proposed bunding. **Mr Hiller** continued, by confirming that whilst there is a strip along the northern side of the proposed replacement site that is exposed to high levels of noise, the areas exposed to high noise levels would not extend as far into the site as they do on the existing site. This is due to the noise bunding provided, which acts as a barrier. He concluded by stating that, therefore, in relation to a comparison of noise levels between the two sites (current and proposed replacement), there is a greater proportion of the proposed replacement site that has lower noise levels when compared to the existing site, so in terms of total areas, there is an improvement in terms of the overall noise levels. **Andy Johnson, for the Applicant** confirmed that these outcomes have been verbally shared with Mr Welch. ***Post Hearing Note:*** *An updated version of the plan shown on screen during ISH2, showing the location of existing and replacement Brough Hill Fair sites alongside and in relation to one another, can be found at Appendix 5.* *The Applicant has acknowledged the ExA's request to provide the technical note from which the noise levels reported by Mr Hiller at ISH2 derive – this is appended at Appendix 7.* *It is important to put this technical note into the context of the Environmental Statement. Chapter 12 Noise and Vibration of the Environmental Statement (ES) [Document Reference 3.2, APP-055] sets out the likely significant effects of the Project in terms of noise and vibration impacts in line with the guidance presented in the Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration, as well as relevant national and international guidance presented in section 12.3 of the ES Noise and Vibration chapter [Document Reference 3.2, APP-055].* *The ES included the noise contour maps resulting from the operation of the Project in Figures 12.2 to Figure 12.7 of the ES [Document Reference 3.3, APP-112 to APP-118]. These maps showed the results of noise modelling for the Do-Minimum and Do-Something scenarios for the opening and future years, including the full extent of both the Brough Hill site (existing site) and the Bivvy site (proposed site).* *However, the Brough Hill site was not identified expressly as a sensitive receptor in the ES based upon the temporary nature of its use. As such, the predicted noise levels were not expressly reported and were not required to be reported in the likely significant effects of the Project.* *Having regard to comments made by Mr Welch in his relevant representation, and as a part of on-going engagement, the Applicant shared verbally with Mr Welch the main outcomes of a more granular level of detail on the noise levels at the Bivvy site. This was not required to be reported in the ES, as outlined above, but was provided to aid Mr Welch's understanding of the Applicant's proposals for the Bivvy site. This work demonstrated*

	that the Bivvy site showed an improvement in terms of noise impacts for the bunded section of the site when comparing to the existing site. *The technical note will be updated at Deadline 3 to reflect the on-going work by the Applicant in respect of potential noise and horse barriers at this location.* **Mr Owen** then explained the nature and status of the Brough Hill Fair rights, as referred to in article 36 of the draft DCO. He commented that the precise nature and legal status of those rights remains subject to a significant degree of uncertainty. The origins of the Fair are traced back to a Royal Charter granted by King Edward III in the 1300s to Robert de Clifford and his heirs of the Manor of Brough under Stainmore. The Charter authorised Robert de Clifford and his heirs to hold one market each week on a Thursday at his manor of Brough under Stainmore and "one fair there lasting for four days that is to say for two days before the feast of St. Matthew the Apostle, on the feast day itself and for one day following so long as the market and the fair do no harm to neighbouring markets and neighbouring fairs." (the feast day of St. Matthew the Apostle is 21 September). **Mr Owen** confirmed that the Applicant has not been able to identify the precise location of the original Fair, or the locations in which it has been held prior to the modern era, but the Applicant is aware that the Brough Hill Fair is known to have been held on Brough Hill and then, approximately 70 years ago, began to be held at its current location. **Mr Owen** confirmed that neither of these locations are within the known boundary of the Manor of Brough under Stainmore. **Mr Owen** further explained that the existing site was transferred to the Ministry of Defence in 1947. The Agreement for Sale dated 22 February 1947 stated that the land would be sold subject to "the ancient right of holding Brough Hill Fair annually and to all liberties and customs as heretofore enjoyed in connection therewith". He confirmed that the Applicant does not have any further information relating to this transfer, but the Applicant is proceeding on the assumption that whatever such rights were in existence prior to the transfer, were transferred with the land. **Mr Owen** further noted that the Applicant is not, and does not purport to be, the arbiter of what legal rights, if any, exist in relation to the Brough Hill Fair. He confirmed that, this notwithstanding, the Applicant has considered the nature and status of those rights to ensure that the provisions of its draft DCO are effective in achieving their intended purpose of relocating the Fair. He further explained that there are a number of ways in which it could be said that there are rights to hold the Brough Hill Fair that the Applicant has considered: 1. Pursuant to the Royal Charter; 2. Prescriptive right; or 3. Customary or public rights.

	Mr Owen noted that the Applicant does not have a view on which, if any, of the above considerations apply to the event known as Brough Hill Fair, but the drafting of article 36 in the draft DCO accounts for all of them. Article 36(5) defines the Brough Hill Fair Rights by reference to the "customary rights, prescriptive rights, rights derived from royal charter and public rights that relate to the event known as the Brough Hill Fair that may immediately subsist," before the relevant power in article 36 is exercised. As a result, article 36 cannot create new rights, but will affect the transfer so that the current rights are to continue. **Mr Owen** clarified that there is nothing relating to the Brough Hill Fair rights within the Book of Reference because they have not been located on the Land Registry and that the Applicant is not of the view that they are proprietary rights. Furthermore, he confirmed that the Applicant is not aware of any local legislation updating the charter referred to by Mr Welch. ***Post hearing note:*** *Appendix 8 contains the results of the Applicant's research into the Royal Charter, including a translation hosted by Cumbria County Council's County Archives. A copy of the 1947 agreement for purchase of land that includes the Brough Hill Fair site is also contained within that appendix, the third schedule of which includes the reservation in relation to the Brough Hill Fair rights mentioned in the hearing.* ***Post hearing note:*** *the Applicant agreed to supply further explanation and examples of the terms used in the definition of "Brough Hill Fair rights" contained in article 36(5) in its summary of oral submission. Article 36(5) of the draft Order defines the Brough Hill Fair rights by reference to "any and all customary rights, prescriptive rights, rights derived from Royal Charter and public rights". Taking each in turn:* *<u>Customary rights</u>* *Customary rights are not exercisable by the public at large, but by members of a particular community or class of persons. For customary rights to exist they must (i) be immemorial; (ii) be reasonable; (iii) be certain in their terms both of the locality over which they are exercisable and in terms of the persons entitled to exercise them; and (iv) have continued as of right without interruption since their time immemorial origin. An example of a customary right incudes the right of parishioners to walk across the local manor to the local church (*Brocklebank v Thompson *[1903]).* *<u>Prescriptive rights</u>* *Prescriptive rights are private rights that arise through long use as of right. Examples of prescriptive rights can include a private right of access over land.*

	<u>Rights derived from Royal Charter</u> *Royal Charters were used by the monarch to grant particular rights and privileges to individuals or localities under prerogative. In later years, they were used to create corporations, prior to the development of company law. There are numerous and varied examples of rights derived from Royal Charter, but they can include the right to hold a market or fair. For a recent discussion of some of the issues the courts have grappled with when construing ancient charters in a modern context (albeit in the Irish High Court) see* Listowel Livestock Mart Ltd v William Bird & Sons Ltd & Others [2007] IEHC 360. *<u>Public rights</u>* *A public right is a right that is exercisable over land by any person under the general law. Examples of public rights include the right of the public at large to use a highway or to navigate in tidal waters.* ***Post hearing note:** the Applicant was also asked to explain why the Brough Hill Fair rights are not listed in the Book of Reference.* *Regulation 7 of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 sets out what information is to be included in a Book of Reference.* *Part 1 is required to contain the names and addresses for service of each person within Categories 1 and 2 as set out in section 57 of the Planning Act 2008. A person is in Category 1 if they are the owner, lessee, tenant or occupier of the land and in category if they have the power to sell or convey the land, or release the land. None of the types of rights that* could *comprise the Brough Hill Fair rights discussed above come within Categories 1 or 2 as whatever may be their nature, they do not comprise ownership, a lease, a tenancy or occupation of the land and nor do they convey a power of sale or release.* *Part 2 of the Book of Reference is required to include persons within Category 3 which is persons entitled to make a "relevant claim". The relevant claims relate to (i) the depreciation in value of retained land that is not acquired, (ii) from the depreciation in value of land from physical factors and (iii) compensation under section 152(3) of the Planning Act 2008 (which relates to claims for nuisance). With the possible exception of prescriptive rights, none of the possible types of rights that could constitute the Brough Hill Fair rights would give rise to relevant claims as such rights do not attach to other land. In relation to possible prescriptive rights the Applicant's diligent inquiries have not identified evidence of the existence of such rights, or details of the land in relation to which the benefit of such rights would attach.* *Part 3 of the Book of Reference is required to contain the names of all those entitled to enjoyment easements or other private rights over land which are proposed to be extinguished, suspended or interfered with. For much the same reasons as Part 2 with the possible exception of prescriptive rights, the different potential ways in which the*

	Brough Hill Fair rights might have arisen are not in the character of private rights or easements over land. In relation to possible prescriptive rights the Applicant's diligent inquiries have not identified evidence of the existence of such rights, or details of the land in relation to which the benefit of such rights would attach. *Parts 4 and 5 deal with special category and Crown land, and whatever may be the nature of the Brough Hill Fair rights, they do not constitute special category land or rights of the Crown, albeit the site of the Brough Hill Fair itself is Crown land.* ***Post hearing note:** the Applicant was also asked to confirm whether there is any relevant local legislation in relation to the Brough Hill Fair rights and to explain the intended use of the power in article 36(3) to temporarily suspend the Brough Hill Fair rights.* *The Applicant can confirm that its review of local legislation did not uncover any local legislation that was relevant to the Brough Hill Fair.* *In relation to the power to temporarily suspend the Brough Hill Fair rights in article 36(3), the Applicant provided an update during the course of the Compulsory Acquisition Hearing held on Friday 2 December 2022 that the provision was included only on a precautionary basis and that further information as to construction methodology is now available. As such the Applicant confirmed that it is content to remove the power to temporarily suspend the Brough Hill Fair rights. This change will be made to the draft DCO when its next iteration is submitted at Deadline 2.* The **ExA** queried what the Applicant's stance would be if Mr Welch (and the Gypsy and Traveller Community) were not content with the replacement site being offered. **Mr Owen** explained that whilst there is no obligation on Mr Welch to accept the proposed replacement site, it is what the Applicant believes to be the most appropriate. He explained that the Applicant has prepared an Equalities Impact Assessment [APP-243] which, amongst other matters, sets out the regard it has had to its public sector equality duty during the development of its proposals for the Project. This includes in relation to its consultation with representatives of the Gypsy and Traveller Community on the proposed replacement for the Brough Hill Fair. **Mr Owen** continued, by confirming that, to date, the engagement and consultation with Mr Welch and the Gypsy and Traveller Community has been detailed and taken place over a long period of time, with a number of face-to-face meetings. **Mr Owen** further confirmed that the Applicant will keep engaging with Mr Welch in the hope that he and the Gypsy and Traveller Community can be persuaded that the proposed replacement site is appropriate and better than a number of alternatives which have been considered. He confirmed that the Applicant understands the concern about the loss of cultural connection, but the Brough Hill Fair has not been at its current location for a particularly long time. Indeed, **Mr Owen** explained that the replacement site is next to the current Fair site and that the loss of the existing site can be mitigated by maintaining some of the old site layout within the replacement site, which the

	Applicant is consulting with Mr Welch on. **Mr Owen** confirmed that the Applicant is unable to move the Brough Hill Fair site to the AONB as Mr Welch proposed for reasons explained at ISH1. The **ExA** queried why the land on which the Brough Hill Fair is currently held has not been identified by the applicant as special category land. **Mr Owen** explained that as noted in the Statement of Reasons [Document Reference 5.8, APP-299], the Applicant does not consider the site of the existing Brough Hill Fair to be special category land, more specifically, it is not considered to be 'open space' within the meaning of section 131(12) of the Planning Act 2008, as land used for the purposes of public recreation. He submitted that the use of land for an annual fair which takes place over a few days is similar to the use of a farmer's land for a popular music festival, the location of an annual sporting event or other regular events – these are not considered to render land as "open space". **Mr Owen** further submitted that it is also not clear that activities carried out at the Brough Hill Fair can be characterised as "public recreation". Whilst recreation is broad concept it isn't clear that the range of activities carried out at the Fair, when viewed in their totality, are recreation or carried out by the public at large. ***Post hearing note:*** *the Applicant was asked to provide further detail as to why it considers that the site of the existing Brough Hill Fair is not 'open space' special category land within the meaning of section 131(12) of the Planning Act 2008 as stated in paragraph 7.3.1 of the Statement of Reasons [APP-299].* *"Open space" is defined in section 19(4) of the Acquisition of Land Act 1981 as "any land laid out as a public garden or used for the purposes of public recreation, or land being a disused burial ground.". The site is neither laid out as a public garden nor comprises a disused burial ground, so the key characteristic to consider is whether or not it can be said to be "used for the purposes of public recreation".* *Considering the legal authorities that have addressed questions of when land can be said to be used for the purposes of public recreation:* • *The characterisation of land as open space is not dependent on the legal basis upon which the public make use of the land (R v Doncaster Metropolitan Borough Council Ex p. Braim (1989) 57 P. & C.R. 1).* • *The use of the land for the purposes of recreation must have an element of continuity of use. Whilst the ability to exclude the public from the land or for certain parts of the land, is not inconsistent with it being "open space" (Burnell v Downham Market Urban District Council [1952] 2 QB 55, at 66), the definition nonetheless suggests an ongoing, rather than occasional, if regular use.* • *It would be surprising if the use of land for an annual fair or similar event had the effect of rendering it open space. Such an interpretation would risk for example, the site of a popular music festival, the location of an annual sporting event or other regular events being considered to have changed the character or use of private land such that they become "open space".*

	• *It is not clear that activities carried out at the Brough Hill Fair can be characterised as "public recreation". Whilst recreation is a broad concept it isn't clear that the range of activities carried out at the fair, when viewed in their totality are recreation, or are carried out by the public at large.* • *The Applicant is content to add a brief note to the Explanatory Memorandum in its next iteration at deadline 2, confirming that the site of the Brough Hill Fair is not special category land.* **Mr Owen** concluded by stating that article 36 of draft DCO provides that the Secretary of State must, following consultation, certify as being appropriate for the purpose, a scheme for the provision of a replacement Brough Hill Fair site. That scheme must be capable of dealing with the issues raised by Mr Welch. It is also important to note that there are improvements within the proposed replacement site in the form of electricity and water, amongst other elements previously mentioned. ***Post hearing note:*** *the Applicant was asked to consider amending article 36(2)(a) to include consultation with representatives of the Gypsy and Traveller community regarding the scheme for the provision of the replacement Brough Hill fair site to be certified by the Secretary of State. The Applicant has reflected on this request and is minded to amend article 36 to provide for consultation with representatives of the Gypsy and Traveller community on the scheme to be certified by the Secretary of State. The Applicant will make the appropriate amendments in the next iteration of the draft Order to be submitted at deadline 2.*

A66 Northern Trans-Pennine Project
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7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 1 – Legal Basis for Including Mitigation Obligations in an Article rather than a requirement

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 1 – Legal basis for including Mitigation Obligations in an article rather than a requirement

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	NH/EX/7.3
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	Date	Status of Version
Rev 1	16 December 2022	Deadline 1

APPENDIX 1 – LEGAL BASIS FOR INCLUDING MITIGATION OBLIGATIONS IN AN ARTICLE RATHER THAN A REQUIREMENT

1. This note provides submissions on the legal basis and enforceability of including commitments in an article of the DCO (in this case, articles 53 to 55 of the draft DCO [APP-285]), when compared to a 'requirement' in a separate Schedule to the DCO (as has been the position in DCOs to date).

2. The starting point in determining the nature of provisions a DCO can include, and their legal status and effectiveness, is the Planning Act 2008 (**the PA 2008**).

3. Section 120(1) of the PA 2008 provides that a DCO "…***may*** *impose requirements in connection with the development for which consent is granted*" (our emphasis).

4. Section 120(2) of the PA 2008 further provides that such requirements:

"…*may in particular include -*

(a) requirements corresponding to conditions which could have been imposed on the grant of any permission, consent or authorisation, or the giving of any notice, which (but for section 33(1)) would have been required for the development;

(b) requirements to obtain the approval of the Secretary of State or any other person, so far as not within paragraph (a)."

5. There are three preliminary points to make in this context:

5.1 first, it is clear that the PA 2008 does not mandate that a DCO must include requirements – see use of the word "may";

5.2 secondly, in any event, the term 'requirement' as used in the PA 2008 does not introduce a unique, legal concept (for example, it is not defined in any special way). Instead, the use of the term 'requirement' in the PA 2008 is referring to the *effect* of any provision that *may* be included in the DCO. As such, the term needs to be given its ordinary meaning, such as "..*a thing that is compulsory; a necessary condition*", taken from the Oxford Dictionary of English; and

5.3 thirdly, nowhere in the PA 2008 is it mandated that requirements, where included in a DCO, must be included in a separate Schedule to the DCO.

6. The Applicant notes the content of the Planning Inspectorate Advice Note 13 *Preparation of a draft Development Consent Order and Explanatory Memorandum*[13], which states that a draft DCO "should" include requirements (para 2.10). However, the Applicant also notes that the Planning Inspectorate Advice Notes provide advice (and do not have any statutory status) and submits that this does not reflect the legal position and therefore affect the approach the Applicant is taking in relation to the securing of mitigation on the Project.

7. Indeed, the Planning Inspectorate Advice Note 15 *Drafting Development Consent Orders*[14] introduces more nuance on this point at paragraph 16.1:

"*An application may have significant adverse environmental effects that require mitigation; such effects will be identified in the accompanying ES and/ or relevant environmental information.* ***Any mitigation measures relied upon in the ES must be robustly secured and this will generally be achieved through Requirements in the draft DCO****. Mitigation that is identified in the ES as being required must also be clearly capable of being delivered*." (our emphasis)

8. Two points arise from this, namely that the Planning Inspectorate, reflecting the PA 2008:

8.1 recognises that 'requirements' are not the only way that mitigation can be secured in a DCO; and

8.2 does not suggest any requirements included in a DCO need to be in a separate Schedule to that DCO.

9. As can be seen, therefore, there is no legal (or indeed policy) requirement in the PA 2008 for a DCO to include requirements or, where it does include requirements, for a DCO to have a separate requirements Schedule. As such, the Applicant submits that the approach taken in the draft DCO for the Project is entirely lawful and consistent with these principles.

10. In this context, there are two alternative legal interpretations as to the approach the Applicant has taken:

10.1 articles 53 to 55 of the DCO are 'requirements' as contemplated by section 120(1) of the PA 2008, but simply drafted as articles of the DCO, as opposed to paragraphs of a Schedule to the DCO; or

10.2 articles 53 to 55 of the DCO are not 'requirements' but provisions (for example) "*relating to, or to matters ancillary to, the development for which consent is granted*"[15] or "*necessary or expedient for giving full effect to any other provision of the [DCO]*"[16].

[13] Version 3 – November 2019
[14] Version 2 – July 2018
[15] Section 120(3) of the 2008 Act
[16] Section 120(5)(c) of the 2008 Act

11. Ultimately, the answer to that question is irrelevant in legal terms – there is a legal basis for including the provisions in the DCO in either case. As the Planning Inspectorate Advice Note 15 states, the key point in all of this is simply whether mitigation measures are "robustly secured". The Applicant submits its approach ensures commitments given in articles 53 to 55 of the DCO are robust and legally enforceable and therefore are robustly secured.

12. The Applicant acknowledges the general approach taken to date on DCOs has been for 'requirements' to be included as paragraphs of a Schedule to the DCO. This stems from the, no longer in force, DCO 'Model Provisions'[17]. Such 'requirements' are routinely referred to as 'Requirement 1, Requirement 2', etc. However, that does not reflect the legal status of those provisions – they are simply the same as any other paragraph of any other Schedule to a DCO, or indeed any article of a DCO. The entirety of a DCO is a statutory instrument, a piece of secondary legislation, and *all* of its terms have the same status.

13. As such, *where* in the DCO a commitment is secured has no bearing from a legal, and therefore enforceability, perspective. Indeed, anything within the DCO is a legal obligation, enforceable by way of the regime set out in Part 8 of the PA 2008. By way of an example, section 161(1) of the PA 2008 provides that:

"*A person commits an offence if without reasonable excuse the person—*

(a) carries out, or causes to be carried out, development in breach of ***the terms*** *of an order granting development consent, or*

(b) otherwise fails to comply with ***the terms*** *of an order granting development consent*." (our emphasis)

14. As can be seen, all of 'the terms' of a DCO are legally enforceable – that includes *both* articles of a DCO and Schedules to a DCO, which are given equal status in terms of enforceability. As such, should the Applicant not comply with, for example, the provisions in article 53 governing the Environmental Management Plan regime, that would be a criminal offence. It matters not one jot whether such an obligation sits in a Schedule to the DCO or in an article of the DCO.

15. In terms of why the Applicant considers articles 53 to 55 of the DCO are most appropriate as articles, rather than paragraphs of a Schedule to the DCO, the Applicant has had regard to the Office of the Parliamentary Counsel Drafting Guidance (June 2020)[18]. This states that, in relation to Bills (but the principle of which applies to DCOs as subordinate legislation, too): "*Schedules can assist clarity by providing a home for material that would otherwise interrupt and distract from the main story you are trying to tell*" (para 3.9.1) but "*relegating text to the end of the Bill may not always help the reader. It may break up the story you are telling; or make the structure of the Bill more complicated*

[17] As contained in the now lapsed Infrastructure Planning (Model Provisions) (England and Wales) Order 2009
[18] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/892409/OPC_drafting_guidance_June_2020-1.pdf

than it needs to be. So don't dispatch material to Schedules without good reason…" (para 3.9.3). The Applicant submits here that there is no good reason in this case. Simply adding a new Schedule and including articles 53 to 55 as paragraphs of that Schedule wouldn't add anything in legal terms and would, as the guidance says, 'break up the story' of the DCO unnecessarily.

16. Given all of this, the Applicant submits that its approach in the draft DCO to not including a separate requirements Schedule:

16.1 is entirely consistent with the legal principles and obligations set out in the PA 2008; and

16.2 in no way dilutes the obligations contained within articles 53 to 55 of the draft DCO, which are all legally enforceable in the same way as provisions contained in a separate requirements Schedule would be and which are therefore robustly secured.

17. As a final point, the Applicant acknowledges that a number of commitments that may ordinarily have been included on the 'face' of a DCO (e.g. in a requirements Schedule) are, in the case of the Project, contained in other 'control' documents. These include the first iteration Environmental Management Plan and the Project Design Principles, both of which are proposed to be 'certified' documents, or the second iteration Environmental Management Plan, which is proposed to be subsequently approved by the Secretary of State post consent. The Applicant wishes to reiterate the point that this approach also has no bearing in legal enforceability terms. Where the DCO compels compliance with a named document, that obligation is a 'term of' the DCO and fully enforceable. The content of that document can, in effect, be 'read in' to the DCO and, as such, non-compliance with that document would equate to non-compliance with the 'terms of' the DCO and be enforceable against (under the PA 2008) accordingly.

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7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 2 – LA120 Environmental Management Plans

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 2 – LA120 Environmental Management Plans

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	NH/EX/7.3
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	Date	Status of Version
Rev 1	16 December 2022	Deadline 1

Design Manual for Roads and Bridges

Sustainability & Environment
Appraisal

LA 120
Environmental management plans

(formerly IAN 183/14 Environmental Management Plans, IAN 183/16 (W) Environmental Management Plans)

Revision 1

Summary
This document sets out the requirements for the preparation and implementation of environmental management plans for construction of highways and/or roads projects.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
1	Mar 2020	Revision 1 (March 2020) Update to references only. Revision 0 (November 2019) LA 120 replaces IAN 183/14 and IAN 183/16 (W). This full document has been re-written to make it compliant with the new Highways England drafting rules.

Foreword

Publishing information

This document is published by Highways England.

This document supersedes IAN 183/14 Environmental Management Plans and IAN 183/16 (W) Environmental Management Plans, which are withdrawn.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

This document provides a framework to manage the environmental effects of projects to demonstrate compliance with environmental legislation, by providing a plan for the delivery of the project's design, mitigation, enhancement and monitoring commitments.

The development of this document has been influenced by:

1) Environmental management systems - Requirements with guidance for use BS EN ISO 14001 [Ref 2.I]; and
2) Environmental Impact Assessment Guide to: Delivering Quality Development (IEMA, 2016) EIAG DQD [Ref 1.I].

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 3.N] apply to this document.

Abbreviations

Abbreviations

Abbreviation	Definition
EAR	Environmental assessment report
EIA	Environmental impact assessment
EMP	Environmental management plan
ES	Environmental statement

Terms and definitions

Terms

Term	Definition
Competent authority	An authority that is legally responsible for discharging the requirements of the 2014/52/EU [Ref 1.N] via the development consenting process.
Competent expert	Individuals who can demonstrate that they have relevant: 1) qualifications (e.g. education and training); and 2) expertise in environmental management.
Environmental management plan	A document (or set of documents) that sets out the mitigation needed to manage environmental effects associated with a development during the construction and operational phases EIAG DQD [Ref 1.I].
Lifecycle stage	Design, construction or operation stage of a project.

1. Scope

Aspects covered

1.1 An environmental management plan (EMP) shall set out the conclusions and the actions needed to manage environmental effects identified within the environmental assessment during construction and operation of a development.

1.1.1 EMPs should be prepared for all projects, including for the management and operation of the existing network.

NOTE *The EMP establishes a suitable mechanism to link assessment assumptions, planning conditions and obligations.*

1.2 In accordance with LA 104 [Ref 2.N], the results of monitoring shall be used to update the EMP during the construction and handover stage.

Implementation

1.3 This document shall be implemented forthwith on all projects on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 3.N].

Use of GG 101

1.4 The requirements contained in GG 101 [Ref 3.N] shall be followed in respect of activities covered by this document.

2. Environmental management plans

Purpose of the environmental management plan

2.1 The EMP shall provide clear and concise information which states how the mitigation and management of environmental effects will be delivered and maintained.

Environmental management plan programme

2.2 The EMP shall set out the control of environmental effects through all lifecycle stages from the design stage in accordance with Table 2.2 and Appendix A.

Table 2.2 Delivery schedule and updates of the EMP

Project stage	EMP iteration	Produced / refined
Design	First iteration of EMP (formerly outline EMP) produced during the design stage for the preferred option.	Produced
Construction (refined for the consented project)	Second iteration of EMP (formerly construction EMP) refined during the construction stage for the consented project, in advance of construction.	Refined
End of construction	Third iteration of EMP (formerly handover EMP) building on the construction EMP refined at the end of the construction stage to support future management and operation.	Refined

2.3 The EMP shall be refined and updated when additional information comes to light to capture any necessary alterations to the proposed mitigation and management of environmental effects.

NOTE Such additional information or alterations can include:

1) new or updated survey data;

2) changes in the physical characteristics of the project;

3) changes in the design and mitigation assumptions;

4) changes in the level of understanding of the current state of the environment and the potential effects of the development (e.g due to greater data availability);

5) changes in legislation, policy and guidance/advice relating to any environmental topic; and

6) changes response to stakeholder consultation.

Environmental management plan preparation, structure and content

2.4 EMPs shall be prepared and authorised by competent experts.

2.5 The EMP shall:

1) provide a clear audit trail outlining the modifications made from any previous iteration;
2) identify roles and responsibilities;
3) identify risks, their associated control measures, compliance and corrective actions; and
4) establish procedures for communication, monitoring, audit mechanisms and reporting of control measures.

2.5.1 Control measures should include a date of completion.

2.6 The EMP shall report on the factors outlined in LA 104 [Ref 2.N].

2.6.1 The EMP should be consistent with the information provided within other environmental reports e.g. environmental assessment report / environmental statement.

2.7 The EMP shall provide sufficient and proportionate level of detail on the measures to mitigate and manage the environmental effects.

2.8 The EMP shall include a register of environmental actions and commitments including:

1) clear and specific description of the action;
2) the objective of the action;
3) how the action is to be implemented/achieved;
4) the source of the action, including references for source documentation e.g. environmental statement;
5) naming of the person responsible for the action;
6) achievement criteria and reporting requirements;
7) the project stage, date or implementation and achievement; and
8) details of any monitoring required and corrective action.

2.9 The EMP shall include details of induction, training and briefing.

2.10 EMPs shall include:

1) a description of the main difficulties encountered in delivery of measures to mitigate and manage the environmental effects; and
2) the main uncertainties involved in the forecasting of measures to mitigate and manage the environmental effects.

3. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	2014/52/EU, 'Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment'
Ref 2.N	Highways England. LA 104, 'Environmental assessment and monitoring'
Ref 3.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'

4. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	IEMA, July 2016. EIAG DQD, 'Environmental Impact Assessment Guide to: Delivering Quality Development'
Ref 2.I	BSI Standards Publication. BS EN ISO 14001, 'Environmental management systems — Requirements with guidance for use'
Ref 3.I	Highways England. LD 117, 'Landscape design'

Appendix A. Environmental management plan structure

Table A.1 EMP content and structure - First iteration (design stage)

Responsibility for document production	Designer
1. Introduction & background to project	
1.1 Purpose of the report	Produced at this stage to include a brief description of the purpose of the EMP.
1.2 The project	Produced at this stage to include: 1) project name; 2) location; 3) programme; 4) why it is needed; and brief outline of proposed works.
1.3 Project objectives	Produced at this stage to include a brief outline of the project objectives (aligning with the objectives set out in the environmental assessment report / environmental statement). NOTE: Project objectives to align with the requirements in LD 117 [Ref 3.I]
2. Project team roles and responsibilities	
	Produced at this stage to include: 1) competent expert statements; 2) roles involved in the delivery of the EMP; 3) responsibilities; and 4) organisations involved.
3. Environmental actions and commitments	

Table A.1 EMP content and structure - First iteration (design stage) (continued)

	Produced at this stage (in table format) to include: 1) clear and specific description of the action/commitment, including the specific location; 2) the assumptions on which the action is based; 3) the objective of the action, including alignment with those set out in Section 1.3. Reference to relevant legislation requirements; 4) how the action is to be implemented/ achieved, including details of risk management; 5) the source of the action (e.g. EAR/ES, Habitat Regulations assessment, Equality Impact Assessment, Traffic Management Plan) including confirmation of commitments agreed with stakeholders; 6) name of the person responsible for the action; 7) achievement criteria; 8) the anticipated project stage, date of implementation or achievement; and 9) details of any monitoring required (including in relation to likely significant adverse effects). Note: Include reference to mitigation commitments relied on within the EIA screening (determination).
4. Consents and permissions	
	Produced at this stage to include summary of anticipated consents / permissions required to deliver the EMP.
5. Environmental asset data and as built drawings	
	Produced at this stage to include: 1) confirmation of submission arrangements for providing as built drawings and environmental asset data to the Overseeing Organisation; 2) species surveys obtained until this point.
6. Details of maintenance and EMP monitoring activities	
	Produced at this stage to include a brief description of maintenance and EMP monitoring activities.
7. Induction, training and briefing procedures for staff	

Table A.1 EMP content and structure - First iteration (design stage) (continued)

	Produced at this stage to include: 1) brief description of induction, training and briefing procedures for staff; and 2) criteria for evaluation of training effectiveness.
8. References and glossary	
9. Annexes	
Annex A: Constraints map	Produced at this stage
Annex B: Relevant management plans	Produced at this stage where commitments have been made to produce specific management plans in outline format.
Annex C: Environmental method statements	Produced at this stage where commitments have been made to produce specific management plans in outline format, including relevant method statements where commitments have been made to do so.
Annex D: Emergency procedures and record of any environmental incidents	Produced at this stage to provide a brief description of emergency procedures and environmental incident record management.
Annex E: Copy of evaluation of change register	Produced at this stage to provide a brief description of evaluation of change register
Annex F: Final environmental investigation and monitoring reports	Produced at this stage to provide a brief description environmental investigation and monitoring.

Table A.2 EMP content and structure - Second iteration (construction stage)

Responsibility for document production	Contractor
1. Introduction & background to project	
1.1 Purpose of the report	This section is refined to reflect the purpose of the EMP at this stage within the project lifecycle.
1.2 The project	Refined, where applicable, in response to the statutory process stage and changes in actions.
1.3 Project objectives	n/a – no amendment anticipated.
2. Project team roles and responsibilities	
	Refined at this stage to include: 1) name and contact details (primary and secondary) for each role; and 2) lines of escalation.
3. Environmental actions and commitments	

Table A.2 EMP content and structure - Second iteration (construction stage) (continued)

	Refined at this stage to include: 1) update existing actions / identify new actions in response to the circumstances listed in the Table 1: Advisory notes; 2) define precise monitoring arrangements, including the monitoring parameters, persons involved, thresholds for remedial action and a remedial action strategy; 3) provide date and signature for completed action/commitments.
4. Consents and permissions	
	Refined at this stage to record: 1) relevant consents; and, 2) permissions from statutory bodies
5. Environmental asset data and as built drawings	
	Refined at this stage to include the relevant data as specified in the design stage EMP.
6. Details of maintenance and EMP monitoring activities	
	Refined at this stage to include: 1) procedures for monitoring and reviewing compliance including inspection/audit frequency and reporting; 2) assessment criteria to identify success; and procedures for rectification of breaching or failings of EMP measures.
7. Induction, training and briefing procedures for staff	
	Refined at this stage to include: 1) a summary of the environmental aspects of the project; 2) awareness of EMP contents; 3) a site induction; and 4) on-site training.
8. References and glossary	
9. Annexes	
Annex A: Constraints map	Refined, where applicable, in response to the statutory process stage and changes in actions.

Table A.2 EMP content and structure - Second iteration (construction stage) (continued)

Annex B: Relevant management plans	Produced or refined, as applicable, in response to the statutory process stage and changes in actions. Plans include: 1) Site waste management plan; 2) Drainage management plan; 3) Materials management plan; 4) Project asbestos management plan; and 5) any other required.
Annex C: Environmental method statements	Produced or refined, as applicable, in response to the statutory process stage and changes in actions
Annex D: Emergency procedures and record of any environmental incidents	Refined at this stage to include: 1) confirmation of procedures in the event of an environmental emergency. A record of environmental incidents (in table format) including the following information: a) date and location of the incident; b) details of the reporting procedure followed; c) description of the incident and relevant legislation; d) remedial actions; e) lessons learnt; and f) details of any contact with enforcing bodies.
Annex E: Copy of evaluation of change register	Refined at this stage to include a copy of the evaluation of change register.
Annex F: Final environmental investigation and monitoring reports	Refined at this stage to include copies of relevant reports (relating to protected species / habitats and cultural heritage investigations, and any environmental monitoring reports.

Table A.3 EMP content and structure - Third iteration (end of construction stage)

Responsibility for document production	Contractor
1. Introduction & background to project	
1.1 Purpose of the report	This section is refined to reflect the purpose of the EMP at this stage within the project lifecycle.

Table A.3 EMP content and structure - Third iteration (end of construction stage) (continued)

1.2 The project	Refined, where applicable, in response to changes in: 1) the physical characteristics of the project; 2) the design and mitigation assumptions; 3) the level of understanding of the current state of the environment and the potential effects of the development (e.g due to greater data availability); 4) in legislation, policy and guidance/advice relating to any environmental topic; and 5) in response to stakeholder consultation.
1.3 Project objectives	n/a – no amendment anticipated.
2. Project team roles and responsibilities	
	Refined, where applicable, in response to project team changes.
3. Environmental actions and commitments	
	Refined, where applicable, in response to changes in: 1) date and signature for further completed action/commitments; 2) the physical characteristics of the project; 3) the design and mitigation assumptions; 4) the level of understanding of the current state of the environment and the potential effects of the development (e.g due to greater data availability); 5) legislation, policy and guidance/advice relating to any environmental topic; and 6) response to stakeholder consultation.
4. Consents and permissions	
	Refined, where applicable, in response to changes in: 1) the consents / permissions; 2) the consents / permissions are no longer relevant; and 3) justification for either of these circumstances.
5. Environmental asset data and as built drawings	
	Refined, where applicable, in response to changes in the asset data changes or more becomes available.
6. Details of maintenance and EMP monitoring activities	

Table A.3 EMP content and structure - Third iteration (end of construction stage) (continued)

	Refined, where applicable, at this stage: 1) to include a description of post construction maintenance requirements; 2) to include assessment criteria to identify success; 3) to include procedures for monitoring and reviewing the EMP; 4) In response to changes in date and signature for further completed action / commitments; 5) In response to changes in the physical characteristics of the project; 6) in response to changes in the design and mitigation assumptions; 7) in response to changes in the level of understanding of the current state of the environment and the potential effects of the development (e.g due to greater data availability); 8) in response to changes in legislation, policy and guidance/advice relating to any environmental topic; and 9) in response to changes in response to stakeholder consultation.
7. Induction, training and briefing procedures for staff	
	This section is refined to reflect procedures for maintenance staff.
8. References and glossary	
9. Annexes	
Annex A: Constraints map	Refined, where applicable, in response to changes in: 1) the physical characteristics of the project; 2) the design and mitigation assumptions; 3) the level of understanding of the current state of the environment and the potential effects of the development (e.g due to greater data availability); 4) legislation, policy and guidance/advice relating to any environmental topic; and 5) response to stakeholder consultation.

Table A.3 EMP content and structure - Third iteration (end of construction stage) (continued)

Annex B: Relevant management plans	Refined, where applicable, in response to changes in: 1) the physical characteristics of the project; 2) the design and mitigation assumptions; 3) the level of understanding of the current state of the environment and the potential effects of the development (e.g due to greater data availability); 4) legislation, policy and guidance/advice relating to any environmental topic; and 5) response to stakeholder consultation.
Annex C: Environmental method statements	Refined, where applicable, in response to changes in: 1) the physical characteristics of the project; 2) the design and mitigation assumptions; 3) the level of understanding of the current state of the environment and the potential effects of the development (e.g due to greater data availability); 4) legislation, policy and guidance / advice relating to any environmental topic; and 5) response to stakeholder consultation.
Annex D: Emergency procedures and record of any environmental incidents	Refined, where applicable, in response to changes in: 1) the procedures for dealing with an environmental emergency change; and 2) where further environmental incidents have occurred.
Annex E: Copy of evaluation of change register	Refined at this stage to include a copy of the evaluation of change register.
Annex F: Final environmental investigation and monitoring reports	Refined at this stage to include any additional reports.

A66 Northern Trans-Pennine Project
TR010062

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 3 – Photo locations

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 3 – Photo Locations

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	NH/EX/7.3
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	Date	Status of Version
Rev 1	16 December 2022	Deadline 1

Examination requested Additional Viewpoints

Proposed Scheme

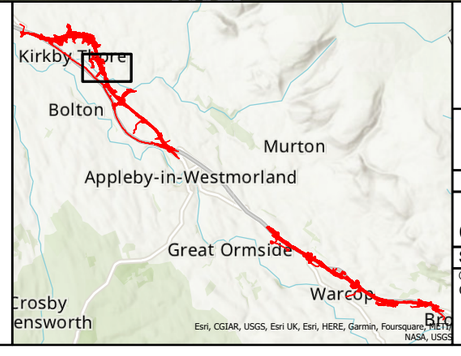
Existing A66

Viewpoint A
Photomontage from existing Viewpoint taken from the gate at Sleastonhow Farm looking south (VP 4.9a).

Viewpoint B
View from the gated entrance to Sleastonhow Farm looking east/northeast.

Viewpoint C
Viewpoint proposed to address requirement for a photomontage of the structure from this location looking east. This will require permission to access private property.

Viewpoint D
Proposed Viewpoint from the footpath to the rear of Sleastonhow Farm as requested by Mrs Nicholson during the Hearing.



national highways

3 Piccadilly Place
Manchester
M1 3BN

Revision	Created	Checked	Reviewed	Approved	Authorised
P01 First Issue	PKEL 07/12/22	CESL 07/12/22	JSIM 07/12/22	AMIT 07/12/22	KWHA 07/12/22

Metres
0 100 200 300 400

Scale @ A3: 1:5,000 | Project Ref No HE565627 | Stage: Stage 3

Project Name
A66 Northern Trans-Pennine Project

Map Title
Figure 1
Examination: Additional Viewpoints
Structure: Trout Beck
Sheet 1 of 1

Map Number

Project	Originator	Volume	Location	Type	Role	Number
HE565627	AMY	ELS	S00	MP	LL	600001

Suitability	Suitability Description	Revision
S4	FIT FOR STAGE APPROVAL	P01

N

Point E

Point F

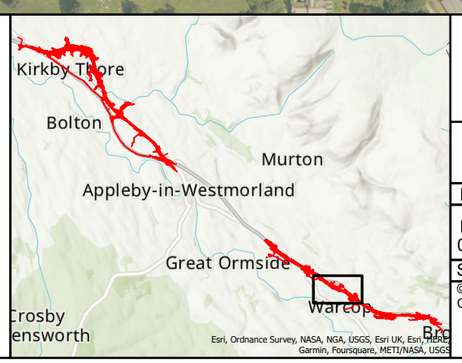
Examination requested Additional Viewpoints

Proposed Scheme

Existing A66

Viewpoint E
Viewpoint on the footpath south of Wheat Sheaf Farm, looking south to present the structure over the Cringle Beck.

Viewpoint F
Viewpoint from footpath 372/021 looking south to present the structure over Moor Beck.



national highways

3 Piccadilly Place
Manchester
M1 3BN

Revision	Created	Checked	Reviewed	Approved	Authorised
P01 First Issue	PKEL	CESL	JSIM	AMIT	KWHA
	07/12/22	07/12/22	07/12/22	07/12/22	07/12/22

Metres
0 100 200 300 400

Scale @ A3: 1:5,000 | Project Ref No HE565627 | Stage: Stage 3

Project Name
A66 Northern Trans-Pennine Project

Map Title
Figure 2
Examination: Addtional Viewpoints
Structure: Cringle Beck & Moor Beck
Sheet 1 of 1

Map Number

Project	Originator	Volume	Location	Type	Role	Number
HE565627	AMY	ELS	S00	MP	LL	600002

Suitability	Suitability Description	Revision
S4	FIT FOR STAGE APPROVAL	P01

PINS Reference Number: TR010062/APP/3.3

A66 Northern Trans-Pennine Project
TR010062

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 4 – LI Technical Guidance Note 06/19: Visual Representations of development proposals

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 4 – LI Technical Guidance Note 06/19: Visual Representations of development proposals

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	NH/EX/7.3
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	Date	Status of Version
Rev 1	16 December 2022	Deadline 1

Landscape Institute Technical Guidance Note

Visual Representation of Development Proposals

Technical Guidance Note 06/19

17 September 2019

This guidance aims to help landscape professionals, planning officers and other stakeholders to select types of visualisations which are appropriate to the circumstances in which they will be used. It provides guidance as to appropriate techniques to capture site photography and produce appropriate visualisations.

Contents

1 Introduction

1.1 Purpose of this Guidance

1.1.1 This document aims to help landscape professionals, planning officers and other stakeholders in the selection, production and presentation of types of visualisation appropriate to the circumstances in which they will be used. In doing so, it follows and amplifies the broad principles set out in The Guidelines for Landscape and Visual Impact Assessment 3rd edition (GLVIA3). Consistent with the Environmental Impact Assessment Regulations (EIA Regs), GLVIA3 advocates proportionate and reasonable approaches to the scope of assessments.

1.1.2 In all instances, the principles of clear, open and transparent communication and fitness for purpose should apply. Visualisations produced in accordance with this guidance should assist in informed decision-making.

1.2 Why Visualisations are Required

1.2.1 The world we live in constantly changes and this affects our visual experience. New development is one of the causes of this change. When people are asked to consider the merits of new development proposals or major changes in the landscape, the information available normally includes images illustrating the likely appearance of the proposals. Developers will often illustrate their proposals in brochures using drawings, photographs and artists impressions. Many other kinds of images are used in the formal planning process.

1.2.2 This guidance focuses on the production of **technical visualisations**, described as Visualisation Types, which are intended to form part of a professional Landscape and Visual Impact assessment (LVIA), Townscape and Visual Impact Assessment (TVIA) or Landscape and Visual Appraisal (LVA) that typically accompany planning applications. It is critical that these visualisations are accurate, objective and unbiased. They should allow competent authorities to understand the likely effects of the proposals on the character of an area and on views from specific points.

1.2.3 In contrast, **illustrative visualisations** may be intended for marketing or to support planning applications by conveying the essence of what a proposal would look like in context. These do not have to be based on specific viewpoints and could, for example, include a colour perspective illustration or an artists impression based on a bird's eye view.

1.2.4 Similarly, context photographs and sketches may be effective ways to communicate to stakeholders, in advance of, or association with, more sophisticated Visualisation Types. Generally speaking, they will not be used to explain design proposals *within the planning process*. They may indicate the appearance or context of a landscape or site, show specific points of detail, or be used for internal design iteration. Such illustrations, sketches and photographs are not, therefore, the subject of this guidance.

1.2.5 Technical visualisations can take a variety of generally 'static' forms, including: annotated photographs, wirelines, photomontages and 3D simulations. Plans and sections are potentially effective ways to communicate to stakeholders, in association with visualisations.

1.2.6 Augmented Reality (AR) and Virtual Reality (VR) are 'dynamic' visualisation techniques which are considered separately in this guidance.

1.2.7 Photographs show the baseline conditions; visualisations show the proposed situation; and both combine to simulate the change, for example as photomontages. Visualisations help to show how a proposed development could give rise to change in the character of a place, or affect the quality and nature of views, for example through introduction of new built elements or structures, changes in ground level, and loss of trees, vegetation or landscape features. Visualisations may also be used to illustrate other forms of landscape change, such as changes arising from landscape management or from influences such as climate change.

1.2.8 Depending upon the nature / type of the development or change, visualisations may need to show the development: during construction (if the construction period is of long duration and a notable element of the proposal's visual impact); at specific points in time during operation to illustrate the effectiveness of landscape mitigation; or possibly at decommissioning and restoration (e.g. as with a quarry or landfill site).

1.2.9 Visualisations should provide the viewer with a fair representation of what would be likely to be seen if the proposed development is implemented and should portray the proposal in scale with its surroundings. In the context of landscape / townscape and visual impact assessment, it is crucial that visualisations are objective and sufficiently accurate for the task in hand. In short, visualisation should be fit for purpose.

1.2.10 Visualisations may be used to illustrate other forms of landscape change, such as changes arising from landscape management or from influences such as climate change.

1.2.11 Some types of visualisation are more readily or quickly produced, but all visualisations share a role as a form of graphic communication, intended to represent the anticipated change in the visual environment, to illustrate key components of the proposed change or to give an indication of how much would or would not be visible from a given location.

1.2.12 As a general principle, any visualisation should reasonably represent the proposal in such a way that people can understand the likely landscape and visual change. The degree of detail shown will typically be relative to the design and / or planning stage that has been reached. Visualisations should assist interested parties in understanding the nature of a proposed development within its context, and its likely effects. Their use as part of an iterative process of assessment and design can help inform sensitive siting, design and primary mitigation, all of which are important considerations in the planning process. Showing the development within its context should help to secure better design at an early stage.

1.2.13 Two-dimensional visualisations, however detailed and sophisticated, can never fully substitute what people would see in reality. They should, therefore, be considered an approximation of the three-dimensional visual experiences that an observer might receive in the field.

1.2.14 Note that this guidance cannot provide a complete manual of techniques. Landscape professionals may need to draw upon the expertise of visualisation specialists, particularly for the most sophisticated forms of photography and visualisation.

1.3 A Proportionate Approach

1.3.1 To maintain a proportionate approach, different types of visualisation may be required, depending on:

- the type and scale of project;
- the aim (Purpose) and likely audience (Users) of the visualisation in the decision-making process; and
- the Sensitivity of the receptors and Magnitude of potential landscape and visual change.

1.3.2 The time, effort, technical expertise and cost involved in producing visualisations should be proportionate to these factors.

1.3.3 Other considerations which influence the scope of required visualisations, which should be reasonable and proportionate in relation to Purpose, are:

- The number of viewpoints to be illustrated photographically, and how many of these require visualisations;
- The Visualisation Type (1-4 in the following guidance); and
- The level of detail illustrated within the visualisation, for example as described in the London View Management Framework (see Appendix 6.4)

1.3.4 This guidance represents current best practice, provides a starting point to identify what types of visualisation may be appropriate and sets out approaches to potential visualisation techniques.

1.4 Relationship to previous LI Guidance

1.4.1 This guidance note replaces Landscape Institute (LI) Advice Note 01/11 (Photography and Photomontage for LVIA) and LI Technical Guidance Note 02/17 (Visual Representation of Development Proposals).

1.4.2 Advice Note (AN) 01/11 has been replaced in order to:-

- reflect other sources of guidance and additional research on the topic (see Section 5 - Further Reading);
- accord with the principles of GLVIA3 (2013) - (especially GLVIA3 paras 8.15-8.34);
- encourage best practice in the presentation of visualisations accompanying LVIAs, LVAs and planning applications; and
- ensure that visualisation techniques are properly explained and easily understood by all Users.

1.4.3 TGN 02/17 has been integrated in this guidance in order to provide a single source of guidance from the LI in respect of visualisations. LI AN 01/11 and TGN 02/17 are now withdrawn.

1.4.4 Further information on related landscape and visual assessment, and visualisation advice, may be found on the LI website: [redacted]

1.4.5 These include:

- Glossary and Abbreviations;
- Earth Curvature;
- Camera Auto Settings and Limitations of Zoom Lenses; and
- Examples of Visualisation Types 1-4.

1.5 Visualisation Guidance by Others

1.5.1 This guidance applies to visual representation of all forms of development. The LI recommends its use to its members and to all parties using visualisations as part of the development process. The LI recognises that, for some types of development, targeted or authority-specific guidance may be appropriate.

1.5.2 The Highland Council (THC) Visualisation Standards for Wind Energy Developments 2016, the SNH Visual Representation of Wind Farms 2017 and the London View Management Framework 2012 (LVMF) are examples of 'authority-specific' guidance.

1.5.3 The LI supports Scottish Natural Heritage Guidance: Visual Representation of Wind Farms v2.2 February 2017 (SNH 2017). This Technical Guidance Note is broadly consistent with SNH 2017, particularly in respect of Type 4 Visualisation (see Sections 3 and 4).

1.5.4 The London View Management Framework provides useful guidance for large-scale urban development, and is particularly useful in identifying what it refers to as 'AVR Types' (0 - 3). See 'Further Reading' and Appendices 6.4 and 11.3.

1.5.5 When regulatory authorities specify their own photographic and photomontage requirements, the landscape professional should follow them unless there is a good reason not to do so. Failure to follow such guidance may risk requests for further information during the planning consultation process. Failure to satisfy stated validation requirements could lead to delays in validating planning applications. Seeking early engagement with the competent authority is recommended.

2 Guiding Principles

2.1 This guidance follows the broad principles set out in GLVIA3. Readers should note should note the comments in the Introduction (para 1.2.13) regarding the limitations of two-dimensional images.

2.2 Baseline photography should:

- be sufficiently up-to-date to reflect the current baseline situation;
- include the extent of the site and sufficient context;
- be presented at a size and relative position, on a corresponding sheet, to allow like-for-like comparison with the visualisation;
- be based on good quality imagery, secured in good, clear weather conditions wherever reasonably possible *(see Appendix 4 and GLVIA3 para 8.22)*;
- avoid foreground clutter; and
- in LVA / LVIA baseline photography, if relying on only existing views with no visualisations, clearly identify the extent of the application site in the view *(see Type 1 Visualisations)*.

2.3 Visualisations should:

- provide a fair representation of what would be likely to be seen if the proposed development is implemented;
- be based on replicable, transparent and structured processes *(Section 4)* and use a reasonable choice of agreed viewpoint locations, view directions, view angles and times of day *(Appendix 4)*;
- be reproduced at a suitable size and level of geometric accuracy relative to the baseline photographs *(Sections 3/4 and Appendices 7/8)*;
- be accompanied by appropriate information, including a Technical Methodology and required data within page title blocks *(Appendix 7.2 and 10)*; and
- where necessary, the photography and visualisation should be capable of being verified *(see Visualisation Type 4, Section 4 and Appendix 11)*.

2.4 The producers of visualisations should:

- refer to GLVIA3 paras 8.15-8.31
- use Visualisation Types 1-4, described further below, selected by reference to Purpose of use and anticipated Users, combined with the indicative overall Degree or Level of Effect (a product of Magnitude and Sensitivity) *(see Section 3)*;
- use techniques and media, with appropriate explanation, that represent the proposed scheme and its setting as accurately as reasonably practicable, proportionate to its potential effect;
- where reasonable within project timescales, include maximum effect scenario *(e.g. winter views - see GLVIA3 paras 6.28, 8.15)*; and
- use appropriate equipment and settings *(Sections 3/4 and Appendices 1-5)*.

3 Taking a Proportionate Approach

3.1 Understanding the Proportionate Approach

3.1.1 This section concerns how to determine which type of visualisation is proportionate to the task in hand. When identifying the need for some form of visual representation, landscape professionals, competent authorities and other stakeholders should use this guidance as the basis for reaching agreement on the appropriate Visualisation Type for the project in question. That does not preclude subsequent preparation of other visualisations, but working this way should help to ensure that public interests are secured in a way that is recognised as proportionate and fit for purpose by all those involved.

3.1.2 The factors which determine the appropriate Visualisation Type are:

- the intended Purpose of the visualisation;
- the anticipated Users;
- the stage in the planning application process;
- the Sensitivity of the context / host environment, having regard to the landscape and visual receptors [1]; and
- the likely overall Magnitude of effect of the development in terms of its 'size and scale', 'geographic extent' and 'duration and reversibility' [2].

3.1.3 Selecting the appropriate Visualisation Type requires a staged approach, described in more detail below in this section, and summarised as follows:

- identifying the Purpose and Users of the visualisation;
- identifying the type and nature of the proposed development and early indications of the likely overall Magnitude of effect it would generate;
- examining the context / host environment in which the development would be placed and assessing its overall Sensitivity;
- using the above to arrive at an indicative overall 'Degree or Level of Effect'; and
- selecting the most appropriate Visualisation Type based on the above criteria; and
- explaining the reason for its selection.

3.1.4 The process of selecting Visualisation Types can be considered in terms of a need for increasing levels of scrutiny of information or evidence required, with Purpose and Users considered alongside the likely overall effect of the proposed development on the host environment.

3.1.5 This guidance proposes four Visualisation Types (1-4), from least to most sophisticated, which are described in more detail in Section 4 and summarised in Tables 1 and 2 below.

[1] GLVIA3, paras 6.31- 6.37

[2] GLVIA3, paras 6.38- 6.41

3.2 Working with the Competent Authority

3.2.1 EIA development may be subject to Scoping, which can be used to help determine the appropriate scope and level of detail for the visual components of the LVIA. For non-EIA development, developers are encouraged to request pre-application ('pre-app') advice. If landscape / townscape and visual issues will be a key issue, submission of the proposed visualisation approach, suggested viewpoints and a Zone of Theoretical Visibility (ZTV), will assist in reaching agreement with the competent authority. Draft visualisations which are not fully worked up can be used for pre-app discussions or scoping requests. This should help reduce risk of requests for further information during the planning consultation period, and consequential further costs and delays.

3.2.2 The landscape professional is likely to need to determine an approach to visualisation before having completed (or possibly started) the LVA / LVIA itself. Therefore, a preliminary judgement on the likely overall 'Degree or Level of Effect' will be required. Whilst this should not prejudice the detailed process or outcome of the LVA / LVIA, the context and likely extent of the proposal will be known at an early stage and should be sufficient to inform the initial assessment.

3.2.3 It may be possible at this stage to anticipate a transition from one Purpose and set of Users to another during the course of the project and, therefore, to determine an approach appropriate to the spectrum of Users involved. A typical example is the transition from Planning Application to Planning Appeal.

3.2.4 Although this guidance is particularly aimed at visualisations prepared for use in the decision making process with competent authorities as the intended main Users, visualisations may also be used iteratively during the design process where the Users will be design / planning professionals and their clients.

3.3 Purpose and Users

Purpose

3.3.1 A principal consideration is the of the visualisation, i.e. the Purpose for which it will be used. For example, does it:

- provide basic contextual information in support of a planning application?
- purport to demonstrate the visual change that will be brought about if the development proceeds? or
- aim to prove or disprove if the development is visible, or demonstrate the effectiveness of a mitigation strategy?

3.3.2 Examples of the potential range of Purposes are:

- the illustration of a project prepared for the client as the project develops;
- the illustration of a development proposal prepared to accompany a planning application; and / or
- to illustrate the likely change in a view that may occur as a result of the development being introduced into that view; to inform an LVA or LVIA, e.g. as part of an EIA.

Users

3.3.3 In addition to being clear about the Purpose of the visualisation, it is important to understand and identify the likely Users. Are they:

- people potentially affected by the development who are being asked to give an early opinion as part of a consultation process?
- clients?
- other consultants communicating with the landscape professional?
- those formally commenting on the planning application?
- planning officers considering the merits of an application?
- participants at public inquiry (including members of the public, expert witnesses, legal advisers, Inspectors and Reporters)? and / or
- decision-makers (Councillors, Reporters / Inspectors, Ministers)?

3.4 Combining Purpose / User and Degree or Level of Effect

3.4.1 Having established the Purpose and Users of the visualisations, it is necessary to consider these in relation to the type of development proposed and the likely overall effect it would have on the host environment, having regard to landscape and visual receptors, in line with GLVIA3 principles.

3.4.2 An assessment of the Sensitivity of the context or host environment, together with a judgement of the likely Magnitude of landscape and visual change that may result as consequence of the development, will establish the indicative overall Degree or Level of Effect. This, considered with the Purpose and Users of the visualisation, will help determine which Visualisation Type would best suit the circumstances of the proposal and aid informed decision making.

3.4.3 Sensitivity and Magnitude, as determinants of Degree or Level of Effect, are extensively discussed in GLVIA3, as amended by GLVIA3 Statement of Clarification 1/13 (10-06-13)[3].

3.4.4 The broad principles of assessment are set out in GLVIA3 Figure 3.5. These principles apply to both landscape and visual effects and have clear contributory factors:

- susceptibility and value for Sensitivity;
- size / scale, extent, duration and reversibility for Magnitude.

3.4.5 When assessing Sensitivity and Magnitude and arriving at a judgement of indicative overall Degree or Level of Effect, consideration should be given to the landscape and visual effects of the project as a whole, rather than against individual viewpoints or receptors.

[3] statements of clarification 3 and 4 clarify and augment GLVIA3 paras 3.32-3.36, p.40-41.

3.5 Selecting the Appropriate Visualisation Type

3.5.1 Drawing these threads together, identifying the Visualisation Type, proportionate to the project under consideration, involves combining its Purpose / Users with the indicative overall Degree or Level of Effect of the proposed development. This, in turn, requires an understanding of:

- the landscape / townscape and visual context within which the development may be seen;
- the type of development proposed, its scale and size; and
- the likely overall landscape and visual effect of introducing the development into the existing environment.

3.5.2 The four Visualisation Types proposed in this guidance comprise the following (from least to most sophisticated, in terms of equipment, processing and presentation):

Type 1 annotated viewpoint photographs;
Type 2 3D wireline / model;
Type 3 photomontage / photowire;
Type 4 photomontage / photowire (survey / scale verifiable).

3.5.3 The most sophisticated Visualisation Types are appropriate when the Purpose / User requires the highest levels of accuracy, and the Sensitivity and Magnitude combine to generate the highest Degree or Level of indicative overall Effect.

3.5.4 The Visualisation Types are summarized in Table 2 and described in more detail in Section 4. Types 1-4 are typically all 'static' visualisations (i.e. capable of being printed).

3.5.5 'Dynamic' visualisations such as Augmented and Virtual Reality (AR / VR) are dealt with separately in Section 4.6.

3.5.6 Table 1 provides a broad indication as to appropriate Visualisation Types for different Purposes and Users. Note that Categories 'A' to 'D' illustrate four convenient levels along a scale, not four fixed interpretations.

Table 1: Relationships between Purpose, User and Visualisation Types

Category	Purpose and Users	Appropriate Visualisation Types
A	Evidence submitted to Public Inquiry, most planning applications accompanied by LVIA (as part of formal EIA), some non-EIA (LVA) development which is contrary to policy or likely to be contentious. Visualisations in public domain.	2 - 4
B	Planning applications for most non-EIA development accompanied by LVA, where there are concerns about landscape and visual effects and effective mitigation is required. Some LVIAs for EIA development. Visualisations in public domain.	1 - 4
C	Planning applications where the character and appearance of the development is a material consideration. LVIA / LVA is not required but supporting statements (such as Planning Statements and Design and Access Statements) describe how the proposal responds to landscape context and policies. Visualisations in public domain.	1 - 3
D	To inform the iterative process of assessment and design with client, and / or pre-application consultations with the competent authority. Visualisations mainly confidential.	1 - 2

3.5.7 The decision as to appropriate Visualisation Type should be based on a proportionate approach, taking account of its Purpose / Users and indicative overall Degree or Level of Effect (based on Sensitivity and Magnitude) of the proposed development. In all cases, professional judgement should be applied, and agreement reached with the competent authority wherever possible.

3.5.8 A combination of simpler and more sophisticated graphics may be appropriate to illustrate specific points. So, for example, 3D models, or annotated viewpoint photos (Types 1 and 2) at less important locations, may usefully support more sophisticated (Types 3 and 4) visualisations at key locations.

3.5.9 However, different interpretations of scale between visualisations should be avoided unless there is a specific reason to do so, which should be explained in the Visualisation Type Methodology, the subject of the next section.

3.5.10 When making a final choice it will be important to consider:

- The contextual Sensitivity and Magnitude of landscape and visual effects of the development overall (rather than that applying to a single location) and the application of a proportionate and consistent approach.

- Cost of the visualisation; several factors are relevant here. Firstly, it depends on what readily available technologies are available to the landscape professional. Secondly, it depends on the nature (type, size and scale) of the development and thirdly, on the degree of realism required. For example, wind farm visualisations are less expensive to prepare than for mixed use or other forms of development, because wind farms consist of a number of single objects of the same size and shape with the same surface finish. However, subject to the proportionality principle, cost considerations should not override the reasonable requirement for appropriate visualisations.

- Available technology – some techniques are dependent on particular technologies / software (e.g. digital photo / panoramic viewers) which not all of those preparing visualisations will have access to. Nor will competent authorities necessarily be able to view particular technologies.

- The nature of the development and how it may best be illustrated. For example, where a development is predominantly screened from view, a photowire image may be more helpful than a photomontage, as it can indicate the position of the development beyond any screening.

3.6 Introducing Visualisation Types 1-4

3.6.1 Table 2 below sets out the general aims of Visualisation Types 1-4, together with indications of appropriate locational accuracy, photographic equipment and presentational approaches.

3.6.2 Note that it is not possible to categorise every possible kind of visualisation into Types 1-4; some inevitably straddle categories. If a visualisation does not fit neatly into one of the four categories, that does not make it unacceptable, provided it is fit for purpose and not misleading, and is clearly explained in the Visualisation Type Methodology.

Table 2 Visualisation Types 1-4		Type 1	Type 2	Type 3	Type 4
		Annotated Viewpoint Photograph	**3D Wireline / Model (non-photographic)**	**Photomontage / Photowire**	**Photomontage / Photowire Survey / Scale Verifiable**
Aim of the Visualisation		To represent context and outline or extent of development and of key features	To represent 3D form of development / context	To represent appearance, context, form and extent of development	To represent scale, appearance, context, form, and extent of development
Photographic Equipment	**Tripod**	Recommended but discretionary	Not relevant	Recommended	Necessary
	Panoramic head	Not relevant		Recommended for panoramas	Necessary for panoramas
	Minimum Camera / Lens	Cropped frame or FFS + 50mm	Not relevant	Cropped frame or FFS + 50mm	Full Frame Sensor (FFS) + 50mm FL lens [1]
Locational Accuracy	**Source of camera/viewpoint location data**	GPS, OS Maps, geo-referenced aerial photography	Varies according to technology	Use good quality data: GPS, OS Maps, geo-referenced aerial photography, LiDAR	Use best available data: High resolution commercial data, LiDAR, GNSS, or measured / topographic surveys
	Survey-verified [2]	Not relevant			When appropriate
Data & Presentation	**Verifiable (SNH) [3]**	Not relevant			Required
	3D model	Not required	Required		
	Image Enlargement [4]	Typically 100%	Not relevant	Typically 100%	100% - 150%
	Form of Visualisation	sketch / outline / arrows	massing / wireline / textured	wireline / massing / rendered / textured to agreed AVR level [5]	
	Viewpoint mapping	Dedicated viewpoint location plan			Dedicated viewpoint location plan, + individual inset maps recommended
	Reporting of methodology and data sources	Outline description of sources and methodology recommended		Data, sources and methodology recommended	Verifiable data, sources and methodology required

Table 2 footnotes:

1 FFS+50mm FL - note exceptions to 50mm lens FL. See Section 4 and Appendices 01 and 06.

2 Survey-verified means the camera position and survey features being recorded by highly accurate survey processes. See Section 4 Locational Accuracy & Appendix 14.

3 Verifiable (SNH) has the same meaning as in SNH 2017 - the photographic process and image scaling is capable of being verified to agreed standards by reference to the original photograph with metadata. See Appendices 6 & 11.

4 Image Enlargement - see 3.8 below.

5 AVR level - see Appendix 6.4.

3.7 Visualisation Type Methodology

3.7.1 For any given project for which visual representation may be required, the proposed approach to visualisation should be set out in a brief description, explaining:

- the anticipated Purpose / Users;
- the indicative assessment of Sensitivity and Magnitude and resulting likely indicative overall Degree or Level of Effect; and
- other factors influencing the selection of the Visualisation Type.

3.7.2 This may be combined with a preliminary selection of proposed viewpoints and submitted to the competent authority and, ideally, agreed prior to submission of any planning application. See also GLVIA3 para 6.18.

Examples

3.7.3 The following are examples of using Tables 1 and 2 to arrive at an appropriate Visualisation Type 1-4. Letters A-D refer to the 'Category' column in Table 1 above.

(1) ***A single house****, submitted as a planning application in a prominent location within a designated landscape, might be regarded as:*

- *Purpose / User C, Planning Application;*
- *High-Medium Sensitivity, Small-Negligible Magnitude;*
- *likely Slight-Moderate Degree or Level of Effect.*

This would suggest ***Type 1*** *visualisations - perhaps an annotated photograph (40° at A3 width) indicating the extent (width / height, or outline) of the proposed development.*

(2) Pre-application discussions with developer over ***proposals to re-work a large clay waste tip*** *on the edge of a National Park, screened as requiring EIA. Accurate output from a 3D model is required to understand the nature and magnitude of visual impacts from key sensitive locations and determine the need for fully rendered photomontage to form part of a formal LVIA.*

- *Purpose / User D, pre-application discussions;*
- *High Sensitivity context, Large Magnitude;*
- *likely Substantial Degree or Level of Effect.*

This would suggest ***Type 2*** *(3D modelling) - outputs required for informed discussion, not determination of planning application.*

(3) ***A small quarry / extension****, submitted as a planning application, in a landscape considered of medium to high sensitivity to the proposed change, might be regarded as:*

- *Purpose / User B, accompanying an LVA;*
- *Medium Sensitivity, Medium Magnitude;*
- *likely Moderate Degree or Level of Effect.*

*This would suggest **Type 3** - photowires or photomontages (40° at A3 width or 90° at A1) indicating the appearance of the proposed development.*

(4) ***A large housing site**, submitted as a planning application with potential implications on a local designation (e.g. Conservation Area or Important Landscape Area) might be regarded as:*

- *Purpose / User B, accompanying an LVA;*
- *High-Medium Sensitivity context, Large-Medium Magnitude;*
- *likely Substantial Degree or Level of Effect.*

*This would suggest **Type 3** photowires or photomontages, or possibly **Type 4** (surveyed) if close-proximity sensitive views were required.*

(5) ***A large wind farm** in a locally-designated landscape area, the subject of a public inquiry, might be regarded as:*

- *Purpose / User A, part of an EIA;*
- *High-Medium Sensitivity, Large Magnitude;*
- *likely Substantial Degree or Level of Effect.*

*This would suggest **Type 4** visualisations, where surveyed locational accuracy is not necessary but image enlargement, to illustrate perceived scale, would be appropriate.*

(6) *Planning application for **a very large energy from waste plant** building with 90m twin stacks and plume emissions on an edge of town industrial estate, within potential visual range of important views from a Grade 2 Registered Historic Park (designated heritage asset):*

- *Purpose / User A / B (Planning / Public Inquiry);*
- *High Sensitivity, Large-Medium Magnitude;*
- *likely Substantial Degree or Level of Effect.*

*This would suggest **Type 4** visualisations, where surveyed locational accuracy may not be necessary but image enlargement, to illustrate perceived scale, would be appropriate.*

(7) ***A proposed new tower block** with potential implications on a designated landscape / townscape, subject to a planning application, might be regarded as:*

- *Purpose / User A / B (Planning / Public Inquiry);*
- *High Sensitivity, Large Magnitude;*
- *likely Substantial or Very Substantial Degree or Level of Effect.*

*This would suggest **Type 4** visualisations. In addition, if the precise visual relationship between the tower block and other buildings is of particular importance, surveyed locational accuracy may be appropriate.*

3.7.4 The preceding examples are just that - examples - and should not be regarded as templates. This approach can be used in preparing a Visualisation Type Methodology. It is not a sophisticated LVA / LVIA, but a review of basic criteria, known early in the project, to inform selection of appropriate Visualisation Types.

3.7.5 The selected Visualisation Type (1-4) should be clearly stated on all visualisation pages, such that recipients can understand the approach being taken.

3.8 Viewing Distance and Image Enlargement

3.8.1 Table 2 introduces the concept of 'image enlargement', which is carried forward into the detail of Visualisation Types 3-4 , described in the next section.

'Monocular' and 'Binocular' viewing

3.8.2 Printed photographic images have a theoretical viewing distance at which the scale of the view is reconstructed, although this assumes that cameras and humans have similar optical systems, which they do not. The essential difference is that cameras (for this purpose) are monocular, and humans are generally binocular. In addition, the fact that reality is viewed as a 3D space, whereas photographs are viewed as 2D projections, combine to alter perceptions of 'scale' and 'depth' between reality and photography. See Section 5 'Further Reading' for more information.

3.8.3 Whilst mathematical viewing distances have historically been quoted alongside visualisations, it is generally regarded that viewing distances of between 500mm – 550mm (approximately arm's length) are the most practical and widely used. All scale-representative views should, therefore, be accompanied by a note: "To be viewed at comfortable arm's length".

100% Reference Image

3.8.4 A 'mathematically correct' image is established for a 50mm FL approximately 39.6 Horizontal Field of View (HFoV) image, printed at a size of 390mm x 260mm on an A3 sheet, and held at 542mm[1] from the eye. This 'monocular view' represents a reference point of 100% in this guidance note, against which enlargements, such as 150%, can be described. For example, a 50% increase in image size can be described as a 150% enlargement.

3.8.5 Changes in the relative size of printed images are described in other documents as the 'Effective Focal Length' (EFL) at which an image is presented. 50mm EFL equates to 100% and 75mm EFL equates to 150%. For simplicity, this guidance describes the enlargement by percentage, related to the 100% reference image.

150% Enlargement Factor

3.8.6 Whilst presenting a 50mm FL image (39.6° HFoV) at A3 size is a straightforward use of the camera image, this approach has been found to be lacking in respect of expansive projects in open landscapes or seascapes, such as windfarms. This is because, for a 50mm FL image printed at A3 and held at comfortable arm's length, the scale of the viewed image is smaller than reality.

3.8.7 As a result of research in Scotland over the last decade (see Section 5 - Further Reading) there is a consensus that increasing the printed image size by 150% (as if a 75mm FL lens had been used) provides a better impression of scale for most viewers using two eyes (binocular vision). This is particularly appropriate for projects such as windfarms, whether viewed on a desktop or on site.

3.8.8 The approach of this guidance is, therefore, to recognise that, for larger-scale projects with more distant components such as windfarms, the approach taken in SNH 2017 (put simply, a 150% enlargement) is appropriate.

3.8.9 This brings with it some issues:

a) Paper size or constrained Field of View

Adding 50% to the image size increases the presentation size (digital or paper). Conversely, the site can only be represented

[1] Note that 542mm simply establishes a mathematical reference point. Generally, there is no need to hold the image at such a specific distance.

if it can be accommodated within an A3 sheet (27°HFoV x 18.2° VFoV) or A1 sheet (53.5°HFoV x 18.2°VFoV). If it occupies a greater vertical or horizontal FoV, then alternatives must be considered.

This is accounted for in the SNH Guidance, in that exceptions to its standard can be discussed and agreed with SNH.

b) Appropriateness in all situations

Whilst the 150% enlargement overcomes the scale issues for the expansive projects for which it was designed, it may over-compensate for projects in more constrained environments, such as urban or small-scale enclosed landscapes. In these situations, less enlargement may be appropriate.

3.8.10 Research by the LI Working Group in the preparation of this guidance, carried out across several cities, suggests that, in mid- to smaller-scale landscapes / townscapes, an enlargement around half-way between 100% and 150% results in a binocular relationship between the presented image and reality.

3.8.11 In addition, there will be situations - for example very close urban contexts or developments of considerable height or width - where scaling at less than 150% may provide more flexibility to fit an image on the page.

3.8.12 In these instances, the landscape professional should present the logic, behind opting for a particular enlargement factor, to the competent authority.

3.8.13 Notwithstanding the above, SNH considers that consistent use of 150% enlargement is beneficial.

Other means of achieving enlarged images

3.8.14 An A3 (50mm FL, 39.6° HFoV) sheet, when printed at A2 size, is enlarged by 141%. This provides a basic way to create a printed page with improved image scaling, simply by printing an A3 figure, enlarged to fill an A2 sized sheet. This will, however, result in some loss of resolution compared to an image which is created to be placed in an A2 sheet at full resolution. It should not, therefore, be used in the more rigorous context of Visualisation Type 4.

3.8.15 A 35mm FL lens on a FFS camera will capture a HFoV of 54.4°, which is very close to the requirements of an SNH 2017 planar A1 panorama (53.5° HFoV). Whilst it will not satisfy SNH 2017 Guidance (which requires the 50mm / FFS combination) a 35mm FL image of sufficient resolution and clarity may, therefore, provide an A1-width planar panoramic image, without stitching and re-projecting of multiple 50mm images.

3.8.16 In either case, the practitioner should ensure that image quality is appropriate for the Purpose, and set out the approach in the Visualisation Type Methodology (3.7) and Technical Methodology (Appendix 10).

4 Description of Visualisation Types 1-4

4.1 Visualisation Types 1-4

4.1.1 The main characteristics of Visualisation Types 1-4 are introduced below. More detail on these 'static' visualisations is provided in the sections which follow, including a separate subsection on 'dynamic' visualisations, namely AR / VR.

Type 1 Annotated Viewpoint Photograph:

Reproduced at a size which aids clear understanding of the view and context, these simply show the extent of the site within the view, and annotate any key features within the view.

Type 1 is the most basic form of visual representation with a focus on the baseline information.

Type 2 3D Wireline / Model:

This covers a range of computer-generated visualisation, generally without a photographic context. Wirelines and other 3D models are particularly suited to graphically describing the development itself.

Type 2 visualisations use basic graphic information to assist in describing a proposed development and its context.

Type 3 Photomontage / Photowire:

This Type encompasses photomontages and photowires which will commonly be produced to accompany planning applications, LVAs and LVIAs. They provide a reasonable level of locational and photographic accuracy, but are not suitable for the most demanding and sensitive of contexts. Type 3 visualisations do not need to be accompanied by verification data, nor is a precise survey of features and camera locations required. Although minimum standards are set for image presentation, the visualisations do not need to be reproduced with scale representation.

Type 3 visualisations offer an appropriate level of detail and accuracy for a range of EIA and non-EIA projects.

Type 4 Photomontage / Photowire (survey / scale verifiable):

Type 4 photomontages and / or photowires require the use of equipment and processes which provide quantifiable verification data, such that they may be checked for accuracy (as per industry-standard 'AVRs' or 'Verified Views'). Precise survey of features and viewpoint / camera locations may be included where warranted. Type 4 visualisations are generally reproduced with scale representation.

Type 4 visualisations represent the highest level of accuracy and verifiability for use in the most demanding of situations. See also Appendix 11, Verified Photomontages.

4.1.2 In providing flexibility across Visualisation Types 3 and 4, there is inevitably some degree of overlap between them, for example in terms of image scaling or presentation size. Whilst Type 3 will be acceptable in many situations, only Type 4 methodology and equipment can provide the levels of verifiable accuracy which are appropriate to high Sensitivity contexts and Purposes.

4.2 Type 1: Annotated Viewpoint Photograph

4.2.1 Viewpoint photographs are often used in LVIAs and LVAs and may usefully be annotated to show the extent or position of the site and other features. 3D-modelling is not required - the annotations of site extent (horizontally) may be estimated by reference to site features such as field or plot boundaries.

4.2.2 Single images will be planar (i.e. as captured by the camera). Alternative lens types may be considered - see Appendix 1. Where single images can capture the site (e.g. 39.6° x 27°) and be presented at A3, they may be supported by two baseline panoramic images (maximum 60° HFoV) presented on an A3 sheet. This is purely to show the location of the full-size single image frame in its context and, as such, should be noted as being 'for context only'. Wide panoramas on an A3 sheet are too small to provide a representation of the proposed development.

4.2.3 Where panoramic images are required to capture the site, they may be presented as cylindrical panoramas of up to 90° HFoV at A1 width with an image size of 820mm x 250mm (see Appendix 8). This sizing equates to around 96% image 'enlargement'.

4.2.4 Locational accuracy is moderately important, and reasonably precise locations can be determined from GPS data, OS maps or aerial photography.

4.2.5 Refer also to the Technical Methodology, Appendix 10.

Table 3: Suitable photographic / print formats (Type 1):

Camera / lens	FFS + 50mm lens	Cropped frame + 28 or 35mm lens
Sheet size	A3	
Image size (mm)	390 x 260	
Presented Field of View (H x V)	39.6° x 27°	Either 35mm = slightly narrower than FFS+50mm, or crop 28mm image to match FFS+50mm
Sheet size	Cylindrical Panoramic image @ A1 width	
Presented Field of View (H x V)	90° x 27° (VFoV as appropriate)	
Image size (mm)	820 x 250 minimum (height as appropriate)	

Type 1 Summary

Type 1 visualisations are simple, annotated photographic illustrations which often accompany LVAs.

- Use a Full Frame Sensor camera with 50mm lens, or cropped-frame sensor camera with 35mm or 28mm fixed lens. See Appendix 1.
- Images will typically be presented with a single frame on an A3 sheet.

4.3 Type 2: 3D Wireline / Model

4.3.1 This Type covers the use of 'static' presentation of 3D models which are visual representations distinct from photographically-based photomontages.

4.3.2 The main examples are computer-generated 3D wirelines (also described as 'wireframes') and 'massing' models, potentially with computer-generated context, such as buildings, terrain or other surrounding features.

4.3.3 'Dynamic' visual representations, such as 'augmented reality' or 'virtual reality' (AR or VR), are dealt with separately in Section 4.6 below.

4.3.4 Images to be included in reports should be of sufficient size to communicate a sense of the scale of the development. An A3 Sheet, as with Types 1 and 3, would generally be appropriate. An image based on a 3D model to show proposed development layout (for example, an aerial view) need have no specific FoV or location reference, but should have a realistic sense of perspective.

4.3.5 Computer models generally do not convey landscape context unless they are extremely sophisticated. Most planning applications should be accompanied by photographs or photomontages, rather than solely relying on Type 2 visualisations to convey an impression of a development proposal.

4.4 Type 3: Photomontage / Photowire

4.4.1 Type 3 visualisations are photomontages or photowires (photographs with wireline overlays) where site photography forms the basis of the imagery, which is then overlaid by a 3D wireframe, massing or rendered model. Type 3 are suitable for representing proposals where precise perception of scale of the printed image, and the highest levels of locational accuracy, are not necessary. If the key criteria for Type 4 cannot be guaranteed, then the visualisation will be classified as a Type 3. 'Type 3' should be clearly stated on all visualisations.

Table 4: Suitable photographic / print formats (Type 3):

Camera / lens	FFS + 50mm lens	Cropped frame + 28 or 35mm lens
Presented Field of View (H x V)	39.6° x 27°	Either 35mm = slightly narrower than FFS+50mm, or crop 28mm image to match FFS+50mm
Sheet size	A3	
Image size (mm)	390 x 260	
Enlargement relative to FFS / 50mm	100%	100 - 120%
Sheet size	Cylindrical Panoramic image @ A1 width	
	90° x 27° (VFoV as appropriate)	
Enlargement relative to FFS / 50mm	96%	
Image size (mm)	820 x 250 minimum (height as appropriate)	

Lens and Camera

4.4.2 Full-Frame Sensor cameras (FFS) are appropriate. Cropped-frame cameras (e.g. Canon APS-C / Nikon DX) are acceptable when a fixed lens of 35mm FL is used. Alternatively a 28mm lens could be used and the resulting photographs cropped to achieve the same FoV as a 50mm FL lens with an FFS. See Appendix 1.2. Note that different cropped-frame lens / camera combinations will result in slightly different FoV and enlargement factors.

Purpose

4.4.3 Type 3 visualisations are intended to represent design, form and context to a reasonable degree of objectivity and accuracy, one which can be understood and relied on by competent authorities and others. This category covers a wide range of applications including non-verifiable viewpoint locations, such as those from moving vehicles / drones and other such situations where the viewpoint coordinates cannot be replicated with the same degree of accuracy / precision as Type 4 visualisations. It would also be appropriate where photographs have been taken by a 3rd party, provided these are prepared in accordance with the principles set out in this guidance and supported by a clear methodology.

4.4.4 Type 3 visualisations should not be selected when printed scale representation is required.

4.4.5 Single images are planar (i.e., as captured by the camera). Alternative lens types may be considered - see Appendix 1.

4.4.6 Where single images can capture the site (e.g. 39.6° x 27°) and be presented at A3, they may be supported by two baseline panoramic images (maximum 60° HFoV) presented on an A3 sheet. This is purely to show the location of the full-size single image frame in its context and, as such, should be noted as being 'for context only'. Wide panoramas on an A3 sheet are too small to provide a

representation of the proposed development. They do not replace baseline photographs, which should be presented at the same size and scale as their corresponding visualisations.

Presentation

4.4.7 Imagery will typically be presented as two related sheets: Baseline photograph and photomontage. These should be presented at the same size to allow direct comparison. A wireframe may be included to explain alignment between the 3D model and site features.

4.4.8 Visualisations should be accompanied by a Technical Methodology, setting out the criteria listed in Appendix 10.

Panoramas

4.4.9 Where panoramic images are required to capture the site for visualisation, they may be presented as cylindrical panoramas of up to 90° HFoV at A1 width with an image size of 820mm x 250mm (see Appendix 8). This sizing equates to around 96% image 'enlargement' (i.e. a slight reduction from the 100% reference). When a wider FoV than 90 degrees needs to be captured, this should be done by using adjoining A1 sheets.

Locational Accuracy

4.4.10 It is important to disclose the level of locational accuracy of Type 3 visualisations, which should be determined on the basis of proximity of viewpoint to the site and on Sensitivity of receptors / importance of the view. The level achieved should be clarified in the methodology and the same approach should be taken for all visualisations presented. Typically, horizontal accuracy of 1-2 metres can be obtained from aerial photography. However, this may vary according to the aerial photography source and location (see Appendix 14) and this should be considered when reporting on locational accuracy in the methodology.

Type 3 Summary

Type 3 visualisations will be appropriate for many planning applications, LVAs and LVIAs, where photomontage is required but a verifiable process and printed scale representation are not needed.

- Use a Full Frame Sensor camera with 50mm lens or cropped-frame sensor camera with 35mm or 28mm fixed lens.
- Images will typically be presented with a single frame on an A3 sheet, providing an enlargement in the range 100-120% subject to camera / lens combination.
- The enlargement factor should be stated on each page, together with the label 'Visualisation Type: 3'.
- For very wide linear infrastructure, consider presenting cylindrical panoramas up to 90° at A1 width, with multiple sheets for very wide panoramas.
- Accompany visualisations with a Technical Methodology (see Appendix 10).

4.5 Type 4: Photomontage / Photowire (survey / scale verifiable)

4.5.1 Type 4 visualisations are photomontages or photowires, produced using quantifiable data, with procedural transparency and appropriate levels of accuracy. This involves using a defined camera / lens combination and establishing the camera location with sufficient locational accuracy to enable accurate scaling and location of the 3D model within the view. In addition, the print presentation size can be determined to provide binocular image scaling when appropriate (see Section 3.8). Note that, due to the variable nature of digital viewing devices, images cannot be assumed to provide a perception of scale unless printed at the specified size. See Appendix 7 for more details. 'Type 4' should be clearly stated on all visualisations.

4.5.2 See Appendix 6 'Preparing Photomontages' and Appendix 8 'Panoramas'.

Lens and Camera

4.5.3 Base photography should be carried out with a Full Frame Sensor (FFS) camera and 50mm Focal Length prime lens, unless there are exceptional conditions where wider-angle lenses are required to fully capture the scene (e.g. tall tower blocks - see below). In such cases, any departures from FFS + 50mm FL should be explained and agreed with the competent authority.

4.5.4 Table 5 represents the range of approaches suitable for Type 4 visualisations. Note that the stated percentage enlargement figures are relative to a 50mm FL image printed on an A3 sheet at 390mm x 260mm image size (para 3.8.4, 100% Reference Image).

Table 5: Suitable photographic / print formats (Type 4)

Camera / lens	FFS + 50mm lens	
Option	1	2
Captured Field of View (HFoV x VFoV)	39.6° x 27°	
Image scaling (see 3.8)	'Monocular'	'Binocular'
Sheet size	Single image @ A3	
Projection (see App 8)	Planar	
Image size (mm)	390 x 260	
Presented Field of View (H x V)	39.6° x 27°	27° x 18.2°
Enlargement relative to FFS / 50mm	100%	150%
Sheet size	Panoramic image @ A1 width	
Projection (see App 8)	Cylindrical (for baseline and very wide linear infrastructure)	Planar
Presented Field of View (H x V)	90° x 27°	53.5° x 18.2°
Enlargement relative to FFS / 50mm	96%	150%
Image size (mm)	820 x 250 minimum (height as appropriate)	

Note that exceptions to lens and image sizes are acceptable if explained and agreed with the competent authority

Presentation

4.5.5 Imagery will typically be presented as three related sheets: Baseline photograph; wireline / wireframe or photowire composite; and photomontage. These should be presented at the same size to allow direct comparison.

4.5.6 Visualisations should be accompanied by a Technical Methodology, setting out the criteria listed in Appendix 10. In addition, a clear written description should be provided to explain the procedures involved in image capture and processing.

Locational Accuracy

4.5.7 For Type 4, the minimum level of locational accuracy is similar to the upper end of the Type 3 range.

4.5.8 The degree of accuracy should be determined on the basis of proximity of viewpoint location to the site and on Sensitivity of receptors / importance of the view. Typically, horizontal accuracy within 1-2 metres can be obtained from aerial photography. See Appendix 14.

4.5.9 In situations where the subject of the photomontage is close and the Sensitivity is high (typically in important urban and heritage contexts) high levels of locational accuracy may be required to establish intervisibility between the viewpoint, the subject of the photomontage and other elements in the scene, e.g. when assessing if a development interrupts a sensitive skyline or not. Such accuracy may be obtained from survey techniques providing sub-metre accuracy (see Appendix 11.4, survey-verified photography).

Image Scaling

4.5.10 The objective of Type 4 visualisation is to present a printed image which gives a realistic impression of scale and detail. Where scale-verifiable output is not possible (Appendix 1.1.7), verified photomontages can still be regarded as Type 4, provided they are supported by quantifiable data and a technical methodology, and agreed by the competent authority.

Table 5, Option 1: 100% enlargement

4.5.11 This is a 39.6° HFoV photograph presented within a 390 x 260mm frame. This option does not provide for binocular image scaling when printed. Nonetheless, it is included within Type 4 for the following reasons:

- where 150% enlargements would be problematic for large / close sites (due to impractical paper sizes), an option is still required for use in the planning process which maintains high levels of accuracy (e.g. levels 'A' or 'B' in Table 1);
- even though a 100% enlargement image will not provide 'binocular' perception scaling, it may still be useful and practical in its own right.
- once the 50mm / FFS combination is engaged, the EXIF metadata of the source RAW / JPG photographs can be interrogated and verified (as per SNH 2017), irrespective of how they are presented - see Appendix 11.2; and
- appropriately captured source photographs are capable of meaningful survey and verification when required - see Appendix 11.4.

4.5.12 In the majority of situations, and wherever context is important to understanding of the proposal, an A1 width 90° cylindrical baseline photograph will provide a 100% enlargement contextual reference.

Table 5, Option 2: 150% enlargement

4.5.13 SNH 2017 effectively requires an image enlargement of 150%, in other words 50% over that which is 'mathematically correct for monocular vision' (see Section 3.8). Option 2 of Table 5 corresponds with this approach. This is regarded as the default enlargement factor for Type 4 visualisations.

4.5.14 The SNH 2017 guidance is endorsed by the LI for windfarms and similar projects which are viewed in expansive landscapes over medium to far distances. Refer directly to the SNH 2017 guidance for full details and requirements.

4.5.15 The image capture and presentation process should be capable of being verified, in accordance with SNH 2017 guidance. See Appendix 11, Verified Photomontages.

4.5.16 As noted at 3.8.10, in mid- to smaller-scale landscapes or townscapes, enlargement factors around halfway between 100% and 150% may be a more appropriate. This guidance does not propose any definitive rule, but considers that this reduced level of enlargement may provide an option for consideration by practitioners and the competent authority.

4.5.17 In either case, the principle, of producing an image which represents the scale of the proposal, is maintained. The proposition, that different approaches may be applied to image scaling, recognises that this depends on context and distance. However, a consistent approach to image scaling should be applied within any project.

Other Approaches

4.5.18 There are circumstances where it may be appropriate to depart from using a 50mm lens on site and from setting up pages with a 150% enlargement. These are described below.

Wider Vertical Field of View (VFoV)

4.5.19 The proposed development, viewed at close quarters, may not be captured by a 50mm lens with FFS camera, or fit within the A3 or A1 width x A4 height page sizes - for example, a tall building or high-voltage overhead lines. Alternative lenses may be required in exceptional circumstances - see Appendix 1.

4.5.20 In such instances, alternatives such as increasing the vertical height of the page (to A2 landscape, A1 landscape width with A3 landscape or even A1 landscape width and height) may be appropriate. Reasons for adopting such dimensions should be set out in the Technical Methodology. Wherever practical, 150% enlargement should be maintained.

Wider Horizontal Field of View (HFoV)

4.5.21 The edge distortion of planar panoramas results in them being unsuitable for images with a wide HFoV. Where the required HFoV exceeds 53.5°, multiple planar panoramas of 53.5° may be butted, or overlapped by 25-50% to provide a wider total HFoV. The extent of overlap may be determined by the total HFoV to be shown. In either case (butting / overlapping) the approach should be clearly explained.

4.5.22 If there is a particular reason to show very wide panoramas, (for example, for linear infrastructure occupying a wide FoV) the use of cylindrical projection (Table 5, Option 1, A1 width) may be considered and, if justified, the reasons explained in the Technical Methodology and the projection set out clearly on the presentation page.

Type 4 Summary

Type 4 visualisations enable the highest level of locational accuracy and image scaling where required:

- For sites / settings which can be captured either as single images or panoramically, use a 50mm lens with Full Frame Sensor camera.
- If the site / setting cannot be captured with the 50mm lens (e.g. close, tall buildings), consider alternative lenses - see Appendix 1.
- Images will typically be presented with a 150% enlargement (27°@ A3, or 53.5° @ A1)
- The enlargement factor should be stated on each presentation page, together with the label 'Visualisation Type: 4'.
- Present Planar projection panoramas for views up to 60° HFoV.
- 100% size (39.6° HFoV @ A3) may be considered and agreed with the competent authority where higher levels of enlargement are not practical.
- For wider view angles, use overlapping or butted planar panoramas.
- For very wide linear infrastructure, consider presenting cylindrical panoramas up to 90° at A1 width, with multiple sheets for very wide panoramas.
- Wherever wider context is important to understanding of the proposal, include an A1 width 90° cylindrical baseline photograph.
- Accompany visualisations with a Technical Methodology (see Appendix 10) including a clear written description of procedures involved in image capture and processing.

4.6 Dynamic Visualisations

4.6.1 Emerging visualisation technologies such as Augmented Reality (AR) and Virtual Reality (VR) currently require specialist skills and technology / software and may have significant cost implications and may, therefore, be beyond the scope of many landscape professionals, their clients and competent authorities. However, as these technologies develop, they are likely to become more widely available and used.

Augmented Reality

4.6.2 Augmented Reality (AR) visuals typically use phones, tablets or headsets. AR visuals have the advantage of being able to present moving elements (such as vehicles or turbines) within the view, and, if used on site, of moving the viewpoint. Images can be captured on site and subsequently used off site. Depending on the viewing screen size, visuals will be presented at a range of scales, so care is needed when interpreting their outputs. Similarly, the cameras of such devices are likely to be wide-angle (in the region of 30-35° HFoV). Note that levels of locational accuracy can be improved with surveying techniques, and that specialist devices with precision lenses, or connected to digital cameras, may come into use. It is likely that, under such circumstances, AR could in the future satisfy the requirement of Type 3 visualisations.

Virtual Reality

4.6.3 Virtual Reality (VR) headsets use computer-modelled backgrounds rather than photographic backgrounds, due to their ability to move location within the model. This is a disadvantage in terms of realism, but an advantage in terms of being able to study movement within or around a development. As such, they present an alternative approach to visualising development. Subject to the quality of the hardware used, image resolution may be relatively poor, compared to print outputs.

Summary

4.6.4 AR and VR visuals are under constant development. Although their preparation and use is beyond the scope of this guidance, they are expected to become increasingly important and common in visualisation, as the technologies mature and improve. For more information on Augmented and Virtual Reality, refer to the LI Digital Realities Technical Information Note.

5 Further Reading

Best Practice Guidance

Landscape Institute and IEMA (2013) - Guidelines for Landscape and Visual Impact Assessment 3rd edition (GLVIA3)

Scottish Natural Heritage (2017) - Visual Representation of Wind Farms: good practice guidance (version 2.2) (SNH 2017)

The Highland Council (2016) - Visualisation Standards for Wind Energy Developments

London View Management Framework Supplementary Planning Guidance (2012)

Research

Alan Macdonald (2012) - Windfarm Visualisation

University of Stirling (2012) - Report on perception of scale and depth in landscape photographs

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Appendix 1 - Camera Equipment

1.1 50mm FL + FFS - Visualisation Types 1,3,4

Cameras

1.1.1 The following specifications are based on a 50mm Focal Length (FL) and Full Frame Sensor (FFS) combination, and are suitable for all types of photography and visualisation. See 1.2 below for an alternative specification (cropped frame) which is acceptable for Types 1 and 3.

1.1.2 Whilst 35mm film itself is largely outdated for technical applications, it is worth being aware of the origin of the term 'Full Frame Sensor'. The point of reference for FFS as a term of specification is the frame size of pre-digital (35mm film strip width) film frames, which is 36mm x 24mm. Whilst Medium and Large Format camera equipment can be used for this work it is considered that this equipment is beyond the scope of this guidance.

Lenses

1.1.3 Lens / camera combinations result in images which capture a Field of View (FoV). The Horizontal Field of View (HFoV) is the angle between the left and right edges of the image. The Vertical Field of View (VFoV) is the angle between the top and bottom of the image. A 'standard' lens (50mm FL + FFS) in landscape orientation typically captures a HFoV of just under 40° and a VFoV of 27°.

1.1.4 50mm FL sits between 'wide-angle' lenses, which can create distortion towards the edges of images, and telephoto lenses, which can create an unnatural visual 'stacking' effect. Whilst both of these can be effective in artistic photography, the 40° HFoV image captured by a 50mm lens is regarded as being the closest to human eyesight, albeit that we typically have wider peripheral vision.

1.1.5 A fixed 50mm FL lens is considered the benchmark for landscape technical photography. A fixed FL lens ensures that the image parameters of every photograph are the same, simplifies the construction of panoramas, and ensures compatibility of photography for all viewpoints. In addition, 50mm FL lenses minimise optical distortion and allow for verification, where required (See Appendix 11).

1.1.6 Where a site or proposal would exceed the VFoV of a landscape-orientated photograph, the camera may be used in portrait orientation, giving HFoV 27° and VFoV 39.6°.

Non-50mm FL Lenses

1.1.7 If a 50mm FL lens cannot capture the view in landscape or portrait orientation (for example, if the highest point of the development is approaching 18° above horizontal) the use of wider-angled prime lenses should be considered, working through the following sequence of fixed lenses in this order: 35mm FL > 28mm FL > 24mm FL > 24mm FL Tilt-Shift. Tilt-Shift Lenses are considered at Appendix 13. In these unusual situations, the reasoning for the choice and the approach used should be documented, and the agreement of the competent authority should be sought (see Appendix 10 Technical Methodology).

1.1.8 Zoom lenses should not be used for the principal photograph from any location, but can sometimes be helpful for distant views to clarify detail, where that is not readily apparent in a 50mm lens image. If presented for such purposes, they should be shown

alongside a 50mm FL photograph with a clear explanation that a zoom lens has been used, and with a statement as to the reasons for its use.

Lens quality

1.1.9 The optical quality of the lens is important. Despite high resolution sensors, it may be that the sharpness of a photograph is limited more by the quality of the lens than by the camera sensor's quoted megapixel count.

1.1.10 A simple check is on the speed / aperture of the lens. A lens with a large maximum aperture (e.g. f/1.8 or 'faster' - see Glossary), combined with good build quality, is generally a suitable lens.

1.1.11 A lens hood will assist in reducing unwanted flare when, for example, sunlight falls onto the front of the lens.

Sensor

1.1.12 FFS digital cameras set a photographic standard which is reliable, well-understood and consistent with professional requirements.

1.1.13 The pixel count of a sensor will determine the maximum resolution that could be achieved in a final image.

1.1.14 A camera with a fairly high resolution (typically 20 megapixel or more) will be required to produce sufficiently good-quality images to be reproduced at the required size. The critical requirement is that the camera should be capable of producing a sharp image when printed at the required page size.

Fig A1.1 *Illustration of Cropped-frame and Full-Frame Sensors (FFS): Canon 7D (cropped APS-C, left) and 6D (full-frame, right)*

1.2 Crop-frame sensor with fixed lens - Visualisation Types 1+3 only

Cropped-frame sensors

1.2.1 Whilst FFS is regarded as the professional standard for digital photography, cropped frame cameras have been developed as the 'pro-sumer' or entry level in digital photography for many years. The overall image quality (in normal lighting situations) is often regarded, for example in camera reviews, as comparable with, or only slightly inferior to, FFS.

1.2.2 The main difficulty arising with cropped-frame cameras is that the image sensor is some 1.5- (Nikon DX standard) to 1.6- (Canon APS-C standard) times smaller than a FFS (see Figure A1.1). Other cropped-frame sizes exist. Whilst image resolution (pixel count) can be maintained with a cropped frame, the smaller sensor effectively crops the image projected through the lens.

1.2.3 The size of a 'Standard' lens is dictated by its focal length in proportion to the diagonal of the film plate or digital sensor. Thus, for example, a fixed 50mm FL lens is regarded as a 'standard' lens on a FFS camera.

1.2.4 Therefore, if a 50mm lens is used on a cropped-frame sensor, because the sensor is smaller, the result is that the image is based on a smaller part of the scene, such that, effectively, it appears 'zoomed'. Thus a 50mm lens on a (1.6x smaller) APS-C camera will result in an image equivalent to 1.6 x 50mm, giving an 80mm effective FL. This (and the variations in cropped-sensor sizes across different brands and models) does not allow for the degree of control or certainty required for a verifiable process within Type 4 visualisations.

1.2.5 If a cropped-frame camera is to be used for Visualisation Types 1 or 3, then the use of a 35mm prime lens is recommended. This will result in photographs with slightly narrower FoV than for the 50mm / FFS benchmark and slightly increased enlargement factors. This is not problematic, provided the site can be captured within these FoVs. Alternatively, a 28mm fixed lens can be used and cropped to the equivalent of a 50mm / FFS FoV (39.6° HFoV).

1.2.6 Cropped-frame photography will present greater difficulties, if wide-angle (28-35mm FFS equivalent) images are required. In these situations, a much wider-angle fixed lens would be required, leading to increased levels of distortion.

1.2.7 Whilst most cropped-frame limitations can be overcome, doing so introduces more scope for error and demands a higher degree of technical competence than working with FFS cameras. For these reasons, the LI and regulators, such as SNH, specify the use of FFS for Type 4 visualisations and prefer it for Type 3.

Appendix 2 - Camera Settings

2.1 Camera Settings - Manual vs Auto

2.1.1 Auto camera settings may be appropriate for single images and may assist less-experienced photographers in capturing acceptable single images. However, auto-focus may focus the image on scene elements which are too far away (the horizon) or too close (e.g. foreground vegetation) and should be avoided.

2.1.2 Panoramic photography should be undertaken using manual controls to avoid the camera creating unwanted differences (focus, exposure, white balance, ISO) between adjacent shots of a panorama. This Appendix outlines appropriate manual settings, whilst the LI TIN 'Camera Auto Settings' explains the issues with Auto settings.

2.1.3 The following fixed (manual) settings are not prescriptive but will provide consistent results, which are essential for panoramic photography.

2.2 Settings

ISO

2.2.1 ISO measures the sensitivity of the image sensor. The lower the number, the less sensitive the camera is to light. Typically, ISO 100-200 will be appropriate on a clear bright day, with higher settings if light levels are low. Higher ISO settings will tend to introduce more image noise and reduce dynamic range.

Aperture

2.2.2 In most cases, the aperture should be set around f/5.6 - f/8 (roughly the middle of most lenses' range) to produce the sharpest image, although an aperture of f/11 - f/16 will provide the greatest depth of field.

Shutter Speed

2.2.3 As a simple rule of thumb, use shutter speeds (in fractions of second) well in excess of the focal length of the lens. For example, with a 50mm FL lens, aim for speeds of greater than 60th/second. Where zoom lenses are used to capture fine detail around the site for reference (not for principal photography) an 85mm FL lens should exceed 100th/second, and a 300mm FL lens should exceed 300th/second, etc.

2.2.4 This is less important when cameras are tripod-mounted, but camera shake (e.g. from a DSLR internal mirror lifting during exposure) can still occur, and its effects are minimised by suitably high shutter speeds. Use of a shutter release cable will reduce camera movement which might otherwise occur when the camera shutter button is pressed.

White Balance

2.2.5 Select an appropriate daylight setting e.g. Sun / Cloud / Shade (review at each viewpoint in case conditions change). Auto White Balance may vary the white balance from shot to shot and is particularly detrimental for panoramas (see Appendix 8).

Focus

2.2.6 For close sites / subjects, the focus should be close to the intervening distance. This will ensure that the sharpest focus occurs where it is most needed. Note that due to the lens depth of field, it is not necessary to focus at infinity in order to have distant objects in focus. For example, a 50mm lens set to f/5.6 and focussed at 15m distance, will result in distant objects being in focus. In addition, by focussing closer than infinity, more of the foreground will be in focus. For more information, search for 'hyperfocal distance'.

2.3 Night-time and low-light photography considerations

2.3.1 If agreed as a specific project requirement with the competent authority, night-time photography will require particular consideration and approaches. These are outlined in Appendix 5.

2.4 Image format: JPG / RAW

2.4.1 All digital cameras offer a range of formats in which the image will be stored on the camera's memory card. Typically these will be JPG at a variety of quality (resolution and compression) settings, and RAW at a variety of resolutions.

2.4.2 Choice of image format is discretionary, but to take advantage of its maximum available resolution, the camera must be set to its highest resolution and, in the case of JPG, minimum compression settings.

2.4.3 RAW formats store the contents of the sensor unaltered hence 'raw' together with a series of parameters recording the camera's current settings. Thus post-processing stages, such as white balance and sharpening, are recorded as parameters but not actually applied to the image. RAW provides the user with the maximum possible opportunity to get the best quality from the image and may be helpful for distant views of development sites, particularly in challenging lighting conditions.

2.4.4 The disadvantage of RAW over JPG is that the file sizes will be 2-6 times larger, requiring more storage space on memory cards and computers and also requiring more time and effort to post-process.

2.4.5 Note that some authorities specify RAW. Otherwise, the choice is down to the user and may be regarded as one of proportionality. Some cameras provide the option of simultaneously storing both RAW and JPG, which allows the choice of format to be made on an image by image basis, but of course requires even more storage space than RAW alone.

2.5 Post Processing for exposure

2.5.1 It can be a challenge to achieve acceptable levels of exposure of both a bright sky and a dark landscape. High Dynamic Range (HDR) photography typically combines three 'bracketed' images (correct, over- and under-exposed) to obtain a final image which has a higher dynamic range (better displays dark and light areas in the image) than can be obtained from a single exposure. Nikon's ADL, Canon's ALO, and other manufacturers' corresponding features achieve a similar effect in-camera, although these only work when shooting JPG, not RAW. The photographer may wish to consider this technique in difficult lighting situations, although it should never be taken so far as to produce a visible 'artistic effect'. It is also worth noting that post-processing of a RAW image allows for good adjustment of shadows and highlights to improve the appearance of the image and bring it closer to what is perceived by the naked eye, without the trouble of producing full HDRs.

Appendix 3 - Site Equipment

3.1 Tripods (Visualisation Types 3-4)

3.1.1 Tripods are used to assist with camera stability (to avoid camera-shake) and to provide levelling in the horizontal and vertical axes. When taking photographs with a view to creating stitched panoramic images, tripods provide adjacent images of consistent level and overlap.

3.1.2 It may be necessary for the camera to 'look up' or 'look down', especially in hilly terrain or close to tall existing or proposed objects. Such vertical orientation will not translate correctly into a stitched panoramic image, and should only be considered for single images. An alternative to 'looking up or down' is to use a 'tilt shift lens' - see Appendix 13. In the majority of situations the camera should remain level to avoid converging verticals, which can be more pronounced, especially when vertical structures are close to the viewpoint.

3.1.3 Camera height is fixed at 1.5m in SNH / THC wind-turbine guidance and this should be adhered to where that guidance is regarded as applying. For other project types, camera height should be set comfortably for the photographer and recorded / stated as noted at Appendix 10. Additional height may be required to represent a proposed change to a viewpoint's finished level e.g. a raised highway.

3.2 Camera mounts (Visualisation Types 3-4)

3.2.1 A Panoramic ('Pano') Head, mounted on top of a tripod, will control the angle between adjacent photographs. With a 50mm lens of approximately 39.6° view angle, setting a 20° interval between shots will give a 50% overlap between adjacent shots. Such an overlap will be useful when stitching photographs later, will minimise edge distortion, and also gives a helpful guide to the view angle of any given panoramic shots. However, it is for the practitioner to determine the amount of overlap which suits their hardware / software.

3.2.2 As noted previously, the camera may need to be mounted in portrait orientation to capture a greater VFoV in which case an overlap between images of around 50% i.e. 15° (or to suit hardware / software) would be suitable.

3.2.3 A correctly set-up Pano head eliminates parallax errors. For close subjects (or close foreground features such as fences) the Pano head allows the camera to pivot around the nodal point of the lens. This prevents parallax errors (where foreground objects appear to move relative to background objects as the camera is rotated) which would otherwise occur if the camera was set on a standard tripod mount.

3.2.4 A 'leveller' (or tribrach) is separate to the Pano head and allows the camera to be levelled in the horizontal and vertical planes. Levelling checked with a small spirit level on the mounting plate will generally be more accurate and easier to read than a bubble level mounted into the leveller. The camera can be rotated through 90° between level checks.

3.2.5 The levelling of the panorama will ensure a better match between the resultant camera image and your 3D model view.

3.3 Taking Panoramas (Visualisation Types 3-4)

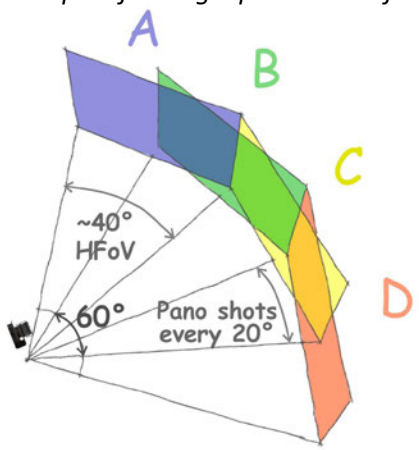
3.3.1 Set the exposure to be correct for the subject / site area, as this is the most important area of the panorama to have suitably lit. If there is no one subject, set the exposure for a point at 90° to the sun's direction (this is an average light level for a panorama). Note that shadows can be lifted (i.e. lightened) whereas clipped highlights cannot be recovered, so slight under-exposure may be useful for panoramas.

3.3.2 Taking photographs in a clockwise direction (left-to-right) will give consistency and avoid the Pano head unscrewing from the tripod. A further benefit is that when image thumbnails are viewed side-by-side, in image management software, they will appear in the correct sequence.

3.3.3 Use the detents on the Pano head to provide constant angles and overlaps between the photographs, such as the 20° with 50% overlap, suggested above.

3.3.4 As far as possible, avoid movement in the scene between adjacent images, such as pedestrian or vehicle movement.

Figure A3-1: *Example of taking a panorama of 4 shots with 20° overlap*



3.4 Recording camera position (Visualisation Types 3-4)

3.4.1 GPS-equipped cameras (with GPS function turned on) will record the location of the shot in the EXIF data, but typically with only around 5-10m accuracy. Hand-held GPS and most Smartphones will provide a similar level of positional accuracy. This is useful in areas with no other visible references (e.g. mountain sides) and when the subject is some distance away. Where visible fixed references are close to the camera location (e.g. trig points, gates, surface features) referring to aerial photography within a GIS system may provide greater positional accuracy for the photograph viewpoint than GPS. See Appendix 14 for comparisons of locational accuracy.

3.4.2 OS grid coordinates should be recorded where known, or converted from other (e.g. GPS latitude / longitude) positional data (for example by using UK gridreferencefinder.com website).

3.4.3 Where a tripod is used for Type 4 visualisations, it should be photographed in a way which assists future confirmation or verification of the viewpoint location. This is a useful technique for all tripod-based photography.

3.4.4 Where there are no visible references and standard GPS would not be of sufficient accuracy, enhanced GNSS (e.g. GNSS RTK) may be hired or provided by a surveyor. The highest levels of locational accuracy are relevant to Type 4 visualisations (survey-verifiable).

3.4.5 If the viewpoint position needs to be recorded accurately and a surveyor is not on site with the photographer, the position of the tripod can be marked (using a plumb line hanging under the tripod head) using spray paint or a survey nail and photographed so that the exact location of the viewpoint can be accurately relocated and surveyed at a later date.

Appendix 4 - In the field

4.1 Viewpoint selection and timing

4.1.1 Viewpoint selection approaches and criteria, for the purposes of photomontage for LVIA / LVA, are set out in GLVIA3 paras 6.16 - 6.28, in particular para 6.18. It is likely that a final selection cannot be made until the viewpoints have been visited and the captured photography is reviewed.

4.1.2 Considerations might include a need for evening / night photography or, in the case of Seascape effects, for morning, daytime or evening images. The illustration of seasonal variations, specifically differences in vegetation cover, should be demonstrated whenever possible and may be a requirement of the competent authority. In particular, instances where key views are available in winter, but not in summer, should be represented (see para 6.28 of GLVIA3). The role of the photographer is to locate the camera such that foreground screening does not obscure the site, unless that is a characteristic of the view / area which is intended to be illustrated.

4.1.3 Section 2 'Guiding Principles' states that photography should *"be based on good quality imagery secured in good, clear weather conditions wherever reasonably possible"*.

4.1.4 It is recognised that, occasionally, it may be difficult to meet this requirement, especially in more remote mountainous locations and in winter months. It is also recognised that the timetable for photography and visualisations may further constrain the ability to take good quality photography. Competent authorities should be advised of these difficulties and a reasonable compromise reached by mutual agreement. The landscape professional should not use 'poor weather' as an excuse for questionable photography and the competent authority should not unreasonably demand good clear weather conditions when the landscape professional has demonstrated reasonable endeavours to obtain good quality photography.

4.1.5 Views should include the full extent of the site / development and show the effect it has upon the receptor location. Additional photographs may illustrate relevant characteristics, such as degree and nature of intervening cover along a highway or footpath, without showing the site / proposal.

4.1.6 Consideration of private residential viewpoints is relevant to Residential Visual Amenity Assessment (RVAA) but generally LVIA will use public viewpoint locations (refer to GLVIA3 paras 6.16 - 6.17). See also Residential Visual Amenity Assessment (RVAA) LI TGN 2/19. Viewpoints on private land which is publicly accessible may be relevant, e.g. open gardens, monuments, communal access points, National Trust land etc.

4.1.7 Where feasible, plan and time site visits such that the sun is not directly over the site in the view, but will be to one side or behind. Planning site photography clockwise from NE to NW is advisable. This is particularly important in the winter when the sun is lower in the sky. Shielding the lens from direct sun (e.g. using a lens hood) is advisable to avoid flare.

4.1.8 Locating the site in advance, on Google Earth or other 3D software, may help locate it on the ground in built-up or open landscapes. Consider preparing draft renders of the 3D model from the proposed viewpoint locations to evaluate extent of visibility and height of development, to ensure that the whole development and appropriate context is captured.

4.2 Capturing the view

4.2.1 The proposal under consideration and its relevant landscape context will determine the FoV (horizontal and vertical) required for photography and photomontage from any given viewpoint. This will, in turn, determine whether a single-frame image will suffice or whether a panorama will be required. Good composition of the scene is important. Views may appear different in winter compared to summer, which may affect the exact location selected, so forward planning is useful if seasonal visualisations are to be prepared in future.

4.2.2 A well-considered approach to baseline photography is necessary in order to provide suitable quality photographs for the production of visualisations.

4.2.3 A 'standard' lens (50mm FL on a FFS camera) typically captures a HFoV of just under 40 degrees. This may be suitable for some purposes, but a single-frame photograph based on this FoV may not convey the breadth of visual information required to represent a proposed development and relevant context. Where it is greater than 40 degrees, a panoramic image, produced by the careful 'stitching' together of single-frame images, can provide a more informative representation of the visibility of a development in the landscape. (See Appendix 8 Panoramas).

4.2.4 As noted in Appendix 1, wider-angle lenses may be appropriate, for example, where tall buildings form part of the scene, but the scale of the presented image is also a consideration (see Appendix 7).

4.2.5 The general requirement is to capture enough of the scene to represent the landscape / townscape setting and the likely visibility of the proposal. Capturing 360° is not always necessary, but may assist in establishing the viewpoint's location and potentially assist in illustrating cumulative effects, if applicable.

4.3 Camera orientation

4.3.1 Where a single image can capture an appropriate HFoV, the view should be aligned to the centre of the development. This will help in matching the perspective of the photograph to that of any subsequent computer-generated image. If the photograph and image do not align, their perspective will not be an accurate match, particularly if, for example, the computer image is placed to the extreme left or right of the photograph.

4.3.2 There may be occasions when the proposed site needs to be offset, such as a view from a window, along an avenue of trees or a well-known 'framed' viewpoint, for example. Where this is necessary, the computer-generated image should use the same horizontal orientation as the photograph.

4.4 Recording image data

4.4.1 Data to be recorded should include: Camera model, Lens focal length, Date and Time. Note that these parameters will be automatically recorded in the EXIF dataset on most digital cameras. Date and time need to be set accurately on the camera. On a GPS-equipped camera, location may also be recorded in the EXIF data. Otherwise it may be recorded with external GNSS equipment.

4.4.2 Other factors which should be recorded in the field include weather, lighting conditions and direction of view - although these may be apparent from the photographs themselves and the location of the camera.

4.4.3 It should be noted that some information within the image, such as people (including children) and car number plates, when associated with time and locational data that has been recorded, could be regarded as 'sensitive information' and appropriate safeguards should be observed.

4.4.4 A full set of details, to be recorded and presented with the project photography overall, and for each viewpoint, is set out on Appendix 10 Technical Methodology.

Appendix 5 - Night-time Photography

The following is an extract from a forthcoming LI-supported publication: Landscape and Visual Assessment: Artificial Light and Lighting (with thanks to Karl Jones of the LI Technical Committee). It provides an outline of considerations specific to night-time photography for the purpose of LVIA.

5.1 Fieldwork

5.1.1 Fieldwork requires suitable weather conditions and consideration of the phase of the moon to get accurate sky darkness results and to accurately record views of the existing night time environment, noting that as temperatures cool in the evening, mist or rain may form. Online weather forecasts targeted for astronomers can assist with predicting the appropriate time to undertake the fieldwork (e.g. www.clearoutside.com or by using smartphone apps (e.g. www.metoffice.gov.uk/datapoint/showcase/scope-nights).

5.1.2 Before undertaking the fieldwork, ensure you know:

- the sunset time;
- where, within the study area, potential viewpoints that need to be checked (for day time and night time effects) are located;
- how to identify the main types of lighting (for recording accurately those already present at the site) and how existing lighting will appear in photographs;
- what potential existing night-time landscape features (e.g. prominent lit important architecture) maybe present;
- how long the night-time work is likely to take (factoring-in time for checking of photographs and the time needed for each exposure (generally taking tens of seconds per photograph); and
- the locations of likely sensitive night landscapes (e.g. dark-sky areas, existing light pollution, 'remote' policies).

5.2 Equipment

5.2.1 Additional equipment, beyond that normally required for daytime fieldwork may usefully include:

- a tripod (to allow long exposure shots to be taken without incurring fuzzy photographs), ideally with luminous or high visibility
- reflective strips on legs to prevent trip hazards;
- a camera lens hood (to avoid glare from lights of passing vehicles or other obliquely located sources of light);
- a head torch (working at night requires additional lighting whilst keeping hands free to work the camera, record notes etc.);
- a tablet (helpful to view photographs, on location, to ensure that the exposure and colour balance reflects the scene viewed with the naked eye, and to record differences);

- UV marker chalk or pegs and black light torch (useful to temporarily record and mark the exact location of daytime viewpoints, to reposition the camera to the same viewpoint in the dark – bearing in mind that the location can look very different in the daytime compared to the night time);

- spare batteries or portable battery charger (as it is generally significantly colder at night, batteries may discharge more quickly, e.g. for mobile phone and camera);

- warm clothing, PPE and appropriate safety equipment.

5.2.2 Further detail will be provided within the LI publication 'Landscape and Visual Assessment: Artificial Light and Lighting' on the topics of exposure, ISO settings etc. Such detail is beyond the scope of this guidance.

5.2.3 Any presented night-time photography should be accompanied by day-time photography from the same location and direction, to give a direct comparison. Photographs taken at half-hour intervals, from dusk to deep night, may be useful in sensitive locations - noting that only one viewpoint sequence can be taken per camera per day.

5.2.4 Note that SNH 2017, paras 174-177, provides useful guidance on illustration of lighting and night-time effects.

5.2.5 Notwithstanding that this is technical guidance, sensible health and safety procedures should be undertaken in respect of night-time work, including risk assessment, reviewing access, and lone working review.

Appendix 6 - Preparing Photomontages

6.1 Common requirements

6.1.1 A digital photomontage consists of a base photograph composited digitally with a computer-generated image of the proposal under consideration. This compositing process will typically include digitally blending the base photography with the computer-generated image, taking into account any masking by foreground features. Compositing necessarily requires digital manipulation, carried out with visual skill, judgement and objectivity.

6.1.2 Incorrect image production and presentation can render otherwise correctly photographed images unfit for purpose. It is crucial that the size of the proposal and its location within the scene depicted in the photograph are accurately represented. In order to achieve this, it is necessary to match the perspective parameters of the photograph accurately, to record viewpoint location and camera settings, and to use 3D software correctly. Additional reference photography whilst on site can be beneficial when existing items in the scene are to be removed as part of the proposals (e.g. the view 'behind' a building / tree to be removed).

6.2 Project stages

6.2.1 It may be necessary to illustrate different time periods associated with the proposal, such as upon completion, and with different stages of establishment of mitigation. Visualisation of the construction period may be relevant if it would be particularly lengthy and distinctly different from the completed project - for example, tall cranes in a sensitive landscape. This should be proportionate and be related to the LVIA / LVA and whether it identifies the construction period as a distinct issue.

6.2.2 Baseline and photomontage images should be produced with identical views presented at the same size, to aid comparison and consideration of the change illustrated.

6.2.3 Where the proposal is to be presented as photo-realistic photomontage, the lighting conditions (sunny, cloudy, direction of light and position of shadow) of the proposal should match the background photograph as far as practically possible.

6.2.4 Techniques for matching photography and 3D modelling are set out in Appendix 12.

6.3 Wirelines and Photowires

6.3.1 The accuracy of a photomontage may usefully be illustrated by means of a wireline image incorporating sufficient topographic or other features to allow a comparison to be made between the wireline and the photograph. The wireline should be presented as a separate image at the same size and scale as the main photograph / photomontage.

6.3.2 A visual presentation which is an overlay of wireline upon the photograph is known as a photowire. A photowire does not replace a photomontage where rendered texture and detail is required, but is sufficient to indicate scale and placement. Where the site cannot be seen from a viewpoint, a photowire could indicate the site's relative size and location within the view (for example, to confirm that it would be hidden from view or to indicate that it may be more visible in winter).

6.4 Relationship to London View Management Framework AVR Levels 0-3

6.4.1 The London View Management Framework (2012) proposes four levels of 'Accurate Visual Representation' (AVR), based on the degree of sophistication of the imagery representing the proposed development. The *graphical* approaches to producing the AVRs (photowire to photomontage) may be applied to Visualisation Types 3 and 4 in this guidance. Selection of these levels of detail should be based on what is required to illustrate the proposal, and may assist in taking a proportionate approach.

6.4.2 **AVR Level 0:** Location and size of proposal. This equates to a photowire and provides an outline of the proposal overlaid onto the photograph base.

6.4.3 **AVR Level 1:** Location, size and degree of visibility of proposal. This shows the massing of the proposal within a 3D context represented by the photograph - that is, what can and cannot be seen.

6.4.4 **AVR Level 2:** As level 1 + description of architectural form. This illustrates architectural form such as doors, windows and floors, and gives a sense of the form and shading of the development within its context.

6.4.5 **AVR Level 3:** As level 2 + use of materials. This is a fully rendered photomontage, usually photo-realistic with texture, shading and reflections as appropriate.

Figure A6-1: *Accurate Visual Representation (AVR) Levels 0-3 (Images ©Nicholas Pearson Associates)*

Appendix 7 - Media and Presentation

7.1 Digital vs Paper

The move towards digital

7.1.1 There is a clear move towards digital media in all aspects of the development process, which impacts on the issues surrounding visualisation presentation. Digital media is readily transferable and reproducible. It may be the case that, for many stakeholders, digital images are the only ones they are likely to see, for example when downloaded from planning portals. Paper-based presentation requires resources (paper, ink, printing) as well as means of transfer or delivery. For large projects with many viewpoints and baseline / wireline / photomontage versions, paper prints may present practical difficulties, particularly where panoramic images are required (Visualisation Types 3 and 4).

Benefits of paper

7.1.2 Paper prints have specific benefits. If based on high-resolution images and using good-quality printing techniques, they can present photomontages at higher resolution than screen-based equivalents of the same size. They are capable of being viewed on the desktop or out on site without technical equipment.

7.1.3 Importantly, they also fix the size of the image (independent of any 'viewing device') to allow a consistent impression of scale. All consideration of 'scale' (as at Section 3.8) only becomes meaningful when a visualisation is printed to the correct-sized sheet of paper.

Benefits of digital

7.1.4 Digital presentation has some benefits over paper, for example, the ability to zoom into an image (effectively magnifying it) and also the ability to switch between pages (e.g. of a PDF) or between multiple files, to obtain a clearer impression of the illustrated change than might be obtained from flipping between paper images.

7.1.5 Additionally images are easily accessible across the internet and can be accessed via file-sharing systems.

Issues with digital

7.1.6 The obvious issue with digital media is the variable screen size and resolution of the receiving devices, from phones to large, high-resolution screens. These potentially constrain the size of the image and result in uncertainty as to what size it should ideally be viewed at.

Best endeavours

7.1.7 Given that the image should contain information on its ideal viewing size, the digital user should attempt to view at or near that size, if it is within the capability of their equipment. It is not uncommon for computer monitors to have a width of around 500mm (laptops and tablets are usually smaller). Notwithstanding the issues noted above, the A3 landscape format is well-suited to this size of monitor. Wider images might be viewed in a two-monitor arrangement which mimics the width of an A1 sheet.

7.1.8 Where communication of scale is considered to be of great importance (this is the defining characteristic of Type 4 visualisations) then paper-based media will provide the most reliable impression of scale. However, manageability of paper may be an issue, and it is for competent authorities to determine their requirements accordingly.

Printed outputs

7.1.9 Inkjet printing, laser printing and digital press technologies all have different colour rendition and resolution issues. A minimum image resolution of 300 pixels per inch will generally be required for high-quality printing.

7.1.10 In most cases, given suitable photographic paper, inkjet printing will provide the highest resolution, colour depth and dynamic range of any print technology. Inkjet prints are also likely to smear / run if wet, but could be laminated / encapsulated to allow multiple use for site viewpoint visits - although this will prevent them being folded. Where the highest quality of printing is appropriate, consideration should be given to the use of inkjet technology, although commercial laser prints may be perfectly acceptable if good quality paper is used.

7.1.11 Critically, when producing documents for print, it is important to check that a print proof shows what you expect it to, that the image is sharp and that there is enough clarity and colour faithfulness to convey what is intended. Ensure that the final prints will be printed with the same printer used for the proofs.

7.1.12 At the request of the competent authority, and particularly for more sensitive sites, the photomontage producer should provide high-quality printed outputs which match the criteria specified above.

Digital outputs

7.1.13 These will typically be in the form of PDFs generated from graphics software. When creating PDFs, there are usually options to set DPI (re-sampling of images) and compression ratio to reduce the overall size of the output file. 300dpi should be the minimum for photomontages (ordinary photographs may be as low as 200dpi but clarity may suffer).

7.1.14 Multi-page PDFs are convenient, but the file size may exceed limitations for upload to planning portals (often 5MB, occasionally 10MB). Combining visualisations with plans etc. into a multi-page document is likely to result in large documents, unless high levels of compression are used. However, compression (usually based on JPG image compression) results in image artefacts which become increasingly visible with greater compression levels. This adversely affects image quality and should, therefore, be avoided.

7.1.15 A single page image-based A3 PDF can be created, with minimal compression, well below 5MB. For more sophisticated visualisations (e.g. Type 4 at A1 width) and where there is a limitation on file size, it follows that each page of a photomontage series (Baseline, Photowire, Photomontage) will need to be produced as a single, high-resolution, low-compression document.

7.1.16 Digital photo / panoramic viewers are an effective way of sharing panoramic images online. They re-project from cylindrical source images to a planar view on-screen. However, although used by some competent authorities and consultants, no standard approach has been widely adopted.

7.2 Accompanying information

Visualisation Type Methodology

7.2.1 This is discussed at Section 3.7. It is intended to provide an early basis for agreement, with the competent authority, as to the appropriate Visualisation Type(s) to accompany the application.

Technical Methodology

7.2.2 A Technical Methodology should be provided as an Appendix to Type 3 and 4 visualisations. This will assist recipients with understanding the level of technical approach and also explain reasoning for any departures from standards. This should be proportionate to the requirements of the assessment and the required images. See Appendix 10.

Information with each Visualisation

7.2.3 Appendix 10 'Per Viewpoint' lists the information which should support each viewpoint, to communicate the equipment used and the approach taken.

Viewpoint Locations

7.2.4 Viewpoints should be clearly located on a map-based figure. Location coordinates (eastings / northings) should be provided. It is helpful to provide small location maps as an inset to site photographs / photomontages, provided they take up a small amount of the page and do not dominate or obscure any of the photograph / photomontage content. See SNH 2017 Guidance for suitable examples.

Appendix 8 - Panoramas

8.1 Generally

8.1.1 Please refer to Section 4 on requirements for Type 3 and 4 visualisations. See also Appendix 11, Verified Photomontages.

8.1.2 All parties should recognise that printed panoramic images are an imperfect way of attempting to recreate the experience of viewing the breadth of a scene. Nonetheless, where it is important to communicate the wide-angle nature or context of the view, panoramas are preferable to limiting the view by cropping.

8.2 Lens distortion

8.2.1 Subject to software and workflow, it may be helpful to correct lens distortion before stitching images into a panorama.

8.3 Cylindrical Panoramas

8.3.1 Panoramic images are required to capture a wide field of view appropriate to certain types of more linear or widespread development (e.g. power lines, transport corridors, solar farms etc) and to provide sufficient landscape context. However, they do come with difficulties in respect of viewing printed images. Cylindrical images need to be curved around the viewer to represent real-world viewing angles. Alternatively they could be viewed flat by moving the head to maintain at a constant viewing distance across the panorama. Both of these options are unlikely to be followed by viewers. They are more likely to be viewed flat from a single position. This may not matter for distant viewpoints, but for close viewpoints (e.g. looking at a site across a road) cylindrical panoramas will look unrealistic. A third option is to use a panoramic viewer which re-projects the cylindrical panorama to planar, but these are not in common use.

8.4 Planar Panoramas

8.4.1 Planar projection overcomes the 'curved distortion' which can occur with a cylindrical image. A panorama projected as a planar image will provide a more realistic impression of the scale of a development, but only from an eye position which is specific and central to that panorama. There will be increasing distortion towards the edges of the panorama in order to maintain the correct impression when it is viewed flat. Planar projection should not, therefore, be used beyond a HFoV of around 60°.

8.5 Reprojecting

8.5.1 In SNH 2017 guidance, baseline photography is presented in cylindrical projection. It is helpful to work in cylindrical projection whilst creating wirelines and renders and matching them to background photography. They may then be re-projected to planar (rectilinear) for the presentation image. See Figure A8.1 below.

8.5.2 Cylindrical to planar projection may be achieved by a variety of software, for example: Hugin (open-source), Photoshop (with or without the Flexify plugin), The GIMP (with G'MIC (open-source) or Flexify plugins). No recommendations are made and searching online will reveal other options which will suit specific platforms and work flows.

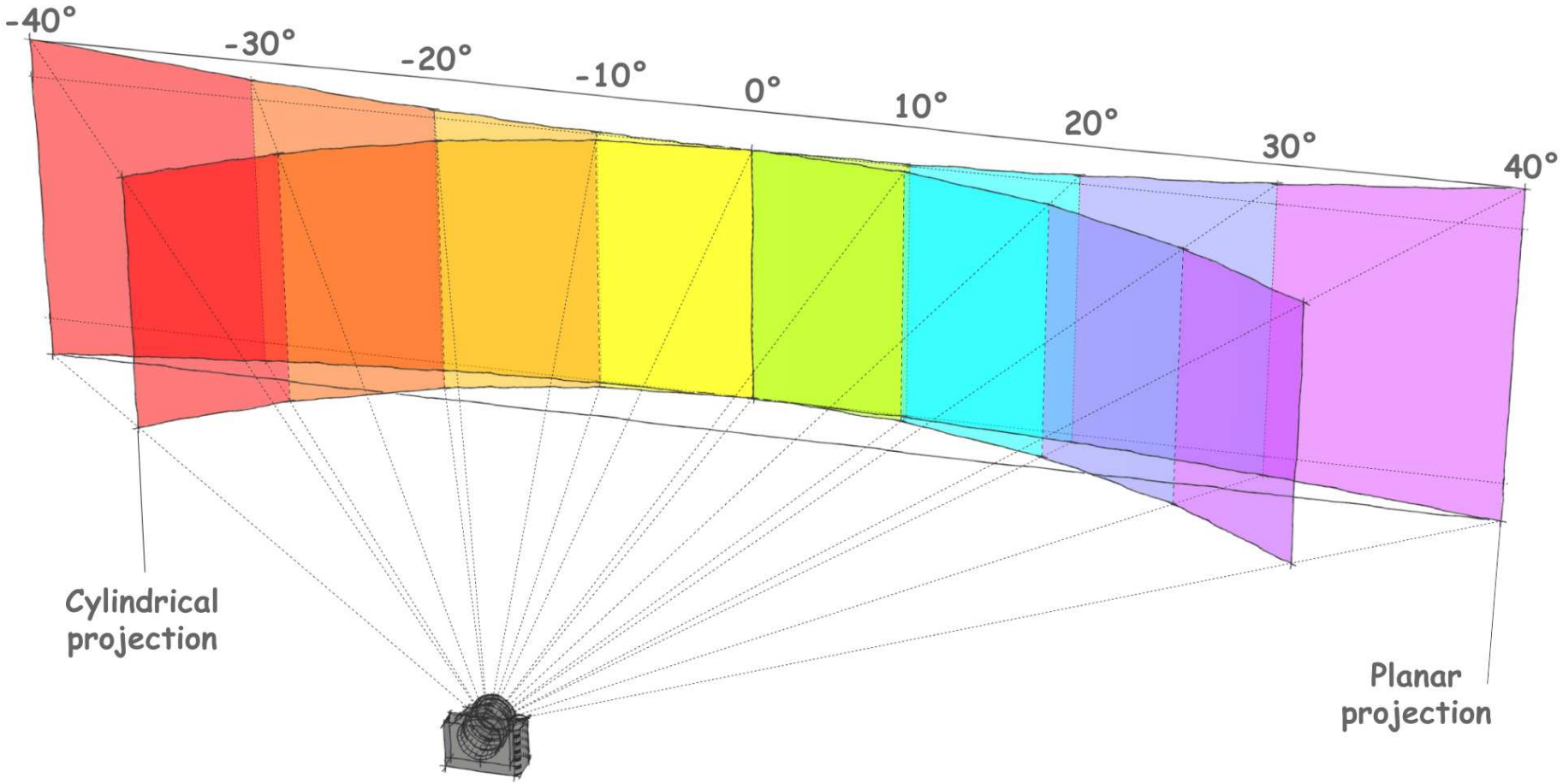


Figure A8-1: *Cylindrical to Planar Projection*

Beyond around 30° to either side of centre (60° HFoV) planar projection becomes increasingly distorted, both laterally (towards the outer edges) and vertically. This limits the usefulness of planar projection for wide panoramas and accounts for the limitation of 53.5° HFoV in SNH 2017 and Type 4 visualisations.

8.6 Calculating view angles

8.6.1 For a panorama created from overlapping frames taken with a stepped Pano head, the view angle can be determined mathematically, based on the stops on the Pano head (see Appendix 1 above). For example, with a 20° stop from centre to centre of adjacent frames, the HFoV of the panorama, from edge to edge, will equal (number of frames x 20°) + 20°, so 3 frames = (3 x 20°)+20° = 80°.

8.6.2 An alternative is to take and stitch a full 360° panorama at each location. Since the completed image must occupy 360° and the image width, in pixels, will be known, any angle can be calculated based on the horizontal count of pixels.

8.6.3 An approximate view angle may be determined from map or aerial data corresponding with what is visible within the panorama frame. For example, the Google Earth measurement tool shows the angle of any line relative to geographic north. Draw a line from the camera position to an object at the left side of the frame, note the angle (say 210°), repeat for the right side of the frame (say 290°) and deduct the first angle from the second angle (290 - 210 = 80° HFoV).

Appendix 9 - Acetates

9.1 Acetates

9.1.1 Acetates may be produced at A3 using a 39.6° HFOV photograph sized at 360mm x 240mm on the page. When viewed at the viewpoint on site, through one eye, the acetate, when held at 500mm from the eye, can be positioned for mathematically correct sizing for that viewpoint. This should confirm that the geometry of the image matches the real landscape.

9.1.2 Provided that the development overlay has been correctly positioned (scale and location) in the image, the acetate will verify the scale and location of development in the view.

9.1.3 Some authorities (for example, SNH) take the view that acetates do not convey any more useful information than a correctly-scaled paper photomontage. Both formats rely on the correct scaling and positioning of the development within the view.

9.1.4 Where a decision-maker considers that they need additional information about scale and position from a site viewpoint, which is not supplied by a paper photomontage, they may request an acetate, but acetates are not regarded as a standard requirement for inclusion in an LVIA or LVA.

9.1.5 The photographic image is usually presented in monochrome on the acetate, with the outline of the proposed development in colour (e.g. red, green) to highlight the proposed change.

Figure A9-1: *Acetate in use © Mike Spence*

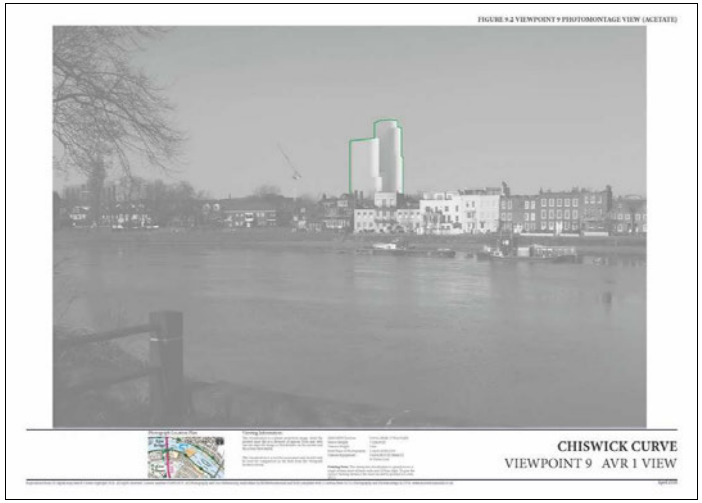


Figure A9-2: *Example acetate © Mike Spence*

Appendix 10 - Technical Methodology

Indicative Listing - For the project:

for the indicated Visualisation Types, this information should be supplied within an overall Technical Methodology

Visualisation Types 1	2	3	4	Photography	Example Responses
✓	✓	✓	✓	Visualisation Types Methodology (see 3.7)	
		✓	✓	Method used to establish the camera location (e.g. handheld GPS/GNSS, GNSS/RTK, survey point, visual reference)	Aerial photography in GIS system
		✓	✓	Likely level of accuracy of location (#m, #cm etc)	Better than 1m
		✓	✓	If lenses other than 50mm have been used, explain why a different lens is appropriate	28mm lens required to capture the height of the development from views 1 and 3
			✓	Written description of procedures for image capture and processing	
			✓	If panoramas used: make and type of Pano head and equipment used to level head	Manfrotto Pano head and leveller
			✓	If working outside the UK, geographic co-ordinate system (GCS) used (e.g. WGS-84)	N/A
				3D Model / Visualisation	
		✓	✓	Source of topographic height data and its resolution	Combination LiDAR + OS Terrain 5m
		✓	✓	How have the model and the camera locations been placed in the software?	Based on survey coordinates
			✓	Elements in the view used as target points to check the horizontal alignment	Existing buildings, telegraph poles, LiDAR DSM
			✓	Elements in the view used as target points to check the vertical alignment	Topography, existing buildings
			✓	3D Modelling / Rendering Software	*As used on project*
				Generally	
✓		✓	✓	Any limitations in the overall methodology for preparation of the visualisations?	Timing of photography e.g. winter / summer

Per Viewpoint:

this information to be provided on each page, within the photograph / visualisation figure notes

Visualisation Types 1	2	3	4	Photography	Example responses
✓	✓	✓	✓	Visualisation Type	Type 3
✓		✓	✓	Projection	Planar or Cylindrical
✓		✓	✓	Enlargement factor for intended sheet size	e.g. 100% @ A3 or 150% @ A1
✓		✓	✓	Date and Time of captured photography	3 March 2019, 13:05
✓		✓	✓	Make and model of camera, and its sensor format	Canon 6D, FFS
✓		✓	✓	Make, focal length of the camera lens(es) used.	Canon / Nikon / Sigma etc 50mm
✓		✓	✓	Horizontal Field of View (HFoV) of photograph / visual	39.6°
✓		✓	✓	Direction of View: bearing from North (0°) or Compass Direction	'90° from N' or 'Looking east'
		✓	✓	Camera location grid coordinates: eastings & northings to relevant accuracy; height of ground in mAOD	E123456, N654321 123m AOD
		✓	✓	Distance to the nearest site boundary, or key development feature, as most appropriate.	1200m to site boundary / turbine
			✓	Height of the camera lens above ground level and, if above 1.65m or below 1.5m, why?	1.5m
				Additional imagery	
		✓	✓	Baseline photograph	
			✓	A composite view generated by overlaying multiple layers of image data: the photograph, 3D model of terrain (LiDAR DTM) and / or 3D model of LiDAR DSM, 3D model of proposed development, 3D model of landscape mitigation. This can explain how the photomontage has been generated.	
			✓	A photograph of the tripod location to confirm the camera / tripod location	

Appendix 11 - Verified Photomontages

11.1 Introduction

11.1.1 There is no industry-standard definition as to what constitutes a 'verified photomontage' and when it is required. Two main applications of the term have come into use, which relate to:

a) verification of image scaling (SNH 2017) of the visualisation (11.2 below); and

b) survey-verification of camera / subject positioning at the viewpoint. These may also be referred to as Visually Verifiable Montages (VVMs), Verified Visual Images (VVIs) or, in the case of the London View Management Framework, Accurate Visual Representations (AVRs).

11.2 SNH 2017: Verification of Image Scaling

11.2.1 SNH's Visual Representation of Wind Farms Guidance (2017) allows for verification that the process described in its guidance has been correctly followed.

11.2.2 SNH 2017 states (para 117):

"In some cases the determining authority may wish to verify the accuracy of the image produced. This is possible using the original image data recorded by the camera (to check camera format and lens used) and a simple template (to check that the image dimensions have been correctly adjusted (by cropping and then enlarging)). This process is described in Annex E. Camera metadata should be provided by the applicant on request."

11.2.3 In the above statement, 'accuracy' refers to:

a) the FoV of the source photograph (based on a camera / lens combination FFS / 50mm); and

b) correct cropping and scaling of the photographs for presentation.

11.2.4 The LI concurs with this approach, where verification of image scaling is required.

11.2.5 SNH 2017 does not require survey-verified photography to determine the position and orientation of the camera, noting that *"167 - An accurate GPS position, taken when the photography was carried out, is almost always sufficient for wind farm applications"*.

11.3 Accurate Visual Representation (AVR)

11.3.1 Other guidance, such as the London View Management Framework Supplementary Planning Guidance (2012) states (para 463):

"An AVR is a static or moving image that shows the location of a proposed development as accurately as possible; it may also illustrate the degree to which the development will be visible, its detailed form or the proposed use of materials. An AVR must be prepared following a well-defined and verifiable procedure so that it can be relied upon by assessors to represent fairly the selected visual properties of a proposed development. AVRs are produced by accurately combining images of the proposed building (typically created from a three-dimensional computer model) with a representation of its context; this usually being a photograph, a video sequence, or an image created from a second computer model built from survey data."

11.3.2 The guidance goes on to require a methodology and information about each AVR including location and coordinates of the camera.

11.4 Survey-verified photography

11.4.1 Survey-verified photography involves using a surveyor, or survey equipment, to capture camera locations and relevant target points within the scene, which are then recreated in the 3D-model and used to match the camera image with a high degree of precision.

11.4.2 Surveying equipment allows the camera location and fixed target points in the view to be calculated down to centimetre accuracy. Highly accurate visualisations may be produced by correctly matching the 3D model camera position and geometry of the view to the original photograph, using pixel level data, resulting in a survey-verified photomontage.

11.5 Summary

11.5.1 Although the terminology is similar, there is a clear distinction between verification of image size and scaling (SNH 2017) and survey-verification of viewpoint / camera location and related data in order to allow resulting imagery to be verified. The first is concerned with image scale (see 3.8), the second with the accuracy of camera position and the precision of subsequent visualisation overlays.

11.5.2 Regarding positional accuracy, the LI takes the view that a proportionate approach is required. Where high levels of positional accuracy are essential to the validity and purpose of the photomontages being produced, for example in sensitive urban contexts, survey-verified photomontage may be required. In other situations, 1-2 metre accuracy, which may be achieved using aerial photography, may be sufficient - see Appendix 14 for further information. Where the subject matter is at close quarters, higher levels of accuracy will be required. However, where the subject is at distances beyond a few kilometres, the level of accuracy of standard GPS (at around 5m horizontal) may be sufficient, noting that ground / camera height can usually be derived more accurately from height data. As Global Navigation Satellite Systems (GNSS) are enhanced, and the cost of equipment reduces, higher levels of locational accuracy will become the norm.

11.5.3 In all cases, as stated at the beginning of this guidance, visualisations should provide a fair representation of what might be seen if the proposed development was built. The level of viewpoint location / camera position accuracy, and how it has been achieved, should be set out in the Technical Methodology (Appendix 10). Where the competent authority has particular expectations or requirements, these should be set out and agreed in advance of site visits.

11.5.4 Visualisation Types 3 and 4, discussed in Section 3 and 4 of this guidance, take account of a range of requirements for viewpoint locational accuracy.

Appendix 12 - Matching Photography and 3D Modelling

12.1 3D-modelling software-based matching

12.1.1 The combination of 50mm FL lens and FFS, is usually quoted as having a HFoV of 39.6°. However, there are no precise 50mm lenses and all models will have a range of effective focal lengths depending on the point of focus. Therefore the HFoV cannot be assumed to be 39.6°and may range from 37-42°. The practitioner should calculate HFoV for the sensor / lens combination being used, if they wish to use this data to match software-generated 3D models to the photographic image.

12.1.2 Given accurate FoV data and orientation, some 3D software is able to output visuals which are perfectly matched, in terms of FoV and pixel size, to the reference photographs. If this mathematical model is relied upon to determine the size of the visualisation within the photograph, the FoV must be known to a high degree of accuracy. Making assumptions as to FoV may result in renders which are out of scale with the background photograph, either larger or smaller.

12.1.3 Using software to directly provide a render, based on accurate FoV data and target points, there should be no need for resizing or repositioning, relative to the background photograph.

12.1.4 Care should be taken when using software or mathematical approaches to determine the size of the render within the photograph. A 'sense-check' will help ensure that overall placement is correct. For example, if there is a low foreground rise in the view, but the development is placed in front of it, when it should be behind, not only will it be in the wrong place geographically, but it will also appear to be too small, because what should be a distant object appears to be 'closer'.

12.2 Image matching

12.2.1 An alternative approach is to use key reference or 'target' points which occur within the 3D model and the background photograph. These will allow alignment and sizing of a visualisation to match the background photograph. It is important, however, if resizing a visualisation within a photograph, to retain its 1:1 aspect ratio. Alteration of the aspect ratio will result in a visual which is either too tall or too short, compared to its background photograph.

12.2.2 Resizing any object or layer in photo-editing software is likely to lead to some loss of resolution and blurring. Resizing should, therefore, be kept to a minimum by, for example, re-sizing in one step rather than in multiple increments. If the background photograph and rendered image are sufficiently high resolution, this is unlikely to be an issue. Some software, e.g. Photoshop, offers 'smart' objects: editing processes (such as resizing) which are non-destructive, with no noticeable loss of resolution. However, the optimal solution is to generate the rendered image to match the resolution of the photograph without resizing.

12.2.3 When using target points within the photograph and targets in the 3D model, these should be accurately geo-referenced, and vertical heights of 3D elements confirmed from either survey or terrain model data (e.g. LiDAR DSM).

Appendix 13 - Tilt Shift Lens

13.1 Tilt Shift Lens

13.1.1 The tilt shift lens is increasingly being used in architectural photography in urban locations. It can also be employed for taking photographs up or down slope. The lens comes in a range of focal lengths including 17mm, 24mm, 45mm and 90mm. The 24mm tilt shift is typically used for visualisation work where viewpoints are located close to a development and the normal range of prime lenses will not capture the proposed site (see example below).

13.1.2 The tilt function allows the lens to be swung about either a vertical or horizontal axis so that the axis of the lens is not perpendicular to the picture plane of the sensor.

13.1.3 The shift function allows the lens to be offset vertically or horizontally so that the axis of the lens remains perpendicular to the plane of the sensor but no longer passes through it centre point.

13.1.4 It is only the shift function which is relevant to photography and visualisations.

13.1.5 The tilt shift lens can be used to direct the eye upwards or downwards, depending on the selected portion of the overall view used. This can be used to (wrongly) accentuate the extent of sky or the extent of foreground in the view, resulting in an over-emphasis on the amount of sky or foreground in the printed image / visualisation, creating an unbalanced view towards a development which doesn't reflect what the camera, or the human eye, would see under normal circumstances.

13.1.6 Prime lenses have a single point of perspective in the middle of the single frame image. With the tilt-shift this point of perspective will vary depending on where the lens is positioned.

13.1.7 Before using a tilt shift, the normal suite of 50mm, 35mm, 28mm and 24mm prime lenses should be explored in both landscape and portrait orientation. Assuming the 24mm lens in portrait will not pick up the verticality of a proposed building, then the tilt shift can be employed.

13.1.8 Images produced with the tilt shift should be stated as such and be presented with clear markings on the image to identify the point of perspective. See examples on following page at Figures A13-1 and A13-2.

13.1.9 The reasons for using tilt shift should be clearly explained in the Technical Methodology.

Figure A13-1: *This image shows the use of a 24mm tilt-shift lens to capture the full vertical extension of the building, whilst avoiding converging verticals.*

In both cases the red arrows indicate the vertical and horizontal points of perspective (Optical Axis) whilst the 'graticules' represent the horizontal and vertical fields of view.

Figure A13-2: *This is a standard 24mm image, levelled horizontally, which does not capture the extent of the building. Tilting this camera/lens combination upwards would result in the vertical elements of the photograph appearing to converge.*

Appendix 14 - Locational Accuracy

14.1 How much does locational accuracy matter?

If you are looking at an object 10m away, which is directly east of you (90° from north), and you move 1m north, the object will appear to shift by 5.7°, and will now be at an angle 95.7 degrees from north.

If the object is 100m away, it will appear to shift 0.57°, to 90.57° from north.

If the object is 1000m away, it will appear to shift 0.057°, to 90.057°.

If the object is 10,000m away, it will appear to shift 0.006°, to 90.006°.

Clearly, a small shift in location can make a large difference to the apparent location of objects when they are close to you. This is especially important due to the effect of parallax, or the apparent shifting of objects' positions based on how near or far they are from you.

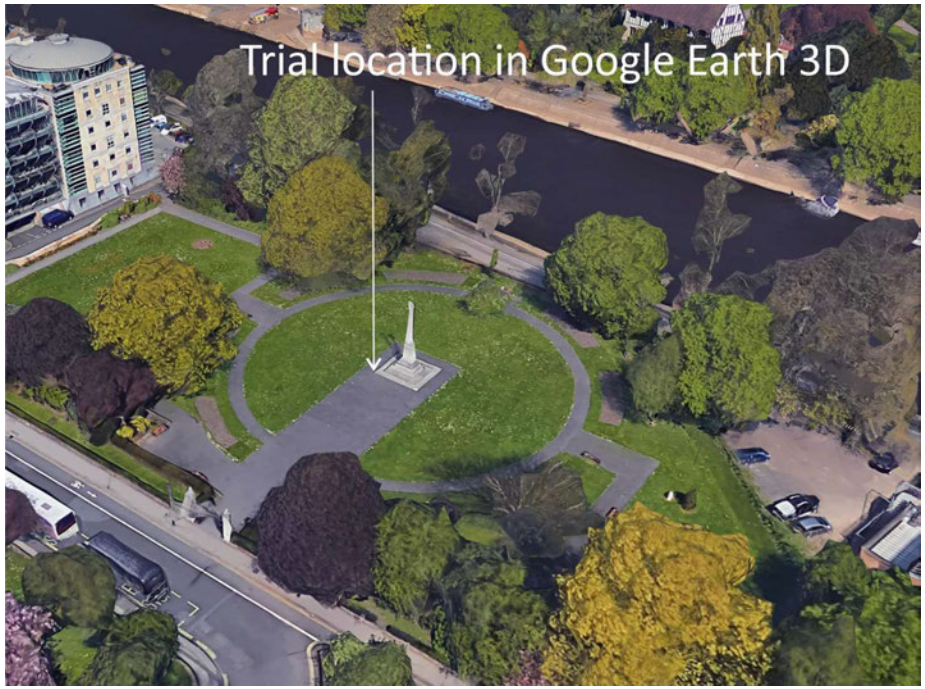
In the photo of the War Memorial in Memorial Gardens, York, if we faced the memorial and stepped 1m to our right, we would no longer be able to see the south tower of York Minster.

War Memorial in Memorial Gardens, York, 2016

This is because the war memorial is close to us and appears to shift substantially, relative to a more distant object such as the Minster.

So if we wanted to accurately 3D model the geometry of the war memorial and match a render to the photograph above, we would need a very accurate understanding of our camera position (x,y,z or easting, northing, height). However, if we were modelling an extension to York Minster south tower, it would not be as critical to know our exact camera position.

In summary, knowing the precise location of the camera, relative to the site, matters more when the subject (site) is closer to the viewpoint, than when it is further away.

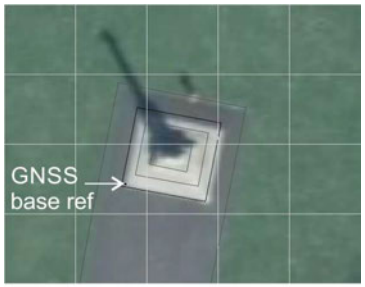


14.2 How accurately can a viewpoint be located?

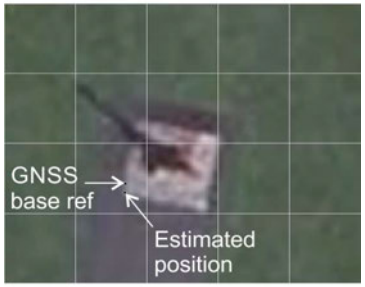
When undertaking research photography for this guidance, one location used was the stepped south-west corner of the War Memorial in Memorial Gardens, York (see photo and Aerial view, previous page). This was selected, in part, because it would be clearly visible in aerial photography. The following images show the location within GIS software, with some of the available means of identifying the location of the corner of the monument.

For each source of aerial photography, the corner position was visually estimated and compared to the base reference.

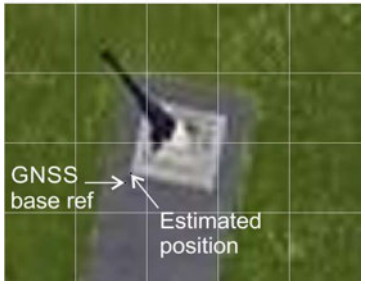
The images below have a 5m grid overlay. This exercise shows that dedicated survey equipment offers a high level of accuracy relative to mapped sources.



GNSS (without RTK), approx 0.18m accuracy. With RTK enhancement, this could have provided sub-cm accuracy. Position reported as E459833.69, N451917.82. Assumed as base reference (ref) for this exercise. Vector outline is OS MasterMap, corner is 0.352m from base ref. Aerial photography is OS Aerial hi-res (2007). Estimated position is 0.073m from base ref.



Aerial photography is Bing Imagery, accessed within GIS. Estimated position is 0.634m from base ref.

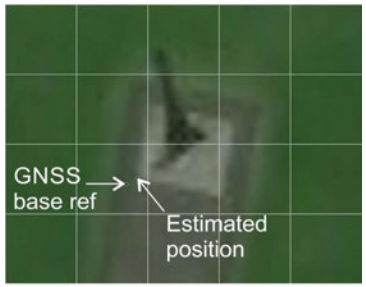


Aerial photography is Google Imagery, accessed within GIS. Estimated position is 0.785m from base ref.

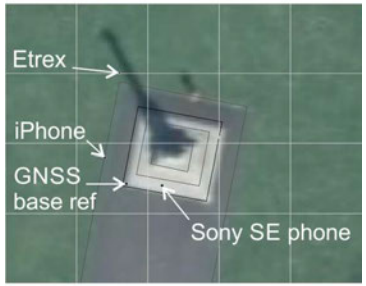
Hand-held GPS devices (all of which were allowed to 'settle') offered accuracy from around 8m to 2m.

Aerial photography varied subject to source: hi-res OS performing best in this instance (accuracy within tolerance of GNSS device) with other sources providing location within 1m from the base ref. Note that performance will vary by location and subject to date, accuracy and resolution of source - this exercise cannot establish the best source in all cases.

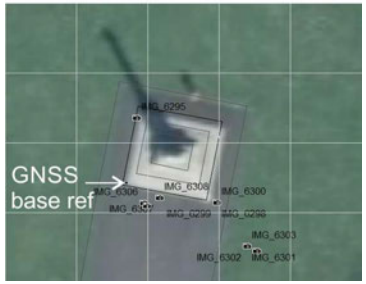
For this clearly-identifiable location, in an urban area with tall buildings and trees (which could compromise GPS signals), aerial photography proved to be more accurate than hand-held or camera GPS. However, the results might be reversed on an open mountainside with no distinguishing locational features.



Aerial photography is World Imagery, accessed within GIS. Estimated position is 0.785m from base ref.



GPS sources plotted against OS background. Reported coordinates were to the nearest metre: iPhone GPS 2.414m from base ref; Sony SE phone 2.478m from base ref; Garmin Etrex Vista HCx (GPS) 7.889m from base ref.



GPS sources plotted against OS background: Canon 6D internal GPS: multiple exposures at base location, recorded GPS coordinates are variable, average 5m from base ref.

This Guidance Note replaces LI Advice Note 01/11, 'Advice on Photography and Photomontage' and Technical Guidance Note 02/17, 'Visual Representation of Development Proposals'. It was prepared by members of the Landscape Institute (LI) Technical Committee, in consultation with LI members and technical experts experienced in photography, photomontage and landscape and visual impact assessment.

Meetings took place with, and comments were received from, the LI Technical Committee and other interested parties, including public sector representatives.

A consultation draft was produced in June 2018. Over fifty responses were received from practitioners and public authorities. Many respondents commented on the need for striking an appropriate balance between the principles of TGN 02/17 and ensuring that any visualisations were fit for purpose, depending on their role and use in the planning, development and consenting process, and including, when necessary, appropriate verifications. The result is this guidance, which combines TGN 02/17 with a thoroughly updated AN 01/11.

Consequently, this document provides a single, new LI Technical Guidance Note on the topic, which considers a range of approaches to visualisation.

It was prepared on behalf of the LI by a working group including the following members:

- Bill Blackledge (Chair) CMLI
- Ian McAulay
- Marc van Grieken FLI
- Mike Spence CMLI, REIA, FRGS
- Simon Odell CMLI

With particular thanks to:

- Chris Hale of Nicholas Pearson Associates
- Christine Tudor CMLI
- Matt Burnett of Scottish Natural Heritage
- Melanie Croll CMLI of Devon County Council
- Michelle Bolger CMLI

The copy editor was Gavin David CMLI.

This guidance is dedicated to the late Mark Turnbull, former chair of the LI Technical Committee.

Approved by LI Technical Committee

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A66 Northern Trans-Pennine Project
TR010062

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 5 – Brough Hill Fair Plan: existing and replacement

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

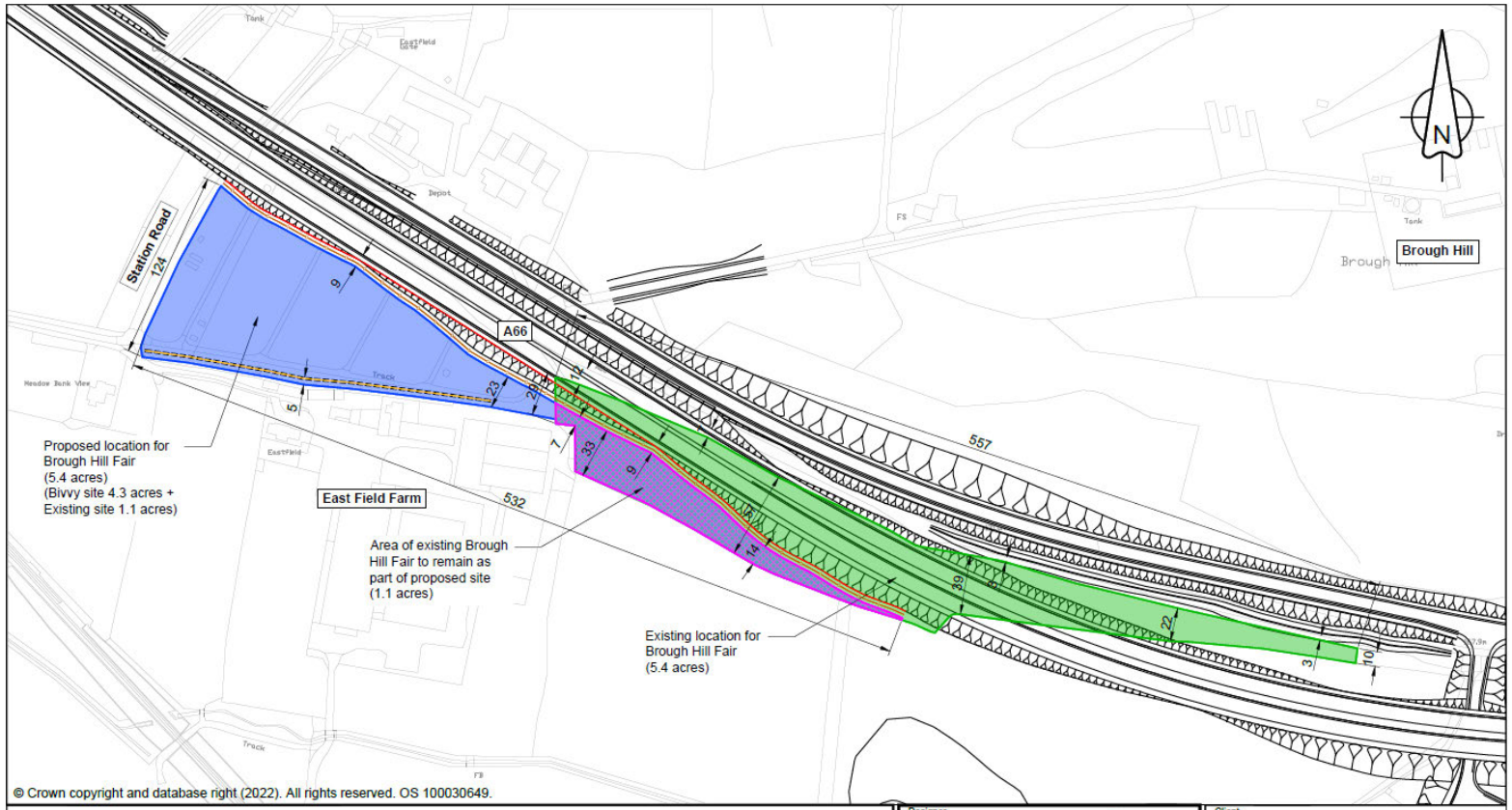
The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 5 – Brough Hill Fair Plan: existing and replacement

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	NH/EX/7.3
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	Date	Status of Version
Rev 1	16 December 2022	Deadline 1



NOTES
1. All dimensions are in metres unless noted otherwise.
2. The design, landscape planting and boundary treatment are subject to confirmation at detailed design stage and so will be set out in the Scheme for approval under article 36 of the Development Consent Order

KEY
- Proposed fence (min 1.3m high)
- Proposed earth bund (height of earth bund to be determined)
- Proposed noise and horse barrier (height of barrier to be determined)
- Existing site location
- Proposed site location
- Existing site location to remain

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P01	FBLA 07/12/22	FBLA 07/12/22	ASCR 07/12/22	DKID 07/12/22	DKID 07/12/22
P02	FBLA 13/12/22	FBLA 13/12/22	ASCR 13/12/22	DKID 13/12/22	DKID 13/12/22

Designer: Amey OW Limited, Chancery Exchange, 10 Furnival Street, London, EC4A 1AB
A66 NTP Integrated Project Team
Client: 3 Piccadilly Place, Manchester, M1 3BN — national highways
Project Name: A66 Northern Trans-Pennine
Drawing Title: Warcop Existing and Proposed Brough Hill Fair Sites Sheet 1 of 1
Project Ref. No.: ---
Stage: PCF3
Scale: 1:2500 @A3
Dimensions: M
Drawing Number: Project HE565627 - Originator AMY - Volume HGN - Location S06 - Type SK - Role CH - Number 000013
Suitability: S1
Suitability Description: Fit for Co-ordination
Revision: P02

A66 Northern Trans-Pennine Project
TR010062

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 6 – Brough Hill Fair Visualisations

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

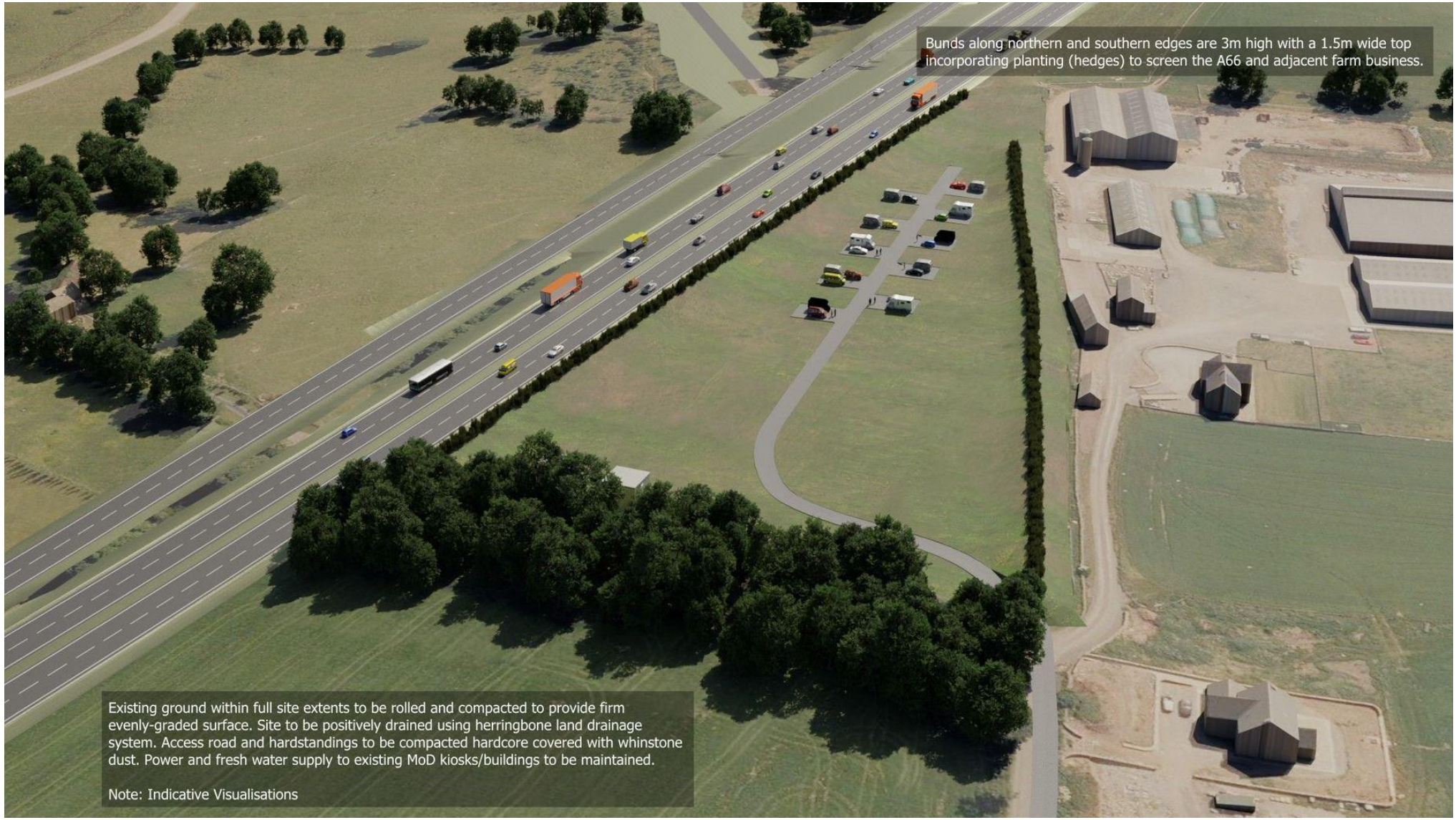
The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

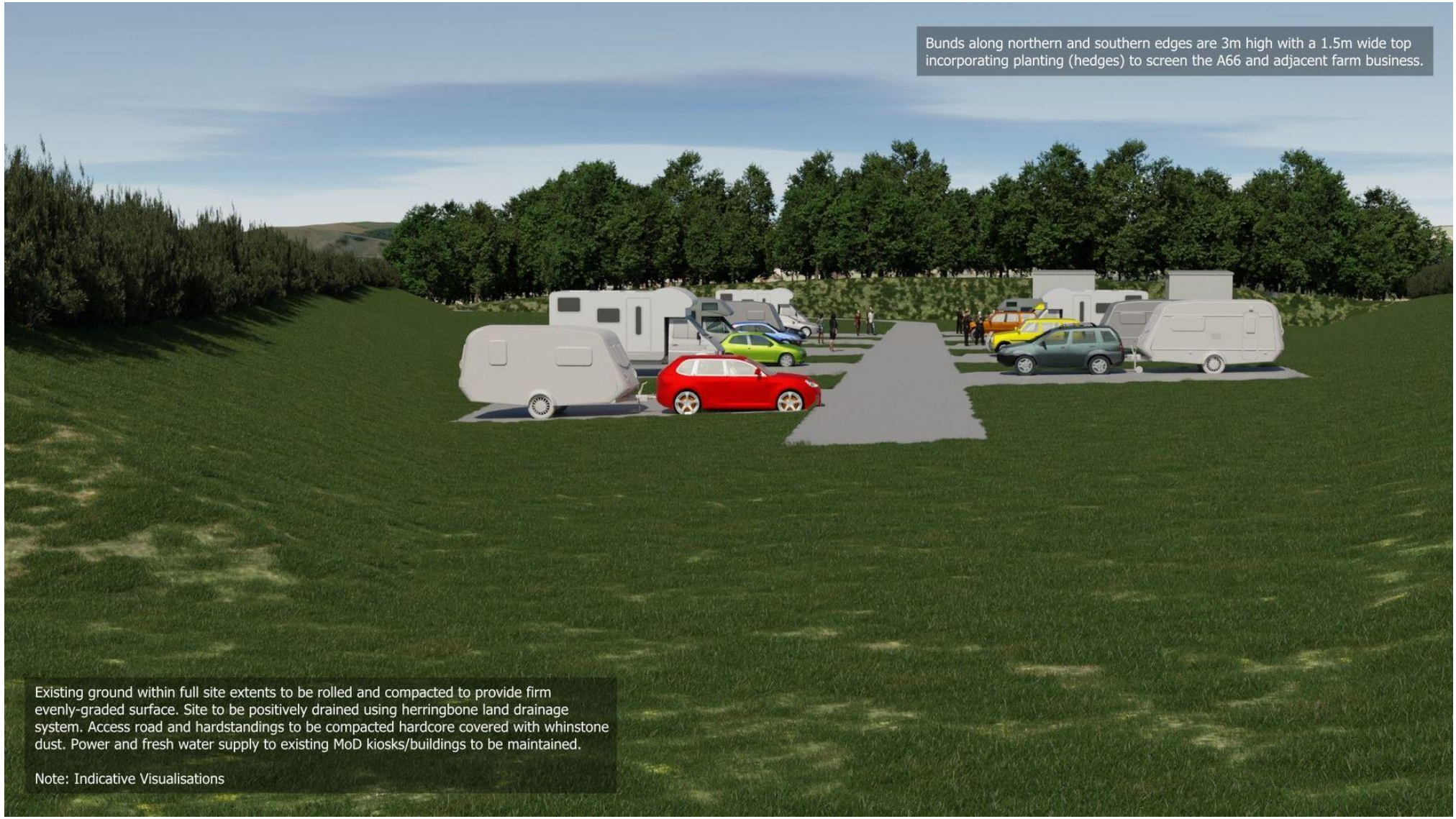
7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 6 – Brough Hill Visualisations

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	NH/EX/7.3
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	Date	Status of Version
Rev 1	16 December 2022	Deadline 1


Bunds along northern and southern edges are 3m high with a 1.5m wide top incorporating planting (hedges) to screen the A66 and adjacent farm business.
Existing ground within full site extents to be rolled and compacted to provide firm evenly-graded surface. Site to be positively drained using herringbone land drainage system. Access road and hardstandings to be compacted hardcore covered with whinstone dust. Power and fresh water supply to existing MoD kiosks/buildings to be maintained.
Note: Indicative Visualisations


Bunds along northern and southern edges are 3m high with a 1.5m wide top incorporating planting (hedges) to screen the A66 and adjacent farm business.
Existing ground within full site extents to be rolled and compacted to provide firm evenly-graded surface. Site to be positively drained using herringbone land drainage system. Access road and hardstandings to be compacted hardcore covered with whinstone dust. Power and fresh water supply to existing MoD kiosks/buildings to be maintained.
Note: Indicative Visualisations


Bunds along northern and southern edges are 3m high with a 1.5m wide top incorporating planting (hedges) to screen the A66 and adjacent farm business.
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Note: Indicative Visualisations

A66 Northern Trans-Pennine Project
TR010062

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 7 – Brough Hill Noise Assessment Technical Note

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 7 – Brough Hill Noise Assessment Technical Note

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	NH/EX/7.3
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	Date	Status of Version
Rev 1	16 December 2022	Deadline 1

TECHNICAL NOTE	Project Title:	A66 Northern Trans-Pennine		
	Document Title	Brough Hill Noise Assessment		
	Document Ref	HE565627-AMY-ENV-S06-RP-LN-000001		
	Suit. Code:	S3	Suitability:	Fit for Internal Review and Comment
	Rev:	P01	Date:	29/11/22

TECHNICAL NOTE		
	Name	**Date**
Created	C.Bustos	28/11/22
Checked	C.Bustos	28/11/22
Reviewed	M.Butterfield	28/11/22
Approved	---	28/11/22
Authorised	---	---

Introduction

National Highways (the Applicant) is promoting the A66 Northern Transpennine Project (the Project). This would dual the remaining single carriageway sections on the route between M6 junction 40 at Penrith and A1(M) at Scotch Corner. These plans for widening the A66 extend through part of a field used for the Brough Hill Fair, which is culturally important to the Gypsy and Traveller community. The Fair started in the 1300s and has been held almost every year since, for four days at the end of September.

It is proposed that, as part of the Project, Brough Hill Fair is relocated onto a site owned by the Ministry of Defence (MoD), adjacent to the current site. The proposed relocation site is currently used by the MoD as a 'Bivvy' or camping site and training area (thus known as the 'Bivvy site'). The access to the site is from Station Road.

This technical note presents additional information as to the noise levels that would be experienced as a result of Scheme 6 (Appleby-in-Westmorland to Brough) upon the proposed Bivvy site. This note presents the predicted noise levels at the proposed Bivvy site (with Scheme 6 in place) compared with the noise levels at the existing Brough Hill Fair site without Scheme 6 in place. The noise levels have been calculated based on the noise model developed for the Project's 2022 Environmental Statement (ES) [Document Reference 3.2, APP-055]. The noise levels are calculated based on predicted traffic growth up to the proposed opening year of the Scheme in 2028.

It is noted that the Brough Hill Fair site (both the existing and proposed relocated sites) was not identified expressly as a sensitive receptor in the Project's 2022 ES based upon the temporary nature of its use. As such, there was no requirement for the Applicant to expressly report the predicted noise levels at the existing or proposed relocated Brough Hill Fair sites to ensure the likely significant effects of the Project were fully reported in the ES. This technical note is therefore prepared to aid the understanding only of the noise levels that are likely to be experienced at the proposed Bivvy site as a result of the Project, taking into consideration comments received during relevant representation and on-going engagement with the relevant stakeholders.

Proposed site

The proposed Bivvy site and existing Brough Hill site are presented in Figure 1 below.

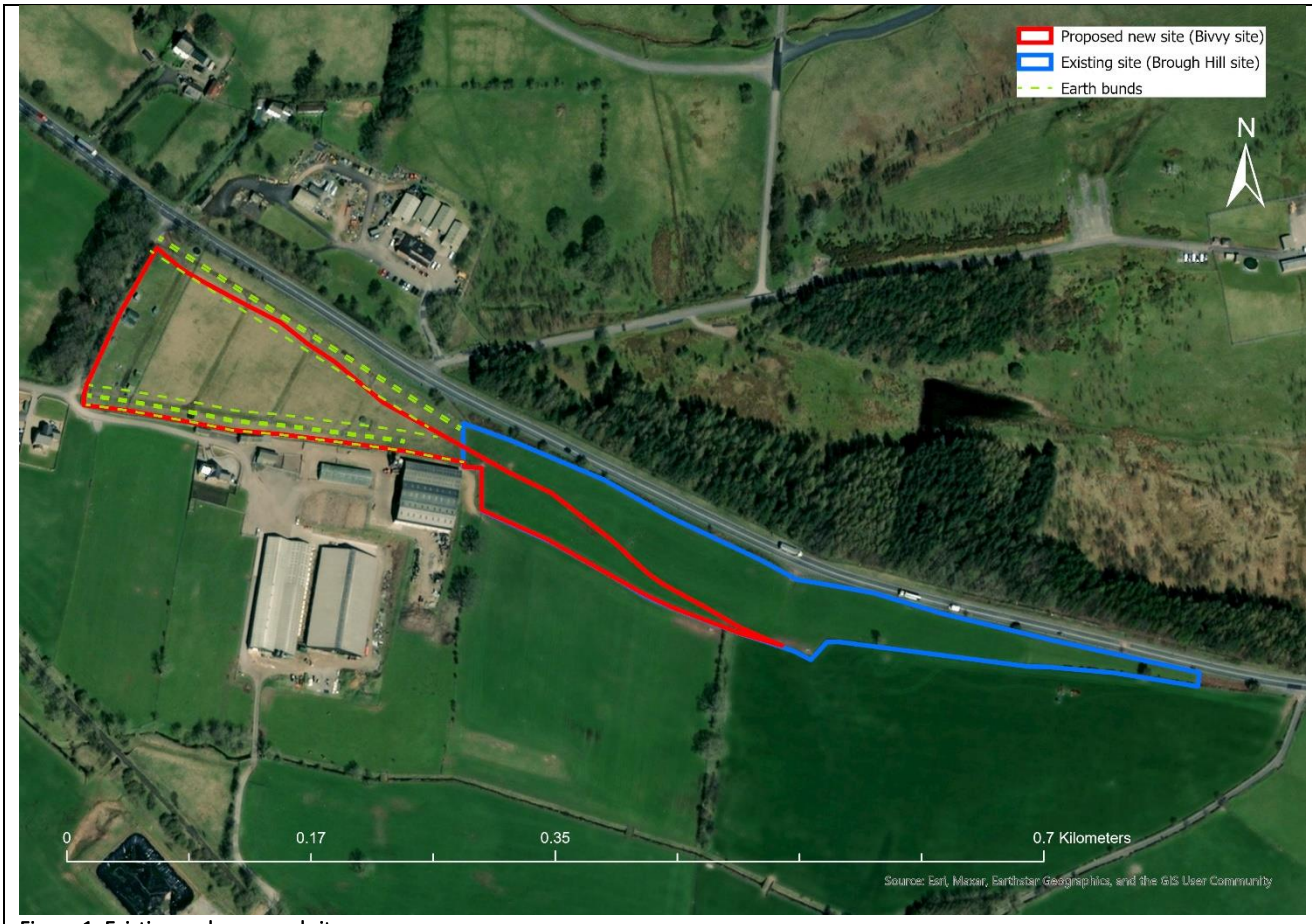


Figure 1: Existing and proposed sites

The proposed Bivvy site is located to the west of the existing site alongside the existing A66, with part of the existing Brough Hill site retained. The topography of the proposed Bivvy site is similar to that of the existing Brough Hill site and its noise climate is dominated by the existing A66. The proposed site would have 3m high perimetral earth bunds along the northern edge (closest to the A66) of the western portion of the site which will provide some level of noise screening to the majority of the site. Three metre high earth bunds will also be provided along the southern edge of the western portion of the site to provide visual screening between the site and the adjacent farm business. The extent of the earth bunds is shown as green dotted lines in Figure 1 and an indicative three-dimensional visualisation is shown in Figure 2. The design of the earth bunds will be updated accordingly to reflect the on-going work by the Applicant and engagement with relevant stakeholders.

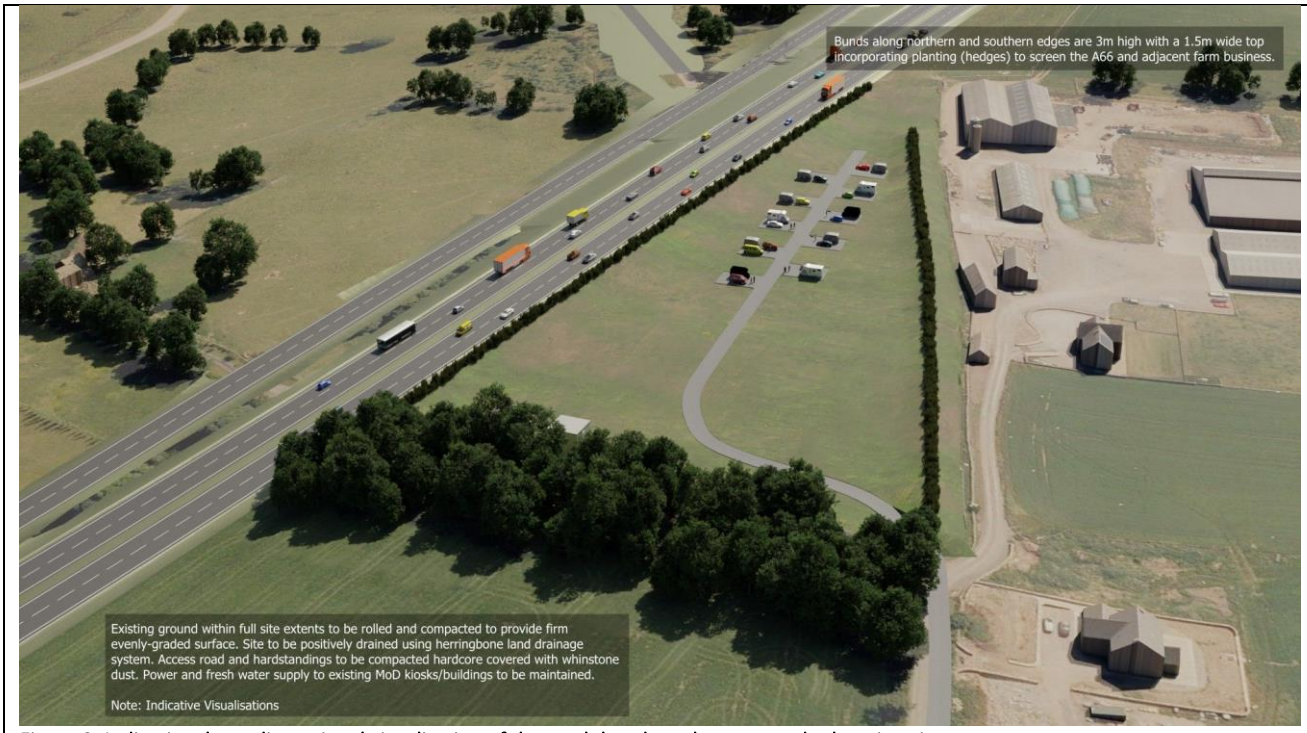


Figure 2: Indicative three-dimensional visualisation of the earth bunds at the proposed relocation site

Assessment methodology

The noise levels reported are based on the three-dimensional noise model developed for the Environmental Statement [Document Reference 3.2, APP-055].

The methodologies adopted reflect those described in section 12.4 of Chapter 12 Noise and Vibration in the ES [Document Reference 3.2, APP-055] and derived from the Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration (DMRB LA 111) and the Calculation of Road Traffic Noise (CRTN) 1988 (Department for Transport, 1988).

Regarding absolute operational noise levels, the LOAEL and SOAEL are defined in Government noise policy NPSE (Noise Policy Statement for England) as thresholds for the onset of the following levels of effect:

- Lowest Observed Adverse Effect Levels (LOAEL) to identify the onset of adverse impacts on health and quality of life.
- Significant Observed Adverse Effect Levels (SOAEL) to identify the onset of significant impacts on health and quality of life.

The effect level categories adopted in DMRB LA 111 for the daytime and night-time LOAEL and SOAEL are set out for all noise sensitive receptors in Chapter 12 Noise and Vibration of the ES and is presented below in Table 1.

The daytime LOAEL is based on the onset of moderate community annoyance and the daytime SOAEL is based on the onset of cardiovascular health effects (according to WHO Guidelines for Community Noise and the noise insulation threshold).

The night-time LOAEL is defined using the WHO Night Noise Guidelines for Europe and the night-time SOAEL is equivalent to the levels above which cardiovascular health effects become a major health concern according to the WHO Guidelines for Community Noise.

Time period	LOAEL	SOAEL
Day	55dB $L_{A10,18hr}$ (façade) 50dB $L_{Aeq,16hr}$ (free-field)	68dB $L_{A10,18hr}$ (façade) 63dB $L_{Aeq,16hr}$ (free-field)
Night	40dB $L_{night,outside}$ (free-field)	55dB $L_{night,outside}$ (free-field)
Notes: Façade – sound level that is determined 1 metre in front of a window or door in a façade. Free-field – the sound level which is measured or calculated 3.5m from reflecting surfaces (as per *BS 8233:2014 Guidance on sound insulation and noise reduction for buildings*), without any reflections from nearby surfaces except the ground.		

Table 1: Operational noise LOAELs and SOAELs

Assumptions and limitations

The assumptions and limitations presented in section 12.5 of Chapter 12 Noise and Vibration of the ES [Document Reference 3.2, APP-055] are appliable for the outcomes presented in this report.

Noise assessment

To allow a more detailed understanding of the predicted road traffic noise levels upon the existing Brough Hill and proposed Bivvy site, the noise model has been updated to show results at a height of 1.5m and with a higher resolution than presented in Volume 3.3. of the ES [Document Reference 3.3, APP-112 to APP-118]. The ES was based on traffic noise levels at a height of 4.0m above local ground level to provide a worst-case assessment to typical first floor window level. This is considered a worst-case scenario in terms of exposure to noise from the Project, i.e. greater angle of view and exposure to incident road traffic noise, rather than at ground level where there is likely to be greater screening of incident traffic noise. The existing Brough Hill and proposed Bivvy site would be used for the fair and therefore noise calculations are more representative at 1.5m above ground i.e. it is unlikely there would be receptors 4m above ground in the fair.

Figure 3 shows the predicted daytime and night-time noise levels at the existing Brough Hill site.

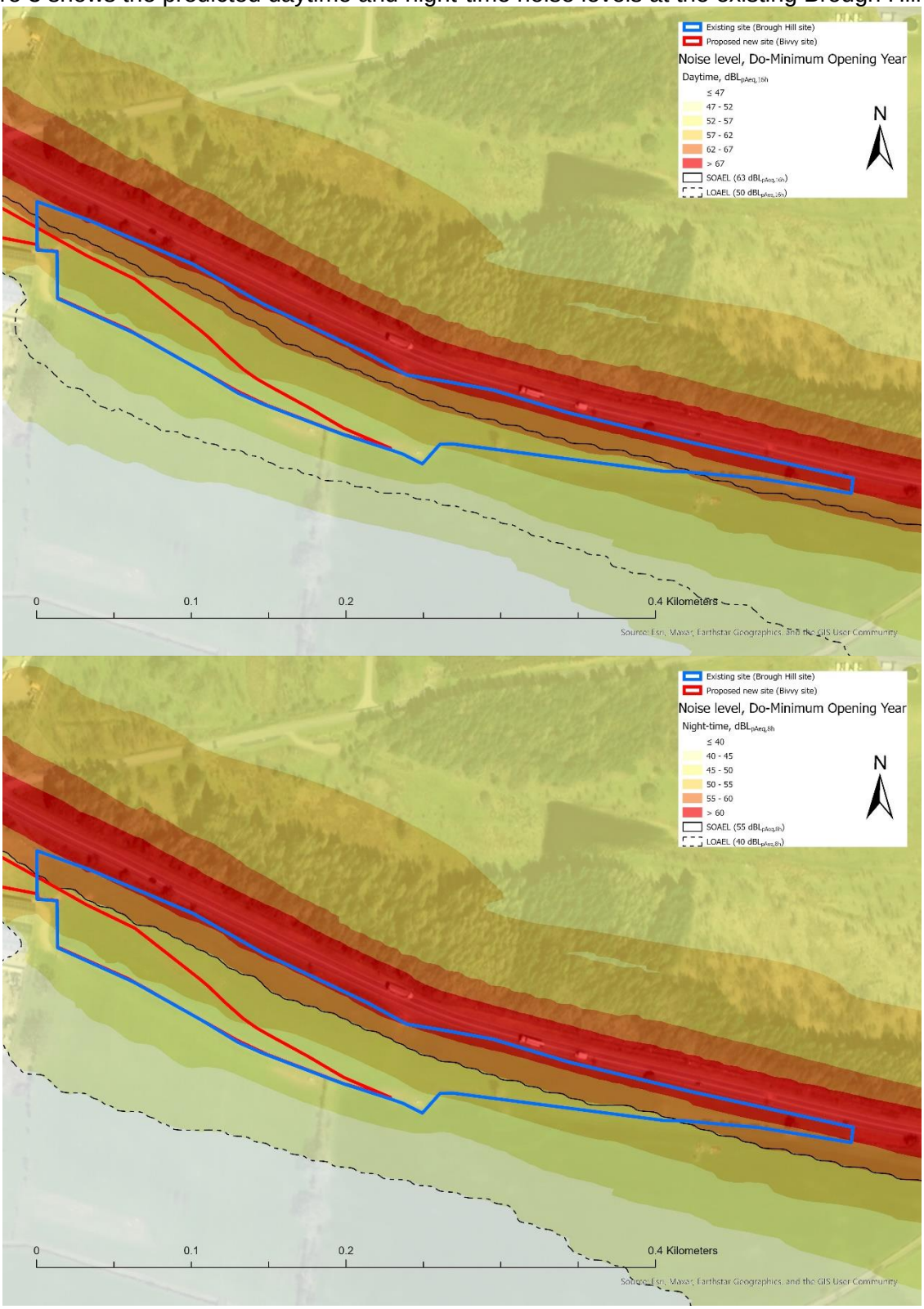


Figure 3: Predicted noise levels at the existing Brough Hill site (blue polygon) for the Do-Minimum Opening Year (DMOY) during the daytime (top) and night-time (bottom)

As shown in the figures above, the majority of the existing Brough Hill site is exposed to daytime noise levels between 57 and 67dB$L_{pAeq,16h}$ and night-time noise levels between 50 and 60dB$L_{pAeq,8h}$. These noise levels range between LOAEL and SOAEL and close to the A66, above SOAEL for the daytime and night-time. Approximately 40% of the Brough Hill site experiences daytime noise levels above SOAEL compared to approximately 45% of the site at night-time. As the ground topography is fairly consistent across the site, noise levels decrease proportionally with distance from the A66.

Figure 4 shows the predicted daytime and night-time noise levels at the proposed Bivvy site.

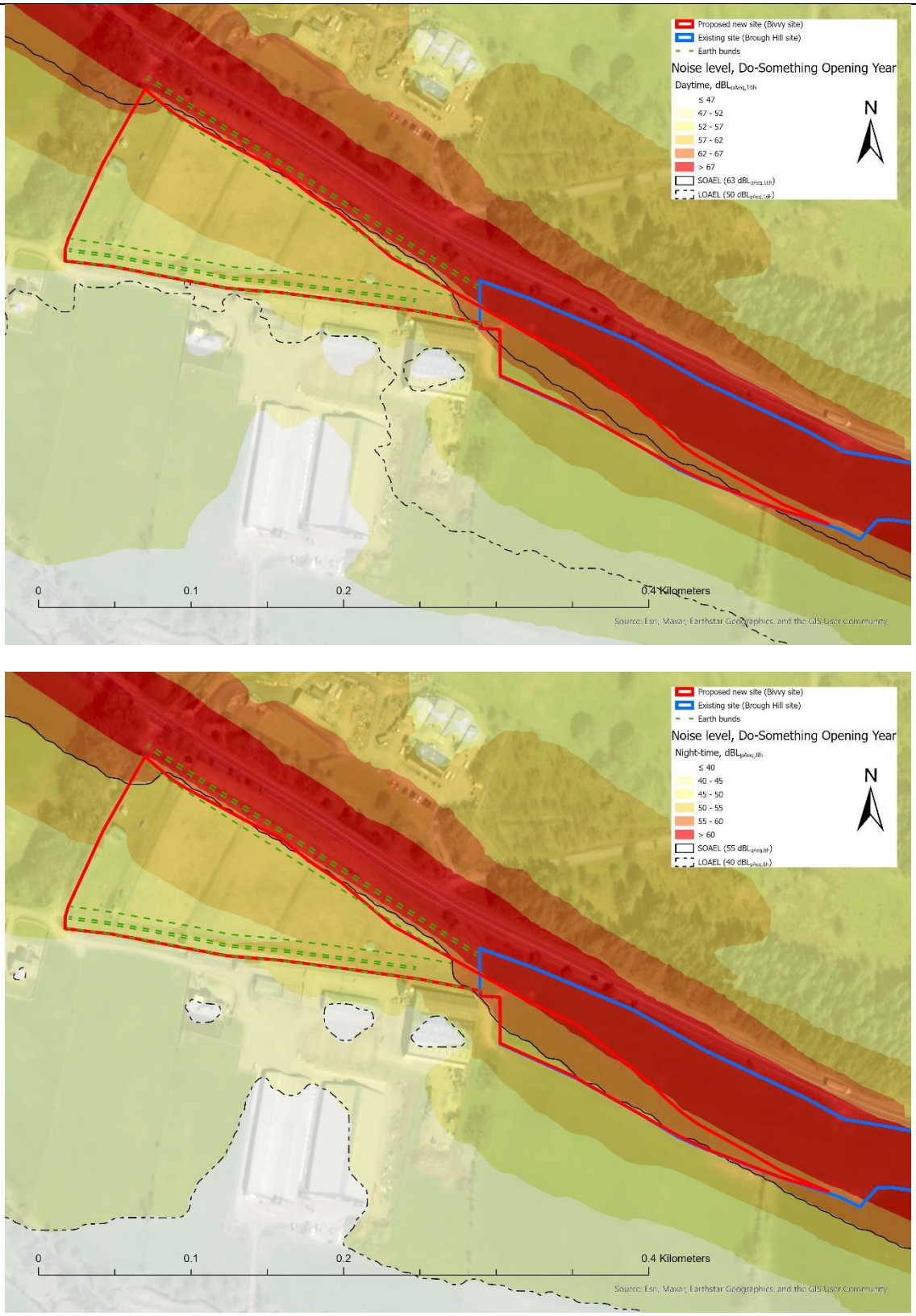


Figure 4: Predicted noise levels at the proposed relocation site (red polygon) for the Do-Something Opening Year (DSOY) during the daytime (top) and night-time (bottom)

In contrast to the existing Brough Hill site, Figure 4 shows that the majority of the proposed site is exposed to daytime noise levels between 52 and 62dB$L_{pAeq,16h}$ and night-time noise levels between 45 and 55dB$L_{pAeq,8h}$. These noise levels for the majority of the site are below the daytime and night-time SOAELs defined in Table 1. Approximately 15% of the site experiences noise levels above the SOAEL during the daytime and approximately 20% at night-time. Of course, the areas of the proposed Bivvy site that overlap with the existing Brough Hill site are exposed to higher levels of noise (>67dB$L_{pAeq,16h}$ and 62-67dB$L_{pAeq,16h}$) due to there being no earth bunds to screen the noise from the A66. This is similar to the case for the existing site, but a smaller proportion of the total area of the proposed site is exposed to these higher levels of noise as explained below.

Figure 5 presents a comparison of the noise levels across both sites as a pie chart and Table 2 presents the results of the noise bands as a percentage of the total site area.

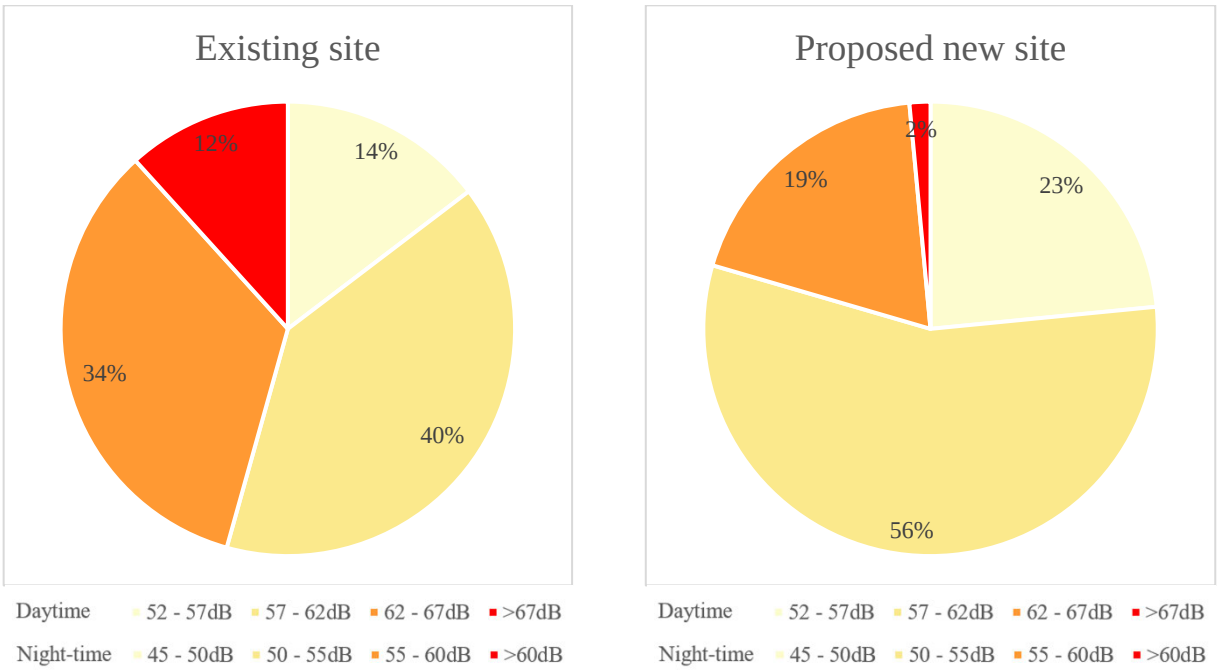


Figure 5: Comparison of the noise levels across each site (dB $L_{pAeq,16h}$), shown as a percentage of the site area

Daytime noise level, dB$L_{pAeq,16h}$	Night-time noise level, dB$L_{pAeq,8h}$	Existing site		Proposed site		Approximate change
		Area (m^2)	Area (%)	Area (m^2)	Area (%)	
47 – 52	40 – 45	--	--	50	<1%	Similar
52 – 57	45 – 50	3,195	14%	5,195	23%	10% increase
57 – 62	50 – 55	8,655	40%	12,420	56%	15% increase
62 – 67	55 – 60	7,405	34%	4,205	19%	15% decrease
>67	>60	2,555	12%	330	2%	10% decrease
Total area (m^2)		21,810		22,200		

Table 2: Areas of the existing and proposed new site within each noise band shown in Figure 3 - Figure 5

Conclusion

Due to the geometry of the proposed Bivvy site (i.e. it extends further away from the A66) and the addition of 3m high earth bunds along the northern perimeter of the western portion of the site, noise levels across the site are generally lower than at the existing Brough Hill site.

The proportion of the area of the proposed Bivvy site experiencing noise levels above SOAEL is considerably lower than at the existing Brough Hill location – approximately 15% during the daytime and 20% during the night-time of the proposed Bivvy site compared to 40% of the existing Brough Hill site during the daytime and 45% during the night-time. The proportion of the area below SOAEL is correspondingly increased. Therefore, the proportion of the area of the proposed Bivvy site which is predicted to experience road traffic noise levels below a SOAEL would increase by roughly 25% in both the daytime and the night-time.

Therefore, it is concluded that the proposed Bivvy site (with the inclusion of 3m earth bunds) provides some improvement on the existing Brough Hill site from a noise perspective.

A66 Northern Trans-Pennine Project
TR010062

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 8 – Documentary Evidence of the Brough Hill Fair Rights

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

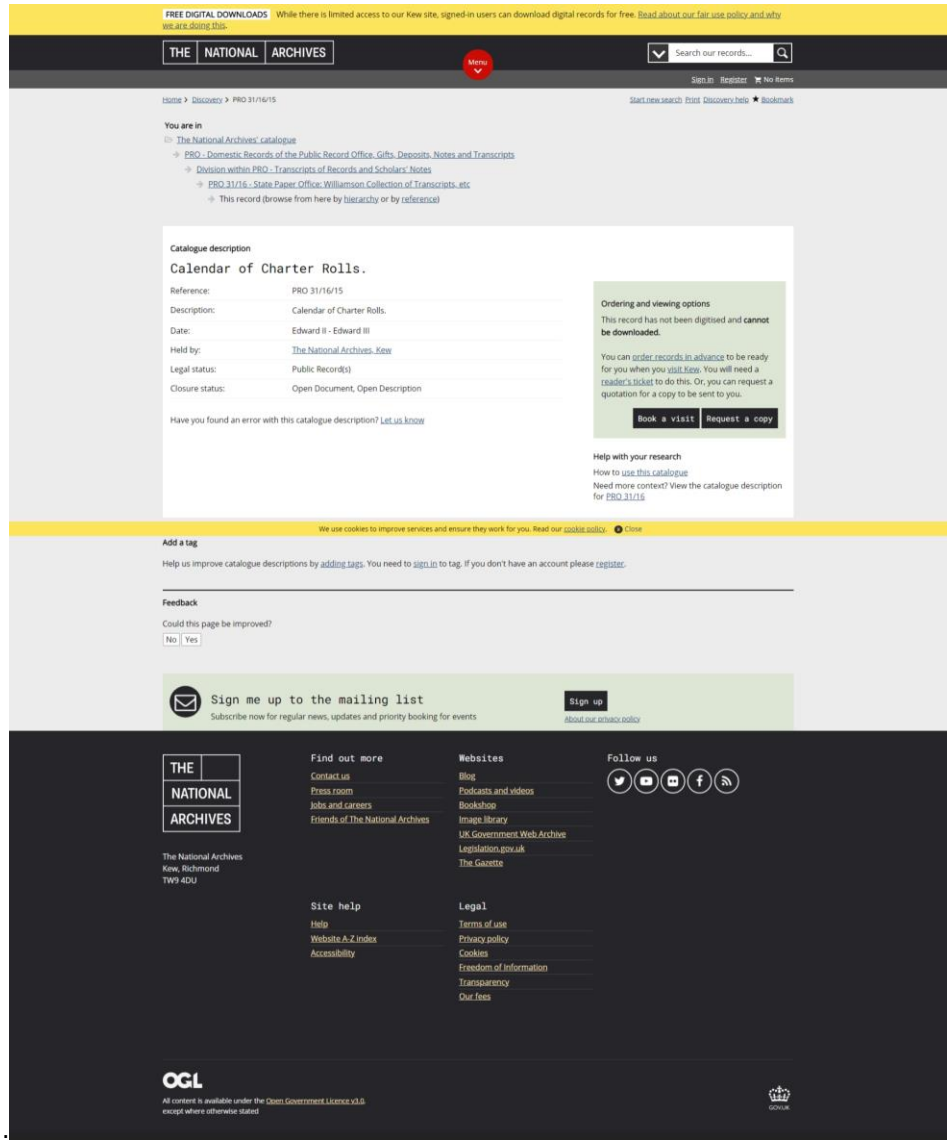
The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 8 – Documentary Evidence of the Brough Hill Fair Rights

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	NH/EX/7.3
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	Date	Status of Version
Rev 1	16 December 2022	Deadline 1



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3 - Title deeds, probate, correspondence and related papers - 1202-1962
45 - Title deeds, probate, correspondence and related papers - 1280-1551

Archive centre	Kendal
Reference	WDHOTH/3/45/16
Title	Charter for Market and Fair at Brough (enclosed a Petition from Brough Tenants to the Earl of Thanet concerning the fair - endorsed with Lord Thanet's instructions) [2 August] 4 Edward III
Description	Edward by the grace of God King of England, Lord of Ireland and Duke of Aquitaine to his archbishops, bishops, abbots, priors, earls, barons, justices, sheriffs, reeves, officials and all bailiffs and faithful ministers greeting. Know that of our special grace we have granted and by this our charter confirmed to our beloved and faithful Robert de Clifford that he and his heirs may have one market each week on a Thursday at his manor of Brough under Stainmore in the county of Westmorland in perpetuity and one fair there lasting for four days that is to say for two days before the feast of St. Matthew the Apostle, on the feast day itself and for one day following so long as the market and the fair do no harm to neighbouring markets and neighbouring fairs. Therefore we wish and firmly order for ourselves and for our heirs that the said Robert and his heirs may have in perpetuity the aforesaid market and fair at his said manor together with all the liberties and free customs pertaining to such a market and fair so long as there is no harm to neighbouring markets and fairs aforesaid. These witnesses H[enry] Bishop of Lincoln our chancellor, R[obert] Bishop of Salisbury, John of Eltham earl of Cornwall, our very dear brother, Roger de Mortimer earl of March, William de Montacute, Oliver de Ingham, Hugh de Turpilton steward of our household and others. Dated by our hand at Northampton on the second day of August in the fourth year of our reign. By writ of privy seal
Date	1330
Extent	1 document
Catalogue level	Item

DATED 21st January 1947

293

VETERIPONT ESTATES LIMITED

- and -

HIS MAJESTY'S PRINCIPAL SECRETARY OF STATE FOR THE WAR DEPARTMENT

Copy

A G R E E M E N T

for the purchase of land at Warcop in the County of Westmorland.

Treasury Solicitor.

T.S.Reference No.W.O.565/E/AIP.

File 119/West/2384.

27 - 1385B

A N A G R E E M E N T made the Twenty-second day of February One thousand nine hundred and forty seven B E T W E E N VETERIPONT ESTATES LIMITED whose Registered Office is at 2 New Square Lincolns Inn in the County of London by CHARLES ELPHINSTONE FORDYCE their Agent duly authorised (hereinafter called "the Vendor") of the one part and HIS MAJESTY'S PRINCIPAL SECRETARY OF STATE FOR THE WAR DEPARTMENT (hereinafter called "the Purchaser") for and on behalf of His Majesty of the other part

W H E R E B Y IT IS AGREED AND DECLARED as follows :-

1. (a) THE Vendor shall sell and the Purchaser shall purchase for the sum of TWO THOUSAND SIX HUNDRED POUNDS the lands (hereinafter referred to as "the property") described in the First Schedule hereto for a legal estate in fee simple absolute in possession subject to tithe redemption annuity but free from all incumbrances land charges and other interests whatsoever (whether or not registered under the provisions of the Land Charges Act 1925 or otherwise)

(b) EXCEPT as hereinafter mentioned the said purchase price of Two thousand six hundred pounds includes all compensation for and shall be deemed to be in full satisfaction of all claims by the Vendor howsoever arising by reason of the exercise by the Purchaser of his statutory or other powers in respect of the said property including loss of tolls from the annual fair at Brough Hill referred to in the Third Schedule hereto

2. THE Purchaser shall pay the purchase money on the day of the expiration of two months from the date hereof (hereinafter called "the date fixed for completion") and the purchase shall be completed on that date at the office of Messrs. Dawson & Co., the Vendors Solicitors at 2 New Square Lincolns Inn aforesaid and upon such payment the Purchaser shall as from the date fixed for completion be entitled to possession or receipt of the rents and profits and shall as from the date fixed for completion pay all outgoings and up to that date all outgoings (except property tax) and any rent shall if necessary be apportioned. The Vendor shall discharge all liability for property tax up to the date fixed for completion and shall produce to the Purchaser before completion satisfactory evidence of such discharge. If from any cause whatever other than neglect or default on the part of the Vendor or of his Settled Land Act Trustees the completion of the purchase is delayed beyond the date fixed for completion the Purchaser shall pay interest at the rate of Three and a half per centum per annum (less tax) on the purchase money from the date fixed for completion up to the day of actual payment thereof. The taking of possession as aforesaid shall not prejudice the investigation of the title by the Purchaser or the provisions of this contract.

3. THE Vendor is selling as absolute owner subject to Family Charges. The property is included with other property of large extent in a Mortgage. The Mortgagees will join in the Conveyance to the Purchaser to release the property now agreed to be sold.

4. THE title to the property shall commence with a Resettlement dated the First February One thousand eight hundred and ninety five and the Vendor will sell under the provisions of the Settled Land Act 1925 free from the before mentioned Family Charges and from all powers of charging. The purchase money will be paid to Trustees of a Compound Settlement appointed by the Court. The Vendor will retain all Title Deeds and other documents and will give to the Purchaser a Statutory acknowledgment (to be included in the Conveyance) of the Purchaser's right to production of the Deeds and Documents so retained and to delivery of copies thereof and the abstract of such title shall be delivered to the Treasury Solicitor within seven days after the date of this Agreement.

5. THE requisitionson title shall be delivered within twenty-one days from the date of the delivery of the Abstract and any further requisitions shall be delivered within fourteen days after the receipt of the replies out of which they arise and all requisitions not so delivered within such times shall be deemed to be waived unless and except in so far as they could not have been made on the information contained in the Abstract as delivered. If the Purchaser shall insist on any requisition which the Vendor shall be unable or on the ground of unreasonable expense unwilling to remove or comply with the Vendor may within one month after the date on which such requisition was delivered and notwithstanding any negotiation in respect of or any attempt to remove or comply with the same but not while litigation is pending in respect of such requisition give notice in writing to the Purchaser or the Treasury Solicitor rescinding this Agreement and unless within fourteen days after the delivery of such notice the Treasury Solicitor on behalf of the Purchaser shall have by notice in writing withdrawn such requisition the notice to rescind shall become effective. Upon such rescission each party shall return to the other all documents (including the part Contract and the Abstract but excluding letters) delivered by either party to the other but neither party shall be entitled to any payment from the other in respect of interest costs or other compensation whatsoever.

6. THE Vendor shall at his own expense ascertain and inform the Purchaser as to the custody of all documents forming part of the title and not in the possession of the Vendor or of his mortgagee or trustee.

7. THE Purchaser shall be entitled to a statutory declaration to be made at his expense that the property or any part thereof as to which there may be some question of identity is that comprised in the documents offered by the Vendor in proof of the title

thereto and that it has been enjoyed according to the title shown thereto for upwards of twelve years last past.

8. THE property is sold subject to all rights of way water light drainage and other easements rights or privileges (if any) affecting the property and to any subsisting liability to repair party walls fences roads or streets.

9. THE Vendor when requested by and at the expense of the Purchaser shall join with the Purchaser in taking all steps necessary to obtain the legal apportionment of any outgoing but the completion of the purchase shall not be thereby delayed.

10. THE property is sold subject to and with the benefit of the leases and tenancies affecting the same and mentioned in the Second Schedule hereto and the yearly sums specified in the last column of the said Schedule shall be the apportioned parts to be henceforth received by the Purchaser from the said tenants (whose assent thereto in writing shall be obtained by the Vendor if the Purchaser so requires).

11. THE Vendor will at any time after the date hereof at the request of the Purchaser give the requisite notice to terminate any current tenancy subject to which the property is sold at the earliest date on which such tenancy is terminable and the Purchaser shall indemnify the Vendor against all tenants claims by reason or in consequence of any such notice other than claims in respect of tenant right and improvements relating to any portion of a holding not included in the property

12. ALL rights claims and demands of lessees or tenants arising prior to the date hereof shall be satisfied by the Vendor provided that the Vendor shall not after the date hereof without first obtaining the consent of the Purchaser thereto consent to any improvement being effected by or to any commitment whatsoever on the part of any lessee or tenant which might give rise to or make possible any claim or demand on the part of such lessee or tenant whether by contract statute custom or otherwise

13. THE property is sold subject to the existing reservations covenants and stipulations specified in the Third Schedule hereto

14. THERE shall be reserved out of the Conveyance the right for the Vendor or other the owner or owners for the time being of the adjoining fell known as Dufton Fell to claim for injurious affection to the sporting rights over Dufton Fell arising out of the use by the Purchaser of the property hereby agreed to be sold subsequent to the expiry or withdrawal of any Order made under the Defence (General) Regulations 1939 governing the use of Dufton Fell provided such claim is made within five years from the expiry or withdrawal of any such Order

15. UPON payment of the purchase money as aforesaid the Vendor and all other necessary parties (if any) shall execute to the Purchaser or as he shall direct a proper assurance or assurances (not exceeding two) of the property to be prepared by and at the expense of the Purchaser. Delivery of a draft or of an engrossment shall not prejudice any outstanding requisition.

16. ANY incorrect statement error or omission found in this Agreement or in any plan annexed hereto shall not annul the sale or entitle the Purchaser to be discharged from his purchase but if the same shall be pointed out by the Purchaser before completion compensation shall be allowed by the Vendor in respect thereof. No objection shall be taken in respect of any slight discrepancies which may occur between the old measurements set out in the muniments of title and the modern decimal Ordnance measurements shown on the Plan annexed hereto.

17. IN case after the date hereof and before the date of actual completion of the purchase any requirement or demand enforceable against the Vendor and of which the Vendor had not notice before the date hereof shall be made by any drainage local or other authority or factory inspectors in respect of the property or the roads streets paths or passages adjoining the same the Purchaser shall on completion repay to the Vendor the amount expended by him in complying therewith or if any such requirement or payment shall not have been complied with or made before completion the Purchaser shall indemnify the Vendor in respect thereof. The Vendor shall upon receiving notice of any such requirement or demand inform the Purchaser thereof and give him the option of complying with or satisfying the requirement or demand in lieu of the Vendor and shall not expend any money for that purpose unless the Purchaser refuses or neglects to comply with or satisfy such requirement or demand within a reasonable time.

18. SECTION 47 of the Law of Property Act 1925 shall not apply to this contract.

19. THE Purchaser shall on completion pay to the Agent of the Vendor his Fee amounting to Thirty six pounds eight shillings based on Ryde's Scale (plus one-third) on the purchase money. The Purchaser shall also on completion pay the Vendor's Solicitors' costs of incident to and consequent upon the preparation execution carrying into effect and completion of this Agreement and the subsequent Conveyance such costs to be based on Schedule I to the Orders for the time being in force under the Solicitors Remuneration Act 1881 amounting to Forty six pounds ten shillings together with any disbursements properly payable and in addition the Statutory Fees of Six pounds in respect of the other parties joining in the Conveyance.

20. ANY dispute or difference as to any compensation or other sum payable hereunder shall (unless expressly otherwise provided) be referred to the decision of a sole arbitrator to be nominated by the President for

the time being of the Chartered Surveyors' Institution subject to and in accordance with the Arbitration Acts 1889 to 1934 or any statutory amendment thereof

21. NOTHING herein contained shall prevent the exercise in respect of the property of any power conferred or to be conferred upon the Purchaser by Statute Order in Council or otherwise.

22. NOTWITHSTANDING the completion of the assurance of the property to the Purchaser or as he shall direct this Agreement shall remain in force with regard to anything remaining to be done performed or observed hereunder and not provided for in the said assurance.

23. IN this Agreement where the context admits the expressions "the Vendor" and "the Purchaser" include beside the Vendor and the Purchaser the persons deriving title under them respectively.

THE FIRST SCHEDULE above referred to

ALL THOSE pieces of land containing in the whole 139.047 acres or thereabouts situate at Brough Hill and Hilton in the Parishes of Warcop and Murton in the County of Westmorland which said pieces of land are delineated on the plan hereto annexed and thereon coloured Pink and particulars of which are as follows:-

Number on Ordnance Survey Map (1919 and 1920 Editions)	Parish	Area Acres
770	Warcop	6.035
829	Warcop	4.986
839 Part	Warcop	.737
755	Warcop	7.052
830	Warcop	55.352
12	Warcop	53.733
497	Murton	2.746
517a	Murton	2.107
412	Murton	3.061
465	Murton	3.238
		139.047

TOGETHER with all such grazing rights and such other rights of common as are appurtenant to the said pieces of land

THE SECOND SCHEDULE above referred to

Date of Lease or agreement	Short particulars and area of property comprised therein	Name and Address of Lessee or Tenant	Date of commencement of and length of term	Total Yearly rent and days for payment thereof	Rent apportioned to the property
14th April 1889 and 20th March 1923	16½ Square yards in North West corner of Ordnance No.755	Westmorland County Council Kendal.	2nd February 1923	1s/- 2nd February	1s/-
28th April 1922	Ordnance No.465	William Idle	2nd February 1922 yearly	£22.15.0.	£6.10.0.
11th January 1930	Ordnance No.412	J.H.Guy	2nd February 1930	£17	£6
19th July 1935	Ordnance Nos.497 517a	R. Todd	2nd February 1935	£9	£9
21st January 1939	Ordnance Nos.770 829 830 839 Part 755 12	Messrs. J.& T.S. Horn	2nd February 1939	£72.10.0	£72.10.0.

THE THIRD SCHEDULE above referred to

Existing Reservations, Covenants and Stipulations.

The property or some part thereof is sold subject to the ancient right of holding Brough Hill Fair annually and to all liberties and customs as heretofore enjoyed in connection therewith

A S W I T N E S S the hand of Charles Elphinstone Fordyce as Agent for and on behalf of the

Vendor and the hand of [redacted]
for and on behalf of the Purchaser

SIGNED by the said Charles Elphinstone Fordyce for and on behalf of the Vendor in the presence of:- [redacted]

[redacted]
for and on behalf of the Purchaser in the presence of:- [redacted]

A66 Northern Trans-Pennine Project
TR010062

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 9 – Climate effects – Note containing explanation of costs in the Combined Modelling and Appraisal Report

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

7.3 Issue Specific Hearing 1 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 9 – Climate effects – Note containing explanation of costs in the Combined Modelling and Appraisal Report

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	NH/EX/7.3
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	**Date**	**Status of Version**
Rev 1	16 December 2022	Deadline 1

The following note explains how the Carbon Tonnages reported in Tables 7-21, 7-22, and 7-23 of ES Chapter 7 Climate [Document Reference 3.2, APP-050] are valued, arriving at the total value of emissions reported in Table 6-9 of the Combined Modelling and Appraisal Report [Document Reference 3.8, APP-237].

Data Sources
The data sources used within the appraisal are listed in Table 1.

Table 1: Data Sources

Data	Source	Notes
GDP Deflator	TAG Databook v1.17 (November 2021)	https://www.gov.uk/government/publications/tag-data-book
Discount Rate	TAG Databook v1.17 (November 2021)	https://www.gov.uk/government/publications/tag-data-book
Social Cost of Carbon	BEIS (2021, as reported in TAG Databook v1.17) Valuation of Greenhouse Gas in Appraisal	https://www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal/valuation-of-greenhouse-gas-emissions-for-policy-appraisal-and-evaluation
UK ETS Permit Price	BEIS (2022) UK ETS reporting	https://www.gov.uk/government/publications/taking-part-in-the-uk-emissions-trading-scheme-markets/taking-part-in-the-uk-emissions-trading-scheme-markets. Applies to 2022 only, with permit prices inflated according to EFC Inflation Index for all other years. This is to be reviewed annually by the end of March each year. 2022 'starting price' is the arithmetic mean of monthly prices from May 2021 to January 2022 (all available data at time of publication)
EFC Inflation Index	National Highways Commercial Services Division	

Construction Emissions
Table 7-21 of ES Chapter 7 Climate [Document Reference 3.2, APP-050] states that the total Construction Stage (tC02e) is 518,562. This is split between Construction Emissions (PAS 2080 modules A1-15), and Land Use Change Emissions (PAS 2080 module D). The Construction Emission tonnages are then assigned to the years in which they arise based on the timing of the construction of each of the individual schemes from the construction programme in the ES (Plate 2.1 [Document Reference 3.2, APP-045]) and the EMP (Plate 1.1 [Document Reference 2.7, APP-019]).

The Land Use emissions have been spread evenly over the construction period. Finally the emissions are split into those sectors that are included within the UK Emissions Trading System (UK ETS) – the 'traded sector' – and those that are not – the 'non-traded sector', in line with Paragraph 4.1.4 of TAG UNIT A3 Environmental Impact Appraisal.

Table 2: Construction Tonnages

Construction Emissions (PAS 2080 module A1-A5)						
Year	2024	2025	2026	2027	2028	Total
Traded tCO2e	31,341	74,218	82,945	35,278	6,494	230,276
Non-traded tCO2e	9,093	21,533	24,065	10,235	1,884	66,809
Total tCO2e						**297,085**
Land Use Change (PAS 2080 module D)						
Year	2024	2025	2026	2027	2028	
Traded tCO2e						0
Non-traded tCO2e	44,656	44,656	44,656	44,656	44,656	223,280
Total tCO2e						**223,280**
Total – Construction Stage						**520,365**

The social cost of non-traded carbon is calculated by:

1. Converting the BIEIS Central Social Cost of Carbon Forecast Rates for each year (see **Table 1**) to 2010 prices using the GDP deflator (see **Table 1**).
2. Applying the value calculated in 1. above to the traded tonnages of carbon (see **Table 2**).
3. Discounting the value calculated in 2. above for each year to 2010 present values using the discount rate (see **Table 1**).

The value of traded carbon is calculated by:

1. Calculating the social cost of carbon, using the same method as that described above, but using the traded tonnages (from **Table 2**).
2. Calculating the permit price (See **Table 1** – UK ETS Permit Price) for each year using the current traded price with forecast based on inflation (See **Table 1** – EFC Inflation Index), and then converting to 2010 prices using the GDP deflator (see **Table 1**). The Permit costs for the Project

are then calculated by applying the permit price calculated for each year to the traded tonnages (from **Table 2**). These costs are then discounted to 2010 present year values using the discount rate (see **Table 1**).

3. The final value of traded emissions is then the social cost of carbon netting off the permit cost, i.e. 1) minus 2) above.

This is a more conservative approach than TAG requires, as TAG only values the non-traded carbon (see paragraph 4.1.5 of TAG UNIT A3 Environmental Impact Appraisal). National Highways consider it appropriate to value all types of carbon in the appraisal.
The valuation of these emissions is shown in **Table 3**. The Land Use Change (D) has been classed as an operating emission by National Highways within this reporting system.

Table 3: Valuation of Construction related Emissions over 60 Years (£m 2010 Values, positive value represents a cost)

	Tailpipe Emissions	Construction & Maintenance Emissions	Operating Emissions	Total
Value of non-traded emissions	-	8.23	27.32	35.55
Value of traded emissions	-	20.64	-	20.64
Total Value of emissions	**-**	**28.88**	**27.32**	**56.19**

Land Use and Forestry (PAS 2080 module D): future ability to sequester carbon from habitats gained (over the 60-year assessment period)
Table 7-23 of ES Chapter 7 Climate [Document Reference 3.2, APP-050] states that the total emissions from Land use and forestry relating to the future ability to sequester carbon from habitats gained by the project is 146,666 tCO2e over the 60-year appraisal period (2029-2088). This equates to an average annualised value of 2,444 tCO2e per year.

Table 4: Land Use and Forestry (PAS 2080 module D)

Year	**Traded tCO2e**	**Non-traded tCO2e**	**Total tCo2e**
Per Year	0	-2,444	-2,444
Total 60 Year Appraisal	0	-146,666	-146,666

The social cost of traded and non-traded carbon is calculated using the same methodology as described above, using the annual stream of traded tonnages from renewal and maintenance described in **Table 8** above.

The valuation of these emissions is shown in **Table 5**. The Land Use Change has been classed as an operating emission by National Highways within this reporting system.

Table 5: Valuation of Land Use and Forestry related Emissions over 60 Years (£m 2010 Values, positive value represents a cost)

	Tailpipe Emissions	Construction & Maintenance Emissions	Operating Emissions	Total
Value of non-traded emissions	-	-	-10.48	-10.48
Value of traded emissions	-	-	-10.48	-10.48
Total Value of emissions	**-**	**-**	**-10.48**	**-10.48**

Tailpipe Emissions

Table 7-23 of ES Chapter 7 Climate [Document Reference 3.2, APP-050] states that the total emissions from vehicles using the highway infrastructure (B9) is 2,068,844 tCO2e over the 60-year appraisal period (2029-2088). This is based on interpolating between the (traffic) modelled years of 2029 and 2044 for the first 15 years of the appraisal, and assuming emissions remain constant at 2044 levels for the subsequent 44 years of the appraisal. This is summarised in **Table 6** below.

Table 6: Emissions Vehicles using the highways infrastructure (PAS 2080 module B9)

Year	Traded tCO2e	Non-traded tCO2e	Total tCo2e
2029	435	38,769	39,204
2044	594	33,160	33,754
Total 60 Year Appraisal	**34,395**	**2,034,449**	**2,068,844**

The social cost of traded and non-traded carbon is calculated using the same methodology as described above, using the annual stream of tonnages from vehicle emissions described in **Table 6** above.

The valuation of these emissions is shown in Table 7

.

Table 7: Valuation of Vehicles using the highways infrastructure Emissions over 60 Years (£m 2010 Values, positive value represents a cost)

	Tailpipe Emissions	Construction & Maintenance Emissions	Operating Emissions	Total
Value of non-traded emissions	147.89	-	-	147.89
Value of traded emissions	1.79	-	-	1.79
Total Value of emissions	**149.68**	**-**	**-**	**149.68**

Renewal and Maintenance Emissions (PAS 2080 module B2-B5)

Table 7-23 of ES Chapter 7 Climate [Document Reference 3.2, APP-050] states that the total emissions from renewal and maintenance (B2-B5) is 121,608 tCO2e over the 60-year appraisal period (2029-2088). This equates to an average annualised value of 2,027 tCO2e per year.

Table 8: Maintenance and replacement (PAS 2080 module B2-B5)

Year	Traded tCO2e	Non-traded tCO2e	Total tCo2e
Per Year	223	1,804	2,027
Total 60 Year Appraisal	13,377	108,231	121,608

The social cost of traded and non-traded carbon is calculated using the same methodology as described above, using the annual stream of traded tonnages from renewal and maintenance described in **Table 8** above.

The valuation of these emissions is shown in Table 9.

.

Table 9: Valuation of Renewal and Maintenance Emissions over 60 Years (£m 2010 Values, positive value represents a cost)

	Tailpipe Emissions	Construction & Maintenance Emissions	Operating Emissions	Total
Value of non-traded emissions	-	0.96	-	0.96
Value of traded emissions	-	5.70	-	5.70
Total Value of emissions	-	6.66	-	6.66

Total Project Carbon Valuation

Adding together the valuations set out in **Table 3**, **Table 5**, Table 7 and Table 9 provides the total valuation of the Project, as shown in Table 6-9 of the ComMA [Document Reference 3.8, APP-237].

provides the total valuation of the Project, as shown in Table 6-9 of the ComMA [Document Reference 3.8, APP-237].

ComMA Table 6-10: Summary of Carbon Impacts - Value of Emissions over 60 Years (£m 2010 Values, positive value represents a cost)

	Tailpipe Emissions	Construction & Maintenance Emissions	Operating Emissions	Total
Value of non-traded emissions	147.89	9.19	16.84	173.91
Value of traded emissions	1.79	26.34	0.00	28.13
Total Value of emissions	**149.68**	**35.53**	**16.84**	**202.05**

A66 Northern Trans-Pennine Project
TR010062

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 10 – IEMA guide

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 10 – IEMA guide

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IEMA Transforming the world to sustainability

Institute of Environmental Management & Assessment (IEMA) Guide:

Assessing Greenhouse Gas Emissions and Evaluating their Significance

2nd Edition

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Contents

Acknowledgements

Working group

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About IEMA

The Institute of Environmental Management & Assessment (IEMA) is the professional home of over 18,000 environment and sustainability professionals from around the globe. We support individuals and organisations to set, recognise and achieve global sustainability standards and practice. We are independent and international, enabling us to deliver evidence to governments, information to business, inspiration to employers and great stories to the media that demonstrate how to transform the world to sustainability.

Join us at [redacted]

List of Abbreviations / Glossary

BaU – Business as Usual

BIM – Building Information Modelling

BREEAM – Building Research Establishment Environmental Assessment Method

CEEQUAL – Civil Engineering Environmental Quality assessment scheme

CEMP – Construction Environmental Management Plan

CEN – European Committee for Standardization

Climate change – changes in general weather conditions over 30 years (seasonal averages and extremes)

Climate Change Adaptation – the process that a receptor or project must go through to ensure it maintains its resilience to climate change

Climate Change Resilience – a measure of ability to respond to changes in climate. If a receptor or project has a good climate change resilience, it is able to respond to the changes in climate in a way that ensures it retains much of its original function and norm

CCC – Climate Change Committee

DBEIS – Department for Business, Energy & Industrial Strategy

DEFRA – Department for Environment, Food & Rural Affairs

DfT – Department for Transport

EIA – Environmental Impact Assessment

EMP – Environmental Management Plan

EPD – Environmental Product Declaration

ES – Environmental Statement

F-gases – a group of greenhouse gases called fluorinated gases, consisting of HFCs, PFCs and SF6

GHG – Greenhouse Gases

GHG practitioner – an environmental consultant with specific experience and knowledge pertaining to GHG modelling and reporting; not to be confused with EIA practitioners who typical have a wider EIA delivery role overseeing the coordination of all environmental topics in an ES

IA – Impact Assessment

IEMA – the Institute of Environmental Management and Assessment

IPCC – Intergovernmental Panel on Climate Change

kWh – kilowatt-hour

LCA – Life Cycle Assessment is a cradle-to-grave or cradle-to-cradle analysis technique to assess environmental impacts associated with all the stages of a product's life, which is from raw material extraction through materials processing, manufacture, distribution, and use.

LICR – Large Infrastructure Carbon Rating

LPA – Local Planning Authority

LULUCF – Land Use, Land-Use Change and Forestry

TCFD – Task Force on Climate-related Financial Disclosures

tCO_2e – tonnes of carbon dioxide equivalent

UK – United Kingdom

UNFCCC – United Nations Framework Convention on Climate Change

WBCSD – World Business Council for Sustainable Development

WRI – World Resource Institute

I – Introduction

1.1 The aim of this guidance

The aim of this guidance is to assist greenhouse gas (GHG) practitioners (hereinafter referred to as 'practitioners') with addressing GHG emissions assessment, mitigation and reporting[1] in statutory and non-statutory Environmental Impact Assessment (EIA). It is a revision of the 2017 IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance[2] (Box 1 lists the key updates from the 2017 version of the guidance). It complements IEMA's latest guide on Climate Change Resilience and Adaptation[3] published in 2020 and builds on the Climate Change Mitigation and EIA overarching principles (as in the previous version of the GHG Guidance). The requirement to consider this topic has resulted from the 2014 amendment to the EIA Directive (2014/52/EU), the Town and Country Planning (Environmental Impact Assessment) Regulations 2017[4] and the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017[5], hereafter referred to as the 'EIA Regulations'.

A lot has changed since 2017. Climate change has moved up the national and international agenda with local authorities across the UK declaring a climate change emergency. The UK's legally binding Climate Change Act 2008[6] was amended in 2019[7] in response to the Paris Agreement, setting a new and challenging target to reduce UK GHG emissions to net zero by 2050, accounting for residual emissions which are offset. Devolved administrations in Scotland and Wales have also set net zero targets. In December 2020, the UK Government's independent advisors, the Climate Change Committee (CCC), set the sixth[8] carbon budget at 965 million tCO_2e from 2033 to 2037, which has since been enshrined in to law. There is a distinct requirement for deeper cuts in emissions across all sectors of the economy to meet the net zero target according to the CCC.

1 Note: Statutory EIA reports are called 'Environmental Statements' in England, Wales and Northern Ireland and 'Environmental Reports' in Scotland.

2 IEMA (2017) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance. Available at: [redacted]

3 IEMA (2020) Climate Change Resilience and Adaptation. Available at: [redacted]

4 UK Legislation (2017) The Town and Country Planning (Environmental Impact Assessment) Regulations 2017. Available at: https://www.legislation.gov.uk/uksi/2017/571/contents/made

5 UK Legislation (2017) The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. Available at: https://www.legislation.gov.uk/uksi/2017/572/contents/made

6 UK Legislation (2008) Climate Change Act 2008. Available at: https://www.legislation.gov.uk/ukpga/2008/27/contents

7 UK Legislation (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019. Available at: https://www.legislation.gov.uk/ukdsi/2019/9780111187654

8 UK Legislation (2021) The Carbon Budget Order 2021. Available at: https://www.legislation.gov.uk/uksi/2021/750/contents/made

Box 1: Key updates to the 2017 guidance

Mitigation has taken a much more prominent role within the EIA. It is no longer an element to be considered towards the later stages of the EIA process (after scoping, emissions assessment and significance determination). Instead, mitigation should be considered from the outset and throughout the project's lifetime, whilst also helping to deliver proportionate EIAs. Mitigation is addressed first in the guidance (Section II) but also as part of the GHG Assessment Methodology (Section V).

The guidance presents more nuanced levels of significance. The 2017 guidance stated that "...in the absence of any significance criteria or defined threshold, it might be considered that all GHG emissions are significant...". This update of the guidance does not change IEMA's position (or the science) that all emissions contribute to climate change, however specifically in the EIA context it now provides relative significance descriptions to assist assessments. Section VI describes five distinct levels of significance which are not solely based on whether a project emits GHG emissions alone, but how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards net zero.

In November 2021 Glasgow hosted COP26 – widely regarded as the most important climate summit since the 2015 Paris Agreement and acknowledging the urgency (as evidenced by latest IPCC reports), the Glasgow Climate Pact was agreed. This set the agenda on climate change for the next decade. Pledges made to further cut emissions, and a plan set to reduce the use of coal and phase-out fossil fuel subsidies are some of the commitments made at COP26. The nations present at COP26 collectively agreed to work to reduce the 'emissions gap' and to ensure that the world continues to advance during the present decade, so that the rise in the average temperature is limited to 1.5°C.

With climate change taking centre stage, projects are increasingly scrutinised and challenged for not mitigating GHG emissions in line with the net zero ambition and the associated required pace of reductions[9]. This critical change is known as the transition imperative. EIA Climate chapters are receiving a lot more attention with clients, project developers and stakeholders often asking: *'what do we need to do and how can we be net zero?'*. Addressing significance and contextualising projects' emissions is an increasingly challenging exercise, especially under a tapestry of national and sectoral carbon targets and budgets, regional and local plans and sectors all on different pathways. This guide aims to provide practitioners with the best advice on how to tackle these questions.

Through a working group facilitated by Arup on behalf of IEMA, this guidance helps practitioners take an informed approach to the treatment of GHG emissions within an EIA. It sets out areas for consideration at all stages of the assessment and offers methodological options that can be explored. It highlights some of the challenges to the assessment, such as establishing study boundaries and what constitutes significance. However, this guidance is not a prescriptive 'how to' guide and will be updated as the process of incorporating GHG assessment in EIA continues to mature.

1.2 EIA and project linkage

EIAs can often be undertaken in silo, separate from the full design process, resulting in an accounting exercise rather than realising the full potential of the GHG emissions reduction opportunity. This can be addressed by delivering the EIA in close cooperation with the project design team.

9 The pace of reduction should align with a credible 1.5°C transition scenario (for example Science Based Targets Initiative Net Zero or Tyndall Centre aligned carbon budget)

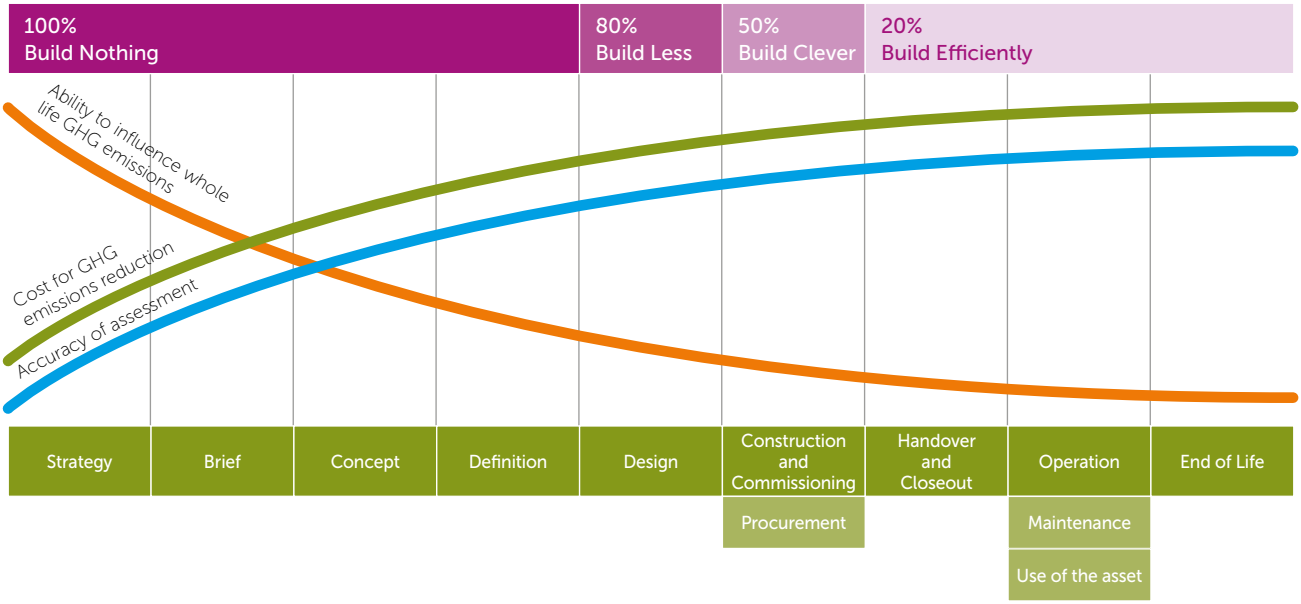


Figure 1: The ability to effect change to achieve GHG emissions reduction for the project reduces over time. This makes it important that the emissions reduction is considered from the outset or at the earliest practical point. (Source: Infrastructure Carbon Review & PAS 2080).

Early stakeholder engagement is fundamental to maximising GHG emissions savings. GHG reductions are likely to be greater if mitigation is considered at project inception and throughout all subsequent work phases: planning, construction and operation stages – enabling mitigation measures to be identified and implemented throughout the life cycle of the proposed project. Examples of stakeholders can be found in Appendix A. Figure 1 illustrates how the potential to achieve GHG emissions reduction declines with time over a project life cycle.

The interaction between the design process and EIA process is underpinned by four key principles:

1. Early, effective and ongoing interaction
2. Appropriate stakeholder engagement
3. Managing consenting risk
4. A clear narrative

For further detail on these principles and ensuring that GHG mitigation measures are built in rather than bolted on at a later stage, refer to IEMA's EIA guide on Shaping Quality Development[10].

The need to ensure that GHG mitigation measures are implemented does not end at the pre-application EIA stage, but extends after consent has been granted to the proposed project. To ensure that GHG mitigation measures are carried forward, the development of Environmental Management Plans (EMP) and Construction Environmental Management Plans (CEMP) are the primary mechanisms. For further information refer to IEMA's EIA guide to Delivering Quality Development[11].

The scope of this document is presented in Figure 2.

10 IEMA (2015) Environmental Impact Assessment Guide to Shaping Quality Development. Available at: [redacted]

11 IEMA (2016) Environmental Impact Assessment Guide to Delivering Quality Development. Available at: [redacted]

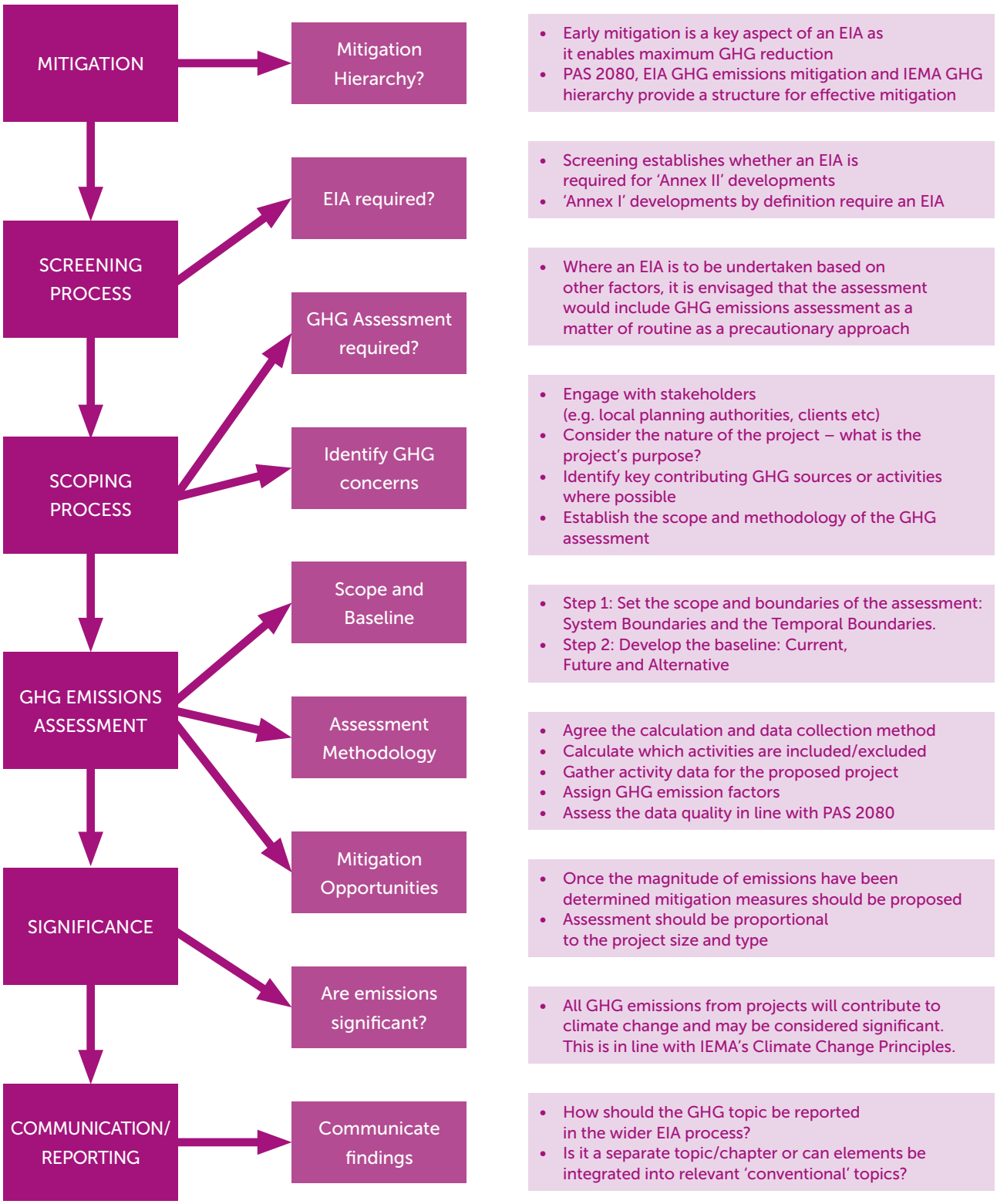


Figure 2: Scope of this guide

II – Mitigation

2.1 Early design mitigation

It is important that project designers incorporate measures to reduce GHG emissions at an early stage. This means evaluating what GHG emissions reduction measures may be appropriate to include in the design. Mitigation should be considered at all stages of design development – from optioneering through to detailed design, not just as a part of the EIA process (see Figure 1). To successfully address GHG emissions at an early stage, it is good practice to ensure there is a 'carbon coordinator' within the design team, who focuses on promoting GHG saving opportunities and ensures GHG reduction is a focus of the design team.

GHG mitigation is best achieved by taking a planned and focused approach following the IEMA GHG management hierarchy principles[12]. There are many different variations on the use of hierarchies in environmental management and assessment, with the commonality that they set out a graded structure of interventions with generally more favourable options presented over others. Such structures typically start with first avoiding or reducing harm, before suggesting compensations. Depending on the proposed project and contextual setting, the practical outcomes of this can be many and diverse. In addition to mitigations listed in IEMA's GHG Management Hierarchy, BS EN ISO 14064-1: 2019[13] on GHG quantification and reporting provides an example list of GHG mitigation interventions such as:

- Energy demand and use management
- Energy efficiency
- Technology or process improvements
- GHG capture and storage in, typically, a GHG reservoir
- Management of transport and travel demands
- Fuel switching or substitution
- Afforestation
- Waste minimisation
- Alternative fuels and raw materials (AFR) use to avoid landfilling or incinerating the wastes
- Refrigerant management

2.2 Mitigation hierarchy

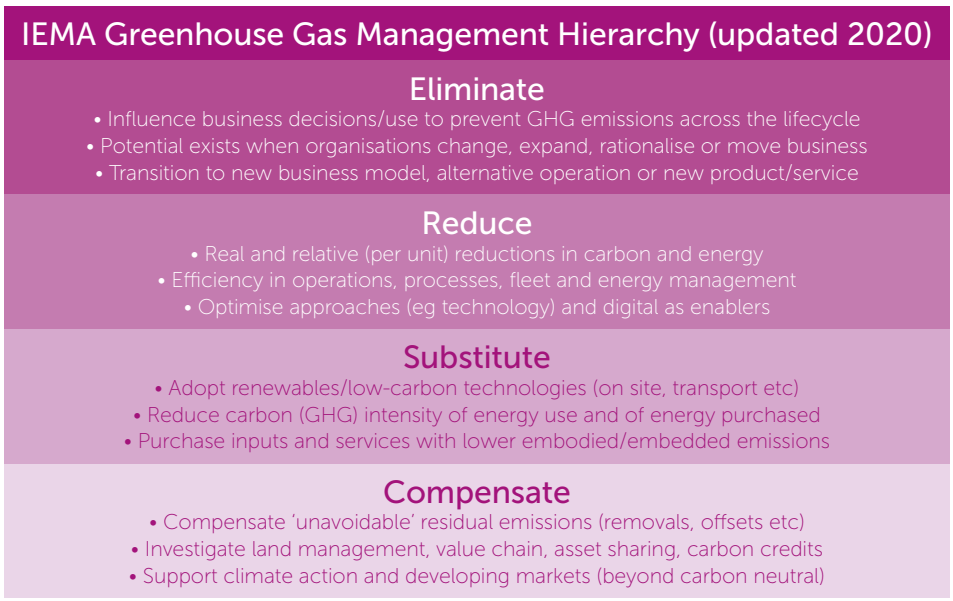
For EIA GHG emissions mitigation, PAS 2080 also provides a useful structure for working through and identifying potential opportunities and interventions. The IEMA GHG Management Hierarchy[14] (see Figure 3) provides a similar structure set out as **eliminate**, **reduce**, **substitute** and **compensate**. A variation of these steps is set out below and can be followed by practitioners in the EIA to identify opportunities that direct GHG mitigation action for a project:

- Do not build: evaluate the basic need for the proposed project and explore alternative approaches to achieve the desired outcome/s
- Build less: realise potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required
- Design clever: apply low carbon solutions (including technologies, materials and products) to minimise resource consumption and embodied carbon during the construction, operation, user's use of the project, and at end-of-life
- Construct efficiently: use techniques (e.g. during construction and operation) that reduce resource consumption and associated GHG emissions over the life cycle of the project

12 IEMA (2020) Pathways to Net Zero: Using the IEMA GHG Management Hierarchy.

13 BS EN ISO 14064-1: 2019 Greenhouse gases – Part 1: specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.

14 IEMA (2014) Position Statement on Climate Change and Energy. Available at:



Updated from original IEMA GHG Management Hierarchy, first published in 2009

Figure 3: IEMA GHG Management Hierarchy

- **Offset and remove emissions:** as a complementary strategy to the above, adopt off-site or on-site means to offset and/or sequester GHG emissions to compensate for GHG emissions arising from the project

2.3 Offsetting residual emissions

Multiple terms are used to describe how offsets are used to mitigate residual emissions, and projects may sometimes be promoted as 'carbon neutral' or 'net zero'. It is important that the EIA is clear in defining any terms used. Figure 3 above sets out the position of carbon offsets (referred to as 'Compensate' in Figure 3) in the mitigation hierarchy. There is a distinction between carbon offsets that provide a financial payment to avoid emissions and offsets that remove and sequester atmospheric GHG emissions, and this should be communicated transparently where offsetting is assessed in an ES chapter.

The October 2021 IEMA's Net Zero Explained report[15] summarises the concept of net zero, its origin and science behind the definition. The report also links to alternative sites providing some clarity behind evolving definitions, such as net zero, carbon neutral and zero carbon. The UNFCCC's Race to Zero Lexicon[16] provides the following definitions:

- Net Zero: *"When anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period."* Net zero is achieved where emissions are first reduced in line with a 'science-based' trajectory with any residual emissions neutralised through offsets.
- Carbon Neutral: *"When anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period... irrespective of the time period or magnitude of offsets required."*

15 IEMA (2021) Net Zero explained. Available at: [redacted]

16 UNFCCC (2021) Race to Zero Lexicon. Available at: [redacted] Lexicon.pdf

- Absolute Zero or Zero Carbon: *"When no GHG emissions are attributed"* to an activity or project without the need for offsets.

After following the mitigation hierarchy, projects can seek to compensate residual emissions by the use of either carbon credits (purchased from credible eligible schemes) or by removals within the organisation or entity itself (e.g. nature based solutions on owned land or land with partners). In order to avoid significant adverse effects, mitigation and compensation (if required) would need to be implemented at a magnitude and in a timescale that is consistent with measures required to achieve a 1.5°C compatible trajectories, as discussed in Section VI on determining significance of effects.

III – Screening

The purpose of screening is to establish whether or not an EIA is required for 'Schedule 2' developments (Schedule 1 developments by definition require an EIA). The EIA Regulations require specific information at the screening stage. This includes the consideration of likely significant effects of the proposed project on the environment, taking into account the following:

- The magnitude and spatial extent of the impact (e.g. the geographical area and size of the population likely to be affected)
- The nature of the impact
- The transboundary nature of the impact
- The intensity and complexity of the impact
- The probability of the impact
- The expected onset, duration, frequency and reversibility of the impact
- The cumulation of the impact with the impact of other existing and/or approved projects
- The possibility of effectively reducing the impact

Applying screening criteria (Schedule 3) will allow a judgement to be made on whether there is potential for likely significant environmental effects to arise which may trigger the need for an EIA. Occasionally, this may apply to only a very limited number of topics, for example in a sensitive location for a relatively small-scale project. Generally, however, where an EIA is required, it is common for there to be several topics that require assessment. As the assessment of most topic areas is well established (e.g. ecology, water, heritage), it is usually clear cut which topics trigger the need for EIA.

Sensitivity of receptor(s)

GHG emissions are not geographically limited. They have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The receptor for GHG emissions is the global atmosphere. The receptor has a high sensitivity, given the severe consequences of global climate change and the cumulative contributions of all GHG emission sources.

It is always good practice to consider whether the effects associated with GHG emissions are likely to be significant enough to trigger an EIA. At the screening stage, proposed mitigation measures that the developer has committed to which aim to avoid or prevent significant adverse effects, may be taken into account when determining whether significant effects are likely to occur.

It should be noted that, as with most environmental topics, there are likely to be only limited cases in which GHG emissions alone are the decisive factor in whether an EIA is needed for a particular project, but in almost all cases GHG emissions are likely to be a relevant factor at the screening stage.

For proposed projects where the need for an EIA has been screened out, it is still important that its GHG emissions are minimised wherever possible, as emissions of any scale contribute cumulatively to global climate change. Undertaking a proportionate assessment of GHG emissions on non-EIA projects is therefore good practice to support decisions that reduce GHG emissions.

IV – Scoping

4.1 Introduction

The scoping process should be used to determine the approach to considering GHGs within the ES. The approach should be proportionate[17] to the proposed project and may, in some cases, not require an ES chapter where it can be justified that GHGs can be addressed within upfront sections of the ES (see further detail in Section V: Methodology, Section VI: Significance and Section VII: Communication/ Reporting). Additionally, ES chapters may differ in scope or assessment detail on a project-by-project basis. The scoping process should therefore consider both the scope of the EIA and the scope of the GHG assessment.

The scoping process should provide an explanation of the likely significant effects of a proposed project. Section VI: Significance sets out the principles in determining likely significant GHG effects which should be reviewed at the scoping stage.

The following should be considered when determining a proportionate approach:

- The type, size, location and temporal scale of the proposed project
- Whether other assessment work has already considered life cycle GHG emissions
- Whether mitigation has already been agreed with the design team, particularly if this is beyond minimum policy requirements
- Whether the proposed project has specific goals or aspirations (e.g. achieving BREEAM certification)

In selecting or developing an approach for an EIA GHG emissions assessment, the aim should be to deliver a robust, proportionate, appropriate and consistent assessment.

During scoping, it is also important to set out in principle the methodological approach that will be taken to assessing project GHG emissions. This means documenting in outline aspects such as baseline setting, assessment approach, how significance will be determined and strategies for mitigation. These are commonly recorded in a project scoping report, and this can form a useful first record of the approach to delivering the GHG emissions assessment. Each of these steps for the EIA are addressed in the following sections, which should be consulted for further detail.

4.2 Stakeholder engagement

Stakeholder engagement is an important part of undertaking an EIA, especially during the scoping stage. It will provide useful information and support the goals of the GHG emissions assessment.

Stakeholder engagement will provide the practitioner better contextual understanding of the project including on key issues, opportunities, constraints and information pertinent to the assessment. Stakeholders will include clients, project developers and statutory consultees who all have an interest and influence on the project.

Depending on the nature of the proposed project, GHG emissions can be discussed during public consultation. Initial consultation with the project team and wider EIA topic specialists may also reveal parallel activities where input from the GHG assessment would be beneficial. For example, clients may wish to report on the sustainability performance of their projects using assessment schemes such as PAS 2080, CEEQUAL and BREEAM. Being able to report on the proposed project's GHG performance will help with such assessments. It may be sensible that a single GHG assessment is carried out which provides evidence for the EIA's GHG scope as well as CEEQUAL or BREEAM assessment requirements. Depending on contractual agreements there are efficiencies to be gained in minimising effort and avoiding duplication of work.

17 IEMA (2017) Delivering Proportional EIA. Available at: [redacted]

Other project management decisions may include the desire to manage the project in an integrated manner, combining 3D models with performance data (including environmental data) such as BIM (Building Information Modelling).

4.3 Benefits and challenges of raising GHG emissions as part of project scoping

By going through the scoping process, the practitioner gains an early and informed understanding of the project's impact and potential sources of GHG emissions. This provides an opportunity to influence and even mitigate GHG emissions early in the design process as well as consider emissions from alternative options.

The challenge at the scoping stage is that there is often limited project information available from the design team at this early stage, resulting in a qualitative-based decision and professional judgement from the practitioner. Nevertheless, by engaging with key stakeholders, the practitioner should be able to define the boundaries of the GHG assessment (see Section 5.3), as well as start to form a view of where the majority of emissions are likely to arise from and appropriate mitigation strategies.

Where the competent authority (e.g. LPA) provides a scoping opinion, the subsequent ES must be 'based on' the expectations set out in the opinion, including any reference to GHG assessment. This underlines the importance of the scoping stage; however, case law has established that the ES can also adapt to development design evolution that occurs post-scoping.

V – GHG emissions assessment methodology

5.1 Introduction

There are many different assessment methods available for measuring and quantifying GHG emissions associated with the built and natural environment. These range from general guidance to formal standards, and many will be appropriate for use in EIA depending on the goals and scope of the assessment required. There is ample GHG quantification guidance in the public domain. However, undertaking an EIA is different to other GHG assessments as the total net impact of the proposed project must be quantified. Therefore, any assessment should follow the principles set out below (see Section 5.2). A list of relevant methods can be found in Appendix B.

Given the wide variation of working situations and the particular aims and objectives of the EIA process, this guidance does not recommend a particular approach. Rather, it sets out advice for the key common components necessary for undertaking a GHG emissions assessment. This guidance does, however, outline a framework of six steps that an assessment should incorporate, which are set out in Section 5.3.

5.2 GHG quantification principles

- GHG quantification within EIA should follow the principles outlined in key documents such as the GHG Protocol Corporate Standard, BS EN ISO 14064-2 or PAS 2080 (see Appendix B) – Relevance, Completeness, Consistency, Transparency and Accuracy
- The assessment should seek to quantify the difference in GHG emissions between the proposed project and the baseline scenario (the alternative project/solution in place of the proposed project). Assessment results should reflect the difference in whole life net GHG emissions between the two options
- The assessment must include all material emissions (defined by magnitude, see Section 5.3, Step 3 *for the exclusion threshold*), direct or indirect (based on the point above), during the whole life of the proposed project. The boundary of the assessment should be clearly defined, in alignment with best practice
- The assessment should seek to present a reasonable worst case
- Any exclusions, limitations, assumptions and uncertainties should be justified and reported where appropriate

5.3 Six Steps of GHG emissions assessment

In developing the approach, the aim should be to deliver a robust, proportionate, appropriate and consistent assessment. The following six steps outline the framework a GHG emissions assessment should incorporate:

1. Set the scope and boundaries of the GHG assessment
2. Develop the baseline
3. Decide upon the emissions calculation methodologies
4. Data collection
5. Calculate/determine the GHG emissions inventory
6. Consider mitigation opportunities and repeat steps 4 & 5

The following sections explore these aspects in more detail. The contextualisation of emissions and determination of significance is addressed in Section VI: Significance.

Step 1: Set the scope and boundaries of the GHG assessment

In the first instance the assessment should set out the rationale for the assessment and its scope, as well as provide background and context. This will normally incorporate a description of the proposed project, its purpose and activities, the system boundary to apply and life cycle stages scoped in and out (including justification) of the assessment.

System boundaries

All material existing sources and removals of GHG emissions prior to project construction and operation (i.e. without the project) should be identified and clearly described.

EIAs should use data that is consistent with and report using the modular approach (Figure 4). A detailed and complete GHG emissions assessment typically covers all life cycle modules.

As projects vary in size, so does the scale of GHG assessments in the spirit of delivering proportionate EIAs. Certain life cycle modules (or stages) can be excluded if these exclusions are clearly highlighted and justified by the practitioner using professional judgement and in accordance with the materiality and cut-off guidance.

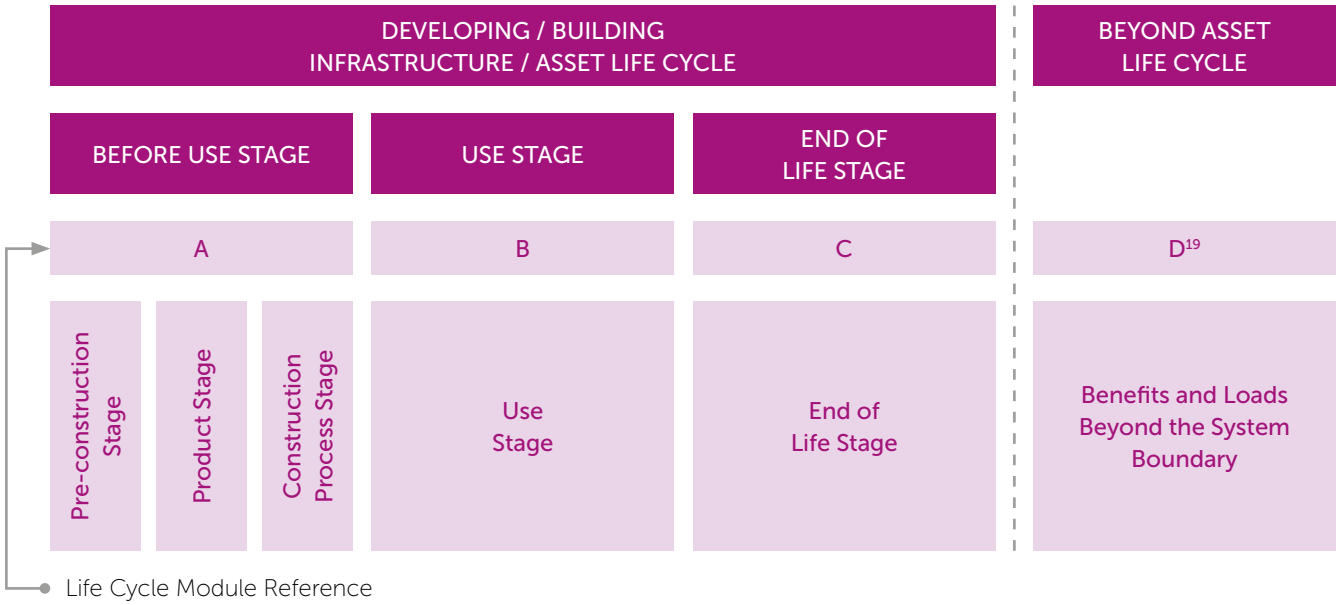


Figure 4: Modular approach of life cycle stages and modules for EIA GHG emissions assessment; the module references are widely used in construction GHG emissions assessment and reduction activities. The figure provides a simplified presentation of the modular approach that can be used for boundary definition and the gathering and reporting of information associated with the assessment. A more detailed presentation of this structure can be found in PAS 2080 and BS EN 15978[20].

18 'For clarity, Module D in Figure 4 (Benefits and Loads Beyond the System Boundary) refers to wider impacts that may not be appropriate to attribute (in part or whole) to the project when calculating net impacts within the study boundary but are nevertheless relevant context to consider. Examples include the benefits of a project sending waste materials for recycling rather than disposal (which is properly attributed to the user of recycled products, but still relevant to acknowledge) or where a major project such as an airport or rail line might affect regional or national travel patterns and emissions (properly attributable to a wider group of transport users, but relevant to acknowledge in the project context).'

19 BS EN 15978:2011 Sustainability of construction works, Assessment of environmental performance of buildings, Calculation method

Temporal boundaries

A reference study period shall be chosen as the basis for the GHG emissions assessment, and this should be based on the expected service life of the construction asset. Additional assistance is available in ISO 15686-1[20], RICS Whole life Carbon Assessment[21] and TAG GHG Assessment guidance[22].

Step 2: Develop the baseline

A baseline is a reference point against which the impact of a new project can be compared against; sometimes referred to as 'business as usual' (BaU) where assumptions are made on current or future GHG emissions. Baseline can take the form of:

A. GHG emissions within the boundary of the GHG quantification but without the proposed project; or

B. GHG emissions arising from an alternative project design and/or BaU for a project of this type.

The ultimate goal of establishing a baseline is being able to assess and report the net GHG impact of the proposed project.

Current baseline

The current baseline represents existing GHG emissions from the assessment prior to construction and operation of the project under consideration. This may include emissions from existing projects (e.g. energy consumption from a building which is scheduled for refurbishment, demolition or replacement) and infrastructure (e.g. current operational and end-user emissions of a road due to be upgraded).

Depending on the nature of the project, in addition to the project baseline, it may also be necessary to establish a sectoral baseline. For example, baseline emissions from BaU power generation would also be important to consider due to the interconnected nature of the electricity grid. This will equally apply to other project types that have wider interlinkages beyond a site level, e.g. many transport, industrial and waste projects.

It may not always be possible to report on current baseline emissions, particularly with projects situated in areas with no physical development or activity. In this instance there would be zero GHG emissions to report at a site level, although particular attention should be paid where changes in land use are expected. For example, land use and land-use change such as woodland creation can sequester carbon over their lifetime and therefore contribute to climate change mitigation. Their disturbance or removal through construction will release previously sequestered GHG emissions.

20 ISO 15686-1:2011Buildings and constructed assets — Service life planning — Part 1: General principles and framework

21 RICS (2021) Whole Life Carbon Assessment for the Built Environment, 1st edition. Available at: [redacted]

22 Department for Transport (2021) TAG unit A3 environmental impact appraisal.
Available at: https://www.gov.uk/government/publications/tag-unit-a3-environmental-impact-appraisal

Future baseline

Future baseline should capture both operational[23] and user[24] GHG emissions irrespective of their source (i.e. direct and indirect emissions). The distinction between operational and user GHG emissions is important. For example, an existing motorway will have operational emissions (i.e. lighting, maintenance, upgrades) as well as user emissions associated with vehicles travelling along the route. Current baseline travel patterns should be assessed as projected change (e.g. changes in mode share, increased efficiency in vehicles and trip numbers). With regards to energy supply and demand (e.g. electricity use in a commercial building), future baseline should report on operational GHG emissions and how these may change over time (e.g. based on occupancy changes, UK grid decarbonisation projection scenarios or the adoption of renewables).

Box 2 lists potential sources of information which can be considered when establishing future baseline emissions.

Box 2: Potential sources of information on GHG and energy projections (see Appendix A for further details)

- Modelled or projected future scenarios and pathways to net zero published by authoritative bodies such as the CCC[25]
- The Department for Business, Energy & Industrial Strategy (previously DECC)[26]
- The Department for Transport (DfT) TAG (the Transport Analysis Guidance) – Data Book[27]
- BEIS Electricity emissions to 2100 factor projections[28]
- GHG emissions from the operation of existing buildings can be estimated using published benchmarks (e.g. CIBSE Guide F – Energy Efficiency in Buildings (2012) or BSRIA Rules of Thumb Guidelines for Building Services (5th Edition, 2011)) where primary data such as annual metered energy consumption is not available
- GHG emissions associated with other sources or activities such as playing fields may be harder to estimate. It may be appropriate to assume zero baseline GHG emissions in such cases to ensure a reasonable worse-case approach to establishing the net GHG effect of the project. It could in such cases be important to also quantify (estimate) emissions release from the land used change and soil disturbance

23 PAS 2080:2016 Carbon Management in Infrastructure defines operational carbon as GHG emissions associated with the operation of infrastructure required to enable it to operate and deliver its service

24 PAS 2080:2016 Carbon Management in Infrastructure defines user carbon as GHG emissions associated with Users' utilisation of infrastructure and the service it provides during operation

25 Climate Change Committee (2020) The Sixth Carbon Budget. Available at: [redacted]

26 The Department for Business, Energy & Industrial Strategy. Available at: https://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy

27 The Department for Transport (2021) Transport Analysis Guidance (TAG). Available at: https://www.gov.uk/guidance/transport-analysis-guidance-tag

28 The Department for Business, Energy & Industrial Strategy (2021) Energy and emissions projections – Net Zero Strategy Baseline. Available at: https://www.gov.uk/government/collections/energy-and-emissions-projections

Alternative baselines

Alternative baselines can be used to supplement the analysis and address uncertainty. For example, it may be unclear what baseline to adopt and compare a proposed project against if the site is 'empty' (i.e. the project is not replacing an existing development). For example: different locations, designs or layouts for building developments; or alternative energy generation options in the instance of a wind or solar farm proposal. However, a realistic worse-case baseline should still be used for assigning significance.

In many instances, alternatives may not have been considered by the developer. Ideally, alternatives would have been considered earlier in the project life cycle, and the EIA is viewed as the platform for improving the preferred design. Nevertheless, where alternative baselines were considered, even a qualitative assessment of their GHG impact would be acceptable as part of the overall assessment.

Step 3: Assessment methodology

Once the scope and baseline is set, the calculation method can be agreed along with data collection. The methodology should result in a relevant, complete, consistent, transparent and accurate assessment of the reasonable worst case. In most cases, the assessment should use activity data and emissions factors. However, where possible, it may be preferable to generate bespoke emissions factors (e.g. through mass balance calculations) or use actual monitored data. The methodology chosen should follow best practice guidance, such as the GHG protocol, and it is not the aim of this guidance to provide this.

Inclusions & exclusions

The project boundary should include its spatial extent and life cycle stages relevant to the scope of the assessment.

Activities that do not significantly change the result of the assessment can be excluded where expected emissions are less than 1% of total emissions, and where all such exclusions total a maximum of 5% of total emissions; all exclusions should be clearly stated.

Step 4: Data collection

Project activity data

To calculate GHG emissions of a proposed project it is necessary to gather data on the activities occurring and associated GHG emissions factors. It is important that data for both these aspects, and particularly the activity data, is specific to the proposed project.

Activity data consists of information that defines and describes the size, magnitude and physical nature of the proposed project. It will take many different forms, including material specifications and quantity, energy and water demand, waste generation, transportation distances and modes, and works techniques/ technologies.

GHG emission factors

GHG emission factors are a value for 'GHG emissions per unit of activity'. Examples of this are:

- HGV: kg CO_2e / tonne.km
- UK electricity grid: kg CO_2e / kWh
- Concrete: kg CO_2e / tonne

GHG emission factors vary in their scope and coverage and will be representative of a single process/activity or multiple of these, sometimes incorporating multiple life cycle stages. Care should be taken to select and reference the right factors for the proposed project.

When undertaking a study, it is often necessary to apply multiple GHG factors for the same activity or material particularly when the assessment is studying a life cycle with a long time period. This may be appropriate when future GHG emissions for that activity are expected to

change; this might occur, for example, when accounting for reduced GHG emissions associated with a national electricity grid and the benefit this brings to demand side GHG emissions of using electric trains.

For examples of sources of GHG factors refer to Appendix A.

Data quality

The following aspects, in line with PAS 2080[29], should be considered when collecting assessment data:

- Primary (measured), secondary (estimated) or benchmarks
- Age (age of data, and the period over which they have been collected)
- Geography (the region or country from where the data have originated)
- Technology (whether the data are specific to a particular technology or mix of many)
- Methodology (the approach applied to gather or calculate the data)
- Competency (proficiency of entity that developed the data)

Baseline GHG emissions from the operation of existing buildings can be estimated using published benchmarks (e.g. CIBSE Guide F – Energy Efficiency in Buildings (2012) or BSRIA Rules of Thumb Guidelines for Building Services (5th Edition, 2011)) where primary data (e.g. annual metered energy consumption) is not available.

Baseline GHG emissions associated with other sources or activities such as agricultural fields may be harder to estimate. It may be appropriate to assume zero baseline GHG emissions in such cases to ensure a reasonable worse-case approach to establishing the net GHG effect of project proposals.

Types of data

The type of data used by the practitioner will vary depending on how detailed the project design is. Most assessments are based on design-stage information, hence activity data specific to the project should in theory be available from the engineering and design teams. If this is not the case, an alternative approach would be to fall back on generic or publicly available information that best represents the project and its activities.

Studies undertaken as part of the planning application for the proposed project outside of EIA process can provide a useful source of information for GHG assessments, for example:

- BREEAM Pre-assessment (especially RIBA 2 evidence for Mat 01 Construction Materials LCA)
- Energy Statement
- Whole Life Carbon Assessment (e.g. London Plan)
- Circular Economy Statement (e.g. London Plan)
- Sustainability Statement

Step 5: Calculate GHG emissions inventory

GHG emissions calculation method

Quantification of the GHG emissions for an EIA may be associated with either a measured or calculated approach or a combination of both for the emissions associated with the project. It is expected that in almost all cases a calculated approach for quantifying GHG emissions will be taken because an EIA is completed in advance of supply chain mobilisation and associated construction works.

29 PAS 2080:2016 Carbon Management in Infrastructure.

When undertaking a quantification calculation the formula for determining a GHG emission (or removal value), associated with the construction works, should have the following structure:

GHG emission factor × Activity data = GHG emission or removal

Calculations may be taken at different scales reflecting specific activities, components or elements of construction. Therefore, individual calculations should be summed to form a GHG emissions inventory for the quantification as a whole.

Study uncertainty

Uncertainty can arise from quality of data, study boundaries and period of assessment, and can never be eliminated from a study. Uncertainty should be considered and if it significantly affects the outcome of the study, additional steps should be taken to reduce it and provide confidence in results. As a reminder, a relevant, complete, consistent, transparent and accurate assessment of the reasonable worst case must be undertaken despite uncertainties.

Uncertainty can be considered by:

- Testing upper and lower limits
- Testing for different inclusions and exclusions
- Modifying study period
- RAG (red, amber, green) rating input data based on data quality criteria presented above
- If the scale of uncertainty provides findings that are likely to change any decision based on the data, then it should be appropriately reduced.

Cumulative GHG emissions

The atmospheric concentration of GHGs and resulting effect on climate change is affected by all sources and sinks globally, anthropogenic and otherwise. As GHG emission impacts and resulting effects are global rather than affecting one localised area, the approach to cumulative effects assessment for GHGs differs from that for many EIA topics where only projects within a geographically bounded study area of, for example, 10km would be included.

For example, air pollutant emissions are dispersed and diluted after emission and only the cumulative contributions of other relatively nearby sources contribute materially to the pollutant concentration, and hence effect, at a particular sensitive receptor in the study area. Due to the persistence of GHGs in the atmosphere, that same dispersion effect contributes to the global atmospheric GHG emissions balance. There is no greater local climate change effect from a localised impact of GHG emission sources (or vice versa).

All global cumulative GHG sources are relevant to the effect on climate change, and this should be taken into account in defining the receptor (the atmospheric concentration of GHGs) as being of 'high' sensitivity to further emissions.

Effects of GHG emissions from specific cumulative projects therefore in general should not be individually assessed, as there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other.

The contextualisation of GHG emissions, as discussed in Section 6.4, should incorporate by its nature the cumulative contributions of other GHG sources which make up that context. Where the contextualisation is geographically – or sector-bounded (e.g. involves contextualising emissions within a local authority scale carbon budget, or a sector level net zero carbon roadmap), then the consideration of cumulative contributions to that context will be within that boundary.

Step 6: Mitigation opportunities

Once the magnitude of emissions has been determined (as discussed in Section 5.3, Step 4), mitigation measures (as discussed in Section 2) should be proposed. Any mitigation measures that are committed to need to be included within the assessment. This means recollecting new activity data where this has changed due to mitigation measures, and new emissions calculations need to be undertaken. Steps 4 & 5 should be repeated as necessary.

5.4 GHG assessment and proportionality

GHG emissions should be assessed and reported as part of a good practice approach to EIA.

Projects will vary by type and size, and so will GHG emissions. An effective scoping exercise ensures that a balance is struck between the amount of GHG emissions emitted or saved by the project and the effort committed to the actual GHG assessment. For example, if most impacts occur during a project's construction phase and operational impacts are negligible, then the GHG assessment can reflect this. A high-level or qualitative GHG assessment for certain project elements or activities can be carried out as long as it is justified and agreed during the scoping stage with stakeholders. This will help contribute towards delivering a proportionate assessment.

It should also be recognised that qualitative assessments are acceptable, for example: where data is unavailable or where mitigation measures are agreed early in the design phase with design and engineering teams.

VI – Significance

6.1 Introduction

IEMA's 2010 principles on climate change mitigation and EIA identify climate change as one of the defining environmental policy drivers and that action to reduce GHG emissions is essential. Specifically, three overarching principles are particularly relevant in considering the aspect of significance[30]:

1. The GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect
2. The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive (e.g. human health, biodiversity, water, land use, air quality)
3. GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit[31]; as such any GHG emissions or reductions from a project might be considered to be significant[32]

This document builds on those principles as follows:

- When evaluating significance, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its life time, which may be positive, negative or negligible
- Where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project's residual emissions at all stages
- Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project's remaining emissions should be considered

The guidance in this document provides further detail of how those principles can be applied, particularly how the net effect of a project and its beneficial or adverse effects can be evaluated in the context of emission reductions on a trajectory towards net zero.

6.2 Background to significance

The goal of the Paris Agreement is to limit global temperature rise to well below 2°C, aiming for 1.5°C, compared with pre-industrial levels, in order to stand a greater chance of avoiding severe adverse effects from climate change.

The UK has set a legally binding GHG reduction target for 2050 with interim five-yearly carbon budgets which define a trajectory towards net zero. The 2050 target (and interim budgets set to date) are, according to the CCC, compatible with the required magnitude and rate of GHG emissions reductions required in the UK to meet the goals of the Paris Agreement, thereby limiting severe adverse effects. Further budgets are set by the devolved administrations in Wales and Scotland, which are also in line with advice from the CCC. Carbon budgets allow for continuing economic activity, including projects in the built environment, in a controlled manner.

To meet the 2050 target and interim budgets, action is required to reduce GHG emissions from all sectors, including projects in the built and natural environment. EIA for any proposed project must therefore give proportionate consideration to whether and how that project will contribute to or jeopardise the achievement of these targets.

30 IEMA (2010) Climate Change Mitigation & EIA. Available at: [redacted]

31 There is a global GHG emission budget that defines a level of dangerous climate change, and any GHG emission that contributes to exceedance of that budget or threatens efforts to stay within it can be considered as significant.

32 The third principle is related to the IPCC carbon budget definition. The IPCC's Sixth Assessment Report (WG1: The Physical Science Basis, Table SPM.2) indicates that the remaining global carbon budget from 2020 that provides a two-thirds likelihood of not exceeding 1.5°C heating is 400 $GtCO_2$; for an 87% likelihood it is 300 $GtCO_2$.

However, it is important to note that:

(a) The UK's and devolved administrations' GHG targets incorporate a staged set of reductions between the present day and 2045 or 2050, defined by five-yearly carbon budgets. A continuing, but, over time, reduced level of GHG emissions is compatible with national and international climate change commitments. Going above and beyond these commitments and achieving net zero at an earlier date is strongly desirable and a high priority.

(b) The necessary level and rate of GHG emission reductions will be unevenly distributed across different economic sectors, activities and types of projects. Net zero for the UK in 2050 (and in the interim) will include some activities with net negative emissions and some with residual emissions greater than zero.

A key goal of EIA is to inform the decision maker about the relative severity of environmental effects such that they can be weighed in a planning balance. Therefore, it is essential to provide context for the magnitude of GHG emissions reported in the EIA in a way that aids evaluation of these effects by the decision maker.

The crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050[33].

Often a project will cause a change in GHG emissions compared to the baseline which should be assessed, as discussed in Sections 5.3. When setting this impact into context to determine significance, it is important to consider the net zero trajectory in line with the Paris Agreement's 1.5°C pathway[34].

The timing of reductions is critical due to the cumulative effect of GHG emissions in the atmosphere. Achieving net zero or very low emissions by 2025 instead of 2040 would avoid 15 years of cumulative heating.

The specific context for an individual project and the contribution it makes must be established through the professional judgement of an appropriately qualified practitioner, drawing on the available guidance, policy and scientific evidence[35].

The following principles are a guide to determining significance.

6.3 Significance principles and criteria

Figure 5 illustrates how to determine significance depending on the project's whole life GHG emissions and how these align with the UK's net zero compatible trajectory. The following section provides further explanation on the different levels of significance and should be read in conjunction with Figure 5.

33 (or other date as defined in targets for devolved administrations or as may be defined for the UK or specific economic sectors in future).

34 IEMA (2021) Net Zero explained. Available at: [redacted]

35 At the time of publication, the applicable evidence is that provided by the IPCC and UNFCCC, supporting the commitments defined in the Paris Agreement, and in the UK that provided by the CCC with regard to GHG budgets and policies that are compatible with the UK's Paris Agreement commitments. Evidence will continue to be developed, for example, through the IPCC's Sixth Assessment Report, future international treaty negotiations and further advice of the CCC or other expert bodies, and the practitioner must evaluate the prevailing evidence at the time.

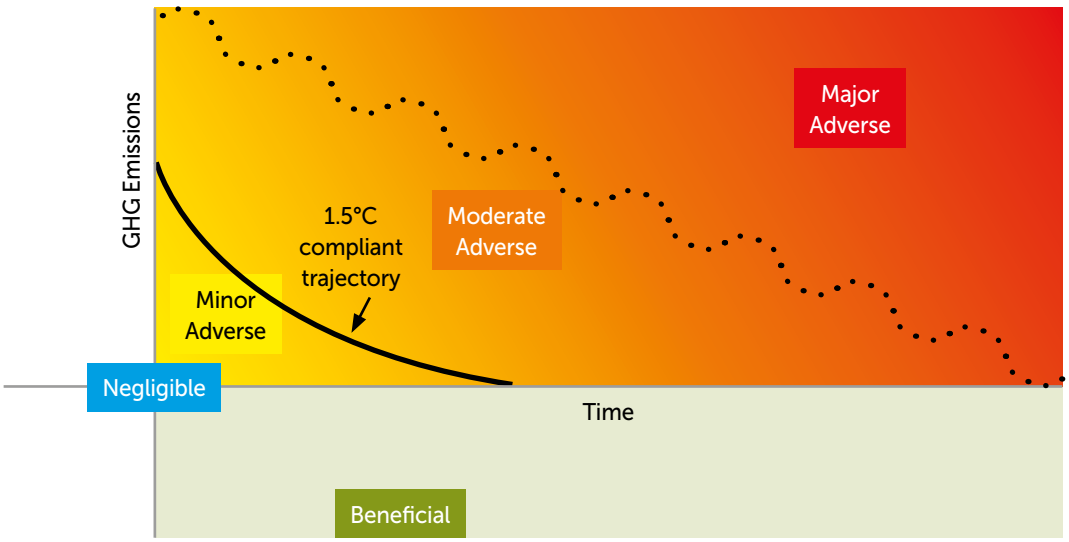


Figure 5: Different levels of significance plotted against the UK's net zero compatible trajectory[36]

A project that follows a 'business-as-usual' or 'do minimum' approach and is not compatible with the UK's net zero trajectory, or accepted aligned practice or area-based transition targets, results in a **significant adverse** effect. It is down to the practitioner to differentiate between the 'level' of significant adverse effects e.g. '**moderate**' or '**major**' adverse effects (see Box 3 for an example of such a differentiation).

A project that is compatible with the budgeted, science-based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that has a **minor adverse** effect that is **not significant**. It may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035[37] and thereby potentially avoiding significant adverse effects.

A project that achieves emissions mitigation that goes substantially beyond the reduction trajectory, or substantially beyond existing and emerging policy compatible with that trajectory, and has minimal residual emissions, is assessed as having a **negligible** effect that is **not significant**. This project is playing a part in achieving the rate of transition required by nationally set policy commitments.

A project that causes GHG emissions to be avoided or removed from the atmosphere has a **beneficial** effect that is **significant**. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged as having a beneficial effect.

36 Ideally, the curve will be quantitative, derived from a set of carbon budgets that show the rate of reduction to be achieved; but where this is not available, it will need to be evaluated qualitatively based on policy goals and advice of expert guidance bodies on the actions needed to achieve the necessary rate of reductions.

37 or other science-based 1.5°C compatible trajectory as may be defined for a specific sector or local area, as applicable

For the avoidance of doubt, a 'minor adverse' or 'negligible' non-significant effect conclusion does not necessarily refer to the *magnitude* of GHG emissions being carbon neutral (i.e. zero on balance) but refers to the likelihood of avoiding severe climate change, aligning project emissions with a science-based 1.5°C compatible trajectory, and achieving net zero by 2050[38]. A project's impact can shift from significant adverse to non-significant effects by incorporating mitigation measures that substantially improve on business-as-usual and meet or exceed the science-based emissions trajectory of ongoing but declining emissions towards net zero.

A 'minor adverse' effect or better is therefore a high bar and indicates exemplary performance where a project meets or exceeds measures to achieve net zero earlier than 2050. However, in the context of the severe threat of climate change, such an effect cannot be judged as significant beneficial – this category is reserved for projects with effects that directly or indirectly remove or avoid GHG emissions in the without-project baseline.

An example of how these principles may be applied in practice is given in Box 3.

Box 3: Examples of significance criteria

For the avoidance of doubt IEMA's position that all emissions contribute to climate change has not changed. This Box 3 provides practitioners with examples of how to distinguish different levels of significance. Major or moderate adverse effects and beneficial effects are **considered to be significant**. Minor adverse and negligible effects are **not considered to be significant.**

Major adverse: the project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.

Moderate adverse: the project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.

Minor adverse: the project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.

Negligible: the project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.

Beneficial: the project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

38 or other date as defined in targets for devolved administrations or as may be defined for the UK or specific economic sectors in future.

A modification to this approach is required for the very largest-scale developments, those that in themselves have magnitudes of GHG emissions that materially affect the UK's or a devolved administration's total carbon budget. An indicative threshold of 5% of the UK or devolved administration carbon budget in the applicable time period is proposed, at which the magnitude of GHG emissions irrespective of any reductions is likely to be significant. A project that meets this threshold can in itself materially affect achievement of the carbon budget.

Practitioners should note that existing policy and regulation may in some cases lag behind the necessary levels of GHG emission reductions (or types of actions to achieve those) that are compatible with the UK's or devolved administrations' targets and with a science-based 1.5°C compatible trajectory towards net zero. Meeting the minimum standards set through existing policy or regulation cannot necessarily be taken as evidence of avoiding a significant adverse effect, and it is recommended that practitioners consider and have reference also to emerging policy/standards and the guidance of expert bodies such as the CCC on necessary policy developments, particularly for multi-phased projects with long timescales. This must be evaluated by the practitioner as part of the evidence base used in the assessment of effects. References to 'existing' and 'emerging' policy in the principles of significance and example criteria above must be interpreted with this in mind.

In following this guidance, the practitioner is contextualising the project to understand whether committed mitigation represents best endeavours, to avoid significant adverse effects in line with the principles and example criteria defined above.

The assessment process for GHG emissions will therefore require a review of the current and emerging policy/regulatory position together with a review of expert scientific advice from bodies such as the CCC or IPCC about where existing policy or regulation is insufficient or not, relative to the science.

It bears reiterating that an ES should inform decision makers about both adverse and beneficial effects, so that all significant effects can be weighed in decisions. Where the fundamental reason for a proposed project is to combat climate change (e.g. a wind farm or carbon capture and storage project) and this beneficial effect drives the project need, then it is likely to be significant.

6.4 Contextualising a project's carbon footprint

The context of a project's carbon footprint determines whether it supports or undermines a trajectory towards net zero. Determining that trajectory and the position of a project within it, however, is the challenge for practitioners.

It is down to the practitioner's professional judgement on how best to contextualise a project's GHG impact.

The UK has a defined national carbon budget and budgets set by devolved administrations which have been determined as being compatible with net zero and international climate commitments. The starting point for context is therefore the percentage contribution to the national or devolved administration carbon budget as advised by the CCC. However, the contribution of most indivdual projects to national-level budgets will be small and so this context will have limited value.

The available contextual information base is rapidly developing and will continue to grow in the coming years as developments such as sector initiatives, locally set carbon budgets and the Task Force on Climate-Related Financial Disclosures (TCFD) and transition risk scenario analysis progress.

Existing government policy will in many cases define goals and necessary action for GHG emissions reduction that is compatible with national climate commitments. However, it is also essential to evaluate this in the context of expert advice/commentary on policy gaps and emerging policy recommendations.

Industry bodies for many sectors crucial to reducing GHG emissions have published analyses, strategies and net zero compatible reduction trajectories for their sectors. This can provide useful and highly specific evidence of what constitutes the necessary type and rate of GHG reduction actions for a particular project type.

For example, the Green Construction Board[39] has calculated carbon budgets for each of the UK built environment sectors. Similarly, the CCC[40] has determined a UK wide carbon budget broken down into the following key sectors: surface transport, buildings, manufacturing and construction, electricity generation, fuel supply, agriculture and land use, land-use change and forestry (LULUCF), aviation, shipping, waste, F-gases, and greenhouse gas removals. Researchers at the Tyndall Centre at the University of Manchester have proposed local authority scale carbon budgets that are compatible with the UK's commitments under the Paris Agreement[41]. Further examples of sectoral strategies and budgets are given in Figure 6 below.

The good practice approach included in Figure 6 below provides an example of how to contextualise your project's carbon footprint against pre-determined carbon budgets or against emerging policy and performance standards where a budget is not available.

Where quantified carbon budgets or a net zero trajectory is lacking, a more qualitative or policy-based approach to contextualising emissions to evaluate significance may be necessary. In these instances, uncertainty and the likelihood of effect should be discussed.

It is good practice to draw on multiple sources of evidence when evaluating the context of GHG emissions associated with a project. The practitioner should be aware that sources of evidence are still emerging, subject to revision as understanding develops and innovation occurs, and in some cases will be contested and conflicted. Professional judgement will therefore be vital in integrating these sources of evidence and evaluating them. Table 1 sets out further sources of contextual information against which the GHG emissions and reduction actions of project can be evaluated.

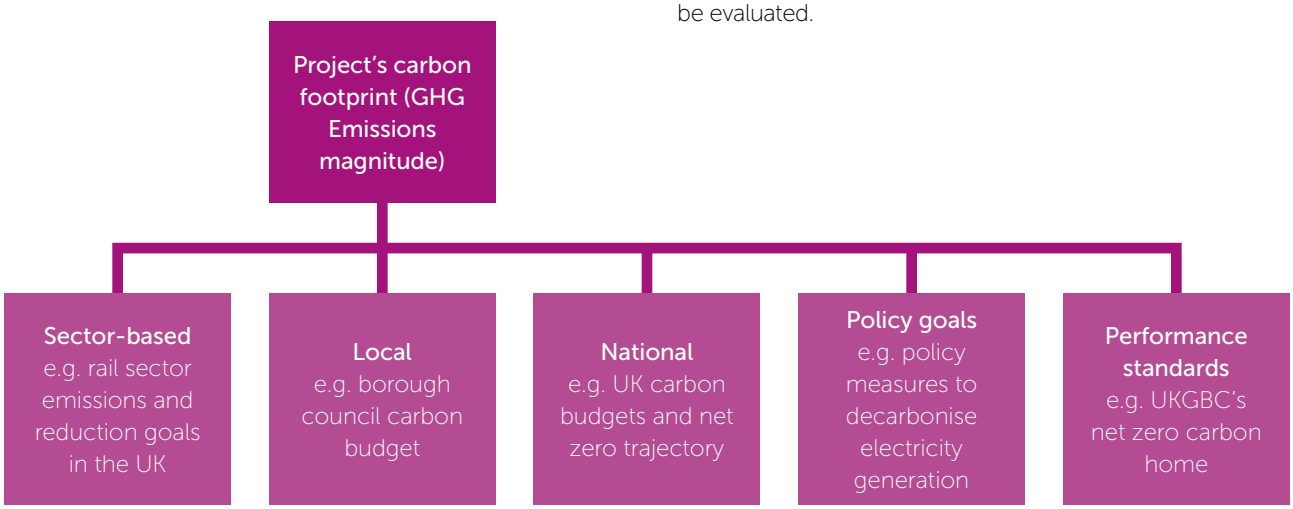


Figure 6: Good practice approaches for contextualising a project's GHG emissions

39 The Green Construction Board (2015) Green Construction Board Low Carbon Routemap for the Built Environment. Available at: [redacted]

40 Climate Change Committee (2020) The Sixth Carbon Budget: The UK's path to Net Zero. Available at: [redacted]

41 Tyndall Centre for Climate Change Research (2022) Quantifying the implications of the United Nations Paris Agreement for local areas. Available at [redacted]

Table 1: Sources of contextual information against which projects can be evaluated.

Context	Advantages	Limitations
National or devolved administration carbon budget and NDC	• Clearly defined and based on robust scientific evidence	• Too high level for most individual projects
Local or regional carbon budgets developed by local authorities and researchers (e.g. the Tyndall Centre at the University of Manchester[42])	• A more pertinent scale for individual projects and local decision-making • Will reflect regional factors such as concentration of industry	• Effects of GHG emissions are not geographically circumscribed, so a geographic budget (below a national budget defined based on negotiated NDCs to commitments to a global budget agreed through the UNFCCC) is not very meaningful • Displacing GHG emissions from one local authority or region to another within the UK has no benefit • It's unclear whether emerging local authority or regional budgets will add up coherently to the UK budget
Sectoral budgets or reduction strategies	• These are available for many crucial sectors (e.g. the Energy Transitions Commission[43] presents net zero strategies for a wide range of sectors) • They often contain detailed, staged measures (and several scenarios) for GHG reductions with interim targets, providing a clearly defined trajectory	• There is a risk that some sectoral strategies represent a lobbying position rather than science-based target setting
Current and future GHG emissions intensity of an activity	• This provides useful context in cases where a project is meeting an established demand, such as for electricity generation, and may have a GHG benefit by displacing a legacy source (e.g. renewable generators displacing gas-fired baseload)	• This would not be applicable context for absolute emissions changes, (e.g. construction emissions or land-use change at a site level), so would need to be combined with other sources of information
Existing and emerging national and local policy or regulation	• This is extensive, providing context for all development types • It will often provide relatively detailed and specific goals and implementation measures • Policy should be compatible with the UK's national GHG commitments and actions to achieve those	• There can be significant policy gaps or policy lag • It will not always be clear that compliance with policy measures, or a subset of them, amounts to a net zero carbon compatible trajectory
Expert advice of guidance bodies Voluntary performance standards (e.g. the UK Green Building Council's 'Net Zero Carbon Building' framework[44])	• Extensive publications and strategies are available, providing context for all development types • Considerable reliance can be placed on the advice of the CCC, which has the statutory duty of advising the government on policy that is necessary to achieve national climate commitments • Expert advice of guidance bodies can identify existing policy/regulatory gaps • Expert advice of guidance bodies can be used as a source to define what constitutes achievable best practice for many development types • Voluntary performance standards provide a framework for evaluating what constitutes best practice for emissions performance, and the means to predict and then monitor this	• Guidance and advice may be contested or conflicting • There is a risk that some guidance represents a lobbying position rather than science-based GHG reductions
Company-specific TCFD reporting, transition risk assessments or Science-Based Targets	• This can provide context that is highly specific to the project in question, where the developer has already set science-based targets and/or undertaken climate risk assessments with scenario analysis that includes a best practice measures / minimum climate risk scenario	• This may not be available for the majority of projects

42 Tyndall Centre for Climate Change Research (2022) Quantifying the implications of the United Nations Paris Agreement for local areas. Available at: [redacted]

43 Energy Transitions Commission (2022) A global coalition of leaders from across the energy landscape committed to achieving net zero emissions by mid-century. Available at: [redacted]

44 UKGBC (2019) Net Zero Carbon Buildings: A Framework Definition. Available at: [redacted]

6.5 Embedded or committed mitigation

When determining significance, any embedded/committed mitigation measures that form part of the design should be considered.

It is valuable and strongly encouraged for GHG emissions mitigation to be considered and embedded at the earliest stages of design, where the greatest influence can be achieved, as discussed in Section II and in IEMA's 'Pathways to Net Zero: GHG Management Hierarchy' guidance[45].

Where embedded/committed mitigation is relied upon in the assessment of effects, the practitioner must form a clear judgement that this mitigation is:

1. Evidenced in the design for the project
2. A committed goal that is secured, e.g. forming part of the description of development, a specific planning condition/requirement, or a legal agreement
3. Realistic and achievable to deliver

In some cases, mitigation commitments (especially in the form of targets or commitments to actions at a later design stage) may not offer sufficient certainty at the time of undertaking the assessment that the practitioner can rely upon in judging the significance of effects.

In this case, the significance of effects should initially be stated without this mitigation, and it should then fall into the assessment of additional mitigation and residual effects.

6.6 Additional mitigation and residual effects

Where the initial assessment identifies significant adverse effects, additional mitigation should be considered to reduce these effects to an acceptable and non-significant level where feasible.

As a matter of good practice, available mitigation to reduce non-significant effects or further enhance beneficial effects should also be considered where possible.

As noted above, where there is embedded mitigation in the form of project commitments to GHG emission reductions but the details of this are not secured within the project design at the time of assessment, further detail of the potential mitigation measures to achieve that commitment can also be considered within the additional mitigation section and assessment of residual effects.

The assessment of potential residual effects, with incorporation of additional mitigation, must be expressed in conditional terms. The residual effects would depend on the additional mitigation recommendations being accepted, secured and delivered in practice. An example of appropriate wording would be:

"Residual effects: with the implementation of [the additional mitigation measures as set out above] and the achievement of [measurable GHG emissions goal] the residual effect could be [reduced to not significant / negligible / beneficial]".

45 IEMA (2020) Pathways to Net Zero: Using the IEMA GHG Management Hierarchy November 2020. Available at: [redacted]

VII – Communication / Reporting

When reporting on GHG emissions assessment in EIA, the text should conform to Schedule 4: Information for inclusion in environmental statements, of the EIA Regulations document.

7.1 Where should GHG emissions be reported within an ES chapter?

There are three main ways in which GHG emissions can be reported on within an ES chapter. These are as follows:

- Within a GHG emissions ES chapter that focuses on the effects of the proposed project on climate change only
- Within an integrated climate change ES chapter that focuses on both the effects of the proposed development on climate change and of the effects of climate change on the proposed development (i.e. climate change resilience and adaptation)
- It may be proportionate for a section in the project description or an appendix to provide information on GHG emissions to support a conclusion about whether these are significant, without a full ES chapter

Regardless of where GHG emissions are reported within the ES chapter, it is crucial that the assessment is transparent and a conclusion on the significance of effects is reached and clearly stated.

7.2 How does reporting on GHG emissions fit with related EIA topics?

The effects of potential future climate change based on the net GHG impact from a project are likely to be interrelated with other key EIA topics. To ensure consistency is provided throughout the ES, the GHG team will need to liaise with other key EIA topics including (but not limited to):

- Logistics/Transport (Transport Assessment)
- Resources and waste management (construction and demolition)
- Noise/vibration and air quality (construction activities, hours of work, fuel uses, list of plant and energy use)
- Ecology, landscaping and Sustainable Urban Drainage Systems (green infrastructure and land-use change)

7.3 What should be included when reporting on GHG emissions within an ES chapter?

Consistent reporting of GHG emissions in EIA will highlight the importance of accounting for GHG emissions from project inception. It will encourage clients, project developers and engineering design teams to consider the impacts of GHG emissions during early design stages. It is suggested that a brief introduction to climate change and the role of GHG emissions as a contributing factor is included where the effects of GHG emissions are reported within the ES chapter. This will help explain the interrelationship between GHG emissions and climate change with other relevant topics to the readers. This may further be supported with relevant links to documents and information on the topic.

When reporting on GHG emissions and mitigation in EIA, the following steps should be presented where available:

- Baseline emissions: the existing and future emissions within the assessment boundary without construction and operation of the project
- Net emissions (Year 1 and lifetime): the direct and indirect emissions of the project during the first year of operation and for the full lifetime of the project expressed as a change compared to the current and/or future baseline
- Significance: a significance value should be assigned to effects based on the criteria set out
- Further mitigation: the GHG reductions that could be achieved through the application of further mitigation (this will be expressed conditionally and may be quantitative or qualitative)
- Residual effects: a new significance value is assigned to effects taking account the further mitigation measures that have been outlined

7.4 What are the challenges associated with reporting on GHG emissions in EIA?

There are a number of challenges, difficulties and opportunities associated with integrating GHG assessment into EIA practice. These challenges and ways to overcome them are presented below:

- The possible effects identified from a GHG emissions assessment can be interlinked with other EIA topic chapters. Therefore, it is important to liaise with other EIA topic specialists where necessary (e.g. transport, waste management, air quality) – and indeed with practitioners providing assessments such as energy modelling and BREEAM/CEEQUAL. This also needs to be considered when reporting on significant effects within the ES.
- GHG emissions associated with a proposed project are often reported as a whole life figure that takes account of both construction and operation. This whole life approach is often at odds with the sub-headings set out in ES chapter templates provided by EIA co-ordinators. However, due to the nature of GHG emissions, it is good practice to include a section that reports on the whole life GHG emissions associated with the proposed project, alongside the sections that assess construction and operation effects in isolation. Additionally, if there is other data or information that needs to be included that doesn't fit into the provided ES chapter template, then additional sub-sections should be added in order to present all the data from the GHG emissions assessment; to inform the EIA and account for the possible effects on future climate change.
- It is challenging to identify fixed numerical thresholds against which to identify the significance of a proposed project regarding the net change in GHG emissions. The GHG assessment should therefore present context for the GHG emissions as discussed in Section VI: Significance.
- Where GHG assessment is used to inform early design stages, it is vital to get stakeholders to understand the importance of minimising the GHG contribution of a project and designing a project that will limit the net change in future GHG emissions.

Appendix A – Potential Stakeholders and Sources of GHG Information

A1 Potential stakeholders, sources of environmental information and carbon tools

Source	Description
Climate Change Committee (CCC) – The Sixth Carbon Budget[46]	The CCC reports on UK carbon budgets, by sector, and reductions that need to be achieved if the UK is to achieve its carbon reduction target of net zero by 2050. This includes reports for GHG emissions by UK industrial sector: surface transport, buildings, manufacturing and construction, agriculture & LULUCF, aviation, shipping, waste, F-gases and GHG removals. Reports for the UK's electricity and fuel supply are also reported.
The Department for Business, Energy & Industrial Strategy (previously DECC)[47]	The UK Government regularly reports on UK energy and emissions projections by source: agriculture, business, energy supply, industrial processes, land-use change, public, residential, transport and waste management. Currently, GHG emissions reach back to 1990 and project into the future up until 2035 and 2040 (for the 2019 projections).
The Department for Business, Energy & Industrial Strategy (previously DECC)[48] UK greenhouse gas emissions statistics	The UK Government also reports on GHG emissions from a geographical perspective, by UK local authority. Current and historical emissions are available which may be used to establish current baseline emissions.
The Department for Transport (DfT) TAG (the Transport Analysis Guidance) – Data Book[49]	TAG provides UK transport modelling values and information including projections on how the UK's modal mix (diesel, petrol, electric) is expected for change over time, current and future fuel efficiency projections (litres or kWh per kilometre travelled) up to 2050. Also reported are carbon dioxide emissions per litre of fuel burnt or kWh used for: petrol, diesel, gas oil and electricity used on road and rail travel.

46 Climate Change Committee (2020) Sixth Carbon Budget. Available at: [redacted]

47 Department for Business, Energy & Industrial Strategy (2021) Energy and emissions projections. Available at: https://www.gov.uk/government/collections/energy-and-emissions-projections

48 Department for Business, Energy & Industrial Strategy (2018) UK greenhouse gas emissions statistics. Available at: https://www.gov.uk/government/collections/uk-greenhouse-gas-emissions-statistics

49 Department for Transport (2021) TAG data book. Available at: https://www.gov.uk/government/publications/tag-data-book

Source	Description
The Green Construction Board – Infrastructure Carbon Review, Technical Report[50]	The GCB has developed a tool that allows stakeholders to model policy changes associated with the built environment and visualise what this means in terms of GHG emissions. Also available is the Low Carbon Routemap report[51] which explores various GHG emissions projections for both building and infrastructure at the UK level.
Inventory of Carbon and Energy (ICE) – University of Bath: Sustainable Energy Research Team[52]	The Inventory of Carbon and Energy (ICE) database is a leading embodied energy and carbon database for building materials.
The Department for Business, Energy & Industrial Strategy (previously DECC)[53] – Government emission conversion factors for greenhouse gas company reporting	The Government conversion factors for greenhouse gas reporting are suitable for use by UK based organisations of all sizes, and for international organisations reporting on UK operations.
Examples of publicly available carbon assessment tools. The list of carbon tools is non – exhaustive and constantly changing. It is up to the practitioner's professional judgement to decide which tool is most appropriate for the project at hand. It is perfectly appropriate to develop bespoke assessment sheets which may provide more flexibility and transparency.	• Scottish Government Windfarm Carbon Assessment tool[54] • Environment Agency Carbon Planning Tool[55] • RSSB Carbon Tool[56] • National Highways Carbon Tool[57] • MacKay Carbon Calculator[58] • Transport Scotland: Carbon Management System (CMS)

50 The Green Construction Board (2013) Infrastructure Carbon Review Technical Report. Available at: [redacted]

51 Institution of Civil Engineers (nd.) Low Carbon Concrete Routemap. Available at: [redacted]

52 Circular Ecology (2019) Embodied Carbon – The ICE Database. Available at: [redacted]

53 Department for Business, Energy & Industrial Strategy (2021) Government conversion factors for company reporting of greenhouse gas emissions. Available at: https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

54 Scottish Government (2018) Carbon calculator for wind farms on Scottish peatlands: factsheet. Available at: https://www.gov.scot/publications/carbon-calculator-for-wind-farms-on-scottish-peatlands-factsheet

55 Environment Agency (2016) Carbon planning tool. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/571707/LIT_7067.pdf

56 RSSB (2021) Rail Carbon Tool. Available at: [redacted]

57 National Highways (2021) Carbon emissions calculation tool. Available at: [redacted]

58 Department for Business, Energy & Industrial Strategy (2020) Carbon calculator. Available at: https://www.gov.uk/guidance/carbon-calculator

Appendix B – List of Standards*

- BRE IMPACT LCA standard – allows the embodied carbon, life cycle environmental (LCA) and life cycle cost (LCC) performance of buildings to be measured and compared in a standardised way.
- BS EN 15686-1:2011 – Buildings and construction assets – service life planning, general principles and framework.
- BS EN 15804:2012 – Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products.
- BS EN 15978:2011 – Sustainability of construction works, Assessment of environmental performance of buildings, Calculation method.
- BS EN ISO 14021:2016 – Environmental labels and declarations. Self-declared environmental claims (Type II environmental labelling).
- BS EN ISO 14025:2006 – Environmental Labels and Declarations. Quantified environmental performance declarations (Type III Environmental Labelling) – guiding principles and procedures.
- BS EN ISO 14044:2006 – Environmental Management. Life cycle assessment. Requirements and guidelines.
- BS EN ISO 14064-1:2018 – guidance on reporting GHG emissions at an organisational level.
- BS EN ISO 14065:2020 – guidance on principles and requirements for bodies performing validation and verification of environmental information statements.
- BS EN ISO 14604-2:2018 – guidance on reporting GHG emissions at the project level.
- ENCORD: the European Network for Construction Companies for Research and Development – a network for active members from the construction industry who have published a 'Construction CO_2e Measurement Protocol'.
- Greater London Authority – draft Whole Life-Cycle Carbon Assessments Guidance.
- PAS 2050:2011 – Specification for the assessment of the life cycle greenhouse gas emissions of goods and services.
- PAS 2070:2013 – Specification for the assessment of greenhouse gas emissions of a city.
- PAS 2080:2016 – Carbon Management in Infrastructure – the world's first standard for managing infrastructure GHG emissions.
- PD CEN ISO/TS 14067:2018 – Greenhouse gases. Carbon footprint of products. Requirements and guidelines for quantification and communication.
- RICS (2021) Whole Life Carbon Assessment for the Built Environment, 1st edition.
- UK Green Building Council – Net Zero Carbon Buildings: A Framework Definition.
- WRI GHG Protocol – the World Resource Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) partnered to develop internationally recognised guidance and standards on GHG accounting and reporting, and includes advice on:
  - Corporate Standards;
  - Corporate Value Chain (Scope 3);
  - Product Life Cycle assessments;
  - Project Protocol (The GHG Protocol for Project Accounting);
  - GHG Protocol for Cities; and
  - Agricultural Guidance.

*Please note this list is not exhaustive, and subject to updates

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TR010062

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 11 – DMRB LA105, LA107, LA114

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

16 December 2022

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

7.3 Issue Specific Hearing 2 (ISH2) Post Hearing Submissions (including written submissions of oral case) - Appendix 11 – DMRB LA105, LA107, LA114

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Application Document Reference	NH/EX/7.3
Author:	A66 Northern Trans-Pennine Project Team, National Highways

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Rev 1	16 December 2022	Deadline 1

Design Manual for Roads and Bridges

Sustainability & Environment
Appraisal

LA 105
Air quality

(formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15)

Revision 0

Summary
This document sets out the requirements for assessing and reporting the effects of highway projects on air quality.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Nov 2019	LA 105 replaces HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13 and part of IAN 185/15. This full document has been re-written to make it compliant with the new Highways England drafting rules.

Foreword

Publishing information

This document is published by Highways England.

This document supersedes the following documents, which are withdrawn:

1) HA 207/07;
2) IAN 170/12;
3) IAN 174/13;
4) IAN 175/13.

This document supersedes the section of IAN 185/15 that covers air quality for the assessment of link speeds and generation of vehicle data into 'speed-bands'.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

Projects can have significant air quality effects on human health and designated habitats and / or affect the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible.

Effects can result from the project itself (alone) or in combination with other plans or projects.

This document provides a framework for assessing, mitigating and reporting the effects of motorway and all-purpose trunk road projects on air quality by:

1) determining whether the impacts of a project on human health or designated habitats can trigger a significant air quality effect;
2) determining whether the impacts of a project affects the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible;
3) determining whether construction activities associated with the delivery of the project triggers a significant air quality effect on nearby sensitive receptors;
4) assessing and applying the appropriate mitigation measures and air quality monitoring where a project:
    a) triggers a significant air quality effect;
    b) affects the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible; or,
    c) results in adverse dust impacts.

This document aligns with Directive 2011/92/EU as amended by 2014/52/EU (hereafter referred to as the EIA Directive [Ref 5.N]).

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 6.N] apply to this document.

Abbreviations

Abbreviations

Abbreviation	Definition
AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
AM	Ante meridiem (morning)
APIS	Air Pollution Information Service
AQD	Air Quality Directive
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
ARN	Affected Road Network
EMP	Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emission Factor Toolkit
EU	European Union
HDV	Heavy Duty Vehicles
IP	Inter peak period (day)
JAQU	Joint Air Quality Unit
kg/ha/year	kilograms per hectare per year
LAQM	Local Air Quality Management
N	Nitrogen
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
OP	Overnight Period
PAQAP	Project Air Quality Action Plan
PCM	Pollution Climatic Mapping
PM	Post meridiem (evening)
PM10	Particulate Matter of 10 microns or less
PM2.5	Particulate Matter of 2.5 microns or less
SAC	Special area of conservation
SPA	Special protection area
TRA	Traffic Reliability Area
v/c	Volume capacity

Terms and definitions

Terms and definitions

Term	Definition
Affected road network	All roads that trigger the traffic screening criteria and adjoining roads within 200m.
Air quality management area	Is an area declared by a local authority which has been determined will exceed the relevant air quality strategy objective.
Air quality threshold	Generic term to represent the relevant pollutant averaging period and concentration value described by the air quality strategy objectives or EU limit values.
Annual average daily traffic	A description of daily traffic characteristics for the representative average 7 day period (Monday to Sunday).
Annual average weekday traffic	A description of daily traffic characteristics for the representative average weekday period only (Monday to Friday).
Base year traffic data	The outputs of the traffic model coinciding with the year the traffic data was collected.
Clean air zone	A defined area where specific measures are identified to improve air quality to support attainment of the EU limit values in the shortest timescales possible.
Competent expert for air quality	Individuals who can demonstrate that they have relevant: 1) qualifications; and 2) expertise in air quality assessment of infrastructure projects.
Competent expert for biodiversity	Individuals who can demonstrate that they have relevant: 1) qualifications; and 2) expertise in biodiversity assessment of infrastructure projects.
Competent expert for traffic	Individuals who can demonstrate that they have relevant: 1) qualifications; and 2) expertise in traffic assessment of infrastructure projects.
Designated habitats	Internationally, nationally and locally designated sites of ecological conservation importance on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity.
Do minimum	The scenario that represents the situation that would occur without the project in operation, which includes permitted developments.
Do something	The scenario that represents the situation that would occur with the project in operation, which includes permitted developments.
Evening peak period (PM)	Period of time representing traffic characteristics in the evening, normally between 4PM and 7PM.
Inter peak period (IP)	Period of time representing traffic characteristics during the day, normally between 10AM and 4PM.

Terms and definitions (continued)

Term	Definition
Local air quality	Assessment of the impact of pollutant concentrations on sensitive receptors within 200m of a road.
Low emission zone	A defined area where access by some polluting vehicles is restricted or deterred with the aim of improving the air quality.
Morning period (AM)	Period of time representing traffic characteristics in the morning, normally between 7AM and 10AM.
Overnight period (OP)	Period of time representing traffic characteristics over night, normally between 7PM and 7AM.
Opening year	First year of operation
Pollutant concentrations	Concentrations of pollutants normally reported as micrograms per cubic metre of air (µg/m^3).
Pollution climatic mapping model	Government's national air quality modelling used to assess and report on compliance with the Air Quality Directive [Ref 4.N] to the European Commission.
Project air quality action plan	The section of the air quality assessment where the proposed viable mitigation measures are set out and assessed.
Projected base year	Represents the opening year of the project assessed with the vehicle emission rates for the base year to inform the assessment of future year projections of NO_x and NO_2.
Sensitive receptor	Includes residential properties, back gardens, schools, hospitals, care homes, public open spaces, public access.
Speed band	A range of categories for which outputs from the traffic model are grouped into to describe their emissions.
Traffic reliability area	The traffic scoping criteria is only be applied to the area covered by the traffic model, that the competent expert for traffic has identified as reliable for inclusion in an environmental assessment, and is referred to as the traffic reliability area.

1. Scope

Aspects covered

1.1 The requirements in this document shall be applied to the assessment, reporting and management of impacts of air quality on human health and biodiversity from the delivery of motorway and all-purpose trunk road projects.

NOTE *Where applicable, Overseeing Organisation specific requirements for air quality are provided in the National Application Annexes.*

1.2 The environmental assessment must, in line with the EIA Directive [Ref 5.N] identify, describe and assess the likely significant effects of proposed projects on the environment resulting from air quality impacts of the project.

1.3 The environmental assessment must identify, describe and assess the risk to affecting the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible.

1.4 The environmental assessment shall identify, describe and assess the risk of dust arising from construction activities that have the potential to result in statutory nuisance.

1.5 Decommissioning associated with a proposed project shall be excluded from assessment of air quality due to the length of the asset operational phase.

NOTE *The assessments of effects on air quality interact / overlap with assessments undertaken for the following factors:*

1) traffic;

2) LA 108 [Ref 2.N] Biodiversity;

3) LA 114 [Ref 3.N] Climate;

4) LA 112 [Ref 9.N] Population and human health.

Implementation

1.6 This document shall be implemented forthwith on all projects involving the assessment of air quality on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 6.N].

Use of GG 101

1.7 The requirements contained in GG 101 [Ref 6.N] shall be followed in respect of activities covered by this document.

2. Assessment methodology

Scoping

2.1 The following traffic scoping criteria shall be used to determine whether the air quality impacts of a project can be scoped out or require an assessment based on the changes between the do something traffic (with the project) compared to the do minimum traffic (without the project) in the opening year:

1) annual average daily traffic (AADT) >=1,000; or
2) heavy duty vehicle (HDV) AADT >=200; or
3) a change in speed band; or
4) a change in carriageway alignment by >=5m.

NOTE 1 *The AADT and HDV criteria are applied to the sum of carriageways and not individual carriageways.*

NOTE 2 *The 1,000 vehicles and 200 HDVs represent the lowest threshold above which the traffic model can represent change in traffic conditions to a reasonable level of confidence.*

2.2 The air quality assessment shall be based on the most likely forecast traffic flows.

NOTE *There is no requirement to model other traffic growth sensitivity scenarios for example high and low growth traffic scenarios.*

2.3 The traffic scoping criteria shall only be applied to the area covered by the traffic model, that the competent expert for traffic has identified as reliable for inclusion in an environmental assessment, and is referred to as the traffic reliability area (TRA).

2.3.1 The competent expert for traffic should work with the competent expert for air quality to ensure that the TRA covers those areas that are likely to be sensitive to changes in air quality e.g. where there are:

1) monitored exceedances of air quality thresholds;
2) air quality management areas (AQMAs);
3) areas identified by the Department for Environment, Food and Rural Affairs (Defra) as exceeding EU limit values; and / or
4) designated habitats.

NOTE *Where applicable, Overseeing Organisation specific requirements for air quality are provided in the National Application Annexes.*

2.4 The traffic and air quality competent experts shall agree the study area to be included in the air quality assessment.

2.5 A statement shall be included in the assessment detailing how the study area was defined and that the TRA is appropriate for the air quality assessment.

2.6 Where the project does not lead to a change in any of the traffic scoping criteria then an air quality assessment shall not be required and can be scoped out.

2.7 Where the air quality assessment is scoped out, a statement shall be provided stating that the traffic scoping criteria have not been triggered and consequently there was no requirement for an air quality assessment.

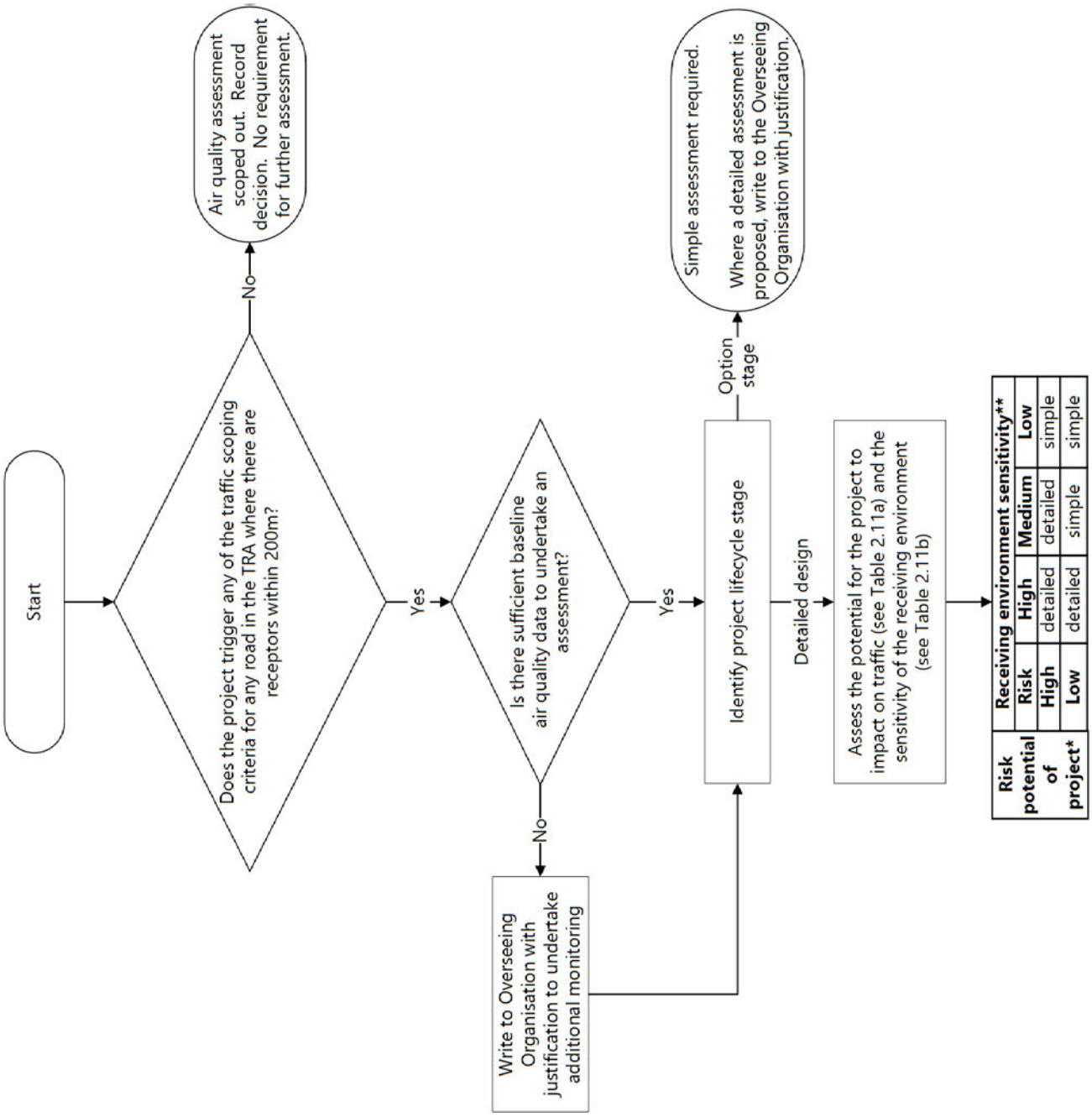
2.8 Where a project triggers the traffic scoping criteria, a figure shall be prepared depicting all the roads that meet these criteria, and all roads with modelled traffic data within 200m of these roads.

NOTE *All roads that trigger the traffic screening criteria and adjoining roads within 200m is defined as the affected road network (ARN).*

2.9 Once the need for an assessment has been concluded, the type of assessment, either a simple or detailed assessment, shall be determined.

2.10 The flow chart in Figure 2.10 shall be used to determine whether a simple or detailed air quality assessment is required and the level of assessment is determined by the level of risk and the stage of assessment for a project.

Figure 2.10 Flow chart for the determination of simple or detailed assessment



2.10.1 The level of assessment is determined by the level of risk and the assessment stage for the project, and at the options selection and preliminary design stage, a simple assessment should be sufficient.

NOTE 1 A simple assessment provides sufficient information to confirm that the project does not result in any exceedances of the air quality thresholds.

NOTE 2 A detailed level of assessment is more likely where there is a risk of exceeding air quality thresholds and for the detailed design stage of the project lifecycle.

2.11 Tables 2.11a and 2.11b shall be used in conjunction with the flowchart in Figure 2.10 to determine a project's risk potential, and whether a simple or detailed air quality assessment is undertaken.

Table 2.11a Project risk potential

Risk	Project examples
High	1) large smart motorway projects, bypass and major motorway junction improvements.
Low	1) junction congestion relief project i.e. small junction improvements, signalling changes; 2) short smart motorway projects.

Table 2.11b Receiving environment sensitivity

Sensitivity	Features of receiving environment
High	1) large number of receptors (human and / or ecological) within 50m of roads triggering traffic screening criteria; 2) base line monitoring data indicates concentrations above the AQS Objective / EU limit value; 3) monitoring indicates exceedances of short term AQS Objectives / EU limit value; 4) projecting forward monitored concentrations to the opening year, indicates exceedances of AQS Objectives / EU limit value; 5) AQMAs or reported EU limit value exceedances within project's study area.
Medium	1) receptors (human or ecological) within 50m of roads triggering traffic change criteria; 2) base line monitoring data illustrates annual mean NO_2 concentrations >36µg/m^3; 3) projections indicate annual mean NO_2 concentrations>36µg/m^3 in opening year; 4) AQMAs or EU limit value exceedances within project's study area.
Low	1) few receptors located close to roads triggering traffic change criteria; 2) base line monitoring data illustrates concentrations in base year below an annual mean of 36µg/m^3; 3) no AQMAs or EU limit value exceedances within project's study area.

NOTE Low risk projects are likely to result in traffic changes that are localised to the project and high risk projects are likely to impact traffic flows over a much wider area.

2.12 Where monitoring data evidence is used to inform the risk to the receiving environment, a competent expert for air quality shall determine whether there is a sufficient coverage of monitoring sites or if

additional monitoring sites are required.

2.13 Table 2.13 includes the requirements for traffic, air quality modelling and receptors that shall be included in the simple and detailed assessment.

Table 2.13 Simple and detailed assessment elements

	Simple assessment	Detail assessment
Traffic input	1) AADT / AAWT	1) period flows: 2) morning (AM); 3) inter peak period (IP); 4) evening peak period (PM); and 5) overnight period (OP).
Air quality modelling	1) qualitative statement; or 2) where required the Overseeing Organisation's air quality spreadsheet model.	1) detail air quality dispersion model
Receptors	1) a proportionate number of representative which are located in areas with the highest concentrations and largest improvements and worsening as a result of the project.	1) representative; 2) all receptors with the likelihood to exceed air quality threshold.

2.14 The competent expert for air quality shall consult the Overseeing Organisation if a detailed assessment is being proposed at options selection and preliminary design stage, with a justification for this approach.

Baseline

Air quality data

2.15 The following baseline information shall be gathered to inform the air quality assessment:

1) air quality monitoring data e.g. obtained from local authority, Defra, Overseeing Organisation;
2) local authority air quality reports including the locations of any AQMAs within, or close to the border of the ARN;
3) local authority air quality action plans (AQAPs);
4) information regarding compliance with the EU Directive, zonal / agglomeration exceedance status including local air quality plans prepared to support the Government's National Air Quality Plan for achieving compliance with the Air Quality Directive [Ref 4.N];
5) pollution climatic mapping (PCM) modelled concentrations that coincide with roads included in the ARN;
6) background maps for NOx concentrations and nitrogen deposition, where designated habitats are included in the assessment;
7) planning applications for any future developments that could introduce new receptors that could be affected by the project in the opening year.

2.16 Where it is identified that additional project specific baseline air quality monitoring is required following the review of the baseline information, this shall be justified to and agreed by the Overseeing Organisation prior to any monitoring being deployed.

2.17 Monitoring data shall be provided to the Overseeing Organisation on a quarterly basis throughout the monitoring period.

Air quality modelling

Selecting sensitive receptors - human health

2.18 Sensitive receptors shall be chosen within 200m of the ARN and include residential properties, schools and hospitals for the assessment of annual mean air quality thresholds.

2.19 Where there is a risk of the short term air quality thresholds being exceeded then sensitive receptors locations including gardens and playing fields shall be assessed.

NOTE *Sensitive receptors are defined in Defra's local air quality management technical guidance (LAQM) [Ref 2.I].*

2.20 Representative sensitive receptors shall be chosen to ensure that those receptors with the highest pollutant concentrations (closest to the road, junctions etc.) or anticipated to experience highest level of change (next to roads within the ARN with the largest change in the traffic screening criteria) are included in the air quality assessment.

2.21 Where exceedances of the air quality thresholds are predicted at the representative sensitive receptors in the air quality modelling, additional sensitive receptors shall be included in the air quality modelling to capture all sensitive receptors with exceedances in either the do minimum or do something scenarios.

2.21.1 There should be no need to model all receptors within 200m, or an excessive number of receptors in the same area, to determine whether there is likely to be any exceedances in the do minimum or do something scenarios.

2.21.2 It should only be necessary to model PM_{10} for the base year to demonstrate that there is no impact on achievement of the PM_{10} air quality thresholds as a result of the project.

2.21.3 Where the air quality modelling indicates exceedances of the PM_{10} air quality thresholds in the base year then PM_{10} should be included in the air quality model in the do minimum and do something scenarios.

2.21.4 There should be no need to model $PM_{2.5}$ as the UK currently meets its legal requirements for the achievement of the $PM_{2.5}$ air quality thresholds and the modelling of PM_{10} can be used to demonstrate that the project does not impact on the $PM_{2.5}$ air quality threshold.

NOTE *There are very few areas in the UK outside of London that exceed the air quality thresholds for particulate matter (PM_{10} or $PM_{2.5}$).*

Selecting qualifying features - compliance risk assessment

2.22 The compliance risk assessment shall only be undertaken on the roads identified in the PCM model which are within the ARN.

2.23 The assessment shall identify areas with qualifying features on the PCM road network that meet Defra's interpretation of the Air Quality Directive [Ref 4.N].

NOTE 1 *Qualifying features include public access (e.g. footpath) and sensitive receptors (e.g. residential properties, schools etc) within 15m of the running lane / kerbside, but are not within 25m of a junction.*

NOTE 2 *Where applicable, Overseeing Organisation specific requirements for air quality are provided in the National Application Annexes.*

2.24 Sensitive receptors shall be chosen within 15m of the ARN and include residential properties, schools, hospitals, and public access for inclusion in the compliance risk assessment for the assessment of annual mean EU limit values.

Selecting sensitive receptors - designated habitats

2.25 Internationally, nationally and locally designated sites of ecological conservation importance on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity (known as designated habitats) within 200m of the ARN shall be included in the air quality assessment.

NOTE *Designated habitats include 'Ramsar' sites, special protection areas, special areas of conservation, sites of special scientific interest, local nature reserves, local wildlife sites, nature improvement areas, ancient woodland and veteran trees.*

2.26 For each designated habitat, transect receptor points at 10m intervals shall be modelled, starting from the nearest point of the designated habitat to the road, up to a maximum distance of 200m regardless of whether the habitat extends beyond 200m.

2.26.1 Only sites that are sensitive to nitrogen deposition should be included in the assessment, it is not necessary to include sites for example that have been designated as a geological feature or water course.

Traffic data requirements

2.27 The traffic data used shall be proportionate to the level of the air quality assessment.

2.27.1 For options selection and preliminary design stage or simple air quality assessment, AADT / AAWT traffic data should suffice.

2.27.2 For a detailed air quality assessment traffic split by the four periods, morning (AM), inter peak (IP), evening peak (PM) and overnight period (OP) should suffice.

2.27.3 It should not be necessary to model weekend traffic conditions unless there is a specific requirement for the project and a weekend traffic model has been produced.

2.27.4 The Overseeing Organisation should be contacted for a copy of the traffic data template, which sets out the required traffic data format to undertake the air quality assessment.

NOTE 1 *It is not necessary to incorporate diurnal profiles into the AADT traffic flows, period flows can be used in preference as they include different flow profiles (total and percentage heavy duty vehicles) and speeds.*

NOTE 2 *The competent expert for traffic can advise on the hours that are most representative of the various periods used in the air quality assessment.*

Choice of air quality model

2.28 The most appropriate air quality model shall be used to complete the air quality assessment.

2.28.1 The DMRB air quality spreadsheet, which is available from the Overseeing Organisation, may be used for early option appraisal and simple air quality assessments.

2.28.2 A detailed dispersion air quality model may be used in instances which requires the modelling of complex motorway junctions or for detailed air quality assessments.

Speed band emission factors

2.29 The pivoted speeds shall be allocated a speed band; there are four speed bands for urban roads and four speed bands for motorways.

2.30 The method specified in Appendix A shall be used to to generate the speed bands from the traffic model.

2.31 The air quality model shall use the latest speed banded emission factors which are available from the Overseeing Organisation.

NOTE *The speed band emissions tool is to be updated when a new version of the emission factor toolkit is released.*

2.32 The emission factors corresponding to each speed band provided from the traffic data shall be used in the air quality model.

NOTE *In addition to speed bands for normal driving conditions, speed bands have also been generated for speed management interventions, including 70mph and 60mph speed management options.*

2.33 Where speed management mitigation measures are included in the project air quality action plan (PAQAP), they shall only be applied to motorways and dual carriageways where they operate at high speed driving conditions.

2.34 Where AADT or AAWT traffic information is used to undertake the assessment, the AADT or AAWT speed shall be used to identify the relevant speed band.

2.35 Where mainline motorway links are identified as being in the heavy congestion speed band category, then a check shall be undertaken by a competent expert for traffic of the observed speeds to ensure that the evidence supports the selection of this speed band.

2.35.1 Within a 100m radius of the centre of the junction on an urban / rural road in all directions should be assigned the light congestion speed band, but there can be instances when the heavy congestion speed band is a better representation of the traffic conditions.

2.36 Only areas around junctions identified as sensitive to changes in air quality that can result in exceedances of air quality thresholds shall be assessed in greater detail.

NOTE *It is recommend that a proportionate approach is adopted when splitting the traffic model links into more detail around junctions.*

2.37 Emissions on motorway entry slip roads shall be set to heavy congestion.

2.38 Emissions on motorway exit slip roads shall be set to free flow.

NOTE *Emissions on motorway entry and exit slip roads can be significantly different due to vehicle dynamics and emissions can be much higher for vehicles using entry slip roads as they accelerate to join the mainline, where as engine load is much lower on exit slip roads as vehicles slow for the junction.*

Calculation of road NO_x

2.39 The air quality assessment shall include predictions for the base year, do minimum and do something scenarios, in the opening year.

2.39.1 The modelling should take account of the latest version of Defra's Local Air Quality Management Technical Guidance [Ref 2.I].

2.40 Road NO_x concentrations shall be calculated for each of the identified sensitive receptors for the base year and do minimum and do something in the opening year.

2.41 For each designated habitat, modelled road nitrogen oxides (NO_x) concentrations shall be calculated at the identified transect receptor points, for the base year and do minimum and do something in the opening year.

2.42 The road NO_x concentration shall be converted to nitrogen dioxide (NO_2) using the latest published version of Defra's air quality tools [Ref 7.N] including the background pollutant maps and NO_x to NO_2 conversion spreadsheet.

Calculation of nitrogen deposition

2.43 For each point along a transect, the road NO_x concentration shall be converted to road NO_2, for the base year, and do minimum and do something in the opening year.

2.44 The road NO_2 shall be converted to dry nutrient nitrogen (N) deposition rate (kg N/ha/yr).

2.44.1 The following conversion rates of NO_2 concentrations (1 $\mu g/m^3$) to N deposition kg N/ha/yr taken from the air quality advisory group guidance document AQTAG06 [Ref 1.I] should be used for:

1) grassland and similar habitats: 1 $\mu g/m^3$ of NO_2 = 0.14 kg N/ha/Yr;
2) forests and similar habitats: 1 $\mu g/m^3$ of NO_2 = 0.29 kg N/ha/yr.

2.44.2 The following conversion rates of NO_2 concentrations (1) to N deposition kg N/ha/yr taken from the air quality advisory group guidance document should be used for:* grassland and similar habitats: 1 of NO_2 = 0.14 kg N/ha/Yr;* forests and similar habitats: 1g/m3 of NO2 = 0.29 kg N/ha/yr.

NOTE *Wet deposition does not need to be considered for the assessment of road projects as this is not significant for short range emissions such as those emitted from vehicles.*

2.45 The road N deposition rate for the base year, do minimum and do something in the opening year shall be added to the background N deposition for each point along the transect.

2.46 The source for the background nitrogen deposition rate shall be recorded in the air quality assessment.

2.46.1 The background nitrogen deposition rate may be obtained from the air pollution information system (APIS) [Ref 4.I] website for the relevant designated habitat.

NOTE *The N deposition rates from the APIS background maps can be used as published and there is no requirement to remove road components from the background maps.*

Addressing uncertainty in predicted future roadside nitrogen dioxide concentrations

2.47 Once the air quality modelling has been completed for the project, adjustments to the verified modelled nitrogen dioxide concentration shall be made to account for future roadside NO_2 concentrations.

2.48 To ensure that the modelled roadside NO_2 concentrations are not too optimistic, an additional scenario (hereafter referred to as the projected base year) shall be included in the air quality modelling to enable a gap analysis to be completed.

NOTE *The gap analysis is the application of adjustment factors which take into consideration the assumed roadside rates of reduction in NO_x and NO_2 by Defra's modelling tools compared to observed roadside monitoring trend i.e. the gap between the predicted reductions and those observed.*

2.49 The projected base year scenario (using the base year traffic data) shall be modelled using the opening year vehicle emission factors and opening year background concentrations and an example of the data requirements are shown in Table 2.49.

Table 2.49 Example of the traffic data, vehicles emissions and background concentrations to complete the assessment for a base year of 2015 and opening year of 2025.

Scenario	Traffic data	Vehicle emissions	Background concentrations
Base year	2015	2015	2015
Projected base year	2015	2025	2025
Do minimum	2025	2025	2025
Do something	2025	2025	2025

2.50 Total NO_2 concentrations for the projected base year scenario shall be calculated and verified using the same approach as the base year and opening year air quality models.

2.51 Individual gap factors shall be calculated for each modelled receptor using the following approach:

1) collate the modelled total NO_2 concentrations for the base year, projected base year, do-minimum and do-something in the opening year;
2) divide the modelled projected base year NO_2 concentration by the modelled base year NO_2 concentration (ratio A);
3) use the long term annual projection factors for annual mean NO_2 concentrations between the base year and opening year i.e. opening year projection factor divided be the base year projection factor (ratio B);
4) calculate the gap factor by dividing ratio B by ratio A.

2.52 The gap factor for each receptor shall be applied to the modelled opening year do minimum and do something NO_2 concentrations as illustrated in Table 2.52.

Table 2.52 Long term annual projection factor for annual mean NO_2 and NO_x

Receptor	2015 Base year	Projected base year 2025	DM 2025	DS 2025	Ratio A (projected base year /base year)	Ratio B	Gap factor (Ratio B / Ratio A)	2025 DM (Do minimum x Gap factor)	2025 DS (Do something x Gap factor)
R1	45.3	26.8	27.8	27.9	0.59	2025 Factor / 2015 Factor	1.22	33.9	34.0

NOTE *The Overseeing Organisation has developed a spreadsheet to be used in this process to undertake the gap analysis which is available on request.*

2.53 The results using the gap analysis methodology shall form part of the assessment significant air quality effect.

2.54 The compliance risk assessment shall use the results from the Defra methodology so the assessment is consistent with Defra's reporting on compliance with the EU limit values.

2.55 Where the gap factor is either too conservative or too optimistic when compared to local monitoring trends, justification for the deviation from the published gap factor shall be clearly laid out and evidenced in the assessment.

NOTE *Evidence supporting such a decision would be primarily based on the trend in air quality monitoring data from monitoring sites local to the project.*

Construction assessment

Dust

2.56 The construction dust assessment shall determine the construction dust risk potential of the project to the receiving environment, which informs the appropriate level of mitigation.

2.57 All sensitive receptors (human and designated habitats) within 0-50m, 50-100m and 100-200m of all construction activity shall be identified on a constraints plan.

2.58 Tables 2.58a and 2.58b shall be followed to determine whether the project has a high or low construction dust risk.

Table 2.58a Construction dust risk potential

Risk	Examples of the types of project
Large	large smart motorway projects, bypass and major motorway junction improvements.
Small	junction congestion relief project i.e. small junction improvements, signalling changes. short smart motorway projects.

Table 2.58b Receiving environment sensitivity to construction dust

Construction dust risk potential	Distance from construction activities		
	0- 50m	50 - 100m	100 - 200m
Large	High	High	Low
Small	High	Low	Low

2.59 The construction dust risk potential shall be used to inform the measures required to support the proposed mitigation.

Construction traffic

2.60 The impact of construction activities on vehicle movements shall be assessed where construction activities are programmed to last for more than 2 years.

NOTE *If the construction activities are less than 2 years it is unlikely that the construction activities would constitute a significant air quality effect or impinge on the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] given the short term duration of the construction activities as opposed to the long term operation of the project.*

2.61 The traffic scoping criteria shall be used to determine whether changes in traffic as a consequence of construction activities require further assessment.

2.62 The assessment of construction traffic impacts on sensitive receptors shall be proportionate and limited to the areas of key risk of exceeding air quality thresholds.

Operational assessment

2.63 The outputs of the air quality modelling shall inform the compliance risk assessment and the local air quality assessment (impact of the project on human and designated sites) to determine whether the project leads to a significant air quality effect.

Compliance risk assessment

2.64 The competent expert for air quality shall determine whether a project affects UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible and inform whether the project triggers a significant air quality effect.

2.65 The assessment shall use the latest reported information from Defra's Pollution Climate Mapping (PCM) model [Ref 8.N] / local authority's air quality plans and the modelled NO_2 concentrations from the project's air quality assessment.

NOTE 1 The PCM network includes the roads that Defra model for reporting whether a zone / agglomeration they reside within complies with the EU limit values.

NOTE 2 For the purposes of assessment and reporting, the UK is divided in to 43 zones and agglomerations (hereafter referred to as zones) and a zone becomes compliant when everywhere in the zone is below the EU limit values.

2.66 The compliance risk assessment shall be based on identifying areas that have qualifying features that meet Defra's interpretation of the Air Quality Directive [Ref 4.N], which include public access (e.g. footpath) and sensitive receptors (e.g. residential properties, schools etc.) that are within 15m of the running lane / kerbside, but are not within 25m of a junction.

NOTE The annual mean EU limit value applies at the qualifying feature as set out in Defra's technical guidance on producing local plans for the purposes of assessing compliance with the Air Quality Directive.

2.67 The road links in the PCM model that reside within the extents of the ARN for the project shall be identified.

2.67.1 The PCM model is not always a perfect match and the professional judgement of a competent expert for air quality should be applied to align the PCM model road network to the roads included in the ARN.

2.68 Where none of the road links from the PCM model coincide with the ARN a compliance risk assessment is not required and shall be scoped out and a statement provided stating that, "There are no road links from the PCM model in the study area for the project and therefore the project does not affect the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible."

Assessment

2.69 For each PCM link within the ARN a review shall be undertaken to determine the location of qualifying features i.e. a sensitive receptor or public access within 15m of the edge of the running lane (excludes the hard shoulder) / kerbside, and outside of 25m of a junction.

2.69.1 In relation to public access, footpaths that are perpendicular to the road i.e. pedestrian crossing, footbridges or pedestrian tunnels across, under or over the road, these features should not be considered as public exposure would be minimal in these locations, and Defra has advised that they are not to be included in the compliance assessment.

2.70 The area 25m around junctions shall be excluded from the compliance risk assessment, irrespective of whether there are any sensitive receptors or public access within 15m of the edge of the roads within the junction.

NOTE 1 For major motorway junctions the area is defined as 25m from the end of the slip road.

NOTE 2 For non-motorway junctions a "major junction" is defined as a junction, which interrupts the traffic flow on the road and includes, for example, traffic light controlled junctions.

2.71 A figure showing the PCM road network and the qualifying features modelled for the compliance risk assessment shall be reported in the environmental assessment.

2.72 If there are no qualifying features within 15m of the running lane and not within 25m of a junction, along the length of the PCM link, then no further assessment for the PCM link shall be undertaken; this conclusion is to be recorded in the environmental assessment.

2.73 Where there are qualifying features along the PCM link the air quality model used for the project shall be used to model NO_2 concentrations for:

1) the nearest qualifying feature along each PCM link where concentrations are highest;
2) a 4m point from the running lane in the same location as the qualifying feature for comparison against the national PCM modelled point.

Local model 4m point validation

2.74 The 4m model results from the project modelling shall be tabulated to include the PCM road census ID, the modelled NO_2 concentration from either the PCM model or local authority local air quality plan for the base year for comparison against the PCM model.

2.75 The 4m point shall be used to determine whether the air quality for the project aligns with the PCM outputs from the national model corresponding to the opening year of the project.

2.75.1 If there are significant differences between the two modelled values at the 4m point i.e. greater than 10%, where there are modelled exceedances in either data set, the inputs into the local model used for the project should be investigated to ensure that the outputs of the project's traffic and air quality modelling are robust.

2.76 The output from this review of the 4m modelling shall confirm that the traffic and the local air quality modelling for the project are robust, i.e. confirmation that the model verification is the most appropriate and the traffic data in that area has been appropriately validated.

2.77 The local air quality model predictions shall be used instead of the reported NO_2 concentrations from the PCM model to inform the compliance risk assessment.

Assessment of compliance risk

2.78 The modelled concentrations in do minimum and do something for the project and the change in concentration in the opening year, the corresponding PCM road census ID, the modelled NO_2 concentration from either the PCM model or local authority local air quality plan for the opening year shall be tabulated.

2.79 The flow chart in Figure 2.79 shall be followed to complete the compliance risk assessment.

Figure 2.79 Compliance risk assessment

2.80 The assessment shall conclude there is no risk to the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescale possible where:

1) there is no modelled exceedances of the air quality thresholds for any PCM link; or
2) there are modelled exceedances of the air quality thresholds for any PCM link, but the change in annual mean NO_2 concentrations between the do minimum and do something is less than or equal to +/-0.4 $\mu g/m^3$;
3) the project does not materially impact on measures within local air quality or national plans for the achievement of compliance.

NOTE 1 *Local air quality plans develop for the purposes of achieving compliance in the shortest timescales possible are not the same as local air quality actions plans developed following the declaration of an air quality management area.*

NOTE 2 *A material impact on the plan is where the project causes a measure within the national or local plan to become non deliverable and thereby having the potential to impact on the achievement of compliance in the shortest timescale possible.*

2.81 A PAQAP shall be prepared describing the proposed mitigation measures as there is a risk to the UK's reported ability to comply with the Air Quality Directive in the shortest timescale possible where:

1) the project causes a compliant zone to become non-compliant or delays compliance i.e. creates a new maximum in any zone;
2) the project materially impacts the delivery of measures set out in local authority local air quality plans.

2.82 Proposed viable mitigation measures shall be set out in the PAQAP to ensure the project:

1) does not cause a compliant zone to become non-compliant or delays compliance otherwise the project cannot be progressed;
2) does not materially impact the delivery of measures set out in local authority local air quality plans.

2.83 Additionally a PAQAP shall be produced where a project leads to a higher concentration at qualifying features with a change >0.4 $\mu g/m^3$ in the do something compared to the do minimum.

NOTE *If the maximum do something predicted modelled concentration is lower than in the maximum predicted do minimum concentration, overall the project is unlikely to delay compliance within the study area for the project.*

2.84 If the proposed measures set out in the PAQAP do not reduce the impact to within 0.4 $\mu g/m^3$ of the do minimum and / or there are worsening in air quality of >0.4 $\mu g/m^3$ on any of the PCM links that exceed the EU limit value, the competent expert for air quality shall conclude whether this would trigger a significant air quality effect.

2.84.1 The competent expert for air quality should use the following criteria to establish whether a project triggers a significant air quality effect;

1) the qualifying feature being affected e.g. little used/small section of footpath, heavily used footpaths (such as high streets with cafes etc), residential properties, school etc;
2) the level of change in concentration as a result of the project and whether is an overall worsening or improvement;
3) the number of features being affected e.g. number of PCM links resulting in a deterioration in air quality as a result of the project.

2.84.2 The use of existing information and mapping collected for the project should provide information on likely use of public access and it is not envisaged that additional surveys are required.

Evaluating the outcomes of the compliance risk assessment

2.85 The concluding view of the risk to compliance with the Air Quality Directive [Ref 4.N] in the shortest timescales possible shall be reported in the environmental assessment.

2.86 The assessment shall summarise the evidence behind the conclusion as to whether the project has:

1) affected the reported ability of the zone to comply with the latest reported timescales;

2) caused a zone to be non compliant; and / or

3) materially affected the national / local air quality plan in relation to achievement of compliance in the quickest time possible.

2.87 The outcomes of the compliance risk assessment shall inform the judgement of significant air quality effects.

Modelled / monitored exceedances not included in the PCM road network

2.88 Where the local air quality assessment for human health predicts air quality concentrations above the air quality thresholds, but do not coincide with the PCM road network or are more than 15m away from a PCM link, the competent expert for air quality shall contact the Overseeing Organisation.

Human health

2.89 Table 2.91 shall be completed using the outputs from the air quality modelling for only those sensitive receptors where there are exceedances of the air quality threshold in either the do minimum and / or do something scenarios.

NOTE *The difference in concentrations is the difference between the do something minus the do minimum modelled concentrations for each relevant receptor in the model year of the project i.e. the worse case for air quality, which is normally the opening year.*

2.90 A conclusion of no likely significant air quality effect for human health shall be recorded where the:

1) outcomes of the air quality modelling for human health indicate that all concentrations are less than the air quality thresholds; and / or,

2) difference in concentrations is imperceptible i.e. less than 1% of the air quality threshold (e.g. 0.4 $\mu g/m^3$ or less for annual mean NO_2).

2.91 Where changes in concentrations are greater than 1% of the air quality threshold at qualifying receptors, then each receptor shall be assigned to one of the six boxes in Table 2.91.

Table 2.91 Information for judgement of significant air quality effects of a project

Magnitude of change in annual mean NO_2 or PM_{10} (µg/m (µg/ m^3)	Total number of receptors with:	
	Worsening of an air quality at sensitive receptor above the air quality threshold or the creation of a new exceedance	**Improvement of an air quality at sensitive receptor above the air quality threshold or the removal of an existing exceedance**
Large (>4)		
Medium (>2)		
Small (>0.4)		
Total change	Sum of above	Sum of above

NOTE *Receptors can reside within more than one magnitude of change category e.g. a receptor with a greater than 4 μ g/m³ change also resides within the medium (>2 μ g/m³) and Small (>0.4 μ g/m³) categories and this is to ensure that the aggregated number of properties are compared to the guideline bands.*

2.92 The magnitude of change criteria shall not be assigned to individual receptors in reported table of results for the project.

NOTE *Table 2.92N presents a framework guideline bands on the number of receptors for each of the magnitude criteria that might result in a significant air quality effect.*

Table 2.92N Guideline band for the number of properties informing a judgement of significant air quality effects

Magnitude of change in annual mean NO_2 or PM_{10} ($\mu g/m^3$)	Total number of receptors with:	
	Worsening of an air quality objective already above the objective or the creation of a new exceedance	Improvement of an air quality objective already above the objective or the removal of an existing exceedance
Large (>4)	1 to 10	1 to 10
Medium (>2)	10 to 30	10 to 30
Small (>0.4)	30 to 60	30 to 60

2.93 The guideline bands shall be used to inform whether the project triggers a significant air quality effect.

2.93.1 Whilst the guideline bands have been provided, they should be a guide as to whether the project is significant e.g. 29 small worsenings is not significant or 31 small worsenings are significant to determine whether a project triggers a significant air quality effect.

2.94 The change in concentration at receptors and the total number of receptors shall be used to inform whether a project has a significant air quality effect.

NOTE 1 Where the total number of receptors compiled in Table 2.92 are less than the lower guideline band for all the six magnitude of change categories, the project is unlikely to trigger a significant air quality effect for human health.

NOTE 2 A project can still be deemed significant if the number of receptors affected are below the lower guideline band, for example where there are change in concentrations in the small magnitude of change category, but the changes are approaching the medium magnitude of change criteria (e.g. 1.8 / 1.9 $\mu g/m^3$) then it can still be concluded that the project triggers a significant air quality effect.

2.95 Where the total number of receptors are greater than the upper guideline band in any of the magnitude categories the project shall trigger a significant air quality effect.

2.95.1 The competent expert for air quality should use the following criteria where the number of properties resides between the lower and upper guideline bands for any of the magnitude of change criteria in Table 2.92:

1) the absolute concentration at each receptor i.e. is the modelled concentration 40 $\mu g/m^3$ or 60 $\mu g/m^3$;
2) how many receptors are there in each of the magnitude of change criteria i.e. does the project create more worsening than improvements;
3) the magnitude of change in concentration at each receptor e.g. 0.6 $\mu g/m^3$ vs 1.8 $\mu g/m^3$.

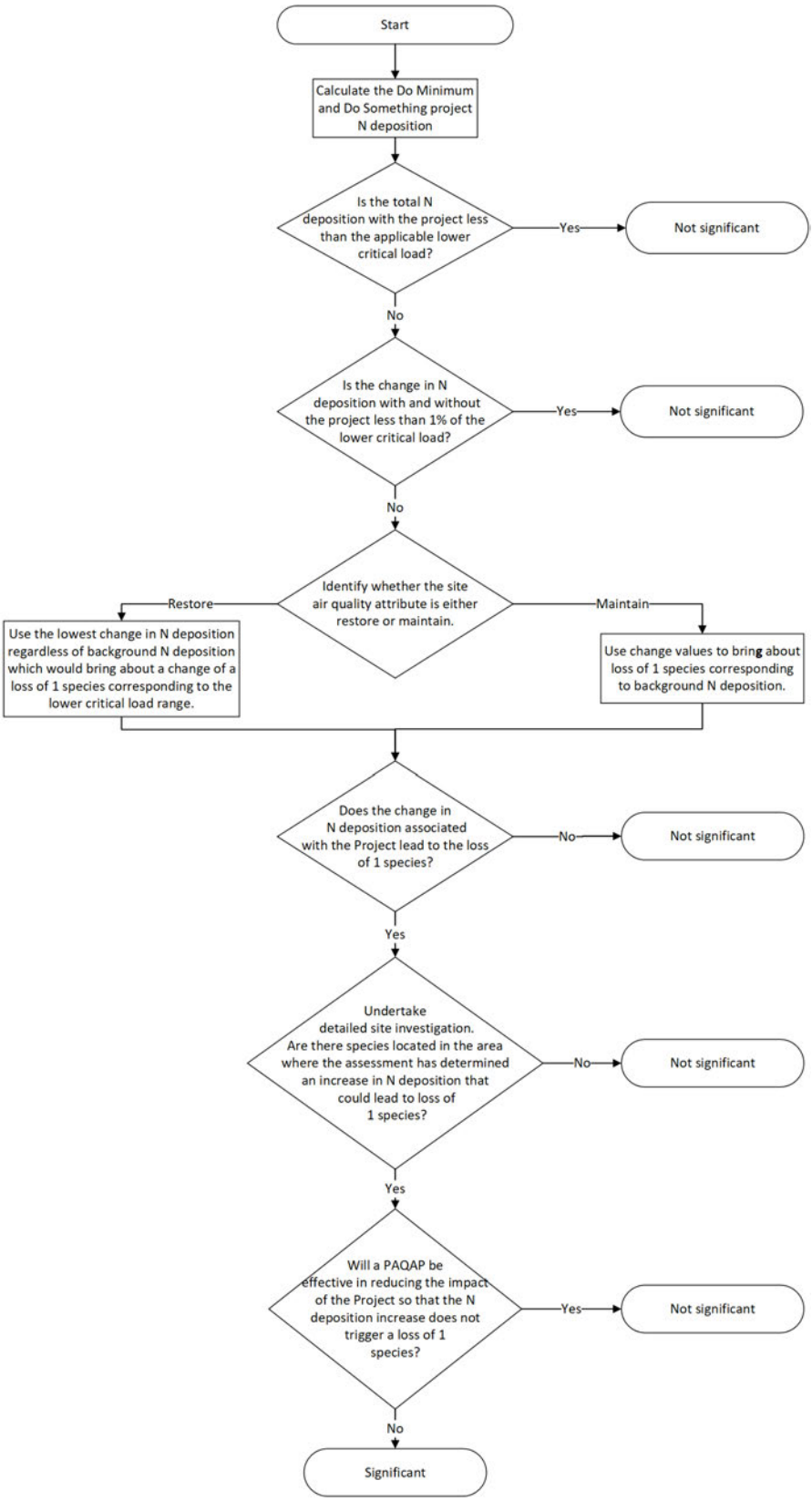
2.96 Where the competent expert for air quality has deemed the project has triggered a significant air quality effect, a PAQAP shall be prepared setting out the measures that are required to mitigate the effects of the project.

Designated habitats

2.97 An assessment of the impacts on designated habitats shall be completed using the outputs from the air quality modelling.

2.98 The flow chart in Figure 2.98 shall be followed to complete the assessment of significant air quality effects on designated habitats by a competent expert for biodiversity.

Figure 2.98 Assessment of significant effects on designated sites



NOTE The presumption is that the air quality attribute for most designated habitats has been set to restore and the air quality assessment is completed on this basis.

2.99 If the change in N deposition is greater than 0.4kg N/ha/yr for the project, the competent expert for biodiversity shall review the air quality attribute target for the site to confirm whether it is restore or maintain and update the assessment if necessary.

2.100 The competent expert for biodiversity shall conclude whether the changes in nitrogen deposition are likely to trigger a significant air quality effect.

2.101 The competent expert for biodiversity shall reference Table 21 in the published nitrogen deposition dose response report by Natural England [Ref 1.N] in their assessment of significant air quality effects.

2.102 For designated habitats not included in Natural England's report, the habitat with the lowest change in nitrogen deposition likely to lead to the loss of one species, excluding nutrient impoverished sand dunes, shall be used to inform the judgement of significant air quality effects.

Evaluating the outcomes of the significance

Operation

2.103 The competent expert for air quality shall determine whether a project triggers a significant air quality effect by assessing the following:

1) the effects on human health;
2) the effects on designated habitats;
3) the outcomes of the compliance risk assessment.

2.104 The effects on human health, designated sites and the outcomes of the compliance risk assessment shall be assessed to determine whether a project triggers a significant air quality effect.

2.105 The view on significance shall be supported by a statement setting out how that judgement was arrived at, together with the supporting evidence.

Construction

2.106 The competent expert for air quality shall determine whether the effect of construction traffic from a project triggers a significant effect by assessing the following;

1) effects on human health;
2) effects on designated habitats;
3) the outcome of the compliance risk assessment.

NOTE *With best practice construction mitigation measures the impact of construction dust are unlikely to trigger a significant air quality effect.*

Design and mitigation

Construction

2.107 Construction dust mitigation measures for the project shall be contained within the environmental management plan (EMP).

NOTE *There is no requirement to provide a detailed breakdown of mitigation measures within the assessment.*

2.108 The construction dust assessment shall be used to inform the best practice mitigation measures in the EMP depending on whether the project has a high or low dust risk potential.

2.108.1 Table 2.108.1 sets out the supporting activities that should be followed, based on the construction dust risk potential, to monitor the effectiveness of the proposed mitigation measures to be included in the EMP.

Table 2.108.1 Measures to monitor mitigation effectiveness for high and low construction dust risk

High	Low
1) Development of dust management plan with measures to monitor effectiveness of mitigation as part of the EMP; 2) Daily on site and off site inspections to be included in EMP; 3) Record of complaints/exceptional dust events to be included in EMP.	1) Inspections on site to confirm no significant dust generation to be included in EMP; 2) Record of complaints, if received and problem identified development of dust management plan to be included in EMP.

NOTE *In most cases monitoring for dust deposition / ambient dust would not be required given the nature of work undertaken on the majority of the construction of road projects.*

Operation

2.109 Where the air quality assessment concluded the project triggered a significant air quality effect and / or affected the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible, a project air quality action plan (PAQAP) shall be included in the air quality assessment.

2.110 Any mitigation measures set out in the PAQAP shall:

1) be viable;
2) quantify the change in concentrations associated with the measure.

2.110.1 The following mitigation measures should be assessed for suitability, alongside any other proposed viable mitigation measure for the project:

1) vertical barrier of at least 9m in height;
2) speed limits adjusted for air quality.

NOTE *Speed limits for air quality can include reduction to 60 and enforcement at 70mph.*

2.111 The policy of the Overseeing Organisation on the purchase of properties shall be sought prior to being considered as a possible mitigation measure.

2.112 PAQAP shall be structured in the following way:

1) a brief description of the project;
2) a brief description of the project impacts over the study area;
3) list all mitigation measures that have been considered in developing the PAQAP, and split by lead delivery authority i.e. Overseeing Organisation, local authority or Government and the change in NO_2 concentrations at the effected receptors;
4) a figure illustrating the single or combination of the identified viable mitigation measures and the receptors that effect.

NOTE *In developing the PAQAP, adopted actions contained within the Government's National Air Quality Plan [Ref 3.I] or local measures within their local air quality plans and already included in the traffic model for the project, cannot be included in the PAQAP as this would be double counting.*

2.113 The impacts of the project shall be re-evaluated, including the proposed mitigation measure(s), to ensure there is no longer a significant air quality effect and / or a risk to affecting the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible.

2.114 In the event that the proposed mitigation measures are assessed not to be effective, further measures shall be investigated and assessed and the impacts of the project re-evaluated.

Assumptions and limitations

2.115 The assumptions and limitations associated with the air quality assessment for the project shall be included in the environmental assessment with a description of the potential influence on the model outcomes.

NOTE *Air quality modelling like all modelling is inherently uncertain, but, it is the most reliable, reasonable and robust tool available to determine whether a project has a significant air quality effect and / or affects the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible.*

2.116 To help manage uncertainty in air quality modelling, the modelled concentrations in the base year shall be verified against air quality monitoring data in accordance with Defra guidance [Ref 2.I].

2.117 The verification adjustment factors shall be applied to the modelled concentrations in the base year and do minimum and do something scenarios in the opening year.

2.118 Uncertainty in future air quality is one of key assumptions in air quality modelling and the approach for addressing uncertainty in predicted future roadside NO_x and NO_2 trends shall be followed.

3. Reporting

3.1 The air quality assessment shall contain the information presented in Table 3.1.

Table 3.1 Air quality assessment reporting requirements

Section	Required information
Scoping	1) a statement confirming whether the traffic scoping criteria have or have not been triggered and whether there is a need for an assessment; 2) where a project does not trigger the traffic scoping criteria the following statement is used. "The traffic scoping criteria have not been triggered and the project would not result in a significant air quality effect nor affect the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescale possible."; 3) where a project does trigger the traffic scoping criteria, a statement on whether a simple or detail assessment will be completed, including reasons why; 4) a statement detailing how the study area was defined and that the TRA is appropriate for the air quality assessment.
Baseline	1) brief description of the baseline air quality environment including, summary of monitoring data and source of data and background maps and source of data; 2) location of any AQMAs within the study area of the project; 3) information regarding compliance with the Air Quality Directive [Ref 4.N], including status of the zones / agglomerations, the date the zone is to achieve compliance, and any local air quality plans developed to support compliance in the shortest timescales possible and the source of data; 4) PCM modelled concentrations for all roads within the study area in the base year and opening year; 5) the source of background nitrogen deposition rate.
Policy	1) description of the relevant sections of applicable national policy; 2) description of any local air quality plans, produced as part of the Government's National air quality plan, that have been considered as part of the air quality assessment; 3) description of any local air quality action plans (AQAPs), produced as part of Local Air Quality Management regime, that have been referenced as part of the air quality assessment.

Table 3.1 Air quality assessment reporting requirements (continued)

Section	Required information
Methodology	1) description of methodology; 2) justification for the choice of the air quality model; 3) list of the guidance documents and relevant sections used to inform the assessment; 4) limitations and assumptions; 5) description on how uncertainty has been addressed in the assessment; 6) description of the model performance, including details of model verification and performance statistics.
Assessment of air quality impacts	1) tabular results of concentrations at representative sensitive receptors (human health and designated habitats) used to inform the air quality outcomes of the project; 2) tabular results of concentrations used to inform the compliance risk assessment; 3) description of project impacts on concentrations and why the concentrations are changing at the selected representative receptors e.g. changes in traffic flows AADT, speed band changes, road alignment changes etc; 4) identify whether the project triggered a significant air quality effect and the justification for this decision; 5) identify whether the project affected the UK's reported ability to comply with the Air Quality Directive in the shortest timescales possible and the justification for this decision.
Assessment of construction impacts	1) the outcome of the construction dust risk assessment; 2) identify whether the project triggered a significant air quality effect as a result of construction traffic and local traffic management, and the justification for this decision; 3) identify whether the project affected the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible as a result of construction traffic and local traffic management, and the justification for this decision.
Compliance with policy	1) description of outcomes against relevant policies.

Table 3.1 Air quality assessment reporting requirements (continued)

Section	Required information
Mitigation	1) PAQAP where mitigation is required an assessment of the effectiveness of the mitigation which is evidence based with the predicted level of improvement in air quality; 2) the proposed date the mitigation measures are no longer required to ensure the project did not trigger a significant air quality effect and / or affect the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible; 3) a description of the proposed air quality monitoring to evaluate the effectiveness of the proposed measures.
Figures	1) figure showing the ARN which includes the traffic reliability area; 2) constraints map identifying: a) air quality monitoring locations; b) AQMAs; c) PCM links; d) area covered by any clean air zones or low emission zones, as applicable. 3) figure identifying receptor locations (human health and designated habitats) including the receptor identification reference; 4) figure identifying sensitive receptors within 0-50m, 50-100m and 100-200m of all construction activities. 5) figure identifying any proposed air quality monitoring as part of mitigation evaluation.

4. Monitoring of mitigation measure(s)

4.1 Where a project has included mitigation measure(s), air quality monitoring shall be implemented to demonstrate when and if the mitigation measure(s) can be removed (assuming the mitigation is time limited and not permanent).

4.2 Where monitoring is required, the competent expert for air quality shall consult the Overseeing Organisation to agree the locations, the type of monitoring to be deployed and the likely duration.

4.2.1 The monitoring should be representative of the area where the assessment predicts the significant air quality effect and / or affected the UK's reported ability to comply with the Air Quality Directive [Ref 4.N] in the shortest timescales possible.

4.3 A map showing the locations shall be produced.

4.4 Air quality monitoring shall not be required for projects that do not require mitigation.

5. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	Natural England Commissioned Report NECR210. 'Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance.'
Ref 2.N	Highways England. LA 108, 'Biodiversity'
Ref 3.N	Highways England. LA 114 , 'Climate'
Ref 4.N	Air Quality Directive, 'DIRECTIVE 2008/50/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 May 2008 on ambient air quality and cleaner air for Europe'
Ref 5.N	EIA Directive, 'Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment'
Ref 6.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 7.N	'Local air quality management tool. https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html '
Ref 8.N	Defra. 'Modelled air quality data'
Ref 9.N	Highways England. LA 112, 'Population and human health'

6. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	AQTAG06, [redacted]
Ref 2.I	Defra. 'Local Air Quality Management Technical Guidance (TG16) February 2018'
Ref 3.I	Defra and DfT. Joint Air Quality Unit. 'UK plan for tackling roadside nitrogen dioxide concentrations ' , 2017
Ref 4.I	[redacted]'

Appendix A. Speed pivoting methodology

A1 Speed banding of traffic modelled speeds for use with air quality assessments

A1.1 Background

The competent expert from the traffic team provides the competent expert for air quality with the speed bands required to generate the vehicle emission factors for the corresponding speed band .

Speed banding ensures that speeds from the traffic model are used to reflect different states of driving conditions with an assigned emission factor.

The speed band descriptors for motorway and urban roads are presented in Tables A.1 and A.2.

Table A.1 Motorway speed bands

Category	Speed range (kph)	General description
Heavy congestion	5 – 48	Traffic with a high degree of congestion and stop: start driving behaviour, junction merges, slip roads with queuing traffic.
Light congestion	48 – 80	Traffic with some degree of flow breakdown, typical volume/capacity (v/c) >80%. Normal operation on slip roads.
Free flow	80 – 96	Motorway generally free flow driving conditions with little or no flow breakdown. Motorway busy but not congested, v/c <80%.
High speed	96 - 140	Motorway unconstrained, typical of overnight conditions when traffic light.

Table A.2 Urban speed bands

Category	Speed range (kph)	General description
Heavy congestion	5 – 20	Traffic with a high degree of congestion. Within a 100m radius of road junction with a high degree of congestion.
Light congestion	20 – 45	Typical urban traffic with a reasonable degree of congestion. Within a 100m radius of road junction.
Free flow	45 – 80	Typical urban traffic with limited or no congestion.
High speed	80 - 112	High speed urban single or dual carriageway.

The speed pivoting methodology is only to be applied to road links included in the traffic reliability area (TRA) and for only those road links used in the air quality assessment.

A proportionate approach to the speed pivoting process is required, e.g. if there is no possibility of exceedances of air quality thresholds, or the air quality assessment is at options stage for the project using AADT traffic data, then speed pivoting is not required.

For early stages of project development it is not necessary to undertake the full speed pivoting process, particularly where the traffic models are likely to be updated. The amount of detail required for the speed banding is proportionate to the stage of the assessment.

Where significant risks to air quality have been identified during the early stages of a project, which could risk a delay to project delivery, it is necessary to undertake selective speed pivoting in the area of concern.

A1.2 Speed pivoting process

Observed vehicle speeds at a link level will need to be obtained for the traffic model base year from data sets such as TrafficMaster, GPS, mobile phone data etc.

The observed traffic speeds along the road links provided for use in the air quality assessment need to be obtained for the base year and averaged over the period corresponding to the same period in the air quality model.

For a detailed air quality assessment, the air quality model is generally broken down into four periods to represent the change in emissions over the day (AM, IP, PM and OP), the AM period for example generally represents a 3-hour period 07:00 until 10:00.

The traffic model network and the network used for the observed speeds are likely to be different, as a result, the data needs to be processed so that the observed speeds are comparable geographically with the traffic modelled road links.

The factor generated between the comparison of the base year modelled speed and the observed speed known as the speed pivot factor (SP) (i.e. SP = speed observed in base year/speed modelled in base year), will need to be calculated and used to adjust the individual base year and forecast year link speeds output from the traffic model.

It is recognised that observed speed data is not always available for every road link in the traffic model and consequently an 'infilling' process will be required to pivot the modelled traffic speeds on these road links.

For those road links and/or times of day when observed speeds are not available infilling needs to be undertaken whereby a SP on roads representative of the link with no observed speeds is used.

The infilling process can be informed by considering for example, the speed pivoting performance on adjacent links, the speed pivoting performance on roads with similar characteristics either in the local area or globally across the TRA if available e.g. motorways, urban centre roads, single carriageways, rural roads.

Where there is no observed speed, i.e. the link is a new road (e.g. bypass) the modelled speed needs to be used to generate the speed band.

Where the speed pivot factors are high then it may not be appropriate to apply these to the forecast speeds as any change (between assessment scenarios) would be magnified and / or the result in speeds being greater than the speed limit of the road.

In these circumstances a judgement should be made by the competent expert for traffic to determine whether the traffic conditions are likely to have changed because of the project from the base year.

If the competent expert for traffic deems the traffic conditions observed for the base year are not likely to significantly change in the forecasts years, then the base year speed band needs to be used and the reasoning behind the judgement recorded.

The speed bands are to be plotted in GIS to check the speed bands spatially in the forecast years to identify any anomalies in the generated speed bands. This will be useful for example to determine whether there are changes in speed bands along the same section of motorway which may be because of very small changes in speed.

Where speed bands have changed between the do minimum and do something scenarios, the bands need to be checked to ensure that the change in band can be justified because of the project.

This analysis however needs to focus on areas identified as sensitive to changes in air quality that may result in exceedances of air quality thresholds to ensure it is proportionate.

Very small changes in speed between modelled scenarios will not always necessitate a change in speed band. It is important that the speed banding process is not just a numerical process whereby the speed ranges are put into the respective bands with no sense checking of the bands that the links have been allocated to.

The receptor concentrations modelled in the base year by the competent air quality expert will provide an indication of the areas that are sensitive to change and hence require greater analysis in relation to changes in speed bands as a result of the project.

Sustainability & Environment
Appraisal

LA 105
England National Application Annex to LA 105 Air quality

(formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15)

Revision 0

Summary
There are no specific requirements for Highways England supplementary or alternative to those given in LA 105.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Nov 2019	Highways England National Application Annex to LA 105.

Department for Infrastructure
An Roinn Bonneagair

Sustainability & Environment
Appraisal

LA 105
Northern Ireland National Application Annex to LA 105 Air quality

(formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15)

Revision 0

Summary
There are no specific requirements for Department for Infrastructure, Northern Ireland supplementary or alternative to those given in LA 105.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated team in the Department for Infrastructure, Northern Ireland. The email address for all enquiries and feedback is: dcu@infrastructure-ni.gov.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Nov 2019	Department for Infrastructure Northern Ireland National Application Annex to LA 105.

Design Manual for Roads and Bridges

Sustainability & Environment
Appraisal

LA 105
Scotland National Application Annex to LA 105 Air quality

(formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15)

Revision 0

Summary
This National Application Annex contains Transport Scotland specific requirements related to air quality.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Transport Scotland team. The email address for all enquiries and feedback is: TSStandardsBranch@transport.gov.scot

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Nov 2019	Transport Scotland National Application Annex to LA 105.

S/1. Applicability of this document

S/1.1 Before undertaking a project in Scotland a competent expert for air quality shall contact Transport Scotland prior to the application of LA 105.

NOTE *The email address is: TSStandardsBranch@transport.gov.scot.*

Llywodraeth Cymru
Welsh Government

Sustainability & Environment
Appraisal

LA 105
Wales National Application Annex to LA 105 Air quality

(formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15)

Revision 0

Summary
There are no specific requirements for Welsh Government supplementary or alternative to those given in LA 105.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Welsh Government team. The email address for all enquiries and feedback is: Standards_Feedback_and_Enquiries@gov.wales

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Nov 2019	Welsh Government National Application Annex to LA 105.

Design Manual for Roads and Bridges

Sustainability & Environment
Appraisal

LA 107
Landscape and visual effects

(formerly DMRB Volume 11 Section 3 Part 5 Landscape Effects and IAN 135/10)

Revision 2

Summary
This document contains the requirements for assessing and reporting the landscape and visual effects of highway projects.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
2	Feb 2020	Revision 2 (February 2020) Additional update to informative references. Ref 4.I replaces previous Ref 1.I and 5.I. Revision 1 (January 2020) Revision to update references only. Revision 0 (September 2019) LA 107 replaces DMRB Volume 11 Section 3 Part 5 and IAN 135/10. This full document has been re-written to make it compliant with the new Highways England drafting rules.

Foreword

Publishing information

This document is published by Highways England.

This document supersedes DMRB Volume 11, Part 5 Landscape Effects and IAN 135/10 Landscape and visual effects assessment which are now withdrawn. This document makes provision for requirements outlined within EU Directive 2011/92/EU as amended by 2014/52/EU (hereafter referred to as the 2014/52/EU [Ref 3.N]).

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

Construction, improvement, operation and maintenance of motorways and all-purpose trunk roads can result in environmental effects on landscape and the visual amenity.

Development of this document has been influenced by:

1) the UK Government's commitment in ratification of the European Landscape Convention ELC 2000 [Ref 10.N] (hereafter referred to as the Convention), to recognising landscape matters in law, and promoting landscape planning, protection, and management policies;
2) the Convention's ELC 2000 [Ref 10.N] widely adopted definition of landscape which recognises:
   a) landscape as a resource inclusive of townscape;
   b) the relationship between people and place; and
   c) all landscapes are important, irrespective of their location (i.e. natural, rural, urban, and peri-urban areas) or condition (i.e. outstanding or degraded);
3) Landscape Institute and IEMA's Guidelines for Landscape and Visual Impact Assessment GLVIA [Ref 1.I]; and
4) Landscape Institute's Technical Information Notes (i.e. Townscape Character Assessment, LI TN 05/2017 [Ref 3.I], Landscape Character Assessment, (Technical Info Note 08/15 [Ref 2.I]) and their visualisation information guidance (Advice on photography and photomontages, and Visual representation of development proposals, TGN 06/19 [Ref 4.I]).

This document aligns with Directive 2011/92/EU as amended by 2014/52/EU [Ref 3.N]

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 7.N] apply to this document.

Abbreviations

Abbreviations

Abbreviation	Definition
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
EMP	Environmental Management Plan
ES	Environmental Statement
GLVIA	Guidelines for Landscape and Visual Impact Assessment
HEMP	Handover Environmental Management Plan
IEMA	Institute of Environmental Management and Assessment
LCA	Landscape Character Area
LI	Landscape Institute
LMP	Landscape Management Plan
LVIA	Landscape and Visual Impact Assessment
NPA	National Parks Authority
PRoW	Public Rights of Way
SLA	Special Landscape Areas
TGN	Technical Guidance Note (Landscape Institute)
TIN	Technical Information Note (Landscape Institute)
VED	Visual Effects Drawing
VES	Visual Effects Schedule
VIA	Visual Impact Assessment
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence

Terms and definitions

Terms and definitions

Term	Definition
Baseline studies	Work to provide an outline, understanding of landscape and visual conditions before or without implementation of the project requiring a mix of desk study consultation and field work.
Characteristics	Elements or combination of elements, which make a particular contribution to distinctive character.
Cumulative effects	Impacts resulting from incremental changes caused by other present or reasonably foreseeable actions likely to occur together with the project. NOTE: For the purposes of this document, a cumulative effect can arise as the result of: 1) specific impacts from a single project on a single receptor/resource; and/or 2) the combined impact of a number of different projects (in combination with the environmental impact assessment) on a single receptor/resource.
Effect	Term used to express the consequence of an impact (expressed as the 'significance of effect').
Enhancement	A beneficial measure that is over and above what is required to mitigate the adverse effects of a project.
Environmental assessment	A process by which information about environmental effects is collected, assessed and used to inform decision-making. NOTE: This can include Environmental Impact Assessment and non-statutory environmental assessment.
Environmental factors	1) Population and human health; 2) Biodiversity; 3) Land, soil, water, air and climate; 4) Material assets, cultural heritage, and landscape; 5) The interaction between the factors listed above (2014/52/EU [Ref 3.N]).
Features	Particularly prominent, "eye-catching" elements or characteristic components (i.e.tree clumps, church towers, or wooded skylines).

Terms and definitions (continued)

Term	Definition
Handover environmental management plan	Package of information on existing and future environmental commitments and objectives, ongoing actions and risks to be managed, handed over to those responsible for future management and operation of the asset.
Impact	Action being taken. NOTE 1: Source of definition GLVIA 3 GLVIA [Ref 1.I]. NOTE 2: For consistency within LVIA "impact" cannot be used interchangeably with "effect" nor to mean a combination of several effects.
Landscape	'An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.' ELC 2000 [Ref 10.N] NOTE 1: About the relationship between people and place. NOTE 2: Inclusive, covering natural, rural, urban, and peri-urban areas and applies not only to special or designated landscapes or countryside but to everyday or degraded landscapes. NOTE 3: A resource that 'results from the way that different components of our environment - natural and cultural - interact together and are perceived'. Source of definition GLVIA 3 GLVIA [Ref 1.I].
Landscape Architect	Competent expert to mean: 1) Chartered Member of the Landscape Institute (CMLI) or; 2) member of a recognised equivalent landscape professional body.
Landscape character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Landscape character area	Single unique areas "which are the discrete geographical areas of particular landscape type." NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I] .
Landscape character assessment	Process of identifying and describing variation in character of the landscape - the unique combination of elements and features that make landscapes distinctive - to assist in managing change in the landscape. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].

Terms and definitions (continued)

Term	Definition
Landscape character type	Distinct types of relatively homogeneous landscape, generic in nature but "...share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern, and perceptual and aesthetics attributes." NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Landscape component	Interplay of physical, natural and cultural factors of our surroundings.
Landscape effects	The consequence of an impact (expressed as the 'significance of effect') on the landscape as a resource in its own right. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Landscape elements	Individual parts of the landscape include physical influences (geology, soils, landform, drainage, and water bodies); land cover (different types of vegetation, patterns, and types of tree cover); and human influences (land use and management, character of settlements of buildings, and pattern and type of fields and enclosure). NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Landscape establishment period	A period after initial planting requiring intervention such as weed control to allow for successful plant establishment. NOTE: Establishment period is also often referred to as the aftercare period.
Landscape management plan	Sets out sustainable management and upkeep requirements of the landscape within a particular area.
Landscape quality (or condition)	Measure of the physical state of the landscape based on judgements, which can include typical character represented in individual areas, integrity of the landscape, and condition of individual elements. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Landscape receptor	Defined aspect of the landscape resource that potentially could be affected by the project. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Landscape resource	Natural and physical attribute (i.e. soils vegetation).
Landscape sensitivity	Applied to specific landscape receptors, combining judgements of the susceptibility of the receptor to the specific type of change proposed and the value related to the receptor. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].

Terms and definitions (continued)

Term	Definition
Landscape and visual impact assessment (LVIA)	A "... tool used to identify and assess the significance of and the effects of change resulting from..." a project on both the landscape as a resource and on people's views and visual amenity. NOTE: Source of definition GLIVA 3 GLVIA [Ref 1.I].
Magnitude of effects	Combines judgements about size and scale of effect, extent of area it occurs over, whether reversible or irreversible and whether short or long term in duration. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Project	Construction works, installations, schemes, or interventions (in the natural surroundings and landscape) including those involving the extraction of mineral resources.
Setting	Contribution of the surroundings to the appearance of an area or feature and the interrelationship of the area or feature to the wider context and sense of place.
Scoping	The process of considering the information required for reaching a (reasoned) conclusion on the likely significant effects of a project on the environment.
Sense of place	The essential character and spirit of an area (genius loci - spirit of the place).
Sensitivity	Term applied to specific receptors, combining judgements of the susceptibility of the receptor to specific type of change proposed and the value related to that receptor. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Susceptibility	Ability of a defined landscape or visual receptor to accommodate the specific proposed change without negative consequences. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Townscape (urban environment)	The landscape within the built-up area, including the buildings, urban open spaces, including green spaces and the relationship between buildings and between buildings and open spaces. NOTE 1: Important relationships of landscape and townscape, often of historic dimensions, contribute to the urban form and character. NOTE 2: Source of definition GLVIA 3 GLVIA [Ref 1.I]

Terms and definitions (continued)

Term	Definition
Value	Relative value or importance of a landscape's quality, special qualities including perceptual aspects such as scenic beauty, tranquillity, or wildness, cultural associations or other conservation issues. NOTE 1: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Visual amenity	Overall enjoyment of a particular area, surroundings, or views in terms of people's activities - living, recreating, travelling through, visiting, or working. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Visual envelope	An area from which the scheme can be visible.
Visual receptor	Individuals and/or defined groups of people who potentially could be affected by a project. NOTE: Source of definition GLVIA 3 GLVIA [Ref 1.I].
Visual sensitivity	Visual experience be it sensitivity to light or visual clutter.
Zone of theoretical visibility	Map produced (usually digitally) to specific criteria to illustrate the area(s) from which a project can theoretically be visual. NOTE: For cumulative visual effects assessment it is the areas of overlap with the ZTV which can prove significant.
Zone of visual influence	Area within which a proposed development can have an influence or effect on visual amenity. NOTE: This is different from the visual envelope.

1. Scope

Aspects covered

1.1 The requirements in this document shall be applied to the assessment, reporting and management of environmental effects on landscape and visual amenity from the delivery of projects.

1.2 Environmental assessments shall describe the likely impacts on the landscape as a resource, and visual amenity in line with the wider requirements and advice provided in;

1) LA 101 [Ref 6.N] Introduction to environmental assessment;
2) LA 102 [Ref 9.N] Screening projects for Environmental Impact Assessment;
3) LA 103 [Ref 8.N] Scoping projects for environment assessment; and
4) LA 104 [Ref 4.N] Environmental assessment and monitoring.

1.3 Environmental assessments must, in accordance with Annex IV of the EIA Directive 2014/52/EU 2014/52/EU [Ref 3.N], identify, describe and assess the likely significant effects of a project on the landscape (i.e. the direct and indirect change to the landscape character, the landscape quality/condition, and the visual amenity and visual receptors).

NOTE 1 In undertaking landscape and visual assessment (LVIA), an understanding of the interaction between environmental factors and their effect on landscape elements (i.e. individual parts of the landscape such as human influences, land cover and physical influences) is necessary, see GLVIA 3 GLVIA [Ref 1.I].

NOTE 2 The LVIA process does not differentiate between "landscape" and "townscape", as it is applicable to any landscape - urban, rural or a combination of both, see GLVIA 3 GLVIA [Ref 1.I].

NOTE 3 For townscape assessment the Landscape Institute have developed a Technical Information Note (TIN) "Townscape Character Assessment" specifically for undertaking a character assessment for "townscape" LI TN 05/2017 [Ref 3.I].

1.4 LVIA shall be clear about the distinction between the following two elements:

1) effects on the landscape as a resource; and
2) effects on views and visual amenity.

NOTE 1 Effects on landscapes of historical, cultural or archaeological significance are assessed in LA 106 [Ref 2.N] Cultural heritage assessment.

NOTE 2 Effects on nature conservation and biodiversity are assessed in LA 108 [Ref 1.N] and LA 115 [Ref 5.N] Habitats Regulations assessment.

Implementation

1.5 This document shall be implemented forthwith on all projects involving landscape and visual effects on the Overseeing Organisations' motorway and all-purpose trunk road network according to the implementation requirements of GG 101 [Ref 7.N].

Use of GG 101

1.6 The requirements contained in GG 101 [Ref 7.N] shall be followed in respect of activities covered by this document.

2. Principles and purpose

Assessment and consultation

2.1 The iterative planning, design and assessment process shall include analysis of the landscape and character of a site as well as its visual amenity and its context to minimise landscape and visual effects.

2.2 Landscape design shall seek:

1) to deliver excellence in design quality that responds to the needs of people and places, while complying with the Overseeing Organisation's design vision and principles; and
2) to deliver an inclusive, resilient and sustainable design solution.

2.3 LVIA, as a key tool to effective decision making that includes landscape character assessment, shall be undertaken by a Landscape Architect.

2.4 Baseline studies shall establish the landscape and visual conditions, potential constraints (i.e. sensitive landscapes - designated sites or locally valued areas) and possible design opportunities (i.e. use of existing land-form/topography to better integrate the design) to inform the design process.

2.5 LVIA application of the term 'sensitivity', as defined in terms and definitions, shall be applied throughout this document.

2.6 Assessment of the project's potential effects against the baseline situation shall examine and assess:

1) seasonal differences with or without the project including summer with foliage and winter without foliage;
2) both day and night time situations with or without the project;
3) a winter scenario in the year of opening, and a summer scenario - fifteenth year of operation to traffic;
4) landscape character types and/or landscape character areas; and
5) the opinions and consensus of the local public and different interest groups, their perception of the landscape, the value they place it and assessment of the change the project will incur.

2.7 The effect of a project on the landscape and visual amenity shall be assessed independently and the outcome combined to a single conclusion of the likely significant effect on landscape and visual amenity.

2.8 Consultation about the impact on the landscape and visual amenity shall be undertaken in accordance with the the Overseeing Organisation's requirements and LA 104 [Ref 4.N] and LA 103 [Ref 8.N].

NOTE 1 *Consultation includes stakeholders likely to be affected by the project, or are aware of certain information or issues to assist the design and assessment (i.e. concerns regarding local sensitivity).*

NOTE 2 *Consultation includes the appropriate statutory body responsible for primary, definitive source of policy, information and opinion on statutory protected landscape.*

2.9 Qualitative judgements used in landscape impact assessment and visual impact assessment shall be clear and transparent so as the reasoning applied at different stages can be understood.

NOTE *Aspects of LVIA are objective (i.e. landscape character assessment), however, many require professional judgement (i.e. determining landscape quality or condition, ascertaining magnitude level of change).*

3. Assessment methodology

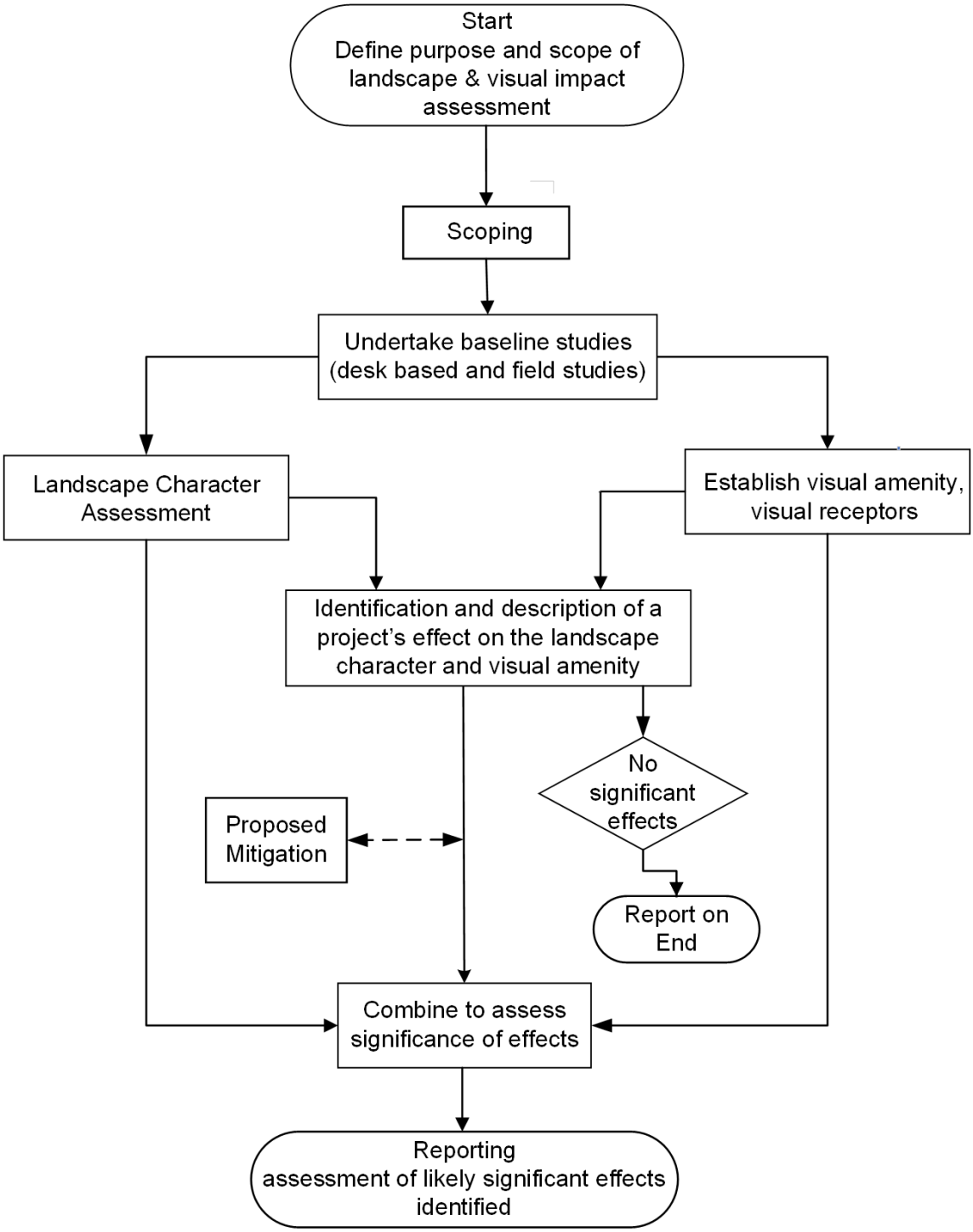
Overview

3.1 LVIA shall identify and assess the significance of and the effects of change of a project on the landscape as a resource, and people's views and visual amenity as part of the iterative steps in assessment and design development, GLVIA 3 GLVIA [Ref 1.I].

3.2 LVIA whether undertaken as part of a statutory Environmental Impact Assessment or non-statutory environmental assessment shall apply to all projects and be informed by these key iterative steps:

1) defining the purpose and scope of assessment;
2) undertaking a desk based study;
3) undertaking a field study to support the assessment; and
4) classification/description of landscape character types/areas, establishing the visual amenity and visual receptors.

Figure 3.2 Steps in assessment levels for landscape and visual effects



3.3 Scoping of landscape and visual effects shall establish principles of good design and best practice measures when reporting likely significant effects.

3.4 The assessment of the likely significant effects shall be informed by:

1) the sensitivity of the landscape receptor (susceptibility to changes combined with value of the receptor) and the magnitude of effects on the landscape (change - scale, extent, duration); and
2) the sensitivity of a visual receptor (susceptibility to changes in views combined with values of the receptor) and magnitude of effects (change - scale, extent, duration) GLVIA 3 GLVIA [Ref 1.I].

3.4.1 The assessment of susceptibility to change should be tailored to the project.

NOTE *A possible example could be where receptors with prominent views towards the highway infrastructure are more likely to have a low susceptibility to change of a project, than receptors with no existing views towards the highway infrastructure which are more likely to have a high susceptibility to change.*

3.4.2 Assessment and reporting of the impacts on the landscape resource, and views and visual amenity from temporary construction works, should follow the wider advice and requirements found in LA 104 [Ref 4.N].

3.5 Baseline information (desk based studies, consultation, field studies) shall be informed by:

1) identifying the local and wider landscape likely to be affected (i.e. character, condition, constituent elements, experience of it, geographical extent, history, its value);
2) identifying the different landscape and visual receptors likely to be affected;
3) identifying the visual amenity and views likely to be affected (i.e. ZTV to identify areas visibly connected with the proposal); and
4) utilising data obtained from a range of relevant sources (i.e. statutory environmental bodies, local authorities, and/or National Park Authorities).

3.5.1 Visualisation (i.e. computer simulation, digital technology, photographs, photomontages, etc.) is important in communicating information and should be proportionate and accord with the Overseeing Organisation's requirements.

3.6 An overall assessment of the likely significance of the cumulative landscape and visual effects required by LVIA shall provide clear evidence and justifications as to inform the professional judgements made.

3.7 Overlaps in assessment shall be identified and clearly cross-referenced as to where the assessment is being reported.

NOTE *For example, the installation of noise screening can have visual implications whereas screen planting can disturb archaeological remains or conflict with wildlife considerations.*

Assessment of landscape effects

Scoping

3.8 LVIA scoping assessment shall identify and report on:

1) the likely nature, extent and scale of the project to determine effects of change and development;
2) the likely nature and scale of landscape effects (positive, neutral or negative) during the construction and operation of the project;
3) the likelihood of the project to affect the aesthetic and perceptual aspects of the landscape, its distinctive character and its elements; and
4) issues likely to require further assessment together with the methods to be applied.

3.9 The scoping assessment shall identify potential significant effects by answering the following questions to gain an understanding of the need to undertake further landscape assessment:

1) is the project likely to affect designated landscapes (statutory or local designation)?;
2) is the project likely to affect the distinctiveness of a landscape character area or type?;
3) is the project likely to affect national, regional or local characteristics or distinctive features?;

4) is the project likely to affect the condition or quality of a landscape?;
5) is the project likely to affect the intrinsic character, qualities and local identity of the urban environment (sense of place)?

3.10 Where the response to one or more of the scoping assessment questions is 'yes', further assessment shall be undertaken.

NOTE *A positive response to the queries above would indicate potential significant effects.*

Study area

3.11 The study area shall be identified on a project by project basis and be proportionate to the following factors:

1) the project boundary/construction activity (including compounds and temporary land take);
2) the wider landscape setting within which the project/its works has the potential to influence;
3) the extent of the area visible by the project; and
4) the full extent of adjacent or affected landscape receptors of special value (i.e. conservation areas, designated areas) whose setting can be influenced by the project.

Baseline scenario

3.12 The scale of landscape character assessment information required to provide a basis for LVIA shall be established at the outset.

3.13 Baseline studies, appropriate and proportionate to the context of the project, shall establish the relative value of the areas of landscape to be affected, either as a whole or individual components that contribute to its character.

3.14 Baseline studies shall identify important characteristics of the landscape including:

1) a description of the landscape receptors that make up the landscape to include night-time characteristics, geological, habitat, as well as historic and cultural landscape features;
2) a description of the aesthetic and perceptual characteristics contributing to the landscape's distinctive character (i.e.pattern, scale, tranquillity, wildness);
3) the condition or quality of the landscape;
4) its importance and/or value (i.e. national parks, Special Landscape Areas (SLAs), local importance or value); and
5) influences of past and future trends and forces for landscape change (i.e. current pressures causing change, future developments with planning permission, climate change).

3.15 Site surveys shall be appropriate/proportionate to confirm, supplement and update the baseline data obtained (i.e. reports, mapping, aerial photographs) for assessing landscape effects, GLVIA 3 GLVIA [Ref 1.I].

Assessment

3.16 Landscape assessment shall judge the nature of receptors likely to be affected (sensitivity), and the nature of effects likely to occur on the landscape (magnitude) to report on a project's likely significant effects.

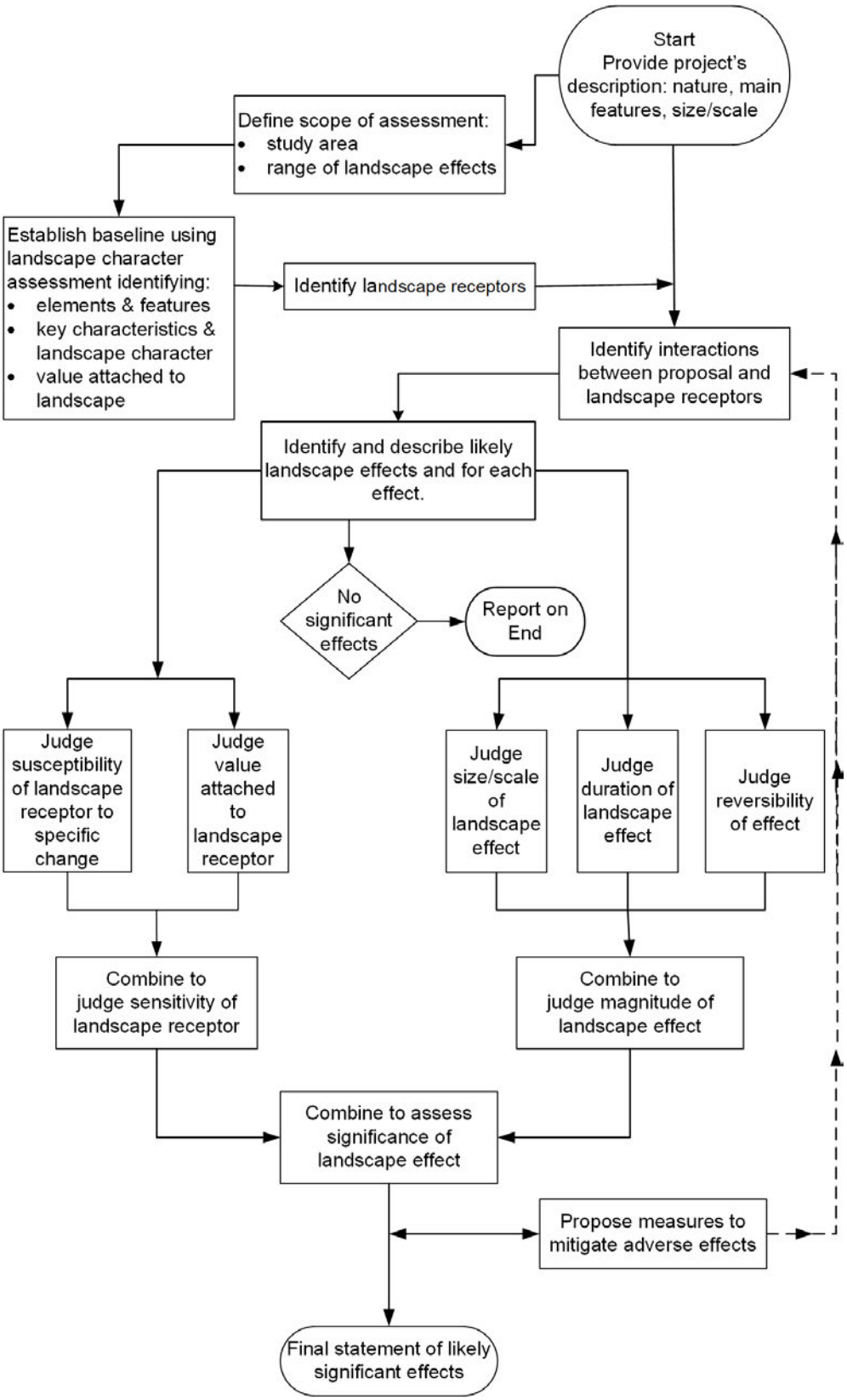
3.17 Landscape character assessment, the key tool to understanding the landscape, shall describe the variation in the landscape's character against the baseline, explaining a project's likely effect on a combination of landscape components, which include:

1) natural/physical (i.e. geology/soils, land form, river/drainage systems, land cover/vegetation, buildings);
2) aesthetic/perceptual (i.e. appearance, architectural styles, scales, tranquillity), and

3) cultural/social (i.e. human interaction, land use, heritage, open spaces, street patterns) that together inform the character of the area.

NOTE *In addition to the requirements of LA 104 [Ref 4.N] Environmental assessment and monitoring, the flow chart (Figure 3.17N) summarises the steps to be taken in undertaking an assessment of landscape effects.*

Figure 3.17N Steps in assessing landscape effects



3.18 Assessment of the sensitivity of landscape receptors shall report on a combined judgement of:

1) the susceptibility of the receptor to the proposed change from the baseline situation; and

2) the value attached to that receptor.

NOTE *A structured approach of identifying and assessing the value of the landscape and its susceptibility to proposed change(s) determines the landscape character distinctiveness, GLVIA 3 GLVIA [Ref 1.I].*

3.19 Assessment of the magnitude of effects on the landscape shall report on a combined judgement of:

1) the size and scale of effect;
2) year 1 (opening year) and year 15 (design year) including summer and winter;
3) the geographical extent of the area to be affected; and
4) the duration of the effect and its reversibility.

Significance criteria

3.20 Reporting the significance of the landscape's sensitivity to change shall include an evaluation of each key landscape element/characteristic affected by the project.

3.21 The significance of the landscape's sensitivity to change shall be informed by its:

1) importance;
2) quality/condition;
3) rarity;
4) value;
5) scale of contribution to the landscape character; and
6) degree to which it can be protected, mitigated, replaced or substituted.

3.22 The landscape sensitivity of receptors/resource in the assessment shall be reported in accordance with the criteria provided in Table 3.22.

Table 3.22 Landscape sensitivity (susceptibility and value) and typical descriptions

Landscape sensitivity (susceptibility and value) of receptor/resource	Typical description
Very high	Landscapes of very high international/national importance and rarity or value with no or very limited ability to accommodate change without substantial loss/gain (i.e. national parks, internationally acclaimed landscapes - UNESCO World Heritage Sites).
High	Landscapes of high national importance containing distinctive features/elements with limited ability to accommodate change without incurring substantial loss/gain (i.e. designated areas, areas of strong sense of place - registered parks and gardens, country parks).
Medium	Landscapes of local or regional recognition of importance able to accommodate some change (i.e features worthy of conservation, some sense of place or value through use/perception).
Low	Local landscape areas or receptors of low to medium importance with ability to accommodate change (i.e. non-designated or designated areas of local recognition or areas of little sense of place).
Negligible	Landscapes of very low importance and rarity able to accommodate change.

NOTE 1 *Whilst designated areas are highly valued, the majority of land is comprised of non-designated areas which can still be of high quality and/or of great local importance.*

NOTE 2 *A landscape in a good state of repair is not necessarily of high quality.*

3.23 Reporting the magnitude of landscape effects (adverse or beneficial) on receptors, the assessment of each effect shall be demonstrated in terms:

1) of size/scale;
2) of geographical extent of influence; and
3) its duration and reversibility.

3.24 The magnitude of effect (change) shall be reported in the assessment in accordance with the criteria provided in Table 3.24.

Table 3.24 Magnitude and nature of effect on the landscape and typical descriptions

Magnitude of effect (change)		Typical descriptions
Major	Adverse	Total loss or large scale damage to existing landscape character or distinctive features or elements; and/or addition of new uncharacteristic, conspicuous features or elements (i.e road infrastructure).
	Beneficial	Large scale improvement of landscape character to features and elements; and/or addition of new distinctive features or elements, or removal of conspicuous road infrastructure elements.
Moderate	Adverse	Partial loss or noticeable damage to existing landscape character or distinctive features or elements; and/or addition of new uncharacteristic, noticeable features or elements (i.e. road infrastructure).
	Beneficial	Partial or noticeable improvement of landscape character by restoration of existing features or elements; or addition of new characteristic features or elements or removal of noticeable features or elements.
Minor	Adverse	Slight loss or damage to existing landscape character of one (maybe more) key features and elements; and/or addition of new uncharacteristic features and elements.
	Beneficial	Slight improvement of landscape character by the restoration of one (maybe more) key existing features and elements; and/or the addition of new characteristic features.
Negligible	Adverse	Very minor loss, damage or alteration to existing landscape character of one or more features and elements.
	Beneficial	Very minor noticeable improvement of character by the restoration of one or more existing features and elements.
No change		No noticeable alteration or improvement, temporary or permanent, of landscape character of existing features and elements.

3.25 The approach to deriving impact significance from receptor/resource sensitivity (susceptibility and value) and magnitude of effects shall be in accordance with the Table 'Significance categories and typical descriptions', set out in the Environmental assessment methodology section of LA 104 [Ref 4.N].

3.26 The approach to deriving impact significance from landscape sensitivity and magnitude of effects shall be based on the significance matrix within the Environmental assessment methodology section of LA 104 [Ref 4.N] and include evidence to support any professional judgements that have been made.

3.26.1 For landscape, LVIA's term for sensitivity should apply to read - 'Landscape sensitivity (susceptibility and value)' instead of 'Environmental value (sensitivity)', as set out in the Environmental assessment methodology section of LA 104 [Ref 4.N].

3.27 Reporting the assessment shall state whether or not a project is likely to give rise to significant landscape effects and the significance of the effect (i.e. large or slight, adverse or beneficial, temporary or permanent).

NOTE *Significant effects comprise of effects that are/remain within the moderate, large or very large categories once design development has identified the necessary mitigation to be taken into account.*

Assessment of visual effects

Scoping

3.28 Visual impact scoping assessment shall identify and report on:

1) the likely nature, extent and scale of the project to determine effects of change and development;
2) the likely nature and scale of effects (positive, neutral or negative) on views and visual receptors during the construction and operation of the project;
3) the likelihood of the project to result in significant visual effects; and
4) issues likely to require further assessment together with the methods to be applied.

3.28.1 The assessment scope, to include identification of representative viewpoints and/or visual receptors should, in accordance with the Overseeing Organisation's requirements, be agreed with the relevant local authority.

3.29 The scoping assessment shall identify likely significant effects by answering the following questions to gain an understanding of the need to undertake further visual assessment:

1) is the project likely to affect receptors (individuals or range of people) views and the visual amenity of the area?;
2) is the project likely to affect the sensitivity of views to and from designated and/or valued landscapes, or from public rights of ways, public open spaces or from national trials?;
3) is the project likely to affect a range of viewpoints and nature of views from which the project is visible?;
4) is the project likely to generate significant visual effects (daytime and night time)?

3.30 Where the response to one or more of the scoping assessment questions is 'yes', further assessment shall be undertaken.

Study area

3.31 The study area shall be identified on a project by project basis and proportionate to the following factors:

1) the project/construction visual footprint (including compounds and temporary land take);
2) the wider visual envelope within which the project has the potential to influence;
3) the extent of representative viewpoints visible of the project; and
4) the extent of adjacent or affected visual receptors and the visual amenity of the area that can be influenced by the project.

3.32 The study area and selection of viewpoints shall be agreed with the Overseeing Organisation.

NOTE 1 Viewpoints selected for assessment and illustration of visual effects fall into three broad categories:

1) representative viewpoints - represents the experience of different types of visual receptors, where large numbers of viewpoints cannot be included individually, with similar (unlikely to differ) significant effects;

2) specific viewpoints - key and sometimes promoted viewpoints in noteworthy areas; and

3) illustrative viewpoints - to demonstrate a particular effect or specific issue, GLVIA 3 GLVIA [Ref 1.I].

NOTE 2 Actual visibility can depend on such visual obstructions as buildings, topography, tree cover, as well as elevation, direction and distance of views and light and weather conditions, GLVIA 3 GLVIA [Ref 1.I].

3.33 Relevant local authorities shall be consulted on the study area and selection of viewpoints early in the assessment process.

3.33.1 The study area, using digital methods to identify the ZVI or ZTV, should include the whole of the area from which any part of the proposed project can be visible.

NOTE Map products ZVI or ZTV, are commonly referred to as ZTV with the latter being the desk study component of visibility analysis and used throughout in reference to land from which the proposal could theoretically be visible, GLVIA 3 GLVIA [Ref 1.I].

Baseline scenario

3.34 The baseline shall establish the various categories of visual receptors, their locations and quantity, as well as the sensitivity of each, focusing on information that helps to identify significant visual effects.

3.34.1 Viewpoints selected should be informed not only through discussions with local authorities, but by the ZTV analysis and fieldwork and take account of:

1) accessibility to the public;
2) number and sensitivity of viewers who can be affected;
3) viewing direction, distance (i.e short, medium or long distance views) and elevation;
4) nature of the viewing experience;
5) view type; and
6) cumulative views in conjunction with other projects.

3.35 The ZTV identified for linear infrastructure projects, such as roads, shall be constructed for a sequence of points along the road with heights of structures (i.e. bridges and gantries) and vehicles along with existing screening features built into it to better demonstrate visibility of all aspects.

3.35.1 Mapping existing screening features identified (i.e. tree lines, woodland, industrial/large buildings, etc.) in the ZTV to assist the visibility analysis is difficult to achieve accurately, therefore field surveys should be used to judge their effects.

NOTE The Landscape Institute's advice on photography and photomontage, technical guidance note on visualisation TGN 06/19 [Ref 4.I], together with advice on visual effects within GLVIA 3 (GLVIA [Ref 1.I]), provide information for what can be required for assessment and presentation purposes.

3.36 ZTVs, determined by computer analysis, shall be site verified to ensure accuracy and applicability.

3.36.1 Separate ZTVs may be required in certain circumstances for a project to facilitate determination of the degree of change resulting from the project.

3.36.2 ZTVs should be undertaken under the guidance of or by a Landscape Architect with an understanding of the requirements in undertaking these together with detailed knowledge of the project proposals.

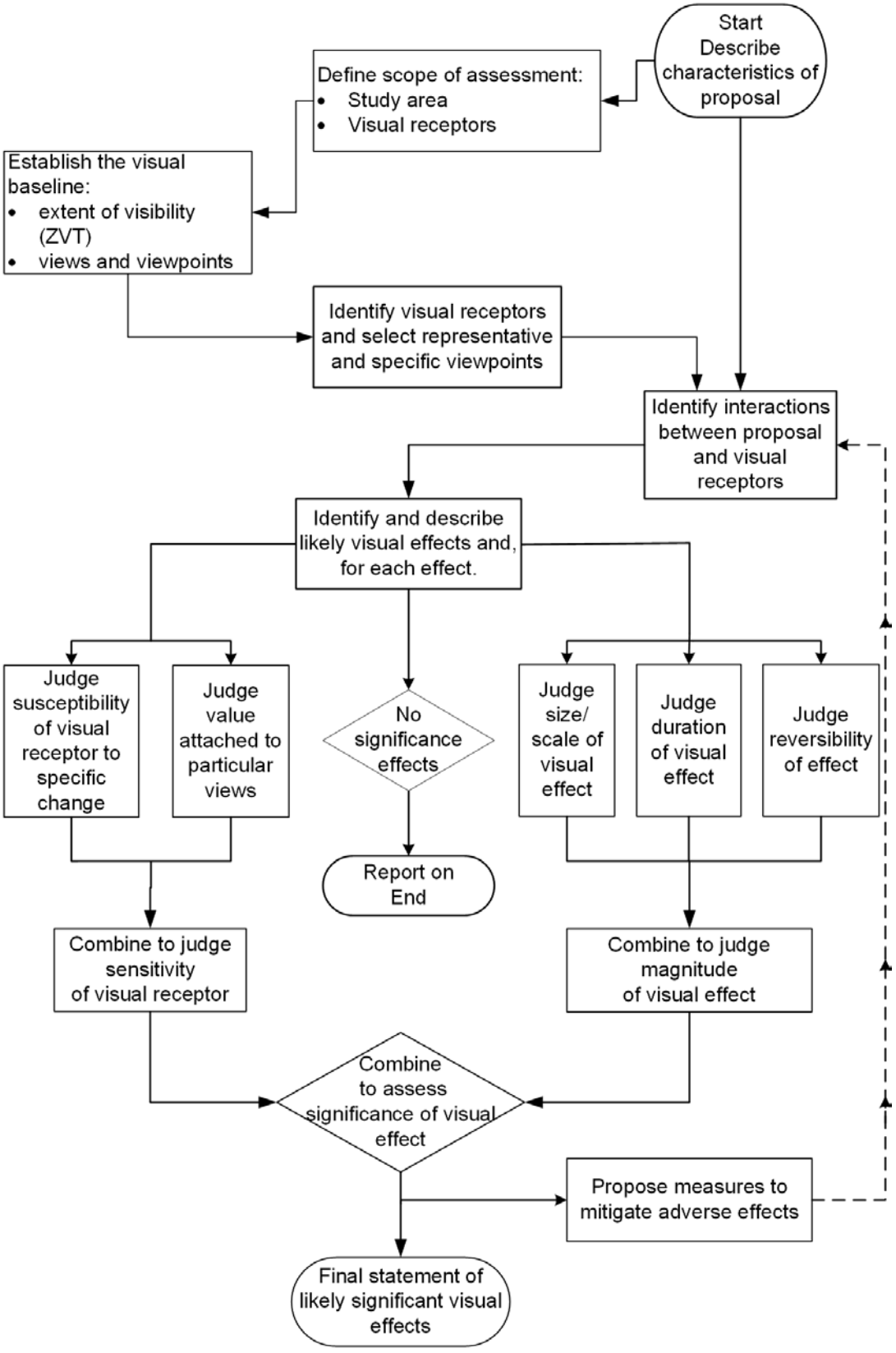
Assessment

3.37 Visual assessment shall record the degree of change in the composition of the view from that which would exist without the project to that which would result as a consequence of the project.

NOTE *Key spatial aspects of visual assessment can be illustrated by means of a ZVI or ZTV plan (or equivalent) together with a visual effects drawing (VED) (or suitable for visualisation) and accompanying visual effects schedule (VES) (depending on the nature of the scheme).*

3.38 The steps in assessing visual effects, as outlined in Figure 3.38 shall be applied to the assessment.

Figure 3.38 Steps in assessing visual effects



3.39 Assessment of sensitivity of the visual receptor shall record judgements of the effect of change in views brought about by the project and its effects on visual receptors in combination with separate projects,

GLVIA 3 GLVIA [Ref 1.I].

NOTE *Determining the susceptibility of different visual receptors to change and the value attached to particular views identified within the ZTV, is of particular importance to the assessment process.*

Significance criteria

3.40 Final judgement of the likely significance of visual effect shall combine judgement of the sensitivity of each visual receptor and the magnitude of their visual effect as a result of the proposed project (Figure 3.38).

3.41 The significance of visual sensitivity shall be reported in the assessment in accordance with the criteria provided in Table 3.41.

Table 3.41 Visual sensitivity (susceptibility and value) and typical descriptions

Sensitivity (susceptibility and value)	Typical descriptions
Very high	1) Static views from and of major tourist attractions; 2) Views from and of very important national/international landscapes, cultural/historical sites (e.g. National Parks, UNESCO World Heritage sites); 3) Receptors engaged in specific activities for enjoyment of dark skies.
High	1) Views by users of nationally important PRoW / recreational trails (e.g. national trails, long distance footpaths); 2) Views by users of public open spaces for enjoyment of the countryside (e.g. country parks); 3) Static views from dense residential areas, longer transient views from designated public open space, recreational areas; 4) Views from and of rare designated landscapes of national importance.
Moderate	1) Static views from less populated residential areas, schools and other institutional buildings and their outdoor areas; 2) Views by outdoor workers; 3) Transient views from local/regional areas such as public open space, scenic roads, railways or waterways, users of local/regional designated tourist routes of moderate importance; 4) Views from and of landscapes of regional importance.
Low	1) Views by users of main roads or passengers in public transport on main arterial routes; 2) Views by indoor workers; 3) Views by users of recreational/formal sports facilities where the landscape is secondary to enjoyment of the sport; 4) Views by users of local public open spaces of limited importance with limited variety or distinctiveness.

Table 3.41 Visual sensitivity (susceptibility and value) and typical descriptions (continued)

Sensitivity (susceptibility and value)	Typical descriptions
Negligible	1) Quick transient views such as from fast moving vehicles; 1) Views from industrial area, land awaiting re-development; 2) Views from landscapes of no importance with no variety or distinctiveness.

NOTE *The flowchart, Steps in assessing visual effects in Figure 3.38, sets out the steps to judging sensitivity; that is to judge susceptibility of the receptor to change and value of the views separately, combining them together to arrive at the sensitivity of the visual receptor or visual sensitivity.*

3.42 Reporting on the magnitude of visual effects shall be informed by the following:

1) scale of change;
2) nature of change;
3) duration of change;
4) distance;
5) screening;
6) direction and focus of the view;
7) year 1 (opening year) and year 15 (design year) including summer and winter;
8) removal of past mitigation or existing vegetation; and
9) whether the receptor is static or moving.

3.43 The magnitude of visual effect shall be reported in the assessment in accordance with the criteria provided in Table 3.43.

Table 3.43 Magnitude (change) of visual effect and typical descriptions

Magnitude (change) of visual effect	Typical descriptions
Major	The project, or a part of it, would become the dominant feature or focal point of the view.
Moderate	The project, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Minor	The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.
Negligible	Only a very small part of the project work or activity would be discernible, or being at such a distance it would form a barely noticeable feature or element of the view.
No change	No part of the project work or activity would be discernible.

3.44 The approach to deriving impact significance from visual sensitivity and magnitude of effects shall be based on the Significance matrix as set out in the Environmental assessment methodology section of LA 104 [Ref 4.N] and include evidence to support any professional judgements that have been made.

NOTE *Mitigation measures can cause visual intrusion themselves (i.e. environmental barriers, earth mounds, lighting, etc.and/or night time effects).*

3.45 For visual sensitivity, 'Environmental value (sensitivity)' LVIA's term for sensitivity shall apply to the vertical column to read instead - 'Visual sensitivity (susceptibility and value)'.

3.46 Assessment of the visual effects of the project and its infrastructure shall include the visual effects of the impacts of any proposed mitigation measures (i.e. environmental barriers, earth mounds, or screening planting).

3.46.1 In determining the magnitude of visual effect (degree of change), it should be agreed prior whether just listing what has been taken into consideration is sufficient or whether some additional explanation is required for clarity.

Cumulative effects

3.47 Cumulative effects, as set out in LA 104 [Ref 4.N] shall establish a project's consequences on key landscape characteristics and visual amenity by examining links between landscape and visual effects, as well as effects identified in other factors (intra-project) and between projects (inter-project).

Design and mitigation

3.48 Design and mitigation hierarchy outlined in LA 104 [Ref 4.N] Environmental assessment and monitoring shall be applied to avoid, reduce or remediate (offset) potential effects on the landscape, views and visual amenity.

3.49 Landscape design shall seek to:

1) reflect the beauty of the natural, built and historic environment through which it passes; and
2) avoid likely significant effects by taking account of the importance and sensitivity of the landscape resource, of views and the visual amenity, their susceptibility and value, to avoid likely significant effects.

3.49.1 Where effects cannot be avoided through alignment/design choices, a mitigation strategy should be developed to reduce the potential effects.

Enhancement

3.50 The LVIA process shall identify enhancement opportunities to form an integral part of project design for improving, reconstructing, and/or restoring the local landscape character and/or visual amenity.

4. Monitoring

4.1 In addition to the requirements found in LA 104 [Ref 4.N], monitoring shall determine the effectiveness of delivery of mitigation measures linked to the landscape or screening commitments agreed as part of the assessment process.

4.2 A handover environmental management plan (HEMP) and/or landscape management plan (LMP), as part of an EMP, shall set out the landscape mitigation measures and commitments agreed to and delivered, together with specific management and/or monitoring requirements over a set period of time stated.

NOTE *A HEMP is an iterative document to be continually updated during the initial environmental and landscape establishment period (aftercare period) and to form the basis for a LMP to agree the management requirements during the routine management period.*

4.3 Monitoring results shall be reported to the Overseeing Organisation and used to update the LMP identifying any necessary non-conforming or remedial actions to be undertaken and the agreed time frame to complete them in.

5. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	Highways England. LA 108, 'Biodiversity'
Ref 2.N	Highways England. LA 106, 'Cultural heritage assessment'
Ref 3.N	2014/52/EU, 'Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment'
Ref 4.N	Highways England. LA 104, 'Environmental assessment and monitoring'
Ref 5.N	Highways England. LA 115, 'Habitats Regulations assessment '
Ref 6.N	Highways England. LA 101, 'Introduction to environmental assessment'
Ref 7.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 8.N	Highways England. LA 103, 'Scoping projects for environmental assessment'
Ref 9.N	Highways England. LA 102, 'Screening projects for Environmental Impact Assessment'
Ref 10.N	Council of Europe, 2000. ELC 2000, 'The European Landscape Convention (2000)'

6. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Routledge. Landscape Institute and the Institute of Environmental Assessment and Management. GLVIA, 'Guidelines for Landscape and Visual Impact Assessment'
Ref 2.I	Landscape Institute. Technical Info Note 08/15 , 'The Landscape Insitute. Technical Information Note 08/15, 'Landscape Character Assessment''
Ref 3.I	Landscape Insitute. LI TN 05/2017, 'Townscape Character Assessment'
Ref 4.I	Landscape Institute. TGN 06/19, 'Visual representation of development proposals'

Design Manual for Roads and Bridges

Sustainability & Environment
Appraisal

LA 114
Climate

(formerly New)

Version 0.0.1

Summary
This document sets out the requirements for assessing and reporting the effects of climate on highways (climate change resilience and adaptation), and the effect on climate of greenhouse gas from construction, operation and maintenance projects.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Latest release notes

Document code	Version number	Date of publication of relevant change	Changes made to	Type of change
LA 114	0.0.**1**	June 2021	Core document, Scotland NAA	Incremental change to notes and editorial updates

This release is for the publication of updated requirements in the Scotland National Application Annex only.

Previous versions

Document code	Version number	Date of publication of relevant change	Changes made to	Type of change
LA 114	0	October 2019		

Foreword

Publishing information

This document is published by Highways England.

This document makes provision for requirements outlined within EU Directive 2011/92/EU as amended by 2014/52/EU 2011/92/EU [Ref 1.N] (hereafter referred to as the EIA Directive) and the Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 10.N].

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

The UK has made commitments to tackle the root cause of climate change by reducing emissions of greenhouse gases (GHG), as well as to increase the resilience of development and infrastructure to the changing climate.

The Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 10.N] sets a target to reduce net GHG emissions by 100% from 1990 levels by the year 2050.

The effective assessment and management of impacts on climate, as well as the effects of climate change on projects offers the opportunity to:

1) improve the resilience of projects to future climate conditions, such as increased risk and severity of flooding, drought, heatwaves, intense rainfall events and other extreme weather events; and
2) reduce the impact of projects on climate by minimising the magnitude of GHG emissions as far as possible.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 6.N] apply to this document.

Abbreviations

Abbreviation	Definition
AADT	Average Annual Daily Traffic
CO_2e	Carbon dioxide equivalent
GHG	Greenhouse gas
PAS2080	Publicly Available Specification (2080): Carbon Management in Infrastructure
tCO_2e	tonnes of Carbon dioxide equivalent
UKCP	United Kingdom Climate Projections

Terms and definitions

Term	Definition
Actual data	GHG emission data derived from recorded / observed activities (rather than predicted)
Adaptive management	A process that enables uncertainty to be included in operational decision-making.
Authorities likely to be concerned	Authorities or organisations (statutory or non-statutory) that have environmental responsibilities or local and regional competences (as defined by the relevant consenting regime)
Benchmarking	Comparison of project performance against other similar projects using consistent metrics
Carbon account	The UK's net carbon emissions
Carbon budgets	UK GHG targets over defined periods of time
Carbon emissions / CO_2e	Shorthand for emissions of any of the seven greenhouse gases (GHGs) that contribute to climate change NOTE 1: Definition from the Kyoto Protocol UNFCCC [Ref 7.N] NOTE 2: Carbon emissions are usually expressed as CO_2e (carbon dioxide equivalent).
Climate	Long-term weather conditions prevailing over a region NOTE: Measured in terms of average precipitation, maximum and minimum seasonal temperatures, and other factors, throughout a year
Construction GHG emissions	GHG emissions associated with the construction phase of a project
Decommissioning	The act of ceasing operation of an asset to a non-active status
Disruption: national level	Closure/partial /obstruction of a strategic route restricting/preventing movement across multiple regions/counties
Disruption: regional level	Closure/partial/obstruction of a strategic route restricting/preventing movement within a region or county
Embodied carbon	Carbon (GHG) emissions associated with energy consumption and chemical processes during the extraction, transport and/or manufacture of construction materials or products NOTE: Typical embodied carbon datasets are 'cradle-to-gate' (i.e. all emissions to the point of delivery from the factory gate) and expressed in kilograms of CO_2e per kilogram of product or material.
Extreme weather	A weather event which is significantly different from the average or usual weather pattern
Future baseline	An outline of the likely evolution of the current state of the environment without implementation of the project
Greenhouse gas (GHG)	A gaseous compound that absorbs infrared radiation and traps heat in the atmosphere NOTE: Greenhouse gases are usually expressed in terms of carbon dioxide equivalents (see 'carbon emissions').

(continued)

Term	Definition
H++ climate scenarios	Extreme climate change scenarios on the margins or outside of the 10th to 90th percentile range presented in the 2009 UK Climate Projections: Briefing Report UK CP18 [Ref 3.N]
Low carbon	Activities/assets which minimise carbon footprint
Material impact	An event/outcome that is a key decision making consideration
Net GHG emissions	The difference in GHG emissions between the do minimum and do something scenarios taking into consideration carbon reduction measures (i.e. mitigation measures)
Operational GHG emissions	GHG emissions associated with 1) the operation and maintenance of the asset, i.e. lighting, maintenance activities etc); and 2) users of the asset (i.e vehicle emissions)
Regional	Geographical regions in the United Kingdom Climate Projections as follows: 1) North East England; 2) North West England; 3) Yorkshire and the Humber; 4) East Midlands; 5) West Midlands; 6) East of England; 7) London; 8) South East England; 9) South West England; 10) Wales; 11) Scotland; and 12) Northern Ireland.
Resilience	The capacity of a project (or lack thereof) to withstand the adverse effects of climate change
Trans-boundary impacts	Any adverse effect on the environment resulting from human activity, the physical origin of which is situated wholly or in part within an area under the jurisdiction of another State
UKCP	The name given to the UK Climate Projections NOTE 1: provides the future climate projections and observed (historical) climate data for UK regions. NOTE 2: This will in turn be superseded by updates such as UK CP18 [Ref 3.N].
Vulnerability	The degree to which a system/asset is exposed and resilient to adverse effects of climate change

1. Scope

Aspects covered

1.1 The requirements in this document shall be applied to the assessment, reporting and management of effects from projects on climate, along with the effects of climate on projects.

1.2 Environmental assessments must, as required by the EIA Directive 2011/92/EU [Ref 1.N], describe the likely significant effects of proposed projects on the environment resulting from the:

1) impact of the project on climate (GHG emissions); and,
2) vulnerability of the project to climate change (adaptation).

1.3 The assessment of effects on climate shall be informed by relevant information collated by other environmental factors, notably material assets and waste.

1.4 The assessment of effects on climate shall be used to inform other environmental factors where appropriate.

1.5 The assessment of climate effects on the project shall be used to inform the assessment of project vulnerability to major accidents and disasters where appropriate.

1.6 An overview of the vulnerability of a project to major accidents and disasters (man-made and natural) shall be reported in environmental assessments within the description of the project.

1.7 Consequential changes in the predicted effects of a project on the environment as a result of major accidents and disasters shall be reported in relevant environmental topics.

Implementation

1.8 This document shall be implemented forthwith on all schemes requiring an assessment of climate on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 6.N].

Use of GG 101

1.9 The requirements contained in GG 101 [Ref 6.N] shall be followed in respect of activities covered by this document.

2. Principles and purpose

Integration with consent procedures and planning policy

2.1 Projects shall use the assessment and design process to demonstrate their contribution to reduced GHG emissions in line with the EIA Directive 2011/92/EU [Ref 1.N] and the Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 10.N].

NOTE 1 The Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 10.N], sets out a target to reduce by 100% the net UK carbon account by 2050 when compared to the 1990 baseline, or the baseline of the relevant transposing national regulations.

NOTE 2 The assessment of GHG emissions early in the life cycle of a project offers the greatest potential for the reduction of GHGs.

Assessment and consultation

2.2 The assessment and reporting shall identify the scale and nature of GHG emissions across the whole project life cycle, taking into account design and mitigation measures already incorporated into the project.

2.2.1 The assessment should report on construction and operational (maintenance and user) GHG emissions.

2.3 Decommissioning associated with a proposed project shall be excluded from assessment of climate (for both impacts on climate and vulnerability of projects to climate change) due to the length of the asset operational phase.

2.3.1 The assessment of climate should report on demolition where an existing asset requires removal prior to construction of a proposed asset.

2.4 Projects shall minimise their vulnerability against the negative effects of projected climate change through appropriate design and mitigation measures.

2.5 The assessment and reporting of the effects on climate shall be undertaken in accordance with the sustainability principles outlined in GG 103 [Ref 4.N].

2.6 The assessment and reporting of the effects on climate shall be undertaken in accordance with the requirements in the four over-arching environmental assessment documents:

1) LA 101 [Ref 5.N] Introduction to environmental assessment;
2) LA 102 [Ref 9.N] Screening projects for Environmental Impact Assessment;
3) LA 103 [Ref 8.N] Scoping projects for environmental assessment;
4) LA 104 [Ref 2.N] Environmental assessment & monitoring.

2.7 The principles of PAS 2080:2016 specification on infrastructure carbon management PAS 2080 2016 [Ref 1.I] (with the exception of setting project level carbon reduction targets) shall be used to inform the assessment of projects on climate and supplement the guidance contained herein.

2.8 Where potential trans-boundary impacts are predicted, projects shall consult with the relevant planning authorities likely to be concerned.

3. Assessment methodology

Impact of projects on climate (GHG Emissions)

Scoping

3.1 The scoping assessment shall report on the likely additional and avoided GHG emissions at each life cycle stage of the project, in comparison with current and future baseline GHG emissions.

3.2 The scoping assessment shall report on the nature and scale of GHG emissions (positive, neutral or negative) and the likelihood of significant effects.

3.3 The scoping assessment shall report on the following questions to gain an understanding of the need to undertake further assessment:

1) are construction GHG emissions (or GHG-emitting activity), compared to the baseline scenario (i.e. when compared to GHG emissions and energy use associated with existing maintenance activities), increasing by >1%?;
2) during operation, will roads meet or exceed any of the following criteria?
    a) a change of more than 10% in AADT;
    b) a change of more than 10% to the number of heavy duty vehicles; and
    c) a change in daily average speed of more than 20 km/hr.

3.4 Where the response to one or more of the scoping assessment questions is 'yes', further assessment shall be undertaken.

3.5 The scoping assessment shall report on life cycle stage or sub-stages for which the GHG emissions are not likely to be significant.

3.5.1 The scoping assessment should address the following:

1) is there (or is there likely to be, within the timescales of the assessment) sufficient certainty on the availability of quantitative GHG emissions information?;
2) will the availability of information allow the effects on climate resulting from GHG emissions to be assessed?

3.6 The scoping assessment shall identify the extent to which operational user GHG emissions are additional to the baseline in the absence of the project (do-minimum vs do-something), and the GHG emissions from traffic which are transferring from other roads in the surrounding area.

3.7 Where there is insufficient, reliable information for quantitative assessment for any life cycle stage of the project, a qualitative assessment of GHG emissions shall be completed in the early stages of project development.

Study area

3.8 For construction and operational maintenance, the study area shall comprise GHG emissions associated with project construction related activities/materials and their associated transport.

3.9 For operational road user GHG emissions, the study area shall be consistent with the affected road network defined in a project's traffic model.

Baseline scenario

3.10 The GHG emissions without the project shall be identified for the current and future baseline (do-minimum scenarios).

3.10.1 The boundary of the baseline GHG emissions should include current operational maintenance GHG emissions and operational user GHG emissions.

3.10.2 The baseline GHG emissions should be consistent with the study area outlined for the project.

Data collection

3.11 GHG emissions shall be calculated and reported for each of the project life cycle stages as required by the scope of the assessment to establish the 'do something' scenario.

3.11.1 Table 3.11.1 outlines the project life cycle stages and potential sources of GHG emission data that should be obtained to inform the assessment.

Table 3.11.1 Sources and lifecycle stages for project GHG emissions

Main stage of project life cycle	Sub-stage of life cycle	Potential sources of GHG emissions (not exhaustive)	Examples of activity data
Construction stage	Product stage; including raw material supply, transport and manufacture.	Embodied GHG emissions associated with the required raw materials.	Materials quantities.
	Construction process stage; including transport to/from works site and construction /installation processes.	Activities for organisations conducting construction work.	Fuel/electricity consumption. Construction activity type/duration. Transportation of materials from point of purchase to site, mode/distance. Area of land use change.
	Land use change.	GHG emissions mobilised from vegetation or soil loss during construction.	Type and area of land subject to change in usage.
Operation ('use-stage') (to extend 60yrs in line with appraisal period)	Use of the infrastructure by the end-user (road user).	Vehicles using highways infrastructure.	Traffic count/speed by vehicle type for highway links.
	Operation and maintenance (including repair, replacement and refurbishment).	Energy consumption for infrastructure operation and activities of organisations conducting routine maintenance.	Fuel/electricity consumption for vehicles, lighting and plant. Raw material quantities and transport mode/distance. Waste and arisings quantities, transport mode/distance and disposal fate.
	Land use and forestry.	Ongoing land use GHG emissions/ sequestration each year.	Type and area of land subject to change in usage. Net change in vegetation.
Opportunities for reduction	GHG emissions potential of recovery including reuse and recycling GHG emissions potential of benefits and loads of additional functions associated with the study system.	Avoided GHG emissions through substitution of virgin raw materials with those from recovered sources.	Waste and arisings material quantities and recycling/reuse fate.

NOTE 1 The first life cycle stage is 'construction', which includes GHG emissions from the construction process and the manufacture/transport of materials.

NOTE 2 The second life cycle stage is 'operation' which includes:

1) *operation and maintenance, repair, replacement, refurbishment and land use changed (operational maintenance GHG emissions); and*
2) *emissions from end-users (operational user GHG emissions).*

NOTE 3 The third life cycle stage comprises opportunities to minimise production/use of GHG emissions i.e. the potential for reduction of GHG emissions through reuse and recycling during the construction of the scheme.

3.12 A proportionate approach shall be applied to calculating and reporting GHG emissions from changes in land use and forestry (i.e reporting only where there is likely to be a substantial change).

3.13 The GHG emissions calculation for the project life cycle shall be completed using an industry recognised carbon calculation tool(s) in accordance with the Overseeing Organisation requirements.

3.14 A proportionate approach shall be applied to capture the principal contributing factors associated with GHG emissions.

3.15 The assessment of projects on climate shall report the quantities of GHG emissions in metric tonnes of carbon dioxide equivalents (tCO2e).

3.16 An appropriate validated traffic model shall be used to estimate operational road user GHG emissions.

3.17 Emissions factor data for user GHG emissions shall enable assessment of the base year, opening year and design (future) year scenarios.

Significance criteria

3.18 An assessment of project GHG emissions against UK government or Overseeing Organisation carbon budgets shall be undertaken and presented as follows:

Table 3.18 Project GHG emissions against relevant carbon budgets

Project stage	Estimated total carbon over carbon budget (tCO2e) ('Do something' Scenario)	Net CO2 project GHG emissions (tCO2e) (Do something - Do minimum)	Relevant carbon budget		
Construction					
Operation					
Total					

3.19 Where a project stage extends over multiple carbon budget periods, the projects GHG emissions shall be reported against each carbon budget for each project stage.

NOTE 1 National policy states that "It is very unlikely that the impact of a road project will, in isolation, affect the ability of Government to meet its carbon reduction plan targets".

NOTE 2 In the context of NOTE 1, it is considered unlikely that projects will in isolation conclude significant effects on climate.

3.20 The assessment of projects on climate shall only report significant effects where increases in GHG emissions will have a material impact on the ability of Government to meet its carbon reduction targets.

3.20.1 Where assessment conclusions indicate that there is likely to be a 'material impact' on the Government's carbon reduction targets, evidence to support this conclusion should be submitted to the Overseeing Organisation.

3.21 Bench marking of project performance shall be undertaken by comparing GHG emissions to other highway projects.

3.21.1 In comparing highways projects, GHG emissions should be normalised to take account of differences in size and scale.

Design and mitigation

3.22 Projects shall seek to minimise GHG emissions in all cases to contribute to the UK's target for net reduction in carbon emissions.

3.22.1 Projects should apply and develop the following options:

1) avoid / prevent:
   a) maximise potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required, and/or explore alternative lower carbon options to deliver the project objectives (i.e. shorter route options with smaller construction footprints);
   b) identify through projects and delivery programmes opportunities to influence user GHG emissions;
2) reduce:
   a) apply low carbon and/or reduced resource consumption solutions (including technologies, materials and products) to minimise resource consumption during the construction, operation, and at end of life;
3) remediate:
   a) identify, assess and integrate measures to further reduce carbon through on or off-site offsetting or sequestration.

NOTE 1 Minimising GHG emissions through design is a core principle of the Government's Infrastructure Carbon Review and the Specification on infrastructure carbon management PAS 2080 2016 [Ref 1.I].

NOTE 2 Offsetting and sequestering can include measures such as adoption of renewable energy technologies or the creation of new habitats or employment of technologies with the capacity to absorb carbon.

3.23 Where carbon offsetting/sequestration is employed to reduce GHG emissions, projects shall agree the long term viability of the scheme with the Overseeing Organisation.

Vulnerability of projects to climate change

Scoping

3.24 The scoping assessment shall identify whether anticipated changing climate conditions and weather events are likely to have significant adverse effects on the project (or elements of the project) during construction and operation.

NOTE 1 Scoping will focus on identification of any likely significant climate changes and likely project exposure to these changes.

NOTE 2 Scoping will identify vulnerable elements of a project that require further assessment.

Study area

3.25 The study area for assessing a project's vulnerability to climate change shall be based on the construction footprint/project boundary (including compounds and temporary land take).

Baseline scenario

3.26 The assessment of a project's vulnerability to climate change shall use published historical regional weather data to demonstrate the current climate impacts on a study area.

NOTE The Met Office provides information on observed and future climate change relative to the baseline period of 1961-1990, based on the latest scientific understanding UK CP18 [Ref 3.N].

3.26.1 Recent weather patterns and extreme weather events should be identified, to provide an indication of how the project will account for climate change in the immediate future i.e. during construction.

3.27 Historical events as a result of weather patterns and extreme weather events, i.e. landslides after heavy rainfall, shall be identified to provide an indication of past vulnerability.

3.28 To identify the future changes to the climate baseline, the following factors shall be identified and used in the assessment:

1) the life span of the project (including timescales for construction and operational life cycle stages);
2) climate trends associated with the UKCP high emissions scenario (50% probability) projection (using the latest available projections);
3) the environmental baseline under future projected climate conditions.

NOTE *UKCP provides probabilistic projections for the whole of the UK, at regional level and at local level UK Climate Projections.*

3.29 The relevant climate variables shall be identified and included in the assessment.

NOTE *UKCP includes a range of different climate variables (e.g. mean daily temperature for summer and winter, mean daily maximum temperatures for summer and mean daily minimum temperatures for winter).*

3.30 Assessments shall use the H++ climate scenarios to test the sensitivity of vulnerable safety critical features, to ensure that such features will not be affected by more radical changes to the climate beyond that projected in the latest set of UK climate projections.

3.31 The assessment of a project's vulnerability to climate change shall take the life span of the project to be 60 years.

3.32 The life cycle stages being assessed shall determine the relevant period over which the projections are selected (e.g. short term 2030, medium term 2050, long term 2080), and the extent to which they will change in comparison to the baseline.

3.33 For projects which are expected to remain in operation beyond the last period of projections, the assessment shall continue to use the last available period for the remainder of the design life of the project.

Data collection

3.34 Following identification of the future climate scenarios, the project receptors within the study area which are vulnerable to climate change shall be identified as below:

1) the construction process (e.g. workforce, plant, machinery etc);
2) the assets and their operation, maintenance and refurbishment (e.g. pavements, structures, earthworks and drainage, technology assets, etc);
3) end-users (e.g. members of public, commercial operators etc).

3.35 The vulnerability of the project to future climate scenarios shall be identified and reported for each phase of the project life cycle.

NOTE *Examples of climate change events and associated impacts that can be assessed during construction and operation are presented in Table 3.35N (not exhaustive).*

Table 3.35N Examples of potential climate impacts during construction and operation

Climate event	Impact
Construction	
Increased frequency of extreme weather.	1) Damage, delay, health and safety impacts, increased costs.
Increased temperatures, prolonged periods of hot weather.	1) Warm and dry conditions exacerbate dust generation and dispersion, health risks to construction workers.
Increased precipitation, and intense periods of rainfall.	1) Flooding of works and soil erosion; 2) Increased risk of contamination of waterbodies; 3) Disruption to supply of materials and goods; 4) Landslides
Operation	
Increased precipitation, especially in Winter.	1) Flooding; 2) Water scour causing structural damage; 3) Weakening or wash-out of structural soils; 4) Change in ground water level and soil moisture.
Gales.	1) Damage from wind borne debris; 2) Additional or uneven loading of structures; 3) Disruption and potential danger to crossing users (including pedestrians and cyclists); 4) Damage to trees / landscaping.
Temperature extremes / dry periods.	1) Stress on structures and technology; 2) Stress on surfaces e.g. difficulties with maintaining required texture depth during construction and operation; 3) Challenges for maintenance regimes.

Table 3.35N Examples of potential climate impacts during construction and operation (continued)

Climate event	Impact
Increased sea level rise and wave height.	1) Flooding, increased corrosion potential/impact stress of structures supporting water crossings.
Increased frequency of extreme weather events.	1) Increased requirement for maintenance and 0pt repair, danger to road users; 2) Increased costs.

Significance criteria

3.36 Where the climate change impact on project receptors is potentially significant, a risk assessment shall be undertaken.

3.37 The risk assessment shall assess the likelihood and consequence of the impact occurring to each receptor, leading to evaluation of the significance of the effect.

3.38 The assessment of significance shall be carried out in accordance with the following steps:

1) the identification of hazards and benefits;
2) assessment of likelihood and consequences;
3) evaluation of significance.

3.39 Once the climate change impacts (hazards and opportunities) have been identified, a risk assessment of those impacts on the operational phase project shall be undertaken using the following framework in Table 3.39a (likelihood categories) and Table 3.39b (measure of consequence).

Table 3.39a Likelihood categories

Likelihood category	Description (probability and frequency of occurrence)
Very high	The event occurs multiple times during the lifetime of the project (60 years) e.g. approximately annually, typically 60 events.
High	The event occurs several times during the lifetime of the project (60 years) e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the project (60 years) e.g. approximately once every 15 years, typically 4 events.
Low	The event occurs during the lifetime of the project (60 years) e.g. once in 60 years.
Very low	The event can occur once during the lifetime of the project (60 years).

Table 3.39b Measure of consequence

Consequence of impact	Description
Very large adverse	Operation - national level (or greater) disruption to strategic route(s) lasting more than 1 week.
Large adverse	Operation - national level disruption to strategic route(s) lasting more than 1 day but less than 1 week or regional level disruption to strategic route(s) lasting more than 1 week.
Moderate adverse	Operation - regional level disruption to strategic route(s) lasting more than 1 day but less than 1 week.
Minor adverse	Operation - regional level disruption to strategic route(s) lasting less than 1 day.
Negligible	Operation - disruption to an isolated section of a strategic route lasting less than 1 day.

3.40 For the construction phase, a qualitative description of disruption risk shall be reported.

Evaluation of significance

3.41 The likelihood and consequence of each impact shall be combined in the form of a matrix to identify the significance of each impact as outlined in table 3.41.

Table 3.41 Significance matrix

		Measure of likelihood				
		Very low	Low	Medium	High	Very high
Measure of consequence	Very large	NS	S	S	S	S
	Large	NS	NS	S	S	S
	Moderate	NS	NS	S	S	S
	Minor	NS	NS	NS	NS	NS
	Negligible	NS	NS	NS	NS	NS

NOTE *NS = Not significant; S = Significant.*

3.42 Significance conclusions for each impact shall be based on and incorporate confirmed design and mitigation measures.

Design and mitigation

3.43 The environmental assessment shall identify how the project can be adapted to protect it from future climate scenarios.

NOTE *Early engagement between design engineers and environmental assessment professionals is the most effective way of eliminating and reducing impacts on the project from climate, thereby reducing the need for additional / subsequent design and mitigation measures.*

3.44 Where an effect has been concluded to be significant, the design and mitigation hierarchy outlined within LA 104 [Ref 2.N] shall be re-assessed to reduce the significance of impacts to an acceptable level (not significant).

3.45 Where residual (non-significant) climate impacts have been identified in the environmental assessment, measures to manage the ongoing risks shall be identified.

4. Monitoring

Impact of projects on climate

4.1 Quarterly GHG emission returns required on projects during the construction and operation stages shall be reported in accordance with the Overseeing Organisation's requirements.

4.2 Actual data provided for the GHG returns shall be evaluated to inform any ongoing monitoring of GHG emissions and also feed back into future assessment of projects during design development and planning approval.

Vulnerability of projects to climate change

4.3 Once a project is operational, asset data shall be managed, maintained and monitored to ensure the project design is operating as intended.

NOTE *Asset management measures can evolve (adaptive management) once the asset is operational as an appropriate response to climate impacts.*

4.3.1 Where a design issue is identified, an assessment should be made to determine if corrective action is required, i.e. drainage amendments to rectify a flooding hotspot that was not anticipated at design stage.

5. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	2011/92/EU, 'Assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014'
Ref 2.N	Highways England. LA 104, 'Environmental assessment and monitoring'
Ref 3.N	UK Met Office. UK CP18 , 'https://www.metoffice.gov.uk'
Ref 4.N	Highways England. GG 103, 'Introduction and general requirements for sustainable development and design'
Ref 5.N	Highways England. LA 101, 'Introduction to environmental assessment'
Ref 6.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 7.N	United Nations. United Nations Framework Convention on Climate Change. UNFCCC, 'Kyoto Protocol'
Ref 8.N	Highways England. LA 103, 'Scoping projects for environmental assessment'
Ref 9.N	Highways England. LA 102, 'Screening projects for Environmental Impact Assessment'
Ref 10.N	The National Archives. legislation.gov.uk. SI No. 1056 CCA 2008, 'The Climate Change Act 2008 (2050 Target Amendment) Order 2019'

6. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	HM Treasury . Construction Leadership Council. PAS 2080, 'Carbon Management in Infrastructure' , 2016

Sustainability & Environment
Appraisal

LA 114
England National Application Annex to LA 114 Climate

Revision 0

Summary
There are no specific requirements for Highways England supplementary or alternative to those given in LA 114.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Oct 2019	Highways England National Application Annex to LA 114.

Design Manual for Roads and Bridges

Sustainability & Environment
Appraisal

LA 114
Northern Ireland National Application Annex to LA 114 Climate

Revision 0

Summary
There are no specific requirements for Department for Infrastructure Northern Ireland supplementary or alternative to those given in LA 114.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

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Contents

Release notes

Version	Date	Details of amendments
0	Oct 2019	Department for Infrastructure, Northern Ireland National Application Annex to LA 114.

Design Manual for Roads and Bridges

Sustainability & Environment
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LA 114 SNAA
Scotland National Application Annex to LA 114 Climate

(formerly New)

Version 1.0.0

Summary
This National Application Annex sets out Transport Scotland's specific requirements for the assessment and management of the impacts that road projects can have on, and experience from, climate change.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Transport Scotland team. The email address for all enquiries and feedback is: TSStandardsBranch@transport.gov.scot

This is a controlled document.

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Latest release notes

Document code	Version number	Date of publication of relevant change	Changes made to	Type of change
LA 114 SNAA	**1**.0.0	June 2021	Scotland NAA	Change to policy, major revision, new document development
(June 2021) Transport Scotland requirements for LA 114 created and published.				

Previous versions

Document code	Version number	Date of publication of relevant change	Changes made to	Type of change

Foreword

Publishing information

This document is published by Highways England on behalf of Transport Scotland.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

This National Application Annex outlines the Transport Scotland-specific requirements related to the assessment and management of the impacts that road projects can have on, and experience from, climate change in the context of Directive 2014/52/EU (hereafter referred to as the EIA Directive) 2014/52/EU [Ref 1.N].

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 5.N] apply to this document.

Abbreviations

Abbrreviations

Abbreviation	Definition
CAT	Carbon account for transport
CCRA	Climate Change Risk Assessment for Scotland
CMS	Carbon Management System
EIA	Environmental impact assessment
GHG	Greenhouse gas
UKCP	UK climate projections

Terms and definitions

Terms

Term	Definition
Baseline scenario	The baseline is the level of GHG emissions against which future GHG emissions are compared.
Boundary	The boundary determines which GHG emissions are accounted for and reported in relation to the project.
Climate change adaptation	Adapting to current and future impacts of climate change to reduce the negative impacts and exploit opportunities.
Climate change mitigation	Reducing GHG emissions in order to slow or stop global climate change.
Direct GHG emissions	These are GHG emissions that originate from sources that are owned or controlled by the project.
Indirect GHG emissions	Indirect emissions are GHG emissions that are a consequence of the project, but that occur at sources owned or controlled by another entity.
GHG emissions	The six main anthropogenic GHGs are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.
Principles for sustainable land use	Reflect Scottish Government's policies on the priorities which should influence land use choices SG/2016/6 [Ref 8.N].
Significant effect	A project is reported as having significant effects on climate where the assessment identifies increases in carbon emissions that will have a material impact on the ability of the Scottish Government to meet its carbon targets.
Tonne of carbon dioxide equivalent	This refers to one metric tonne of carbon dioxide or an amount of any other greenhouse gas with an equivalent global warming potential, as calculated in accordance with international carbon reporting practice.

S/1. The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017 (additional to LA 114)

Identification, description and assessment of climate impacts

S/1.1 The significant direct and indirect effects of the construction and operation of the proposed project on climate (for example the nature and magnitude of greenhouse gas (GHG) emissions) shall be identified.

Data collection

S/1.2 A carbon management or measurement tool shall be agreed with Transport Scotland in advance of data collection.

S/1.2.1 Transport Scotland's Carbon Management System (CMS), which was created to support the use of data in Transport Scotland project appraisal and design decisions, should be used to ensure that GHG emissions across a project's life-cycle are assessed in a consistent manner.

NOTE 1 The Transport Scotland Project Carbon Tool, a component of the CMS, can be used to support the assessment and reporting of GHG emissions across the whole project lifecycle and recommends:

1) *a boundary for GHG emissions mapping for road projects, including with regard to embodied carbon (material resourcing, processing and manufacturing);*
2) *transport of materials to site, transport of waste; and*
3) *maintenance activities.*

NOTE 2 The CMS:

1) *supports the identification and categorisation of emissions in relation to the 'activities' that are responsible for generating them;*
2) *is based on established measurement protocols that allow for quantification of climate impacts using a carbon dioxide equivalent approach; and*
3) *lists dimensions and assumptions associated with specific elements of road projects.*

S/1.3 The climate change principles for sustainable land use introduced in the Land Use Strategy for Scotland SG/2016/6 [Ref 8.N] shall be applied in the assessment of projects that will have a significant effect on the use of land.

NOTE 1 The Land Use Strategy SG/2016/6 [Ref 8.N], states that 'land-use decisions can be informed by an understanding of the opportunities and threats brought about by the changing climate.' Greenhouse gas emissions associated with land use can be reduced so that land can continue to contribute to delivering climate change adaptation and mitigation objectives.

NOTE 2 The climate change effects identified in assessments can reflect the potential for decisions that affect land-use to create an impact, including on natural systems, many miles away.

Significance criteria

S/1.4 Following the assessment of a project's GHG emissions using the criteria in LA 114 [Ref 2.I], the relevant carbon budget shall be assessed against the emissions envelope's within the Scottish Government's Climate Change Plan SG RPP3 [Ref 3.N].

NOTE The Scottish Government's targets identified in the Climate Change Plan were established using the TIMES model with envelopes calibrated by Scottish specific data and sector intelligence.

Vulnerability of projects to climate change

S/1.5 The Climate Change Risk Assessment 2017 (CCRA) ASC (2016) [Ref 9.N] and The UK Climate Projections (UKCP) UK CP18 [Ref 4.N] shall inform the environmental assessment's assessment of project vulnerability to climate change in Scotland.

NOTE 1 *CCRA 2017 ASC (2016) [Ref 9.N] describes, and where possible quantifies over 130 impacts from climate change that Scotland will experience until 2100 and it is updated every five years.*

NOTE 2 *The UK Climate Projections (UKCP) UK CP18 [Ref 4.N] is an analysis tool designed to help decision makers assess the risk exposure of a project to climate. The projections are updated on a 9 year basis.*

NOTE 3 *The (CCRA) 2017 ASC (2016) [Ref 9.N], provides a robust basis for understanding the impacts of climate change and for adaptation planning.*

Design and mitigation

S/1.6 Impacts of climate change to a project shall take into account the Climate Ready Scotland: Scottish Climate Change Adaptation Programme 2019-2024 SG/2014/83 [Ref 7.N], which sets out policies and proposals to prepare Scotland for the challenges that we face as our climate continues to change in the decades ahead.

NOTE 1 *The Scottish Climate Change Adaptation Programme is a requirement of the Climate Change (Scotland) Act 2009 and addresses the risks set out in the CCRA 2017 ASC (2016) [Ref 9.N], published under section 56 of the UK Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 6.N].*

NOTE 2 *The Scottish Climate Change Adaptation Programme sets strategic principles that can underpin approaches to climate change adaptation and related measures, relating to direct and indirect effects of climate change impacts to road infrastructure .*

S/2. Scottish Government climate change targets (additional to LA 114)

S/2.1 The assessment of projects on climate shall only report substantial effects where increases in GHG emissions will have a significant impact on the environment and the Scottish Government's ability to meet its carbon emission targets CCA(S) 2009 [Ref 2.N].

S/2.2 The GHG emission reduction targets set by Scottish Ministers, as mandated by The Climate Change (Scotland) Act 2009 CCA(S) 2009 [Ref 2.N] shall be taken into account with the respective contributions towards meeting the GHG reduction targets for the industry sector SG Climate policy [Ref 3.I].

NOTE 1 The significance criteria set out in LA 114 [Ref 2.I] will be used to assess project GHG emissions, however this will be assessed against Scottish Government sector targets set in the updated Climate Change Plan SG RPP3 [Ref 3.N] (due to be published).

NOTE 2 The Climate Change (Scotland) Act 2009 CCA(S) 2009 [Ref 2.N], which is the statutory framework for addressing climate change in Scotland, details a target to reduce GHG emissions to net-zero by 2045 on the baseline (which is either 1990 or 1995 depending on the GHG) in line with that of the UK's Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 6.N].

NOTE 3 The Climate Change (Scotland) Act 2009 CCA(S) 2009 [Ref 2.N] employs the unit 'tonnes of carbon dioxide equivalent for measurement and calculation of GHG emissions, and reductions thereof, as calculated in accordance with international carbon reporting practice.

NOTE 4 The Carbon Account for Transport (CAT) TS CAT [Ref 1.I], which is published by Transport Scotland annually, outlines the contribution of Scotland's transport sector to achieving Scotland's GHG emission reduction target (it reports on the 'reducing emissions' strategic outcome for Scotland's National Transport Strategy) and can be used for comparative purposes.

S/3. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	2014/52/EU, 'Assessment of the effects of certain public and private projects on the environment'
Ref 2.N	CCA(S) 2009, 'Climate Change (Scotland) Act 2009'
Ref 3.N	Scottish Government. https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018/. SG RPP3, 'Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3)'
Ref 4.N	UK Met Office. UK CP18 , 'https://www.metoffice.gov.uk'
Ref 5.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 6.N	The National Archives. legislation.gov.uk. SI No. 1056 CCA 2008, 'The Climate Change Act 2008 (2050 Target Amendment) Order 2019'
Ref 7.N	SG/2014/83, 'The Scottish Government (2014) Climate Ready Scotland: Scottish Climate Change Adaptation Programme. SG/2014/83 [laid before the Scottish Parliament under Section 53 of the Climate Change (Scotland) Act 2009]'
Ref 8.N	SG/2016/6 , 'The Scottish Government (2016) Getting the best from our land. A Land Use Strategy for Scotland 2016 – 2021. SG/2016/6 [in pursuance of Section 57 of the Climate Change (Scotland) Act 2009].'
Ref 9.N	Committee on Climate Change, London. Adaptation Sub-Committee. ASC (2016), 'UK Climate Change Risk Assessment 2017, Evidence Report, Summary for Scotland'

S/4. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Transport Scotland. https://www.transport.gov.scot/publication/carbon-account-for-transport-no-12-2020-edition/. TS CAT, 'Carbon Account for Transport (CAT)'
Ref 2.I	Highways England. LA 114, 'Climate'
Ref 3.I	Scottish Government. https://www.gov.scot/policies/climate-change/. SG Climate policy, 'Climate Change policy'

Llywodraeth Cymru
Welsh Government

Sustainability & Environment
Appraisal

LA 114
Wales National Application Annex to LA 114 Climate

Revision 0

Summary
There are no specific requirements for Welsh Government supplementary or alternative to those given in LA 114.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Welsh Government team. The email address for all enquiries and feedback is: Standards_Feedback_and_Enquiries@gov.wales

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