APPENDIX A - ASSESSMENT METHODOLOGIES- ENVIRONMENTAL STATEMENT (2021)

AIR QUALITY(SEE SECTION 7.2 OF ES)

Guidance

The assessment of air quality has been completed using the following guidance:

- Design Manual for Roads and Bridges (DMRB) Sustainability & Environment
- Appraisal, LA 105 Air quality (Highways England, 2019)
- Institute of Air Quality Management (**IAQM**) Guidance on the assessment of dust from
- demolition and construction (IAQM, 2016)
- Local Air Quality Management (LAQM) Technical Guidance, LAQM.TG(16) (Defra, 2018)

Data Collection

Information for the assessment of air quality has been collected through the use of:

- LAQM review and assessments and air quality monitoring undertaken by Wealden District Council (WDC, 2020) and Lewes District Council (LDC, 2020) and reported in their Air Quality Annual Status Reports (ASRs)
- Defra background maps, for a 2018 reference year (Defra, 2020)
- Observed meteorological data at Herstmonceux in 2019
- The Atmospheric Dispersion Modelling Software (ADMS)-Roads air dispersion model,
- which was used to estimate annual mean pollutant concentrations at sensitive receptors (see Appendix 7.2)
- A Vissim traffic model, which provided data on traffic flow, composition and speed on the local road network (both with and without the Project)
- Ordnance Survey (OS) datasets, including AddressBase Plus (to identify sensitive human receptors), MasterMap and Highway Network
- MAGIC (Defra, 2020), Ancient Tree Inventory (Woodland Trust, 2020) and local
- ecological datasets to identify designated ecological habitat locations

Air Pollution Information Systems (APIS) for baseline rates of nitrogen deposition in designated habitats

Study area

Construction Phase Effects

DMRB LA 105 (Highways England, 2019) suggests a simple approach for assessing construction dust risks. However, the more detailed approach for assessing construction dust risks set out in the IAQM guidance (IAQM, 2016) has been used instead, the outputs of which can be directly linked to good practice mitigation measures defined in the IAQM guidance itself, depending on the level of risk identified.

IAQM guidance (IAQM, 2016) indicates that an assessment will normally be required where there is:

- A ‘human receptor’ within:
  - 350 m of the boundary of the site
  - 50 m of the route(s) used by construction vehicles on the public highway, up to
  - 500 m from the site entrance(s)
- An ‘ecological receptor’ within:

- 50 m of the boundary of the site
- 50 m of the route(s) used by construction vehicles on the public highway, up to
- 500 m from the site entrance(s)

As such, the study area for the assessment of construction phase air quality effects has been defined based on a distance of 350 m from the boundary of the site and 50 m of the routes likely to be used by construction vehicles on the public highway, up to 500 m from the site entrance, the extent of which is shown in **Figure 7.5**. These distances have been applied to both main site at Exceat Bridge and the construction compound along the A259 towards Seaford.

Operational Phase Effects

The study area for the assessment of operational phase air quality effects has been defined in line with DMRB LA 105 (Highways England, 2019). The extent of the air quality study area, also referred to as the Affected Road Network (**ARN**), was defined by identifying any road links (and adjoining roads within 200 m) likely to experience any of the following changes between the Do-Something (**DS**) traffic (with the Project) compared to the Do-Minimum (**DM**) traffic (without the Project) in the opening year:

- Annual average daily traffic (AADT) ≥1,000;
- Heavy duty vehicle (HDV) AADT ≥200;
- A change in speed band; or
- A change in carriageway alignment by ≥5 m.

The term 'speed band' referred to above refers to a range of categories for which outputs from the traffic model are grouped into to describe their emissions. This process, which is defined in DMRB LA 105 (Highways England, 2019), and associated emission factors (which are not published, and only available upon request from Highways England) are, however, only relevant to Highways England projects. As such, the following criteria (taken from previous Highways England air quality guidance HA 207/07 (Highways England, 2007), were used to identify road links where changes in vehicle speeds have the potential to result in air quality effects:

- Daily average speeds change by 10 km/hour or more
- Peak hour speed changes by 20 km/hour or more

It should be noted that these changes in speed are considered equivalent to those required to result in a change in 'speed band' and are therefore comparable to the speed change criteria proposed in DMRB LA 105 (Highways England, 2019). DMRB LA 105 states that the traffic scoping criteria should only be applied to the area covered by the traffic model that the competent expert for traffic has identified as reliable for inclusion in an environmental assessment, referred to as the traffic reliability area (**TRA**). For the purposes of this assessment, the full extent of the traffic model has been used, as this was confirmed to be sufficiently reliable for inclusion in an environmental assessment by the competent expert for traffic.

Data from the traffic modelling described in the Transport Assessment (**TA**) have been used to define the study area in accordance with the criteria described above, the extent of which is shown in **Figure 7.1** (see Appendix D). As the criteria for road alignment described above are exceeded on a number of road links, this confirms the need for an air quality assessment.

Sensitive Receptors

Construction Phase

With regards to construction phase effects, different types of receptors can be considered to be of low, medium or high sensitivity to dust soiling effects, health effects of PM_{10} and

ecological effects, as described in **Appendix 7.4**. Such receptors include the human health and ecological receptors considered within the operational phase assessment described below, as well as other receptors where adverse effects could be experienced during construction, including car parks, parks and places of work.

Operational Phase – Human Health

Within the study area, residential properties are the only sensitive human receptors present and have therefore been considered for the assessment of annual mean air quality thresholds. Based on a review of baseline conditions (see Section 7.3), there is considered to be a low risk of short term air quality thresholds (e.g. the hourly mean NO_2 and daily mean PM_{10} AQOs) being exceeded in the study area and, as such, sensitive receptor locations relevant to these thresholds, such as gardens and playing fields, have not been considered.

Building usage has been determined using the Ordnance Survey Address-Base Plus dataset and pollutants concentrations estimated at the nearest building façade to the busiest road.

A total of six human health receptors were included in the air quality assessment (the locations of which are shown in **Figure 7.2**). Results for all modelled receptors are provided in Section 7.4.

Operational Phase - Compliance Risk

In accordance with DMRB LA 105, a compliance risk assessment is required to determine whether the Project has the potential to affect the UK's reported ability to comply with air quality Limit Values in the shortest timescales possible.

The guidance states that a compliance risk assessment should be carried out for those PCM road links that are within the ARN of the Project. In this case, there are no road links from the PCM model in the study area of the Project and therefore the Project does not affect the UK's reported ability to comply with the Air Quality Directive in the shortest timescales possible. As such, no further assessment is required.

Operational Phase - Ecological Receptors

Receptors representing all internationally, nationally and locally designated sites of ecological conservation importance on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity (known as ‘designated habitats’) within 200 m of the ARN have been included in the air quality assessment.

Designated habitats, as defined within DMRB LA 105 (Highways England, 2019) include Ramsar sites, Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSIs), Local Nature Reserves (LNRs), Local Wildlife Sites (LWSs), Nature Improvement Areas (NIAs), ancient woodland and veteran trees. National Nature Reserves (NNRs) are also assumed to be relevant, although there are none within the air quality study area.

For each designated habitat considered sensitive to nitrogen deposition, transect receptor points at 10 m intervals were modelled, starting from the nearest point of the designated habitat to the road, up to a maximum distance of 200 m. Where multiple, overlaying designated habitats were present along a transect, at different distances from the road, additional receptor points were placed at the closest part of each habitat to the roadside.

A summary of the designated habitats and features included in the assessment is provided in Section 9, the locations of which are shown in **Figure 7.1**. These sites are considered to have the potential to contain features which are sensitive to nitrogen deposition.

Table 7.1: Designated ecological habitats and features included in assessment

Designated habitat/feature	Habitat Description	Designation	Broad Habitat Type
South Downs Way ahead	Calcareous grassland, coastal floodplain grazing marsh	SSSI	Grassland
Seaford Head	Calcareous grassland, coastal floodplain grazing marsh	LNR	Grassland
South Downs Way Ahead	Calcareous grassland, coastal floodplain grazing marsh, native broadleaved, mixed-yew woodland	NIA	Forest and Grassland

Assessment Methodology

Construction Phase

This assessment considered the potential impacts of dust and PM_{10} at sensitive receptors following the methodology outlined within the IAQM Guidance on the assessment of dust from demolition and construction (IAQM, 2016). The assessment has been undertaken using the best available information at the time of writing and any assumptions made have been clearly stated. The dust assessment provides a qualitative risk-based appraisal with reference to the Project in relation to sensitive locations, the planned construction process and local site characteristics. The methodology for the construction dust assessment is provided in greater detail in Appendix 7.4. A summary is provided in Table 7.2.

Table 7.2: Summary of IAQM construction and dust assessment methods

Step	Assessment methods
1	Screen the need for a detailed assessment
2a	Determine the potential dust emission magnitude - Small, Medium or Large, for each site activity– Demolition, Earthworks, Construction and Trackout.
2b	Define the sensitivity of the area – Low, Medium or High, which includes specific sensitivities of receptors based on proximity and numbers of those receptors and the local background PM_{10} (pertinent to human health effects).
2c	Define the risk of impacts, based on the dust risk and area sensitivity conclusions from Step 2a and 2b (without mitigation).
3	Define site specific mitigation (if required).
4	Determination of residual effects.

Operational Phase

A detailed assessment of the potential air quality effects of the Project has been undertaken using the dispersion modelling software, ADMS-Roads. This is an atmospheric dispersion modelling system that focuses on road traffic as a source of pollutant emissions and is a recognised tool for carrying out air quality impact assessments. Version 5.0 (March 2020) was used for this assessment. Further information on the modelling methodology followed can be found in Appendix 7.2.

Air quality modelling, like all modelling, is inherently uncertain, but it is the most reliable, reasonable and robust tool available to determine whether a project has the potential to have

a significant air quality effect. To help manage uncertainty in the air quality modelling, the modelled concentrations in the base year were verified against air quality monitoring data in accordance with the methodology described within LAQM.TG(16) (Defra, 2018). The verification adjustment factor derived was applied to the modelled concentrations in the base year, DM (without the Project in place) and DS (with the Project in place) scenarios. A description of the model performance, including details of model verification and performance statistics, is provided in **Appendix 7.3**.
Uncertainty in future air quality is one of the key assumptions in air quality modelling. Therefore, the approach for addressing uncertainty in predicted future roadside NO_2 trends set out in DMRB LA 105 (Highways England, 2019) has been followed, as described in Appendix 7.3. This approach uses a Gap Analysis method to apply projected Long-Term Trends (termed '**LTTE6**') to model predictions, whereby an adjustment is made to model predictions based on the difference between the predicted rate of improvement in NO_2 concentrations between the modelled base and opening years, and that projected by LTTE6 (which is more conservative).

At the start of the assessment, the Opening Year was assumed to be 2022, but this has since been amended to 2024. Vehicle traffic is not anticipated to change substantially within the study area between 2022 and 2024. In addition, there will be an improvement in vehicle emission rates and background air pollutant concentrations over this period. Model predictions for 2022 have therefore been used for the purposes of the air quality assessment, which is considered a conservative approach, as absolute pollutant concentrations are likely to be lower in 2024 than 2022.

Temporal Scope

The assessment of operational air quality effects has considered the following scenarios:

- The base year (2019), to allow model outputs to be verified against monitoring results
- The DM scenario in the modelled Project opening year (2022 DM)
- The DS scenario (i.e. with the new bridge) in the modelled Project opening year (2022 DS)

Magnitude and Significance

Operational phase – Human Health

Predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations were compared to the relevant AQOs set out in Error! Reference source not found. for each of the scenarios modelled in this assessment.

Table 7.3: Relevant National Air Quality Objectives for human health

Pollutant	Threshold Concentration (µg/m3)	Averaging period
NO_2	40	Annual Mean
PM_{10}	40	Annual Mean
$PM_{2.5}$	24	Annual Mean

In order to convey the level of impact on air quality, it is necessary to determine its significance. The 'significance' of an environmental impact is a function of the 'sensitivity' of the receptor and the 'scale' or magnitude of the impact. The model results were used to assess whether there are any significant effects as a result of the Project in accordance with Highways England's approach to evaluating significant air quality effects, as set out in DMRB LA 105 (Highways England, 2019).

The DMRB approach to air quality assessment identifies and assesses sensitive receptors near roads where air quality might be affected, in particular, in areas where AQOs are exceeded or are close to being exceeded, such as within AQMAs. The model results were used to identify receptors in exceedance of the relevant AQOs in either the DM or DS scenario.

These are the only receptors that are considered in the judgement of significance. The change in predicted concentration is then calculated as the difference between DS and DM model results at these receptors. Where the difference in concentrations are less than or equal to 1% of the AQO (e.g. less than or equal to 0.4 µg/m$_3$ for annual average NO_2) then the change at these receptors is considered to be imperceptible and can be scoped out of the judgement on significance.

Highways England has developed a framework to provide guidance on the number of receptors for each of the magnitude of change categories that might result in a significant effect. These are guideline values only but have been used to inform professional judgement of the significance of the effects of the Project. The guideline bands are based on Highways England's considered opinion and are intended to help provide consistency across all Highways England schemes, but are considered equally applicable to the Project.

A receptor with a predicted change in annual mean NO_2 or PM_{10} concentration greater than 'imperceptible' (i.e. greater than a magnitude of 0.4 µg/m$_3$) is assigned to one of six categories (large, medium and small for either worsening or improvement) where there is a predicted AQO exceedance. If any exceedances are predicted, the number of receptors in each category are compared to guideline ranges provided in Table 2.92N of DMRB LA 105 (Highways England, 2019), as presented in Error! Reference source not found.. Where the AQO is not modelled to be exceeded at any receptors in either the DM or DS scenarios, the effect would be considered 'not significant'.

Table 7.4: Guideline band for the number of properties informing a judgement of significant air quality

Magnitude of change in annual mean NO_2 or PM_{10} concentration (µg/m^3)	**Total number of receptors with:**	
	Worsening of AQO already above objective or creation of a new exceedance	**Improvement of an AQO already above objective or the removal of an existing exceedance**
Large (>4)	1 to 10	1 to 10
Medium (>2)	10 to 30	10 to 30
Small (>0.4)	30 to 60	30 to 60

Where the number of receptors falls below the lower value of the range in all given categories, it is considered that the Project is likely to have a 'not significant' effect (e.g. small increases at a total of 20 receptors exceeding the AQO would be considered 'not significant'). Conversely, where the number of receptors is greater than the upper limit of the range for any given category, it is considered that the potential impact of the Project is likely to cause a 'significant' effect (e.g. medium increases at a total of 40 receptors exceeding the AQO would be considered 'significant').

Where the number of receptors lies within the guideline ranges for any given category, further consideration based on a balanced judgement of the overall impacts across the whole study area is undertaken, including consideration of:

- The absolute concentration at each receptor (i.e. is the modelled concentration 40 µg/m3 or 60 µg/m3?)
- How many receptors are there in each of the magnitude of change criteria (i.e. does the project create more 'worsenings' than 'improvements'?)
- The magnitude of change in concentration at each receptor (e.g. 0.6 µg/m3 vs 1.8 µg/m3)

Operation Phase – Ecological

An assessment of the impacts of changes in nitrogen deposition rates resulting from the Project on designated ecological habitats has been undertaken using the outputs from the air quality modelling. As suggested in DMRB LA 105, the assessment of significant air quality effects on designated habitats has been undertaken by the competent expert for biodiversity (see Section 9 - Biodiversity).

ARCHAEOLOGY AND CULTURAL HERITAGE (SEE SECTION 8.2 OF ES)

The method of assessment for value, magnitude of impact, and significance of effects on archaeology and cultural heritage has followed DMRB LA 106, Cultural heritage assessment (Highways Agency, 2020) and LA 104 as outlined in Section 6. Specific examples relating to the assessment of value for cultural heritage receptors are presented in **Table 8.1** and the criteria for assessing the magnitude of impact are presented in **Table 8.2.**

Table 8.1: Assessing the value of cultural heritage receptors

Value	Criteria
Very high	*Very high importance and rarity, international scale and very limited potential for substitution* For example: World Heritage Sites (including buildings and those inscribed for their historic landscape qualities) • Assets of acknowledged international importance • Assets that can contribute significantly to acknowledged international research objectives • Extremely well-preserved historic landscapes with exceptional coherence, time-depth or other critical factors
High	*High importance and rarity, national scale, and limited potential for substitution* For example: • Scheduled Monuments (including standing remains) • Designated historic landscapes of outstanding interest • Undesignated assets of schedulable quality and importance • Assets that can contribute significantly to national research objectives • Designated structures (i.e. Listed Buildings) • Conservation Areas containing very important buildings • Undesignated structures of clear national importance • Undesignated landscapes of outstanding interest, high quality or importance and of demonstrable national value • Well-preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factors
Medium	*Medium or high importance and rarity, regional scale, limited potential for substitution* For example: • Designated or undesignated assets that contribute to regional research objectives • Undesignated historic landscapes that would justify special historic landscape designations, or landscapes of regional value • Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor • Conservation Areas containing buildings that contribute significantly to its historic character • Historic Townscape or built-up areas with important historic integrity in their buildings, settings or built settings
Low	*Low or medium importance and rarity, local scale*

	For example: • Designated and undesignated assets of local importance • Robust undesignated historic landscapes and historic landscapes with importance to local • interest groups • Historic landscapes whose value is limited by poor preservation and / or poor survival of • contextual associations • Assets compromised by poor preservation and/or poor survival of contextual associations • Assets of limited value, but with potential to contribute to local research objectives • 'Locally Listed' buildings • Historic (unlisted) buildings of modest quality in their fabric or historical association • Historic Townscape or built-up areas of limited historic integrity in their buildings or built settings
Negligible	*Very low importance and rarity, local scale* For example: • Assets with very little or no surviving archaeological interest • Buildings of no archaeological or historical note, or buildings of an intrusive character • Landscapes with little or no significant historical interest

Table 8.2: Criteria for assessing the magnitude of impact.

Magnitude or impact	Typical description
Major	Loss of resource/receptor and/or its quality and integrity; severe damage or major improvement to key characteristics, features or elements. Large scale or major improvement of resource or receptor quality; extensive restoration; major improvement of attribute quality.
Moderate	Loss of resource/receptor but not adversely affecting its integrity; partial loss or damage to key characteristics, features or elements. Benefit to or addition of key characteristics, features or elements; improvement of attribute quality.
Minor	Some measurable change in attributes, quality or vulnerability; minor loss or alteration to one or more key characteristics, features or elements. Minor benefit or positive addition to one or more key characteristics, features or elements; some beneficial impacts on attribute or a reduced risk of negative impact occurring.
Negligible	Very minor loss or detrimental alterations to one or more characteristics, features or elements. Very minor benefit or positive addition to one or more characteristics, features or elements.
No change	No loss or alteration

The significance of effects has been determined by consideration of the value of receptors and magnitude of impacts as discussed in Section 6.

Study Area

The study area has been defined as the footprint of the temporary and permanent components of Project (including the Red Line Boundary of the Project and the extended highways boundary where smaller works such as kerb replacements and the installation of signage are proposed) as shown in Figure 4.1 and Figure 4.2 (Section 4), plus a surrounding buffer of 300 m (hereafter 'the wider study area'). The study area is in accordance with the DMRB LA 106 guidance.

The data used to determine the baseline conditions for this appraisal were accessed from the following sources:

- National Heritage List for England (**NHLE**) for information of designated cultural heritage assets
- East Sussex Historic Environment Record (**HER**) for information on non-designated cultural heritage assets and previous archaeological interventions
- The National Trust Heritage Records for information on heritage assets within National Trust land
- SDNPA for information on Conservation Areas and buildings of local importance
- Sussex Historic Landscape Characterisation (**HLC**) project
- Historic mapping available online.

CLIMATE (SEE SECTION 10.2 OF ES)

Greenhouse Gas Emissions

The methods of assessment are based on the guidance of DMRB LA 114 on Climate (Highways England, 2019). This requires that the assessment reports on construction and operational GHG emissions:

- The assessment of construction impacts includes emissions derived from emissions associated with the raw materials used during construction, construction activities and changes in land use.
- The assessment of operational impacts includes emissions derived from traffic and any maintenance activities over design life of the Project.

Any GHG emissions associated with decommissioning are not assessed due to the length of the operational phase, designed to be 100 years. In accordance with standard convention, GHG emissions have been assessed in terms of tonnes of carbon dioxide equivalents (**tCO_2e**). An energy assessment of emissions associated with construction has been carried out in accordance with SD48: Climate Change and Sustainable Use of Resources" from the Sustainable Construction Supplementary Planning Document published by South Downs National Park Authority (August 2020). A copy of the full assessment report and the assumptions made are presented within the CEMP. A summary is presented in this section.

A separate assessment of emissions associated with the raw materials used during construction has also been carried out. The bridge design was analysed using an attributional approach (SimaPro, Release date April 2019). A copy of the assessment report is presented in Appendix 10.

The criteria used to define the magnitude of GHG emissions has been based on definitions used by The International Finance Corporation (IFC). These provide GHG reporting thresholds for projects to which the Corporation contributes funding of over 25,000 tCO2e in any year (IFC, 2011). The definitions, whereby the magnitude of impact is determined by a boundary of less than or more than 1% of the carbon budgets, or more than 25,000 tCO2e in any year, are outlined in Table 10.1.

The carbon budget set for the period of 2023 to 2027 in the UK at 1,950 million tCO2e, dropping to 1,725 million tCO2e for the budgetary period of 2028 to 2032.

Table 10.1: Magnitude criteria for GHG emissions

Magnitude	Criteria
High	Annual GHG emissions are more than or equal to 1% of the relevant annual National Carbon Budget or are more than 25,000 tCO2e in any year.
Low	Annual GHG emissions represent less than 1% of the relevant annual National Carbon Budget or are less than 25,000 tCO2e in any year.

The significance of effects has been determined by consideration of both the magnitude of effects and the sensitivity of the receiving environment as shown in **Table 10.2**. However, it should be noted that, for climate, the sensitivity of the receptor (the global climate) to changes in GHG emissions is always assigned a sensitivity of 'High'. Combined with the magnitude of impact as defined above in terms of either low of high, the significance of effect is defined as being either Minor (Not significant) or Major (Significant). This is in line with the IEMA guidance (IEMA, 2017), which states that the application of the standard EIA significance criteria is not considered to be appropriate for climate change mitigation assessments.

Table 10.2: Determination of significance of effects for GHG emissions

Magnitude of impact	Sensitivity of receptor
	High
Low (<1% of carbon budget or less than 25,000 tCO_2e in any year)	Minor (not significant)
High (≥1% of carbon budget or more than 25,000 tCO_2e in any year)	Major (significant

The study area for the assessment of operational traffic comprises the affected road network (**ARN**) defined in the Project's traffic model.

Climate change resilience

The assessment of the vulnerability of the Project to climate change has been based on a review of baseline weather conditions, how these are predicted to change over time, and the effects of these on the Project and users of the Project. In this case, the Project has been designed on the basis of a flood risk assessment and to accommodate a 1 on 200-year flood event taking account of predicted climate change over the design life of the Project of 100 years (further details of the assessment scenarios and design parameters relating to flood risk can be found in the Flood Risk Assessment submitted as part of the planning application).

Specific receptors or users of the Project considered vulnerable to climate change comprise:

- the construction process (comprising the workforce, plant and machinery)
- the assets and their operation, maintenance and refurbishment (including the new bridge, the pavements, earthworks, drainage and lighting)
- end-users (comprising members of public and traffic)

The study area for the assessment of the Project's vulnerability to climate change has been based on the construction footprint and Project boundary.