

Wicklow County Council

**N11/M11 Junction 4 to Junction 14
Improvement Scheme**

Option Selection Report
Appendix C6 – Air quality and
climate

265455-ARP-EAQ-SWI-RP-LA-0002

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Contents

	Page	
1	Air quality and climate	1
1.1	Introduction	1
1.2	Methodology	1
1.3	Assessment criteria - air quality	3
1.4	Assessment criteria - climate	4
1.5	Stage 1 corridor options assessment – air quality	4
1.6	Stage 1 corridor options assessment – climate	7
1.7	Conclusion	9
1.8	References	9

Tables

Table 1.1: Air quality corridor assessment - Northern Section

Table 1.2: Air quality corridor assessment - Southern Section

Table 1.3: Climate corridor assessment - Northern Section

Table 1.4: Climate corridor assessment - Southern Section

1 Air quality and climate

1.1 Introduction

This report details the environmental assessment of the Stage 1 Preliminary Options for the N11/M11 Scheme with respect to the Air quality and climate constraints identified in **Section 5** (Air quality and climate) of **Volume B**.

For the corridor assessment, the overall scheme has been split into two sections, i.e. the Northern Section and the Southern Section and the corridor options assessed are those discussed in **Section 6.1** of **Volume A**.

There are three zones associated with each corridor option referred to in this assessment:

- The potential road “footprint” which is the potential land take required to construct or improve the road;
- The road “corridor” which is a 200m wide corridor centred around the alignment centre line for all off-line corridors. For the on-line Corridor Options 1 (North), 1 (South) and 5 (South), the width is variable, but is typically narrower than the width of the off-line corridors. The “footprint” sits inside the “corridor” boundary; and
- 0-50m outwards from the “footprint” is the “zone of interest” that is used in the property counts element of the air quality assessment, **Section 1.5**.

Section 1.2 outlines the methodology that was used to carry out the assessment, and **Section 1.3** and **Section 1.4** describe the assessment criteria which were used. The Stage 1 assessment and summary is presented in **Sections 1.5** and **1.6** for air quality and climate, respectively. The conclusion is presented in **Section 1.7** and references are listed in **Section 1.8**.

1.2 Methodology

The corridor options were assessed comparatively for the northern and southern sections. The multi-criteria air and climate assessments were undertaken with reference to the TII Project Appraisal Guidelines for National Roads (PAG) Unit 7.0 – Multi Criteria Analysis¹ (hereafter referred to as the TII PAG). The assessment includes both a quantitative and qualitative element. Each impact is scored qualitatively based on the seven-point scale¹ below and an integer is assigned according to the impact level.

- 7 – Major or highly positive;
- 6 – Moderately positive;

¹Transport Infrastructure Ireland (TII) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi-Criteria Analysis, 2016. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

- 5 – Minor or slightly positive;
- 4 – Not significant or neutral;
- 3 – Minor or slightly negative
- 2 – Moderately negative; or
- 1 – Major or highly negative.

Using the impact scores and professional judgement a determination as to whether each corridor option assessed is ‘Preferred’, ‘Intermediate’ or ‘Least Preferred’ is made. The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports² were also referred to when undertaking this assessment, particularly **Table 3.3** in determining the significance of the impact.

The air quality assessment has been prepared in accordance with the Transport Infrastructure Ireland (TII), formerly, the National Roads Authority (NRA), Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes³.

Property counts⁴ and granted residential/sensitive receptor planning applications from Geohive⁵ were used to determine the proximity and number of sensitive receptors in the air quality assessment. Sensitive receptor locations are defined in the Guidelines³ as residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present. The granted planning applications⁵ give an indication of the potential number of future sensitive receptors in the area of interest. In addition, ecological sites in the area of interest are also considered in the assessment.

Projected 2042 Reference Case and Do-Something traffic volumes, in the form of Annual Average Daily Traffic (AADTs), have been provided for the nine corridor options. These traffic flows were reviewed to inform the air quality and climate impact assessments.

² Environmental Protection Agency (EPA), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, Draft 2017. Available from: <https://www.epa.ie/publications/monitoring--assessment/assessment/draft-guidelines-on-the-information-to-be-contained-in-environmental-impact-asse.php>

³ Transport Infrastructure Ireland Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes, 2011. Available from <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf>

⁴ Ordnance Survey Ireland. Licence Number 2020/35/CCMA/Wicklow County Council, OSI Digital Terrain Data (Prime 2) [Received from Wicklow County Council: 20 September 2019]

⁵ Department of House, Planning and Local Government, National Planning Applications. Available from: <https://data.gov.ie/dataset/national-planning-applications> [Accessed: 02 April 2020]

1.3 Assessment criteria - air quality

The air quality assessment is based on the number of sensitive receptors in proximity to each corridor option and the projected traffic volumes accessing the corridors during the operational stage.

The construction phase is assessed through the consideration of the number of sensitive properties located in proximity to the likely construction works where dust impacts may be experienced.

Section 2.3, Route Selection Process Stage 1 Preliminary Options Assessment, of the above Guidelines³ includes the initial steps to assess air quality within a study area as follows:

“The specific objectives of the air quality input to the Stage 1 Preliminary Options Assessment of the Route Selection Process are to characterise the existing and ambient air quality in the study area and to initially identify all sensitive receptor locations within the study area likely to be impacted by the proposed scheme before feasible route options are identified. Once feasible route options are identified and in order to undertake the preliminary options assessment, the total number of sensitive receptors (e.g. residential properties) within 50m of the carriageway of each feasible route option should be recorded with a view to eliminating those routes with the greater number of sensitive receptors likely to be impacted by the proposed scheme.”

The existing and ambient air quality and the initial identification of sensitive receptor locations within the study area are included in **Section 5** (Air quality and climate) of **Volume B**. The air quality and climate conditions for this assessment are in line with the baseline conditions set out in the aforementioned **Section 5**.

The scope of the air quality assessment is described in **Section 2.3** of the Guidelines as follows:

“Identify and record all sensitive receptor locations within the study area and all sensitive receptors within 50 m of the carriageway of each feasible route option that are, or have the potential to be significantly affected by a proposed scheme”

In line with the guidance, a quantitative assessment of potential air quality impacts on existing⁴ and potential⁵ sensitive receptors was undertaken.

The traffic data provided for each corridor option demonstrates that each corridor option results in no relative significant traffic generation. Traffic remains equivalent on the on-line options to the redistributed traffic when moved off-line. This is due to the corridor options essentially following the same desire lines with minimal deviation and due to the indicative number of lanes being equal across the corridor options assessed in both the northern and southern sections. Therefore, changes in traffic volumes are not considered a differentiator in the air quality options assessment.

TII Guidelines³ state that there is the potential for significant changes in emissions on road links where a change in AADT of $\pm 5\%$ is predicted. As stated previously, the on-line options are not predicted to generate significant additional traffic, resulting in no significant change in air quality.

Off-line options, however, have the effect of significantly increasing traffic volumes, assuming a zero baseline. The primary differentiator, therefore, is the potential for decreases in air quality along each corridor at new receptor points. The principle being that introducing impacts at new receptors is less preferable to removing impacts at current receptors.

1.4 Assessment criteria - climate

The climate assessment evaluates potential carbon emissions from road traffic during the operational stage while also considering potential embodied carbon from the construction phase of each corridor.

As outlined above in **Section 1.3**, the traffic data provided for each corridor option demonstrates that each corridor option has the effect of redistributing traffic with no relative significant traffic generation. Therefore, changes in traffic volumes are not considered a differentiator in the climate options assessment.

The construction phase assessment focusses on the likely additional road construction required, i.e. based on the new road length. Therefore, an online option is expected to generate significantly less embodied carbon.

1.5 Stage 1 corridor options assessment – air quality

The number of existing⁴ and potential⁵ sensitive receptors in proximity to each corridor option determines air quality impacts. The zone of interest for the assessment is 0-50m from each corridor option potential road footprint. This is an offset from the edge of the potential road footprint of each corridor option and assumes that properties within the potential footprint would be acquired and would therefore not be counted as receptors.

The number of sensitive receptors in proximity to each corridor option and the air quality assessment determinations are outlined in **Table 1.1** for the Northern Section.

Table 1.1: Air quality corridor assessment - Northern Section

Assessment Criteria Distance from footprint	Corridor Option 1 (North)	Corridor Option 2 (North)	Corridor Option 3 (North)	Corridor Option 4 (North)
Property counts - existing sensitive receptors				
0 - 50m	527	404	307	366
Property counts - granted planning applications for sensitive receptor developments				
0 – 50m	39	35	8	11
Total receptors (sum of property counts and granted planning applications)				
Total No. of Receptors within 0-50m	566	439	315	377

Assessment Criteria Distance from footprint	Corridor Option 1 (North)	Corridor Option 2 (North)	Corridor Option 3 (North)	Corridor Option 4 (North)
Assessment				
Qualitative Assessment	Not significant or neutral	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative
Score / Impact Level	4	3	3	3
Preference	Preferred	Least preferred	Least preferred	Least preferred

As outlined in **Table 1.1**, Corridor Option 1 (North) has the highest number of both existing⁴ and potential⁵ receptors in proximity. Nonetheless, an impact level of not *significant or neutral* was assigned, as this option does not result in any significant changes to traffic volumes accessing this existing route, i.e. the Reference Case and Do-Something volumes remain essentially the same. Therefore, no change to air quality at sensitive receptors is predicted to occur resulting in a neutral impact. Similarly, no change to air quality and therefore, no significant air quality impact, is expected on Kilmacanogue Marsh pNHA (Site Code 724) from the online Corridor Option 1 (North).

Northern Corridor Options 2 (North), 3 (North), and 4 (North) were assigned the impact level *minor or slightly negative*. Although, fewer receptors are located in proximity to these corridor options compared to Corridor Option 1 (North), there is the potential to decrease air quality in the vicinity of the corridors due to the introduction of traffic to the area. However, the increase in pollutant concentrations is not expected to be significant and concentrations are likely to be in compliance with air quality standards.

As Corridor Option 1 (North) is rated as *not significant or neutral* it was deemed to be the preferred option. The remaining options are least preferred. However, Corridor Option 3 (North) would be ranked as the second preference with Corridor Option 4 (North) as the third preference on the basis of the number of sensitive receptors located in proximity.

The numbers of sensitive receptors in proximity to each corridor option and the air quality assessment determinations are outlined in **Table 1.2** for the Southern Section.

Table 1.2: Air quality corridor assessment - Southern Section

Assessment Criteria Distance from Corridor	Corridor Option 1 (South)	Corridor Option 2 (South)	Corridor Option 3 (South)	Corridor Option 4 (South)	Corridor Option 5 (South)
Property counts - existing sensitive receptors					
0 - 50m	158	69	114	121	158

Assessment Criteria	Corridor Option 1 (South)	Corridor Option 2 (South)	Corridor Option 3 (South)	Corridor Option 4 (South)	Corridor Option 5 (South)
Property counts - granted planning applications for sensitive receptor developments					
0 – 50m	10	3	8	8	10
Total receptors (sum of property counts and granted planning applications)					
Total No. Receptors Existing and Proposed within 0-50m	168	72	122	129	168
Assessment					
Qualitative Assessment	Not significant or neutral	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative	Not significant or neutral
Score / Impact Level	4	3	3	3	4
Preference	Preferred	Least preferred	Least preferred	Least preferred	Preferred

As outlined in **Table 1.2**, Corridor Options 1 (South) and 5 (South) have the highest number of both existing⁴ and potential⁵ receptors in proximity. Nonetheless, an impact level of *not significant or neutral* was assigned, as these options do not result in any significant changes to traffic volumes accessing the existing routes, i.e. the Reference Case and Do-Something volumes remain essentially the same. Therefore, based on the methodology within the TII Guidelines³, no change to air quality at sensitive receptors is predicted to occur resulting in a neutral impact. Similarly, no change to air quality and therefore, no significant air quality impact, is expected on Glen of the Downs SAC (Site code 719) from the online Corridor Options 1 (South) and 5 (South).

Southern Corridor Options 2 (South), 3 (South) and 4 (South) were assigned the impact level *minor or slightly negative*. Although, fewer receptors are located in proximity to these corridor options compared to Corridor Options 1 (South) and 5 (South), there is the potential to decrease air quality in the vicinity of the corridor options due to the introduction of traffic to the area. However, the increase in pollutant concentrations is not expected to be significant and concentrations are likely to be in compliance with air quality standards.

As Corridor Options 1 (South) and 5 (South) are rated as *not significant or neutral* they were deemed to be the preferred options. The remaining options are *Least preferred*. However, Corridor Option 2 (South) would be ranked as the third preference with Corridor Option 3 (South) as the fourth preference due to the number of sensitive receptors located in proximity.

In conclusion, Corridor Option 1 (North) and Corridor Options 1 (South) and 5 (South) are determined as preferred options from an air quality perspective.

1.6 Stage 1 corridor options assessment – climate

From a climate perspective, greater corridor lengths have the potential to increase carbon emissions from road traffic during the operational stage due to increased vehicle kilometres. In addition, the more materials required to construct a corridor option, the greater the embodied carbon generated for the construction phase. The corridor lengths and climate assessment determinations are outlined in **Table 1.3** for the Northern Section.

Table 1.3: Climate corridor assessment - Northern Section

Assessment Criteria	Corridor Option 1 (North)	Corridor Option 2 (North)	Corridor Option 3 (North)	Corridor Option 4 (North)
Travel distance required				
Corridor Length (km)	8.97	9.07	9.69	9.72
Scale of construction	New interchanges / junctions	New road mainline infrastructure plus new interchanges / junctions	New road mainline infrastructure plus new interchanges / junctions	New road mainline infrastructure plus new interchanges / junctions
Qualitative Assessment	Minor or slightly negative	Major or highly negative	Major or highly negative	Major or highly negative
Score / Impact Level	3	1	1	1
Preference	Preferred	Least preferred	Least preferred	Least preferred

As outlined in **Table 1.3**, the on-line option, Corridor Option 1 (North) is the preferred option for the Northern Section for the following reasons:

- the shortest corridor length resulting in the lowest vehicle kilometres travelled;
- requires only the construction of new interchanges, slip roads and junctions as the existing road infrastructure would be used as much as possible;
- generates the least carbon emissions relative to the other options for both construction and operational stages.

Although it is preferred, Corridor Option 1 (North) is rated *minor or slightly negative* as realignments of the existing road and junction improvement works

will require the use of materials which generate carbon, for example concrete, bitumen and aggregates.

The Northern Corridor Options 2 (North), 3 (North) and 4 (North) were rated as *major or highly negative*. This is due to the potential for increased carbon emissions from the operational stage due to greater vehicle kilometres travelled in comparison with Corridor Option 1 (North). In addition, the embodied carbon in the materials required to construct the new road infrastructure have the potential to result in a significant negative impact on carbon emissions and thereby climate. As a result, Corridor Options 2 (North), 3 (North) and 4 (North) were ranked as least preferred for the Northern Section.

The corridor lengths and climate assessment determinations are outlined in **Table 1.4** for the Southern Section.

Table 1.4: Climate corridor assessment - Southern Section

Assessment Criteria Travel distance required	Corridor Option 1 (South)	Corridor Option 2 (South)	Corridor Option 3 (South)	Corridor Option 4 (South)	Corridor Option 5 (South)
Corridor Length (km)	14.41	14.84	14.73	14.91	14.41
Scale of construction	New interchanges / junctions	New road mainline infrastructure plus new interchanges / junctions	New road mainline infrastructure plus new interchanges / junctions	New road mainline infrastructure plus new interchanges / junctions	New interchanges / junctions
Qualitative Assessment	Minor or slightly negative	Major or highly negative	Major or highly negative	Major or highly negative	Minor or slightly negative
Score / Impact Level	3	1	1	1	3
Preference	Preferred	Least Preferred	Least Preferred	Least Preferred	Preferred

As outlined in **Table 1.4**, the on-line options, Corridor Options 1 (South) and 5 (South) are the preferred options for the Southern Section, for the following reasons:

- the shortest corridor lengths resulting in the lowest vehicle kilometres travelled;
- requires only the construction of new interchanges, slip roads and junctions as the existing road infrastructure would be used as much as possible;

- generates the least carbon emissions relative to the other options during both construction and operational stages.

Although preferred, Corridor Options 1 (South) and 5 (South) are rated *minor or slightly negative* as realignments of the existing road and junction improvement works will require the use of materials which generate carbon, for example concrete, bitumen and aggregates.

The Southern Corridor Options 2 (South), 3 (South) and 4 (South) were assigned an impact level of *major or highly negative*. This is due to the potential for increased carbon emissions from the operational stage due to greater vehicle kilometres travelled in comparison with Corridor Options 1 (South) and 5 (South).

In addition, the materials required to construct the new road infrastructure have the potential to result in a significant negative impact on carbon emissions and thereby climate. As a result, Corridor Options 2 (South), 3 (South) and 4 (South) were ranked as least preferred for the Southern Section.

In conclusion, Corridor Option 1 (North) for the Northern Section and Corridor Options 1 (South) and 5 (South) for the Southern Section were found to be the preferred options from a climate perspective. These preferences were determined from an assessment of overall corridor length and assumed scale of construction works generating embodied carbon.

1.7 Conclusion

The results from the air quality assessment conclude that Corridor Option 1 (North) and Corridor Options 1 (South) and 5 (South) are preferred. This determination is based on the consideration of the numbers of sensitive properties in proximity to each option compared to the existing situation. The on-line options are preferred as there is no significant change relative to the Reference Case scenario with no change in traffic volumes forecast.

The results from the climate assessment conclude that Corridor Option 1 (North) for the Northern Section and Corridor Options 1 (South) and 5 (South) for the Southern Section are preferred. These preferences were determined from an assessment of overall corridor length and assumed scale of construction works generating embodied carbon.

1.8 References

Department of Housing, Planning and Local Government, National Planning Applications. Available from: <https://data.gov.ie/dataset/national-planning-applications> [Accessed: 02 April 2020]

Environmental Protection Agency (EPA), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, Draft 2017. Available from: <https://www.epa.ie/publications/monitoring--assessment/assessment/draft-guidelines-on-the-information-to-be-contained-in-environmental-impact-asse.php>

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