

Chapter 21
Cumulative Impacts
& Environmental
Interactions

Contents

21. Cumulative Impacts and Environmental Interactions	1
21.1 Introduction	1
21.1.1 Cumulative Impacts	1
21.1.2 Environmental Interactions	1
21.1.3 Guidance	2
21.2 Methodology for Cumulative Impacts Assessment	2
21.2.1 Introduction	2
21.2.2 Stage 1: Establishing the Long List of 'Other Projects'	2
21.2.3 Stage 2: Establishing the Shortlist of 'Other Projects'	6
21.2.4 Stage 3: Information Gathering for the Shortlist of 'Other Projects'	7
21.2.5 Stage 4: Assessment.....	7
21.2.6 Traffic Related Cumulative Impacts: Construction Scenarios for Assessment	8
21.2.7 Operational Scenario for Assessment.....	9
21.2.8 Summary of Assessment Methodology for CEA	10
21.3 Assessment of Cumulative Impacts and Environmental Interactions	10
21.3.1 Construction Impacts.....	10
21.3.2 Operational Impacts	36
21.4 Environmental Interactions	60
21.5 Mitigation	67
21.5.1 Construction Phase	67
21.5.2 Operational Phase.....	67
21.6 Summary of Residual Cumulative Impacts and Environmental Interactions	67
21.7 References	70

21. Cumulative Impacts and Environmental Interactions

21.1 Introduction

This chapter reports the assessment of cumulative impacts of the Blanchardstown to City Centre Core Bus Corridor Scheme (hereafter referred to the Proposed Scheme) in combination with other existing and or approved projects and projects which, at the time of assessment, were yet to be approved, but for which a decision on such project is reasonably foreseeable over the likely consenting and construction period anticipated for the Proposed Scheme.

In addition, the chapter addresses the potential for interactions between impacts on different environmental factors of the Proposed Scheme itself on the receiving environment.

21.1.1 Cumulative Impacts

Annex IV of the EIA Directive (2011/92/EU as amended by 2014/52/EU) requires that an EIAR provides a 'description of the likely significant effects of the project on the environment resulting from...the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.'

The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022) define cumulative effects as:

'The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.'

Note that the EPA guidelines use the terms impacts and effects interchangeably. A relatively minor effect on a particular receptor caused by the Proposed Scheme could result in a significant effect if it is added to by impacts from other nearby projects. This chapter identifies and provides an assessment of likely significant cumulative effects caused by the Proposed Scheme in combination with other planned projects. This includes consideration of the potential effects of the other BusConnects Core Bus Corridor Schemes as well as other projects (e.g., Metrolink, DART+). Section 21.2 sets out the process for deciding which other planned projects were included in the assessment.

21.1.2 Environmental Interactions

Environmental interactions are the reactions between impacts, whether between the impacts of just one project (i.e., the Proposed Scheme), or between the impacts of multiple projects. For each environmental topic there will be certain interactions or interdependencies with other environmental topics, whereby impacts may interact to create a greater effect or different type of effect. An assessment of these interactions has been undertaken as required by Article 3 of the EIA Directive, which states the following:

'The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

- (a) Population and human health;
- (b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
- (c) Land, soil, water, air and climate;
- (d) Material assets, cultural heritage and the landscape;
- (e) The interaction between the factors referred to in points (a) to (d).'

Some of the topic assessments within this EIAR already address environmental interactions. For example, Chapter 10 (Population) provides an assessment of effects on community amenity, which relates to the interaction of impacts on air quality; visual amenity; traffic and transport; and noise and vibration. Furthermore, Chapter 11 (Human Health) describes and assesses how a combination of impacts on health determinants (air quality; noise and vibration; community amenity; traffic and transport) can interact and influence health outcomes. Section 21.4.3 of this chapter sets out the main environmental interactions identified from the Proposed Scheme, sign-posting chapters which already address environmental interactions and providing a description and assessment of environmental interactions which are not addressed elsewhere in this EIAR.

21.1.3 Guidance

This assessment has been completed with reference to the following guidance documents:

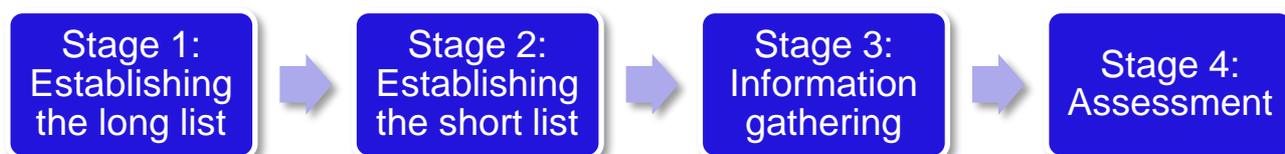
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022);
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999); and
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Union 2017).

21.2 Methodology for Cumulative Impacts Assessment

21.2.1 Introduction

Broadly speaking, the potential cumulative effects of the Proposed Scheme can be classed as traffic related or non-traffic related. The traffic related effects such as potential air emissions or noise resulting from the cumulation of traffic distribution from multiple projects are predicted through the results of traffic scenario modelling. The traffic modelling scenarios for the cumulative assessment are described in Section 21.2.6.

For non-traffic related cumulative effects, it is necessary to consider the scale, nature and likely impacts of other projects which could combine with the Proposed Scheme to cause cumulative effects. It was therefore necessary to identify which other projects should be included for analysis as part of the cumulative effects assessment (CEA). A staged approach to identify such other projects was applied as illustrated below, with each stage described in subsequent chapter sections.



21.2.2 Stage 1: Establishing the Long List of 'Other Projects'

The first stage of the CEA was to identify other projects deemed potentially relevant to be included in the long list. While the EIA Directive only requires the consideration of other existing and/or approved projects, this assessment has gone further in that it is assumed that the BusConnects Dublin - Core Bus Corridors Infrastructure Works (i.e., the 12 BusConnects Core Bus Corridor schemes) will be undertaken over a circa six year period (with construction commencing in 2023 subject to approval being granted). There is also potential for a number of other projects to receive approval and be progressed within that time period which may give rise to cumulative effects in combination with the Proposed Scheme. It was, therefore, considered appropriate to identify projects which, at the time of assessment, were yet to be approved, but for which a decision and potentially approval is reasonably foreseeable over the likely consenting and construction period anticipated for the Proposed Scheme.

21.2.2.1 Sources for the identification of other projects

Potentially relevant other projects include those from various sectors, such as residential and commercial projects, utilities, and other transport projects. The identification of projects for the long list considered the following sources:

- An Bord Pleanála website (<http://www.pleanala.ie/index.htm>) – for details of strategic infrastructure projects and Strategic Housing Developments;
- Local authority websites and the development plans for Dublin City, South Dublin, Dún Laoghaire-Rathdown, Fingal and Wicklow – for details of allocations and areas for regeneration;
- National Planning Application Database (<https://data.gov.ie/dataset/national-planning-applications>) – for downloadable list of planning applications sent from Local Authorities;
- Projects being planned by the National Transport Authority (the NTA website, (<https://www.nationaltransport.ie/planning-and-investment/transport-investment/projects/>, provides detail) as part of other major transport projects and programmes in accordance with the Transport Strategy for the Greater Dublin Area 2016 – 2035;
- Project Ireland 2040, which combines the National Development Plan and National Planning Framework. ([gov.ie](http://www.gov.ie) - [Project Ireland 2040 \(www.gov.ie\)](http://www.gov.ie) and its interactive mapper (<https://geohive.maps.arcgis.com/apps/MapSeries/index.html?appid=f05a07c5a0324b1a887cd9d5d7103e22>);
- Transport Infrastructure Ireland website (<https://www.tii.ie/public-transport/projects-and-improvements/>) – to identify major transport projects and programmes;
- Discussion between the BusConnects Infrastructure Team/TII/Iarnród Éireann to gain an understanding of each organisation's relevant projects and programmes;
- The EIA Portal (<https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal>) maintained by the Department of Housing, Planning and Local Government – for applications for development consent accompanied by an EIAR; and
- Irish Water's website, which includes a page on its projects (<https://www.water.ie/projects/>).

All planning application data provided by each local authority is fed into the national Data.Gov.ie database (<https://data.gov.ie/dataset/national-planning-applications>). This dataset was used to identify planning applications within a search area of the Proposed Scheme. The dataset included planning applications of various scales, most of which were for small-scale applications such as domestic residential modifications. The planning application lists were searched to identify and exclude very minor applications from the long list on the basis that given their minor nature these were not likely to have a cumulative effect noticeable over the effects of the Proposed Scheme in isolation. Examples of planning applications which were excluded from the preliminary long list were applications to construct or demolish conservatories, house extensions, loft conversions, change of uses for single or small numbers of buildings, construction of outbuildings, modifications to driveways and retention applications. Granted and pending applications older than ten years were also excluded from the preliminary long list on the basis that they would likely already have been built (and so would form part of the existing baseline) or are now unlikely to be progressed. Applications which have been refused or annulled were discounted from the preliminary long list on the basis that they are unlikely to progress, unless through successful appeal. The exercise to identify relevant planning applications was undertaken in November 2020 and subsequently updated in May 2021 and again in October 2021.

In addition to this process and to capture other potentially relevant foreseeable projects, major projects as part of transport and other infrastructure programmes were added to the preliminary long list. As noted earlier, this included the identification of major transport projects from the Transport Strategy for the Greater Dublin Area 2016 – 2035. It also included other known major projects or programmes of schemes that are currently undergoing some form of formal environmental appraisal, for example, Metrolink and the DART+ programme.

As noted previously, the other 11 BusConnects Core Bus Corridor schemes were also included for assessment. While each of the other BusConnects Core Bus Corridor schemes will be subject to an application for approval, they have a similar likelihood of going ahead as this Proposed Scheme and therefore, the potential cumulative effects of the other BusConnects Core Bus Corridor schemes are of relevance to the potential cumulative effects of this Proposed Scheme so they were included on the preliminary long list. Types of projects that were identified for consideration on the long list have been classed as follows:

- Local Planning Applications – those projects for which planning permission is applied for through the local planning authorities themselves and were identified from local authority planning application lists;
- Strategic Housing Developments – housing developments of a certain type and scale (e.g., 100 or more houses or student accommodation units) for which applications are lodged directly with An Bord Pleanála;
- Strategic Infrastructure Developments - major infrastructure developments by local authorities and others for which applications are lodged directly with An Bord Pleanála;
- Greater Dublin Area Park & Ride Projects – strategic rail and bus-based Park & Ride projects identified in the Transport Strategy for the Greater Dublin Area 2016 – 2035;
- Irish Water projects – projects under the programmes of work listed on Irish Water’s website;
- Other Major Projects – projects which were at a pre-application stage at the time of identification, but which are anticipated to be developed over the time period for the Core Bus Corridor Infrastructure Works. These include projects from various sectors including energy, utilities and transport; and
- Other Core Bus Corridor schemes: the other 11 Core Bus Corridor schemes proposed by the NTA.

21.2.2.2 Search areas to guide the inclusion of projects for the long list

In the absence of specific guidance on CEA study areas, consideration was given as to the distance over which impact pathways from other projects could potentially combine with the impact pathways of the Proposed Scheme to have likely significant effects on relevant receptors for each environmental topic. The starting point was taken to be impact pathways relating to biodiversity as this was deemed likely to be the most extensive. The Natura Impact Statement which has been prepared complies with the requirements of the Habitats Directive (Council Directive 92/43/EEC) and contains all of the information, data and analysis to inform the Appropriate Assessment to be conducted by the competent authority in order for the competent authority to establish whether the Proposed Scheme individually or in combination with other plans or projects, will have a significant effect on a European site.

The Guidance for Planning Authorities on Appropriate Assessments (Department of Environment, Heritage and Local Government 2009) recommends a study area of 15km is applied. However, any Appropriate Assessment to be conducted by the competent authority needs to consider all potential pathways to impacts on European nature conservation sites and therefore the application of an arbitrary distance may not be suitable. For example, this may be the case where highly mobile species are concerned, or where there is a credible impact pathway which extends over some distance, such as a watercourse. Consideration was therefore given to the distance and scales of projects that should be included on the long list for consideration that would be considered for the biodiversity cumulative assessment in this EIAR. This has meant that some major projects added to the long list were more than 15km from the Proposed Scheme itself. All major and strategic projects that have been (or would be) lodged with An Bord Pleanála within a 15km search area, or otherwise identified by the Biodiversity assessors as discussed above, were included on the preliminary long list.

Waste management is undertaken on a regional basis and therefore for the Waste & Resources assessment, consideration has been given to projects within the Eastern Midlands Waste Region (EMWR) – see also 21.2.3.3.

The Climate assessment has been considered on a national basis and not confined to a specific study area, as the drivers and impacts of climate change operate on a wider scale.

It was considered that a smaller search area could be applied to guide the identification of the majority of planning applications. A buffer of 500m from the Proposed Scheme was applied for this purpose, with flexibility retained so that particularly large-scale planning applications were included on the preliminary long list where they were considered to have potential significant cumulative impacts.

This 500m buffer was deemed appropriate since guidance from the Chartered Institution of Highways and Transportation (CIHT) (CIHT 2018) indicates that the preferred walking distance to a bus stop is 400m. A buffer of 500m is therefore sufficient to capture the population that is most likely to interact with the Proposed Scheme, and which could reasonably be exposed to cumulative effects in combination with other projects. The 500m buffer is greater than the study areas for all the other environmental topics with the exception of Biodiversity and Waste

& Resources. For Biodiversity, it was considered that the scale and nature of most projects that seek planning permission through local authorities (rather than through An Bord Pleanála) are unlikely to give rise to impacts that would be noticeable above the baseline trends of Dublin’s urban environment on biodiversity interests. However, as noted above, some flexibility was retained to allow some particularly large further afield planning applications lodged with local authorities to be included on the preliminary long list, as per the major and strategic projects identified.

21.2.2.3 Zones of influence

The long listing process next involved establishing the topic Zones of Influence (Zol). This was done by establishing whether each of the other projects identified would fall within the study areas for the topics considered for the Proposed Scheme in isolation, as assessed in the topic chapters of this EIAR. The Zol provides a guide as to the likelihood that another project may contribute to potentially significant cumulative effects with the Proposed Scheme. All local planning applications were included on the finalised long list to be considered further during the Stage 2 as described above being a short-listing process stage, while some of the major projects, Strategic Infrastructure Developments and Strategic Housing Developments, some of which were outside of any Zol, would not be taken through to the shortlisting stage.

Table 21.1 sets out the pre-defined Zol to guide the long-listing process.

Table 21.1: Pre-defined Zol for CEA

Topic	Zol*
Air quality (construction)	350m
Climate	N/A (Informed by traffic modelling scenario and the area of influence the Proposed Scheme has on changing traffic volumes and on long-term trends of climate change)
Noise & vibration (construction)	300m
Population	Community areas
Human Health	500m
Biodiversity	15km (not including watercourses linked to estuarine habitats and highly mobile species)
Water	500m
Land & soils	250m
Archaeology	50m
Architectural heritage	50m
Landscape & visual impacts	50m
Archaeology	50m
Architectural heritage	50m
Landscape & visual impacts	50m
Waste	N/A waste assessment is informed by regional data on waste. Study area of Eastern-Midlands Waste Region (EMWR) is applied to waste assessment.
Material assets	50m (used as proxy for footprint of Proposed Scheme & affected utilities.)
Traffic and transport	N/A Informed by traffic modelling scenario and the area of influence the Proposed Scheme has on changing traffic volumes
*Note: Zol = Zones of influence. These were used as a guide only. Where appropriate, other projects which were outside the pre-defined Zol for the topic were considered on the basis that potentially likely significant effects of a cumulative nature could extend beyond the pre-defined Zol for the Proposed Scheme in isolation.	

The outcome of Stage 1 was a long list of projects for review (and amendment if required) and consideration at Stage 2 of the assessment being the establishment of the short list of projects. The long list of other projects is provided in Appendix A21.1 Record of Stages 1 and 2 of the CEA in Volume 4 of the EIAR.

The review step of the Stage 1 long list was more applicable to the Biodiversity and Waste topics topic. In the case of Biodiversity, any major or strategic project within 15km of the Proposed Scheme was included in the long list to be reviewed at Stage 2. For the major and strategic projects outside of the 15km buffer, considering issues such as connectivity to sensitive habitats via watercourses has helped inform whether further afield projects could contribute to likely significant cumulative impacts with the Proposed Scheme. In relation to the Waste & Resources assessment, consideration was given to the potential for likely significant cumulative impacts within the Eastern-Midlands Waste Region.

21.2.3 Stage 2: Establishing the Shortlist of ‘Other Projects’

The aim of Stage 2 was to narrow down the Stage 1 long list to include only those other projects where there was potential for significant cumulative effects arising in combination with the Proposed Scheme. To do this, the following was considered:

- Whether the project has been completed, or the planning applications have been refused (where not identified at stage 1), annulled or expired (if so, they were not shortlisted). If a project was identified as completed, it has been considered as part of the baseline as appropriate;
- Whether there is a likelihood of temporal overlap (including overlap for construction periods) between the Proposed Scheme and the other project; and
- Whether the scale and nature of the other project is likely to significantly contribute to the effects of the Proposed Scheme, taking account of the aspects of the environment for which the Zol are relevant.

21.2.3.1 Scale and nature of other projects

In considering the scale and nature of the other projects, regard was had for the screening thresholds set out in Schedule 5 of the Planning and Development Regulations 2001 (as amended). For example, the threshold for screening a housing project for EIA is where there are more than 500 dwelling units. The use of EIA screening thresholds was only a guide however, and some projects which are below thresholds yet relatively close in proximity to the Proposed Scheme and still of a scale to be noticeable in the local context were shortlisted. Ultimately, the judgement as to whether a project should be shortlisted depended on whether the scale, location and/or nature could be sufficient to generate impacts which would be noticeable against typical baseline trends in the same zones of influence as the Proposed Scheme.

21.2.3.2 Shortlisting

The shortlisting was informed by input from the environmental topic specialists involved in the preparation of this EIAR, which allowed for consideration as to whether a particular type of project could result in impacts to receptors of interest for the Proposed Scheme assessment. In most cases, the Zol for the topic has informed whether or not another project is likely to have a cumulative effect. However, in some instances the environmental topic specialists have considered that there is potential for a likely significant cumulative effect beyond the Zol applied for the Proposed Scheme in isolation, and therefore a project could be scoped into Stages 3 and 4 for an individual topic even though it was outside of the pre-defined Zol identified at Stage 1. The rationale for whether a project should be scoped or not is recorded where relevant in Appendix A21.1 Record of Stages 1 and 2 of the CEA in Volume 4 of the EIAR, which provides a record of key decisions made when shortlisting projects for Stages 3 and 4 of the CEA. This includes a note of reasons where a specialist has scoped out a project that falls within the Zol for their topic. The shortlisted projects are indicated on Figures 21.1 and 21.2 in Volume 3 of the EIAR.

21.2.3.3 Biodiversity, Climate, Waste and Resources

For some topics a slightly different approach has been deemed appropriate. The biodiversity assessment has primarily considered individual Strategic Infrastructure Developments, Strategic Housing Developments and other Major Projects for shortlisting within the CEA. For other projects, such as those covered by local planning applications, the scale of each project was not deemed sufficient to warrant a specific assessment of cumulative impacts on biodiversity. Instead, the Biodiversity cumulative assessment assesses how the general trend of development across Dublin cumulatively impacts on the biodiversity resource. This is set out as part of the assessment reported in Section 21.4.1.6.

The Climate assessment has considered the cumulative influence of the Proposed Scheme with other developments on a national basis.

The Waste and Resources assessment has focused on key projects that were considered to have potential for likely significant effects on a regional basis, Specifically it has focused on those projects likely to generate a similar waste profile to the Proposed Scheme such as soil and stones and bitumen containing material, which may lead to cumulative effects associated with the off-site treatment of solid waste that will be generated by the construction and operational phase of the Proposed Scheme, and other projects in the Eastern Midlands Waste Region (EMWR) that will have simultaneous requirements for landfill and treatment capacity of any construction and demolition (C&D) waste generated during the construction timeframe. The approach to the CEA for waste is set out in more detail along with the assessment in Section 21.4.1.12.

21.2.4 Stage 3: Information Gathering for the Shortlist of ‘Other Projects’

The CEA has relied primarily on the gathering of environmental information from a range of sources published as part of planning application submissions or planning documentation for the shortlisted projects. In addition, where environmental assessments have not yet been undertaken or published, then any published Strategic Environmental Assessments (SEA) have been relied on for additional supporting information where available. Specific information has been obtained from the following sources:

- Planning application documentation and supporting environmental assessments obtained via the National Planning Application Database and the EIA Portal;
- Local authority websites and the development plans for Dublin City, South Dublin, Dún Laoghaire-Rathdown, Fingal and Wicklow Local Authorities for details of SEAs; and
- Developers’ websites, for example for Irish Water and other utilities companies.

The information sought focused on:

- Proposed design and location of the project;
- Proposed programme of construction, operation and decommissioning (if relevant); and
- Environmental assessments, if available, that set out baseline data and effects arising from the project.

In many cases there is limited information on the above available with which to inform the CEA; for example, for many of the projects in a pre-application stage.

21.2.5 Stage 4: Assessment

The CEA assessment has been undertaken with the findings recorded in Appendix A21.2 Stage 4 Specialist Assessments in Volume 4 of the EIAR. The assessment has been made for construction effects and operation effects based on the scenarios outlined below.

For Construction Phase cumulative impacts, it has been generally assumed that other projects (including the other 11 Core Bus Corridor schemes), would be under construction concurrently with the Proposed Scheme, to present a worst-case scenario. In some cases, a worst case was considered to be likely where other projects are constructed sequentially, with the effect of lengthening the time that certain receptors may be exposed to similar impacts. For example, this has been the case with the Landscape (Townscape) and Visual impact assessment. Individual topics have set out any such assumptions in the assessments provided in Appendix A21.2 Stage 4 Specialist Assessments in Volume 4 of the EIAR.

For the assessment of Operational Phase cumulative impacts, an assumption has been made that all 12 Core Bus Corridor schemes and any other shortlisted projects, would be complete and in operation, to present a worst-case scenario.

The level of assessment is commensurate with the level of information available for each shortlisted other project.

21.2.6 Traffic Related Cumulative Impacts: Construction Scenarios for Assessment

While for the purposes of the cumulative impacts assessment, it is assumed that the other 11 Core Bus Corridor schemes will be approved, however, as with any proposed project, there is a risk of delay in grant of approval or indeed a risk of refusal, or delay in starting construction, due to unforeseen circumstances. As noted in the EPA EIAR Guidelines (EPA 2022), *where uncertainty arises then an EIAR needs to describe the 'worst case' of the accumulation of effects that could arise from these other projects*. For this reason, a 'Combined Worst-Case' scenario, where all 12 Core Bus Corridor schemes and other major schemes would be constructed at the same time, was developed and modelled within the Local Area Model (LAM) to inform the assessment of the potential traffic effects. The scenario includes for background traffic and HGV growth for a common construction year of 2024, to ensure increased travel demand activity during the construction stage period was captured which is expected to incorporate all additional construction traffic relating to new development in the study area.

It is envisaged that the Proposed Scheme construction works will be completed in advance of DART+ West works, particularly where major construction work and hence greater construction traffic volumes are required on the road network.

21.2.6.1 Combined Worst-Case Traffic Scenario

In order to assess the impacts of the 'Combined Worst-Case Traffic Scenario', the construction traffic management plans (CTMPs) associated with the worst-case stage of construction for each of the 12 Core Bus Corridor schemes and other major schemes in combination was modelled on top of a 2024 Do Minimum model year scenario in the local area model (LAM). The year 2024 was selected as representative of the likely receiving traffic network environment during the construction timeframe of the 12 Core Bus Corridor schemes. The 2024 modelled scenario also includes for background traffic growth from reasonably foreseeable projects in line with regional growth projections and local development plans, therefore taking account of the effects of traffic generated by a mix of construction projects and general traffic across the city when the CTMPs are applied. It was envisaged that the results of the Combined Worst-Case construction scenario modelling would allow the identification of the more significant locations of traffic displacement and associated environmental impacts to help inform mitigation proposals.

The results from modelling the traffic effects of the Combined Worst-Case scenario in the LAM revealed that there would be significant traffic displacement across the Dublin area.

These significant increases would occur on both main traffic arteries (Regional, National roads) as well as local and residential roads. The increases on the main traffic arteries were not deemed to generate a significant adverse impact on the road network due to the function of these roads to accommodate high volumes of traffic. However, the large cumulative increase on local roads had the potential to generate a significant adverse impact. The implications of the increases in traffic were assessed in terms of traffic flows and highway network performance. The modelling indicated that there would be a significant increase in total travel time and delay, with associated increases in queuing and decreases in average speed when compared to the 2024 Do Minimum scenario. The most notable issues were the 'Over Capacity Queues' (an indicator of traffic congestion) across the network which would increase by approximately 59% in the morning (AM) peak and by 82% in the evening (PM) peak.

Due to the modelled impacts based on traffic congestion from the Combined Worst-Case scenario and the risk of generating associated significant air quality and noise impacts, a revised construction scenario was developed.

21.2.6.2 Revised Construction Traffic Scenario

Based on the outputs from the assessment of the Combined Worst-Case scenario, it is proposed that the following schemes will not be constructed concurrently with adjacent BusConnects Core Bus Corridor schemes so as to avoid potential traffic and associated environmental impacts:

- Ballymun/ Finglas to City Centre Core Bus Corridor Scheme – will not be constructed concurrently with Swords to City Centre Core Bus Corridor Scheme and the Proposed Scheme;
- Lucan to City Centre Core Bus Corridor Scheme – will not be constructed concurrently with Liffey Valley to City Centre Core Bus Corridor Scheme and the Proposed Scheme; and

- Templeogue /Rathfarnham to City Centre Core Bus Corridor Scheme will not be constructed concurrently with Kimmage to City Centre and Bray to city Centre Core Bus Corridor Schemes.
- Bray to City Centre Core Bus Corridor Scheme – will not be constructed concurrently with Blackrock/Belfield to City Centre and Templeogue /Rathfarnham to City Centre Core Bus Corridor Schemes.

For example, no section of the Bray to City Centre scheme will be constructed at the same time as Templeogue /Rathfarnham to City Centre and Belfield / Blackrock to City Centre Core Bus Corridor Schemes. Also, no section of the Ballymun / Finglas to City Centre scheme will be constructed at the same time as the Proposed Scheme or Swords to City Centre schemes. The remaining eight schemes can be constructed concurrently or with a combination of other schemes incorporating the limitations outlined above.

Limiting the schemes under construction concurrently will minimise additional congestion and associated significant impacts over and above the standalone schemes. As the Proposed Scheme is not expected to generate significant adverse environmental impacts at receptor locations when constructed concurrently with other adjacent Core Bus Corridor schemes, over and above those identified as part of the standalone scheme assessment, no such limits are required on construction works timing. Therefore, the localised assessments such as traffic, air (non-regional) and noise are based on the Proposed Scheme under construction concurrently with adjacent Core Bus Corridor schemes. For the purposes of the climate and regional air assessments, consideration is given to the construction traffic impacts due to all schemes as these assessments are considered on a regional (non-local) basis and on the basis that 2024 was selected as representative of the likely receiving traffic network environment. In addition, both the Do Minimum and Do Something scenarios include for background traffic and HGV growth for a common construction year of 2024, which accounts for the construction of other projects such as those provided in Appendix A21.1 Record of Stages 1 and 2 of the CEA in Volume 4 of the EIAR.

The Proposed Construction Traffic Scenario (i.e., the worst-case stage of construction of the Proposed Scheme with adjacent Core Bus Corridor Schemes) has formed the basis of the air quality and noise and vibration construction phase cumulative impact assessments in Sections 21.3.1.2 and 21.3.1.4 respectively where the Proposed Scheme is assessed by comparing the 2024 Do Minimum construction scenario to the DoSomething cumulative construction scenario. The climate and regional air assessment considers all schemes as the impacts are considered on a regional (not local) basis and again compares the 2024 Do Minimum construction scenario to the DoSomething cumulative construction scenario. As above the Do Minimum and Do Something scenarios are expected to account for traffic associated with the development of other schemes.

21.2.7 Operational Scenario for Assessment

For operational cumulative effects including the Proposed Scheme, the assessment has been undertaken based on a scenario where all the other 11 Core Bus Corridor schemes are also operational. This has been done for the following reasons:

- It is the NTA's intention that all BusConnects Core Bus Corridor schemes would be completed by 2028, therefore the scenario is considered to be reasonable; and
- It is the largest scale option and therefore represents a reasonable worst case for operational effects in terms of redistribution of traffic and traffic related effects.

The Do Minimum scenarios (in both 2028 and 2043) include all other elements of the BusConnects Programme (apart from the Core Bus Corridor Infrastructure Works elements) i.e. the new BusConnects routes and services (as part of the revised Dublin Area bus network), new bus fleet, the Next Generation Ticketing and integrated fare structure proposals are included in the Do Minimum scenarios.

In 2028, other notable Do Minimum transport schemes include; the roll out of the DART+ Programme, Luas Green Line capacity enhancement and the Greater Dublin Area Cycle Network Plan implementation (excluding BusConnects Core Bus Corridor elements). As outlined above, the 2043 Do Minimum scenario assumes the full implementation of the GDA Strategy schemes and so assumes that proposed major transport schemes such as MetroLink, DART+ Tunnel, Luas line extensions to Lucan, Finglas and Bray are all fully operational. The level crossing closures associated with DART+ West scheme have also been included within the modelling.

Appendix A6.2 (Transport Modelling Report) in Volume 4 of the EIAR, contains further information on the modelling assumptions contained within the Do Minimum scenario including the full list of transport schemes included.

For non-traffic modelling related CEA, the assessment is on the basis that the other shortlisted projects would all be in an operational state for the assessment. For traffic modelling related CEA, the Operational Phase scenario has been modelled including for background growth from reasonably foreseeable projects in line with regional growth projections and local development plans to capture the wider traffic effects expected from projected development in Dublin.

21.2.8 Summary of Assessment Methodology for CEA

In summary, a four-stage process has been adopted for assessing cumulative effects for all environmental topics. Stage 1 involved developing and reviewing a long list of other existing and / or approved projects as well as reasonably foreseeable projects and planning applications and identifying whether or not they fall within a ZoI for any of the assessment topics. Stage 2 involved the review of the long list of projects and deciding whether the distance, location, scale and nature of the proposed projects have potential to result in significant impacts in cumulation with the Proposed Scheme. At the end of Stage 2 a shortlist was established for further assessment of potential cumulative effects. Stages 3 and 4 involved the gathering of available information on the projects in the shortlist and carrying out the assessment. The results of these assessments are summarised in Section 21.3, with supporting detail contained in Appendix A21.2 Stage 4 Specialist Assessments.

For the Operational Phase CEA, it was assumed that all 12 Core Bus Corridor schemes are operational and all shortlisted projects are operational as they form part of general traffic growth. For the Construction Phase CEA, it was generally assumed that all 12 Core Bus Corridor schemes and other projects on the short list would be under construction at the same time as a worst case unless, for a particular environmental topic, it was considered that sequential construction of projects would represent a worst case.

In addition to the process summarised here, for assessment topics which depend on traffic modelling (i.e., Air Quality, Noise and Vibration and Traffic and Transport) traffic modelling scenarios for construction and operation were prepared. For the Construction Phase, a Proposed Worst-Case Scenario was modelled whereby the eight schemes outlined earlier would be under construction concurrently and have their CTMPs implemented at the same time. For Operational Phase cumulative traffic related effects, it was assumed that all 12 Core Bus Corridor schemes are operational in addition to other transport schemes in line with the progressive roll out of the Greater Dublin Area (GDA) Transport Strategy. These schemes were applied, along with the forecasted increased travel demand from general development, within the model to capture projected traffic growth from reasonably foreseeable development across the city in both 2028 and 2043.

21.3 Assessment of Cumulative Impacts and Environmental Interactions

This section provides a topic-by-topic assessment of likely significant cumulative effects of the Proposed Scheme in combination with other projects, before moving on to a description of the main environmental interactions identified for the Proposed Scheme.

In total, 61 other projects, including all eleven other Core Bus Corridor schemes, were shortlisted for further cumulative assessment. Appendix A21.1 Record of Stages 1 and 2 of the CEA of Volume 4 of this EIAR sets out a record of which projects were shortlisted for assessment against the relevant topics for which they were shortlisted. Reference should be made to Figures 21.1 and 21.2 in Volume 3 of the EIAR, for the locations of the shortlisted projects.

21.3.1 Construction Impacts

21.3.1.1 Traffic and Transport

As described in Section 21.6, it is proposed to limit the number of Core Bus Corridor schemes which would be under construction concurrently as part of the proposed realistic worst-case scenario to manage overall construction impacts across the city region. The following schemes will not, therefore, be constructed concurrently

with adjacent schemes to limit potential for significant adverse traffic, air quality and noise issues during the construction stage:

- Ballymun/ Finglas to City Centre Core Bus Corridor Scheme;
- Lucan to City Centre Core Bus Corridor Scheme;
- Templeogue /Rathfarnham to City Centre Core Bus Corridor Scheme; and
- Bray to City Centre Core Bus Corridor Scheme.

The effect of limiting the concurrent construction of certain Core Bus Corridor schemes is that the traffic redistribution impacts, during the construction stage, of each of the Core Bus Corridor schemes will be limited to the adjacent areas of the direct study area of each scheme. This will ensure limited overlap of traffic dispersion into the direct study areas of other Core Bus Corridor schemes which has the potential to cause cumulative traffic impacts above the levels of the schemes in isolation.

In terms of the Proposed Scheme in isolation, significant impacts due to general traffic redistribution away from the direct study area are not anticipated during the Construction Phase. This is based on the intended nature of the progressive works along the corridor whereby traffic flows are maintained in both directions – refer to Chapter 6 (Traffic & Transport) for further information on the Proposed Scheme assessment. There may be a requirement for some localised temporary lane closures for short durations of the day or night, which will involve consultation between the appointed contractor and relevant authorities. Access for general traffic to existing residential and commercial units immediately adjacent to the Proposed Scheme will be accommodated throughout the Construction Phase.

A CTMP has been prepared and is included in the CEMP (Appendix A5.1 in Volume 4 of the EIAR). The appointed contractor will develop the CTMP to ensure that it gives due consideration to provision of local access requirements and designates appropriate diversion routes in the cases where localised temporary closures are required. It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the CTMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála, should they grant approval.

The DART + West project is planned within the Proposed Scheme Study Area. This is part of the wider DART+ Programme and would involve upgrading of existing infrastructure to enable and increase in frequency of train services on the corridor. The Proposed Scheme will interface with DART+ West at the existing Castleknock, Navan Road Parkway and Ashtown stations. The closure of the level crossing at Ashtown is the key construction interface between the schemes and works on both schemes will be coordinated to ensure no overlap in works or construction vehicle routes between the Proposed Scheme and the DART+ scheme during their construction. As specified in Chapter 5 (Construction) interface liaison will take place on a case-by-case basis, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

The MetroLink project is also planned in the coming years in the vicinity of the Proposed Scheme. Whilst there is no direct spatial interface with the Proposed Scheme there is a potential for an indirect interface through traffic redistribution during both the construction and operation of the Proposed Scheme for those wishing to remain in cars. Interface liaison has taken place during the planning phases of both schemes and this liaison will continue to ensure that there is co-ordination between projects so as to avoid significant cumulative impacts.

Based on the aim to coordinate between the Proposed Scheme works and other major infrastructure projects and major projects which are proposed along the route, or in the vicinity of the Proposed Scheme, no likely significant cumulative effects are predicted on Traffic and Transport over and above the effects of the Proposed Scheme in isolation which are reported in Chapter 5 (Construction) and Chapter 6 (Traffic and Transport).

21.3.1.2 Air Quality

21.3.1.2.1 Construction Dust Assessment

An appraisal has been carried out to assess the cumulative risk to sensitive receptors as a result of dust soiling, health impacts and ecology impacts due to the Construction Phase of the Proposed Scheme, and other projects listed in Appendices A21.1 and A21.2 in Volume 4 of the EIAR, in accordance with the IAQM's Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014). The assessment methodology is described in full in Section 7.2.4.4 in Chapter 7 (Air Quality). Other projects were identified within the 350m Zol (refer to Section 21.2.2.3) of the Proposed Scheme and sensitive receptors identified within this Zol were identified and shortlisted for the construction dust assessment. The other projects within the Zol for which there is potential for construction dust effects are as follows:

- DCC planning reference 3163/16: A mixed use development comprising removal of existing buildings on site, construction of a commercial unit and 33 apartments in two buildings on North Brunswick Street and North King Street;
- DCC planning references 4261/16 (superseded by 4734/18): Residential development involving demolition of existing structures, including no. 20 Stoneybatter, and the construction of 142 student apartments;
- DCC planning reference 2038/17 and ABP309657: Construction of new district shopping centre development and 175 no. residential units (3 no. houses, 29 no. Build to Rent apartments and 584 no. student bedspaces) at Park Shopping Centre and numbers 42 – 45 Prussia Street;
- FCC planning reference FW17A/0048: Residential development involving construction of 17 two storey houses with an access road off Navan Road;
- FCC planning reference FW17A/0108: Demolition of existing structures on the site including garage and office and construction of a new two storey building with a service station on the ground floor and studio rooms for fitness related use on the first floor;
- DCC planning reference 3328/18: A residential development comprising a 6-8 storey residential over ground floor commercial development, in one block accommodating 28 apartments. Access to the residential units will be provided via a private entrance lobby off Usher Street, with access to the commercial unit provided off Usher's Quay;
- FCC planning reference FW18A/0051: Construction of eight houses at Clonross, Navan Road, Dublin 15;
- DCC planning reference 4252/19: Development of a multi-unit residential scheme comprising 15 apartments in 3 blocks at 14 Ushers Island (a Recorded Protected Structure), Dublin 8;
- DCC planning reference 4237/19: Residential development of 33 no. residential units comprising of: 2 no. 3 storey, 4-bedroom semi-detached houses;
- DCC planning reference 2409/20: Development at this site of c.0.055ha of Nos. 1, 1A and 2 Usher's Street and Nos. 29/30 Usher's Quay, Dublin 8. The demolition of all existing structures and construction of a 7 to 8 storey over single basement building which will comprise a 106-no. bedroom hotel;
- FCC planning reference FW19A/0211: Demolition of existing detached bungalow and garage and construction of 5 no. dwellings comprising of 1 no. detached, two storey, five bedroom dwelling (facing Beechpark Avenue and 4 no. semi-detached, two storey, three -bedroom dwellings to the rear of the site);
- FCC planning reference FW20A/0023: Construction of 51 number dwellings to the south west end of the Phoenix Park Racecourse site (Deerpark Boundary), Castleknock Road, Dublin 15;
- SHD reference 305979: 485 Residential Units. Former CIE Lands, 2-4 Carnlough Road, Cabra, Dublin 7;
- SHD reference 307976: Demolition of existing building Construction of 210 Apartments. Bradys Castleknock Inn, Old Navan Road, Blanchardstown, Dublin 15;
- Major project reference MP08: DART+ Programme West;
- Major project reference MP10: Widening of the N3 between Junction 1 (M50) and Junction 4 (Clonee), plus related junction and necessary changes to the existing national road network;
- Major project reference MP12: DART+ Programme South West;

- Major project reference MP15: DART+ Tunnel Element (Kildare Line to Northern Line);
- Major project reference MP17: LUAS Cross City incorporating LUAS Green Line Capacity Enhancement - Phase 1;
- Major project reference MP33: Greater Dublin Drainage (GDD);
- Major project reference MP34: Greater Dublin Area Cycle Network Plan – notably the Royal Canal Greenway element;
- Major project reference MP37: Snugborough Interchange upgrade;
- Ballymun-Finglas to City Centre Core Bus Corridor Scheme; and
- Liffey Valley to City Centre Core Bus Corridor Scheme.

Without mitigation, there is the potential for significant cumulative impacts near these other projects. However, in order to ensure that no dust nuisance impacts occur on human health or ecological receptors, a series of mitigation measures have been identified that will be implemented during construction of the Proposed Scheme. These are set out in Chapter 7 (Air Quality). Mitigation measures to reduce construction dust are standard practice for moderate/major scale developments likely to generate dust. Therefore, it is predicted that no significant cumulative impacts will arise from the concurrent construction of the other Core Bus Corridor schemes and those other projects (see Appendix A21.2 Stage 4 Specialist Assessments in Volume 4 of the EIAR and the Proposed Scheme).

21.3.1.2.2 Construction Traffic Assessment

21.3.1.2.2.1 Local Air Quality

As outlined in Section 21.2.6.2, limitations on the construction of four Core Bus Corridor schemes concurrently with other Core Bus Corridor schemes are proposed to minimise the potential impact on air quality. The Blanchardstown to City Centre Core Bus Corridor Scheme will not be constructed concurrently with the Liffey Valley to City Centre and Lucan to City Centre Schemes.

Two new additional significant adverse localised impacts on R109 Parkgate St are identified when comparing the Do Minimum to the Do Something cumulative construction scenario compared with the standalone scenario assessed in Section 7.4.3.2 in Chapter 7 (Air Quality), refer to Appendix A.21.3 Air Quality Cumulative Modelling Results for full set of air quality results. This localised moderate adverse impact is considered negative, significant and short-term as NO₂ concentrations exceed the limit value but only occur during the short term construction phase.

In accordance with the EPA Guidelines (EPA 2022) the impacts associated with the cumulative Construction Phase traffic emissions arising from the Proposed Scheme in combination with the adjacent Core Bus Corridor schemes are overall Neutral and Short-term.

As outlined in Section 21.3.1.2.1, a number of other local projects could directly interface with the construction of the Proposed Scheme. As outlined in Section 5.9 of this EIAR, liaison with third-party developers will take place on a case-by-case basis, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

Based on the aim to coordinate between the Proposed Scheme works and other major infrastructure projects and major projects which are proposed along the route, or in the vicinity, of the Proposed Scheme, no likely significant cumulative effects are predicted on air quality over and above the effects of the Proposed Scheme in isolation which are reported in Chapter 7 (Air Quality).

21.3.1.2.3 Ecological Assessment

An assessment of the cumulative impact of the Proposed Scheme and the other adjoining Core Bus Corridor Schemes apart from the Liffey Valley to City Centre and Lucan to City Centre Schemes on ecological receptors has been undertaken using the approach outlined in Section 7.2.4.3 in Chapter 7 (Air Quality)).

The cumulative impact on the nearby ecologically sensitive areas within 200m of roads impacted by the Proposed Scheme, as defined in Section 7.2.4.1 in Chapter 7 (Air Quality), is outlined in Table 21.2. The annual mean NO_x concentration has been compared to the critical level of 30µg/m³ at each of the designated habitat sites. All sites exceed the critical level for NO_x in both the Do Minimum and the cumulative operational Do Something scenarios, within 150m of the nearest impacted road.

Table 21.2: Significance of Construction Cumulative Impacts at Key Ecological Receptors (NO_x Annual Mean Concentration In 2024)

Annual Mean NO _x in 2024 At Closest Point Within Ecological Site To Road							
Receptor	Receptor Location (ITM)	Do Minimum (µg/m ³)	Distance from road beyond which concentration is below critical level (30µg/m ³) (m)	Do Something (µg/m ³)	Distance from road beyond which concentration is below critical level (30µg/m ³) (m)	Impact (DS – DM) (µg/m ³)	Change as a percentage of critical level (30µg/m ³) (%)
Liffey Valley pNHA (M50 northbound)	707624, 735853	80.9	>200m	81.1	>200m	0.2	1%
Liffey Valley pNHA (M50 southbound)	707647, 735872	128.9	>200m	129.4	>200m	0.4	1%
Royal Canal pNHA (Binn's Bridge, western side)	715830, 736004	76.3	>200m	35.8	>200m	-40.4	-135%
Royal Canal pNHA (Binn's Bridge, eastern side)	715846, 735998	86.0	>200m	35.7	>200m	-50.3	-168%
Royal Canal pNHA (Cross Guns Bridge, western side)	715015, 736301	57.2	>200m	58.3	>200m	1.1	4%
Royal Canal pNHA (Cross Guns Bridge, eastern side)	715027, 736292	65.3	>200m	66.7	>200m	1.4	5%
Royal Canal pNHA (Longford Bridge, western side)	710930, 737442	39.2	>200m	42.4	>200m	3.2	11%
Royal Canal pNHA (Longford Bridge, eastern side)	710936, 737442	43.0	>200m	47.6	>200m	4.6	15%
Royal Canal pNHA (M50, western side)	708917, 738188	109.6	>200m	109.5	>200m	-0.2	-1%
Royal Canal pNHA (M50, eastern side)	708945, 738206	99.3	>200m	99.3	>200m	<0.1	0%

Annual Mean NO _x in 2024 At Closest Point Within Ecological Site To Road							
Receptor	Receptor Location (ITM)	Do Minimum (µg/m ³)	Distance from road beyond which concentration is below critical level (30µg/m ³) (m)	Do Something (µg/m ³)	Distance from road beyond which concentration is below critical level (30µg/m ³) (m)	Impact (DS – DM) (µg/m ³)	Change as a percentage of critical level (30µg/m ³) (%)
Royal Canal pNHA (M50 slip road)	709083, 738203	64.1	>200m	63.7	>200m	-0.3	-1%
Royal Canal pNHA (Navan Road N3, western side)	708803, 738183	79.1	>200m	68.2	180m	-10.9	-36%
Royal Canal pNHA (Navan Road N3, eastern side)	708815, 738184	99.5	>200m	83.0	>200m	-16.5	-55%
Royal Canal pNHA (Navan Road R806, eastern side)	708997, 738189	74.8	>200m	74.2	>200m	-0.6	-2%
Royal Canal pNHA (Navan Road R806, western side)	708985, 738190	69.2	>200m	68.5	>200m	-0.7	-2%
Royal Canal pNHA (Ratoath Road Bridge, western side)	712628, 737394	47.0	>200m	51.1	>200m	4.1	14%
Royal Canal pNHA (Ratoath Road Bridge, eastern side)	712652, 737367	55.0	>200m	61.0	>200m	6.0	20%
Royal Canal pNHA (New Dunsink Lane, western side)	709275, 738155	48.3	>200m	49.6	>200m	1.3	4%
Royal Canal pNHA (New Dunsink Lane, eastern side)	709295, 738103	52.2	>200m	54.0	>200m	1.8	6%
Royal Canal pNHA (Royal Canal Avenue)	711722, 737477	32.1	>200m	32.4	150m	0.4	1%
Royal Canal pNHA (Whitworth Road)	715183, 736244	34.0	>200m	34.0	>200m	<0.1	0%

Nitrogen deposition levels have been compared to the lower critical load for the designated habitat sites in Table 21.3. All sites are below the lower critical load for the designated habitat site in both the Do Minimum and the Do

Something cumulative operational scenarios, with the exception of Liffey Valley pNHA (M50 southbound), Royal Canal pNHA (M50) and Royal Canal pNHA (Navan Road N3, eastern side).

Table 21.3: Significance of Cumulative Construction Impacts at Key Ecological Receptors (N Deposition In 2024)

Annual Mean N Deposition In 2024 At Closest Point Within Ecological Site To Road									
Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Minimum (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Do Something (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Change relative to lower critical load (%)	Distance from road beyond which the change is <1% (m)	Change in deposition kgN/ha/yr
Liffey Valley pNHA (M50 northbound)	707624, 735853	5	4.51	0m	4.52	0m	0%	0m	0.01
Liffey Valley pNHA (M50 southbound)	707647, 735872	5	6.41	30m	6.42	30m	0%	0m	0.01
Royal Canal pNHA (Binn's Bridge, western side)	715830, 736004	5	4.31	0m	2.38	0m	-39%	0m	-1.93
Royal Canal pNHA (Binn's Bridge, eastern side)	715846, 735998	5	4.72	0m	2.37	0m	-47%	0m	-2.35
Royal Canal pNHA (Cross Guns Bridge, western side)	715015, 736301	5	3.44	0m	3.49	0m	1%	20m	0.05
Royal Canal pNHA (Cross Guns Bridge, eastern side)	715027, 736292	5	3.82	0m	3.88	0m	1%	10m	0.06
Royal Canal pNHA (Longford Bridge, western side)	710930, 737442	5	2.55	0m	2.71	0m	3%	20m	0.16

Annual Mean N Deposition In 2024 At Closest Point Within Ecological Site To Road									
Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Minimum (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Do Something (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Change relative to lower critical load (%)	Distance from road beyond which the change is <1% (m)	Change in deposition kgN/ha/yr
Royal Canal pNHA (Longford Bridge, eastern side)	710936, 737442	5	2.75	0m	2.97	0m	5%	30m	0.23
Royal Canal pNHA (M50, western side)	708917, 738188	5	5.68	20m	5.67	20m	0%	0m	-0.01
Royal Canal pNHA (M50, eastern side)	708945, 738206	5	5.27	10m	5.27	10m	0%	0m	<0.01
Royal Canal pNHA (M50 slip road)	709083, 738203	5	3.76	0m	3.74	0m	0%	0m	-0.02
Royal Canal pNHA (Navan Road N3, western side)	708803, 738183	5	4.43	0m	3.95	0m	-10%	0m	-0.48
Royal Canal pNHA (Navan Road N3, eastern side)	708815, 738184	5	5.28	10m	4.60	0m	-14%	0m	-0.68
Royal Canal pNHA (Navan Road R806, eastern side)	708997, 738189	5	4.24	0m	4.22	0m	-1%	0m	-0.03
Royal Canal pNHA (Navan Road R806, western side)	708985, 738190	5	3.99	0m	3.96	0m	-1%	0m	-0.03

Annual Mean N Deposition In 2024 At Closest Point Within Ecological Site To Road									
Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Minimum (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Do Something (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Change relative to lower critical load (%)	Distance from road beyond which the change is <1% (m)	Change in deposition kgN/ha/yr
Royal Canal pNHA (Ratoath Road Bridge, western side)	712628, 737394	5	2.95	0m	3.15	0m	4%	20m	0.20
Royal Canal pNHA (Ratoath Road Bridge, eastern side)	712652, 737367	5	3.34	0m	3.62	0m	6%	50m	0.28
Royal Canal pNHA (New Dunsink Lane, western side)	709275, 738155	5	3.01	0m	3.07	0m	1%	10m	0.06
Royal Canal pNHA (New Dunsink Lane, eastern side)	709295, 738103	5	3.20	0m	3.29	0m	2%	10m	0.09
Royal Canal pNHA (Royal Canal Avenue)	711722, 737477	5	2.18	0m	2.20	0m	0%	0m	0.02
Royal Canal pNHA (Whitworth Road)	715183, 736244	5	2.28	0m	2.29	0m	0%	0m	<0.01

In accordance with the EPA Guidelines (EPA 2022), the ecological impacts associated with the cumulative Construction Phase traffic emissions arising from the Proposed Scheme in combination with the other Core Bus Corridor schemes apart from the Liffey Valley to City Centre and Lucan to City Centre Schemes are overall Negative, Slight and Short-term.

21.3.1.2.1 Regional Air Quality Assessment

The potential changes in regional air emissions due to the cumulative construction phase traffic impacts have been assessed using the ENEVAL tool (methodology set out in Section 7.2.4.2 in Chapter 7 (Air Quality)). This

assessment considers all 12 schemes on a regional basis to account for the total emissions, although, as outlined in Section 21.2.6.2, all 12 schemes will not be constructed concurrently.

Pollutant emissions (in tonnes) produced in both the Do Minimum and Do Something scenarios for the 2024 cumulative Construction Phase are shown in Table 21.4. The Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes is predicted to increase emissions of all pollutants modelled. The majority of these increases result from redistribution of vehicles onto other longer routes, while construction of the schemes takes place. To produce these emissions estimates, the traffic model and therefore the ENEVAL tool has applied the peak construction day in 2024 across the whole year. Emissions are therefore worst-case and likely to be lower in reality.

Table 21.4. Cumulative Construction Phase Regional Pollutant Emissions (tonnes) – Construction Year 2024

	Vehicle Class	NO _x (tonnes)	NO ₂ (tonnes)	PM ₁₀ (tonnes)	PM _{2.5} (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
DM	Car	1,625	489	18.4	17.5	86	1,952	1.5	1.2
DS		1,659	499	18.8	17.9	89	2,007	1.5	1.2
Change		34	10.4	0.4	0.4	2.1	55	0.04	0.02
% Change		2.1%	2.1%	2.1%	2.1%	2.5%	2.8%	2.6%	1.6%
DM	Goods	1,437	408	11.3	10.7	43	223	0.4	0.5
DS		1,468	416	11.5	10.9	44	231	0.4	0.5
Change		30.7	7.5	0.2	0.2	0.8	7.9	0.02	0.01
% Change		2.1%	1.8%	1.7%	1.7%	1.8%	3.5%	5.8%	1.6%
DM	Urban Bus	44	4.5	0.7	0.7	2.0	8.9	0	0.05
DS		52	5.2	0.8	0.8	2.2	10.2	0	0.05
Change		7.6	0.8	0.09	0.08	0.24	1.3	0	0.004
% Change		17.2%	17.2%	11.5%	11.5%	12.3%	15.0%	0%	9.6%
DM	Total	3,106	902	30	29	132	2,184	1.8	1.72
DS		3,179	920	31	30	135	2,249	1.9	1.75
Change		73	19	0.7	0.6	3.1	64	0.06	0.03
% Change		2.3%	2.1%	2.2%	2.2%	2.4%	3.0%	3.2%	1.8%

In accordance with the EPA Guidelines (EPA 2022) the regional impacts associated with the cumulative Construction Phase traffic emissions from the Proposed Scheme, the other 11 Core Bus Corridor schemes are considered overall Negative, Not Significant and Short-term.

21.3.1.2.2 Summary of Predicted Cumulative Construction Phase Impacts

Table 21.5 summarises the predicted impacts associated with the construction of the Proposed Scheme cumulatively with the other Core Bus Corridor Schemes concurrently.

Table 21.5: Summary of Predicted Cumulative Construction Phase Impacts

Assessment Topic	Predicted Impact – Cumulative Construction
Construction dust	Neutral, Short-term
Road traffic impacts on local human receptors	Neutral, Short-term
Road traffic impacts on local ecological receptors	Negative, Slight, Short-term

Assessment Topic	Predicted Impact – Cumulative Construction
Regional air quality	Negative, Not significant, Short-term

With the implementation of the dust minimisation measures detailed in the CEMP (Appendix A5.1 in Volume 4 of the EIAR), fugitive emissions of dust will be insignificant and pose no nuisance at nearby receptors. Thus, there will be no residual cumulative Construction Phase dust impacts.

The air dispersion modelling assessment of cumulative 2024 Construction Phase traffic emissions has found that the Proposed Scheme will be neutral overall in the study area, as with the standalone scenario described in Section 7.4.3.2 of Chapter 7 (Air Quality). No specific construction phase mitigation measures are required.

Overall, therefore, it is considered that the cumulative residual effects as a result of the Proposed Scheme's construction is Neutral and Short-term, whilst meeting the scheme objectives set out in Chapter 1 (Introduction). Two additional significant localised negative impacts are predicted over and above the standalone assessment for the Proposed Scheme as outlined in Chapter 7 (Air Quality).

21.3.1.3 Climate

21.3.1.3.1 Construction Embodied Carbon Assessment

As outlined in Section 21.2.2.3, the zone of influence for the embodied carbon climate assessment is not limited to the study area and is considered on a national basis. The construction of a wide range of projects in Ireland over the construction period of BusConnects Dublin - Core Bus Corridors Infrastructure Works will result in the generation of embodied carbon. These projects include local planning applications, major projects and strategic developments with a varying extent of embodied carbon generation. IEMA guidance (IEMA 2017) advises that all carbon emissions contribute to climate change and, in the absence of a defined threshold (e.g., national sector-specific targets and trajectories), any increase (or decrease) in carbon emissions may be considered as significant. Therefore, any developments which result in the generation of embodied carbon during its construction phase, can be considered as significant negative.

However, notwithstanding that carbon emissions are to be considered on a national basis, an appraisal has been carried out to assess the Embodied Carbon associated with the Construction Phase of the Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes using the 'TII Carbon Assessment Tool' (Version 2) (TII 2020). The methodology to assess Embodied Carbon is described in full in Section 8.2.4.1 in Chapter 8 (Climate). As has been previously outlined in Section 21.2.6.2, four Core Bus Corridor schemes will not be constructed concurrently with adjacent Core Bus Corridor Schemes, however for the purpose of the Embodied Carbon assessment, the timing of the construction of the schemes is not considered a determining factor for the assessment. It is assumed that all 12 Core Bus Corridors will ultimately be constructed and therefore the carbon impacts associated with the schemes would materialize.

Based on the TII Carbon Tool (TII 2020), the breakdown of the activities between the different phases of the Proposed Scheme cumulatively with all other Core Bus Corridors has been assessed. Table 21.6: Construction Greenhouse Gas Emissions provides the key phases of the cumulative GHG generation which are the embodied carbon of the construction materials and construction activities, which when combined account for 91% of all carbon emissions. Pre-construction together with construction waste is expected to account for 10% of all cumulative emissions.

Table 21.6: Construction Greenhouse Gas Emissions

Activity	Kilotonnes (kt) CO _{2eq} / Total	% Of Total
Pre-Construction	0.8	1%
Embodied Carbon	84.7	77%
Construction Activities	15.6	14%
Construction Waste	9.4	9%
All	110.5	100%

The Proposed Scheme, cumulatively with all other Core Bus Corridor schemes, is estimated to result in total Construction Phase GHG emissions of 110.5 kt embedded CO_{2eq} for materials (refer to Table 21.6) equivalent to an annualised total of 0.14% of Ireland's non-ETS (Emissions Trading Scheme) 2020 target or 0.16% of Ireland's non-ETS 2030 target. Over the predicted operational 60-year lifespan of the Proposed Scheme, the annualised emissions due to the Construction Phase of the Proposed Scheme is projected to reach, at most, 0.006% of Ireland's non-ETS 2030 emissions target. The operational lifespan of 60 years is the default used in the TII Carbon Tool and is the default in LA 114 Climate (UKHA 2019). 60 years is also the timeline for the appraisal of the Core Bus Corridor Infrastructure Works business case. The predicted impact to climate due to embodied carbon emissions during the cumulative Construction Phase, prior to mitigation, is therefore short-term, negative and significant.

As outlined in Section 21.3.1.3.1 and in line with IEMA guidance (IEMA 2017), the combined impact of the Proposed Scheme with other schemes under construction concurrently is considered to result in a cumulative negative, short-term and significant impact. In general, the carbon emissions associated with embodied carbon and energy to construct schemes on a national basis is accounted for cumulatively as part of the ETS.

21.3.1.3.2 Construction Traffic Assessment

As outlined in Section 21.2.6.1, the traffic data used for both the 2024 Do Minimum and Do Something cumulative construction scenarios includes background traffic growth accounting for wider construction activity. Therefore, it is assumed that potential emissions associated with the concurrent construction traffic related to other projects alongside the construction of the Proposed Scheme are included in the carbon emission forecasts in both the Do Minimum and Do Something scenarios.

The climate impact assessment of road traffic emissions from the construction phase of the Proposed Scheme cumulatively with all other Core Bus Corridor schemes has been carried out according to methodology outlined in Section 8.2.4.2 in Chapter 8 (Climate).

Specifically, the predicted GHG emissions from the Do Minimum scenario were compared with the GHG emissions from the Do Something cumulative construction scenario. The cumulative construction scenario assumed construction of the Proposed Scheme in addition to all other Core Bus Corridor Schemes concurrently, as a worst-case as the greatest level of traffic redistribution would occur with all Core Bus Corridor schemes under construction at the same time.

A comparison of the construction traffic associated with the Proposed Scheme cumulatively with all other Core Bus Corridors and the Do Minimum GHG emissions in the construction year of 2024 indicates that there is predicted to be an overall temporary increase of 40.4 kilotonnes (kt) in CO_{2eq}, refer to Table 21.7. This is equivalent to a 2.6% temporary increase in CO_{2eq} relative to the construction year Do Minimum estimates. To put these figures in context, approximately 11,000 Kt CO_{2eq} are projected to be emitted in Ireland by the Transport sector in 2024 (EPA 2021). The majority of these increases will result from redistribution of vehicles onto other longer routes, while construction of the Proposed Scheme takes place. To produce these emissions estimates, the traffic model and therefore the ENEVAL tool have applied the peak construction day in 2024 across the whole year. Emission predictions are therefore a highly conservative worst-case and are likely to be conservatively 50% lower in reality.

Carbon emissions are accounted for on an annual basis by the EPA. The predicted cumulative greenhouse gas emissions included in Table 21.7 are totalled across all schemes which are expected to be constructed over a six year period. Therefore, an average annual greenhouse gas emission value is also provided on a per annum basis.

Table 21.7: Cumulative Construction Phase Traffic CO_{2e} emissions total over a six year period and per annum

Scenario	Vehicle Class	CO _{2eq} (Kt CO _{2eq})	CO _{2eq} (Kt CO _{2eq}) per annum
DM	Car	875.0	145.8
DS		899.2	149.9
Change		24.2	4.0
% Change		2.8	2.8

Scenario	Vehicle Class	CO _{2eq} (Kt CO _{2eq})	CO _{2eq} (Kt CO _{2eq}) per annum
DM	Goods	648.0	108.0
DS		660.0	110.0
Change		12.0	2.0
% Change		1.9	1.9
DM	Bus	30.4	5.1
DS		34.4	5.7
Change		4.1	0.7
% Change		13.4	13.4
DM	Total	1553.3	258.9
DS		1593.6	265.6
Change		40.4	6.7
% Change		2.6	2.6

The predicted impact to climate due to cumulative construction traffic, prior to mitigation, is short-term, negative and significant.

A series of embedded mitigation measures have been incorporated into the design of the Core Bus Corridor schemes with the goal of reducing the embodied carbon and traffic emissions associated with the Construction Phase of all Core Bus Corridor schemes. It is proposed that where feasible concrete containing Portland cement will be replaced with concrete containing ground granulated blast furnace slag (GGBFS). This measure will lead to a cumulative saving of approximately 11.1 kt of CO_{2eq} across all 12 Core Bus Corridor Schemes. In addition, the Core Bus Corridor schemes will minimise wastage of materials due to poor timing or over ordering on site thus helping to minimise the embodied carbon footprint of the Proposed Scheme; and where practicable, opportunities for materials reuse will be considered within the extent of the Core Bus Corridor schemes. In addition, where practicable, materials will be sourced locally to reduce the embodied emissions associated with transport.

Notwithstanding the implementation of mitigation measures, the predicted impact to climate due to the Construction Phase of the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes, after mitigation, is short-term, negative and significant.

21.3.1.3.3 Overall Cumulative Construction Climate Assessment

Table 21.8 summarises the predicted impacts on climate associated with the Proposed Scheme cumulatively with the construction of all other Core Bus Corridor schemes.

Table 21.8: Summary of Predicted Cumulative Construction Phase Climate Impacts

Assessment Topic	Predicted Impact – Cumulative Construction
Embodied Carbon	Negative, Significant and Short-Term
Construction Traffic	Negative, Significant and Short-Term
Combined Construction Phase	Negative, Significant and Short-Term

21.3.1.4 Noise and Vibration

21.3.1.4.1 Construction Noise Assessment

An appraisal was carried out to assess the cumulative impact to noise sensitive locations (NSLs) as a result of construction noise due to the Construction Phase of the Proposed Scheme, the other Core Bus Corridors and the other projects listed in Appendix A21.1 Record of Stages 1 and 2 of the CEA in Volume 4 of the EIAR. The

following 16 projects were identified with the 300m Zone of Influence (ZOI) of the Proposed Scheme (refer to Section 21.2.2.3) and NSLs identified within this ZOI were identified:

- DCC planning reference 3163/16: A mixed use development comprising removal of existing buildings on site, construction of a commercial unit and 33 apartments in two buildings on North Brunswick Street and North King Street;
- DCC planning references 4261/16 (superseded by 4734/18): Residential development involving demolition of existing structures, including no. 20 Stoneybatter, and the construction of 142 student apartments;
- DCC planning reference 2038/17 and ABP309657: Construction of new district shopping centre development and 175 no. residential units (3 no. houses, 29 no. Build to Rent apartments and 584 no. student bedspaces) at Park Shopping Centre and numbers 42 – 45 Prussia Street;
- FCC planning reference FW17A/0048: Residential development involving construction of 17 two storey houses with an access road off Navan Road;
- FCC planning reference FW17A/0108: Demolition of existing structures on the site including garage and office and construction of a new two storey building with a service station on the ground floor and studio rooms for fitness related use on the first floor;
- DCC planning reference 3328/18: A residential development comprising a 6-8 storey residential over ground floor commercial development, in one block accommodating 28 apartments. Access to the residential units will be provided via a private entrance lobby off Usher Street, with access to the commercial unit provided off Usher's Quay;
- FCC planning reference FW18A/0051: Construction of eight houses at Clonross, Navan Road, Dublin 15;
- DCC planning reference 4252/19: Development of a multi-unit residential scheme comprising 15 apartments in 3 blocks at 14 Ushers Island (a Recorded Protected Structure), Dublin 8;
- DCC planning reference 2409/20: Development at this site of c.0.055ha of Nos. 1, 1A and 2 Usher's Street and Nos. 29/30 Usher's Quay, Dublin 8. The demolition of all existing structures and construction of a 7 to 8 storey over single basement building which will comprise a 106-no. bedroom hotel;
- FCC planning reference FW19A/0211: Demolition of existing detached bungalow and garage and construction of 5 no. dwellings comprising of 1 no. detached, two storey, five bedroom dwelling (facing Beechpark Avenue and 4 no. semi-detached, two storey, three -bedroom dwellings to the rear of the site;
- FCC planning reference FW20A/0023: Construction of 51 number dwellings to the south west end of the Phoenix Park Racecourse site (Deerpark Boundary), Castleknock Road, Dublin 15;
- SHD reference 307976: Demolition of existing building Construction of 210 Apartments. Bradys Castleknock Inn, Old Navan Road, Blanchardstown, Dublin 15;
- IW05: Blanchardstown Sewer Rehabilitation Works;
- IW06: Regional Drainage Scheme;
- Major project reference MP08: DART+ Programme West;
- Major project reference MP10: Widening of the N3 between Junction 1 (M50) and Junction 4 (Clonee), plus related junction and necessary changes to the existing national road network;
- Major project reference MP12: DART+ Programme South West;
- Major project reference MP15: DART+ Tunnel Element (Kildare Line to Northern Line);
- Major project reference MP17: LUAS Cross City incorporating LUAS Green Line Capacity Enhancement - Phase 1;
- Major project reference MP33: Greater Dublin Drainage (GDD);
- Major project reference MP34: Greater Dublin Area Cycle Network Plan – notably the Royal Canal Greenway element;
- Major project reference MP37: Snugborough Interchange upgrade;
- Ballymun-Finglas to City Centre Core Bus Corridor Scheme; and
- Liffey Valley to City Centre Core Bus Corridor Scheme.

The highest noise impacts associated with the Proposed Scheme are calculated at NSLs along the immediate boundary of the proposed construction works (typically within 50m of a specific working area). Due to the linear nature of works associated with the Proposed Scheme, construction noise impacts will occur over temporary periods at any one location. Construction activities associated with the Proposed Scheme will therefore dominate noise levels at the closest NSLs to the Proposed Scheme when occurring in their proximity. Due to the further distance of the other Core Bus Corridor schemes and the other projects to these NSLs, the cumulative construction noise levels will remain dominated by the Proposed Scheme and the magnitude of impacts described in Section 9.4.4.2 of Chapter 9 (Noise & Vibration) remain valid.

In order to ensure that construction activities associated with the Proposed Scheme are controlled at the closest NSLs, a series of mitigation measures will be implemented throughout the construction phase. These measures are set out in Section 9.5.1.1 of Chapter 9 (Noise & Vibration) . With the implementation of the mitigation measures to reduce construction noise levels associated with the Proposed Scheme and due to the separation from the nearest other Core Bus Corridor scheme, there are no significant cumulative impacts predicted to occur from concurrent construction of the Proposed Scheme in combination with the other Core Bus Corridor schemes and other projects identified.

21.3.1.4.2 Construction Traffic Assessment

Potential noise impacts associated with Construction Phase traffic during the construction of the Proposed Scheme has been assessed in Section 9.4.4.4 of Chapter 9 (Noise & Vibration). The assessment methodologies and significance criteria used for the assessment is set out in Section 9.2.4.1 and Section 9.2.4.2 of Chapter 9 (Noise & Vibration).

The assessment of potential cumulative construction traffic noise impacts has been undertaken using the following approach:

- Traffic noise levels have been calculated along the modelled roads within a 1km study area of the Proposed Scheme;
- Noise levels have been calculated for the Do Minimum scenario for the assessed construction year, 2024;
- Noise levels have been calculated for the Cumulative Do Something scenario for the assessed construction year, 2024 which includes the adjacent Core Bus Corridor schemes with the exception of those set out in Section 21.3.1.1;
- The change in traffic noise levels between the Do Minimum and Cumulative Do Something scenarios for the year 2024 has been calculated and the associated magnitude of change and noise level ranges using the same methodology as the stand-alone scheme, as set out in Section 9.2.4 of Chapter 9 (Noise & Vibration); and
- It is assumed that other schemes that may be under construction concurrently are captured in the 2024 Do Minimum and Do Something traffic volumes which accounts for traffic and HGV growth.

For the majority of the 1km study area relative to the standalone Proposed Scheme and assessed for the cumulative 2024 construction scenario, traffic noise impacts are determined to be Neutral, Imperceptible to Slight, and Temporary due to the negligible to low volume of additional traffic along the road network during the cumulative construction phase scenario.

There are a small number of roads in the overall study area where there are potential for significant impacts because of traffic redistribution onto the surrounding road network due to temporary traffic management measures during the construction phase. These are defined as roads with a traffic noise level above a daytime noise level of 55 dB $L_{Aeq,16hr}$ and an increase in noise level greater than 3 dB. The results are provided for both the standalone and the cumulative scenarios in Table 21.9.

Table 21.9: Summary of Predicted Construction Traffic Noise Impacts Due to Standalone Proposed Scheme and Cumulative Construction (other Bus Connects Core Bus Corridors under Construction)

Road	Predicted Impact – Standalone Proposed Scheme	Predicted Impact – Cumulative Construction
Nephin Road	Negative, Moderate, Temporary	Negative, Moderate -Significant, Temporary

Road	Predicted Impact – Standalone Proposed Scheme	Predicted Impact – Cumulative Construction
Blanchardstown Centre	Negative, Slight -Moderate, Temporary	Negative, Slight -Moderate, Temporary
Blanchardstown Crowne Plaza	Negative, Slight -Moderate, Temporary	Negative, Slight -Moderate, Temporary
Chesterfield Avenue	Negative, Not Significant, Temporary	Negative, Not Significant - Slight, Temporary
Carnlough Road	Negative, Moderate - Significant, Temporary	Negative, Moderate - Significant, Temporary
Swilly Road	Negative, Moderate - Significant, Temporary	Negative, Moderate - Significant, Temporary
Manor Place	Neutral, Imperceptible, Temporary	Negative, Moderate - Significant, Temporary
Oxmantown Road	Negative, Slight. Temporary	Negative, Moderate - Significant, Temporary
St Joseph's Road	Negative, Not Significant, Temporary	Negative, Moderate, Temporary
Cowper Street	Neutral, Imperceptible, Temporary	Negative, Moderate - Significant, Temporary
Blackhorse Avenue	Negative, Slight, Temporary	Negative, Moderate, Temporary

Under the cumulative construction traffic scenario, the same magnitude of impacts are experienced along the majority of roads assessed due to the standalone Proposed Scheme. The exception to this is along Nephin Road, Manor Place, Oxmantown Road, St Joseph's Road, Cowper Street, and Blackhorse Avenue where increased traffic noise impacts are calculated as a result of cumulative schemes under construction. Impacts are calculated as negative, moderate and temporary to negative, moderate to significant and temporary along these roads. Similar magnitudes of impacts are calculated along road affected by the standalone Proposed Scheme. All traffic noise impacts are temporary in nature.

Based on the aim to coordinate between the Proposed Scheme works and other major infrastructure projects and major projects which are proposed along the route, or in the vicinity, of the Proposed Scheme, a small number of roads will experience cumulative effects on noise and vibration over and above the effects of the Proposed Scheme in isolation which are reported in Chapter 9 (Noise & Vibration).

21.3.1.5 Population

The Population assessment has considered potential cumulative effects on land-take, amenity and accessibility during construction. Only one project was shortlisted as having potential interfaces with population receptors affected by the Proposed Scheme as assessed in Chapter 10 (Population). This was:

- DCC planning reference 2038/17 and ABP309657: Construction of new district shopping centre development and 175 no. residential units (3 no. houses, 29 no. Build to Rent apartments and 584 no. student bedspaces) at Park Shopping Centre and numbers 42 – 45 Prussia Street.

The assessment identified that there was potential for cumulative effects on land-take from the project in combination with the Proposed Scheme, affecting part of the car park. However the Proposed Scheme would only require a small area of car park. There is also the potential for adverse cumulative amenity impacts for surrounding businesses. No cumulative impacts on accessibility are expected. It was considered the residual effect on cumulative land-take and amenity would be neutral and not significant.

21.3.1.6 Human Health

The Human Health assessment identified 19 other projects with potential for likely significant cumulative effects with the Proposed Scheme and took into the assessment stages 3 and 4 (see Appendix A21.1 Record of Stages 1 and 2 of the CEA), of which ten were deemed to have potential for construction related cumulative effects. These were:

- DCC planning reference 3163/16: A mixed use development comprising removal of existing buildings on site, construction of a commercial unit and 33 apartments in two buildings on North Brunswick Street and North King Street.

- DCC planning references 4261/16 (superseded by 4734/18): Residential development involving demolition of existing structures, including no. 20 Stoneybatter, and the construction of 142 student apartments.
- DCC planning reference 2038/17 and ABP309657: Construction of new district shopping centre development and 175 no. residential units (3 no. houses, 29 no. Build to Rent apartments and 584 no. student bedspaces) at Park Shopping Centre and numbers 42 – 45 Prussia Street.
- FCC planning reference FW17A/0048: Residential development involving construction of 17 two storey houses with an access road off Navan Road.
- FCC planning reference FW17A/0108: Demolition of existing structures on the site including garage and office and construction of a new two storey building with a service station on the ground floor and studio rooms for fitness related use on the first floor.
- FCC planning reference FW20A/0023: Construction of 51 number dwellings to the south west end of the Phoenix Park Racecourse site (Deerpark Boundary), Castleknock Road, Dublin 15.
- SHD reference 307976: Demolition of existing building Construction of 210 Apartments. Bradys Castleknock Inn, Old Navan Road, Blanchardstown, Dublin 15.
- Major project reference MP08: DART+ Programme West.
- Major project reference MP12: DART+ Programme South West.
- Major project reference MP15: DART+ Tunnel Element (Kildare Line to Northern Line).
- Major project reference MP17: LUAS Cross City incorporating LUAS Green Line Capacity Enhancement - Phase 1.
- Major project reference MP33: Greater Dublin Drainage (GDD).
- Major project reference MP34: Greater Dublin Area Cycle Network Plan – notably the Royal Canal Greenway element.
- Major project reference MP37: Snugborough Interchange upgrade.
- Ballymun-Finglas to City Centre Core Bus Corridor Scheme.
- Lucan to City Centre Core Bus Corridor Scheme.
- Liffey Valley to City Centre Core Bus Corridor Scheme.

The greatest cumulative impacts predicted are for the Greater Dublin Area Cycle Network, which would potentially coincide with the Proposed Scheme in a number of locations. If constructed at the same time, it is assessed as having potential to disrupt pedestrian and cycle access in cumulation with the Proposed Scheme where works areas are in proximity to each other. This could make journeys on foot or by bicycles temporarily inconvenient and frustrating should issues such as multiple diversions or temporary surfaces need to be negotiated during a single pedestrian or cycle journey. While this has the potential to have negative impacts on wellbeing, the effects would be of a temporary or short-term in nature, and are not anticipated to affect a change of health status to the population in the study area as a whole. In the absence of mitigation, the impact on health is assessed as Negative, Moderate and Temporary to Short-term.

The potential cumulative effects of the other projects were all assessed as Negative, Slight and Temporary to Short-term or Negative, Not Significant and Short-term. (refer to Table A21.2.4 in Appendix A21.2 Stage 4 Specialist Assessments for details of the assessments made).

21.3.1.7 Biodiversity

This cumulative impact assessment examines whether the Proposed Scheme, along with any other projects could cumulatively result in a likely significant effect on biodiversity. Projects either in place, or proposed, are considered in assessing the potential for cumulative impacts to increase the significance of the impacts predicted for the Proposed Scheme on biodiversity. These projects are outlined in Table A21.2.5 in Appendix A21.2 Stage 4 Specialists Assessment in Volume 4 of the EIAR.

The potential for cumulative impacts on biodiversity to arise are limited to those residual impacts associated with the Proposed Scheme and those effects the Proposed Scheme will have on the receiving environment that are measurable in some way, but themselves will not result in a likely significant residual effect on biodiversity.

The residual biodiversity impacts associated with the Proposed Scheme itself, as reported in Section 12.6, Chapter 12 (Biodiversity) in this EIAR are all significant at the local geographic scale and are summarized as follows and in the Table 21.10 under the following categories.

- Habitat loss;
- Disturbance / displacement of fauna (bats, badgers, otter, breeding and winter birds); and
- Loss of foraging / commuting habitat, habitat fragmentation and/or mortality for bats and birds.

Table 21.10: Summary of Construction Phase Significant Residual Impacts

Ecological Receptor	Ecological Valuation	Predicted Impact (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation)
Habitats (outside of designated areas for nature conservation)				
(Mixed) broadleaved woodland (WD1)	Local Importance (Higher Value)	Habitat Loss, Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the local geographic scale	Likely significant effect at the local geographic scale
Mixed broadleaf/conifer woodland (WD2)	Local Importance (Higher Value)	Habitat Loss, Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the local geographic scale	Likely significant effect at the local geographic scale
Scattered trees and parkland (WD5)	Local Importance (Higher Value)	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the local geographic scale	Likely significant effect at the local geographic scale
Hedgerows (WL1)	Local Importance (Higher Value)	Habitat Loss, Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the local geographic scale	Likely significant effect at the local geographic scale
Treelines (WL2)	Local Importance (Higher Value)	Habitat Loss, Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the local geographic scale	Likely significant effect at the local geographic scale
Fauna Species				
Bats	Local Importance (Higher Value)	Habitat loss / fragmentation; Disturbance / displacement	Likely significant effect at the local geographic scale	Likely significant effect at the local geographic scale
Otter	County Importance	Habitat degradation (hydrology; disturbance / displacement)	Likely significant effect at the local geographic scale	Likely significant effect at the local geographic scale
Kingfisher	National Importance	Habitat degradation (hydrology; disturbance/ displacement)	Likely significant effect at the local geographic scale	Likely significant effect at the local geographic scale

21.3.1.7.1 Impacts from Habitat Loss

Potential cumulative impacts on habitat loss will relate to the following four key environmental receptor (KER) habitats where the Proposed Scheme will result in the residual loss of a proportion of five KER habitats resulting in a residual effect significant at the local geographic level; Hedgerows (WL1), Treelines (WL2), (Mixed) broadleaf woodland (WD1) and Scattered trees and parkland (WD5) and Mixed broadleaf/conifer woodland (WD2).

The majority of these habitats are located adjacent to the existing roadway and are highly disturbed and typically fragmented in nature. Given the location of the Proposed Scheme and the on-going urban development trends across Dublin, there is likely to be continued habitat loss and fragmentation. In relation to areas of locally important habitats that will be lost, given the nature and availability of the habitat types involved in the wider environment, any cumulative losses of these habitat types are not likely to increase the impact significance above the residual local geographic scale.

Various protective polices in place within the land use plans will also moderate any future losses of habitats of a biodiversity value, including the following policies within the Fingal Development Plan 2017-2023 (FCC, 2017) and the Dublin City Development Plan 2016-2022 (DCC 2016) respectively.

The Proposed Scheme is compliant with all of the plan level biodiversity protection policies and objectives described within the Fingal County Development Plan 2017 – 2023 and Dublin City Development Plan 2016 – 2022 – listed below. Furthermore, the Proposed Scheme will not prevent the achievement of any of these plan level biodiversity protection policies and objectives across the identified potential impact pathways.

Fingal County Development Plan 2017 - 2023

Objective GI03: Develop the green infrastructure network to ensure the conservation and enhancement of biodiversity, including the protection of European Sites, the provision of accessible parks, open spaces and recreational facilities (including allotments and community gardens), the sustainable management of water, the maintenance of landscape character including historic landscape character and the protection and enhancement of the architectural and archaeological heritage

Objective GI24: Ensure biodiversity conservation and/or enhancement measures, as appropriate, are included in all proposals for large scale development such as road or drainage schemes, wind farms, housing estates, industrial parks or shopping centers.

Objective NH20: Maintain and/or enhance the biodiversity of the Nature Development Areas indicated on the Green Infrastructure maps.

Objective NH23: Protect the ecological functions and integrity of the corridors indicated on the Development Plan Green Infrastructure Maps.

Objective NH27: Protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character and ensure that proper provision is made for their protection and management.

Objective NH28: Consider the use of Tree Preservation Orders (TPOs) to protect important trees, groups of trees or woodlands.

Dublin City Development Plan 2016 - 2022

GI25: To make provisions for habitat creation/ maintenance and facilitate biodiversity by encouraging the development of linear parks, nature trails, wildlife corridors, urban meadows and urban woodlands.

GI26: To have regard to the conservation and enhancement of significant non-designated areas of ecological importance in accordance with development standards set out in this plan.

GI025: To protect trees in accordance with existing Tree Preservation Orders (TPOs) and, subject to resources, explore the allocation of additional TPOs for important/ special trees within the city based on their contribution to amenity or the environment.

GI026: To review ancient and species-rich hedgerows within the city (as identified in the 2006 survey of ancient and species rich hedgerows in Dublin city) and protect existing hedgerow sections.

GI027: To protect trees, hedgerows or groups of trees which function as wildlife corridors or 'steppingstones' in accordance with Article 10 of the EU Habitats Directive.

Where habitat losses can be compensated for this would also reduce the impact significance and the potential for any cumulative impacts with any future developments. However, the Proposed Scheme is likely to result in cumulative impacts with regard to loss of Hedgerows (WL1) and Treelines (WL2) habitat at the local geographic scale; no higher than the already predicted residual effects significant at the local geographic scale for the Proposed Scheme alone.

21.3.1.7.2 Impacts on Bats

Section 12.6 of Chapter 12 (Biodiversity) in this EIAR reports that there are predicted residual impacts on bats with regard to loss of foraging habitat, fragmentation and disturbance/displacement.

Disturbance/displacement of bats and loss of foraging habitat and fragmentation to bat movements may result from other developments within the vicinity of the Proposed Scheme. Habitats / features which could be used by

bats which are also proposed for removal / development in the immediate vicinity include hedgerows, treelines and woodlands. In addition to direct habitat loss the flight paths of bats moving between areas could be impacted by additional artificial lighting that may be proposed in the future as a result of the other proposed developments.

However, all of these impacts will be controlled by the assessment of individual planning applications which must consider the effects on protected species such as bats as part of their appraisal by the competent authority, having regard to the protective environmental policies outlines in the Fingal Development Plan 2017-2023 and the Dublin City Development Plan 2016-2022.

The Proposed Scheme is likely to result in cumulative impacts with regard to these impacts on bats but no higher than the already predicted residual effects significant at the local geographic scale for the Proposed Scheme alone.

21.3.1.7.3 Impacts on Birds

Section 12.6 of Chapter 12 (Biodiversity) in this EIAR reports that there are predicted residual impacts on the local bird population with regard disturbance and the loss of foraging / nesting habitat as a result of the Proposed Scheme.

Disturbance to local bird populations as well as loss of foraging and nesting habitat may result from other developments within the vicinity of the Proposed Scheme. Habitats / features which could be used by birds which are also proposed for removal / development in the immediate vicinity include hedgerows, treelines and woodlands. Pressures on local bird species are likely to continue given the location of the Proposed Scheme in the wider environment. Given the on-going urban development across Dublin there is likely to be continued habitat loss and fragmentation of suitable foraging and nesting habitat as well as disturbance associated with on-going development.

In respect of Kingfisher, disturbance to local populations may result from other developments within the vicinity of the Proposed Scheme. No habitats / features which could be used by Kingfisher, e.g. nesting bankface or removal of overhanging perching vegetation are proposed for removal / development and Kingfisher territory along the River Tolka should not be impacted by the project itself. Pressures on Kingfisher are likely to continue given the location of the Proposed Scheme in the wider environment adjacent to the River Tolka valley corridor. Given the on-going urban development across Dublin there is likely to be continued disturbance associated with on-going development.

However, disturbance or displacement impacts during construction will be temporary or short-term and are not likely to have long-term population level effects, even cumulatively with any future development projects that might be proposed.

Additionally, potential cumulative impacts will be controlled by the assessment of individual planning applications which must consider the effects on protected species such as birds as part of their appraisal by the competent authority, having regard to the protective environmental policies outlines in the Fingal Development Plan 2017-2023 and the Dublin City Development Plan 2016-2022.

The Proposed Scheme is likely to result in cumulative impacts with regard to these impacts on birds but no higher than the already predicted residual effects significant at the local geographic scale for the Proposed Scheme alone.

21.3.1.7.4 Impacts on Terrestrial Mammals - Otter

Section 12.6 of Chapter 12 (Biodiversity) in this EIAR reports that there are predicted residual impacts with regard to disturbance from construction and operational activities on terrestrial mammals including otter and badger as a result of the Proposed Scheme.

Disturbance to local mammal populations may result from other developments within the vicinity of the Proposed Scheme. Habitats / features which could be used by badger which are also proposed for removal / development in the immediate vicinity include hedgerows, treelines and woodlands, while Otter are known to use lands within the footprint of the Proposed Scheme with known otter holts present elsewhere along the River Tolka. Pressures

on terrestrial mammal species are likely to continue given the location of the Proposed Scheme in the wider environment. Given the on-going urban development across Dublin there is likely to be continued disturbance associated with on-going development.

However, disturbance or displacement impacts during construction will be temporary or short-term and are not likely to have long-term population level effects, even cumulatively with any future development projects that might be proposed.

Additionally, potential cumulative impacts will be controlled by the assessment of individual planning applications which must consider the effects on protected species such as birds as part of their appraisal by the competent authority, having regard to the protective environmental policies outlines in the Fingal Development Plan 2017-2023 and the Dublin City Development Plan 2016-2022.

The Proposed Scheme is likely to result in cumulative impacts with regard to these impacts on terrestrial mammals but no higher than the already predicted residual effects significant at the local geographic scale for the Proposed Scheme alone.

21.3.1.7.5 Other Biodiversity Impacts

The other impacts associated with the Proposed Scheme that are measurable in some way, but themselves will not result in a likely significant effect on biodiversity and these are also discussed below:

- Impacts on the existing hydrological and hydrogeological regimes;
- Impacts on air quality; and
- Disturbance to species not already listed in Table 21.10.

Specific assessments have been undertaken by air quality, hydrogeology, and hydrology specialists to identify the potential for in-combination effects to occur.

The Proposed Scheme will not have any significant residual effects on the existing air environment as is set out in detail in Chapter 7 Air Quality of the EIAR. Standard design and environmental mitigation measures have been included to address any potential effects such so that there will be no significant residual effects on air quality. Therefore, the Proposed Scheme is not anticipated to act in combination with any other projects to result in significant residual air quality effects.

Any proposed projects must comply with statutory licensing and planning requirements and be in accordance with the objectives and policies of the relevant land use plans (Development Plans, Local Area Plans etc.). These land use plans contain objectives and policies to ensure the protection of biodiversity.

Proposed projects will be subject to planning consent, including preparation of an EIAR and AA Screening Report / Natura Impact Statement, if required. Following this, projects will be bound by environmental commitments confirmed within the planning consent.

Impacts on the existing hydrological and hydrogeological regimes

The Proposed Scheme will not have any significant residual effects on the existing hydrological or hydrogeological regime in those surface and ground water catchments crossed by the Proposed Scheme or in the downstream receiving surface and marine water environment, either through affecting existing flow conditions or affecting surface or ground water quality as is set out in detail in Chapter 13 Water and Chapter 14 Land, Soils, Geology and Hydrogeology of the EIAR and in Appendix A13.1 in Volume 4 of the EIAR (the Water Framework Directive Assessment). Specific design and mitigation measures have been included to address any potential effects such that there will be no significant residual effects. Therefore, the Proposed Scheme is not anticipated to act in combination with any other projects to result in significant residual hydrological or hydrogeological effects.

The Proposed Scheme lies within Hydrometric Area (HA) 09 (Liffey and Dublin Bay) and is within the Liffey River catchment. The objectives for this catchment are outlined in The River Basin Management Plan for Ireland (2018-2021), which aims to protect all waters within the district and, where necessary, improve waters and achieve sustainable water use. The purpose of the River Basin Management Plan is to reduce pollution levels, to restore good water quality status and to prevent deterioration in water quality in the river basins and groundwater bodies.

There are many land-use plans and projects that lie within the catchment that have the potential to affect surface water and groundwater bodies. However, all of the overarching land use plans have environmental protective policies to protect the existing surface water and groundwater network. Therefore, there are no other plans or projects that are likely to result in a significant effect on biodiversity, cumulatively with the Proposed Scheme, as a consequence of surface water or groundwater impacts.

Impacts on air quality

The Proposed Scheme will not have any significant residual effects on the existing air environment as is set out in detail in Chapter 7 (Air Quality) of the EIAR. Specific design and mitigation measures have been included to address any potential effects such that there will be no significant residual cumulative effects on air quality. Therefore, the Proposed Scheme is not anticipated to act in combination with any other projects to result in significant residual air quality effects.

Impacts on fauna species (excluding those discussed in Table 21.10) as a result of disturbance or displacement

The Proposed Scheme will not result in a likely significant residual effect on any fauna species (excluding those listed in Table 21.10) as a result of disturbance or displacement effects during the Construction Phase. Disturbance or displacement impacts during the Construction Phase are temporary and are not likely to have long-term population level effects, even cumulatively with any future development projects that might be proposed.

Impacts on European Sites

The potential for other plans or projects to act cumulatively with the Proposed Scheme to adversely affect the integrity of any European sites, is considered in Section 8 of the NIS which is provided as a standalone document in the planning application package with this EIAR (termed “in combination effects” in the context of the NIS assessment). The conclusion of that assessment is summarised here.

The Proposed Scheme will not affect the integrity of any European sites. It will not result in the loss or fragmentation of any Qualifying Interest (QI) habitats, or habitats supporting populations of QI / Special Conservation Interest (SCI) species, in (or associated with) any European sites, nor will it degrade any such habitats or affect QI / SCI species as a result of hydrological or hydrogeological impacts (quality or quantity), air quality impacts or introducing/spreading non-native invasive plant species.

The in-combination assessment has concluded that there is no potential for adverse effects on the integrity of any European sites, to arise as a consequence of the Proposed Scheme in combination with any other plans or projects, as in consideration of the mitigation measures detailed in Section 7 of the NIS, no adverse effects on European site integrity will arise from the implementation of the Proposed Scheme. Furthermore, for the same reasons, there will be no adverse effects on the integrity of any European sites as a consequence of the Proposed Scheme acting in-combination with any, some or indeed all taken together, of these plans or projects.

The implementation of, and adherence to, the policies and objectives within the following plans; Fingal County Development Plan 2017 – 2023 and Dublin City Development Plan 2016 – 2022, will ensure the protection of European sites across all identified potential impact pathways, and will include the requirement for any future project to undergo Screening for Appropriate Assessment and/or Appropriate Assessment as relevant.

Therefore, as the Proposed Scheme will not adversely affect the integrity of European sites within the Zol of the Proposed Scheme, and given the protection afforded to European sites under the overarching land use plans, it has been concluded that there will be no adverse effects on the integrity of any European sites, either alone or to arise as a consequence of the Proposed Scheme acting in combination with any other plans or projects.

21.3.1.8 Water

The Water assessment identified seven other projects for potential construction related cumulative effects. These are:

- FCC planning reference FW17A/0048: Residential development involving construction of 17 two storey houses with an access road off Navan Road.

- FCC planning reference FW17A/0108: Demolition of existing structures on the site including garage and office and construction of a new two storey building with a service station on the ground floor and studio rooms for fitness related use on the first floor.
- DCC planning reference 4237/19: The proposed development will consist of a residential development of 33 no. residential units. The proposed development would also consist of the demolition of the 2 no. existing single storey detached dwellings and associated outbuildings and sheds. Vehicular access from Villa Park Road and pedestrian access from Villa Park Road and Blackhorse Avenue and Blackhorse Avenue, Dublin 7.
- FCC planning reference FW20A/0023: Construction of 51 number dwellings to the south west end of the Phoenix Park Racecourse site (Deerpark Boundary), Castleknock Road, Dublin 15.
- Major project reference MP08: DART+ Programme West.
- Major project reference MP10: Widening of the N3 between Junction 1 (M50) and Junction 4 (Clonee), plus related junction and necessary changes to the existing national road network.
- Major project reference MP33: Greater Dublin Drainage (GDD).

The further assessment predicted that given the mitigation measures set out in the Surface Water Management Plan (SWMP) for the Proposed Scheme and the assumption that other projects would implement good practice measures during construction, the cumulative impacts during construction would be of imperceptible significance.

21.3.1.9 Land, Soils, Geology and Hydrogeology

The residual impacts on Land, Soils, Geology and Hydrogeology due to the Proposed Scheme are expected to be of negligible magnitude and imperceptible significance as a result of the construction of the Proposed Scheme. It is also considered following on from a review of other proposed projects within the study area that the construction of the Proposed Scheme in combination with other proposed projects will not result in significant cumulative impacts.

From a Land, Soils, Geology and Hydrogeology perspective most of the proposed projects will result in the loss of a small quantity of soil and geology. However, the cumulative loss is still considered small on a local scale. As such, there are no likely significant direct, indirect cumulative impacts in combination with other proposed projects on land, soils, geology and hydrogeology.

21.3.1.10 Archaeological and Cultural Heritage

The Archaeological and Cultural Heritage Assessment identified one project with potential for cumulative effects during construction. This was:

- DCC planning reference 2038/17 and ABP309657: Construction of new district shopping centre development and 175 no. residential units (3 no. houses, 29 no. Build to Rent apartments and 584 no. student bedspaces) at Park Shopping Centre and numbers 42 – 45 Prussia Street.

This project was identified as being within Historic City of Dublin Zone of Archaeological Potential and at RMP site of 18th/19th century house. Any remains that survive will be partial and heavily truncated by the previous development. Archaeological investigations have already place and further mitigation will occur. The assessment identified that works can and will be archaeologically mitigated. Taken in conjunction with the Bus Connects Project, they will not cause an additional significant impact from an archaeological perspective.

21.3.1.11 Architectural Heritage

The Architectural Heritage Assessment did not identify any projects with potential to give rise to cumulative effects on architectural heritage. This was because in locations where projects were within the zone of influence for architectural effects, the Proposed Scheme itself would not have any residual impacts on architectural heritage.

21.3.1.12 Landscape (Townscape) and Visual

The Landscape (Townscape) and Visual assessment shortlisted the following projects for potential cumulative construction related effects:

- DCC planning reference 2453/15: Permission for residential development of a site of c.0.31ha. at Nos. 30 & 32-36 Thomas Street and 10 Hanbury Lane, Dublin 8.
- DCC planning reference 3163/16: A mixed use development comprising removal of existing buildings on site, construction of a commercial unit and 33 apartments in two buildings on North Brunswick Street and North King Street.
- DCC planning references 4261/16 (superseded by 4734/18): Residential development involving demolition of existing structures, including no. 20 Stoneybatter, and the construction of 142 student apartments.
- DCC planning reference 2038/17 and ABP309657: Construction of new district shopping centre development and 175 no. residential units (3 no. houses, 29 no. Build to Rent apartments and 584 no. student bedspaces) at Park Shopping Centre and numbers 42 – 45 Prussia Street.
- IW06: Irish Water project - Blanchardstown. Regional Drainage Scheme (part of Greater Dublin Drainage).
- Major project reference MP08: DART+ Programme West.
- Major project reference MP10: Widening of the N3 between Junction 1 (M50) and Junction 4 (Clonee), plus related junction and necessary changes to the existing national road network.
- Major project reference MP12: DART+ Programme South West.
- Major project reference MP33: Greater Dublin Drainage (GDD).
- Major project reference MP34: Greater Dublin Area Cycle Network Plan – notably the Royal Canal Greenway element.
- Major project reference MP37: Snugborough Interchange upgrade.
- B1 Swords to City Centre Core Bus Corridor Scheme
- D1 Ballymun-Finglas to City Centre Core Bus Corridor Scheme.
- A2 Lucan to City Centre Core Bus Corridor Scheme.
- B2 Liffey Valley to City Centre Core Bus Corridor Scheme.
- A3 Tallaght-Clondalkin Core Bus Corridor Scheme.

Where the Proposed Scheme will coincide with other projects, a localised moderate temporary to short-term construction effect on townscape was predicted for most projects, with the exception of the Irish Water IW06 project, MP08 DART + Programme West and MP12 DART+ Programme South West which are predicted to experience significant, negative, temporary / short-term effects, should construction periods overlap.

For the other identified Core Bus Corridor Schemes, there is potential for temporary in-combination indirect townscape effects. These effects would be limited by distance for Core Bus Corridor IDs B1, A2, B2 and A3 and no potential cumulative visual effects are predicted. For ID D1 (Ballymun – Finglas to City Centre Core Bus Corridor Scheme) potential for indirect townscape / visual effects on local intervening townscape around Smithfield, interconnecting roads, Liffey Quays and other local receptors are predicted and there is potential for moderate short-term / temporary cumulative construction effects if the construction periods coincide or are successive.

21.3.1.13 Waste and Resources

The waste management baseline for the Eastern Midlands Waste Region (EMWR), established for the assessment using publicly available data from the Regional Waste Management Offices and the EPA, has been used as the baseline for the cumulative assessment. Tables 18.3, 18.4 and 18.5 in Section 18.3 of Chapter 18 of this EIAR, set out permitted and licensed capacity and Article 27 notifications for 2020. This data has been used to establish a baseline for 2020. The available C&D waste and by-product capacity in EMWR for 2020 is approximately 10.7 million tonnes based on the following assumptions, see Table 21.11:

- Using the available capacity for permitted facilities for construction and demolition wastes;
- Including only licensed facilities accepting soil and stones; and
- Including all Article 27 notifications for 2020 in the EMWR.

Table 21.11: C&D waste management baseline for EMWR, 2020 (permitted, licensed and Article 27 notifications)

C&D Waste Management Baseline for 2020	Authorised Annual Waste and By Product (Tonnes)
Permitted capacity (Regional Waste Management Office (Offaly County Council 2021)	4,625,286
Licensed annual intake (soil and stone facilities) (EPA 2021e)	3,893,800
Article 27 (by-product) notifications (EPA 2020)	2,504,482
Total	10,663,568

Therefore, the authorised C&D waste and by product tonnage in EMWR in 2020, and so the construction and operation waste baseline, is an estimated 10.7 million tonnes per annum.

The Regional Waste Authorities state in the publication ‘*Construction and Demolition Waste Management Plans 2015-2021: Update Report 2020*’ (which sets out the national capacity of primarily soil and stone treatment facilities):

“the licensed capacity is most prominent in the EMWR which has a healthy supply of active capacity and substantial new capacity due to come on stream. The Region contains 80% of the active national capacity ... New licensed facilities are also due to come on stream. Future capacities (new applications and un-commenced operations) exceed 2.1m tonnes nationally, with 73% of this capacity planned for the EMR... The urban centres of Dublin and Cork which are a focal point for development and construction are (or will be) well served by licensed capacity.”

“Nationally there were 325 registered and permitted facilities at the end of 2018, with an estimated 5.2m tonnes of lifetime capacity remaining by the end of the year. It is noted that the reported remaining capacity and intake data at permitted and registered facilities is an under-estimation due to incomplete rates of reporting.”

The Update Report sets out that there were four inert landfill facilities active nationally in 2018, all located in the EMWR. Two of these facilities are located in Fingal and Kildare and the Update Report notes that they have significant remaining capacity:

- IMS, Co. Dublin;
- Walshestown, Co. Kildare;
- Kyletalesha, Co. Laois; and
- Tara Mines, Co. Meath.

Due to the nature of waste management in Ireland cumulative effects for waste have been considered on a regional basis. A short-list of proposed projects planned within the region, was also developed, including having regard to those projects set out in Project 2040 (Department of Public Expenditure and Reform 2018; Investment Projects and Programmes Office 2019). These projects were reviewed and screened based on the following criteria:

- Construction phases likely to overlap with the Proposed Scheme - where unknown, overlap is considered as a worst case; and
- Similar project waste profile is expected to be generated i.e., tunnelling excavation material, soil and stones and bitumen containing material.

A list of regional projects that have been taken into account in the cumulative effect’s assessment is provided in Table 21.12.

Table 21.12: Regional Projects Included in Cumulative Assessment

Project Name	Project Type	Anticipated Construction completion (year) where known	Waste type likely to be generated
Metrolink	19km rail line running from Swords to Charlemont, majority of the line will be run underground via a single bore tunnel.	2028	<ul style="list-style-type: none"> • Soil and stones • General C&D waste
Dart Underground	7.5km twin bore tunnel for electrified heavy rail in Dublin city centre, linking the Northern line to the Heuston Main line.	TBC	<ul style="list-style-type: none"> • Soil and stones • General C&D waste
Dublin Port Masterplan 2040	Works include construction of new quays and jetties, remediation of contamination on the bed of the basin, capital dredging to deepen the basin, infilling of the Basin at some berth locations and construction of a new river berth with a double tiered Ro-Ro ram and deepening of fairway and approach to Dublin port.	TBC	<ul style="list-style-type: none"> • Soil and stones • General C&D waste
N2 Slane Bypass	3.4km long bypass that runs from the east of Slane to the existing N2 at a location 500m north of McGruder's crossroads	2026	<ul style="list-style-type: none"> • Soil and stones • Bitumen containing material • General C&D waste
Ardee bypass	6km single carriageway, commencing in the townland of Mandistown to Glebe townland north of Ardee.	2024	<ul style="list-style-type: none"> • Soil and stones • Bitumen containing material • General C&D waste
M11 Capacity Enhancement (Phase 1 & Phase 2) including Glen of the Downs tunnel	The N11/M11 is 22 km in length between Junction 4 to Junction 14. The primary objectives of the scheme are to improve the efficiency of road based public transport and journey time, and to provide continuity of road type between Junction 6 and Junction 15. 2km tunnel under the west side of the Glen of the Downs.	TBC	<ul style="list-style-type: none"> • Soil and stones • Bitumen containing material • General C&D waste
Blanchardstown Regional Drainage Scheme	The project involves the upgrade of the sewer network currently serving Blanchardstown, Mulhuddart and Castleknock as well as a number of towns in Meath.	2022	<ul style="list-style-type: none"> • Soil and stones
North Dublin sewage plant (pipeline)	Construction of an underground pipeline beginning at Blanchardstown which will collect and transfer sewage, via a new pumping station at Abbotstown to the plant at Clonshaugh. The treated water will be discharged through a 6km marine outfall pipeline.	2026	<ul style="list-style-type: none"> • Soil and stones
Water Supply Project – Eastern and Midlands Region	Abstraction and treatment of water at Parteen Basin in Co. Tipperary, together with a 170km underground treated water pipeline from Parteen Basin to Dublin	2030	<ul style="list-style-type: none"> • Soil and stones
Greater Dublin Drainage Project	The orbital sewer route will intercept an existing sewer at Blanchardstown and will divert it from this point to the proposed wastewater treatment plant at Clonshaugh (13.7km in length; 5.2km of a 1.4m diameter rising main and 8.5km of a 1.8m diameter gravity sewer.)	2029	<ul style="list-style-type: none"> • Soil and stones
Automated people mover (APM) Dublin Airport	Approximately twin bore tunnel across the apron in Dublin Airport for an APM	TBC	<ul style="list-style-type: none"> • Soil and stones
Eastern Bypass project	Cut and cover tunnel - Dublin Tunnel to Sandymount Strand	TBC	<ul style="list-style-type: none"> • Soil and stones
O'Devaney Gardens Regeneration Programme	Development consists of 1,047 residential units across 10 blocks up to 14 storeys tall	2025	<ul style="list-style-type: none"> • Soil and stones • Bitumen containing material • General C&D waste
Belcamp Hall Residential Development	Residential development consisting of 2,718 residential units (2,233 no. apartments, 485 no. houses), 2 no. creches and all associated site works.	TBC	<ul style="list-style-type: none"> • Soil and stones • Bitumen containing material • General C&D waste

In addition to the projects listed above, the assessment has taken account of the other 11 Core Bus Corridor schemes. All the Core Bus Corridor schemes are anticipated to be constructed in the period 2023 to 2028.

The projects identified comprise a mixture of major infrastructure transport projects, commercial and residential projects. Each project would generate solid waste from construction and from operation for management within the regional areas. Waste will generally be generated over the period of construction for each project. Additionally, waste generation will vary over time as the nature of the projects are multi-year and are undertaken with a phase approach i.e., demolition, excavation and construction.

21.3.1.13.1 Cumulative construction effects

Construction of projects within the region will produce C&D waste, a proportion of which will be sent for recycling, further treatment or disposal to landfill. In line with the waste hierarchy and relevant policy including the Waste Framework Directive, also applicable to the Proposed Scheme, it is anticipated that all these projects will seek to minimise disposal to landfill and manage waste in accordance with the waste hierarchy.

The Proposed Scheme, together with all the other Core Bus Corridor schemes and the projects listed in Table 21.12 will add to the need for off-site capacity for recovery, recycling, treatment and disposal of waste to landfill. Many of the listed projects are in very early stages so documentation hasn't been published or associated planning documents submitted which would include waste generation estimates however is anticipated that the proposed projects will give rise to similar types of wastes to the Proposed Scheme and that the quantities will vary depending on the type of project

Opportunities are likely to continue to arise during the construction phase of other projects to provide C&D waste and surplus excavated material for use in other local construction projects thereby increasing diversion of such materials from landfill.

As set out above, the EMWR has the most capacity of all the regions. The Regional Waste Management Offices Report states, the Dublin region is (or will be) well served by licensed capacity to support construction and development. Additionally, it was acknowledged the volumes of waste being generated would support the provision of further licensed capacity:

“The available intake data indicates that current volumes would support the development of long-term licensed capacity in these areas to support planned infrastructure and housing developments.”

The Construction Phase impact of the Proposed Scheme has been assessed as not significant short-term and adverse. Considering therefore, the likely potential for waste generation from other projects, the opportunities to divert waste from off-site treatment and the amount of inert, non-hazardous and hazardous waste treatment capacity likely to be available in the region in the coming years over the time period for the delivery of the Proposed Scheme, it is considered that there will be no likely significant cumulative effects as a result of the construction of the Proposed Scheme in combination with the construction of the other Core Bus Corridor schemes and the projects listed in Table 21.12.

21.3.1.14 Material Assets

Material quantities for the Proposed Scheme are considered insignificant and therefore no likely significant cumulative effects on material quantities are predicted as a result of the Proposed Scheme in combination with other proposed development in Dublin.

The Material Assets assessment did not identify any potential for likely significant cumulative effects on services and utilities during the Construction Phase and so no other development was shortlisted for further assessment.

21.3.2 Operational Impacts

21.3.2.1 Traffic and Transport

A detailed assessment of cumulative impacts on Traffic and Transport is set out in Appendix A6.1 in Volume 4 of the EIAR (Traffic Impact Assessment Report). Reference should be made to that appendix for details on

cumulative transport demand, and the cumulative impacts on People Movement. A summary of the findings is set out in this section of the EIAR.

In general, total trip demand (combining all transport modes) will increase into the future in line with projected population and employment growth. A greater share of meeting this increasing demand will be by sustainable modes (public transport, walking, cycling) as the GDA Strategy is progressively implemented.

The analysis indicates that with the 12 Core Bus Corridor schemes in place, there will be a significant positive impact on sustainable mode share. Cumulatively, the 12 Core Bus Corridor schemes, while supporting less congested bus based public transport and cycling movement, will also act as a constraint to increasing private car traffic within the study area, with the assessment indicating a reduction in car trips below 2020 (Pre-COVID19) levels.

In the 2028 Opening Year scenario, it is estimated that for people travelling within a 500m catchment area of the Core Bus Corridor schemes (including City Centre) there will be a 12% increase in public transport trips, 2% decrease in general traffic trips (i.e., motorists) and a 14% increase in cycling trips in the AM Peak Hour. Across the whole day (7am-7pm), there will be a corresponding 12% increase in public transport, 3% decrease in general traffic and a 12% increase in cycling trips each day. In the 2043 Design Year scenario, it is estimated that for people travelling within the 500m Core Bus Corridor catchment area for all Core Bus Corridor schemes (including City Centre) there will be a 11% increase in public transport trips, 4% decrease in general traffic trips (i.e. motorists) and a 15% increase in cycling trips in the morning peak hour and a 9% increase in public transport, 5% decrease in general traffic and a 13% increase in cycling trips each day (7am-7pm).

General traffic levels reduce more in 2043 when compared to 2028 due to the increased level of additional non-bus public transport infrastructure and services (MetroLink, Luas extensions and DART+ from the GDA Strategy) in tandem with the road capacity reduction measures as part of the Proposed Scheme leading to increased usage on all public transport modes.

The modelling outputs for the 2028 Cumulative Opening Year scenario demonstrate that there is a high growth in bus patronage along all the Core Bus Corridor schemes in the AM Peak Hour. The bigger increases occur in the inbound direction on the Blanchardstown to City Centre, the Rathfarnham to City Centre and the Bray to City Centre schemes where the loadings reach more than 2,000 additional passengers per hour compared to the Do Minimum scenario.

In the 2028 Opening Year AM Peak Hour scenario with the Proposed Scheme and the other 11 Core Bus Corridor schemes in place, there will be an estimated 10% more passenger boardings across all public transport services and 17% more boardings on bus services. In the 2028 Opening Year Operational Cumulative PM Peak Hour scenario with the Proposed Schemes in place, there will be an estimated 11% increase in total passengers boarding Public transport services and 18% more passengers boarding buses services.

In the 2043 Design Year AM and PM Peak Hour scenarios, increase in total passengers boarding all public transport services will be 9% respectively, and the increase in passengers boarding bus services will increase by 23% and 22% respectively.

Overall, the Proposed Scheme and the other 11 Core Bus Corridor schemes are expected to facilitate a long term, profound positive cumulative effect on People Movement by sustainable modes. The Core Bus Corridor schemes are seen to enable significant improvements in People Movement by sustainable modes along the direct Core Bus Corridor alignments, particularly by bus and cycling, with reductions in car mode share due to the enhanced sustainable mode provision. The Proposed Scheme and the other 11 Core Bus Corridor schemes provide for enhanced integration and efficiencies for all public transport modes by facilitating substantial increases in public transport average network wide travel speeds.

Consideration of Traffic Related Cumulative Effects in the Design Process

Throughout the development of the Preliminary Design for the Proposed Scheme there have been various design stages undertaken based on a common understanding of the maturity of the design at a given point in time. Part of this process was to ensure the environmental and transport impacts were mitigated to the greatest extent possible during the design development iteration and to take account of information on potential impacts from the

various Environmental Impact Assessment (EIA) and Transport Impact Assessment (TIA) disciplines. This iterative approach resulted in mitigation being embedded into the design process by the continual consideration of potential environmental impacts. A key consideration was the potential for cumulative effects that the Proposed Scheme could have in combination with the other 11 Core Bus Corridor schemes under development.

A multi-tiered modelling framework (described further in Chapter 6) was developed to support this iterative design process, whereby the emerging design for each of the Proposed Schemes has been tested using the transport models as part of this iteration both in isolation and with all Core Bus Corridor schemes in place. Each of the CBC projects worked closely together to align proposals at direct interface points (e.g. overlapping junctions) as well as in the indirect / offline areas where displaced traffic would arise. This included the provision of complimentary traffic management arrangements and/or turn bans to ensure that any displaced traffic was kept to a minimum and / or was maintained on higher capacity roads, whilst continuing to meet scheme objectives along the Proposed Scheme.

For the Proposed Scheme, the iterative process concluded when the design team were satisfied that the Proposed Scheme both in isolation and in combination with the other 11 Core Bus Corridor Schemes, met its required objectives (maximising the people movement capacity of the Proposed Scheme) and that the environmental impacts and level of residual impacts were reduced to a minimum.

Traffic Related Cumulative Effects

To examine the potential cumulative traffic effects that the Proposed Scheme may have in combination with any of the other Core Bus Corridor schemes, an area of influence for each scheme was determined to understand the scale of traffic displacement and its interactions with other schemes. The 'area of influence' is the area in which traffic flows are likely to change as a result of the Proposed Scheme measures as indicated by the transport modelling. The outcome of this assessment revealed that the Proposed Scheme has indirect interface with the proposed Ballymun / Finglas to City Centre Core Bus Corridor Scheme.

In terms of indirect effects, modelling has indicated that both the Proposed Scheme and the Ballymun / Finglas to City Centre Core Bus Corridor Scheme have overlapping traffic zones of influence e.g., each scheme results in traffic displacement affecting the other corridor.

The Ballymun/Finglas to City Centre CBC scheme proceeds along the Phibsborough Road and interacts with proposed implementation of traffic management measures for the Proposed Scheme at Monck Place and Phibsborough junctions.

Works proposed to the junctions include the introduction of short one-way sections, kerblines realignment and uncontrolled raised crossings, along with landscaping and a cycle track at Monck Place junction along with the introduction of right turn bans onto Phibsborough Road.

The design teams of both schemes have coordinated the respective scheme designs to provide flexibility in the proposals such that construction sequencing and physical works can be coordinated or delivered in sequence should both schemes be implemented.

The traffic management measures to be implemented by the Proposed Scheme are located at R108 Phibsborough Road / Phibsborough junction and R108 Phibsborough Road / Monck Place junction as shown on the General Arrangement drawings (BCIDC-ARP-GEO_GA-0005_XX_00-DR-CR-9001) included in Volume 3 of this EIAR.

When both schemes are operational (as well as all other proposed Core Bus Corridor schemes), this has the effect of constraining the opportunity for traffic to displace onto adjoining / adjacent roads when compared to the effect when only one of the Core Bus Corridor schemes is operational. In addition to this, with all the Core Bus Corridor schemes operational, there is predicted to be a higher modal shift from private car trips to sustainable modes of travel compared to the singular scheme scenario. This is due to the combined effect of all Core Bus Corridor schemes being operational and the journey time savings and reliability for bus travel and the interchange opportunities that this provides to travel around Dublin in combination with the BusConnects network re-design proposals. In addition, the Core Bus Corridor schemes will facilitate a step change in the level of segregated cycling provision in comparison with existing conditions along the entire length of the corridors resulting in more people cycling.

The result of the above is that the cumulative effect of all Core Bus Corridors in operation and in tandem with the roll out of the wider GDA Transport Strategy measures, future growth in overall travel demand is catered for by sustainable modes. No significant negative effects over and above those considered in the standalone assessments for the Operational Phase were predicted in the cumulative impact assessment and therefore no additional mitigation measures are considered necessary.

21.3.2.2 Air Quality

21.3.2.2.1 Local Air Quality

The traffic data used in the cumulative assessment for the Do Minimum and Do Something scenarios for future years also considers development, traffic growth and transport schemes proposed for the Dublin area which may have an effect on traffic volumes.

The air quality impact assessment of cumulative road traffic emissions from the operational phase of the Proposed Scheme in combination with the other 11 Core Bus Corridor Schemes has been carried out according to methodology outlined in Section 7.2.4.1 in Chapter 7 (Air Quality).

No new additional significant adverse impacts are identified in the cumulative scenario compared with the standalone scenario assessed in Section 7.4.4.3 in Chapter 7 (Air Quality), refer to Appendix A21.3 Air Quality Cumulative Modelling Results in Volume 4 of this EIAR.

In accordance with the EPA Guidelines (EPA 2022), the impacts associated with the cumulative Operational Phase traffic emissions arising from the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes are overall Neutral, Not significant and Long-term.

To put the impacts of the Proposed Scheme into context, a comparison of the impacts associated with the Proposed Scheme in isolation and the total impacts predicted across all Core Bus Corridors in the cumulative Operational Phase is shown in Table 21.13, impacts are based on significance criteria outlined in Table 7.10 in Chapter 7 (Air Quality).

Table 21.13: Comparison of Predicted Cumulative Impacts During Operational Phase

NO ₂ Impacts (number of modelled receptors)							
Operational Phase	Negligible	Slight Adverse	Moderate Adverse	Substantial Adverse	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Individual Blanchardstown	309	6	-	-	82	22	10
Cumulative All Core Bus Corridors	4,769	203	68	18	532	207	177

It is clear from the above table that the Proposed Scheme generates little change or positive change in air quality in the context of the cumulative situation with all Core Bus Corridors in operation.

21.3.2.2.2 Ecological Assessment

An assessment of the cumulative impact of the Proposed Scheme and the other 11 Core Bus Corridor Schemes on ecological receptors has been undertaken using the approach outlined in Section 7.2.4.3 in Chapter 7 (Air Quality)).

The cumulative impact of the Proposed Scheme and the other 11 Core Bus Corridor Schemes on the nearby ecologically sensitive areas within 200m of roads impacted by the Proposed Scheme, as defined in Section 7.2.4.1 in Chapter 7 (Air Quality)), is outlined in Table 21.14. The annual mean NO_x concentration has been compared to the critical level of 30µg/m³ at each of the designated habitat sites. All sites exceed the critical level for NO_x in both the Do Minimum and the cumulative operational Do Something scenarios, within 200m of the nearest impacted road.

Table 21.14: Significance of Operational Cumulative Impacts at Key Ecological Receptors (NO_x Annual Mean Concentration In 2028)

Annual Mean NO _x in 2028 At Closest Point Within Ecological Site To Road							
Receptor	Receptor Location (ITM)	Do Minimum (µg/m ³)	Distance from road beyond which concentration is below critical level (30µg/m ³) (m)	Do Something (µg/m ³)	Distance from road beyond which concentration is below critical level (30µg/m ³) (m)	Impact (DS – DM) (µg/m ³)	Change as a percentage of critical level (30µg/m ³) (%)
Liffey Valley pNHA (M50 northbound)	707624, 735853	79.3	>200m	78.6	>200m	-0.7	-2%
Liffey Valley pNHA (M50 southbound)	707647, 735872	126.5	>200m	125.7	>200m	-0.8	-3%
Royal Canal pNHA (Binn's Bridge, western side)	715830, 736004	77.5	>200m	84.8	>200m	7.3	24%
Royal Canal pNHA (Binn's Bridge, eastern side)	715846, 735998	87.3	>200m	96.8	>200m	9.5	32%
Royal Canal pNHA (Cross Guns Bridge, western side)	715015, 736301	54.8	>200m	53.1	>200m	-1.6	-5%
Royal Canal pNHA (Cross Guns Bridge, eastern side)	715027, 736292	62.4	>200m	60.7	>200m	-1.7	-6%
Royal Canal pNHA (Longford Bridge, western side)	710930, 737442	38.1	>200m	36.0	>200m	-2.1	-7%
Royal Canal pNHA (Longford Bridge, eastern side)	710936, 737442	38.7	>200m	36.4	>200m	-2.3	-8%
Royal Canal pNHA (M50, western side)	708917, 738188	112.0	>200m	112.1	>200m	0.1	0%
Royal Canal pNHA (M50, eastern side)	708945, 738206	102.3	>200m	102.6	>200m	0.4	1%
Royal Canal pNHA (M50 slip road)	709083, 738203	62.6	>200m	59.7	>200m	-2.9	-10%

Annual Mean NO _x in 2028 At Closest Point Within Ecological Site To Road							
Receptor	Receptor Location (ITM)	Do Minimum (µg/m ³)	Distance from road beyond which concentration is below critical level (30µg/m ³) (m)	Do Something (µg/m ³)	Distance from road beyond which concentration is below critical level (30µg/m ³) (m)	Impact (DS – DM) (µg/m ³)	Change as a percentage of critical level (30µg/m ³) (%)
Royal Canal pNHA (Navan Road N3, western side)	708803, 738183	77.1	>200m	57.9	>200m	-19.1	-64%
Royal Canal pNHA (Navan Road N3, eastern side)	708815, 738184	95.8	>200m	69.1	>200m	-26.7	-89%
Royal Canal pNHA (Navan Road R806, eastern side)	708997, 738189	76.1	>200m	59.8	>200m	-16.4	-55%
Royal Canal pNHA (Navan Road R806, western side)	708985, 738190	70.2	>200m	57.8	>200m	-12.4	-41%
Royal Canal pNHA (Ratoath Road Bridge, western side)	712628, 737394	47.8	>200m	53.0	>200m	5.2	17%
Royal Canal pNHA (Ratoath Road Bridge, eastern side)	712652, 737367	56.0	>200m	63.6	>200m	7.6	25%
Royal Canal pNHA (New Dunsink Lane, western side)	709275, 738155	49.1	>200m	47.0	>200m	-2.0	-7%
Royal Canal pNHA (New Dunsink Lane, eastern side)	709295, 738103	53.4	>200m	50.7	>200m	-2.6	-9%
Royal Canal pNHA (Royal Canal Avenue)	711722, 737477	32.3	>200m	33.3	>200m	1.0	3%
Royal Canal pNHA (Whitworth Road)	715183, 736244	33.7	>200m	35.6	>200m	1.9	6%

Nitrogen deposition levels have been compared to the lower critical loads for the designated habitat sites in Table 21.15. All sites are below the lower critical load for the designated habitat site in both the Do Minimum and the

Do Something cumulative operational scenarios, with the exception of Liffey Valley pNHA (M50 southbound), Royal Canal pNHA (M50) and Royal Canal pNHA (Navan Road N3, eastern side).

Table 21.15: Significance of Cumulative Operational Impacts at Key Ecological Receptors (N Deposition In 2028)

Annual Mean N Deposition In 2028 At Closest Point Within Ecological Site To Road									
Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Minimum (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Do Something (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Change relative to lower critical load (%)	Distance from road beyond which the change is <1% (m)	Change in deposition kgN/ha/yr
Liffey Valley pNHA (M50 northbound)	707624, 735853	5	4.46	0m	4.43	0m	-1%	0m	-0.03
Liffey Valley pNHA (M50 southbound)	707647, 735872	5	6.36	30m	6.33	30m	-1%	0m	-0.03
Royal Canal pNHA (Binn's Bridge, western side)	715830, 736004	5	4.38	0m	4.69	0m	6%	20m	0.32
Royal Canal pNHA (Binn's Bridge, eastern side)	715846, 735998	5	4.80	0m	5.19	10m	8%	20m	0.39
Royal Canal pNHA (Cross Guns Bridge, western side)	715015, 736301	5	3.33	0m	3.25	0m	-2%	0m	-0.08
Royal Canal pNHA (Cross Guns Bridge, eastern side)	715027, 736292	5	3.69	0m	3.62	0m	-2%	0m	-0.08
Royal Canal pNHA (Longford Bridge, western side)	710930, 737442	5	2.50	0m	2.39	0m	-2%	0m	-0.11
Royal Canal pNHA (Longford Bridge, eastern side)	710936, 737442	5	2.53	0m	2.41	0m	-2%	0m	-0.12

Annual Mean N Deposition In 2028 At Closest Point Within Ecological Site To Road									
Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Minimum (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Do Something (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Change relative to lower critical load (%)	Distance from road beyond which the change is <1% (m)	Change in deposition kgN/ha/yr
Royal Canal pNHA (M50, western side)	708917, 738188	5	5.80	20m	5.81	20m	0%	0m	<0.01
Royal Canal pNHA (M50, eastern side)	708945, 738206	5	5.42	10m	5.43	10m	0%	0m	0.01
Royal Canal pNHA (M50 slip road)	709083, 738203	5	3.70	0m	3.56	0m	-3%	0m	-0.14
Royal Canal pNHA (Navan Road N3, western side)	708803, 738183	5	4.36	0m	3.48	0m	-18%	0m	-0.88
Royal Canal pNHA (Navan Road N3, eastern side)	708815, 738184	5	5.16	10m	4.00	0m	-23%	0m	-1.15
Royal Canal pNHA (Navan Road R806, eastern side)	708997, 738189	5	4.32	0m	3.57	0m	-15%	0m	-0.75
Royal Canal pNHA (Navan Road R806, western side)	708985, 738190	5	4.05	0m	3.48	0m	-12%	0m	-0.58
Royal Canal pNHA (Ratoath Road Bridge, western side)	712628, 737394	5	2.99	0m	3.25	0m	5%	30m	0.26
Royal Canal pNHA (Ratoath Road Bridge, eastern side)	712652, 737367	5	3.39	0m	3.75	0m	7%	70m	0.36

Annual Mean N Deposition In 2028 At Closest Point Within Ecological Site To Road									
Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Minimum (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Do Something (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Change relative to lower critical load (%)	Distance from road beyond which the change is <1% (m)	Change in deposition kgN/ha/yr
Royal Canal pNHA (New Dunsink Lane, western side)	709275, 738155	5	3.05	0m	2.95	0m	-2%	0m	-0.10
Royal Canal pNHA (New Dunsink Lane, eastern side)	709295, 738103	5	3.26	0m	3.13	0m	-3%	0m	-0.13
Royal Canal pNHA (Royal Canal Avenue)	711722, 737477	5	2.19	0m	2.25	0m	1%	10m	0.05
Royal Canal pNHA (Whitworth Road)	715183, 736244	5	2.27	0m	2.37	0m	2%	>200m	0.10

In accordance with the EPA Guidelines (EPA 2022), the ecological impacts associated with the cumulative Operational Phase traffic emissions arising from the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes are overall Negative, Slight and Long-term.

21.3.2.2.3 Regional Air Quality Assessment

The potential changes in regional air emissions when comparing the Do Minimum to the cumulative Do Something in the operational phase have been assessed using the ENEVAL tool (methodology set out in in Section 7.2.4.2 in Chapter 7 (Air Quality)).

Pollutant emissions (in tonnes) produced in both the Do Minimum and Do Something cumulative scenarios during the opening year (2028) of the Operational Phase are shown in Table 21.16.

Table 21.16: Cumulative Operational Phase Regional Pollutant Emissions (tonnes) – Opening Year 2028

	Vehicle Class	NO _x (tonnes)	NO ₂ (tonnes)	PM ₁₀ (tonnes)	PM _{2.5} (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
DM	Car	1,318	382	9.2	8.7	79	1,700	0.9	1.2
DS		1,309	380	9.1	8.7	79	1,704	0.9	1.1
Change		-8.7	-2.5	-0.06	-0.06	-0.6	4.2	-0.006	-0.01
% Change		-0.7%	-0.7%	-0.6%	-0.6%	-0.7%	0.2%	-0.7%	-1.1%
DM	Goods	1,675	473	3.8	3.6	46	248	0.4	0.5
DS		1,710	481	3.9	3.7	47	257	0.5	0.6

	Vehicle Class	NO _x (tonnes)	NO ₂ (tonnes)	PM ₁₀ (tonnes)	PM _{2.5} (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
Change		35	8.5	0.08	0.07	0.8	9.0	0.03	0.01
% Change		2.1%	1.8%	2.0%	2.0%	1.7%	3.6%	6.4%	1.8%
DM	Bus	17	1.7	0.2	0.2	0.7	5.4	0	0.006
DS		16	1.6	0.1	0.1	0.6	4.8	0	0.005
Change		-1.2	-0.1	-0.02	-0.02	-0.1	-0.7	0	-0.001
% Change		-6.9%	-6.9%	-12.7%	-12.7%	-13.3%	-12.3%	0%	-12.8%
DM	Total	3,010	857	13	12	127	1,953	1.3	1.7
DS		3,035	863	13	12	127	1,966	1.3	1.7
Change		25	5.9	-0.003	-0.003	0.1	12.5	0.02	-0.004
% Change		0.8%	0.7%	-0.02%	-0.02%	0.1%	0.6%	1.7%	-0.2%

The Proposed Scheme will be overall beneficial with regards to cars and buses, with reductions in emissions of all pollutants modelled. The majority of these reductions result from a predicted modal shift, with decreased car usage (Section 6.4.5.2.2, Chapter 6 (Traffic & Transport)) and a cleaner and more efficiently routed bus fleet. The NTA has committed to replacing its diesel-powered vehicles with plug-in hybrid and fuel cell electric buses by 2028 and zero emission vehicles by 2043, so the reductions in emissions due to the Scheme are due to more efficiently operated routes. Emissions from goods vehicles increase for all pollutants, reflecting the technical challenges in converting particularly the HGV fleet to electric vehicles.

Pollutant emissions (in tonnes) produced in both the Do Minimum and cumulative Do Something scenarios during the design year of the Operational Phase are shown in Table 21.17.

Table 21.17: Cumulative Operational Phase Regional Pollutant Emissions (tonnes) – Design Year 2043

	Vehicle Class	NO _x (tonnes)	NO ₂ (tonnes)	PM ₁₀ (tonnes)	PM _{2.5} (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
DM	Car	508	147	4.3	4.1	37	654	0.4	0.6
DS		507	146	4.3	4.0	37	661	0.4	0.6
Change		-1.2	-0.3	-0.01	-0.01	-0.1	7.0	-0.0005	-0.006
% Change		-0.2%	-0.2%	-0.3%	-0.3%	-0.3%	1.1%	-0.1%	-1.1%
DM	Goods	1081	284	3.3	3.1	34	190	0.3	0.4
DS		1117	291	3.4	3.2	34	197	0.3	0.4
Change		35	7.2	0.08	0.08	0.7	7.2	0.02	0.005
% Change		3.3%	2.5%	2.4%	2.4%	2.0%	3.8%	7.0%	1.3%
DM	Bus	16	1.6	0.2	0.1	0.7	5.5	0	0.006
DS		15	1.5	0.1	0.1	0.6	4.8	0	0.005
Change		-1.0	-0.1	-0.02	-0.02	-0.1	-0.7	0	-0.001
% Change		-6.1%	-6.1%	-12.6%	-12.6%	-13.2%	-12.2%	0%	-12.8%
DM	Total	1606	432	7.7	7.3	72	850	0.6	0.95
DS		1639	439	7.8	7.4	72	863	0.6	0.95
Change		33	6.8	0.05	0.05	0.5	13.5	0.02	-0.002

	Vehicle Class	NO _x (tonnes)	NO ₂ (tonnes)	PM ₁₀ (tonnes)	PM _{2.5} (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
% Change		2.1%	1.6%	0.6%	0.6%	0.6%	1.6%	3.0%	-0.2%

In accordance with the EPA Guidelines (EPA 2022) and considering that the change in concentrations is within the traffic model and ENEVAL tool margin of variability, the regional impacts associated with the cumulative Operational Phase traffic emissions arising from the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes are considered overall Neutral and Long-term. Emissions from goods vehicles increase for all pollutants, reflecting the technical challenges in converting particularly the HGV fleet to electric vehicles.

21.3.2.2.4 Summary of Predicted Cumulative Operational Phase Impacts

In 2028, all receptors are predicted to be in compliance with the ambient air quality standards for the cumulative operational Do Something (and Do Minimum) scenario. There are no substantial or moderate adverse effects expected as a result of the cumulative Operational Phase of the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes. As outlined earlier, the traffic data used in the cumulative assessment for the cumulative Do Minimum and Do Something for future years represents other potential projects.

Overall therefore, it is considered that the residual effects during the cumulative Operational Phase of the Proposed Scheme and the other 11 Core Bus Corridor schemes are Neutral, and short-term whilst meeting the scheme objectives set out in Chapter 1 (Introduction). No additional significant negative impacts are predicted over and above the standalone assessment for the Proposed Scheme, refer to Table 21.18.

Table 21.18: Summary of Predicted Cumulative Operational Phase Air Quality Impacts

Assessment Topic	Predicted Impact – Cumulative Operational
Road traffic impacts on local human receptors	Neutral, Not significant, Long-term
Road traffic impacts on local ecological receptors	Negative, Slight, Long-term
Regional air quality	Neutral, Long-term

21.3.2.3 Climate

The Climate Action and Low Carbon Development Act, 2021, as amended, commits to a reduction in greenhouse gas emissions such that the total amount of annual greenhouse gas emissions in the year ending on 31 December 2030 is 51 per cent less than the annual greenhouse gas emissions reported for the year ending on 31 December 2018. Policy changes will include the acceleration of the electrification of the transport system, including electric bikes, electric vehicles and electric public transport, alongside a ban on new registrations of petrol and diesel cars from 2030. In addition, there is a policy to ensure an unprecedented modal shift in all areas by a reorientation of investment to walking, cycling and public transport.

In 2028, the Do Minimum and DoSomething scenarios assumes a number of transport schemes to be in the traffic model including the roll out of the DART+ Programme, Luas Green Line capacity enhancement and the Greater Dublin Area Cycle Network Plan implementation (excluding BusConnects Core Bus Corridor elements) as well as general traffic growth. The 2043 Do Minimum and Do Something scenarios assume the full implementation of the GDA Strategy schemes and so assumes that proposed major transport schemes such as MetroLink, DART+ Tunnel, Luas line extensions to Lucan, Finglas and Bray are all fully operational as well as general traffic growth.

The climate impact assessment of road traffic emissions from the operational phase of the Proposed Scheme cumulatively with the other 11 Core Bus Corridors schemes has been carried out according to methodology outlined in Section 8.2.4.2 in Chapter 8 (Climate). The core assessment scenario outlined below has considered a reasonable worst-case operational scenario for assessment purposes. In addition to the core scenario, an alternative scenario has been analysed in order to demonstrate the potential for further carbon reduction should the alternative scenario, in terms of higher bus frequencies materialise. The assessment has been carried out according to best practice and guidelines relating to climate and greenhouse gas (GHG) emissions.

Given the current absence of specific sectoral carbon budgets in Ireland, for the purposes of this assessment any changes in net GHG emissions (either positive or negative) due to the Proposed Scheme will be significant. This viewpoint aligns with Institute of Environmental Management and Assessment (IEMA) guidance note on Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA 2017) which advises that all carbon emissions contribute to climate change and in the absence of a defined threshold (e.g., national sector-specific targets and trajectories), any increase (or decrease) in carbon emissions may be considered as significant. The EPA Guidelines (EPA 2022) describe the quality of effects in terms of positive, neutral and negative where neutral is defined as effects that are imperceptible, within normal bounds of variation. Taking into account both the IEMA and EPA guidance approach, this chapter has assessed impacts as being either neutral or positively / negatively significant with neutral defined as a change in GHG emissions which is less than $\pm 0.5\%$ of the baseline emission level.

The direct and indirect impacts have been considered with reference to the following study area extents:

- **Direct Study Area** – The Proposed Scheme cumulatively with the other 11 Core Bus Corridors (i.e. the transport network along the Proposed Scheme); and
- **Indirect Study Area** – This is the area of influence that the Proposed Scheme has cumulatively with the other 11 Core Bus Corridors in terms of changing traffic volumes above a defined threshold with reference to TII’s Traffic and Transport Assessment Guidelines (May 2014).

21.3.2.3.1 Direct Cumulative Operational Phase Carbon Emissions

The BusConnects Core Bus Corridors will provide an attractive alternative to private car travel, encouraging more travel by more sustainable modes. Supported by the Proposed Scheme and other projects planned under the GDA Transport Strategy, a greater share of travel demand will be by sustainable modes (public transport, walking and cycling). The Proposed Scheme in combination with the other 11 Core Bus Corridors will result in reductions in capacity for general traffic along its route with a rebalancing of this capacity towards sustainable modes. The potential changes in GHG emissions due to the direct Operational Phase traffic impacts of the Proposed Scheme cumulatively with the other 11 Core Bus Corridors have been assessed using the Environmental Appraisal Module, which is based on the ENEVAL software (refer to Chapter 8, Climate for further information).

A comparison between Do Minimum and cumulative Do Something GHG emissions for Total Car and Bus in the Opening Year of 2028 predicts a decrease of 29.5 kt in CO_{2eq} cumulatively along the routes of the Core Bus Corridors, refer to Table 21.19. This is equivalent to a 27% decrease in CO_{2eq} relative to the Opening Year Do Minimum estimates.

Table 21.19: Direct Cumulative Operational Phase CO_{2eq} emissions – Opening Year 2028

Scenario	Vehicle Class	CO _{2eq} (Kt CO _{2eq})
DM	Car	104
DS		77
Change		-27
% Change		-26%
DM	Goods	67
DS		55
Change		-12
% Change		-17%
DM	Bus	5.2
DS		2.5
Change		-2.7
% Change		-51%
DM	Total	176.2

Scenario	Vehicle Class	CO _{2eq} (Kt CO _{2eq})
DS		134.9
Change		-41.3
% Change		-23%
DM	Total (Car & Bus)	109
DS		79.5
Change		-29.5
% Change		-27%

A comparison between the direct Do Minimum and Do Something operational cumulative GHG emissions in the Design Year of 2043 predicts a decrease of 12kt in CO_{2eq}, refer to Table 21.20. This is equivalent to a 25% decrease in CO_{2eq} relative to the Design Year Do Minimum estimates. This lower reduction compared to the 2028 projections is due to decreases in carbon emissions from all vehicles in the 2043 scenario.

Table 21.20: Direct Cumulative Operational Phase CO_{2eq} emissions – Design Year 2043

	Vehicle Class	CO _{2eq} (Kt CO _{2eq})
DM	Car	47.5
DS		35.5
Change		-12.
% Change		-25.%
DM	Goods	59.4
DS		50.3
Change		-9.1
% Change		-15%
DM	Bus	0.0
DS		0.0
Change		0.0
% Change		0.0
DM	Total	107
DS		85.8
Change		-21.2
% Change		-19.8%
DM	Total (Car & Bus)	47.5
DS		35.5
Change		-12.0
% Change		-25%

21.3.2.3.2 Indirect Cumulative Operational Phase Carbon Emissions

The Core Bus Corridor Infrastructure Works aims to provide an attractive alternative to the private car and promote a modal shift to public transport, walking and cycling. It is, however, recognised that there will be an overall reduction in operational capacity for general traffic along the direct study area given the proposed changes to the road layout and the rebalancing of priority to walking, cycling and bus. This reduction in operational capacity for general traffic along the Proposed Scheme and the other 11 Core Bus Corridors will likely create some level of trip redistribution onto the surrounding road network, in the absence of wider regional wide demand management measures (outside the scope of the Core Bus Corridor Infrastructure Works).

The potential changes in GHG emissions due to the indirect Operational Phase traffic impacts of the Proposed Scheme cumulatively with the other 11 Core Bus Corridors have been assessed using the Environmental Appraisal Module, which is based on the ENEVAL software.

A comparison between the indirect cumulative Do Something and Do Minimum CO_{2eq} emissions in the Opening Year of 2028 predicts an overall increase of 22.7 kt in CO_{2eq} due to the indirect impact of the Proposed Scheme in parallel with the other 11 Core Bus Corridors, refer to Table 21.21. This is equivalent to a 4.8% increase in CO_{2eq} relative to the Opening Year Do Minimum estimates.

Table 21.21: Indirect Cumulative Operational Phase CO_{2eq} emissions – Opening Year 2028

Scenario	Vehicle Class	CO _{2eq} (Kt CO _{2eq})
DM	Car	459
DS		482
Change		23
% Change		5%
DM	Goods	425.5
DS		443.1
Change		17.6
% Change		4.1%
DM	Bus	15.4
DS		15.2
Change		-0.2
% Change		-1.5%
DM	Total	900.3
DS		940.6
Change		40.3
% Change		4.5%
DM	Total (Car & Bus)	474.8
DS		497.5
Change		22.7
% Change		4.8%

A comparison between the cumulative indirect Do Something and Do Minimum GHG emissions in the Design Year of 2043 predicts an overall increase of 11.4 kt in CO_{2eq} refer to Table 21.22. This is equivalent to a 5.3% increase in CO_{2eq} relative to the Design Year Do Minimum estimates.

Table 21.22: Indirect Cumulative Operational Phase CO_{2eq} emissions – Design Year 2043

	Vehicle Class	CO _{2eq} (Kt CO _{2eq})
DM	Car	214.7
DS		226.1
Change		11.4
% Change		5.3%
DM	Goods	393.2
DS		407.2
Change		14.0
% Change		3.6%

	Vehicle Class	CO _{2eq} (Kt CO _{2eq})
DM	Bus	0
DS		0
Change		0
% Change		0%
DM	Total	607.9
DS		633.3
Change		25.4
% Change		4.2%
DM	Total (Car & Bus)	214.7
DS		226.1
Change		11.4
% Change		5.3%

21.3.2.3.3 Overall Cumulative Operational Phase Carbon Emissions

The potential changes in GHG emissions due to the combined direct and indirect Operational Phase traffic impacts of the Proposed Scheme cumulatively with the other 11 Core Bus Corridors have been assessed.

A comparison between the cumulative operational DoSomething and Do Minimum GHG emissions in the Opening Year of 2028 in parallel with the other 11 Core Bus Corridors predicts a decrease of 6.9 kt in CO_{2eq}, refer to Table 21.23. This is equivalent to a 1.2% decrease in CO_{2eq} relative to the Opening Year Do Minimum estimates. To put these figures in context, approximately 12,000 Kt CO₂ equivalent were emitted in Ireland by the Transport sector in 2019 (EPA 2021) and approximately 9,000 Kt CO₂ equivalent emissions are projected in 2028.

The Core Bus Corridor schemes will also support the delivery of government strategies outlined in the Climate Action Plan (CAP) 2019 and the 2021 Climate Act by enabling sustainable mobility and delivering a sustainable transport system. Its aim is to provide enhanced walking, cycling and bus infrastructure on key access corridors in the Dublin region. This will subsequently enable and deliver integrated sustainable transport movement along these corridors. BusConnects provides connectivity and integration with other public transport services leading to more people availing of public transport. The CAP outlines measures to deliver decarbonisation targets for transport. The delivery of the Proposed Scheme, the Bus Connects programme and other major sustainable-mobility projects listed in the CAP are critical to the achievement of climate reduction targets.

Table 21.23: Combined Direct and Indirect Cumulative Operational Phase CO_{2eq} emissions – Opening Year 2028

Scenario	Vehicle Class	CO _{2eq} (Kt CO _{2eq})
DM	Car	563.4
DS		559.4
Change		-4
% Change		-0.7%
DM	Goods	492.5
DS		498.4
Change		5.9
% Change		1.2%
DM	Bus	20.6
DS		17.7
Change		-2.9

Scenario	Vehicle Class	CO _{2eq} (Kt CO _{2eq})
% Change		-14.0%
DM	Total	1,076.5
DS		1075.5
Change		-1.00
% Change		-0.1%
DM	Total (Car & Bus)	583.9
DS		577.1
Change		-6.9
% Change		-1.2%

A comparison between the cumulative operational Do Something and Do Minimum GHG emissions in the Design Year of 2043 cumulatively with the other 11 Core Bus Corridors predicts a decrease of 0.6 kt in CO_{2eq}, refer to Table 21.24, This is equivalent to a 0.24% decrease in CO_{2eq} relative to the Design Year Do Minimum estimates.

Both the Do Minimum and Do Something benefit from predicted increases in electric car usage and further electrification of the bus fleet. Light and heavy goods vehicles are estimated to contribute the majority of CO₂ emissions in 2043, reflecting the technical challenges in converting particularly the heavy goods fleet to electric vehicles.

Table 21.24: Combined Direct and Indirect Cumulative Operational Phase CO_{2eq} emissions – Design Year 2043

Scenario	Vehicle Class	CO _{2eq} (Kt CO _{2eq})
DM	Car	262
DS		261.4
Change		-0.6
% Change		-0.2%
DM	Goods	452.6
DS		457.5
Change		4.9
% Change		1.1%
DM	Bus	0
DS		0
Change		0
% Change		0%
DM	Total	714.8
DS		719.1
Change		4.3
% Change		0.6%
DM	Total (Car & Bus)	262.2
DS		261.6
Change		-0.6
% Change		-0.24%

Using the EPA definitions of significance (EPA 2022), the impact of the Proposed Scheme cumulatively with the other 11 Core Bus Corridors is predicted to be positive and significant in 2028 and neutral in 2043. Thus, the

predicted impact to climate during the Operational Phase of the Proposed Scheme cumulatively with the other 11 Core Bus Corridors is initially positive and significant.

For context, the reduction in GHG emissions in the cumulative assessment for 2028, is equivalent to the removal of approximately 23,000 car trips per weekday from the road network. This represents a significant contribution towards the national target of 500,000 additional trips by walking, cycling and public transport per day by 2030 as outlined as a target in the 2021 Climate Action Plan (CAP) (DCCAE 2021).

Overall, due to the Operational Phase of the Proposed Scheme cumulatively with the eleven other Core Bus Corridor Schemes will lead to a decrease in GHG emissions associated with the Proposed Scheme cumulatively with the other 11 Core Bus Corridors.

In terms of policy measures, CO₂ emissions for the average new car fleet will reduce from 130g/km (grams per kilometre) over the period 2015 to 2019 to 95g/km in 2021 (European Commission 2020). In addition, from 2025 the average emissions from new car fleet are required to reduce by 15% relative to 2021 levels and, by 2030, the average emissions from new car fleet are required to reduce by 37.5% relative to 2021 levels as outlined in Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO₂ emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011.

In relation to decarbonising the transport sector, the CAP has set a target that all new cars and vans sold in Ireland will be zero carbon emissions or zero emission capable by 2030. Targets are also included for public transport buses and trains. The realisation of these targets will ensure that GHGs from transport will decrease significantly in line with the projections outlined in the CAP.

The other source of GHG emissions during the operational phase is maintenance. Maintenance GHG emissions of the Proposed Scheme cumulatively with other 11 Core Bus Corridors is predicted to be 5,665 tonnes of CO_{2eq} over the 60 year operational span. It is expected that GHG emissions from the 12 Bus Connects Core Bus Corridors and other GDA Strategy schemes will primarily arise from the use of bitumen containing material use to maintain road pavement quality. The impact on GHG emissions due to the embodied carbon associated with the maintenance phase of the Operational Phase of the Proposed Scheme will be negative, permanent and significant.

Table 21.25 summarises the predicted impacts associated with the Proposed Scheme cumulatively with the operation of all 12 Core Bus Corridor Schemes. The predicted impact to climate due to cumulative operation of all 12 Core Bus Corridor Schemes is predicted to be positive and significant in 2028 and neutral in 2043.

Table 21.25: Summary of Predicted Operational Phase Impacts Due to Proposed Cumulative Operational Scheme

Assessment Topic	Predicted Impact – Cumulative Construction
Maintenance	Negative, Significant and Permanent
Operational Traffic	Positive, Significant in 2028 and Neutral in 2043.

The CBC Infrastructure Works will also support the delivery of government strategies outlined in the CAP (DCCAE 2019) and the 2021 Climate Act by enabling sustainable mobility and delivering a sustainable transport system. Its aim is to provide enhanced walking, cycling and bus infrastructure on key access corridors in the Dublin Region. This will subsequently enable and deliver integrated sustainable transport movement along these corridors. The CBC Infrastructure Works will provide connectivity and integration with other public transport services leading to more people availing of public transport, helping to further reduce GHG emissions.

21.3.2.3.4 Climate Sensitivity Analysis and Other Considerations

21.3.2.3.4.1 Introduction

As outlined previously, the Core Bus Corridor Infrastructure Works aims to provide an attractive alternative to the private car and promote a modal shift to public transport, walking and cycling. It is, however, recognised that there

will be an overall reduction in operational capacity for general traffic along the direct study area of the Core Bus Corridor schemes given the proposed changes to the road layout and the rebalancing of priority to walking, cycling and bus. This reduction in operational capacity for general traffic along the Core Bus Corridor schemes will likely create some level of trip redistribution onto the surrounding road network, in the absence of wider regional wide demand management measures (outside the scope of the CBC Infrastructure Works).

The Do Minimum and Do Something scenarios are based on the assumption that travel behaviour will remain broadly consistent over time and that car demand, used for this assessment, represents a likely worst-case scenario. It is possible that societal trends in the medium to long term may reduce car demand further due to the ongoing changes to travel behaviours and further shifts towards sustainable travel, flexibility in working arrangements brought on following COVID-19 restrictions, and delayed car ownership trends that are emerging. Due to the uncertainties around how travel behaviours may change in the future, it was considered prudent to assess a worst-case scenario based on current trends for the core scenario.

21.3.2.3.4.2 Increased Bus Frequency Resilience Scenario

To fully understand the benefits that the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes could provide in relation to carbon reduction, further sensitivity analysis has been undertaken to demonstrate the potential the Core Bus Corridor schemes have in supporting further reductions in carbon above those levels presented in the worst-case assessment scenarios above. An increased bus frequency resilience scenario was undertaken. Further to this sensitivity test, consideration has also been given to the potential enabling effects that the CBC Infrastructure Works will have in supporting a significant increase in cycle mode share and to support traffic demand management measures.

As described in Chapter 6, for the purposes of this EIAR and the transport modelling undertaken in support of the EIAR, no increase in bus service frequency beyond that planned under the current Bus Connects Network redesign proposals was assessed. The bus frequencies used in the modelling are based on the proposed service rollout as part of the BusConnects Network Redesign and are the same in both the Do Minimum and Do Something scenarios. This rollout is currently underway. The rationale for undertaking this approach was that the planning consent being sought and which this EIAR supports is solely for the infrastructural improvements associated with providing bus priority along the Proposed Scheme.

This analysis, however, is highly conservative as the bus priority infrastructure improvements and indeed the level of protection it will provide to bus journey time consistency and reliability will provide a significant level of resilience for bus services that will use the Core Bus Corridor Schemes from implementation into the future. This resilience will allow the service pattern and frequency of bus services to be increased into the future to accommodate additional demand without having a significant negative impact on bus journey time reliability or the operation of cycle and pedestrian facilities. In order to assess this resilience and the potential impacts of this resilience on carbon emissions, an additional analysis has been undertaken, which is detailed in Chapter 6 (Traffic & Transport).

This assessment shows that the Proposed Scheme can accommodate higher levels of bus frequency whilst maintaining journey time reductions and reliability. A key benefit of the provision of a resilient BusConnects Service network, one which can provide reliable and consistent journey times, is that it has potential to cater for further significant transfer from private car travel to more sustainable and environmentally friendly travel via public transport.

Following on from the analysis in Chapter 6 (Traffic & Transport), an additional climate scenario assessment was undertaken to estimate the potential carbon emission savings that could be achieved if the additional residual capacity, facilitated by the Core Bus Corridor Schemes, was satisfied by a shift from car to bus. To undertake this assessment a carbon calculator was developed to account for the potential per person carbon emissions savings for each car removed from the network and absorbed by the additional residual capacity provided by increased bus frequency. The calculator includes the following assumptions:

- Bus design capacity of 90 people;
- Additional bus frequency of 10 buses per hour per BusConnects Spine route;
- Average emissions per car – 120 / 55 g CO₂ / km (Source: ENEVAL software (2028 / 2043));

- Average emissions per bus (average across fleet) – 422 / 0 g CO₂ / km (Source: ENEVAL software (2028 / 2043));
- Annualisation factor – 251 (i.e., weekdays only (excluding bank holidays));
- Average trip length of 9.9km (Source: NTA Regional Modelling System).

To account for the uncertainty associated with future carbon policies (e.g., beyond the current planned increase in the carbon tax to €100 per tonne by 2030) that will be imposed by the Government aimed at reducing carbon emissions, the assessment examined the impact of a notional 100%, 75% and 50% transfer from car-based travel to public transport with the uplifted bus service frequency along the Proposed Scheme corridor in place. Table 21.26 and Table 21.27 outlines the results of the sensitivity analysis.

Table 21.26: Combined Direct and Indirect Operational Phase CO₂ Emissions with Additional Service Frequency – Opening Year (2028)

Additional Service Frequency Scenario	Vehicle Class	Core Scenario CO ₂ (kt CO ₂)	100% Uptake of residual capacity from Car	75% Uptake of residual capacity from Car	50% Uptake of residual capacity from Car
			CO ₂ (kt CO ₂)	CO ₂ (kt CO ₂)	CO ₂ (kt CO ₂)
DM	Car	563.4	562.9	562.9	562.9
DS		559.4	531.4	536	540.7
Change		-4	- 31.5	- 26.9	- 22.2
% Change		-0.7%	-5.6%	-4.8%	-3.9%

Table 21.27: Combined Direct and Indirect Operational Phase CO₂ Emissions with Additional Service Frequency – Design Year (2043)

Additional Service Frequency Scenario	Vehicle Class	Core Scenario CO ₂ (kt CO ₂)	100% Uptake of residual capacity from Car	75% Uptake of residual capacity from Car	50% Uptake of residual capacity from Car
			CO ₂ (kt CO ₂)	CO ₂ (kt CO ₂)	CO ₂ (kt CO ₂)
DM	Car	262	262	262	262
DS		261.4	248.1	250.3	252.5
Change		- 0.6	- 13.9	- 11.7	- 9.5
% Change		-0.2%	-5.3%	-4.5%	-3.6%

The analysis shows that should a portion of the drivers currently modelled as redistributed general traffic make the decision to make their journeys by public transport, the impact of this shift in transport mode would result in a further significant reduction in GHG emissions compared to the core scenario. The core scenario assumes no additional frequency beyond that planned under the current Bus Connects Network redesign proposals. Even if an uptake of only 50% of the residual capacity was achieved by a transfer from car, a 3.9% and 3.6% reduction in CO₂ emissions across the study area could potentially be achieved in 2028 and 2043 respectively.

For context, the 31.51kt and 13.91 kt reduction in CO₂ emissions in 2028 and 2043 respectively, achieved by a 100% uptake of residual capacity, is equivalent to the removal of approximately 105,500 and 102,200 car trips per weekday from the road network in 2028 and 2043. With a 50% uptake of residual capacity, the equivalent reduction in weekday car trips would be 74,400 and 69,700 in 2028 and 2043 respectively. This represents a significant contribution towards the national target of 500,000 additional trips by walking, cycling and public transport per day by 2030 as outlined as a target in the 2021 Climate Action Plan (CAP) (DCCAE 2021).

21.3.2.3.4.3 Future Growth in Cycling

The Core Bus Corridor schemes will facilitate a step change in the level of segregated cycling provision in comparison with existing conditions along the entire length of the corridors. The representation of improvements to cycling infrastructure in the transport models follows a standard approach and are appropriate for the strategic nature of the model. It is applied by way of an increase in cycling speed on the network where the improvements have been made, as well as new connectivity by way of new links as part of the CBC Infrastructure Works. Modelling cycling infrastructure improvements using speeds is a standard approach that means an increase in cycling mode share can be obtained through a reduction in the modelled cost of a journey by bicycle relative to other modes. This has been applied as part of the modelling to represent improvements with a cycling mode share of approximately 6% achieved. The transport modelling undertaken, is therefore conservative in terms of the predicted cycling mode share. This has the effect that predicted traffic levels are on the higher and conservative side in relation to a potential future receiving environment. This is appropriate for EIAR purposes as a reasonable worst-case has been assessed in terms of traffic levels on the road network.

It must be noted, however, that the Core Bus Corridor schemes have been designed to cater for much higher levels of cycling uptake and the significant segregation and safety improvements to walking and cycling infrastructure. This will provide the opportunity for a significant increase in the movement of people travelling sustainably along the corridor and will therefore cater for higher levels of future population and employment growth and support higher cycling mode share levels, which would otherwise not be achieved in the absence of the schemes. The background environment changes with regards to cycling segregation and safety improvements will encourage more people to cycle in greater numbers. The Core Bus Corridor schemes provide the capacity to facilitate a greater uptake in cycling than what has been predicted in the core assessment and facilitates the opportunity for further reductions in CO_{2eq} emissions, beyond those reported in the above assessment.

21.3.2.3.4.4 Demand Management

The GDA Transport Strategy, of which the Proposed Scheme is a key element of, aims to provide for the efficient, effective and sustainable movement of people and goods and to accommodate future travel growth in a managed and balanced way. Increased public transport provision, coupled with enhanced cycling and walking facilities in the urban areas, will enable a transition to more sustainable travel modes for many people in addition to providing the means to cater for much of the increased travel demand. However, without complementary demand management measures the full benefits of the Strategy will not be achieved.

The Core Bus Corridor schemes will be an enabler to allow for further reductions in car mode share with corresponding transfer to public transport, walking and cycling modes. Sustainable modes capacity is significantly enhanced by the Core Bus Corridor schemes which in turn will support demand management measures which could be applied to meet climate emission targets. This growth in sustainable mode share cannot be accommodated in the absence of the Proposed Scheme and the other Core Bus Corridor schemes. A greater increase in sustainable mode share can be accommodated by the Core Bus Corridor schemes which will in turn lead to further reductions in CO_{2eq} emissions, beyond those reported in the above assessment.

21.3.2.3.5 Climate Impact Summary

The Proposed Scheme in combination with the other Core Bus Corridor schemes achieves the project objectives in supporting the delivery of an efficient, low carbon and climate resilient public transport service, which supports the achievement of Ireland's emission reduction targets. The Proposed Scheme has the potential to reduce GHG emissions equivalent to the removal of approximately 105,500 and 102,200 car trips per weekday from the road network in 2028 and 2043 respectively. This represents a significant contribution towards the national target of 500,000 additional trips by walking, cycling and public transport per day by 2030 as outlined as a target in the 2021 Climate Action Plan (CAP) (DCCA 2021). It is concluded that, cumulatively, the Core Bus Corridor Infrastructure Works will make a significant contribution to carbon reduction.

21.3.2.4 Noise and Vibration

Since the Operational Phase assessment for Noise and Vibration takes account of the traffic model outputs (which incorporates future traffic growth from projected development including GDA Strategy development), the cumulative operational impacts, as assessed in Chapter 9 (Noise & Vibration), represent a cumulative scenario with the consideration of future development.

The impact assessment of cumulative road traffic noise levels associated with the operational phase of the Proposed Scheme in combination with the other 11 Core Bus Corridor Schemes has been carried out according to methodology outlined in Section 9.4.5.1 in Chapter 9 (Noise & Vibration). The modelled results were compared to those predicted for the standalone Proposed Scheme, to determine if any additional impacts are expected.

The traffic data used in the both the standalone Proposed Scheme and cumulative assessment for future years also considers projects and transport schemes proposed for the Dublin area which may have an effect on traffic volumes.

The potential changes in traffic noise due to the cumulative operational phase traffic impacts have been assessed in this section and compared with those assessed for the standalone Proposed Scheme. The assessment has concluded that during the year of opening, 2028 there will be more moderate term impacts experienced during the short to medium term when compared to the Proposed Scheme in isolation. During the design year, 2043, traffic volumes are, for the majority, predicted to be lower than the opening year (2028) along the surrounding road network which result in lower calculated traffic noise impacts.

The identified roads with predicted noise impacts of moderate or greater compared to the standalone Proposed Scheme are summarised in Table 21.28 for the opening year 2028 and the design year 2043.

Table 21.28: Summary of Predicted Operational Traffic Noise Impacts Due to Standalone Proposed Scheme and Cumulative Operational- Opening and Design Years

Road	Predicted Impact – Standalone Proposed Scheme	Predicted Impact – Cumulative Operational - 2028	Predicted Impact – Cumulative Operational - 2043
Leix Road	Indirect, Negative, Not Significant - Slight, Short to Medium Term	Indirect, Negative, Slight - Moderate, Short to Medium Term	Indirect, Negative, Imperceptible, Long Term
Erris Road	Indirect, Negative, Not Significant - Slight, Short to Medium Term	Indirect, Negative, Slight - Moderate, Short to Medium Term	Indirect, Negative, Imperceptible, Long Term
Swilly Road	Indirect, Negative, Slight - Moderate, Short to Medium Term	Indirect, Negative, Moderate, Short to Medium Term	Indirect, Negative, Slight - Moderate, Long Term
Nephin road	Indirect, Negative, Slight - Moderate, Short to Medium Term	Indirect, Negative, Moderate, Short to Medium Term	Indirect, Negative, Slight, Long Term
Annaly Road	Indirect, Negative, Not Significant - Slight, Short to Medium Term	Indirect, Negative, Slight - Moderate, Short to Medium Term	Indirect, Negative, Imperceptible, Long Term
Back Lane	Indirect, Neutral, Imperceptible, Short to Medium Term	Indirect, Negative, Moderate, Short to Medium Term	Indirect, Negative, Not Significant, Long Term
John Dillon Street	Indirect, Neutral, Imperceptible, Short to Medium Term	Indirect, Negative, Moderate, Short to Medium Term	Indirect, Negative, Not Significant, Long Term
Dean Swift Square	Indirect, Neutral, Imperceptible, Short to Medium Term	Indirect, Negative, Moderate, Short to Medium Term	Indirect, Negative, Not Significant, Long Term
John Dillon Street	Indirect, Neutral, Imperceptible, Short to Medium Term	Indirect, Negative, Moderate, Short to Medium Term	Indirect, Negative, Not Significant, Long Term
Gray Street	Indirect, Neutral, Imperceptible, Short to Medium Term	Indirect, Negative, Moderate, Short to Medium Term	Indirect, Negative, Not Significant, Long Term
Fassaugh Ave	Indirect, Negative, Slight, Short to Medium Term	Indirect, Negative, Moderate, Short to Medium Term	Indirect, Negative, Not Significant, Long Term

During the year of opening, five of the roads assessed as part of the standalone are calculated to experience marginally higher noise impacts when assessed against the cumulative scenario of all 12 Core Bus Corridor Schemes in place. The impacts are increased from Indirect, Negative, Slight - Moderate, Short to Medium Term to Indirect, Negative, Slight to Moderate or Moderate, Short to Medium Term along these roads. There are six additional roads which are determined to have an indirect, negative, moderate, short to medium term noise impact when the compared to the standalone Proposed Scheme in accordance with the methodology outlined in Section

9.4.5.1 in Chapter 9 (Noise & Vibration). The impacts are calculated at roads outside of the Proposed Scheme due to traffic redistribution.

During the future design year, 2043, the predicted cumulative noise impacts are lower than the opening year along the same roads due to the lower magnitude of impact assigned to changes in road traffic noise over time and lower traffic volumes across the network predicted into the future. The combined effect results in a similar or lower magnitude of impact when compared to the standalone Proposed Scheme.

Section 9.4.4.1.1.6 of Chapter 9 (Noise & Vibration) notes that traffic noise levels along the surrounding road network, will be lower than those assumed for the impact assessment due to lower noise emissions from the future fleet of electric vehicles along urban and suburban roads with lower speeds, particularly those along residential streets and roads. In reality, the impacts determined and presented for both years will be further reduced when the lower noise emissions associated with electric fleet along low speed roads are factored in.

21.3.2.5 Population

The Population assessment considered potential cumulative effects on land-take, amenity and accessibility during operation. No potential likely significant cumulative impacts on the receptors assessed in Chapter 10 (Population) were identified during operation.

21.3.2.6 Human Health

The Human Health assessment has identified potentially beneficial cumulative effects on human health from the following developments during the Operational Phase.

- DCC planning reference 2038/17 and ABP309657: Construction of new district shopping centre development and 175 no. residential units (3 no. houses, 29 no. Build to Rent apartments and 584 no. student bedspaces) at Park Shopping Centre and numbers 42 – 45 Prussia Street;
- Major project (id MP08) - DART+ Programme West;
- Major project (id MP12) - DART+ Programme South West;
- Major project (id MP15) - DART+ Tunnel Element (Kildare Line to Northern Line);
- Major project (id MP32) – MetroLink;
- Major project (id MP34) - Greater Dublin Area Cycle Network Plan;
- Major Project (id MP37) – Snugborough Interchange;
- Clongriffin to City Centre Core Bus Corridor Scheme;
- Swords to City Centre Core Bus Corridor Scheme;
- Ballymun/ Finglas to City Centre Core Bus Corridor Scheme;
- Blanchardstown to City Centre Core Bus Corridor Scheme;
- Lucan to City Centre Core Bus Corridor Scheme;
- Liffey Valley to City Centre Core Bus Corridor Scheme;
- Tallaght/Clondalkin to City Centre Core Bus Corridor Scheme;
- Templeogue /Rathfarnham to City Centre Core Bus Corridor Scheme;
- Kimmage to City Centre Core Bus Corridor Scheme;
- Bray to City Centre Core Bus Corridor Scheme; and
- Ringsend to City Centre Core Bus Corridor Scheme.

The Human Health assessment predicted that both the Proposed Scheme and the proposed new district shopping centre and strategic housing development (planning reference 2038/17 and ABP309657) at Park Shopping Centre, Prussia Street, would result in an improvement to the public realm which may encourage more social interaction and improve wellbeing. However the impact is not expected to be significant and is judged to be Slight, Positive, Medium term.

The Human Health assessment judged that there were likely significant cumulative effects from the above transport projects, even though eight of the Core Bus Corridor schemes will be outside the zone of influence for

the Proposed Scheme when considered in isolation. This is because cumulatively the Core Bus Corridor schemes would have the effect of linking all the schemes' Human Health study areas, thereby affecting a much greater population. Assuming all 12 Core Bus Corridor schemes would become operational, as well as the DART+, MetroLink and Cycle Network, it is considered likely that this would encourage greater uptake of sustainable transport options among the population surrounding the Proposed Scheme by offering a choice of efficient public transport journeys and active travel opportunities. This would be beneficial to health by improving wellbeing from greater journey reliability, access to services (including health services) for those without a car and supporting greater physical activity as a part of an active travel journey or overall journey via public transport. The implementation of the above projects will facilitate a step change in modal shift, reducing reliance on car travel. In the medium to long term this should help environmental improvement such as reduced air pollutants, improved public realm and better use of social space. Due to the substantial size of overall population with the opportunity to benefit from the proposals, the effect is assessed as Positive, Significant to Very Significant and Long-term for health.

21.3.2.7 Biodiversity

Most residual biodiversity impacts of the Proposed Scheme relate to the Construction Phase, there is limited potential for likely significant cumulative effects on biodiversity during the Operation Phase.

Birds

During operation, the predicted disturbance from the Proposed Scheme is likely to be limited to the immediate vicinity. Given the location of the Proposed Scheme (i.e. adjacent to the existing roadway) bird species including Kingfisher present are likely to already be habituated to noise from traffic therefore may be resilient to noise during the construction phase. Also, considering the majority of bird species recorded were common birds associated with suburban habitats, future development is not likely to result in a significant effect on biodiversity, cumulatively with the Proposed Scheme, as a consequence of disturbance or habitat loss with regard bird species.

Additionally, potential cumulative impacts will be controlled by the assessment of individual planning applications which must consider the effects on protected species such as birds as part of their appraisal by the competent authority, having regard to the protective environmental policies outlines in the Fingal Development Plan 2017-2023 and the Dublin City Development Plan 2016-2022.

Otter

During operation, the predicted disturbance from the Proposed Scheme is likely to be limited to the immediate vicinity. Given the location of the Proposed Scheme (i.e. adjacent to the existing roadway) otter present are likely to already be habituated to noise from traffic therefore may be resilient to noise during the construction phase. In light of this, future development is not likely to result in a significant effect on biodiversity, cumulatively with the Proposed Scheme, as a consequence of disturbance with regard terrestrial mammal species.

Additionally, potential cumulative impacts will be controlled by the assessment of individual planning applications which must consider the effects on protected species such as birds as part of their appraisal by the competent authority, having regard to the protective environmental policies outlines in the Fingal Development Plan 2017-2023 and the Dublin City Development Plan 2016-2022.

The Proposed Scheme is likely to result in cumulative impacts with regard to these impacts on terrestrial mammals but no higher than the already predicted residual effects significant at the local geographic scale for the Proposed Scheme alone.

21.3.2.8 Water

The Water assessment identified nine other projects for potential operation related cumulative effects. These are:

- FCC planning reference FW17A/0048: Residential development involving construction of 17 two storey houses with an access road off Navan Road.
- FCC planning reference FW17A/0108: Demolition of existing structures on the site including garage and office and construction of a new two storey building with a service station on the ground floor and studio rooms for fitness related use on the first floor.

- DCC planning reference 4237/19: The proposed development will consist of a residential development of 33 no. residential units. The proposed development would also consist of the demolition of the 2 no. existing single storey detached dwellings and associated outbuildings and sheds. Vehicular access from Villa Park Road and pedestrian access from Villa Park Road and Blackhorse Avenue and Blackhorse Avenue, Dublin 7.
- FCC planning reference FW20A/0023: Construction of 51 number dwellings to the south west end of the Phoenix Park Racecourse site (Deerpark Boundary), Castleknock Road, Dublin 15.
- IW05: Irish Water project - Blanchardstown Sewer Rehabilitation Works.
- IW06: Irish Water project - Blanchardstown. Regional Drainage Scheme (part of Greater Dublin Drainage).
- Major project reference MP08: DART+ Programme West.
- Major project reference MP10: Widening of the N3 between Junction 1 (M50) and Junction 4 (Clonee), plus related junction and necessary changes to the existing national road network.
- Major project reference MP33: Greater Dublin Drainage (GDD).

The further assessment predicted that given the mitigation measures set out in the Surface Water Management Plan (SWMP) for the Proposed Scheme and the use of SUDs, the cumulative impacts during operation would be of imperceptible significance.

21.3.2.9 Land, Soils, Geology and Hydrogeology

The residual impacts on Land, Soils, Geology and Hydrogeology due to the Proposed Scheme are expected to be of negligible magnitude and imperceptible significance as a result of the Operational Phase of the Proposed Scheme. There are no likely significant direct or indirect cumulative impacts of the Proposed Scheme in combination with the other projects on land, soils, geology and hydrogeology during the Operational Phase.

21.3.2.10 Archaeological and Cultural Heritage

The Archaeological and Cultural Heritage assessment has identified that no residual impacts would occur as a result of the construction of the Proposed Scheme. It is considered therefore that the operation of the Proposed Scheme in combination with other proposed projects will not result in significant cumulative impacts.

21.3.2.11 Architectural Heritage

No projects were identified that were considered likely to contribute to significant cumulative effects with the Proposed Scheme in relation to architectural heritage during the Operational Phase.

21.3.2.12 Landscape (Townscape) and Visual

The Landscape (Townscape) and Visual assessment identified that other development and the Proposed Scheme would contribute to cumulative increases in built form, contributing to townscape effects. The following projects were identified as having potential cumulative effects during the Operational Phase:

- IW06 - Irish Water project: Blanchardstown. Regional Drainage Scheme;
- Major project MP08: DART+ Programme West;
- Major project MP10: Widening of the N3 between Junction 1 (M50) and Junction 4 (Clonee), plus related junction and necessary changes to the existing national road network;
- Major project MP33: Greater Dublin Drainage (GDD);
- Major project MP34: Cycling: Greater Dublin Area Cycle Network Plan (excluding Radial Core Bus Corridor elements);
- Major project MP37: Snugborough Interchange Upgrade; and
- D1 Dublin BusConnects: CBC 0304 Ballymun-Finglas.

In the case of IW06, there is potential for moderate or significant long-term landscape / townscape effects due to overall increase in built form and loss of trees in Tolka Valley. However, these effects result largely from IW06 as opposed to the Proposed Scheme, and effects will be reduced over time by the growth of replacement planting.

The effect is predicted to reduce to slight / moderate, negative in the long term. This is part of the Greater Dublin Drainage project (MP33).

In the case of MP08, there is potential for moderate, negative, short-term townscape effects from changes to townscape mainly through loss of existing established trees in the townscape. This is most likely in the Ashtown area. The effect would reduce over time with establishment of proposed planting, and is predicted to reduce to not-significant, neutral in the long term.

MP10 is predicted to contribute a slight / moderate short-term townscape effect, primarily from loss of (mainly young) roadside trees. This effect will be reduced over time through growth of replacement planting, and the effect is predicted to reduce to slight, negative / neutral in the long term.

There is potential for contribution to a cumulative change in the urban realm from the Greater Dublin Area Cycle Network Plan (MP34), but one which is in keeping with the urban context of ongoing development, and therefore no significant cumulative effects are expected. Potential for slight / moderate, short-term effects largely from potential loss of trees in the townscape. The effect will be reduced over time through growth of replacement planting, and the effect is predicted to reduce to slight, negative / neutral in the long term.

There is potential for moderate short-term cumulative effects on areas of trees in the local area that would be affected by MP37 Snugborough Interchange Upgrade. As tree cover in this area is generally young, the effects will be greatly reduced in the long-term as replacement vegetation establishes with a predicted reduction to negligible, neutral effects in the long-term.

For the Ballymun-Finglas to City Centre Core Bus Corridor Scheme there is potential for slight cumulative operational townscape/visual effects on townscape in the intervening area between the two schemes around Smithfield / Liffey Quays but as the Proposed Scheme has a positive effect in this area, the cumulative effects are predicted to be positive / neutral overall.

21.3.2.13 Waste and Resources

The predominant source of Operational Phase waste from the Proposed Scheme may arise as a result of carriageway maintenance which will be undertaken at regular intervals, or as necessary. This will primarily consist of bitumen containing material due to maintenance of carriageway pavement. The predicted impact of Operational, Construction and demolition waste will be positive (on the basis that less material will be generated and less overall maintenance will be required compared to the Do Nothing scenario), not significant and long-term. It is therefore considered that the Operational Phase waste arising from the Proposed Scheme considered on combination with the types of waste arising from other projects will not give rise to likely significant cumulative effects.

21.3.2.14 Material Assets

No likely significant cumulative effects were identified for Material Assets for the Operational Phase and so no projects were shortlisted for further assessment.

21.4 Environmental Interactions

Table 21.29 sets out a matrix to indicate where interactions between different effects on different environmental factors have been addressed. This is in line with the approach set out in the EIAR Guidelines (EPA 2022). These interactions are described briefly in Table 21.29.

Table 21.29: Environmental Interactions Matrix

Typical Inter-Relationship Matrix – Environmental Elements	Population		Human Health		Biodiversity		Land and Soils		Water		Air Quality		Climate		Noise and Vibration		Waste		Landscape/Townscape		Cultural Heritage		Architectural Heritage		Material Assets		Traffic and Transport		Major Accidents and / or Disasters	
	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Population																														
Human Health	✓	✓																												
Biodiversity																														
Land and Soils			✓		✓																									
Water			✓		✓	✓	✓																							
Air Quality	✓	✓	✓	✓	✓	✓																								
Climate				✓						✓	✓	✓																		
Noise and Vibration	✓	✓	✓	✓	✓	✓																								
Waste							✓																							
Landscape/Townscape	✓	✓		✓	✓	✓	✓		✓																					
Cultural Heritage																				✓	✓									
Architectural Heritage																					✓	✓								
Material Assets			✓				✓																✓	✓						
Traffic and Transport	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓										✓	✓			
Major Accidents and / or Disasters	✓	✓	✓	✓	✓		✓		✓	✓		✓		✓						✓						✓				

Notes: This matrix should be read down, starting with each topic identified across the top. ✓ = significant interaction between. Blank cells indicate no or weak interaction. Con. = Construction phase. Op. = Operational phase.

21.4.1.1 Interactions between Population and Human Health

The topics of 'Population' and 'Human Health' are inextricably linked. Chapter 10 (Population) of this EIAR has focused on how the Proposed Scheme could have impacts on communities and the local economy (commercial businesses). As outlined in the methodology in Chapter 11 (Human Health), the social conditions, community networks and economic conditions within which people live are considered wider determinants of health and have an important influence on human health.

Construction Phase

The Population assessment has identified areas of community and commercial land-take, some of which would be permanent. The impacts would be felt at a local, individual level rather than widespread community level. It is considered that the impacts would be strongly linked with impacts on amenity and general disruption from construction activities. Similarly, both the Population and Human Health assessments identify that accessibility may be temporarily disrupted for pedestrians and cyclists during construction, with requirements for short diversions. However access to businesses and properties will be maintained at all times. Health outcomes associated with these construction impacts are likely to be psychosocial, such as stress and anxiety. Where footpaths or cycle tracks are affected by construction, a safe route will be provided past the work area, and where practicable, provisions for matching existing facilities for pedestrians and cyclists will be made. This will limit the likelihood of adverse psychosocial responses.

Operational Phase

The Population and Human Health assessments identify positive impacts on accessibility. While the Population assessment looks at this in relation to community and commercial receptors, the Human Health assessment considers the health outcomes which may be associated with this improved accessibility. This could include improved and more equitable access to health, education and other services. This is also a social impact, improving the wider determinant of health in relation to transport and opportunities to access services. Health outcomes may also be associated with improved physical fitness arising from increased active travel linked to the proposed improvements to walking and cycling infrastructure and improved social interactions.

21.4.1.2 Interactions between Population and Air Quality, Noise and Vibration and Landscape (Townscape) and Visual

Chapter 10 (Population) assesses impacts on amenity, which involves an assessment of the interactions between Landscape (Townscape) & Visual, Air Quality, Noise and Vibration. It therefore inherently addresses environmental interactions during both the Construction and Operational Phases. Reference should be made to Chapter 10 for the assessments on commercial and community amenity. Visual impacts and landscape impacts on properties have been assessed in Chapter 17 (Landscape (Townscape) & Visual).

21.4.1.3 Interactions between Human Health; Land, Soils, Geology and Hydrogeology; Water; and Air Quality; and Noise and Vibration

The quality of the environment, including exposure to pollution and environmental hazards, is an important consideration in health protection. The Human Health assessment reported in Chapter 11 has considered the interaction of these environmental factors on human health.

Chapter 13 (Water) assesses a variety of potential impacts on water including impacts on water quality and impacts on flood risk, both of which have an interaction with human health.

Chapter 14 (Land, Soils, Geology & Hydrogeology) assesses the potential for the excavation of contaminated ground, which can pose an environmental health hazard.

Construction Phase

Chapter 13 (Water) has assessed the potential impacts for temporary increases in flood risk from possible disruption of local drainage systems due to construction works, as well as temporary increases in hardstanding

and / or soil compaction which could temporarily increase surface water run-off rates to waterbodies. The assessment has also considered the potential to impact on water quality due to contamination with anthropogenic substances such as oil, chemicals or concrete washings. These issues can pose a risk to human health. However, the Water assessment found impacts on water during construction to be imperceptible and so there is no likely significant interaction between Water and Human Health from this Proposed Scheme during construction.

During construction, there is a risk of excavating potentially contaminated ground. Chapter 14 (Land, Soils, Geology & Hydrogeology) has identified potential sources of contamination from a review of current and historic land uses. The processes in place for the investigation of potential ground contamination and management and disposal of contaminated substances ensure health protection. These measures are outlined in Section 14.5 of Chapter 14 (Land, Soils, Geology & Hydrogeology). There are very limited areas of excavation, so the risk of disturbing contaminated materials is slight. Therefore, there is no likely significant interaction between Land, Soils, Geology, and Hydrogeology, and Human Health from this Proposed Scheme during construction.

Chapter 11 (Human Health) has assessed the interaction between Air Quality and Noise and Vibration and Human Health. Reference should be made to Chapter 11 (Human Health) for an assessment of potential health outcomes linked with these issues during the Construction Phase.

Operational Phase

Chapter 13 (Water) has assessed potential impacts on water quality such as from dispersal of traffic onto other roads meaning 'routine' road contaminants, such as hydrocarbons and metals may drain to a different catchment or have less stringent pollution control infrastructure. No potential impact on flood risk was assessed on the basis that the drainage design ensures no net increase in run-off rates. In terms of potential impacts on surface water quality the Water assessment identified that the impacts were imperceptible. Therefore there is no likely significant interaction between Water and Human Health from this Proposed Scheme during the Operational Phase.

Chapter 14 (Land, Soils, Geology & Hydrogeology) assesses no significant residual impacts from the Proposed Scheme. On this basis there is no likely significant interaction between Land, Soils, Geology, and Hydrogeology, and Human Health from this Proposed Scheme during the Operational Phase.

Chapter 11 (Human Health) has assessed the interaction between Air Quality and Noise and Vibration and Human Health. Reference should be made to that Chapter 11 (Human Health) for an assessment of potential health outcomes linked with these issues during the Operational Phase.

21.4.1.4 Interactions between Human Health and Landscape (Townscape) and Visual

The assessment of Human Health has an indirect interaction between Landscape (Townscape) and Visual via the assessment of amenity in Chapter 10 (Population).

Operational Phase

The quality of the built environment can influence how people feel about a place and is therefore connected with mental wellbeing. Improvements to the public realm have been identified as a possible pathway to supporting more social interaction, which is beneficial to health outcomes.

21.4.1.5 Interactions between Human Health and Material Assets

Material assets are resources of both natural and human origin that have intrinsic value. Chapter 19 (Material Assets) provides an assessment of impacts on major infrastructure and utilities and imported materials. The chapter notes that other types of material assets are assessed in other chapters of the EIAR, for example, roads and traffic are assessed in Chapter 6 (Traffic & Transport).

Construction Phase

During construction the Material Assets assessment identified negative moderate temporary impacts of disruption to water supplies, electricity, gas and telecommunications, due diversions which may be required for the Proposed Works. There is an interaction with Human Health as these disruptions could affect the essential services needed

to support healthy lives (i.e. fresh water, sanitation, energy and communication). In the case of the Proposed Scheme it is not considered that any of these disruptions would be of a duration to affect health at a population level. The most likely health effects are transient psychosocial impacts such as annoyance and frustration, which are unlikely to result in any change of overall health status.

Operational Phase

No significant Operational Phase impacts on material assets were identified and therefore there is no likely interaction between material assets and Human Health during the Operational Phase.

21.4.1.6 Interactions between Population, Human Health, Air Quality, Noise and Vibration and, Traffic and Transport

There is significant interaction between these topics. The Traffic and Transport assessment has informed the assessments of Population' Human Health, Air Quality and Noise and Vibration. The Population assessment has considered effects on accessibility which directly interacts with Traffic and Transport. The Population assessment has also assessed effects on amenity which relate to traffic emissions of air pollution and noise, which indirectly interact with Traffic and Transport. The Human Health assessment has considered the evidence of associations with health outcomes from exposure to air pollution, traffic noise as well as changes to wider determinants of health such as traffic and transport, and access. It is considered that the key interactions for both Construction and Operational Phases, are inherently captured across Chapter 6 (Traffic & Transport), Chapter 7 (Air Quality), Chapter 9 (Noise & Vibration), Chapter 10 (Population) and Chapter 11 (Human Health).

21.4.1.7 Interactions between Biodiversity, Traffic and Transport, Land, Soils, Geology and Hydrogeology; Water; and Air Quality; Noise and Vibration and, Landscape (Townscape) and Visual

The Biodiversity assessment has considered the interactions between species, habitats and various other environmental issues. Specifically, there is an interaction between Traffic and Transport and mortality risk for species. There is an interaction between Water, Air Quality and Biodiversity as declines in surface water pollution and air pollution can contribute to habitat degradation. Non-native invasive plant species can be spread through soils, and also contribute to habitat degradation, meaning there is an interaction with Biodiversity. Some trees and areas of other planting will be removed during the Construction Phase as set out in in Chapter 17 (Landscape (Townscape) & Visual). However, the Proposed Scheme also includes for replacement and new trees and other planting, with associated opportunities for enhancement of local biodiversity. While it will take time for new trees to establish and mature, no significant medium or long-term impact arises from the interrelationship between biodiversity and landscape and visual factors. Chapter 12 (Biodiversity) describes and assesses how different impacts of the Proposed Scheme on traffic, water, soils, air quality, noise and landscape may interact with biodiversity interests. Reference should be made to Chapter 12 (Biodiversity) to understand those interactions.

21.4.1.8 Interactions between Land, Soils, Geology and Hydrogeology and Water

There is an interaction between Chapter 14 (Land, Soils, Geology & Hydrogeology) and Chapter 13 (Water). Chapter 14 (Land, Soils, Geology & Hydrogeology) assesses potential impacts on water supply and the pollution of groundwater and watercourses from potential land contamination. There is therefore a potential interaction between land contamination and surface water. Surface water is interlinked with hydrogeology, so while impacts on these issues are assessed in separate chapters, there is an interrelationship. It is considered that these interactions are captured within Chapter 14 (Land, Soils, Geology & Hydrogeology) and Chapter 13 (Water) since they are intrinsic to the assessments.

21.4.1.9 Interactions between Land, Soils, Geology and Hydrogeology; Waste and Material Assets

The main interaction between these topics will be during the Construction Phase.

Construction Phase

Chapter 19 (Material Assets) assesses the impact of imported materials, whereas Chapter 18 (Waste & Resources) assesses the use of site-won materials which can be re-used within the Proposed Scheme. There is

an interaction between these issues as the amount of material to be imported will depend on the amount of material which can be recovered and re-used on-site. Chapter 14 (Land, Soils, Geology & Hydrogeology) provides an assessment of impacts on soils, including potentially contaminated land. There is an interaction between this issue and waste because the likelihood of excavated materials being suitable for use on site will depend on whether or not it is contaminated, and the type of contamination. This would be established through detailed ground investigations as set out in Chapter 14 (Land, Soils, Geology & Hydrogeology). One of the main reasons for undertaking any excavation of soils as part of the Proposed Scheme is to allow for utility diversions. The need to utility diversions is assessed in Chapter 19 (Material Assets), whereas the likelihood of encountering contaminated materials from this activity is assessed in Chapter 14 (Land, Soils, Geology & Hydrogeology).

21.4.1.10 Interactions between Land, Soils, Geology and Hydrogeology; and Traffic and Transport

Chapter 14 (Land, Soils, Geology & Hydrogeology) identifies traffic and transport as a potential source of pollution during the Operational Phase of the Proposed Scheme. Specifically, it identifies the potential for occasional accidental leakage of oil, petrol or diesel (all can come from motor vehicles), allowing contamination of the surrounding environment. While there is an interaction, this same interaction exists in the Do Nothing scenario and so the significance of the impact is imperceptible.

21.4.1.11 Interactions between Water and, Traffic and Transport

Chapter 13 (Water) identifies the potential impact from the interaction between traffic and transport and the water environment. It refers to traffic modelling described in Chapter 6 (Traffic & Transport) to inform the likelihood of a significant impact on pollutants and sediment from road surface run-off. The chapter identifies that all changes in traffic flows would occur within the same drainage catchments and so there would be no significant impacts from this interaction.

21.4.1.12 Interactions between Climate, Air Quality, Material Assets, Waste and, Traffic and Transport

Chapter 8 (Climate) provides an assessment of the effects of the Proposed Scheme on greenhouse gas (GHG) emissions.

Construction Phase

There is an interaction between Climate and Material Assets as the amount of material to be imported, and waste generated during construction of the Proposed Scheme, influences the embodied carbon footprint of the Proposed Scheme, which is assessed in Chapter 8 (Climate). The redistribution of traffic associated with the traffic management during construction, will also generate GHG emissions, which have informed the assessment in Chapter 8 (Climate).

Operational Phase

Operational Phase traffic is intrinsic to the assessment of climate impacts reported in Chapter 8 (Climate). This interaction is therefore captured within that chapter.

21.4.1.13 Interactions between Climate and Water

The impact of climate change is considered in the flood risk assessment (Appendix A13.2 in Volume 4 of this EIAR), which is summarised in Chapter 13 (Water) and Chapter 8 (Climate). The interaction between climate change and flood risk is therefore captured in these assessments.

21.4.1.14 Interactions between Landscape (Townscape) and Visual

As an environmental factor landscape and visual considerations have natural relationships with all other environmental factors. Some are clearly direct relationships, e.g., population and visual impacts; biodiversity and landscape; land, soils and water and landscape; or the setting around features of cultural heritage etc. Others may be indirect, e.g. human health, air quality and landscape, material assets and landscape and visual aspects. Wherever possible these potential interactions have been incorporated into the landscape and visual impact assessment presented in this chapter.

The principal potential interrelations for Landscape and Visual Impact with other environmental factors are outlined in the following paragraphs. The main interactions have been identified for Construction phase impacts. Other interrelations do not have potential for significant impacts with landscape and visual aspects.

Construction Phase

The construction phase will have impacts on a number of local amenities and open spaces, which have an interaction with population and human health. Access will be maintained to the open spaces and reinstated at the end of the Construction Phase, with replacement / set back boundary fences, footpaths, and replacement and new tree planting. The visual and landscape impacts on properties are assessed in Chapter 17 (Landscape (Townscape) & Visual).

The Proposed Scheme is located within a developed sub-urban / urban area. Nevertheless, the Construction Stage of the Proposed Scheme has potential to interact with local drainage and is located in the vicinity of the Royal Canal and the Liffey Valley. However, no significant works are proposed for these rivers corridors and the proposed drainage is integrated with the existing network. Additional drainage improvement measures, such as Sustainable Drainage Systems (SuDS) are also included with the Proposed Scheme. No significant impact arises from the interrelationship between water and landscape and visual factors.

The Proposed Scheme is located within a developed sub-urban / urban area. Nevertheless, the Construction Stage of the Proposed Scheme will impact on small areas of land / soil along the road corridor, mainly roadside verges, edges of open spaces, small landscape areas and garden areas. The Proposed Scheme will result in an overall minor reduction of soil area, mainly as a result of localised road widening, however, disturbed areas will be reinstated, and landscaped. No significant medium or long-term impact arises from the interrelationship between land and soils and landscape and visual factors.

21.4.1.15 Interactions Between Landscape (Townscape) & Visual, Architectural Heritage, Archaeology and Cultural Heritage

Architectural heritage has an influence on the quality of townscape and therefore there is an interaction between these topics. Also, archaeological heritage may also be of architectural interest. Cultural heritage includes tangible heritage such as archaeology, architectural heritage, settlements, buildings and structures, designed landscapes, in addition to placenames and intangible heritage such as folklore, traditions and traditional practices. These issues are therefore interrelated.

Visual impacts and landscape impacts on features / properties of cultural heritage value have been assessed in this landscape and visual chapter. The Construction Phase will have impacts on a number of local features of heritage value, e.g., Protected Structures, Conservation Areas, historic mileposts etc. and the impacts on these features are set out in in Chapter 17 (Landscape (Townscape) & Visual).

The main impacts on archaeology, cultural heritage and architectural heritage would take place during the Construction Phase. Relevant interactions are captured in Chapter 15 (Archaeological & Cultural Heritage) and Chapter 16 (Architectural Heritage).

21.4.1.16 Interactions between Material Assets and Traffic and Transport

Chapter 19 (Material Assets) notes that roads and traffic can also be classed as material assets. However, the issues of roads and traffic are assessed in Chapter 6 (Traffic & Transport). The interaction of the traffic and transport infrastructure included as part of the Proposed Scheme with material assets is captured in Chapter 19 (Material Assets) and includes issues such as utility diversions during construction and use of energy during the Operational Phase.

21.4.1.17 Risk of Major Accidents and / or Disasters

Chapter 20 (Risk of Major Accidents and / or Disasters) inherently considers several potential interactions. For example, it assesses the risk of impacts on or from utilities (interacting with Chapter 19 (Material Assets)) such as a gas mains strike. It assesses the risk of tree instability, which has an interaction between Chapter 17 (Landscape (Townscape) & Visual) and it assesses the risk of spreading invasive species which is interrelated

with Chapter 12 (Biodiversity) and Chapter 14 (Land, Soils, Geology & Hydrogeology). Also related to Chapter 14 (Land, Soils, Geology & Hydrogeology) is the risk of encountering contaminated ground or materials. Chapter 20 (Risk of Major Accidents and / or Disasters) assesses the risk of extreme weather events, which are linked to Chapter 8 (Climate) and flood risk (Chapter 13 (Water) and Appendix A13.2 in Volume 4 of this EIAR). The risk of a major road traffic event due to construction traffic is also assessed in Chapter 20 (Risk of Major Accidents and/or Disasters) which is an issue interrelated with Chapter 6 (Traffic and Transport) as well as Chapter 11 (Human Health). Since all identified risks have the potential to harm human health, the assessment in Chapter 20 (Risk of Major Accidents and / or Disasters) is strongly interrelated to human health.

21.5 Mitigation

21.5.1 Construction Phase

As set out in Section 21.2.6 of this chapter, there is a likelihood of significant negative traffic related impacts should all 12 Core Bus Corridor schemes be constructed at the same time. The mitigation for this will be to programme the construction phases of the Core Bus Corridor schemes (assuming they are consented) so that the four schemes identified in Section 21.2.6.2 of this chapter will not be constructed concurrently with adjoining schemes.

Limiting the schemes under construction concurrently, will minimise additional congestion and associated air quality and noise impacts over and above the standalone schemes.

Appropriate construction planning of the Proposed Scheme and other nearby projects was identified as mitigation for the Human Health assessment which identified potential cumulative impacts of general construction disruption on neighbouring communities.

Other major infrastructure projects could directly interface with the construction of the Proposed Scheme. Interface liaison will take place on a case-by-case basis through the NTA, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

21.5.2 Operational Phase

No significant negative effects over and above those considered in the standalone assessments for the Operational Phase were predicted in the cumulative impact assessment. No additional mitigation measures are considered necessary.

21.6 Summary of Residual Cumulative Impacts and Environmental Interactions

This chapter has identified and assessed the likely significant cumulative effects caused by the Proposed Scheme in combination with other existing and planned projects. This section provides a summary of the main effects predicted.

The results of the modelling showed that with the CTMPs for all schemes in place at the same time, there would be significant traffic displacement across the Dublin area. The large cumulative increase of traffic on local roads had the potential to generate a significant adverse impacts of traffic congestion along with the risk of generating air quality and noise impacts. A revised construction scenario was developed which is based on four schemes which cannot be constructed concurrently with adjoining schemes. This scenario was development to minimise potential significant impacts on traffic, air quality and noise.

A small number of roads will experience cumulative effects on noise and vibration over and above the effects of the Proposed Scheme in isolation which are reported in Chapter 9 (Noise & Vibration) due to cumulative construction traffic.

Where the Proposed Scheme will coincide with other projects, a localised moderate temporary to short-term construction effect on townscape was predicted for most projects, with the exception of the Irish Water IW06 project, MP08 DART + Programme West and MP12 DART+ Programme South West which are predicted to experience significant, negative, temporary / short-term effects, should construction periods overlap.

There is potential for significant in-combination effects on biodiversity due to disturbance and displacement of fauna during construction of the Proposed Scheme and other identified major projects, in the event construction periods overlap. However, these effects are predicted to be at a local geographic scale. No other significant construction related cumulative effects were identified from the Proposed Scheme in combination with other projects (including the other Core Bus Corridor Schemes) over and above those identified in the standalone assessments.

For Operational Effects, the assessments assume all 12 proposed Bus Corridor Schemes would be operational, along with other identified projects and GDA Strategy projects included in the Do Minimum and Do Something scenarios. For traffic and transport, the assessment predicted that the Proposed Scheme and the other 11 Core Bus Corridor schemes are expected to facilitate a long term, profound positive cumulative effect on People Movement by sustainable modes. The Core Bus Corridor schemes are seen to enable significant improvements in People Movement by sustainable modes along the direct Core Bus Corridor routes, particularly by bus and cycling, with reductions in car mode share due to the enhanced sustainable mode provision. The Proposed Scheme and the other 11 Core Bus Corridor schemes provide for enhanced integration and efficiencies for all public transport modes by facilitating substantial increases in public transport average network wide travel speeds.

The climate impact assessment predicts a negative, significant and permanent cumulative impact on climate during the maintenance phase. A significant and positive impact is predicted on climate in 2028 with a neutral impact in 2043 due to the predicted cumulative change in operational traffic and the significant mode shift from car to more sustainable modes (walking, cycling and public transport). Fewer climate benefits are seen in 2043 relative to 2028 due to the further electrification of the wider fleet in both the Do Minimum and Do Something scenarios.

The Core Bus Corridor Infrastructure Works will also support the delivery of government strategies outlined in the CAP (DCCA 2019) and the 2021 Climate Act by enabling sustainable mobility and delivering a sustainable transport system. The Core Bus Corridor Infrastructure Works will provide connectivity and integration with other public transport services leading to more people availing of public transport, helping to further reduce GHG emissions.

Based on the analysis outlined above, it is concluded that the Core Bus Corridor Infrastructure Works achieves the project objectives in supporting the delivery of an efficient, low carbon and climate resilient public transport service, which supports the achievement of Ireland's emission reduction targets. The Core Bus Corridor Infrastructure Works has the potential to reduce GHG emissions equivalent to the removal of approximately 105,500 and 102,200 car trips per weekday from the road network in 2028 and 2043 respectively. This represents a very significant contribution towards the national target of 500,000 additional trips by walking, cycling and public transport per day by 2030 as outlined as a target in the 2021 Climate Action Plan (CAP) (DCCA 2021). It is concluded that, cumulatively, the Core Bus Corridor Infrastructure Works will make a significant contribution to carbon reduction.

The only other significant cumulative impacts identified over and above the standalone scheme relate to human health. It was assessed that the proposals for the cycle network, the DART+, MetroLink, Snugborough Interchange, and the other 11 Core Bus Corridor schemes and the Proposed Scheme are complementary and could have a cumulative beneficial effect by encouraging active travel and increased use of public transport through offering a choice of routes. Due to the substantial size of overall population with the opportunity to benefit from the proposals, the effect is assessed as positive, very significant and long-term for health.

Significant environmental interactions occur between the topics of population, human health, air quality, noise and vibration and traffic and transport. The assessments made for each of those topics consider those interactions both directly and indirectly. As an environmental factor, landscape and visual considerations have natural relationships with all other environmental factors. Some are direct relationships, e.g., population and visual impacts; biodiversity and landscape; land, soils and water and landscape; or the setting around features of cultural heritage etc. Others may be indirect, e.g. human health, air quality and landscape, material assets and landscape

and visual aspects. Wherever possible these potential interactions have been incorporated into the relevant assessments.

In brief, the Proposed Scheme will address sustainable mode transport infrastructure deficits while contributing to an overall integrated sustainable transport system as proposed in the GDA Strategy. It will increase the effectiveness and attractiveness of bus services operating along the corridor and will result in more people availing of public transport due to the faster journey times and reliability improvements which the Proposed Scheme provides. This in turn will support the potential to increase the bus network capacity of services operating along the corridor and thereby further increasing the attractiveness of public transport. In addition to this, the significant segregation and safety improvements to walking and cycling infrastructure that is a key feature of the Proposed Scheme will further maximise the movement of people travelling sustainably along the corridor and will therefore cater for higher levels of future population and employment growth.

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Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive).

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment.

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU.