

Adran yr Economi a'r Seilwaith
Department for Economy and Infrastructure



Llywodraeth Cymru
Welsh Government

**THE CHESTER TO BANGOR TRUNK ROAD (A55) (JUNCTIONS 16 AND 16A
IMPROVEMENT REALIGNMENT AND SLIP ROADS) ORDER 202-**

**THE CHESTER TO BANGOR TRUNK ROAD (A55) (JUNCTIONS 16 AND 16A
IMPROVEMENT REALIGNMENT AND SLIP ROADS) (SIDE ROADS) ORDER 202-**

**THE WELSH MINISTERS (THE CHESTER TO BANGOR TRUNK ROAD (A55)
(JUNCTIONS 16 AND 16A IMPROVEMENT REALIGNMENT AND SLIP ROADS))
COMPULSORY PURCHASE ORDER 202-**

PROOF OF EVIDENCE

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WELSH GOVERNMENT, CLIMATE CHANGE AND CARBON

DOCUMENT REFERENCE: WG 1.04.02

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1. Author

- 1.1 I am Simon Declan Price
- 1.2 I have over 40 years of experience working with major plans and projects and their potential impacts on the environment. Much of this experience has been gained in the Highways sector with projects such as:
 - a) Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment - Lead Author and Editor
 - b) M25 Access /Heathrow Terminal 5 Public Inquiry - Expert Witness Air Quality Policy
 - c) A650 Bingley Bypass - Project Engineer and Lead Witness
 - d) A65 Coniston Cold Bypass - Project Engineer and Lead Witness
- 1.3 I have experience in civil engineering contracting, local and central government, a period as an advisor to the UK environment minister and as a consultant leading a major environmental consultancy business. I have been a member of the 2016 EU/US expert group on transport climate adaptation, and I held the Chair of the World Road Association (PIARC) Technical Committee Climate Change and Sustainability from 2007 to 2015.
- 1.4 I am the Climate Change Witness for the A55 Junctions 15 Improvements Scheme. My Proof of Evidence addresses the climate change considerations of the Scheme. The opinions expressed are my own unless I state otherwise. I have been assisted by colleagues from within the project team in the various tasks that are reported in this document. Colleagues are also presenting evidence within their specialist expertise. Where a topic is covered in detail by the proof of evidence of another specialist, I provide a cross reference to the relevant proof.
- 1.5 The project for improvements at Junction 15 and 16 has developed so that it encompasses Junctions 14 and 16A as well. Furthermore, the two sets of junctions, namely Junctions 14 and 15 to the west at Llanfairfechan, and Junctions 16 and 16A to the east at Dwygyfylchi and Penmaenmawr, are being treated under different sets of draft Orders and Environmental Statements. This proof of evidence addresses Junctions 16 and 16A, hereby referred in this proof of evidence as the 'Scheme' or the 'Junction 16 Scheme' as appropriate. I have prepared another proof of evidence for the Junction 15 scheme.
- 1.6 It is not my intention to reproduce large sections of text from the Environmental Statement (ES), but simply to cross refer to, or highlight key procedural and technical matters that are pertinent to the assessment of the published Scheme. Consequently, I will refer in this Proof of Evidence to

supporting material contained within the ES and the ES Supplements where relevant.

1.7 My Proof of Evidence is structured in the following manner:

Part 2 Review of the relevant UK and Welsh Government legislation and policy

Part 3 The Climate Change Assessment

- GHG emissions
- Climate Resilience
- In-Combination Climate Change Impacts

Part 4 Objections to the Scheme – This provides a summary of the matters raised in the objections that are relevant to my Proof of Evidence

Part 5 Consideration of Alternatives

Part 6 Conclusion and Declaration

Links with other Proofs of Evidence

1.8 I will rely on the following expert witnesses to cover their respective specialist fields:

- a) Jonathan Bayliss (Engineering) (WG 1.05)
- b) Nigel Roberts (Traffic and Economics) (WG 1.03)

2. UK and Welsh Government Climate Legislation and Policy as Relevant to the A55

- 2.1 Relevant Legislation, policy and guidance to inform the consideration of climate change are set out in Section 16.2 of Chapter 16 of the ES (Document Reference WG 3.01.01). Since the ES was prepared significant changes have occurred and these are reviewed below.
- 2.2 The Climate Change Act 2008¹ (Document Reference WG 4.01.07) is the basis for the UK's approach to tackling and responding to climate change. The 2050 Target Amendment Order² (Document Reference WG 4.01.30) imposes a duty on the Secretary of State to reduce UK wide greenhouse gas emissions to net zero by 2050 (reductions of least 100% from the 1990 baseline by 2050).
- 2.3 Parts 4 and 5 of the Act impose limited duties and confer limited powers on Welsh Ministers in terms of contributing towards meeting the UK wide carbon targets. The Environment (Wales) Act 2016 imposes specific carbon budgeting duties on Welsh Ministers like those to which the Secretary of State is subject.
- 2.4 On 29 April 2019 The Welsh Government declared a climate emergency³, being the first country in the world to do so.
- 2.5 On 9 February 2021 following a recommendation report from the independent Climate Change Committee (CCC) the Welsh Government set out its legal commitment to achieve net zero emissions by 2050 and in March 2021 the Senedd agreed to revise Wales's statutory climate targets in line with all of the CCC's recommendations in the December 2020 advice. The revised budgets are as follows:
- a) Carbon Budget 2 (2021-2025): 37% average reduction
 - b) Carbon Budget 3 (2026-2030): 58% average reduction
 - c) 2030: 63% reduction
 - d) 2040: 89% reduction
 - e) 2050: At least 100% reduction ('net zero')

¹ UK Government. Climate Change Act 2008. Available online: <https://www.legislation.gov.uk/ukpga/2008/27/contents> [Accessed 13/08/2021]

² UK Government. Climate Change Act 2008 (2050 Target Amendment) Order 2019. Available online: <https://www.legislation.gov.uk/ukdsi/2019/9780111187654> [Accessed 13/08/2021]

³ Welsh Government. Llywodraeth Cymru. Climate Emergency Declaration. (2019). Available online: <https://gov.wales/welsh-government-makes-climate-emergency-declaration> [Accessed 13/08/2021]

- 2.6 All reductions are against a 1990 baseline.
- 2.7 The National Development Framework (NDF) for Wales⁴ (Document Reference WG 4.01.38) published earlier this year provides a spatial context for development in Wales over the next 20 years. The evidence of Ms Shan Wyn-Jones (Document Reference WG 1.04.02) details the NDF relevance to the scheme. Several Welsh Government strategies and policies, including the new Llwybr Newydd The Wales Transport Strategy 2021⁵ (Document Reference WG 4.01.39), and Prosperity for All: A Low Carbon Wales Plan⁶ (Document Reference WG 4.01.12) forms the basis for the NDF.
- 2.8 Following the commitment to net zero, in March 2021 the Welsh Government published Llwybr Newydd: The Wales Transport Strategy ("The Strategy"). It establishes a 20-year vision for an accessible, sustainable and efficient transport system based on three priorities:
- a) Bring services to people in order to reduce the need to travel;
 - b) Allow people and goods to move easily from door to door by accessible, sustainable and efficient transport services and infrastructure; and
 - c) Encourage people to make the change to more sustainable transport.
- 2.9 Within the Strategy investment priority is to be given to funding projects and programmes that meet the ambitions and priorities in Llwybr Newydd. For existing infrastructure, it states "We will continue to make best use of existing transport infrastructure by maintaining and managing it well. We will invest in improving road safety, addressing congestion and adapting transport infrastructure to a changing climate and upgrade it to support modal shift." (Section 4.1 Investing responsibly, Page 40.)
- 2.10 Within the Strategy the Mini Plan for Roads Streets and Parking sets out a range of priorities including "upgrade, improve and future-proof our road network, addressing congestion pinch points and investing in schemes that support road safety, journey reliability, resilience, modal shift and electric bike, motorbike and vehicle charging." (Section 7.4 Roads Streets and Parking, page 69.)

⁴ Welsh Government. Llywodraeth Cymru. National Development Framework 2020 – 2040. Consultation Draft. 2019. (2021). Available online: <https://gov.wales/sites/default/files/consultations/2019-08/Draft%20National%20Development%20Framework.pdf> [Accessed 13/08/2021]

⁵ Llwybr Newydd The Wales Transport Strategy. (2021). Available online: https://gov.wales/sites/default/files/publications/2021-03/llwybr-newydd-wales-transport-strategy-2021-full-strategy_0.pdf [Accessed 13/08/2021]

⁶ Welsh Government. Prosperity for All. A Low Carbon Wales. (2019). Available online: https://gov.wales/sites/default/files/publications/2019-06/low-carbon-delivery-plan_1.pdf [Accessed 13/08/2021]

- 2.11 On 14 July 2021 the UK Government published the Decarbonising Transport: A Better, Greener Britain⁷ (Document Reference WG 4.01.40) which sets out the pathway for the UK transport sector to be Net Zero by 2050.
- 2.12 Removing tailpipe emissions from cars and vans is fundamental to decarbonising transport. From 2030 the sale of new petrol and diesel vehicles will end and from 2035 all new cars and vans must be zero emission at the tailpipe. Between 2030 and 2035, new cars and vans will only be able to be sold if they offer significant zero emission capability.
- 2.13 For Heavy Goods Vehicles (HGV) the UK Government is consulting on ending the sale of new non-zero emission HGVs by 2035, for vehicles 26 tonnes and under, and 2040, for vehicles over 26 tonnes. Two different dates are proposed to encourage the faster uptake of zero emission technology in smaller vehicles, where this product is already reaching the market. Emissions savings may be modest initially but will ramp up considerably as new technologies come to market and operators refresh their vehicle fleets.
- 2.14 In addition to action on carbon the Climate Change 2008 Act established a requirement to undertake a Climate Change Risk Assessment (CCRA) every five years and develop a programme for adaptation action in response to risks identified. The UK Government commissions the UK Committee for Climate Change (CCC) to undertake the risk assessment⁸ (Document Reference WG 4.01.41).
- 2.15 In response to CCRA2 the Welsh Government published in 2019 Prosperity for All: A Climate Conscious Wales⁹ (Document Reference WG 4.01.42), detailing actions to reduce the risks of climate change to Wales over the period 2020-2025.

⁷ Department for Transport. Decarbonising Transport: A Better, Greener Britain. (2021). Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009448/decarbonising-transport-a-better-greener-britain.pdf [Accessed 13/08/2021]

⁸ Committee on Climate Change. UK Climate Change Risk Assessment 2017. (2016). Available online: <https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Synthesis-Report-Committee-on-Climate-Change.pdf> [Accessed 13/08/2021]

⁹ Welsh Government. Llywodraeth Cymru. Prosperity for All: A Climate Conscious Wales. A climate change adaptation plan for Wales. (2019). Available online: https://gov.wales/sites/default/files/publications/2019-11/prosperity-for-all-a-climate-conscious-wales_0.pdf [Accessed 13/08/2021]

- 2.16 In June 2021 the CCC published their advisory report to inform the UK CCRA3 due in 2022 together with a technical report and summary for Wales¹⁰ (Document Reference WG 4.01.43). This assesses 61 risks and opportunities from climate change to Wales, including to business, infrastructure, housing, the natural environment, our health and risks from the impacts of climate change internationally.
- 2.17 The Welsh Government has committed to reviewing climate adaptation actions and processes in the light of the updated evidence within the CCRA3.

¹⁰ Climate Change Committee. UK Climate Risk. Evidence for the third UK Climate Change Risk Assessment (CCRA3). Summary for Wales. (2021). Available online: <https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA-Evidence-Report-Wales-Summary-Final.pdf> [Accessed 13/08/2021]

3. The Climate Change Assessment

- 3.1 An assessment of the scheme under the heading of climate change is presented in Chapter 16 of the ES (Document Reference WG 3.01.01).
- 3.2 At the time that the ES climate change assessment was prepared there was no guidance within the Design Manual for Roads and Bridges (DMRB) volume 11 on assessment under the climate topic. Therefore, the assessment was undertaken with reference to the following guidance:
- a) Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation¹¹ (Document Reference WG 4.01.44). This guidance aims to assist Environmental Impact Assessment (EIA) practitioners with addressing climate assessment and mitigation. It outlines the process for incorporating climate change resilience into a project and outlines an approach to considering in combination with the impacts of the project and how it relates to the EIA stages.
 - b) IEMA Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance¹² (Document Reference WG 4.01.45). This guidance aims to assist EIA practitioners with addressing greenhouse gas emissions assessment and mitigation. It outlines the process for undertaking the carbon assessment as it relates to the EIA stages.
 - c) Publicly Available Specification (PAS) 2080:16 Carbon Management in Infrastructure¹³ (Document Reference WG 4.01.46). PAS 2080 provides a framework on how to manage whole life carbon when delivering infrastructure assets and programmes of work. This assessment follows the principles set out in PAS 2080 for the quantification of greenhouse gas emissions.

¹¹ Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation. (2020). Available online: <https://www.iema.net/resources/reading-room/2020/06/26/iema-eia-guide-to-climate-change-resilience-and-adaptation-2020> [Accessed 13/08/2021]

¹² Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance. (2017). Available online: <https://www.iema.net/preview-document/assessing-greenhouse-gas-emissions-and-evaluating-their-significance> [Accessed 13/08/2021]

¹³ BSi. Publicly Available Specification (PAS) 2080:16 Carbon Management in Infrastructure. Available online : <https://shop.bsigroup.com/ProductDetail?pid=000000000030323493> [Accessed 13/08/2021]

- 3.3 Since publication of the ES, the DMRB has been updated with new guidance on Climate Change Assessment in LA114 Climate¹⁴ (Document Reference WG 4.01.47). The Paragraphs which follow set out the original assessment, but with the additional consideration of the requirements of LA 114 where these differ and as detailed in an A55 Climate Change Assessment Technical Note Number 1 (Document Reference WG 4.06.02).
- 3.4 Three aspects were considered as part of the ES climate assessment:
- a) Greenhouse Gas (GHG) Emissions Assessment – quantifies the potential GHG emissions associated with the construction and operation of the Scheme and identifies mitigation measures to reduce these emissions.
 - b) Climate Change Resilience (CCR) Assessment – evaluates the effectiveness and feasibility of adaptation measures integrated into the Scheme to avoid or reduce hazards and/or increase resilience of the Scheme to climate change impacts during construction and operation; and
 - c) In-combination Climate Change Impact (ICCI) Assessment – evaluates the combined effect of the Scheme and potential climate change impacts on the receiving environment during construction and operation.

The Greenhouse Gas (GHG) Emissions Assessment

- 3.5 A GHG assessment has two components: those GHG emissions which arise from the construction of the scheme, and those which arise from its operation.

GHG Emissions from the Construction of the Scheme

- 3.6 The ES assessment quantifies the potential GHG emissions associated with the construction of the Scheme and identifies mitigation measures to reduce these emissions. The study area for the GHG assessment includes the Scheme as well as the transport network utilised for transport of materials, the embodied carbon associated with the relevant construction materials and the emissions arising during construction of the Scheme.
- 3.7 An assessment of the construction GHG emissions is reported in Chapter 16 of the ES (Document Reference WG 3.01.01), summarised in Table 16.7 shown in table 1 below.

¹⁴ Design Manual for Roads and Buildings (DMRB). LA114. Climate (2020). Available online: <https://www.standardsforhighways.co.uk/dmrbs/search/d1ec82f3-834b-4d5f-89c6-d7d7d299dce0> [Accessed 13/08/2021]

Table 1 Extract from Chapter 16 of the ES Junction 16, Construction Stage GHG Emissions

Table 16.7: GHG Emissions (tonnes of CO₂e)

Item	Estimated GHG Emissions (tCO ₂ e) over 24 Month Demolition and Construction Pperiod
Embodied GHG emissions	5745.9
Construction onsite GHG emissions	5472.05
Construction transport GHG emissions	481.50
Waste disposal GHG emissions	0.19
Total	11,699

- 3.8 GHG emissions are measured in tonnes of carbon dioxide equivalent emissions (tCO₂e). CO₂e is a measure used to compare the emissions from various greenhouse gases based upon their global warming potential. The sources of greenhouse gas emissions associated with the construction of the Scheme included within the scope of the assessment are summarised in Table 16.4 of the ES. For each of the items, input data such as material bill of quantities has been provided by the design team, or reasonable assumptions made using professional judgement, and this has been used in calculations with standardised GHG emissions factors for determining the associated GHG emissions.
- 3.9 LA 114 (see Paragraph 3.3 above) adds a new component of Land Use Change to the assessment, that is GHG emissions mobilised from vegetation or soils loss during construction.
- 3.10 The Scheme will require a land take of approximately 25 hectares including approximately 9 hectares of agricultural land. Whether the land is currently acting as a source or sink for carbon emissions will depend on exactly how the land is managed, for example agricultural land does not generally sequester carbon and often acts as a net source of emissions¹⁵.
- 3.11 The scheme will involve conversion of some of this existing land to hard surfaces as well as for planting of verges and landscaping. These new land uses are not anticipated to lead to any significant change in carbon emissions compared to the baseline.
- 3.12 Soils contain a store of carbon which can be released to the atmosphere under certain conditions. During construction works soils would be disturbed, however soils with high carbon content that are most vulnerable to disturbance such as waterlogged peatland habitat are not present. Soils that

¹⁵ Carbon Storage and Sequestration by Habitat 2021 (NERR094), April 2021.
Available online: <http://publications.naturalengland.org.uk/file/6726246198411264>
[Accessed 18/09/2021]

are disturbed would be reused on site where appropriate to minimise emissions.

- 3.13 With respect to the impact on GHG emissions the scale of overall land take and land use change is considered to be small and in line with LA114¹⁴ advice on proportional assessment no further assessment of Land Use change GHG emissions has been made.
- 3.14 The ES reported that construction of the scheme would result in the emission of approximately 11,700 tonnes of CO₂e, or approximately 0.0005% (five ten thousandths of 1%) of the UK's 3rd carbon budget (2018-2022). In line with the IEMA guidance¹² of the time this emission was reported as significant.
- 3.15 The current guidance in LA114 introduces a new definition of significance advising in Paragraph 3.2 that "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."
- 3.16 To put the impact of the Scheme in context, the annual Welsh carbon budget baseline from 1990 is 56 million tonnes. Annual carbon emissions for Wales averaged 41.2 million tonnes (2016 to 2020) and Carbon Budget 2 for 2021-2025 is reduced to 35.5 million tonnes per year. The total construction carbon emissions for the proposed project are estimated to be about 11,700 tonnes. This therefore represents about 0.03% (three one hundredths of 1%) or about 1/3000th of the carbon budget and is not expected to materially affect the Welsh Government's ability to achieve its target. On this basis therefore the emissions are not considered significant.
- 3.17 It is important to note that the assessment of the construction emissions made for the ES does not take into account the impact of further requirements to minimise carbon which will be put into the contract documents should the scheme proceed.
- 3.18 In a manner consistent with PAS2080: 16 Carbon Management in Infrastructure¹³ the main works contractors will be required to set out how GHG emissions reductions will be identified, prioritised, implemented and monitored during construction. The approach will be agreed with Welsh Government.
- 3.19 The Contractor will be required to reduce GHG emissions below the baseline emissions presented in the ES and to develop a carbon reduction target to be agreed by the Welsh Government, which will become a contractual commitment to achieve.
- 3.20 Pre-Construction Environmental Management Plan (CEMP) has been prepared in advance of construction and this is included in the ES Appendix 2.2 (Document Reference WG 3.01.01). A Register of Environmental Actions

and Commitments (REAC) has also been prepared and included in ES Appendix 2.3 (Document Reference WG 3.01.01). The REAC is a live document which is being updated as new actions are identified and commitments made. The Pre-CEMP and the REAC would define all mitigation measures to be adopted to ensure as the design progresses, consideration of construction emissions and design enhancement measures should be used as a decision-making criterion, with the aim of minimising emissions where practicable.

GHG Emissions from the Operation of the Scheme

- 3.21 As reported in Chapter 16 of the ES emissions arising from the operation of the scheme, principally that is emissions from traffic on the road, were not included in the assessment. The following justification was provided in the ES:

“In this instance, during the operational stage, although traffic flows could change because of external factors, the Scheme itself is considered likely to result in no overall additional traffic or resulting emissions. Similarly, although the replacement of the roundabout with slip roads could result in minor fluctuations in emissions, these are considered likely to have a negligible effect on human and ecological receptors. In this instance, it is therefore considered that operational GHG emissions will be negligible, and therefore also scoped out”

However, in the ES an assessment of CO₂ emissions in the opening year was set out in Table 12.14 of the Air Quality assessment.

- 3.22 This assessment shows an increase of 45 tonnes of CO₂ in the opening year when comparing the situation of the Do Minimum (DM) against the Do Something (DS) i.e. with and without the scheme.
- 3.23 To account for uncertainties in future vehicle fleet composition, this assessment utilised 2022 emission factors contained with the DEFRA Emissions Factor Toolkit (EFT)¹⁶ (Document Reference WG 4.01.48), thus assuming no future technological vehicle improvements.
- 3.24 Since the assessment undertaken for the ES, the UK Government Decarbonising Transport Plan (DTP) has been published and the EFT updated. Therefore, the assessment of the operational emissions over the appraisal period has now been updated to reflect this new advice.
- 3.25 The UK vehicle fleet (cars, vans and HGVs) is projected by Department for Transport (DfT) to decarbonise rapidly between now and 2050. Figure 1

¹⁶ Department for Environment Food & Rural Affairs (DEFRA). Emissions Factors Toolkit (EFT). Available online: <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html> [Accessed 13/08/2021]

below extracted from the DTP shows the projection for cars. Projections for vans and HGVs are similar.

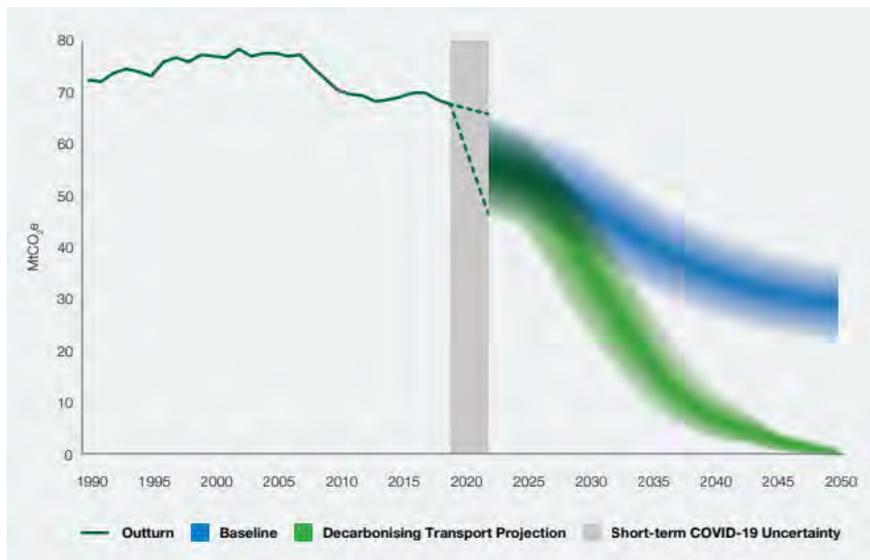


Figure 1: Decarbonising Transport Car GHG Projections, Versus the Baseline (Source: DfT Decarbonising Transport Plan)

3.26 For the Junction 16 Scheme this means that the additional annual carbon of 45 tonnes in the assumed opening of 2022 will fall to zero by 2050. Over the 60 year appraisal period the additional carbon would be 1005 tonnes, see Table 2 below. To place this in context the impact of the fleet decarbonisation would mean a fall in carbon emissions over the same period of more than 387,000 tonnes for Junction 16 with or without the Scheme.

Table 2 Operational Stage GHG Emissions for Do Minimum and Do Something (updated to reflect the decarbonisation of the fleet)

	J16 DM Emissions (tCO₂e)	J16 DS Emissions (tCO₂e)	J16 DS-J16DM (tCO₂e)
Opening Year (2022)	8,750	8,795	45
Over 60 year appraisal period	137,944	138,949	1005

3.27 In addition to the operational road user GHG emissions there will be emissions associated with the operational maintenance / refurbishment of the Scheme over its lifetime, in addition to operational energy use e.g. lighting. These were not considered in the ES assessment but are considered under LA114 which further advises in Paragraph 3.14 that “a proportionate approach shall be applied to capture the principal contributing factors associated with CHG emissions”

3.28 The Scheme involves the replacement of steel crash barriers with concrete ones which will require less ongoing maintenance. Other aspects of the scheme are considered to have similar maintenance requirements to the existing infrastructure. Therefore, it is considered reasonable to assume that the DS scenario will not result in any significant additional operational GHG emissions from energy use or maintenance in comparison to the DM scenario and no more detailed analysis of these emissions has been made.

Climate Change Resilience

- 3.29 A Climate Change Resilience Assessment (CCRA) for the scheme has been undertaken to assess the risks to the scheme from climate change. The assessment provides:
- a) An assessment of current and future climate trends in the study area using data from United Kingdom Climate Change Projections (UKCP18)¹⁷ (Document Reference WG 4.01.49) on projected changes in climate variables;
 - b) A review of potential future climate impacts that could affect the Scheme during operation;
 - c) A summary of design and mitigation measures for the Scheme that improve its resilience to future climate trends; and
 - d) Identification of any residual climate resilience risks.
- 3.30 Construction works for the Scheme were anticipated to begin in Quarter (Q) 2 of 2021 and to be completed by Q2 of 2023. For the climate change resilience assessment, any adverse effects associated with climate change are anticipated to be more significant in the 2030s and beyond. Climate change over the construction period is anticipated to be limited. Therefore, the assessment during the construction period focuses on the potential impacts of extreme weather events on the construction programme and people on the construction site.
- 3.31 Climate projections can be used to determine the likely future climate conditions in the locality of the Scheme through its lifetime. Climate projections take into account uncertainty due to natural variability and our incomplete understanding of the climate system and its imperfect representation in models. The projections do this by giving the probabilities of a range of possible outcomes, as estimated by scientific methodology. Good practice in the UK uses projections based on UKCP18 and published literature such as the UK Climate Change Risk Assessment. UCKP18

¹⁷ Met Office. United Kingdom Climate Change Projections (UKCP18). Available online: <https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index> [Accessed 13/08/2021]

includes projections of a range of climate variables for different time slices until the end of the century.

- 3.32 The probabilistic projections in the UKCP18 provide local low, central and high changes across the UK, corresponding to 10%, 50% and 90% probability levels. There are also a number of Representative Concentrations Pathways (RCPs) available for UKCP18 with each pathway resulting in a different range of global mean temperature increases over the 21st century. The RCP pathways represent a broad range of climate outcomes and are neither forecasts nor policy recommendations. They include a wide range of assumptions regarding population growth, economic development, technological innovation and attitudes to social and environmental sustainability.
- 3.33 The ES assessment used the central estimate (50th percentile) projections for the 2060-2079 high GHG concentration scenario (RCP8.5), following the precautionary principle. The 2060 to 2079 scenario was chosen as the Scheme reference lifespan, however LA 114 states that the lifespan should now be taken as 60 years. RCP8.5 represents a pathway in which global greenhouse gas emissions continue to rise leading to an increase in global mean surface temperatures of 3.2-5.4 degrees C when compared with the pre-industrial period 1850 to 1900. This therefore represents a lot more warming than is the goal of the Paris climate change agreement whose aims include *“holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change”*.
- 3.34 Recognising that the design of the scheme already included allowances for climate change, for example allowances for increased rainfall as a result of climate change in the sizing of drainage infrastructure (Document Reference WG 3.01.01), the ES Climate Change Risk assessment concluded that climate change posed no significant risk to the scheme and that no further mitigation measures were required.
- 3.35 In line with the requirements of LA114 the scheme has now undergone an additional assessment to consider a range of more extreme scenarios known as H++ scenarios¹⁸ (Document Reference WG 4.01.50). These are more extreme scenarios on the margins or outside of the 10th to 90th percentile range presented in the 2009 UK Climate Projections. LA114

¹⁸ Met Office, Centre for Ecology and Hydrology and University of Reading. Developing H++ climate change scenarios for heat waves, droughts, floods, windstorms and cold snaps. (2015). Available at: <https://www.theccc.org.uk/publication/met-office-for-the-asc-developing-h-climate-change-scenarios/> [Accessed 13/08/2021]

requires that these scenarios are used “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” (LA114 Paragraph 3.30).

- 3.36 For the A55 two safety critical features have been identified, drainage and earthworks.
- 3.37 This additional LA114 assessment is detailed in Document Reference WG 4.06.02. The assessment has concluded that there are no significant new impacts arising from the H++ scenarios which require further mitigation.

The In-combination Climate Change Impact (ICCI) Assessment

- 3.38 This assessment evaluates the combined effect of the Scheme and potential climate change impacts on the receiving environment during construction and operation. The basis of this assessment is to review the identified residual effects for each discipline contained within the environmental statement. If it is considered that climate change could produce an additive effect which changes the significance of a residual effect, the residual effect taking account of climate change will be reported using the same terminology as the relevant discipline.
- 3.39 The assessment is qualitative using information presented in other environmental assessments carried out by applying objective professional judgement. All other topics considered as part of this ES have been considered and a review has been carried out of the topics likely to have the potential for interactions between the impacts identified and the changing climate. The in-combination assessment considers:
- a) The nature of the effect;
 - b) Design and mitigation measures that have been identified;
 - c) The implications of climate change;
 - d) Additional mitigation that may be required to address the effects of climate change; and
 - e) The residual effect taking account of climate change.
- 3.40 The assessment is detailed in Table 16.5 of the ES (Document Reference WG 3.01.01) and concludes that climate change is unlikely to alter the significance of any of the effects identified in the impact assessment.
- 3.41 This assessment is not addressed within LA114 and therefore unaffected by it.

4. Objections to the Scheme

- 4.1 Objections have been made that raise matters that fall within the scope of my proof of evidence or that of one of my colleagues. I will address each and where appropriate I will refer to the proofs of others.

Objection

- 4.2 *Response to Climate Emergency.*

Response

- 4.3 The WG does not consider that the scheme contravenes the declaration of a climate emergency.
- 4.4 On 29 April 2019 The Welsh Government declared a climate emergency³, being the first country in the world to do so and, declared its ambition to set a net zero target asking the Climate Change Committee (CCC) for advice on achieving this.
- 4.5 On 9 February 2021 following a recommendation report from the CCC the Welsh Government set out its legal commitment to achieve net zero emissions by 2050 and in March 2021 the Senedd agreed to revise Wales's statutory climate budgets to achieve this
- 4.6 The total construction carbon emissions for the proposed Junction 16 project are estimated to be about 11,700 tonnes. This therefore represents about 0.03% or about 1/3000th of the (2021 to 2025) carbon budget and is not expected to materially affect the Welsh Government's ability to achieve its budget.
- Objection
- 4.7 *Construction of the Scheme will Produce Significant Greenhouse Gases.*
- Response
- 4.8 The ES reported that construction of the scheme would result in the emission of approximately 11,700 tonnes of CO_{2e}. To put the impact of the Scheme in context, the annual Welsh carbon budget baseline from 1990 is 56 million tonnes. Annual carbon emissions for Wales averaged 41.2 million tonnes (2016 to 2020) and Carbon Budget 2 for 2021-2025 is reduced to 35.5 million tonnes per year. The construction carbon emissions therefore represent about 0.03% or about 1/3000th of the carbon budget.
- 4.9 The current guidance on climate change assessment LA114 Climate, published in October introduces a new definition of significance advising that "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." On this basis therefore the emissions are not considered significant.

- 4.10 It is important to note that the assessment of the construction emissions made for the ES does not take into account the impact of further requirements to minimise carbon which will be put into the contract documents should the scheme proceed.
- 4.11 The Contractor will be required to reduce GHG emissions below the baseline emissions presented in the Environmental Statement and to develop a carbon reduction target to be agreed by the Welsh Government, which will become a contractual commitment to achieve.

5. Conclusion and Declaration

- 5.1 The construction emissions are approximately 11,700 tCO₂e. This is likely to be lowered as contractors respond to the additional requirements to minimise GHG emissions. Nevertheless, there will be excess GHG emissions compared to the Do Minimum.
- 5.2 Whilst the Scheme will lead to additional annual GHG emissions from traffic these are small and will decline as the fleet is decarbonised.
- 5.3 However, overall and when seen in the context of the Welsh Government carbon budgets and, taking into account the scale and timing of these GHG emissions, it is in my opinion unlikely that these emissions will materially affect the Welsh Government's ability to achieve its budget.
- 5.4 Turning to climate resilience the assessment demonstrated the resilience of the Scheme under a wide range of climate change impacts including those arising from what are currently considered to be extreme climate change scenarios. Further the detailed design of the Scheme will continue to refine the response to these impacts. Therefore, in my opinion the Scheme is resilient to the impacts arising from the currently advised range of climate change scenarios.
- 5.5 Finally, the assessment of the combined effect of the Scheme and potential climate change impacts on the receiving environment during construction and operation demonstrates that climate change is unlikely to alter the significance of any of the effects identified in the ES.
- 5.6 My evidence includes facts which I regard as being relevant to the opinions which I have expressed. In my opinion the Climate Assessment has been undertaken in accordance with published professional guidance.
- 5.7 I believe the facts I have stated in this proof of evidence are true and that the opinions expressed are correct.
- 5.8 I understand my duty to the Inquiry to assist it with matters within my expertise and believe that I have complied with that duty.