



Norwich Western Link

Environmental Statement

Chapter 15: Climate - Greenhouse Gases

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Glossary of Abbreviations and Defined Terms

The definition of key terms used in this report are provided below. These definitions have been developed by reference to the definitions used in EU and UK legislation and guidance relevant to greenhouse gas as well as professional judgement based on knowledge and experience of similar schemes in the context of the Proposed Scheme.

Term	Definition
Baseline	Greenhouse gas emissions baseline that represents the reference point against which future greenhouse gas emissions performance will be measured.
Carbon	Generic term used traditionally in carbon footprinting parlance to describe the combination of greenhouse gas emissions reported as carbon dioxide equivalent (CO ₂ e).
Carbon dioxide	Both a naturally occurring gas and one of the most abundant greenhouse gases in the atmosphere, and a by-product of industrial processes, combustion of fossil fuels and land use changes.
Carbon dioxide equivalent	The universal unit of measurement to indicate the global warming potential (GWP) of GHGs, expressed in terms of the GWP of one unit of carbon dioxide. For the purposes of this assessment, carbon dioxide is taken to be equivalent to the common greenhouse gases, as defined in the Kyoto Protocol, 1997.
Climate Change	A pattern of change affecting global or regional climate, measured by criteria such as average temperature and rainfall, and / or changes in the frequency and intensity of extreme weather conditions and events. This variation is caused by both natural processes (e.g. volcanic activity) and human activity. Global warming is one aspect of climate change.



Term	Definition
Embodied carbon	Emissions occurring as a result of raw material extraction, processing, manufacture and transportation of materials and goods within the supply chain up to the point of the final factory gate.
Global warming potential	The GWP was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of 1 tonne of a gas would absorb over a given period of time, relative to the emissions of 1 tonne of CO ₂ . The larger the GWP, the more that a given gas warms the Earth compared to CO ₂ over that time period.
Greenhouse gas emissions	Defined by the IPCC as ‘those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit [infrared] radiation’. The Kyoto Protocol identifies the seven main greenhouse gases as: carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (N ₂ O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF ₆) and nitrogen trifluoride (NF ₃).
Net zero	Refers to the balance between the amount of greenhouse gas produced and the amount removed from the atmosphere. When the amount of greenhouse gases added is no more than the amount taken away.
Net zero trajectory	A quantified forecast of an organisations GHG emissions over time accounting for business growth and anticipated reductions to demonstrate the “path” required to reach net zero.
Source	Any process or activity that releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas into the atmosphere.



15 Greenhouse Gases

15.1 Introduction

15.1.1 This Chapter reports the impacts on the climate by providing an assessment of greenhouse gas (GHG) emissions that result from the Proposed Scheme.

15.1.2 It describes the assessment methodology and the baseline conditions relevant to the assessment, which have been used to reach these conclusions. It also provides a summary of the likely significant effects leading to any additional mitigation measures required to avoid, prevent, reduce or, if possible, offset any likely significant adverse effects. The likely residual effects are then summarised. Opportunities for environmental enhancement, where such opportunities exist, are discussed.

15.2 Legislative framework, policy and guidance

15.2.1 A summary of the international, national, and local legislation, planning policy and guidance relevant to the GHG assessment for the Proposed Scheme is set out below. It should be noted that legislation and policy are one mechanism to achieve the net zero transition, there are however other mechanisms such as standards and taxation which are not considered in this chapter.

Legislative framework

15.2.2 The applicable legislative framework is summarised as follows:

International

- United Nations Framework Convention on Climate Change (**Ref. 15.1**);
 - The UK is a member of the United Nations Framework Convention on Climate Change (UNFCCC) which drives international action on climate change. The UK has pledged to reduce emissions under the Paris Agreement, as a part of a joint



pledge by members of the European Union (EU). This provides an overarching commitment by the UK.

- The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (**Ref. 15.2**).
 - The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the TCPA EIA Regulations) set out the procedures to be followed in relation to environmental impact assessments linked to certain types of developments in England. The TCPA EIA Regulations requires the EIA process to identify, describe and assess the direct and indirect significant effects of a project on the climate. It also stipulates that the information to be included within the Environmental Statement should include where relevant “*impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change*”.

National

- Environment Act 2021 (**Ref. 15.3**);
 - The Act was passed into UK law last year, which acts as the UK’s new framework of environmental protection. The Act sets out clear statutory targets for the recovery of the natural world in four priority areas and includes the requirement for the production of an Environmental Improvement Plan by the Secretary of State to significantly improve the natural environment. The targets are aligned with the government’s Net Zero Strategy and will play a key role to play in reducing GHG emissions through actions to improve air quality as well as across the agriculture, waste and land-use and forestry sectors.
- Climate Change Act 2008 (2050 Target Amendment) Order 2019 (**Ref. 15.4**);



- The 2019 amendment to the Climate Change Act 2008 established a legal requirement for reaching net zero GHG emissions in the UK economy by 2050, which is reflected in the UK Net Zero Strategy. The 2008 Act also created the Committee on Climate Change, with a responsibility for:
 - Setting five-year carbon budgets;
 - Advising and scrutinising the UK Government's; associated climate change adaptation programmes; and
 - Producing a national adaptation plan for the UK Government to implement.
- The Carbon Budget Order 2021 (**Ref.15.5**);
 - This Order set the sixth carbon budget to limit the net amount of GHG emissions that the UK can release to 965 MtCO₂e during the five-year period from 2033 to 2037. The sixth carbon budget implies reducing GHG emissions by 78% by 2035 compared to 1990 levels.

Policy

15.2.3 The approach to the assessment aligns with the following policy:

- Draft National Policy Statement for National Networks (2023) (**Ref. 15.6**);
 - This is a draft of the revised National Networks Planning Policy Statement which was published for consultation between March and June 2023. The draft policy recognises the important role that national networks play in supporting decarbonisation, promoting the need to assess whole life carbon at every stage of a proposed development to minimise emissions as far as possible. The policy also states that opportunities to embed nature-based or technological solutions to mitigate, capture or



offset construction emissions with the design of a proposed development should be explored.

- The draft policy recognises that *“while all steps should be taken to reduce and mitigate climate change impacts, there will likely be residual emissions from national networks infrastructure, particularly during the economy wide transition to net zero, and potentially beyond”*.
- The draft policy also recognises that *“Operational greenhouse gas emissions from some types of national network infrastructure cannot be totally avoided... Operational emissions will be addressed in a managed, economy-wide manner, to ensure consistency with carbon budgets, net zero and our international climate commitments. Therefore, approval of schemes with residual carbon emissions is allowable and can be consistent with meeting carbon budgets, net zero and the UK’s Nationally Determined Contribution.”*
- National Planning Policy Framework (2023) (**Ref. 15.7**);
 - This policy sets out the core planning principle of supporting *“the transition to a low carbon future in a changing climate...”*:
 - **Chapter 9: Promoting Sustainable Transport** - considers how people should be limited in their need to travel and offered a genuine choice of transportation modes to reduce congestion and GHG emissions. *“Transport issues should be considered from the earliest stages of plan-making and development proposals, so that:*
 - (c) opportunities to promote walking, cycling and public transport use are identified and pursued;*
 - (d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains”*.



- **Chapter 14: Meeting the Challenge of Climate Change, Flooding and Coastal Change** – states that “*new development should be planned in ways that:*
 - (b) *can help to reduce GHG emissions, such as through its location, orientation and design*”.
- Infrastructure Carbon Review (2013) (**Ref. 15.8**);
 - In 2013, the UK government published the Infrastructure Carbon Review, aiming to “*release the value of lower carbon solutions and to make carbon reduction part of the DNA of infrastructure in the UK.*” Major infrastructure owners, operators and developers were invited to endorse, become signatories and make commitments under the review.
 - The review provided increased emphasis on “capital carbon” (GHG emissions associated with raw materials, activities and transport for construction, repairs, replacement, refurbishment and de-construction of infrastructure) while acknowledging that “operational carbon” (associated with energy consumption for the operation and use of infrastructure) will continue to dominate overall emissions to 2050 and beyond.
 - The Infrastructure Carbon Review highlighted the importance of assessing GHG emissions early in the lifecycle of an infrastructure scheme when there is the greatest carbon reduction potential.
- Net Zero Strategy: Build Back Greener (2021) (**Ref. 15.9**);
 - The UK’s Net Zero Strategy sets out the policies to decarbonise all sectors to meet the UK’s net zero target by 2050. Key transport policies include a zero emission vehicle mandate, further funding for zero emissions vehicle grants and EV infrastructure including further funding for local EV infrastructure



and expanding zero road freight trials to zero emissions HGV technologies at scale on UK roads.

- Decarbonising Transport: A Better, Greener Britain (2021) (**Ref. 15.10**);
 - The UK's transport decarbonisation plan sets out the commitments, actions and timings to decarbonise all forms of transport in the UK by 2050. Key commitments set out in plan to decarbonise road transport include ending the sale of new petrol and diesel cars and vans by 2030, requiring all new cars and vans to be 100% zero emission at the tailpipe by 2035, ending the sale of all non-zero emission HGVs by 2040 and ensuring the UK's charging infrastructure network meets demand. In September 2023 the UK Government pushed the ban on the sale of new petrol and diesel cars and vans from 2030 to 2035. However, the UK Government did not change the requirement for all new cars and vans to be 100% zero emission at the tailpipe by 2035, the requirement for HGVs and the zero emission vehicle mandate. The Climate Change Committee released a statement (**Ref. 15.11**) regarding the UK Government's comments: *"Delaying the fossil car phase-out date to 2035 is expected to have only a small direct impact on future emissions, due to the now-confirmed ZEV Mandate, which will ensure that 80% of new cars sold by 2030 will be zero-emission. However, there may be other indirect consequences, through the uncertainty that has been introduced by changing near-term consumer targets. The risk is that the public and automotive companies perceive a weakening of government commitment to the electric vehicle transition, which could undermine consumer confidence and / or jeopardise some inward investment relating to EV manufacturing."*
- Norfolk County Council (2024) Norfolk Council Council's Climate Policy 2024 (**Ref. 15.12**);



- This policy sets out Norfolk County Council's (NCC's) commitment to *“using its powers, influence and partnerships towards supporting the county's low carbon development in line with the UK-wide target to reach net zero by 2050”*. As part of this Policy, *“The council seeks to take a pragmatic approach to supporting carbon reduction county-wide by prioritising the areas where we have the greatest opportunity to make positive change”*.
- Norfolk County Council (2019) Norfolk Council Council's Environmental Policy (**Ref. 15.13**);
 - This policy sets out NCC's commitment to enable *“people in Norfolk to benefit from an enhanced environmental and quality of life”*. NCC's Environmental Policy reflects amendments also made in NCC's Climate Policy. As outlined within the Monday 4th March 2024 NCC Cabinet papers, a minor update to the county wide statement made within the 'Norfolk County Council Environmental Policy 2019' will be made, however that update does not materially affect the policy effects on the NWL scheme. As it is not confirmed within the Cabinet papers whether the proposed update will necessitate an update of the policy title or date, as such this planning application shall maintain throughout, reference to the 'Norfolk County Council Environmental Policy 2019.'
- Broadland District Council, Norwich City Council and South Norfolk Council (2024) Greater Norwich Local Plan (GNLP) (**Ref. 15.14**);
 - The GNLP was adopted by Norwich City Council at a Council meeting on 12 March 2024. Norwich City Council's adoption of the plan is now subject to a 6 week legal challenge period which ends on 24 April 2024.



- The Applicant deems that the advanced stage of the review and update along with the conclusion of the independent inspectors report offers sufficient confidence that the GNLP will be adopted by the remaining local planning authorities.
- As such, this Statement has captured the policies from the GNLP as 'Active Policy', and not 'Emerging Policy'.
- This plan sets out the Greater Norwich Development Partnership's proposed strategy to develop a low carbon economy and respond to climate change in its delivery of the planned growth for new homes, jobs and infrastructure within Greater Norwich.
- Norfolk County Council (2022) Local Transport Plan 4 Strategy and Implementation Plan (**Ref. 15.15**);
 - The Local Transport Plan 4 Strategy sets out NCC's plans, policies and programmes on transport and is used as a guide for investment priorities and may be material to planning decisions. As part of the plan, NCC will prioritise a shift to more efficient vehicles, with an emphasis on electric vehicles, and look at behaviour change and interventions that will help to increase the use of sustainable transport.
 - As part of the Location Transport Plan 4 Implementation Plan, NCC has set annual carbon targets for transport emissions to achieve net zero carbon emissions from transport by 2050.

Guidance

15.2.4 The following guidance documents have been used during the preparation of this Chapter:

- Design Manual for Roads and Bridges (DMRB) LA 114 Climate (**Ref. 15.16**);



- PAS 2080:2023 Carbon Management in Buildings and Infrastructure (Ref. 15.17);
- Royal Institute of Chartered Surveyors (RICS) Whole life carbon assessment for the built environment (2017) (Ref. 15.18);
- Transport Analysis Guidance: Unit A3 Environmental Impact Appraisal (Ref. 15.19);
- Institute of Environmental Management and Assessment (IEMA) (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition (Ref. 15.20); and
- National Planning Practice Guidance on Climate Change (Ref. 15.21).

15.3 Consultation, scope, methodology and significance criteria

Consultation undertaken to date

15.3.1 Other than EIA Scoping (discussed below) no other formal consultation has been undertaken to date in relation to the assessment of GHG emissions.

Scope of the assessment

15.3.2 The scope of this assessment has been established through the EIA scoping process. Further information can be found in Chapter 5: Approach to EIA of the EIA Scoping Report 2020 (Document Reference 3.05.01) and Chapter 5: Approach to EIA of the Scoping Report Addendum 2022 (Document Reference 3.05.03).

15.3.3 This section provides an update to the scope of the assessment and states the evidence base for scoping out elements following further iterative assessment.



Table 15-1 Scoping Opinion Responses

Consultee	Comments provided in Scoping Response	Response to comments
County Planning Authority (CPA)	<p>Whilst it is noted that the Applicant has not undertaken any consultation relating to Greenhouse Gases emission or Climate Resilience, the CPA welcomes that discussions have been held with the NCC Sustainability Manager.</p> <p>The England Biodiversity Strategy published by Defra establishes principles for the consideration of the effects of climate change. The ES should reflect these principles and identify how the Proposed Development [Scheme] effects on the natural environment will be influenced by climate change, the impacts greenhouse gases, climate resilience both during construction and when in operation.</p>	<p>The impact of the Proposed Scheme on GHG emissions during the construction and operational phases have been assessed quantitatively within this chapter using methodologies in line with best practice.</p>

Elements scoped out of the assessment

15.3.4 The elements shown in Table 15-2 are not considered to be material GHG emission sources as a result of the Proposed Scheme and have therefore not been considered within this assessment (as per PAS 2080:2023 Carbon Management in Buildings and Infrastructure (herein referred to as PAS2080) categories of emissions (**Ref. 15.17**)).



Table 15-2 Elements scoped out of the assessment

Element scoped out (as per PAS 2080)	Phase	Justification
Electricity used for lighting	Operation	The Proposed Scheme is largely unlit, with new lighting columns proposed only to tie in with the A47 where up to 10 new lighting columns are proposed. Emissions arising from lighting of this scale are not considered to be material.
Maintenance, Repair, Refurbishment	Operation	Maintenance, repair and refurbishment associated with the Proposed Scheme is not considered to be a material emission source as any works represent only a small amount of additional materials use to the maintenance, repair and refurbishment that already takes place within the regional network.
Decommissioning process and transport and disposal of materials	End of Life	Expected timescales for decommissioning are so far into the future that there is insufficient certainty about the likelihood, type or scale of emissions activity to determine their likely magnitude, even if they take place at all. As such these emissions sources will not be considered.

Elements scoped into the assessment

15.3.5 The elements shown in Table 15-3 are considered to have the potential to be material GHG emission sources as a result of the Proposed Scheme and



have therefore been considered within this assessment (as per PAS2080 categories of emissions (Ref. 15.17)).

Table 15-3 Elements scoped into the assessment

Element scoped in (as per PAS2080)	Phase	Justification
Product stage (manufacture and transport of raw materials to suppliers)	Construction	Raw materials required for the Proposed Scheme would result in embodied emissions and have the potential to be material.
Transport of materials to site	Construction	Construction stage emissions from fuel / energy consumption due to the delivery of material to site have the potential to be material.
Transport of waste away from site	Construction	Construction stage emissions from the transport of waste away from site have the potential to be material.
Disposal of waste	Construction	Construction stage emissions from the disposal of waste away from site have the potential to be material.
Plant and equipment use during construction	Construction	Fuel / energy consumption of plant and equipment used during construction would generate GHG emissions.
Land use, land use change and forestry (LULUCF)	Construction	Construction-stage emissions from the disposal of biomass have the potential to be material.



Element scoped in (as per PAS2080)	Phase	Justification
Replacement	Operation	The replacement elements of the Proposed Scheme (e.g. resurfacing) would release a potentially material magnitude of emissions.
Land use, land use change and forestry (LULUCF)	Operation	There would be tree removal and planting as a result of the Proposed Scheme which has the potential to have a material impact on carbon sequestration during the operation-stage.
End-user emissions (regional traffic flows)	Operation	Changes to regional traffic flows are expected and this has the potential to result in a material change in GHG emissions.

Extent of the Study Area

15.3.6 The GHG assessment is not restricted by geographical area but instead includes any increase or decrease in emissions as a result of the Proposed Scheme, wherever that may be. This includes:

- Construction emissions from the Proposed Scheme footprint but also related to the transport of materials to and from the Proposed Scheme and their manufacture (this may be distant from the Proposed Scheme’s location); and
- Operational emissions (increase or reduction) which result from the end-use of the Proposed Scheme and any shifts in transport modes / patterns which may occur. Such emissions include those for traffic using the Proposed Scheme as well as the surrounding regional road network – within which traffic flows may be affected.



Assessment methodology

15.3.7 The assessment approach has considered the likely magnitude of anticipated GHG emissions (or avoided emissions) of the Proposed Scheme (“Do Something”) in comparison with the baseline (“Do Minimum”) and future baseline (“Do Nothing”) scenarios without the Proposed Scheme.

15.3.8 Where data was available, GHG emissions have been quantified using the methodologies described below. Please refer to the assumption and limitations in **Section 15.8** for further information. Where data was unavailable, the impact on GHG emissions was assessed qualitatively using professional judgement and experience on projects of a similar nature and scale.

15.3.9 In accordance with DMRB LA 114 (**Ref. 15.16**), the appraisal period of 60 years has applied for the operational phase.

Calculation of GHG Emissions

15.3.10 The land use, land use change and forestry (LULUCF) assessment compared the carbon storage of habitats that are subject to change between the Do Minimum, Do Nothing and Do Something (with the Proposed Scheme) scenarios. Carbon storage refers to the amount of carbon that is “locked up” in biomass, including vegetation and soil. It is referred to as the stock of carbon and measured in tonnes of carbon (tC). Carbon can be locked up for hundreds of years (for example in the case of established woodland).

15.3.11 To quantify the carbon storage of habitats in the Do Minimum, Do Nothing and Do Something scenarios, data on the habitat types and area (aligning to the Phase 1 Habitat types as reported in **Chapter 10: Biodiversity** (Document Reference 3.10.00) within the Red Line Boundary was used. A habitat carbon calculator was then used to estimate the carbon storage of each habitat using the most appropriate carbon storage values sourced from Natural England (**Ref. 15.22**) and the Woodland Carbon Code (**Ref. 15.23**).

15.3.12 The construction stage emissions from LULUCF are reported as the loss of carbon stored from habitats removed between the Do Something and the Do



Minimum scenarios. The operational stage emissions from LULUCF are reported as the difference between the Do Something and the Do Nothing scenario.

- 15.3.13 To quantify emissions from the reduction in the sequestration potential of soils of high organic content soil (treated as peat in this assessment), the Peatland Code Emissions Calculator (fens) was used (**Ref. 15.24**).
- 15.3.14 To quantify the embodied emissions of construction materials and materials required for replacement, materials data (for example the type and quantity of materials) was provided by the contractor. The quantity of materials was multiplied by emissions factor data, sourced from the Bath Inventory of Carbon & Energy (ICE) v3.0 (**Ref. 15.25**).
- 15.3.15 To estimate the emissions associated with transporting materials during construction and materials required for replacement, the expected mass of materials were multiplied by transport distance assumptions provided by the RICS (**Ref. 15.18**), resulting in tonne kilometres. The tonne kilometres were then multiplied by an appropriate emission factor published by the Department for Business, Energy and Industrial Strategy (BEIS) (**Ref. 15.26**).
- 15.3.16 To quantify emissions from the disposal of waste, the expected mass of materials (provided by the contractor) was multiplied by appropriate emission factor published by BEIS (**Ref. 15.26**).
- 15.3.17 To quantify the emissions associated with plant and equipment during construction, plant data (for example the type and quantity of fuel to be used) provided by the contractor. The quantities of fuel used during the construction were multiplied by an appropriate BEIS emission factor (**Ref. 15.26**).
- 15.3.18 End-user vehicle emissions were calculated in accordance with DMRB Volume 11, Section 3, Part 14 Climate; LA114 (**Ref. 15.16**). Emissions were quantified using WebTAG data from the Department for Transport (**Ref. 15.27** and **Ref. 15.28**). This took into account the proportions of the vehicle types, fuel type, forecast fuel consumption parameters and emission factors. From



this, emissions were quantified for each year over the lifetime of the Proposed Scheme (up to 2088).

15.3.19 The construction and operational phase emissions were compared with the UK carbon budgets (**Ref. 15.29**) and NCC's carbon targets for transport (**Ref. 15.15**). As operational emissions have been assessed over 60 years, the appraisal period goes beyond the UK's 2050 net zero target. Operational emissions emitted after 2050 have been assessed in their ability for the UK to continue to be net zero beyond 2050.

Significance criteria

15.3.20 There are currently no agreed thresholds for what level of GHG emissions are considered significant for EIA. The significance of GHG emissions is assigned with reference to the magnitude of emissions, their context on the UK's trajectory towards net zero, guidance from the Institute of Environmental Management and Assessment (IEMA) (**Ref. 15.20**), and the use of professional judgement.

15.3.21 As climate change impacts are global in nature, it is not possible to link a specific project with a specific environmental impact from climate change. Recently published guidance from IEMA (**Ref. 15.20**) sets out five distinct levels of significance based on the GHG emissions' relative contribution towards achieving a science-based 1.5°C aligned transition towards net zero by 2050. As such, significance of GHG emissions have been put into context through comparison with the respective UK carbon budgets (Table 15-4) and Norfolk carbon targets for transport (Table 15-5) to assess their compatibility with the UK's net zero trajectory and local policy goals. Please note that the UK carbon budgets presented in Table 15-4 are given in million tonnes of CO₂e (MtCO₂e) and the Norfolk carbon targets for transport presented in Table 15-5 are given in kilo tonnes of CO₂e (ktCO₂e), rather than tCO₂e



Table 15-4 National carbon budgets set by the Government (MtCO₂e) (Ref. 15.29)

Carbon budget period	UK carbon budget
Third: 2018-2022	2,544 MtCO ₂ e
Fourth: 2023-2027	1,950 MtCO ₂ e
Fifth: 2028-2032	1,725 MtCO ₂ e
Sixth: 2033-2037	965 MtCO ₂ e

Table 15-5 Norfolk carbon targets for transport set by Norfolk County Council (ktCO₂e) (Ref. 15.15)

Carbon target date	Carbon target
2022	1,657 ktCO ₂ e
2023	1,636 ktCO ₂ e
2024	1,617 ktCO ₂ e
2025	1,591 ktCO ₂ e
2026	1,522 ktCO ₂ e
2027	1,454 ktCO ₂ e
2028	1,346 ktCO ₂ e
2029	1,243 ktCO ₂ e
2030	1,125 ktCO ₂ e
2031	1,017 ktCO ₂ e
2032	903 ktCO ₂ e
2033	751 ktCO ₂ e
2034	670 ktCO ₂ e
2035	591 ktCO ₂ e
2036	531 ktCO ₂ e



Carbon target date	Carbon target
2037	478 ktCO ₂ e

Effect Significance

15.3.22 The following terms have been considered in addition to the use of professional judgement to assess the significance of the effects identified as set out in IEMA guidance (**Ref. 15.20**):

- **Major adverse (significant):** the 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 and does not make a meaningful contribution to the UK’s trajectory towards net zero;
- **Moderate adverse (significant):** the 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, falling short of fully contributing to the UK’s trajectory towards net zero;
- **Minor adverse:** the GHG impacts are fully consistent with applicable existing and emerging policy requirements and good practice design standards, fully in line with measures necessary to achieve the UK’s trajectory towards net zero. It should be noted that IEMA (**Ref. 15.20**) states "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”;
- **Negligible:** the GHG impacts are 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; and
- **Beneficial (significant):** the 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, substantially exceeding net zero requirements with a positive climate impact.

15.4 Baseline conditions

Existing baseline

- 15.4.1 In the baseline (Do Minimum) scenario, GHG emissions occur constantly and widely as a result of human and natural activity including energy consumption (fuel, power), industrial processes, land use and land use change. In line with IEMA guidance (**Ref. 15.20**), the GHG assessment considers the impact of the Proposed Scheme, which includes instances in which the Proposed Scheme results in additional or avoided emissions in comparison to the baseline scenario. The baseline conditions therefore focus on those emissions sources subject to change between the baseline scenario and the Proposed Scheme.
- 15.4.2 The “Do Minimum” scenario involves no construction activities and therefore the construction baseline is zero emissions.
- 15.4.3 The operation and management of the existing assets under the baseline scenario are likely to require a small number of components (for example, light bulbs and signage) as well as some bulk material (cement, concrete, sand and gravel) for minor works and repairs of the highway and ancillary infrastructure. These materials would have embodied emissions associated with them, and the installation of these materials would result in emissions due to their transport or plant use. These baseline emissions are expected to be small, and as such will not be quantified.
- 15.4.4 The existing operational baseline includes the current carbon storage of habitats within the Red Line Boundary, which has been quantified as outlined in the **Section 15.3**. The total carbon storage of habitats within the Red Line Boundary in the existing operational baseline (operational LULUCF) is estimated to be approximately -53,330 tC.



Future baseline

15.4.5 The future baseline scenario is considered over the 60-year appraisal period of the Proposed Scheme, in line with DMRB LA 114 (Ref. 15.16).

15.4.6 The future baseline scenario involves no construction activities and therefore the construction baseline is zero emissions.

15.4.7 The future operational baseline (“Do Nothing”) includes the future carbon storage of habitats within the Red Line Boundary at the end of the 60-year appraisal period, which has been quantified as outlined in the Section 15.3. The total carbon storage of habitats within the Red Line Boundary in the future operational baseline (operational LULUCF) is estimated to be approximately -58,821 tC.

15.4.8 The “Do Minimum” (baseline) end-user traffic GHG emissions (modelled using data from the Proposed Scheme’s traffic model) are presented in Table 15-6 for the year 2029 (the first operational year of the Proposed Scheme) and the future modelled year 2044. In addition, the average annual and total GHG emissions from 2029 to 2088 are presented for comparison with the 60-year appraisal period of the Proposed Scheme. For additional information on the baseline assessment please see Chapter 19: Traffic and Transport (Document Reference 4.01.00), the Transport Assessment (Document Reference 4.01.00) and Transport Assessment Appendix 8 (Document Reference 4.01.08) for details on of the Proposed Scheme’s traffic model.

Table 15-6 Total baseline GHG emissions for traffic in the strategic and local road network (tCO2e)

Scenario	2029 (operational year)	2044 (future year)	Average per year (2029-2088)	Total (2029-2088)
Baseline (“Do Minimum”)	536,647	338,645	365,045	21,902,709



15.5 Sensitive receptors

15.5.1 The impacts of GHGs relate to their contribution to global warming and climate change. These impacts are global and cumulative in nature, with every tonne of GHGs contributing to impacts on natural and human systems. Whilst vulnerable communities are more at risk of the effects of climate change, GHG emissions result in the same global effects wherever and whenever they occur. Therefore, the sensitivity of different human and natural receptors is not considered in this assessment and vulnerability of the Proposed Scheme to climate change is considered in **Chapter 16: Climate Resilience** (Document Reference 3.16.00) assessment.

15.6 Assessment of potential effects, mitigation and residual effects

15.6.1 This section details the assessment of predicted impacts and effects for the Proposed Scheme during both the construction and operational phases pre-mitigation.

Construction phase

15.6.2 The total estimated GHG emissions arising from the product stage (manufacture and transport of raw materials to suppliers), transport of materials to site, transport of waste away from site, waste disposal, construction plant use and construction LULUCF have been quantified as outlined in the **Section 15.3** and are presented in Table 15-7, Table 15-8, Table 15-9, Table 15-10, Table 15-11, Table 15-12, respectively. Please note that due to rounding the sum of the rows would not exactly equal the totals. The total GHG emissions arising from the product stage, transportation of materials to Proposed Scheme, transport of waste away from site, waste disposal, plant use for the construction of the Proposed Scheme and construction LULUCF are estimated to be approximately 129,724 tCO_{2e}.



Table 15-7 Estimated Product Stage Emissions

Material	Embodied carbon (tCO₂e)
Steel	57,895
Concrete	10,575
Asphalt	5,598
Aggregate	4,858
Stone	344
HDPE	302
Geotextile	76
Timber	40
Sand	37
Polyethylene	25
Waterproofing material	21
Copper	8
Elastomeric material	6
Paint	3
UPVC	3
Total	79,791

Table 15-8 Estimated Emissions for the Transport of Materials to Site

Material	Transport to Site (tCO₂e)
Steel	1,212
Concrete	818
Asphalt	1,023
Aggregate	6,941
Stone	46
HDPE	8
Geotextile	2
Timber	8



Material	Transport to Site (tCO ₂ e)
Sand	53
Polyethylene	1
Waterproofing material	<1
Copper	<1
Elastomeric material	<1
Paint	<1
UPVC	<1
Total	10,113

Table 15-9 Estimated Emissions for Transport of Waste Away from Site

Material	Emissions (tCO ₂ e)
Asphalt (from road plannings) – hazardous quantity taken to landfill	12
Earthworks (soils) – hazardous quantity taken to landfill	9
Earthworks (high organic content soils) – hazardous quantity taken to landfill	646
Total	667

Table 15-10 Estimated Emissions for Disposal of Waste

Material	Emissions (tCO ₂ e)
Asphalt (from road plannings) – hazardous quantity taken to landfill	2
Earthworks (soils) – hazardous quantity taken to landfill	20



Material	Emissions (tCO ₂ e)
Earthworks (high organic content soils) – hazardous quantity taken to landfill	1,360
Total	1,381

Table 15-11 Estimated Emissions for Construction Plant and Equipment

Fuel type	Emissions (tCO ₂ e)
Diesel	8,164
Total	8,164

Table 15-12 Estimated Emissions from Construction LULUCF

Biomass Type	Emissions (tC)
Removed vegetation	29,608
Total	29,608

Potential Effects

15.6.3 The construction phase GHG emissions have been contextualised against the UK carbon budgets, shown in Table 15-13 below. Construction is expected to start in 2025 and finish in 2029. The construction phase emissions are assumed to be emitted at a linear rate over the four years and as a result construction GHG emissions are apportioned evenly between Carbon Budget Four and Five.

Table 15-13 Contextualisation of construction phase GHG emissions against the UK carbon budgets

UK carbon budget	Carbon budget (tCO ₂ e)	Construction GHG emissions (tCO ₂ e)	% of budget
Fourth carbon budget (2023-27)	1,950,000,000	64,862	0.003%



UK carbon budget	Carbon budget (tCO ₂ e)	Construction GHG emissions (tCO ₂ e)	% of budget
Fifth carbon budget (2028-32)	1,725,000,000	64,862	0.004%

15.6.4 Based on the results presented in Table 15-7, Table 15-8, Table 15-9, Table 15-10, Table 15-11 and Table 15-12 as well as the contextualisation against the UK carbon budgets presented in Table 15-13, guidance from IEMA and professional judgement, the magnitude of GHG emissions from the product stage, transport of materials, transport of waste away from site, waste disposal, plant and equipment use and construction LULUCF for the Proposed Scheme is predicted to have a **moderate adverse** (Significant) effect during construction. The potential effects judgement considers mitigations already implemented by the Proposed Scheme. The potential effects judgement does not consider the mitigations committed to by the Principal Contractor (detailed in **Section 15.6.6**) or the additional mitigations being actively explored by the (detailed in in **Section 15.6.7**). As stated in **Section 15.3.22**, IEMA (**Ref. 15.20**) states “A ‘minor adverse’ effect or better is therefore a high bar and indicates exemplary performance...”

Additional Mitigation

15.6.5 The design of the viaduct for the Proposed Scheme was optimised to a ladder beam configuration, reducing the overall deck width required compared to the reference design. It has been estimated that this design change has resulted in an embodied carbon saving of approximately 10,367 tCO₂e compared to the earlier design. This is not a saving from the construction phase emissions reported in this chapter as the ladder beam configuration of the viaduct is included in the detailed design of the Proposed Scheme used for the GHG assessment.

15.6.6 The Principal Contractor has committed to the following measures to reduce carbon emissions further during the construction phase of the Proposed Scheme:



- Adopting the London Low Emission Construction Partnership requirements for vehicles involved in construction activities;
- Following the Non-Road Mobile Machinery (NRMM) Practical Guidance which sets the emission standards for carbon monoxide, hydrocarbons, oxides of nitrogen and particulate matter for diesel engines;
- Promoting the use of start-stop technology plant on site;
- Implementation of a network of electricity sockets to feed a fleet of electric site vehicles for the contractor's vehicle fleet where practicable;
- Maximising the re-use of site won materials for earthworks and pavements;
- The majority of earthworks materials that are non-hazardous surplus excavated arisings would be reused off-site (recycle);
- Using solar panels for site lighting where practicable;
- Showing preference for providers that use 100% renewable sources of electricity;
- Minimise energy consumption including fuel usage by, for example, minimising plant use and idling;
- Maximising the use of local suppliers; and
- Producing a Carbon Management Plan.

15.6.7 The Principal Contractor is actively exploring the feasibility of the following measures to reduce carbon emissions further during the construction phase of the Proposed Scheme:

- Where possible, further proportionate design optimisation of elements of the Proposed Scheme to reflect the carbon reduction hierarchy (found in clause 4.3 of PAS 2080 (**Ref. 15.17**)). It should be noted that some elements of the hierarchy have already been used to inform design decisions throughout the process.



- Promoting the use of Hydrotreated Vegetable Oil fuel by the supply chain;
- Use of sustainable concrete such as Ground Granulated Blast-Furnace Slag or Concrete (graphene-enhanced concrete) where practicable and subject to design specification compliance;
- Use of low or cold application asphalts where practicable and subject to design specification compliance;
- Use of re-cycled construction materials for haul roads and temporary working areas or platforms where practicable and subject to design specification compliance;
- Subject to the Principal Contractors Detailed Quantitative Risk Assessment outputs, bituminous materials cold milled during the works could be reused where they do not present a pollution hazard in the permanent works and subject to design acceptance. For example, a substitute for type 1 subbase in footways and hard standings;
- Pavement design is being developed using a fully analytical / performance approach that would result in a considerable reduction in pavement thickness with the associated CO₂e reduction. Furthermore, there is an ongoing investigation, testing campaign and design work to demonstrate that the sub-base can be constructed and stabilised using site won material reducing the requirements for importing aggregate to virtually zero;
- The Principal Contractor would be encouraged to use solar power and facilities to reduce water use where practicable e.g., charging of traffic signal and sign batteries if applicable;
- Procuring sustainable welfare cabins;
- Maximise the use of local waste management facilities;



- Identification of synergies among suppliers during the procurement stage; and
- Incentivisation of carbon reduction practices within the supply chain via procurement strategies.

Monitoring

15.6.8 No operational monitoring is proposed in relation to the GHG assessment.

Residual Effects

15.6.9 The total GHG emissions arising from the product stage, transportation of materials to site, transportation of waste away from site, disposal of waste, construction plant use and construction LULUCF are estimated to be approximately 129,724 tCO₂e. There is likely to be a **moderate adverse** residual effect on GHG emissions (*Significant*). The residual effects judgement considers mitigations already implemented by the Proposed Scheme as well as additional mitigations committed to by the Principal Contractor (detailed in **Section 15.6.6**). The residual effects judgement does not consider the additional mitigations being actively explored (detailed in **Section 15.6.7**). As stated in **Section 15.3.22**, IEMA (**Ref. 15.20**) states "A 'minor adverse' effect or better is therefore a high bar and indicates exemplary performance..."

Operational phase

15.6.10 The total estimated GHG emissions arising from replacement, operational LULUCF and end user traffic have been quantified as outlined in the **Section 15.3** and are presented in Table 15-14, Table 15-15 and Table 15-16 respectively. Please note that due to rounding the sum of the rows may not equal the totals.

15.6.11 The total GHG emissions arising from replacement, operational LULUCF and end user traffic during the operation of the Proposed Scheme over its 60-year appraisal period are estimated to be approximately 293,616 tCO₂e, which is approximately 4,894 tCO₂e per year.



Table 15-14 Estimated Emissions from Replacement

Material	Embodied carbon (tCO ₂ e)	Transport to Site (tCO ₂ e)
Asphalt	2,443	447
Total	2,443	447

Table 15-15 Estimate Emissions from Operational LULUCF

Carbon Sequestration Scenario	Emissions (tC)
Do Nothing (future baseline)	-58,821
Do Something	-63,151
Change in sequestration potential of floodplain soils of high organic content	67
Overall change in sequestration	-4,263

Table 15-16 Total GHG emissions for traffic in the strategic and local road network (tCO₂e) (Note 1)

Scenario	2029 (operational year)	2044 (future year)	Average per year (2029-2088)	Total (2029-2088)
Baseline (“Do Minimum”)	536,647	338,645	365,045	21,902,709
Do Something	543,634	343,241	369,961	22,197,631
Difference	6,987	4,597	4,915	294,922
% change	1.3%	1.4%	1.3%	1.3%

Note 1 - Please see **Section 15.4** and **Chapter 19: Traffic and Transport** for details on of the Proposed Scheme’s traffic model

Potential Effects

15.6.12 The operational GHG emissions have been contextualised against the UK carbon budgets, shown in Table 15-17 below. The GHG emissions for traffic



in Norfolk have been contextualised against NCC’s carbon targets for transport, shown in Table 15-18 below. Estimated emissions from replacement are not expected to occur prior to 2037 and have therefore have not been included in the Operational GHG emissions values calculated in Table 15-17 and Table 15-18.

Table 15-17 Contextualisation of operational GHG emissions against the UK carbon budgets

UK carbon budget	Carbon budget (tCO ₂ e)	Operational GHG emissions (tCO ₂ e)	% of budget
Fifth carbon budget (2028-32)	1,725,000,000	26,714	0.002%
Sixth carbon budget (2033-2037)	965,000,000	26,664	0.003%

Table 15-18 Contextualisation of GHG emissions for traffic in Norfolk against the Norfolk carbon targets for transport

Carbon target date	Carbon target (ktCO ₂ e)	GHG emissions from traffic (ktCO ₂ e)	% of target
2029	1243	7.0	0.6%
2030	1125	6.8	0.6%
2031	1016.9	6.7	0.7%
2032	903.1	6.5	0.7%
2033	751.4	6.3	0.8%
2034	670	6.2	0.9%
2035	591.3	6.0	1.0%
2036	530.9	5.9	1.1%
2037	477.5	5.7	1.2%

15.6.13 Based on the results presented in Table 15-14, Table 15-15 and Table 15-16 as well as the contextualisation against the UK carbon budgets and Norfolk



carbon targets for transport presented in Table 15-15 and Table 15-16, guidance from IEMA and professional judgement, the magnitude of GHG emissions from replacement, operational LULUCF and end user traffic as a result of the operation of the Proposed Scheme is predicted to have a **moderate adverse (significant)** effect during operation. The potential effects judgement considers mitigations already implemented by the Proposed Scheme. The potential effects judgement does not consider the additional mitigations proposed (detailed in **Section 15.6.14**). As stated in **Section 15.3.22**, IEMA (**Ref. 15.20**) states "*A 'minor adverse' effect or better is therefore a high bar and indicates exemplary performance...*"

Additional Mitigation

15.6.14 The magnitude of GHG emissions associated with the eventual operation of the Proposed Scheme can be minimised by, amongst others:

- Specifying efficient mechanical and electrical equipment such as lighting that is long-lasting and based on its durability, repairability and energy efficiency credentials.
- Opportunities to sequester carbon through increased tree planting and high organic soil restoration.
- Use low carbon road surface options, informed using the carbon reduction hierarchy.
- Use road surface options with greater longevity, to reduce frequency of replacements.
- Operating and maintaining the Proposed Scheme using best-practices in energy efficiency, and using low / no-carbon approaches, plant, and equipment.

Monitoring

15.6.15 No operational monitoring is proposed in relation to the GHG assessment.



Residual Effects

15.6.16 The total GHG emissions arising from replacement, operational LULUCF and end user traffic from the operation of the Proposed Scheme over its 60-year appraisal period are estimated to be approximately 293,616 tCO₂e. There is likely to be a **moderate adverse (Significant)** residual effect on GHG emissions. The residual effects judgement considers mitigations already implemented by the Proposed Scheme. The residual effects judgement does not consider the additional mitigations proposed (detailed in **Section 15.6.14**). As stated in **Section 15.3.22**, IEMA (**Ref. 15.20**) states *"A 'minor adverse' effect or better is therefore a high bar and indicates exemplary performance..."*

Assessment against future baseline

15.6.17 Compared to the future construction baseline scenario, there is an increase in emissions arising from the product stage, transport of materials to Proposed Scheme, construction plant use and construction LULUCF by 129,724 tCO₂e.

15.6.18 Compared to the future operational baseline scenario, there is an increase in emissions arising from replacement, operational LULUCF and end user traffic by 293,616 tCO₂e over the 60-year appraisal period of the Proposed Scheme.

Cumulative effects

15.6.19 The purpose of the GHG assessment is to assess the impact of the Proposed Scheme compared to the baseline. Consideration of cumulative GHG emissions is inherent to the approach taken as GHG emissions of the Proposed Scheme are assessed against various contextual scales, such as sector and local authority policies and UK carbon budgets. For the Proposed Scheme, this includes comparing the GHG emissions against the UK carbon budgets (Table 15-4) and Norfolk's carbon targets for transport (Table 15-5).

15.6.1 For information on how to assessment of end user traffic has cumulatively considered the impact of the Proposed Scheme see **Chapter 19: Traffic and Transport** (Document Reference 4.01.00), the Transport Assessment (Document Reference 4.01.00) and Transport Assessment Appendix 8



(Document Reference 4.01.08) for details on of the Proposed Scheme's traffic model.

15.7 Opportunities for environmental enhancement

15.7.1 By utilising the mitigation measures for the Proposed Scheme design, as well as during construction and operation, as per **Section 15.3** the GHG emissions from the Proposed Scheme can be reduced and subsequently the impact on the climate.

15.8 Difficulties and uncertainties

15.8.1 To ensure transparency within the EIA process, the following limitations and assumptions have been identified:

- In EIA, there is currently no specific carbon emissions threshold, which, if exceeded, is considered significant. Professional judgement and current guidance have been used to derive findings in this assessment;
- For the current LULUCF baseline and construction LULUCF scenarios, woodland habitats are assumed to be 50 years old;
- A worst-case scenario has been used to estimate the emissions from the disposal of biomass;
- A worst-case approach has been used to quantify the reduction in the sequestration potential of soils of high organic content, whereby it was assumed to be peat for the purposes of the assessment and it was assumed that all "peat" would be lost and in the do-minimum scenario, none of the "peat" would be degraded;
- A worst-case scenario has been assumed for the area of soils of high organic content to be disturbed;
- Due to the varied depth of the (soils of high organic content) an average soils of high organic content depth has been assumed;



- Where specific material data was not available an appropriate emissions factor has been selected based on professional judgement;
- In the absence of detailed material specification, a worst case scenario has been assumed for copper and an emission factor for 100% virgin material has been applied;
- In the absence of detailed material specification, a worst case scenario has been assumed for asphalt and an emission factor for asphalt with 7% binder content has been applied;
- In the absence of detailed material specification, all concrete is assumed to be in-situ and 32/40 MPa;
- In the absence of detailed material specification, a worst case scenario was assumed for diesel and an emissions factor for 100% mineral diesel has been applied;
- Embodied emissions have been calculated based on data provided by the Principal Contractor. The volumes of bulk construction materials required by the Proposed Scheme may alter as the design progresses, however this would not be expected to materially alter the assessment findings;
- Where specific distances were not available, the transportation of materials to site (i.e., the source of materials) has been taken from RICS (**Ref. 15.18**) assumptions for transportation scenarios;
- In line with best practice, traffic emissions from the affected traffic route have been assessed using data from the traffic model for two forecasted years;
- The opening year for the Proposed Scheme has been modelled from the year 2029;
- There will be some uncertainty regarding forecast traffic modelling data as this is based on predicted future use;



- A linear trajectory has been assumed for the change in traffic emissions between the two forecasted years. From 2044 onwards, traffic emissions are assumed to remain constant. This is a worst case scenario as, due to the expected decarbonisation of the road network, traffic emissions are expected to reduce to net zero by 2050. However, this would be the case for both the Do-Nothing and Do-Something scenarios; and
- The appraisal period of the Proposed Scheme is assumed to be 60 years.

15.9 Summary

15.9.1 Table 5-19 provides a summary of the findings of the assessment.

Table 15-19 Summary of GHG effects

Receptor	Potential effects	Additional mitigation	Residual effects	Monitoring
Construction phase GHG emissions	GHG emissions arising from the product stage, transport of materials to site, transportation of waste away from site, disposal of waste, construction plant and equipment and construction LULUCF are estimated to be approximately 129,724 tCO ₂ e.	Construction emissions will be minimised by maximising the re-use of site won materials for earthworks and pavements and implementing of a network of electricity sockets to feed a fleet of electric site vehicles for the contractor's fleet as well as other measures detailed in Section 15.6 . Construction emissions could be further minimised though design optimisation to reflect the carbon reduction hierarchy as well as other measures detailed in Section 15.6 .	Moderate adverse (significant)	No monitoring is required.

Receptor	Potential effects	Additional mitigation	Residual effects	Monitoring
Operational phase GHG emissions	GHG emissions arising from replacement, operational LULUCF and end-user traffic emissions during the operation of the Proposed Scheme over its 60-year appraisal period are estimated to be approximately 293,616 tCO ₂ e.	Operational emissions could be minimised by specifying high efficiency mechanical and electrical equipment, using low carbon road surface options and using road surface options with greater longevity as well as other measures detailed in Section 15.6 .	Moderate adverse (significant)	No monitoring is required.



15.10 References

Ref. 15.1 – United Nations (1992) United Nations Framework Convention on Climate Change

Ref. 15.2 – The Town and County Planning (Environmental Impact Assessment) Regulations 2017

Ref. 15.3 – Environment Act (2021)

Ref. 15.4 – Climate Change Act 2008 (2050 Target Amendment) Order 2019

Ref. 15.5 – The Carbon Budget Order 2021

Ref. 15.6 – Department for Transport (2023) Draft National Policy Statement for National Networks

Ref. 15.7 – Ministry of Housing, Communities & Local Government (2023) National Planning Policy Framework

Ref. 15.8 – HM Treasury (2013) Infrastructure Carbon Review

Ref. 15.9 – Department for Business, Energy and Industrial Strategy (2021) Net Zero Strategy: Build Back Greener

Ref. 15.10 – Department for Transport (2021) Decarbonising Transport: A Better, Greener Britain

Ref. 15.11 – Committee on Climate Change (2023) CCC Assessment of Recent Announcements and Developments on Net Zero

Ref. 15.12 – Norfolk County Council (2024) Norfolk Council Council's Climate Policy 2024

Ref. 15.13 – Norfolk County Council (2019) Norfolk Council Council's Environmental Policy

Ref. 15.14 – Broadland District Council, Norwich City Council and South Norfolk Council (2024) Greater Norwich Local Plan

Ref. 15.15 – Norfolk County Council (2022) Local Transport Plan 4 Strategy and Implementation Plan



Ref. 15.16 – Highways Agency (2019) Design Manual for Roads and Bridges (DMRB) Sustainability and Environment Appraisal, Climate LA 114, Revision 0

Ref. 15.17 – BSI (2023) PAS 2080 Carbon Management in Buildings and Infrastructure

Ref. 15.18 – RICS (2017) Whole life carbon assessment for the built environment

Ref. 15.19 – Department for Transport (2019) TAG Unit A3 Environment Impact Appraisal Chapters 4 Greenhouse Gases

Ref. 15.20 – IEMA (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition

Ref. 15.21 – Ministry of Housing, Communities & Local Government (2019) National Planning Practice Guidance on Climate Change

Ref. 15.22 – Natural England (2021) Carbon Storage and Sequestration by Habitat (2nd)

Ref. 15.23 – Woodland Carbon Code (2021) Woodland Carbon Code Calculator V4

Ref. 15.24 – IUCN UK (2023) Peatland Code Emissions Calculator (fen)

Ref. 15.25 – ICE Database (2019) v3.0

Ref. 15.26 – BEIS (2021) Greenhouse Gas Reporting: Conversion Factors 2021

Ref. 15.27 – Department for Transport (2022) Guidance: Tag Data Book

Ref. 15.28 – Department for Transport (2021) Road Traffic Statistics

Ref. 15.29 – Committee on Climate Change, UK Carbon Budgets