Chapter 12
Air Quality

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12. Air Quality

12.1. Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála.

The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

This chapter of the EIAR identifies, describes and presents an assessment of the likely significant effects of the proposed Project on Air Quality. The assessment will examine the potential impacts during the construction and operational phases of the proposed Project.

This Chapter should be read in conjunction with the following Chapters:

- Chapter 4: Project Description
- Chapter 5: Construction Strategy
- Chapter 6: Traffic & Transportation

12.2. Legislation, Policy and Guidance

The key legislation and guidance referenced in the preparation of the EIAR is outlined in Chapter 1: Introduction (Sections 1.5, 1.6 and 1.7). Specific to Air Quality, the following legislation, policy and relevant guidance has informed the assessment as outlined below.

12.2.1. Legislation

The assessment has been undertaken in accordance *inter alia* with the 2001 Act and the EIA Directive.

In terms of legislation for air quality, this is presented on two separate levels as follows:

- Ambient air quality legislation for the protection of human health, and
- National emissions legislation for transboundary pollution.

The ambient air quality standards in Ireland are outlined in the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) (as amended) by the Air Quality Standards (Amendment) and Arsenic,

Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air (Amendment) Regulations 2016 (S.I. 659 of 2016) ("the Air Quality Regulations"), which incorporate the ambient air quality limits set out in Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (known as the CAFE Directive), for a range of air pollutants.

The Air Quality Regulations set limit values for the pollutants nitrogen dioxide (NO_2) and nitrogen oxides (NO_X), particulate matter (PM) with an aerodynamic diameter of less than 10 microns (PM_{10}), PM with an aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$), lead (Pb), sulphur dioxide (SO_2), benzene and carbon monoxide (CO) as presented in Table 12.1.

Table 12.1: Air Quality Regulations (based on the CAFE Directive[1])

Pollutant	Regulation	Limit Type	Value
Nitrogen Dioxide	S.I. 180 of 2011	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200µg/m^3 NO_2
		Annual limit for protection of human health	40µg/m^3 NO_2
Nitrogen Oxides (NO + NO_2)		Critical limit for the protection of vegetation and natural ecosystems	30µg/m^3 NO + NO_2
Lead	S.I. 180 of 2011	Annual limit for protection of human health	0.5µg/m^3
Sulphur Dioxide	S.I. 180 of 2011	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	350µg/m^3
		Daily limit for protection of human health - not to be exceeded more than three times/year	125µg/m^3
		Critical limit for the protection of vegetation and natural ecosystems (calendar year and winter)	20µg/m^3
Particulate Matter (as PM_{10})	S.I. 180 of 2011	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50µg/m^3
		Annual limit for protection of human health	40µg/m^3
Particulate Matter (as $PM_{2.5}$)	S.I. 180 of 2011	Annual limit for protection of human health	25µg/m^3
Benzene	S.I. 180 of 2011	Annual limit for protection of human health	5µg/m^3
Carbon Monoxide	S.I. 180 of 2011	8-hour limit (on a rolling basis) for protection of human health	10mg/m^3

[1] CAFE Directive replaces the previous Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management and daughter directives, Council Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air and Directive 2000/69/EC of the European Parliament and of the Council of 16 November 2000 relating to limit values for benzene and carbon monoxide in ambient air.

On a national level, Ireland is a party to the Convention on Long Range Transboundary Air Pollution (CLRTAP) under which certain transboundary air pollutants are controlled. For EU Member States, implementation of the Gothenburg Protocol (a daughter protocol of the CLRTAP) is achieved through limits set out in Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants ("the NEC Directive") which has been amended by Directive (EU) 2016/2284.

The NEC Directive sets national emission ceilings for key pollutants including particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), nitrogen oxides (NO_x), ammonia (NH_3) and Volatile Organic Compounds (VOCs). The aim of the Directive is to cut the negative impacts of air pollution on human health by almost half by 2030. Reducing levels of illness, including respiratory and cardiovascular diseases and premature death is the main priority.

Ireland's emissions ceilings under the first NEC Directive applied until December 2019 with reference to 2005 as the base year. Article 4(1) and Annex II of the Directive (as amended) then sets out new reduction commitments which apply from 2020 to 2029, and from 2030 onwards as shown in Table 12.2.

Table 12.2: Ireland's National Emissions Ceiling Directive 2020 and 2030 Targets

Pollutant	2010-20 Targets under 2001/81/EC (kilotonnes)	Targets under 2016/2284/EU (kilotonnes)	
		2020	2030
SO_2	42	25.574	10.960
NO_X	65	66.836	40.626
NMVOC	55	56.335	51.077
NH_3	116	112.066	107.539
$PM_{2.5}$	N/A	15.606	11.229

12.2.2. Policy

12.2.2.1. National Policy

The National Clean Air Strategy is currently being devised to outline how the State will enhance and protect the quality of the air that citizens breathe and realise the full environmental and health benefits of cleaner air. A draft for consultation was launched in March 2022 by the Department of the Environment, Climate and Communications but the final Strategy has yet to be published, however is expected for publication later in 2022.

The draft Clean Air Strategy provides the high level strategic policy framework necessary to identify and promote the integrated measures across government policy that are required to reduce air pollution and promote cleaner ambient air while delivering on wider national objectives. The key strategic priorities presented in the draft Strategy are:

- To ensure continuous improvements in air quality across the country;
- To guarantee the integration of clean air considerations into policy development across Government;

- To increase the evidence base that will help continue to evolve the understanding of the sources of pollution in order to address them more effectively;
- To enhance regulation and improve the effectiveness of enforcement systems; and
- To promote and increase awareness of the importance of clean air.

Specifically in relation to rail travel, the transport interventions required to deliver results in the draft Strategy include the following measures which support the proposed Project:

- Rollout of a range of sustainable mobility projects, including the DART+ Programme, Metro Link and the BusConnects programme;
- Expansion of the DART fleet with potential for up to 750 electric/battery-electric carriages with the first of the units entering service in 2025.

National Policy Objective 64 of the National Planning Framework - Project Ireland 2040 relates to ensuring improvements in air quality and preventing unacceptable levels of pollution in urban and rural areas through integrated land use and spatial planning that supports public transport. The DART is specifically discussed and noted as a key priority as part of the Metropolitan Area Strategic Plan.

12.2.2.2. Regional Policy

In 2021 the EPA notified the four Dublin Local Authorities and informed them that an updated Air Quality Management Plan must be prepared and submitted to the European Commission by the end of 2021 due to breaches in the annual mean EU limit value for NO_2 at some EPA Air Quality Zone A monitoring stations during 2019. As a consequence, the Dublin Region Air Quality Management Plan 2021 - Air Quality Plan to improve Nitrogen Dioxide levels in Dublin Region was published in October 2021 with an aim to remediate exceedances in the air quality limit values. The plan sets out 14 measures to be put in place to achieve these aims including the following:

- Integrate ‘15 Minute Neighbourhoods’ concept in City and County Development Plans;
- Public Parking Controls;
- Continued Delivery of the Active Travel Programme;
- Introduction of Clean Air Zones/ Low Emission Zones;
- Enhanced Air Quality Monitoring and Modelling;
- Air Quality and Health Research; and
- Air Quality - Citizen Engagement.

12.2.3. Guidance

This assessment has had due regard to national and international guidelines relating to the assessment of air quality impacts that include the following:

- World Health Organization (WHO) WHO global air quality guidelines: Particulate Matter ($PM_{2.5}$ and PM_{10}), Ozone, Nitrogen Dioxide and Sulfur Dioxide (hereafter referred to as the WHO Air Quality Guidelines) (WHO, 2021);

- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) – LA 105 Air Quality (hereafter referred to as LA 105 Air Quality) (UKHA, 2019);
- United Kingdom (UK) Department of Environment Food and Rural Affairs (DEFRA) Part IV of the Environment Act 1995: Local Air Quality Management Policy Guidance (PG16) (hereafter referred to as LAQM (PG16)) (DEFRA, 2016);
- Institute of Air Quality Management Guidance (IAQM, 2016);
- TII's Environmental Assessment and Construction Guidelines, including the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (National Roads Authority, 2006, revised 2011); and
- UK Department for Environment, Food & Rural Affairs, Local Air Quality Management Technical Guidance (TG22) (2022).

The WHO Guidelines are particularly pertinent in relation to the statutory limits for the protection of human health as presented in Table 12.1. The WHO Guidelines are based on reducing the risk to human health and in some cases the levels differ from the statutory limits as these limits are based on balancing health risks with technological feasibility, economic considerations and various other political and social factors in the EU. The 2021 Air Quality Guidelines (AQG) and interim targets recommended by the WHO are presented in Table 12.3. These guidelines are not legally binding, however, they do provide WHO Member States with an evidence-informed tool to inform legislation and policy. The levels are presented as an ultimate guideline as well as a series of interim targets which are proposed as incremental steps in a progressive reduction of air pollution and are intended for use in areas where pollution is high.

Table 12.3: WHO Recommended Air Quality Guideline (AQG) Levels and Interim Targets (2021)

Pollutant	Averaging Time	Interim Target				AQG
		1	2	3	4	
$PM_{2.5}$ (µg/m^3)	Annual	35	25	15	10	5
	24-hour	75	50	37.5	25	15
PM_{10} (µg/m^3)	Annual	70	50	30	20	15
	24-hour	150	100	75	50	45
O_3 (µg/m^3)	Annual	100	70	-	-	60
	24-hour	160	120	-	-	100
NO_2 (µg/m^3)	Annual	40	30	20	-	10
	24-hour	120	50	-	-	25
SO_2 (µg/m^3)	24-hour	125	50	-	-	40
CO (mg/m^3)	24-hour	7	-	-	-	4

12.3. Methodology

12.3.1. Study Area

The proposed Project has been divided into four distinct geographic zones along the length of the corridor (Zones A to D) as outlined in Chapter 4 Project Description and is summarised below. The proposed Project is described from west to east along the railway corridor.

- Zone A - Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station (refer to Section 4.6);
- Zone B - Park West & Cherry Orchard Station to Heuston Station (incorporating Inchicore Works) (refer to Section 4.7);
- Zone C – Heuston Yard & Station (incorporating New Heuston West Station) (refer to Section 4.8);
- Zone D - Liffey Bridge to Glasnevin Junction (Phoenix Park Tunnel Branch Line) (refer to Section 4.9).

12.3.1.1. Construction Phase Study Area

During the Construction Phase, the focus is on air quality sensitive receptors adjacent to dust generating activities or roads impacted due to construction activities. For construction dust, the Institute of Air Quality Management (IAQM) 2016 guidance states that a dust assessment is typically required where there is:

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

To ensure a robust assessment the zone of influence (ZoI) for the construction phase dust impacts is set at 350 metres from all works areas.

In addition to the study area considered with respect to construction dust, additional areas must also be considered with respect to emissions from vehicles on impacted public roads. Potential impacts to air quality relate to alterations to traffic patterns (e.g. road closures/traffic diversions) such as around Kylemore area due to the reconstruction of the Le Fanu Road Bridge (OBC7) and Kylemore Road Bridge (OBC5A). The study area is up to 200m from roads that experience a significant change in traffic numbers, road alignment or speed band, as per the UKHA DMRB LA - 105 Guidance. The assessment study area is focused on sensitive human receptors and designated ecological sites in proximity to the impacted routes.

12.3.1.2. Operational Phase Study Area

The DART+ South West Project will upgrade the rail line with electrification of two tracks from Hazelhatch & Celbridge Station to Heuston Station and Glasnevin Junction and as a result is not predicted to have significant adverse direct air quality emissions in the locality. By employing trains that use electrical traction instead of fossil fuel, local air emissions associated with those rail journeys are reduced.

The project will also increase the passenger carrying capacity of the DART which has the potential for indirect positive impacts by improving modal shift to public transport offering and assisting the reducing private car mode of transport reliance. In this regard, these operational emissions are on a national scale and the State is considered the operational study area.

12.3.2. Survey Methodology

12.3.2.1. Desk Study

The baseline ambient air quality environment has been characterised through a desk study of publicly available published data sources and baseline ambient monitoring surveys undertaken in the area.

A desk-based air quality assessment was carried out following TII's Environmental Assessment and Construction Guidelines, including the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (National Roads Authority, 2006 and revised 2011) – referred to throughout this chapter as 'TII Guidelines'. The guideline states that wherever possible use should be made of existing quality assured air quality data such as that undertaken by the EPA. Air quality monitoring programmes have been undertaken in recent years by the EPA and Local Authorities in the Dublin region. The most recent EPA Annual Air Quality in Ireland reports detail the range and scope of monitoring undertaken throughout Ireland and data from these reports is referenced to inform the baseline air quality.

The Urban Environmental Indicators: Nitrogen Dioxide levels in Dublin Report prepared by the EPA in 2020 assessed spatial variations in ambient air quality in Dublin using indicative diffusion tube sampling and detailed air dispersion modelling. The relevant results from this study in the area around the proposed Project are also referenced.

The Clear Air Together Project led by the EPA and the Environmental Education Unit of An Taisce took place in October-November 2021 and worked with 1000 Dublin citizen scientists to measure NO_2 concentrations across Dublin using diffusion tubes. Relevant data from this study is also employed to identify spatial baseline data in the study area.

Relevant monitoring data from other transport projects in the Dublin Area (DART+ West, MetroLink and BusConnects) has also been collated and used to inform the spatial baseline trends in the area.

A review of potentially sensitive ecological areas has also been conducted using the National Parks and Wildlife Services (NPWS) online mapping services.

12.3.3. Assessment Methodology

During the construction phase the air quality impact of the redistribution of local road traffic during road closures and through construction traffic is assessed both locally and regionally. In addition,

potential emissions of construction related dust are assessed. A regional air quality assessment of the change in emissions from rolling stock and rail service frequency has been considered as part of the assessment of the operation phase of the proposed Project.

12.3.3.1. Local Air Quality Impact Assessment from Traffic Emissions in the Construction Phase

The local air quality assessment of traffic impacts during construction was undertaken using the methodology outlined in the DMRB LA 105 Air Quality. This general approach has been recommended for use in assessing Irish road schemes by the TII. The significance criteria have been adopted for the proposed Project and are detailed in Section 12.3.4.

The TII Guidelines state that the significance of air quality impacts due to vehicle emissions during the construction phase is dependent on the number of additional vehicle movements, the proportion of HGVs and the proximity of sensitive receptors to site access routes. If construction traffic would lead to a significant change (i.e. >10%) in Annual Average Daily Traffic ("AADT") flows near to sensitive receptors, then a quantified assessment of potential impacts should be undertaken. The traffic and transportation assessment (including AADT flows) is provided in Chapter 6 Traffic & Transportation of this EIAR.

Traffic data has been supplied by the Traffic & Transportation Team that quantifies the traffic impacts of the main road closures to accommodate bridge demolition and reconstruction and for transporting construction materials. Traffic data has been supplied for all main routes in the study area as AADT and %HGV for each of the following scenarios:

- Existing (i.e. current traffic with all roads and bridges open to traffic);
- The temporary closure of Le Fanu Bridge;
- The temporary closure of Kylemore Road Bridge; and
- The temporary closure of Memorial Road Bridge.

The change in traffic over the existing traffic and each of the road closures has been undertaken to assess which roads will experience >10% change in traffic volumes. Impacts on properties situated on roads that will experience >10% increase in traffic are then assessed to quantify the impact to air quality.

12.3.3.2. Regional Air Quality Impact Assessment from Traffic Emissions in the Construction Phase

Regional emissions from construction traffic are quantified using the regional assessment model of the DMRB LA 105 Air Quality. Traffic from all affected routes is incorporated including traffic levels and lengths of routes to determine the net change in regional emissions as a result of the three bridge closures listed.

12.3.3.3. Air Quality Impact Assessment from Construction Dust

The proposed Project will be constructed over the majority of the existing operational railway corridor and therefore this will reduce the potential for dust emissions compared to a new major infrastructure project which would require significantly greater construction works. Dust generation rates depend on

the site activity, particle size, the moisture content of the material and weather conditions. Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air.

The USEPA states that it is typical to assume no dust is generated under 'wet day' conditions where rainfall greater than 0.2mm has fallen. The 30-year average rainfall (1981 – 2010) from Casement Aerodrome, the closest weather station to the proposed Project with available data shows that on average 183 days per annum (50%) will experience rainfall greater than 0.2mm. High levels of moisture either retained in soil or because of rainfall help suppress the generation of dust due to the cohesive nature of water between dust particles. Rain also assists in removing dust from the atmosphere through washout. Wind can lift particles up into the air and transport the dust downwind as well as drying out the surface. The worst dust deposition conditions typically occur, therefore, during dry conditions with strong winds.

Sensitivity to dust depends on the duration of the dust deposition, the dust generating activity, and the nature of the deposit. Therefore, a higher tolerance of dust deposition is likely to be shown if only short periods of dust deposition are expected and the dust generating activity is either expected to stop or move on. Due to the scale of the proposed Project construction sites are likely to be in operation for extended periods and therefore detailed consideration of potential dust impacts and how to mitigate impacts is required.

The criteria for appraisal of the magnitude of dust emissions is reviewed for each site compound area in the tables below under the headings of demolition, earthworks, construction and track-out based on a series of criteria set out by the IAQM. The risk of potential for dust impacts with respect to dust nuisance, human health and ecology are a function of magnitude of the dust generation at each construction site in combination with the sensitivity of the surrounding area as detailed in Section 12.4.2.

12.3.3.3.1. Demolition

Dust emission magnitude from demolition can be classified as small, medium or large and are described as follows:

- Large: Total building volume >50,000m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20m above ground level;
- Medium: Total building volume 20,000m^3–50,000m^3, potentially dusty construction material, demolition activities 10m-20m above ground level; and
- Small: Total building volume 20,000m^3, construction material with low potential for dust release, demolition activities <10m above ground, demolition occurring during wetter months.

Table 12.4: Risk of Dust Impacts - Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

12.3.3.3.2. Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. This may also involve levelling the site and landscaping. Dust emission magnitude from earthworks can be classified as small, medium or large and are described as follows:

- Large: Total site area > 10,000m^2, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8m in height, total material moved >100,000 tonnes;
- Medium: Total site area 2,500m^2–10,000m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m–8m in height, total material moved 20,000–100,000 tonnes; and
- Small: Total site area < 2,500m^2, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4m in height, total material moved < 20,000 tonnes, earthworks during wetter months.

Table 12.5: Risk of Dust Impacts - Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

12.3.3.3.3. Construction

Dust emission magnitudes from construction can be classified as small, medium or large and are described as follows:

- Large: Total building volume > 100,000m^3, on-site concrete batching, sandblasting;
- Medium: Total building volume 25,000m^3–100,000m^3, potentially dusty construction material (e.g. concrete), on-site concrete batching; and
- Small: Total building volume < 25,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Table 12.6: Risk of Dust Impacts - Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

12.3.3.3.4. Track-out

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, vehicle numbers, geology and duration. Track-out refers to the dirt, mud, or other debris tracked or carried onto the public road network on the wheels of vehicles exiting construction sites. Dust emission magnitude from Track-out can be classified as small, medium or large and are described as follows:

- Large: > 50 HGV (> 3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100m
- Medium: 10 - 50 HGV (> 3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100m; and
- Small: < 10 HGV (> 3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50m.

Table 12.7: Risk of Dust Impacts – Track-out

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

12.3.3.4. Ecological Assessment from Construction Traffic

The potential for impact on an ecological site is highest within 200m of the proposed Project and within 200m of roads where significant changes in AADT (>5%) occur. While the TII Guidelines were developed for road schemes they are relevant and regularly used for developments have impacts on road traffic or alignment. The following assessment criteria is used to determine whether an assessment for nitrogen deposition should be conducted:

- There is a designated area of conservation within 200m of the proposed development; and
- There is a significant change in AADT flows.

The only designated sites within 200m of the boundary of the proposed Project is the Royal Canal proposed Natural Heritage Area (site 002103) which lies under the existing track alignment, the overbridge Royal Canal and Luas Twin Arch (OBO8) at Glasnevin. Proposed Natural Heritage Areas ("pNHA") were published on a non-statutory basis in 1995. They have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats. A process is underway to resurvey and formally designate some pNHAs as NHAs.

The Air Quality Regulations outline an annual critical level for NO_X for the protection of vegetation and natural ecosystems in general. The CAFE Directive defines 'Critical Levels' as '*a level fixed on the basis of scientific knowledge, above which direct adverse effects may occur on some receptors, such as trees, other plants or natural ecosystems but not on humans*'.

12.3.3.5. National Direct Emissions from Rail Traffic during the Operation Phase

National emissions of the changes in rail car emissions are undertaken using the procedures outlined in the European Monitoring and Evaluation Programme (EMEP) and European Environment Agency (EEA) 2019 Air Pollutant Emission Inventory Guidebook for Railways). Emissions for diesel units are provided using the guidebook are designed to facilitate reporting of emission inventories by countries to the UNECE Convention on Long-range Transboundary Air Pollution and the EU National Emission Ceilings Directive. Emissions from diesel engines can be broken in three categories and the stated emission factors for each category are presented in Table 12.8.

Table 12.8: EMEP Emission Factors for Rail

Tier 2 Shunting Locomotives			
Pollutant	**kg/Fuel Tonne** Note 1	**kg Pollutant/km** Note 2	**g Pollutant /km**
NO_x	54.4	0.031	30.50
PM_{10}	2.1	0.0012	1.18
$PM_{2.5}$	2	0.0011	1.12
SO_2 (Tier 1 only) Note 3	0.4	0.0002	0.22
Tier 2 Rail Cars			
Pollutant	**kg/Fuel Tonne** Note 1	**kg Pollutant/km** Note 2	**g Pollutant /km**
NO_x	39.9	0.022	22.37
PM_{10}	1.1	0.00062	0.62
$PM_{2.5}$	1	0.00056	0.56
SO_2	N/A	N/A	N/A
Tier 2 Line-Haul Locomotives			
Pollutant	**kg/Fuel Tonne** Note 1	**kg Pollutant/km** Note 2	**g Pollutant /km**
NO_x	63	0.035	35.32
PM_{10}	1.2	0.00067	0.67
$PM_{2.5}$	1.1	0.00062	0.62
SO_2	N/A	N/A	N/A

Note 1: Emissions factors from Air Pollutant Emission Inventory Guidebook for Railways (EMEP and EEA 2019)

Note 2: Emission factors based on Air Pollutant Emission Inventory Guidebook for Railways (EMEP and EEA 2019) and Irish Rail average Diesel usage

Note 3: IE confirmed sulphur content is less than 0.2%. Only Tier one emissions are available for SO2 as per Air Pollutant Emission Inventory Guidebook for Railways (EMEP and EEA 2019).

12.3.3.6. National Indirect Emissions from Energy Use during the Operation Phase

Electric multiple units (EMU) are powered by electricity generated at stationary power plants as well as other sources. As the rail stock move from diesel multiple units ("DMUs") to EMUs the associated emissions will be emitted at the power plants generating electricity rather than through the DMU tailpipe. The emissions of pollutants generated due to the electricity power demand for the EMUs are calculated using the carbon intensity of the fuel mix used in the generation of electricity nationally.

The pollutant intensity is the amount of a specific pollutant that will be released per kilowatt hour (kWh) of energy of a given fuel. For most fossil fuels the emissions per unit is almost constant, but in the case of electricity it will depend on the fuel mix used to generate the electricity and on the efficiency of the technology employed. A figure for carbon (CO_2) is updated by Sustainable Energy Authority of Ireland (SEAI) annually. However, no figure for other pollutants (i.e. NO_x, $PM_{2.5}$, SO_2) is provided by SEAI or the EPA. The 2020 carbon intensity figure of 296 gCO_2/kWh has been published by SEAI. For other regional pollutants of local concern (NO_x, $PM_{2.5}$, SO_2) which do not have an intensity figure linked to their usage as CO_2 does, estimated rates of emissions per kWh can be estimated for 2019 using data produced by the EPA and SEAI. This is done using the emissions related to energy production for those pollutants and comparing it to the total energy produced. The emission factors are shown in Table 12.9. The estimate generated will be valid for 2019 however it is expected that the pollution intensity per kWh will reduce by the opening year.

The 2021 Climate Action Plan set a national target of up to 80% of electricity demand by renewables by 2030 and this commitment is reiterated in the Climate Action Plan 2023. Currently circa 40% of the national grid electricity comes from renewable sources. Increasing the proportion of renewables will reduce the emissions per kWh of electricity produced on the national grid. Iarnród Éireann has agreed to purchase up to 80% of its operational demand from certified low or zero carbon electricity for operations. This will ensure that should the CAP target of 80% renewables not be achieved, the proposed Project will still achieve the target. For the purposes of the assessment it has been assumed both the Do Minimum and Do Something have 80% renewables.

The remaining power on the national grid that will be supplied by fossil fuel the emissions of which are carefully controlled by the EPA under the suppliers Industrial Emissions Directive, which ensures that no significant impacts occur due to air quality emissions of air pollutants (including NO_2, particulates and VOCs) for nearby sensitive human or ecology receptors.

Table 12.9: Emission Factors of Regional Pollutants per kWh

Pollutant	kg Pollutant/kWh
Estimated Emission Factors at 80% Renewables	
NO_x	0.0000324
SO_2	0.000012
$PM_{2.5}$	0.0000013

12.3.4. Impact Assessment Criteria

12.3.4.1. Air Quality Assessment Criteria for Traffic Impacts

The TII Guidelines detail the methodology for determining air quality impact significance criteria for road schemes in Ireland as outlined in Section 12.3.3.1. The degree of impact is determined based on both the absolute (Table 12.10, Table 12.11 and Table 12.12) and relative impact of the proposed Project. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the annual mean limit values (40µg/m^3). However, the criteria have also been applied to the predicted annual $PM_{2.5}$ concentrations for the purpose of this assessment.

Table 12.10: Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations (Source: TII Guidelines)

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. Days with PM_{10} Concentration > 50 µg/m^3	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥ 4µg/m^3	Increase / decrease >4 days	Increase / decrease ≥ 2.5µg/m^3
Medium	Increase / decrease 2µg/m^3 - < 4µg/m^3	Increase / decrease 3 or 4 days	Increase / decrease 1.25µg/m^3 - <2.5µg/m^3
Small	Increase / decrease 0.4µg/m^3 - < 2µg/m^3	Increase / decrease 1 or 2 days	Increase / decrease 0.25µg/m^3 - <1.25µg/m^3
Imperceptible	Increase / decrease < 0.4µg/m^3	Increase / decrease <1 day	Increase / decrease < 0.25µg/m^3

Table 12.11: Air Quality Impact Descriptors for Changes to Annual Mean Nitrogen Dioxide and PM10 and $PM_{2.5}$ Concentrations at a Receptor (Source: TII Guidelines)

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Proposed Development			
Above Objective/Limit Value With Scheme (≥40µg/m^3 of NO_2 or PM_{10}) (≥25µg/m^3 of $PM_{2.5}$)	Slight adverse	Moderate adverse	Substantial adverse
Just Below Objective/Limit Value With Scheme (36 - <40µg/m^3 of NO_2 or PM_{10}) (22.5µg/m^3 - <25µg/m^3 of $PM_{2.5}$)	Slight adverse	Moderate adverse	Moderate adverse
Below Objective/Limit Value With Scheme (30 - <36µg/m^3 of NO_2 or PM_{10}) (18.75µg/m^3 - <22.5µg/m^3 of $PM_{2.5}$)	Negligible	Slight adverse	Slight adverse
Well Below Objective/Limit Value With Scheme (<30µg/m^3 of NO_2 or PM_{10}) (<18.75µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight adverse
Decrease with Proposed Development			
Above Objective/Limit Value With Scheme (≥40µg/m^3 of NO_2 or PM_{10}) (≥25µg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Substantial beneficial
Just Below Objective/Limit Value With Scheme (36µg/m^3 - <40µg/m^3 of NO_2 or PM_{10}) (22.5µg/m^3 - <25µg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Moderate beneficial
Below Objective/Limit Value With Scheme (30µg/m^3 - <36µg/m^3 of NO_2 or PM_{10}) (18.75µg/m^3 - <22.5µg/m^3 of $PM_{2.5}$)	Negligible	Slight beneficial	Slight beneficial

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Medium	Large
Well Below Objective/Limit Value With Scheme (<30µg/m^3 of NO_2 or PM_{10}) (<18.75µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight beneficial

Table 12.12: Air Quality Impact Descriptors for Changes in Number of Days with PM_{10} Concentrations Greater than 50µg/m^3 at a Receptor (Source: TII Guidelines)

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (32 days - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (26 days - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (32 days - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

12.3.4.2. Assessment of the Magnitude of Impact from Construction Dust

To determine the level of dust mitigation required during the Construction Phase, the potential dust emission magnitude for each dust generating activity needs to be considered, along with the sensitivity of the area. These major dust generating activities are divided into four types (where relevant) to reflect their different potential impacts as outlined below:

- Demolition - Any activity involved with the removal of an existing structure (or structures);
- Earthworks – The processes of soil-stripping, ground-levelling, excavation and landscaping;
- Construction - Any activity involved with the provision of a new structure (or structures), its modification or refurbishment; and
- Track-out - The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.

An assessment of the sensitivity of the proposed Project completed in Section 12.4.2 with respect to the criteria shown in the IAQM guidance.

12.3.4.3. Ecology

The TII Guidelines reference the United Nations Economic Commission for Europe (UNECE) Critical Loads for Nitrogen where a *'Critical Load*' is defined by the UNECE as a '*a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge*' (UNECE, 2003). The TII Guidelines outline a methodology to derive the road contribution to dry deposition and thereafter to compare with the published critical loads for the appropriate habitat.

12.3.5. Consultation

The overall project stakeholder and public consultation undertaken in respect of the Project is set out in the Public Consultation No. 1 Findings Report (for PC1) and Public Consultation No. 2 Findings Report (for PC2) which are included in Volume 4, Appendix 1.3 and 1.4. All feedback was collated, including feedback specific to the EIAR topic 'Air Quality'. This feedback has informed this chapter including the baseline and impact assessment presented.

Specific consultation was also undertaken with key stakeholders in relation to EIA Scoping. A summary of the issues raised in relation to the scope of the EIA is included in Volume 4, Appendix 1.2. Feedback on the scope and level of detail of the assessment, data sources and methodologies as they pertain to the EIAR topic 'Air Quality' have been reviewed and have influenced this chapter of the EIAR.

Specific consultation was also undertaken with representatives of various Departments in Kildare, South Dublin and Dublin City Councils. This included a combination of presentations, workshops and meetings to discuss the project, technical design issues and environment and planning matters.

Nine pre-application meetings were held with ABP to explain the project and present technical and environmental information. A summary of the information presented and the environmental issues discussed at the nine meetings is provided in Volume 4, Appendix 1.6. Feedback relevant to the topic 'Air Quality' has been reviewed and has influenced this chapter of the EIAR.

12.3.6. Difficulties Encountered / Limitations

This Chapter of the EIAR has been prepared based upon the best available information and in accordance with current best practice and relevant guidelines. There were no technical difficulties or otherwise encountered in the preparation of this chapter of the EIAR.

12.4. Receiving Environment

As outlined in Chapter 4 Project Description, the project has been divided into four main geographic areas (Zones A to D), which delineate the rail corridor from west to east. The following sections describe the baseline conditions in the vicinity of the proposed Project, with reference to the project zones where relevant, based on a review of published data and onsite monitoring.

12.4.1. Baseline Ambient Air Quality

12.4.1.1. EPA Data

As part of the implementation of the Air Quality Standards Regulations 2011, four air quality zones have been defined in Ireland for air quality management and assessment purposes. The four areas are as follows:

- Zone A: Dublin Conurbation;
- Zone B: Cork Conurbation;
- Zone C: Other cities and large towns comprising Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Letterkenny, Celbridge, Newbridge, Mullingar, Balbriggan, Greystones, Leixlip and Portlaoise; and
- Zone D: Rural Ireland, i.e. the remainder of the State excluding Zones A, B and C.

In terms of air monitoring zoning, the area of the proposed Project (refer to Section 12.3.1) is located within air quality Zone A and Zone C.

12.4.1.2. Oxides of Nitrogen

Nitrogen Dioxide (NO_2) is classed as both a primary and a secondary pollutant. As a primary pollutant, NO_2 is emitted from all combustion processes (such as a gas/oil fired boiler or a car engine). The EPA report that in Ireland, the main source of NO_2 is from road transport. As a secondary pollutant NO_2 is derived from atmospheric reactions of pollutants that are themselves, derived mainly from traffic sources.

Long term EPA air quality monitoring data at St. John's Road, Davitt Road and Ballyfermot are selected for this assessment as stations are less than 1km from the proposed Project. The location of these monitoring stations are illustrated in Figure 12-1.

Concentrations of NO_2 over the period 2015 to 2019 are available for the Ballyfermot Station while NO_2 concentrations over the period 2018 to 2019 are available for Davitt Road and St. John's Road stations and these are summarised in Table 12.13.

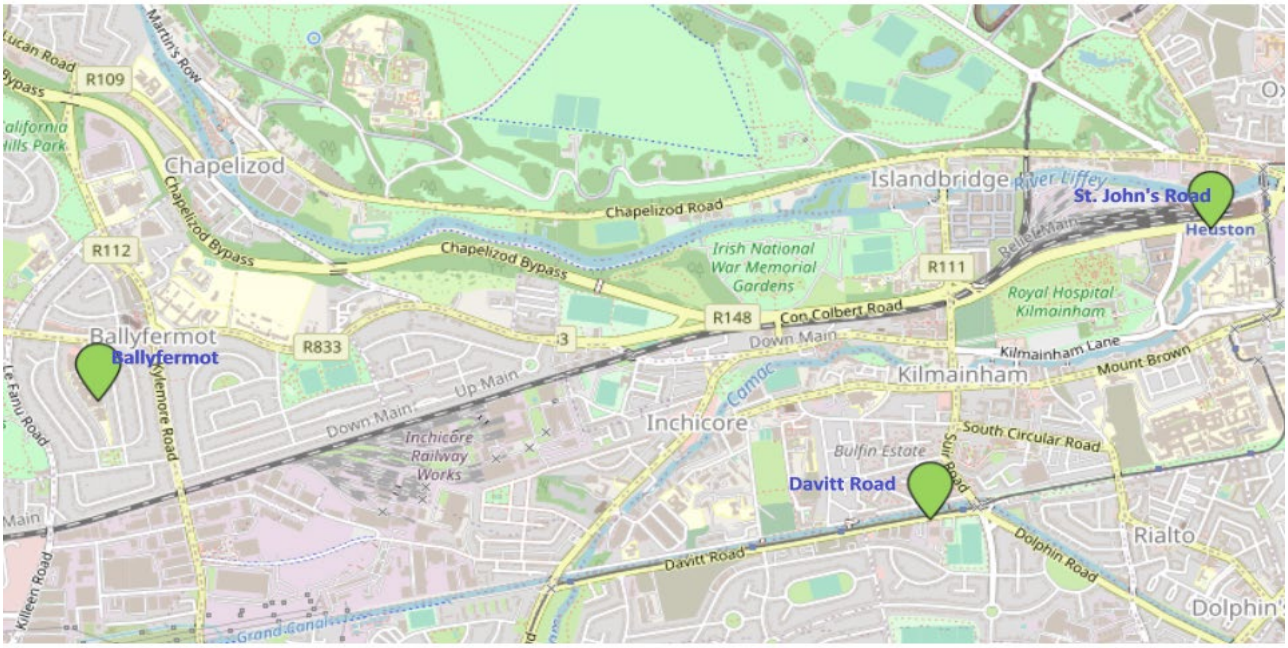

Figure 12-1 EPA Air Monitoring Stations (Source: EPA[2])

Results show that the concentration at the city centre location of St. John's Road, which is located near Heuston Station, were in exceedance of the limits for 2018 and 2019 and these high levels are largely associated with the levels of road traffic and congestion in the area. Results at Davitt Road and Ballyfermot are in compliance with the statutory limit and are lower than St. John's Road given the more suburban nature of these locations. All levels recorded are above the WHO Guideline. As a result of the high levels at the St John's Road monitoring station, the Dublin Region Air Quality Plan was prepared and published in 2021.

Table 12.13: NO_2 Concentrations at EPA monitoring stations located near the Proposed Project 2015 to 2020

Station	Averaging Period	Year					
		2015	2016	2017	2018	2019	2020[3]
St. John's Road, Kilmainham, Dublin 8	Annual Mean NO_2 (µg/m^3)	-	-	-	44	43	30
Davitt Road, Inchicore, Dublin 12	Annual Mean NO_2 (µg/m^3)	-	-	-	26	24	14
Ballyfermot, Dublin 10	Annual Mean NO_2 (µg/m^3)	16	17.3	16.5	17	20	12
Statutory Limit	Annual Mean NO_2 (µg/m^3)	40					
WHO Guideline	Annual Mean NO_2 (µg/m^3)	10					

[2] https://airquality.ie/
[3] The 2020 concentrations, although shown, have not been included in the baseline section as data collected is not consistent with long-term trends due to the Covid-19 Lockdown.

In addition to the continuous monitoring stations, the EPA has gathered NO_2 data using passive diffusion tubes. The diffusion tube sampling was carried out in conjunction with Dublin City Council in 2017 and 2018 and results in the area of the proposed Project are presented in Table 12.14. It is noted that monitoring was undertaken for a single calendar year and therefore long-term averages are not available. All locations are roadside monitoring locations in proximity to Heuston Station and the surrounding road network on the north and south quays.

With the exception of Conyngham Road to the north of the station, all other locations were in exceedance of the statutory limit and the WHO Guideline in 2017 and 2018. Again, this supports the findings of the EPA continuous monitoring which indicated elevated levels around St. John's Road as a result of traffic.

Table 12.14: EPA NO_2 Diffusion Tube Monitoring Data[4]

Monitoring Site	Annual Mean NO_2 Concentration ($\mu g/m^3$)	
	2017	2018
Heuston Station (Revenue Building on St. John's Road West)	-	46.2
Doctor Steeven's Hospital (St. John's Road West)	53.6	46.3
Heuston Station Environs 1 (St. John's Road West)	-	43.0
Heuston Station Environs 2 (Victoria Quay)	52.3	51.3
Heuston Station Environs 3 (Wolfe Tone Quay)	48.4	45.6
Heuston Station Environs 4 (Conyngham Road)	-	30.7
Statutory Limit	40	
WHO Guideline	10	

Table 12.15 shows the values for the Clean Air Together Project diffusion tubes that are located ≤200m from the proposed development. It should be noted that these results were over a shortened period of one month in October – November 2021 and while they provide some spatial illustration, these do not carry the same significance as the EPA continuous monitoring data.

Overall, the results show that NO_2 air quality remained below the limit in most suburban locations with levels typically ranging between 15-25$\mu g/m^3$. While these levels are below the statutory limit, all are above the WHO Guideline for the protection of human health. Again, the primary source of NO_x is road traffic pollution and this is illustrated with the highest levels reported close to busier roads at Heuston Station (33.95$\mu g/m^3$) and Prospect Avenue, Glasnevin, Dublin (35.6$\mu g/m^3$).

Table 12.15: EPA NO_2 Clear Air Together Diffusion Tube Monitoring Data

Location	Tube No.	Distance from proposed Project (m)	Mean NO_2 Concentration ($\mu g/m^3$)
Landen Rd	1845283	25	23.70
Kylemore Road	1845474	190	19.89
Cremona Rd	1845449	105	16.80
Landen Road	1845300	41	17.38

[4] EPA Online Diffusion Tube Results https://www.epa.ie/environment-and-you/air/diffusion-tube-results/ Accessed 03/05/2022

Location	Tube No.	Distance from proposed Project (m)	Mean NO_2 Concentration (µg/m^3)
Lally Rd	1845542	130	15.57
Sarsfield Rd	1845306	152	17.09
Inchicore Rd	1845723	90	21.50
Inchicore Rd	1845754	60	16.97
Inchicore Rd	1845616	60	16.93
Inchicore Rd	1845034	60	19.42
Inchicore Rd	1845004	70	21.23
Inchicore Rd	1845691	80	16.96
Inchicore Rd	1845742	60	20.27
Heuston Station	1845706	0	33.95
Parkgate Rd	1845617	191	28.67
North Circular Rd	1845665	50	24.19
St David's Terrance	1845720	140	21.10
Glenbeigh Rd	1845669	60	16.12
Old Cabra Rd	1845078	170	17.48
Cabra Rd	1845681	40	14.20
Quarry Rd	1845032	117	18.18
Quarry Rd	1845013	160	15.67
Shandon Park	1845051	200	13.24
Leinster St N	1845010	130	13.68
Leinster St N	1845079	125	15.34
David Park	1845619	200	16.92
Prospect Ave	1845671	150	35.60
Prospect Ave	1845744	150	33.21
Iona Rd	1845659	200	18.22
Statutory Limit			40
WHO Guideline			10

In addition to the information collated by the EPA and partners, relevant baseline data has been gathered from other projects in the West Dublin area to inform this baseline. The monitoring data referenced is diffusion tube data collated from the reporting of the following projects:

- DART+ West: Monitoring was conducted over the six-month period from 17 September 2020 to 4 March 2021;
- MetroLink: Monitoring was conducted over 12-months from September 2018 to September 2019;
- BusConnects (Liffey Valley to City Centre and Lucan to City Centre): Monitoring was completed for a seven-month period from 15 November 2019 to 8 June 2020. However, due

to COVID-19 impacts on the baseline traffic environment during the initial lockdown in 2020, the final two data sets (16 March 2020 to 8 June 2020) are considered non 'typical' baseline data and therefore were not included in the baseline data set.

The results of this monitoring that are relevant to the area of the proposed Project in West Dublin are presented in Table 12.16. The results are higher than the Clear Air Together Project but lower than the EPA diffusion tube surveys. Typically, the more suburban locations show levels of the range 20-35µg/m^3 as all locations are on more heavily trafficked roads. While these levels are below the statutory limit, all are well above the WHO Guideline.

For the more urban locations (St. Johns Road and St. James Hospital) the levels are higher and marginally above the limit and well above the guideline. These results largely tally with the EPA continuous monitoring (Table 12.13) providing a high level of confidence in the data.

Table 12.16: Baseline NO_2 Monitoring from Other Transport Projects

Location	East (ITM)	West (ITM)	Mean NO_2 Concentration (µg/m^3)
Coldcut Crescent	707585	734187	31.5
Cherry Orchard Hospital	709064	733769	24.8
Ballyfermot Community Civic Centre	708045	733930	30.2
Le Fanu Road	709474	733510	18.2
De La Salle National School	710270	733726	31.7
181 Sarsfield Road, Kilmainham	711145	733761	31.4
14 Grattan Crescent, Inchicore	711851	733554	27.4
173 Emmet Road, Inchicore	711998	733484	30.8
38 Emmet Road, Inchicore	712533	733589	29.2
4 / 6 Brookfield Road / Brookfield Street Junction	713151	733500	32.8
St James Hospital	713539	733785	40.5
Fonthill Road, Liffey Valley	706984	735091	14.5
Chapelizod Court	710032	734260	38.1
125 Inchicore Road, Chapelizod	712056	733721	36
St. John's Road West, (EPA Colocation)	713589	734197	40.7
Statutory Limit			40
WHO Guideline			10

12.4.1.3. Particulate Matter

Particulate Matter (PM_{10} and $PM_{2.5}$) may be emitted as a primary pollutant from road vehicle exhausts as well as from the combustion of solid fuels (coal, peat, wood) and the EPA report that the main source (especially of the smaller and more dangerous $PM_{2.5}$ particles) is solid fuel burning for home heating.

Continuous PM_{10} and $PM_{2.5}$ monitoring is carried out by the EPA at St. John's Road, Davitt Road (Inchicore) and Ballyfermot (circa >1 km distance from the rail line). This data is presented in Table 12.17 for PM_{10} and Table 12.18 for $PM_{2.5}$.

The PM_{10} data shows levels in the range of 10-19µg/m^3 with an average of 14µg/m^3. These levels are largely stable in recent years and while well below the limit for the protection of human health, levels fluctuate above and below the WHO Guideline in the period 2015 to 2019. Similarly, $PM_{2.5}$ data is largely stable, well below the limit but in this case consistently above the WHO Guideline.

Table 12.17: Trends in PM_{10} Concentration (µg/m^3) in Zone A 2015 to 2020

Station	Averaging Period	Year					
		2015	2016	2017	2018	2019	2020[5]
St. John's Road, Kilmainham, Dublin 8	Annual Mean PM_{10} (µg/m^3)	-	-	-	14	14	13
Davitt Road, Inchicore, Dublin 12	Annual Mean PM_{10} (µg/m^3)	-	-	-	14	19	15
Ballyfermot, Dublin 10	Annual Mean PM_{10} (µg/m^3)	12	10.7	12	16	14	12
Statutory Limit	Annual Mean PM_{10} (µg/m^3)	40					
WHO Guideline	Annual Mean PM_{10} (µg/m^3)	15					

Table 12.18: Trends in $PM_{2.5}$ Concentration (µg/m^3) in Zone A 2018 to 2020

Station	Averaging Period	Year		
		2018	2019	2020[6]
St. John's Road, Kilmainham, Dublin 8	Annual Mean $PM_{2.5}$ (µg/m^3)	9	9	7
Davitt Road, Inchicore, Dublin 12	Annual Mean $PM_{2.5}$ (µg/m^3)	8	11	9
Ballyfermot, Dublin 10	Annual Mean $PM_{2.5}$ (µg/m^3)	7	10	8
Statutory Limit	Annual Mean $PM_{2.5}$ (µg/m^3)	25		
WHO Guideline	Annual Mean $PM_{2.5}$ (µg/m^3)	5		

[5] The 2020 concentrations, although shown, have not been included in the baseline section as data collected is not consistent with long-term trends due to the Covid-19 Lockdown.
[6] The 2020 concentrations, although shown, have not been included in the baseline section as data collected is not consistent with long-term trends due to the Covid-19 Lockdown.

12.4.2. Existing Baseline Dust Sensitivity Assessment

An appraisal has been carried out to assess the risk to sensitive receptors because of dust soiling, health impacts and ecological impacts due to the construction phase in accordance with the IAQM Guidance. This appraisal reviews the sensitivity of the site's location with respect to dust nuisance, human health and ecological impacts and then calculates a risk of impact using the magnitude of site activities. Receptor sensitivity can be described as follows with respect to nuisance dust as per the IAQM Guidance:

- High sensitivity receptor with respect to dust nuisance – surrounding land where:
  - Users can reasonably expect enjoyment of a high level of amenity;
  - The appearance, aesthetics or value of their property would be diminished by soiling;
  - The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land; or
  - Examples include dwellings, museums and other culturally important collections, medium and long-term car parks.
- Medium sensitivity receptor with respect to dust nuisance – surrounding land where:
  - Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home;
  - The appearance, aesthetics or value of their property could be diminished by soiling;
  - The people or property would not reasonably be expected to be present continuously or regularly for extended periods as part of the normal pattern of use of the land; or
  - Indicative examples include parks and places of work.
- Low sensitivity receptor with respect to dust nuisance – surrounding land where:
  - The enjoyment of amenity would not reasonably be expected;
  - Property would not reasonably be expected to be diminished in appearance, aesthetics, or value by soiling;
  - There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land; or
  - Indicative examples include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short term car parks and roads.

Receptor sensitivity can be described as follows with respect to human health as per the IAQM Guidance:

- High sensitivity receptor with respect to human health – surrounding land where:

- Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day); or

- Indicative examples include residential properties. Hospitals, schools, and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.

- Medium sensitivity receptor with respect to human health – surrounding land where:

- Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, relevant location would be one where individuals may be exposed for eight hours or more in a day); or

- Indicative examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.

- Low sensitivity receptor with respect to human health – surrounding land where:

- Locations where human exposure is transient; or

- Indicative examples include public footpaths, playing fields, parks, and shopping streets.

Receptor sensitivity can be described as follows with respect to ecology as per the IAQM Guidance:

- High sensitivity receptor with respect to ecology – surrounding land where:

  - Locations with an international or national designation and the designated features may be affected by dust soiling; or

  - Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.

- Medium sensitivity receptor with respect to ecology – surrounding land where:

  - Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or

  - Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.

- Low sensitivity receptor with respect to ecology – surrounding land where:

  - Locations with a local designation where the features may be affected by dust deposition; or

  - Indicative example is a local Nature Reserve with dust sensitive features.

Prior to assessing the impact from dust emissions, the sensitivity of the area must be established using the headings:

- Dust Soiling Effects on People and Property;
- Human Health Impacts; and
- Ecological Impacts.

The sensitivity of the area is considered as per the criteria outlined in the IAQM Guidance and as reproduced in Table 12.19, Table 12.20 and Table 12.21.

In terms of the sensitivity of the area to dust soiling effects on people and property, the receptor sensitivity, number of receptors and their distance from the source are considered. Using these criteria as outlined in Table 12.19, the sensitivity of the area to dust soiling can be established. The sensitivity will change along the linear project with some areas more sensitive to potential dust soiling effects than others. As there are greater than 10 receptors within 20m of the rail boundary, the sensitivity of the area to dust soiling effects on people and property is considered 'high'.

Table 12.19: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

The IAQM Guidance also outlines the criteria for assessing the human health impact from PM_{10} emissions from construction activities based on the current annual mean PM_{10} concentrations, receptor sensitivity and the number of receptors effected as per Table 12.20. The annual mean background PM_{10} concentration was reviewed in Section 12.4.1.3. This found concentrations to be significantly less than 24 µg/m^3 (Table 12.20). With this taken into consideration, as there are greater than 100 residential receptors within 20m of the redline boundary, the sensitivity of the area to human health impacts is considered 'medium'.

In addition to the track alignment, there are other areas with the potential for dust emissions these include; temporary construction compounds, bridge demolition/reconstruction, Heuston West Station, etc. The sensitivity of any of these individual compounds will not be greater than that of the rail alignment.

Table 12.20: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from Source (m)				
			<20	<50	<100	<200	<350
High	> 32µg/m^3	>100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from Source (m)				
			<20	<50	<100	<200	<350
		1 - 10	High	Medium	Low	Low	Low
	28µg/m^3 - 32µg/m^3	>100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24µg/m^3 – 28µg/m^3	>100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	< 24µg/m^3	>100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	> 32µg/m^3	>10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28µg/m^3 - 32µg/m^3	>10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24µg/m^3 - 28µg/m^3	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	< 24µg/m^3	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	1+	Low	Low	Low	Low	Low

An assessment of the proposed Project was completed with respect to the sensitivity criteria presented in Table 12.19 and Table 12.20. Where the number of receptors was not clear, conservative sensitivities were assumed. In addition, when calculating the sensitivity with respect to human health, the background concentrations of particulates were reviewed.

Dust deposition impacts on ecology can occur due to chemical or physical effects. This includes reduction in photosynthesis due to smothering from dust on the plants and chemical changes such as acidity to soils. Often impacts will be reversible once the works are completed and dust deposition ceases. The proposed Project will be within close proximity to the Grand Canal pNHA which is classed as a highly sensitive receptor. As shown in Table 12.21 the worst-case sensitivity of the area to ecological impacts is considered 'high' under this guidance without adequate mitigation.

Table 12.21: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

An overall summary of the baseline to dust nuisance, human health and ecological impacts is shown in Table 12.22.

Table 12.22: Summary of Sensitivity of the Area to Dust

Location	Description of Works	Chainage	Area (m^2)	Nuisance Sensitivity	Human Health Sensitivity	Ecology Sensitivity
Hazelhatch Station (West)	Compound CC-PW-3A-21355-A	24+700	1,400	Low	Low	Low
Hazelhatch Station	Compound CC-PW-3A-21356-A/B	24+200	2,220/1,045	High	Medium	Low
Loughlinstown Road	Compound CC-UTL-3A-21357-A/B	23+650	210/320	High	Medium	Low
Tubber Lane Road	Compound CC-UTL-3A-21358-A/B	22+600	220/1,290	High	Medium	Low
Adamstown (West)	Compound CC-SUB-3A-21359-A	21+000	3,050	High	Medium	Low
Adamstown Station	Compound CC-UTL-3A-21360-A/B	19+500	975/540	High	Medium	Low
Kishoge	Compound CC-UTL-3A-21361-A/B/C	18+000	1,920/1,430/1,055	High	Medium	Low
Clover Hill Road	Compound C-SET-3A-21362-A	15+500-	2,980	High	Medium	Low
East of the M50 and west of Park West Avenue	Compound CC-SET-3A-21363-A/B	14+300-14+500	1,780/4,760	High	Medium	Low
Cherry Orchard Ave / Cloverhill Road (north of railway line)	Compound CC-PW-3B-21365-A/B	13+200	900/3,535	High	Medium	Low
Friel Avenue (south of railway line)	Compound CC-STR-3B-21366-A	12+800	8,610	High	Medium	Low
Killeen Road Car Park	Compound CC-PW-3B-21366-A	12+800	9,110			
Killeen Road	Compound CC-PW-3B-21367-A/B	12+600	1,395/880			

Location	Description of Works	Chainage	Area (m^2)	Nuisance Sensitivity	Human Health Sensitivity	Ecology Sensitivity
Le Fanu Road	Compound CC-PW-3C-21368-A/B/C	12+600	-	High	Medium	Low
Inchicore West	Compound CC-PW-3D-21369-A	11+700	5,760	Medium	Medium	Low
Inchicore (Khyber Pass South)	Compound CC-PW-3D-21370-A/B	10+900	-	Medium	Medium	Low
Sarsfield Road Underbridge	Compound CC-STR-3E-21371-A/B/C	10+500	-	High	Medium	Low
Memorial Road	Compound CC-STR-3E-21372-A	10+300-	2,180	High	Medium	Low
Memorial Road / Con Colbert Road	Compound CC-STR-3F-21373-B	10+000	500	High	Medium	Low
Heuston West Station	Compound CC-PW-3I-21376-A/B/C	8+950	1,620/4,030/1,335	Low	Medium	Low
Cabra Compound at the old Cabra Sidings	Compound CC-PW-3J-21377-A	6+500-7+000	10,255	High	Medium	Low – c. 500m from Grand Canal pNHA
Glasnevin Cemetery Carpark	Compound CC-STR-3J-21378-A	5+650	1,650	High	Medium	Low – c. 200m from Grand Canal pNHA
Rail Line (General Works)	General civil, structural and electrical works.	5+600-24+400	--	High	Medium	High – crosses the Grand Canal pNHA at Ch 6+000
Rail Line (Track Expansion)	Installation of new railway tracks, Cutting into embankments. Construction of new retaining walls.	9+300-13+300		High	Medium	Low

12.4.3. Evolution of the Environment in the Absence of the Project (Do Nothing)

Annex IV of the EIA Directive sets out the information required to be included in an EIAR. This includes

> "*a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the Proposed Project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge*".

In the event that the proposed Project does not proceed, an assessment of the future baseline conditions has been carried out and is described within this section.

The baseline air quality trends shown for the Dublin area and nationally in recent years show a static or very slight gradual decline for pollutants. These gradual decreases are based on the implementation of a series of national and EU driven policies and legislation on emissions from road traffic, industrial emissions and space heating. The EPA air quality reports highlight the main challenges of reducing air pollution from key sources such as particulate matter emissions from solid fuel burning (e.g. peat, coal and wood) in the residential sector and NOx emissions from vehicles in the transport sector.

Looking forward, the Government's proposed 'National Clean Air Strategy' (to be published in 2023) is expected to propose further policy solutions to address the major public health and environmental challenges posed by air pollution. It is anticipated that this policy document will enable further improvements in ambient air quality with the objective of achieving compliance with the WHO Guidelines (2021).

The Climate Action Plan 2021 and the updated Climate Action Plan 2023 have committed to achieving a net zero carbon energy system objective through a combination of targets. The transport targets, while related to climate, will have resultant co-benefits for air quality if successfully implemented by reducing the direct emissions from road traffic vehicles. This reduction may be achieved through both modal shift and the electrification of the road traffic fleet.

Ongoing reductions in tailpipe emissions for road traffic will also be delivered through the EU Auto Oil program which regulates a continual reduction in emissions per fleet vehicle in Ireland as newer Euro 6/VI vehicle, hybrids and electric vehicles (EV) replace older vehicles. This decrease may be somewhat offset by the increased number of vehicles in the fleet and/or a reduction in efficiency on the road network.

Industrial, energy and space heating emissions are expected to show a gradual decrease through greater regulation from a range of EU and national policies, targets and strategies on emissions reductions and demand management.

In short, there is a broad mix of EU and national policy and legislation directed at reducing transport, industrial and space heating emissions to improve air quality. It is expected that national and ambient levels of air quality pollutants will decrease in future years with the successful implementation of the above policy and regulation.

12.5. Description of Potential Impacts

The proposed Project will involve the electrification of the rail line from Hazelhatch & Celbridge Station to Glasnevin via the Phoenix Park Tunnel Branch Line. The total length of the proposed Project is approximately 20 kilometres. When considering a Project of this nature, the potential air quality impact on the surroundings must be considered for each of two distinct stages:

- Construction phase; and
- Operational phase.

12.5.1. Potential Construction Impacts

12.5.1.1. Construction Traffic Regional Impacts

During construction , there are a number of temporary bridge closures across the Project area which will require a level of traffic diversion with potential for air quality impact. The main potential for significant impact will be during the closures of Le Fanu Road Bridge (OBC7), Kylemore Road Bridge (OBC5A) and Memorial Road Bridge (OBC3) and these are addressed in detail below. The temporary closure of the Sarsfield Road Underpass Bridge (UBC4) is expected to be 5-7 days in duration and while there is short term potential for traffic disruption, the resultant impact on air quality in the area will be negligible in this timeframe and is not considered in detail in this analysis. Similarly, the temporary closure of the Glasnevin Cemetery Bridge (OBO10) will only be for a period of 21 days for the temporary closure where traffic will be suspended and while there is potential for impact in the shortened timeframe the magnitude of impacts to air quality is considered negligible. Closure of the Khyber Pass Footbridge (OBC5) has no potential for air quality impact from traffic as this is a footbridge and will not require traffic diversions.

Revising the traffic patterns may have a resultant impact on emissions and the total vehicular emissions on the road network under the existing conditions coupled with each of the proposed diversions are shown in Table 12.23. The results indicate that emissions from road traffic on the surrounding road network will increase as a result of all three diversions at Le Fanu Road Bridge (OBC7), Kylemore Road Bridge (OBC5A) and Memorial Road Bridge (OBC3) but the impact is minimal (less than 3%) over the existing traffic emissions.

Table 12.23: Regional Impact of Changes to Traffic Patterns as a result of Planned Diversions

Scenario	Total NO_x (kg/year)	Total PM_{10} (kg/year)
Existing (No Construction)	31,579	867
Closure of Le Fanu Road Bridge	32,329	888
Net Change (%)	2% Increase	2% Increase
Closure of Kylemore Road Bridge	32,340	890
Net Change (%)	2% Increase	3% Increase
Closure of Memorial Road Bridge	31,706	875
Net Change (%)	0.4% Increase	1% increase
Total Potential Increase (kg/year)	**1,638**	**52**

In addition to the planned bridge closures and diversions, there are also potential emissions from construction traffic delivering personnel and materials to each of the works areas. The total predicted traffic and associated emissions for each of the main works areas are shown in Table 12.24. Results are presented based on a conservative assumption that the listed AADT will be required for a full calendar year and each trip undertaken will be 100km each way.

As expected, the results indicate that the work areas with the greatest traffic requirement (areas between Park West and Heuston) will result in the highest emissions. Overall, the annual emissions assuming all work areas operate simultaneously equate to 70,167 kg of NO_x and 1,983kg PM_{10}.

Table 12.24: Regional Impact of Construction Traffic

Works Area	Predicted AADT	Total NO_x (kg/year)	Total PM_{10} (kg/year)
Hazelhatch Station to Park West and Cherry Orchard Station	108	2,752	78
Park West & Cherry Orchard Station to Le Fanu Road Bridge	482	12,280	347
Le Fanu Road Bridge to Kylemore Road Bridge	348	8,866	251
Kylemore Road to Sarsfield Road	382	9,733	275
Sarsfield Road Bridge to Memorial Road Bridge	380	9,682	274
Memorial Road Bridge to Heuston Yard Junction	398	10,140	287
Heuston Yard	288	7,338	207
Heuston West	148	3,771	107
Phoenix Park Tunnel North to Glasnevin Connection	220	5,605	158
Total Emissions (kg/year)		**70,167**	**1,983**

Cumulatively, the additional emissions associated with both the diversions and the construction traffic amount to 71,805kg (71.8 tonnes) of NO_x and 2,035kg (2.0 tonnes) of PM_{10} during construction. These levels equate to 0.18% of the NO_x emissions ceiling for 2030 and 0.02% of the PM_{10} emission ceiling for 2030 as presented in Table 12.2. As a consequence, these regional impacts to air quality as a result of diversions and construction traffic are considered to be a short term 'slight adverse' impact.

12.5.1.2. Construction Traffic Impacts on Human Receptors

In addition to the regional emissions, the proposed diversions and construction traffic may also have potential for local air quality impacts for residents located along the roads proposed as diversionary routes and haul routes. Where traffic levels are in excess of 10% of the baseline, there is a potential for significant effect on air quality for these residents. The routes where the greatest changes to road traffic as a result of the diversions and/or construction traffic have been assessed for local impact in

this analysis. Predicted pollutant concentrations are provided at the worst-case receptors, i.e. those properties that are closest to the routes most affected by diversions and haul routes.

For the diversions to accommodate the reconstruction of the Le Fanu Road Bridge (OBC7), traffic will be diverted to Kylemore Avenue, Kylemore Road and Kylemore Park North. The receptors closest to these routes and the estimated traffic increases are listed as follows:

- **R1:** Residential properties at ~10m from Kylemore Road between Ballyfermot Road and Kylemore Avenue (27% temporary increase in traffic);
- **R2:** Residential properties at ~8m from Kylemore Avenue (64% temporary increase in traffic);
- **R3:** Residential properties at ~10m from Kylemore Road between Kylemore Avenue and Landen Road (52% temporary increase in traffic);
- **R4:** Residential properties at ~10m from Kylemore Road Bridge (54% temporary increase in traffic); and
- **R5:** Commercial properties at ~11m from Kylemore Park North (77% temporary increase in traffic).

The results of the analyses for these receptors are presented in Table 12.25. The table shows the urban background derived from the nearest monitoring station at Ballyfermot but excluding 2020 data (see Table 12.13). The table shows the level of traffic pollution (including background) for each receptor under the existing traffic flows and the net impact with the additional traffic associated with the diversions. The net increase is also shown and the results are compared against the TII significance criteria shown in Table 12.10.

All receptors will experience a temporary increase in traffic pollution as a result of increased traffic on these routes caused by the diversion. Both with the existing traffic patterns and the diversion traffic, all receptors will experience levels of traffic pollution below the statutory limit for the protection of human health. However, all scenarios show the average NO_2 level above the WHO Guideline and the PM_{10} levels are only marginally below the corresponding WHO guideline.

The largest increases in pollution are at R2 (Kylemore Avenue), R3 (Kylemore Road), R4 (Kylemore Road Bridge) and R5 (Kylemore Park North). At properties along these routes there is a projected 'small' increase in annual average NO_2 for the duration of the diversion. Applying the TII significance criteria in Table 12.11, a 'small' increase but remaining well below the limit value results in a 'negligible' impact for local air quality for these properties as a result of the temporary diversion.

Table 12.25: Local Impact to Air Quality as a result of the Le Fanu Road Bridge (OBC7) Diversion

Property Group	Scenarios	Nitrogen Dioxide (µg/m³)	Particulate Matter (PM_{10}) µg/m³
		Annual Average NO_2	Annual Average PM_{10}
Background		**17**	**13**
R1	Existing	21.25	14.10
	Diversion	21.53	14.20
	Net Change	**+0.28**	**+0.10**
	Impact Rating	**Imperceptible**	**Imperceptible**

Property Group	Scenarios	Nitrogen Dioxide (µg/m³)	Particulate Matter (PM_{10}) µg/m³
		Annual Average NO_2	Annual Average PM_{10}
Background		**17**	**13**
R2	Existing	18.31	13.32
	Diversion	18.97	13.52
	Net Change	**+0.66**	**+0.20**
	Impact Rating	**Small**	**Imperceptible**
R3	Existing	21.34	14.11
	Diversion	21.91	14.31
	Net Change	**+0.57**	**+0.20**
	Impact Rating	**Small**	**Imperceptible**
R4	Existing	21.14	14.08
	Diversion	21.72	14.28
	Net Change	**+0.58**	**+0.20**
	Impact Rating	**Small**	**Imperceptible**
R5	Existing	19.71	13.56
	Diversion	21.19	13.98
	Net Change	**+1.48**	**+0.42**
	Impact Rating	**Small**	**Small**
Statutory Limits		**40**	**40**
WHO Guidelines		**10**	**15**

For the diversions to accommodate the reconstruction of the Kylemore Road Bridge (OBC5A), traffic will be similarly diverted via Kylemore Avenue, Le Fanu Road and Kylemore Park North. The receptors closest to these routes and the estimated traffic increases are listed as follows:

- **R1:** Residential properties at ~10m from Le Fanu Road (49% temporary increase in traffic);
- **R2:** Residential properties at ~8m from Kylemore Avenue (42% temporary increase in traffic);
- **R3:** Residential properties at ~8m from Le Fanu Road Bridge (85% temporary increase in traffic); and
- **R4:** Commercial properties at ~11m from Kylemore Park North (77% temporary increase in traffic).

The results of the analyses for these receptors are presented in Table 12.26. Like the Le Fanu Road Bridge (OBC7) diversion, all receptors will experience a temporary increase in traffic pollution as a result of increased traffic on these routes caused by the diversion and it is noted that properties on Kylemore Avenue and Kylemore Park North will experience an increase in pollution for the duration of both diversions.

Both with the existing traffic patterns and the diversion traffic, all receptors will experience levels of traffic pollution below the statutory limit for the protection of human health. But again, all scenarios show the average NO_2 level above the WHO guideline and the PM_{10} levels are only marginally below the corresponding WHO guideline.

All properties along the diversion route are projected to experience a 'small' increase in pollution for the duration of the diversion. Applying the TII significance criteria in Table 12.11, a 'small' increase but remaining well below the limit value results in a 'negligible' impact for local air quality for these properties as a result of the temporary diversion.

Table 12.26: Local Impact to Air Quality as a Result of the Kylemore Bridge Diversion

Property Group	Scenarios	Nitrogen Dioxide (µg/m³)	Particulate Matter (PM_{10}) µg/m³
		Annual Average NO_2	Annual Average PM_{10}
Background		**17**	**13**
R1	Existing	18.70	13.46
	Diversion	19.47	13.69
	Net Change	**+0.77**	**+0.23**
	Impact Rating	**Small**	**Imperceptible**
R2	Existing	18.31	13.32
	Diversion	18.83	13.46
	Net Change	**+0.52**	**+0.14**
	Impact Rating	**Small**	**Imperceptible**
R3	Existing	19.11	13.59
	Diversion	20.38	14.01
	Net Change	**+1.27**	**+0.42**
	Impact Rating	**Small**	**Small**
R4	Existing	19.71	13.56
	Diversion	21.03	13.92
	Net Change	**+1.32**	**+0.36**
	Impact Rating	**Small**	**Small**
Statutory Limits		**40**	**40**
WHO Guidelines		**10**	**15**

For the diversions to accommodate the reconstruction of Memorial Road Bridge (OBC3), traffic will be diverted via the R111 (South Circular Road) north of the junction with the Inchicore Road. The receptors closest to these routes and the estimated traffic increases are listed as follows:

- **R1:** Residential properties at ~7m from South Circular Road between Inchicore Road and the Chapelizod Bypass (38% temporary increase in traffic); and
- **R2:** Residential properties at ~5m from South Circular Road north of the Chapelizod Bypass (33% temporary increase in traffic).

The results of the analyses for these receptors are presented in Table 12.27. All receptors will experience a temporary increase in traffic pollution as a result of increased traffic on these routes caused by the diversion. Both with the existing traffic patterns and the diversion traffic, all receptors will experience levels of traffic pollution below the statutory limit for the protection of human health. But again, all scenarios show the average NO_2 level above the WHO guideline and the PM_{10} levels are only marginally below the corresponding WHO guideline.

All properties along the diversion are projected to experience a 'small' increase in pollution for the duration of the diversion. Applying the TII significance criteria in Table 12.11, a 'small' increase but remaining well below the limit value results in a 'negligible' impact for local air quality for these properties as a result of the temporary diversion.

Table 12.27: Local Impact to Air Quality as a result of the Memorial Road Bridge (OBC3) Diversion

Property Group	Scenarios	Nitrogen Dioxide (µg/m³)	Particulate Matter (PM_{10}) µg/m³
		Annual Average NO_2	Annual Average PM_{10}
Background		**17**	**13**
R1	Existing	20.78	14.11
	Diversion	21.22	14.25
	Net Change	**+0.45**	**+0.14**
	Impact Rating	**Small**	**Imperceptible**
R2	Existing	20.78	14.11
	Diversion	21.22	14.25
	Net Change	**+0.44**	**+0.14**
	Impact Rating	**Small**	**Imperceptible**
Statutory Limits		**40**	**40**
WHO Guidelines		**10**	**15**

In addition to the diversions as outlined, there is also potential for localised air quality impact from construction vehicles operating on the haul routes serving the work areas. The projected traffic numbers for each work area (as presented in Table 12.24) have been used to quantify the potential increase in pollution level on the points between the sites and the haul routes. The data is presented as a worst case which assumes that all traffic for all work packages is delivered simultaneously with maximum traffic.

The results of this analysis are presented in Table 12.28 and shows the predicted levels of increase of pollution under these circumstances. Again, the net increase is also shown and the results are compared against the TII significance criteria shown in Table 12.10.

Construction traffic for all work areas shows an increase in localised air pollution ranging from 'imperceptible' in the areas where construction traffic need is lower (Hazelhatch and Heuston West) to 'small' for the more intense work areas. Applying the TII significance criteria in Table 12.11, a 'small' increase but remaining well below the limit value results in a 'negligible' impact for local air quality as a result of construction traffic.

Table 12.28: Local Impact to Air Quality as a result proposed Haul Routes

Works Area	Immediate Haul Route	Predicted Increase in Annual Average NO_2 (µg/m^3)	Predicted Increase in Annual Average PM_{10} (µg/m^3)	TII Significance
Hazelhatch Station to Park West and Cherry Orchard Station	Hazelhatch Road	+0.29	+0.02	Imperceptible
Park West & Cherry Orchard Station to Le Fanu Road Bridge	Le Fanu Road North and South and South via Park West Road	+1.06	+0.10	Small
Le Fanu Road Bridge to Kylemore Road Bridge	Kylemore Road north and South	+0.80	+0.07	Small
Kylemore Road to Sarsfield Road	Kylemore and Long Mile Road to South	+0.87	+0.08	Small
Sarsfield Road Bridge to Memorial Road Bridge	Sarsfield Road	+0.86	+0.08	Small
Memorial Road Bridge to Heuston Yard Junction	Con Colbert Road	+0.90	+0.08	Small
Heuston Yard	St John's Road	+0.68	+0.06	Small
Heuston West	St John's Road	+0.38	+0.03	Imperceptible
Phoenix Park Tunnel North to Glasnevin Connection	Cabra Road	+0.54	+0.05	Small

It is noted that both Kylemore Road and Le Fanu Road are predicted to experience a negative impact both from diversions for bridge works and from construction traffic for compounds in the area. The potential for cumulative adverse air quality impact on these roads for both diversions and construction traffic are summarised below.

The Le Fanu Road is predicted to experience an increase of 0.77-1.27µg/m^3 in annual average NO_2 as a result of diversions to accommodate the Kylemore Road Bridge (Table 12.26) as well as a further 1.06µg/m^3 for construction traffic (Table 12.28). Cumulatively this equates to a potential increase of 2.3µg/m^3 for properties on this road equating to a cumulative 'medium' increase in pollution. Applying the TII significance criteria in Table 12.11, a 'medium' increase but remaining well below the limit value results in a 'negligible' impact for local air quality.

The Kylemore Road is predicted to experience an increase of 0.28-0.58µg/m^3 in annual average NO_2 as a result of diversions to accommodate the Kylemore Road Bridge (Table 12.26) as well as a further 0.80µg/m^3 for construction traffic (Table 12.28). Cumulatively this equates to a potential increase of 1.4µg/m^3 for properties on this road equating to a cumulative 'small' increase in pollution. Applying the TII significance criteria in Table 12.11, a 'small' increase but remaining well below the limit value results in a 'negligible' impact for local air quality.

12.5.1.3. Construction Traffic Impacts on Ecological Receptors

The impact of the proposed Project on ecologically sensitive areas within the study area during the Construction Phase has also been considered for the only designated habitat site in the study area (i.e. Grand Canal pNHA located at Chainage 6+100 in Glasnevin).

There are no planned diversions in this area so there are no direct impacts to this receptor. There are compounds located in the area that will be served by road traffic but this work is moderate and traffic is limited to the following:

- 12 AADT to Glasnevin compound; and
- 22 AADT to accommodate bridge road and car park construction at Glasnevin cemetery.

This combined 36 AADT of construction will potentially raise the ambient levels of NO_x in the immediate area of the road by 0.2µg/m^3. This is an 'imperceptible' increase and the potential impact on the Grand Canal pNHA from construction traffic is 'negligible'.

12.5.1.4. Construction Dust

The greatest potential impact on air quality during the construction phase is from construction dust emissions, PM_{10} and $PM_{2.5}$ emissions and the potential for nuisance dust. Dust is characterised as encompassing particulate matter with a particle size of between 1 and 75 microns (1- 75µm), therefore includes both PM_{10} and $PM_{2.5}$. Deposition typically occurs in close proximity to each site and potential impacts generally occur within 350m of the route used by construction vehicles on the public road, up to 500m from the site entrance.

Large particle sizes (greater than 75 microns) fall rapidly out of atmospheric suspension and are subsequently deposited in close proximity to the source. Particle sizes of less than 75 microns are of interest as these can remain airborne for greater distances and give rise to the potential dust nuisance at the sensitive receptors.

This section of the chapter provides an overview of the typical activities that have potential for dust impacts during the construction phase of the proposed Project. The potential for dust emissions due to construction can vary substantially day to day and are strongly influenced by the level of activity, the specific operations, and the prevailing meteorological conditions. While each individual site compound will differ, the processes that have the potential for the generation of construction dust will be similar. Further details on construction methods can be found in Chapter 5 which contains an overview of the activities and methods that are anticipated to be used during construction and commissioning of the proposed Project.

The following operations are the main dust generating sources or activities:

- Vegetation clearance – removes grass and other soil covering;
- Demolition – detailed demolition plans will be required to minimise dust generation;
- Movement of trucks along paved public roads – potential of track-out[7] of dust on vehicle tyres from construction sites or resuspension of dust;

[7] Trackout accounts for the risk of dust being emitted as a result of dirt, mud or other debris from construction traffic, as they emerge from construction sites onto public roads.

- Movement of trucks along unpaved haul roads (this will only be relevant for a number of sites) – potential for resuspension of dust as vehicles move around the site;
- Extraction of material – works will be broken down into different types however all will involve the movement of potentially dusty material which has the potential to generate dust; and
- Stockpiling of material – stockpiles have the potential to generate dust due to dry material movement and wind erosion.

12.5.1.4.1. Assessment of Potential Sensitivity and Potential Impact to Construction Dust

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude (Section 12.3.3.3) for each dust generation at each site needs to be taken into account in conjunction with the previously established sensitivity of the area (Section 12.4.2). Using the appraisal criteria for the assessment of risk at sensitive receptors as detailed in Table 12.4 to Table 12.7, a summary of dust emission magnitudes from the main construction sites is shown in Table 12.29, where compounds or sites are located in proximity these have been grouped with respect to dust assessment. This is due to these compounds acting as a single potential source with respect to dust emission magnitudes.

The resultant requirement levels (i.e. high, medium or low levels of mitigation) for mitigation with respect to nuisance dust, health impacts and ecological impacts are shown in Table 12.30 to Table 12.33 and an overall summary provided in Table 12.34.

The mitigation requirement levels take into account the sensitivity of the location established in Section 12.4.2 and the activities conducted on site which may generate dust, the assessment finds that a high level of dust mitigation is required for the majority of sites. Dust mitigation measures will also be put in place at any auxiliary sites not listed in the table below. Given the interconnected nature of the sites it is recommended that a high level of mitigation is provided at all locations.

Consistent implementation of good dust minimisation practices will ensure that the impact from construction dust is localised, reversible and not significant when considered with respect to the EPA description of effects.

Table 12.29: Summary of Emission Magnitude

Location	Description of Works	Chainage	Demolition	Earthworks	Construction	Track-out
Hazelhatch Station (West)	Compound CC-PW-3A-21355-A	24+700	Small	Small	Small	Small
Hazelhatch Station	Compound CC-PW-3A-21356-A/B	24+200	Small	Small	Small	Small
Loughlinstown Road	Compound CC-UTL-3A-21357-A/B	23+650	Small	Large	Medium	Medium
Tubber Lane Road	Compound CC-UTL-3A-21358-A/B	22+600	Small	Large	Large	Medium
Adamstown (West)	Compound CC-SUB-3A-21359-A	21+000	Small	Large	Large	Medium
Adamstown Station	Compound CC-UTL-3A-21360-A/B	19+500	Small	Large	Large	Medium
Kishoge	Compound CC-UTL-3A-21361-A/B/C	18+000	Small	Small	Small	Small
Clover Hill Road	Compound C-SET-3A-21362-A	15+500-	Small	Large	Medium	Medium
East of the M50 and west of Park West Avenue	Compound CC-SET-3A-21363-A/B	14+300-14+500	Small	Large	Large	Medium
Cherry Orchard Ave / Cloverhill Road	Compound CC-PW-3B-21365-A/B	13+200	Small	Large	Large	Medium
Friel Avenue	Compound CC-STR-3B-21366-A	12+800	Small	Large	Large	Medium
Killeen Road Car Park	Compound CC-PW-3B-21366-A	12+800	Medium	Large	Large	Medium
Killeen Road	Compound CC-PW-3B-21367-A/B	12+600	Medium	Large	Large	Medium
Le Fanu Road	Compound CC-PW-3C-21368-A/B/C	12+600	Medium	Large	Medium	Medium
Inchicore West	Compound CC-PW-3D-21369-A	11+700	Medium	Medium	Large	Medium
Inchicore	Compound CC-PW-3D-21370-A/B	10+900	Medium	Medium	Medium	Medium
Sarsfield Road Underbridge	Compound CC-STR-3E-21371-A/B/C	10+500	Small	Medium	Medium	Medium
Memorial Road	Compound CC-STR-3E-21372-A	10+300-	Small	Medium	Medium	Medium
Memorial Road / Con Colbert	Compound CC-STR-3F-21373-B	10+000	Small	Medium	Large	Medium

Location	Description of Works	Chainage	Demolition	Earthworks	Construction	Track-out
Road						
Heuston West Station	Compound CC-PW-3I-21376-A/B/C	8+950	Medium	Medium	Large	Medium
Cabra Compound at the old Cabra Sidings	Compound CC-PW-3J-21377-A	6+500-7+000	Small	Medium	Large	Small
Glasnevin Cemetery Carpark	Compound CC-STR-3J-21378-A	5+650	Small	Medium	Small	Small
Rail Line (Track Expansion)	Installation of new railway tracks, Cutting into embankments. Construction of new retaining walls.	9+300-13+300	Medium	Large	Large	Medium
Rail Line (General Works)	General civil, structural and electrical works.	5+600-24+400	Medium	Large	Large	Medium

Table 12.30: Summary of Demolition Risk to Define Site-Specific Mitigation

Location	Description of Works	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Hazelhatch Station (West)	Compound CC-PW-3A-21355-A	Negligible	Negligible	Negligible
Hazelhatch Station	Compound CC-PW-3A-21356-A/B	Low	Low	Negligible
Loughlinstown Road	Compound CC-UTL-3A-21357-A/B	Low	Low	Negligible
Tubber Lane Road	Compound CC-UTL-3A-21358-A/B	Low	Low	Low
Adamstown (West)	Compound CC-SUB-3A-21359-A	Low	Low	Negligible
Adamstown Station	Compound CC-UTL-3A-21360-A/B	Low	Low	Negligible
Kishoge	Compound CC-UTL-3A-21361-A/B/C	Medium	Medium	Low
Clover Hill Road	Compound C-SET-3A-21362-A	Medium	Medium	Negligible
East of the M50 and west of Park West Avenue	Compound CC-SET-3A-21363-A/B	Medium	Medium	Low
Cherry Orchard Ave / Cloverhill Road	Compound CC-PW-3B-21365-A/B	Medium	Medium	Low
Friel Avenue	Compound CC-STR-3B-21366-A	Medium	Medium	Low
Killeen Road Car Park	Compound CC-PW-3B-21366-A	Low	Low	Negligible
Killeen Road	Compound CC-PW-3B-21367-A/B	Low	Low	Negligible
Le Fanu Road	Compound CC-PW-3C-21368-A/B/C	Medium	Medium	Low
Inchicore West	Compound CC-PW-3D-21369-A	Low	Low	Negligible
Inchicore	Compound CC-PW-3D-21370-A/B	Low	Low	Negligible
Sarsfield Road Underbridge	Compound CC-STR-3E-21371-A/B/C	Low	Low	Negligible
Memorial Road	Compound CC-STR-3E-21372-A	Low	Low	Negligible
Memorial Road / Con Colbert Road	Compound CC-STR-3F-21373-B	Low	Low	Negligible
Heuston West Station	Compound CC-PW-3I-21376-A/B/C	Low	Low	Negligible
Cabra	Compound CC-PW-3J-	Low	Low	Negligible

Location	Description of Works	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Compound at the old Cabra Sidings	21377-A			
Glasnevin Cemetery Carpark	Compound CC-STR-3J-21378-A	Low	Low	Negligible
Rail Line (Rail Corridor Widening)	Installation of new railway tracks	Medium	Medium	Low
Rail Line (General Works)	General works.	Medium	Medium	Medium

Table 12.31: Summary of Earthworks Risk to Define Site-Specific Mitigation

Location	Description of Works	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Hazelhatch Station (West)	Compound CC-PW-3A-21355-A	Low	Negligible	Negligible
Hazelhatch Station	Compound CC-PW-3A-21356-A/B	Low	Low	Negligible
Loughlinstown Road	Compound CC-UTL-3A-21357-A/B	High	Medium	Low
Tubber Lane Road	Compound CC-UTL-3A-21358-A/B	High	Medium	Low
Adamstown (West)	Compound CC-SUB-3A-21359-A	High	Medium	Low
Adamstown Station	Compound CC-UTL-3A-21360-A/B	High	Medium	Low
Kishoge	Compound CC-UTL-3A-21361-A/B/C	High	Medium	Low
Clover Hill Road	Compound C-SET-3A-21362-A	High	Medium	Low
East of the M50 and west of Park West Avenue	Compound CC-SET-3A-21363-A/B	Medium	Medium	Low
Cherry Orchard Ave / Cloverhill Road	Compound CC-PW-3B-21365-A/B	Medium	Medium	Low
Friel Avenue	Compound CC-STR-3B-21366-A	Medium	Medium	Low
Killeen Road Car Park	Compound CC-PW-3B-21366-A	Medium	Medium	Low
Killeen Road	Compound CC-PW-3B-21367-A/B	Medium	Medium	Low
Le Fanu Road	Compound CC-PW-3C-21368-A/B/C	Medium	Medium	Low
Inchicore West	Compound CC-PW-3D-21369-A	Medium	Medium	Low

Location	Description of Works	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Inchicore	Compound CC-PW-3D-21370-A/B	Low	Medium	Low
Sarsfield Road Underbridge	Compound CC-STR-3E-21371-A/B/C	Medium	Medium	Low
Memorial Road	Compound CC-STR-3E-21372-A	Medium	Medium	Low
Memorial Road / Con Colbert Road	Compound CC-STR-3F-21373-B	Medium	Medium	Low
Heuston West Station	Compound CC-PW-3I-21376-A/B/C	Medium	Medium	Low
Cabra Compound at the old Cabra Sidings	Compound CC-PW-3J-21377-A	Medium	Medium	Low
Glasnevin Cemetery Carpark	Compound CC-STR-3J-21378-A	Medium	Medium	Low
Rail Line (Rail Corridor Widening)	Installation of new railway tracks	High	Medium	Low
Rail Line (General Works)	General works.	High	Medium	High

Table 12.32: Summary of Construction Risk to Define Site-Specific Mitigation

Location	Description of Works	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Hazelhatch Station (West)	Compound CC-PW-3A-21355-A	Negligible	Negligible	Negligible
Hazelhatch Station	Compound CC-PW-3A-21356-A/B	Negligible	Negligible	Negligible
Loughlinstown Road	Compound CC-UTL-3A-21357-A/B	Medium	Low	Low
Tubber Lane Road	Compound CC-UTL-3A-21358-A/B	High	Medium	Low
Adamstown (West)	Compound CC-SUB-3A-21359-A	High	Medium	Low
Adamstown Station	Compound CC-UTL-3A-21360-A/B	High	Medium	Low
Kishoge	Compound CC-UTL-3A-21361-A/B/C	High	Medium	Low
Clover Hill Road	Compound C-SET-3A-21362-A	High	Medium	Low
East of the M50 and west of Park West Avenue	Compound CC-SET-3A-21363-A/B	Medium	Medium	Low
Cherry Orchard Ave / Cloverhill Road	Compound CC-PW-3B-21365-A/B	Medium	Low	Low
Friel Avenue	Compound CC-STR-3B-	Medium	Low	Low

Location	Description of Works	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
	21366-A			
Killeen Road Car Park	Compound CC-PW-3B-21366-A	Medium	Low	Low
Killeen Road	Compound CC-PW-3B-21367-A/B	Medium	Low	Low
Le Fanu Road	Compound CC-PW-3C-21368-A/B/C	High	Medium	Low
Inchicore West	Compound CC-PW-3D-21369-A	High	Medium	Low
Inchicore	Compound CC-PW-3D-21370-A/B	Low	Medium	Low
Sarsfield Road Underbridge	Compound CC-STR-3E-21371-A/B/C	Low	Negligible	Negligible
Memorial Road	Compound CC-STR-3E-21372-A	Medium	Low	Low
Memorial Road / Con Colbert Road	Compound CC-STR-3F-21373-B	Medium	Low	Low
Heuston West Station	Compound CC-PW-3I-21376-A/B/C	Medium	Low	Low
Cabra Compound at the old Cabra Sidings	Compound CC-PW-3J-21377-A	Medium	Low	Low
Glasnevin Cemetery Carpark	Compound CC-STR-3J-21378-A	Medium	Low	Low
Rail Line (Rail Corridor Widening)	Installation of new railway tracks	High	Medium	Low
Rail Line (General Works)	General works.	High	Medium	Low
Rail Line (General Works)	General civil, structural and electrical works.	High	Medium	Medium

Table 12.33: Summary of Trackout Risk to Define Site-Specific Mitigation

Location	Description of Works	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Hazelhatch Station (West)	Compound CC-PW-3A-21355-A	Negligible	Negligible	Negligible
Hazelhatch Station	Compound CC-PW-3A-21356-A/B	Medium	Low	Negligible
Loughlinstown Road	Compound CC-UTL-3A-21357-A/B	Medium	Medium	Low
Tubber Lane Road	Compound CC-UTL-3A-21358-A/B	Medium	Medium	Low
Adamstown (West)	Compound CC-SUB-3A-21359-A	Medium	Medium	Low
Adamstown Station	Compound CC-UTL-3A-	Medium	Medium	Low

Location	Description of Works	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
	21360-A/B			
Kishoge	Compound CC-UTL-3A-21361-A/B/C	Medium	Medium	Low
Clover Hill Road	Compound C-SET-3A-21362-A	Medium	Medium	Low
East of the M50 and west of Park West Avenue	Compound CC-SET-3A-21363-A/B	Medium	Medium	Low
Cherry Orchard Ave / Cloverhill Road	Compound CC-PW-3B-21365-A/B	Medium	Medium	Low
Friel Avenue	Compound CC-STR-3B-21366-A	Medium	Medium	Low
Killeen Road Car Park	Compound CC-PW-3B-21366-A	Medium	Medium	Low
Killeen Road	Compound CC-PW-3B-21367-A/B	Medium	Medium	Low
Le Fanu Road	Compound CC-PW-3C-21368-A/B/C	Medium	Medium	Low
Inchicore West	Compound CC-PW-3D-21369-A	Medium	Medium	Low
Inchicore	Compound CC-PW-3D-21370-A/B	Negligible	Medium	Low
Sarsfield Road Underbridge	Compound CC-STR-3E-21371-A/B/C	Low	Low	Negligible
Memorial Road	Compound CC-STR-3E-21372-A	Medium	Medium	Low
Memorial Road / Con Colbert Road	Compound CC-STR-3F-21373-B	Medium	Medium	Low
Heuston West Station	Compound CC-PW-3I-21376-A/B/C	Medium	Medium	Low
Cabra Compound at the old Cabra Sidings	Compound CC-PW-3J-21377-A	Medium	Medium	Low
Glasnevin Cemetery Carpark	Compound CC-STR-3J-21378-A	Low	Low	Negligible
Rail Line (Rail Corridor Widening)	Installation of new railway tracks	Medium	Medium	Low
Rail Line (General Works)	General works.	Medium	Medium	Medium

12.5.1.4.2. Summary of Potential Dust Impacts

The risk of dust impacts arising from the proposed Project are summarised in Table 12.34. The magnitude of risk determined is used to prescribe the level of site-specific mitigation required for each activity to prevent significant impacts occurring. The impacts associated with construction phase dust emissions are considered short term ‘slight adverse’ impacts.

Table 12.34: Summary Overall Dust Impact Risk to Define Site-Specific Mitigation

Location	Description of Works	Chainage	Worst Case Risk
Hazelhatch Station (West)	Compound CC-PW-3A-21355-A	24+700	Low
Hazelhatch Station	Compound CC-PW-3A-21356-A/B	24+200	Medium
Loughlinstown Road	Compound CC-UTL-3A-21357-A/B	23+650	High
Tubber Lane Road	Compound CC-UTL-3A-21358-A/B	22+600	High
Adamstown (West)	Compound CC-SUB-3A-21359-A	21+000	High
Adamstown Station	Compound CC-UTL-3A-21360-A/B	19+500	High
Kishoge	Compound CC-UTL-3A-21361-A/B/C	18+000	High
Clover Hill Road	Compound C-SET-3A-21362-A	15+500-	High
East of the M50 and west of Park West Avenue	Compound CC-SET-3A-21363-A/B	14+300-14+500	Medium
Cherry Orchard Ave / Cloverhill Road	Compound CC-PW-3B-21365-A/B	13+200	Medium
Friel Avenue	Compound CC-STR-3B-21366-A	12+800	Medium
Killeen Road Car Park	Compound CC-PW-3B-21366-A	12+800	Medium
Killeen Road	Compound CC-PW-3B-21367-A/B	12+600	Medium
Le Fanu Road	Compound CC-PW-3C-21368-A/B/C	12+600	High
Inchicore West	Compound CC-PW-3D-21369-A	11+700	High
Inchicore	Compound CC-PW-3D-21370-A/B	10+900	Medium
Sarsfield Road Underbridge	Compound CC-STR-3E-21371-A/B/C	10+500	Medium
Memorial Road	Compound CC-STR-3E-21372-A	10+300-	Medium
Memorial Road / Con Colbert Road	Compound CC-STR-3F-21373-B	10+000	Medium
Heuston West station	Compound CC-PW-3I-21376-A/B/C	8+950	Medium
Cabra Compound at the old Cabra Sidings	Compound CC-PW-3J-21377-A	6+500-7+000	High
Glasnevin Cemetery Carpark	Compound CC-STR-3J-21378-A	5+650	Medium
Rail Line (Rail Corridor	Installation of new railway tracks,	9+300-13+300	High

Location	Description of Works	Chainage	Worst Case Risk
Widening)	Cutting into embankments. Construction of new retaining walls.		
Rail Line (General Works)	General civil, structural and electrical works.	5+600-24+400	High

12.5.2. Potential Operational Impacts

12.5.2.1. Operational Rail Impacts

While fossil fuel powered trains have significantly lower emissions per passenger than road vehicles, these trains do generate direct emissions and have the potential to have local impacts on air quality. The proposed Project aims to provide greater frequency of trains which will aid in supporting a modal shift from road to rail transport and thereby a potential indirect net reduction in transport emissions in the area.

The potential changes in direct emissions from rail transport depends on the number and share of electric multiple units (EMUs) and diesel multiple units (DMUs) relative to the current business as usual scenario where only DMUs are employed. An assessment of mass emissions on the railway line has been conducted which compares the total emissions from the Do Minimum and Do Something scenarios for the proposed Project.

Rail emissions are calculated using detailed information on the future service plans (with and without the proposed Project) and emissions data for the rail stock. Irish Rail diesel usage data indicates that fuels in 2018 was 1.54 km/l and in 2017 was 1.53 km/l. An average of the two years was taken when assessing the fuel usage and associated emissions per km. In addition, information has been provided on the electric power required to power an EMU (DART Unit 8537) for a km (1.43 kWh/km).

Table 12.35 shows the change to rail train numbers from the Do Minimum and Do Something Scenarios. These rail car numbers indicate an additional 126 EMU on the network as part of this project. In addition, the data shows a reduction of 12 DMU on the network representing a 7% decrease in these rail cars on the proposed rail corridor. The rail traffic figures are used in conjunction with the length of the section (approx. 20km) and the emission factors detailed in Table 12.8 to calculate the mass pollutant emissions for the main pollutants.

Table 12.35: Changes to Daily Rail Train Numbers

Service Type	Train Model and Size	Do-Minimum (Future Level of Service)	Do-Something (proposed Project)
DART + Commuter	5 & 10 carriage BEMU or EMU	0	126
Outer Commuter	22000 Class DMU	84	72
Intercity	Existing MkIV + 201 locomotive	84	84
Freight	Shunting DMU	8	8
Empty Trains	22000 Class DMU	5	5
Total	-	**181**	**295**

Mass pollutant emissions produced in both the Do Minimum and Do Something scenarios during the operational phase are shown in Table 12.36 and Table 12.37 respectively.

Table 12.38 shows the change in mass emissions between the Do Minimum and Do Something.

For the Do Minimum scenario the emissions from the 181 DMU on the circa 20km rail corridor equate to circa 29 tonnes of NO_x per annum (equates to 29,298kg) and circa 0.04 tonnes of $PM_{2.5}$ (equates to 39kg).

The results of the analysis indicates that despite the proposed increase in rail cars on the network under the Do Something scenario, there will be a decrease in emissions generated. The circa 7% decrease in DMU operating on the rail line for the Do Something scenario will result in similar decrease in the levels of direct diesel emissions generated.

The emissions from the proposed 126 EMU in the Do Something scenario are very low (circa 0.15%) when compared to the total emissions from the DMU fleet. In this regard, the proposed EMU fleet has minimal impact over and above the Do Minimum scenario. The emissions in the Do Something scenario include emissions with respect to the generation of electricity to power the EMUs.

The decreases in annual emissions associated with the Do Something scenario, relative to the Do Minimum scenario, are circa 1,866kg NO_x and circa 1kg $PM_{2.5}$. When compared to the 2030 National Target (Article 4(1) of Directive 2016/2284 as per Table 12.2), these decreases equate to 0.0046% of the NO_x target and 0.0001% of the $PM_{2.5}$ target. While these decreases in emissions are low nationally, given the ongoing difficulties in achieving the national emissions ceilings, any decrease is considered positive.

In accordance with the EPA Guidelines, the air quality impacts associated with the operational phase rail traffic emissions pre-mitigation are overall slight beneficial.

Table 12.36: Do-Minimum Rail Emissions

Do Minimum		
Service Type	**kg NO_x**	**kg $PM_{2.5}$**
DART + Commuter	0	0
Outer Commuter	36.590	0.047
Intercity	36.590	0.047
Freight	4.910	0.009
Empty Trains	2.178	0.003
Sum Daily (kg Pollutant)	**80.27**	**0.106**
Sum Annually (kg Pollutant)	**29,298**	**39**

Table 12.37: Do Something Rail Emissions

Do Something - DMUs		
Service Type	**kg NO_x**	**kg $PM_{2.5}$**
DART + Commuter	0	0
Outer Commuter	31.3632	0.04032

Intercity	36.5904	0.04704
Freight	4.9104	0.0088
Empty Trains	2.178	0.0028
Sum Daily (kg Pollutant)	**75.04**	**0.09896**
Sum Annually (kg Pollutant)	**27,390**	**36**
Do Something - EMUs		
Service Type	**kg NO_x**	**kg $PM_{2.5}$**
DART + Commuter	0.116	0.005
Outer Commuter	0	0
Intercity	0	0
Freight	0	0
Empty Trains	0	0
Sum Daily (kg Pollutant)	**0.116**	**0.005**
Sum Annually (kg Pollutant)	**42**	**2**
Do Something - All Rail		
	kg NO_x	**kg $PM_{2.5}$**
Sum Daily (kg Pollutant)	**75.16**	**0.103**
Sum Annually (kg Pollutant)	**27,433**	**38**

Table 12.38: Change in Rail Emissions

Do Something - Do Minimum - All Rail		
	kg NO_x	**kg $PM_{2.5}$**
Change Daily (kg Pollutant)	-5.11	-0.002
Change Annually (kg Pollutant)	-1,866	-1
DS as Percentage of DM	94%	98%
Change as % of the 2030 National Target (Article 4(1) of Directive 2016/2284)	-0.0046%	-0.0001%

The analysis indicates that with a slightly decreased number of DMU on the proposed rail network there will be a corresponding slight decrease in rail emissions. Properties adjacent to the rail network may experience a resultant decrease in exposure from diesel rail emissions.

The UK Department for Environment, Food & Rural Affairs, Local Air Quality Management Technical Guidance (2022) cites guidance to assess the significance of diesel rail emissions on air quality. This guidance states that diesel fired stationary locomotives can give rise to high short-term NO_2 concentrations near railway stations or depots and moving locomotives can contribute to elevated short-term NO_2 concentrations close to the track. Below the following criteria the risk of exceedance of the air quality limits is low:

- Where stationary diesel locomotives are regularly (at least three times a day) stationary for periods of 15-minutes or more with properties within 15m of the locomotives; and

- Where properties are located within 30m of moving diesel locomotives and the background annual mean NO_2 concentration is above 25µg/m^3 in these areas.

In terms of stationary locomotives, there are no depots proposed. One new station is proposed at Heuston West. There are no properties located within 15 metres of this station and no risk of significant population exposure to diesel emissions.

In relation to the baseline air quality in the areas where properties are located within 30m of the railway line (e.g. Ballyfermot), the data reported by the EPA shows that levels of NO_2 are well below 25µg/m^3 (refer Section 12.4.1.2). As such, the risk of adverse human health caused by rail emissions is not considered significant.

12.5.2.2. Operational Road Traffic Impacts

In terms of road traffic changes during the operation phase, there are no station car parks, level crossings, depots or other infrastructure that will significantly alter the traffic patterns and natural growth on the road network. As such, no detailed analysis has been undertaken given the absence of any potential for significant effect on air quality.

It is noted that there is potential for indirect positive impact to air quality from the proposed Project. This potential positive impact may be realised if the proposed increase in rail services results in a meaningful modal shift from road traffic to rail traffic. Road transport is one of the principal sources of emissions to atmosphere for pollutants such as NOx both in terms of ambient air quality as well as in terms of national emissions ceilings. Reducing the number of car kilometres travelled through modal shift will reduce emissions from road transport. The scale of any modal shift may not be fully quantified but even a moderate modal shift from road to rail transport on the proposed scheme may result in a long tern indirect slight positive impact for air quality.

12.6. Mitigation Measures

To sufficiently ameliorate the likely air quality impact, a schedule of air control measures has been formulated for both construction and operational phases associated with the proposed Project.

12.6.1. Construction Phase

12.6.1.1. Construction Phase Dust Mitigation Measures

Further details on construction methods can be found in Chapter 5 Construction Strategy of the EIAR which contains an overview of the activities and methods that are anticipated to be used during construction and commissioning of the proposed Project.

Before commencing relevant works, an air quality management plan shall be prepared by the appointed main contractor and submitted for approval to the relevant planning authority. The plan must include all appropriate dust and emissions mitigation measures, applicable to the circumstances of the relevant site, based on the mitigation in this EIAR and local authority requirements and industry best practices. Dublin City Council (DCC) guidance document titled "*Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition*" (2018) will be taken into consideration with respect to mitigation dust measures.

The plan will be developed by the main contractor and for each worksite shall include:

- An inventory and timetable of activities which may give rise to emissions or dust;
- Alert levels;
- Alert system to be used (including notification process);
- Details of control measures;
- Details of dust monitoring arrangements, including the location of sensitive receptors, monitoring locations, and monitoring equipment to be used; and
- Details of the air quality reporting requirements.

A pre-construction dilapidation survey of all buildings will be required prior to commencement of the construction phase. If asbestos potential is indicated in the pre-construction dilapidation survey, a fully intrusive asbestos-containing materials survey will be completed. Prior to commencement of the demolition works, all asbestos containing materials identified by the survey will be removed by a suitably trained and competent person. Asbestos-containing materials will only be removed from site by a suitably permitted/licensed waste contractor and will be brought to a suitably licensed facility. The Health and Safety Authority will be contacted where needed in relation to the handling of asbestos and material will be dealt with in accordance with the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006, as amended and associated approved Codes of Practice.

To reduce dust nuisance, a series of measures will be implemented including:

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- Liaison with local authorities and community groups;
- Hoarding will be provided around the construction compounds; and
- It is anticipated that methods of collecting rainwater and recycling for general site use, will be adopted where practical.

Strict dust prevention will be always in place, to minimise any potential emissions and these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Monitoring of construction dust deposition at nearby sensitive receptors that are identified based on potential risk of dust nuisance during the construction phase of the proposed Project is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2 m above ground level. The TA Luft limit value is 350 mg/m^2/day (for non-hazardous dusts) during the monitoring period between 28 – 32 days.

Consistent implementation of good dust minimisation practices will ensure that the impact from construction dust is short-term, localised, reversible and not significant.

12.6.1.2. Construction Phase Traffic Mitigation Measures

The modelling of road traffic for impacts on human and ecological receptors has found no significant impacts that require mitigation measures with respect to the modelling of emissions. However, some mitigation measures can be put in place to minimise emissions:

- Implement a policy which prevents idling of vehicles both on and off-site including HGV holding sites;
- Construction phase traffic shall be monitored to ensure construction vehicles are using the designated haul routes;
- A construction Traffic Management Plan will be prepared by the contractor to give effect to the relevant mitigation measures presented in this EIAR and having considered any potential cumulative impacts of works staging and other projects in the public space;
- The contractor must adhere to defined traffic routes as noted in the Traffic Management Plan;
- Efficient scheduling of deliveries to minimise number of truck movements; and
- Construction vehicles should conform to the current EU emissions standards and where reasonably practicable, their emissions should meet upcoming standards prior to the legal requirement date for the new standard. This will ensure emissions on haul routes are minimised.

Mitigation measures are required for the control of dust with respect to HGV movements onsite with the site and deliveries to/from the site:

- HGV traffic leaving site will pass through a wheel wash;
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary. If public roads are deemed to require additional cleaning where possible a suction device for road cleaning will be utilised to access spaces around cars and other street furniture more effectively; and
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

12.6.2. Operational Phase

As all ambient air pollutants will remain in compliance with the ambient air quality standards and the proposed Project has negligible impacts at all modelled receptors no specific operation phase mitigation measures are required.

12.7. Monitoring

12.7.1. Construction Phase

Monthly monitoring of dust deposition levels will be undertaken for the duration of construction for comparison with the guideline of 350 mg/m^2/day (for non-hazardous dusts). This monitoring shall be

carried out at a series of locations based on potential risk of dust nuisance during the construction phase of the proposed Project.

This monitoring should be carried out at a minimum of three locations at construction compounds with a medium to high risk of dust nuisance and further monitoring locations at sensitive receptors around the proposed works.

Where dust levels are measured to be above the guideline of 350 mg/m^2/day, the mitigation measures in the area must be reviewed and improved to ensure that dust deposition is reduced to below 350 mg/m^2/day. Should high dust levels continue to occur following these improvements, the contractor will provide alternative mitigation measures and/or will modify the construction works taking place.

12.7.2. Operational Phase

No monitoring measures are proposed for the operational phase.

12.8. Residual Effects

12.8.1. Construction Phase

When the dust minimisation measures detailed in the mitigation section of this chapter are implemented, fugitive emissions of dust from the site are not predicted to be significant and pose no nuisance, human health or ecological risk to nearby receptors. Thus, there will be no residual construction phase dust impacts.

The assessment of construction phase traffic emissions has found negligible air quality impacts from traffic disruption caused by diversions to accommodate bridge closures as well as from construction traffic.

The construction phase of the assessment identifies a negligible impact on air quality in the vicinity of the proposed development. Therefore, overall it is considered that the residual effects are overall short-term and not significant.

12.8.2. Operational Phase

The proposed Project aims to provide greater frequency of trains by electrification. The proposed Do Something system will become heavily weighted towards electric multiple units (EMUs). The regional mass emissions modelling for the rail line found that for the proposed future operational scenario the air quality impacts are slightly beneficial compared to the Do Minimum emissions where the use of DMU is slightly decreased on the non-electrified lines as part of the proposed Project. Ireland has exceeded its emission ceilings for NO_x by 50% in 2019 and has exceeded the ceiling for all years since 2010 and the slight decrease in rail emissions associated with the proposed Project must be viewed in this regard.

It is noted that there is also potential for indirect positive impact to air quality during the operation phase of the proposed Project. This potential positive impact may be realised if the proposed increase in rail services results in a meaningful modal shift from road traffic to rail traffic. Reducing the number of car kilometres travelled through modal shift will reduce emissions from road transport. The scale of any modal shift may not be fully quantified but even a moderate modal shift from road to

rail transport on the proposed Project may result in a long term indirect slight positive impact for air quality.

12.9. Cumulative Effects

The cumulative assessment of relevant plans and projects is undertaken separately in Chapter 26 of this EIAR.

12.10. References

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