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Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document

PE-ENV-01106
December 2022

PE Planning & Evaluation

Technical

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Contents

Contents Table

Glossary of Terms

Term	Definition
Active Travel Infrastructure	All types of pedestrian and cycle facilities which improve conditions for people walking, wheeling, and cycling.
Affected Road Network (ARN)	All roads which trigger the traffic screening criteria.
Annual Average Daily Traffic (AADT)	A description of daily traffic characteristics for the representative average 7-day period (Monday to Sunday).
CO_2e	Carbon dioxide equivalent" or "CO_2e" is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2e signifies the amount of CO_2 which would have the equivalent global warming impact.
Competent Practitioner for Biodiversity	Proposed Scheme lead for biodiversity.
Consenting Authority	The authority which determines the application for consent, permission, licence, or other authorisation to proceed with a proposal. The authority must consider the environmental information before granting any kind of authorisation.
Cumulative Effects	Effects that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the proposed road project, to create larger and more significant effects. In terms of air quality, cumulative effects should ensure that the predicted concentrations include emissions from existing traffic as well as committed Schemes (i.e. schemes which have planning approval and funding approval) as part of the do-minimum and do-something scenarios.
Cycleway	An offline public road reserved for the exclusive use of people cycling or people walking, wheeling, and cycling (see also definitions of 'Greenway' and 'Shared Use Active Travel Facility'). All mechanically propelled vehicles, other than mechanically propelled wheelchairs and electric bikes, are prohibited from entering except for the purpose of maintenance and access.
Cycle Track	A part of the road carriageway, including adjacent to a footway, which is reserved for the use of cycles and from which all mechanically propelled vehicles, other than mechanically propelled wheelchairs and electric bikes, are prohibited from entering except for the purpose of maintenance and access. A cycle track can be off-road, on-road (see definition of 'Cycle Lane') or shared (see definition of 'Shared Use Active Travel Facility').
Cycle Lane	An on-road part of the road pavement reserved for use by cycles. The cycle lane forms part of the road pavement, and it is thus located within the contiguous road surface. It is not a cycleway and therefore, generally not for the exclusive use of cycles.
Designated Habitat	Internationally, nationally and locally designated sites of ecological conservation importance on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity
Directive	A directive is a legal act of the European Union, which requires member states to achieve a particular result without dictating the means of achieving that result. It can be distinguished from regulations which are self-executing and do not require any implementing measures.

Term	Definition
	An example is the CAFÉ Directive 2008/50/EC legislation which was published by the EU in May 2008 in order to improve the quality of air in Europe and limit exposure to air pollution. These rules include how we should monitor, assess, and manage the ambient air quality.
Do–minimum scenario	The scenario that represents the situation that would occur without the proposed scheme in operation, which includes permitted developments.
Do-something scenario	The scenario that represents the situation that would occur with the proposed scheme in operation, which includes permitted developments.
Earthworks	Covers the processes of soil-stripping, ground-levelling, excavation and landscaping.
Effects	Any change in the receiving physical, natural, or cultural environment brought about by the proposed scheme (see also: 'impact').
Environmental Impact Assessment (EIA)	The process to systematically assess the potential environmental effects of proposed development. An environmental impact assessment is a legal requirement for certain public and private projects in countries within the European Union under Directive 2011/92/EU, as amended by Directive 2014/52/EU.
Environmental Impact Assessment Report (EIAR)	The Environmental Impact Assessment Report is the document prepared by the Developer that presents the output of the assessment. It contains information regarding the project, the likely significant effect of the project, the baseline scenario, the proposed alternatives, the features and measures to mitigate adverse significant effects as well as a non-technical summary and any additional information specified in Annex IV of the EIA Directive.
Greenway	A cycleway that caters for people walking, wheeling and cycling in a mainly recreational environment.
Haul Route	Temporary road provided within a contractor's site area to allow for the movement of construction material, construction machinery and/or construction labour around the site.
Heavy Duty Vehicles	Vehicles greater than 3.5 tonnes, including buses and coaches.
In-combination effects	In-combination effects arise where air quality receptors are affected by a combination of a number of environmental effects, e.g. noise etc.
Local Planning Authority	The local authority or council that is empowered by law to exercise planning functions.
Magnitude (of effect)	A term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible, and whether it is short or long term in duration.
Monin-Obukhiv length	Used to limit stable stratification in an urban area i.e. the height at which turbulence is generated more by buoyancy than by wind shear.
Motorway Service Area	Areas provided at regular intervals along motorways allowing drivers to park and rest. Facilities typically include fuel stations and canopies, toilets, convenience shops, and can also include a café/restaurant/food outlet, showers, tourist information, and play areas for children. They are usually well lit and may include some landscaping.
Motorway	The highest category of road in Ireland; major linear transport infrastructure for fast flowing traffic with multiple lanes connecting cities/regions.

Term	Definition
National Roads	The national primary and secondary road network in Ireland which TII operates, maintains and improves.
Natura 2000	Natura 2000 is a network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right. It stretches across all 27 EU countries, both on land and at sea. The aim of the network is to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under both the EU Birds Directive and the EU Habitats Directive.
Non-Technical Summary	A report which briefly describes the main points discussed in the EIAR without the use of technical language.
Nuisance	The term nuisance dust is often used in a general sense when describing amenity dust. However, this term also has a specific meaning in environmental law: (a) Statutory nuisance, as defined in section79(1) of the Environmental Protection Act 1990 (as amended). (b) Private nuisance, arising from substantial interference with a person's enjoyment and use of his land. (c) Public nuisance, arising from an act or omission that obstructs, damages or inconveniences the rights of the community. Each of these applying in so far as the nuisance relates to the unacceptable effects of emissions. It is recognised that a significant loss of amenity may occur at lower levels of emission than would constitute a statutory nuisance.
Opening Year	First year of operation.
Park and Ride	A public transport system in which car drivers may leave their cars in car parks outside the city centre and utilise public transport for the remainder of the journey.
Project	Projects funded through TII and/or TII is the Approving Authority, unless otherwise instructed by TII. It refers to the range of stages of the development and delivery of proposed schemes.
Project Manager	As defined in TII Project Management Guidelines (PE-PMG-02041). To summarise the Project Manager's duties include: • Overall responsibility for the management, delivery and implementation of the Project; • Developing and maintaining the PEP and supervising its execution through the planning, design and construction phases; • Checking all documentation produced for publication for compliance with TII policies, guidelines and requirements in advance of submission to TII; • Managing the procurement and appointment of Technical Advisors, Service Providers and Contractors, as required; • Liaising with and providing status reports to the Sponsoring Agency, Steering Group and Stakeholders (as required) and ensuring the Project meets their needs; and • Obtaining Approving Authority approvals and other statutory approvals necessary to progress the Project.
QA/QC	The technical review of data and deliverables.
Re-alignment	The modification of the horizontal alignment of linear infrastructure route.
Risk	The likelihood of an adverse event occurring.

Term	Definition
Scoping	An initial stage in the environmental impact assessment process to determine the nature and potential scale of environmental effects arising as a result of a proposed development, and an assessment of what further studies are required to establish their potential environmental impacts and effects.
Shared Use Active Travel Facility	A cycleway or cycle track that is provided for people walking, wheeling, and cycling.
Specified Infrastructure Projects	Include National Roads, motorway service areas and toll schemes, as well as light rail, metro rail, and rural cycleways (offline & greenways).
Trackout	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. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.
Traffic Study Area	The Traffic Study Area (TSA) is the area of traffic identified as reliable for inclusion in an environmental assessment i.e. the data had undergone a level of analysis/sense checking to assess model 'noise', location of zone connecters and the level of calibration/validation in the model. The competent practitioner from traffic and air quality teams should define the TSA and ensure it covers areas that are likely to be sensitive to changes in air quality e.g. where there are monitored exceedances of the air quality thresholds.

Abbreviations and Acronyms

List of Acronyms and Abbreviations	
AADT	Annual Average Daily Traffic Flow
ABP	An Bord Pleanála
ARN	Affected Road Network
ALPHA	Adapted Low-cost Passive High Absorption
AQA	Air Quality Assessment
AQAP	Air Quality Action Plan
AQEG	Air Quality Expert Group
AQLV	Air Quality Limit Values
AQTAG	Air Quality Technical Advisory Group
APIS	Air Pollution Information System
BSI	British Standards Institute
CAFE	Clean Air for Europe
CBA	Cost Benefit Analysis
CEMP	Construction Environmental Management Plan
CERC	Cambridge Environmental Research Consultants
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CREAM	Calculator for Road Emissions of Ammonia
DEFRA	Department for the Environment, Food & Rural Affairs
DELTA	DEnuder for Long-Term Atmospheric sampling
DM	Do-Minimum
DMRB	Design Manual for Roads and Bridges
DMUG	Dispersion Modellers User Group
DoT	Department of Transport
DS	Do-Something
EC	European Commission
EEA	European Environment Agency
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EFT	Emissions Factors Toolkit
EPA	Environmental Protection Agency
EU	European Union
FDMS	Filter Dynamics Measurement System
HDV	Heavy Duty Vehicles
IAQM	Institute of Air Quality Management

List of Acronyms and Abbreviations	
km	Kilometres
kg N/ha/yr	Kilograms of nitrogen deposition per hectare per year
km/yr	Kilometres per year
LAQM.TG	Local Air Quality Management Technical Guidance
LTT	Long Term Trend
LV	Limit Value
MCA	Multi-Criteria Assessment
N deposition	Nitrogen deposition
NAEI	National Atmospheric Emissions Inventory
NAPCP	National Air Pollution Control Programme
NDP	National Development Plan
NECD	National Emissions Ceiling Directive
NEE	Non-Exhaust Emissions
NH_3	Ammonia
NHA	Nature Heritage Areas
NIFTI	National Investment Framework for Transport in Ireland
NO_2	Nitrogen dioxide
NO_X	Nitrogen oxides
NPF	National Planning Framework
NRMM	Non-Road Mobile Machinery
NRN	National Roads Network
NTA	National Transport Authority
NTS	Non-Technical Summary
O_3	Ozone
OTD	Overarching Technical Document
PABS	Project Appraisal Balance Sheet
PAG	Project Appraisal Guidelines
PEP	Project Execution Plan
$PM_{2.5}$	Particulate Matter (with a diameter < 2.5µm)
PM_{10}	Particulate Matter (with a diameter < 10µm)
PMG	Project Management Guidelines
pNHA	Proposed Nature Heritage Areas
pSAC	Proposed Special Area of Conservation
pSPA	Proposed Special Protected Area
QA/QC	Quality Assurance/Quality Control
REM	Road Emissions Model
RMSE	Root Mean Square Error

List of Acronyms and Abbreviations	
RPGs	Regional Planning Guidelines
RSES	Regional Spatial Economic Strategies
SAC	Special Area of Conservation
SARs	Strategic Assessment Reports
SCR	Selective Catalytic Reduction
SPA	Special Protection Area
SD	Standard Document
SO_2	Sulphur dioxide
TEOM	Tapered Element Oscillating Microbalance
TII	Transport Infrastructure Ireland
TII REM	Transport Infrastructure Ireland Roads Emission Model
TSA	Traffic Study Area
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UUNN	UK Urban NO_2 Network
µg/m^3	Micrograms per meter cubed
WHO	World Health Organisation

1. Introduction

This *"Overarching Technical Document"* (OTD) **PE-ENV-01106,** provides guidance on the methodology, scope and processes underlying the air quality assessment (AQA) for Specified Infrastructure Projects.

The document describes the use of the AQA to evaluate the existing air quality conditions within a study area, the methodology to predict the air quality effects at human receptors and sensitive designated habitats and provides advice on determining the significance of these effects.

1.1 Application of Guidelines

OTD **PE-ENV-01106** sets out the approach of AQA to all TII projects, whilst the Standards Document **PE-ENV-01107** sets out the required standards for proposed National Roads, motorway service areas, and toll schemes. They are applicable to Projects which are funded through TII and/or where TII is the Approving Authority.

The NTA is the Approving Authority for Public Transport Projects, in such cases the Project Approval Guidelines for Projects Funded by the NTA shall apply. Where TII is the Sponsoring Agency, then agreement shall be reached at Project outset with the relevant Approving Authority as to the applicability of these guidelines.

These Guidelines should be applied to for Specified Infrastructure Projects where the proposed scheme results in a significant change in traffic flow/composition or alignment of a road.

For each of these schemes, the pollutants of most concern in relation to emissions from road traffic are nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). In addition, the effects of ammonia and nitrogen oxides (NO_x) should be considered with respect to the potential effects on sensitive designated habitats. During construction works dust emissions are also of concern.

Box 1: Specified Infrastructure and Air Quality

Specified Infrastructure and Air Quality

- **National Road schemes** may change traffic flows and air quality. Schemes may reduce traffic and improve air quality in bypassed locations (e.g. bypasses).
- **Toll schemes** may alter driver behaviour changing traffic and air quality for toll and non-toll routes.
- **Motorway services** may change air quality through the introduction of new entry and exits on existing routes.
- **Light rail and metro rail** may affect air quality by:
  - Changes in road alignments (e.g. new bridges to accommodate tracks).
  - Modal shift, encouraging car users to shift mode to public or active transport thereby improving air quality.
  - Increased trips on some routes as commuters travel to any new transport hubs.
  - Reducing available road capacity (e.g. along a route causing traffic to divert to alternative routes).
- **Rural cycleways (offline & greenways)** are least likely to result in changes in traffic and air quality:
  - Greenways with car parking facilities may have limited additional trips.
  - Cycleways that affect available road space could also affect air quality (as described above).
  - Modal shift, encouraging car users to shift mode to active transport may improve air quality.

All of the above types of Specified Infrastructure Projects are considered likely to generate dust during construction.

It should also be noted, light rail and metro rail in the context of this guidance are electrified and do not result in additional emissions to local air quality.

All of the above types of Specified Infrastructure Projects are considered likely to generate construction dust and require a construction phase AQA.

1.2 Purpose of the Guidelines

The purpose of this document is to provide a key reference for the methodologies and theory underlying the AQA. It should be noted that where UK based guidance is referred to within the SD and OTD this is in the absence of equivalent Irish guidance.

Together with the SD **PE-ENV-01107**, the intent is to deliver consistency in the approach to the consideration and description of air quality and to the assessment and mitigation of likely significant effects of Specified Infrastructure Projects:

- OTD to provide the theory and methodology.
- SD to provide the standard approach to the analysis and production of AQA and outputs / documents being prepared for use in National Roads and related infrastructure. Note that consideration of public transport and rural cycleways (offline & greenways) is excluded from the SD.

Box 1: Purpose of these Guidelines

In terms of Specified Infrastructure Projects, these Guidelines (and the key references in the bibliography):

- Set out the principles and processes underlying the AQA as they apply to Specified Infrastructure Projects.
- Introduce guidance on the methodology for undertaking AQA to ensure consistent and appropriate description, and evaluation of the baseline environment relevant to Specified Infrastructure Projects.
- Provide guidance on the methodology for AQA for the planning, design and assessment phases of delivering Specified Infrastructure Projects.
- Promote a context-sensitive approach to the design of appropriate mitigation measures for likely significant air quality effects of Specified Infrastructure Projects.

1.3 Organisation of the Guidelines

These Guidelines are organised as detailed in Figure 1.1 below and are intended for use by suitably qualified Air Quality Professionals (as defined in Appendix B) carrying out an AQA for Specified Infrastructure Projects for which Chapters 3 to 5 are of relevance.

These Guidelines are also intended as a reference for individuals with a direct involvement in the planning, design and evaluation of Specified Infrastructure Projects. This includes the project manager, local authorities and other authorities, infrastructure engineers, biodiversity professionals, and human health professionals *etc*, for which all chapters are of relevance.

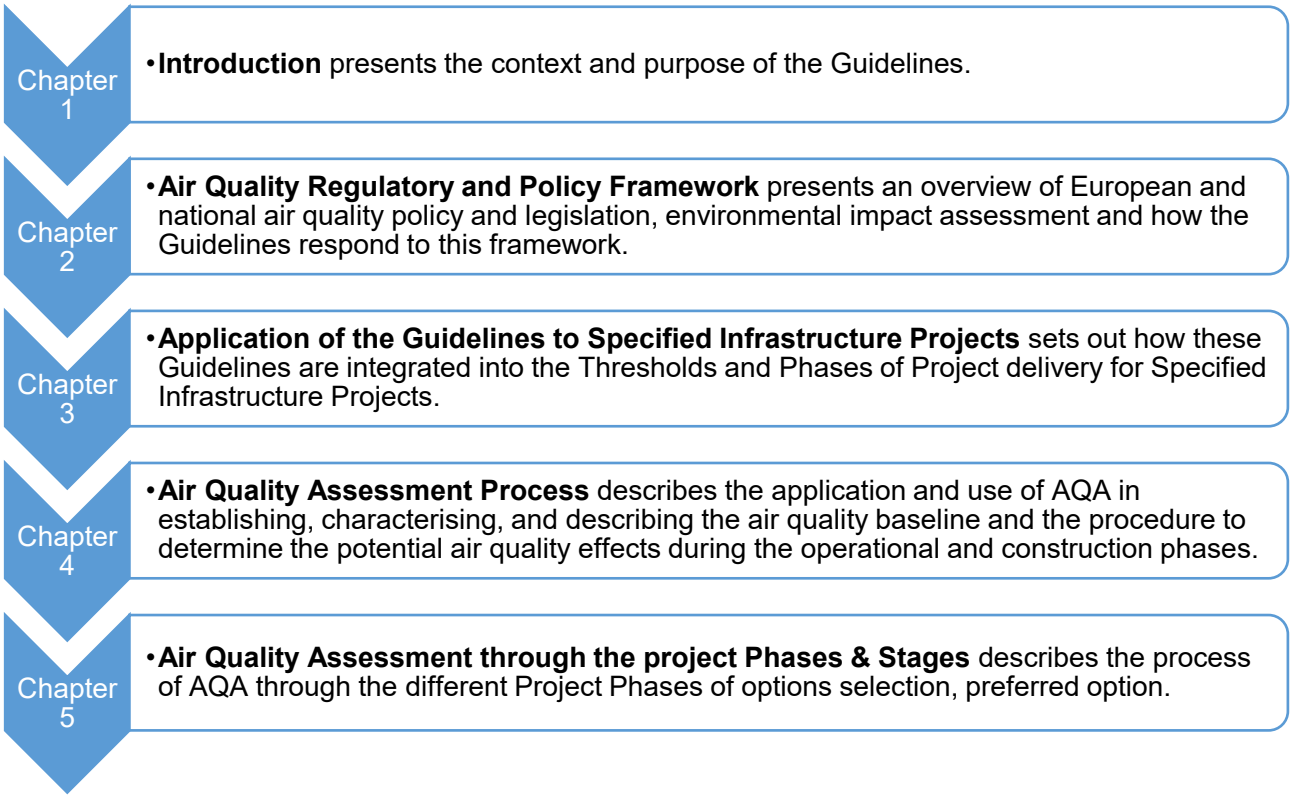

Figure 1.1 Organisation of Guidelines

1.4 Requirements of the Air Quality Practitioner

Directive 2011/92/EU, as amended by Directive 2014/52/EU, stipulates that the Environmental Impact Assessment Report (EIAR) and assessments must be carried out by competent practitioners. Where required for Specified Infrastructure Projects, the AQA will be carried out for Project Phase 2 and Phase 3 (and any AQA updates in Phase 4) by a suitably qualified and competent Air Quality Professional. The Air Quality Professional will have appropriate qualifications and previous experience in this field. More specifically, the requirements of the Air Quality Technical Lead, who has overall responsibility for the air quality deliverables are outlined in **Appendix B** of this document.

1.5 Related Documents and Tools

The following documents and tools are of relevance to air quality practitioners undertaking AQA (Table 1.1).

The Climate OTD and SD are relevant, as air quality practitioners will be required to use these documents to guide the provision of road user carbon emission calculations to Climate teams.

TII have developed the TII Road Emissions Model (REM) and the TII Carbon Tool, for use in the assessment of air quality and climate effects for Specified Infrastructure Projects and these are described in the OTD and SD for air quality and climate respectively. TII should be contacted by the project team to request access to these tools.

Table 1.1 Relevant Documents and Tools

Document	Reference	Description
Air Quality SD	**PE-ENV-01107**	Sets out the methodology for the AQA for developments on National Roads, including motorway service areas and toll schemes.
Climate OTD	**PE-ENV-01104**	Provides guidance on the methodology, scope and processes underlying climate assessment for Specified Infrastructure Projects.
Climate SD	**PE-ENV-01105**	Sets out the methodology for Climate Assessment for proposed National Roads, including motorway service areas and toll schemes.
TII REM-Model Development Report*****	**GE-ENV-01107**	The TII REM tool calculates greenhouse and non-greenhouse gas emissions from road transport integrating traffic volumes and speeds for light and heavy vehicles on the Irish national road network with Irish fleet composition information.
TII Carbon Tool -User Guidance Document*****	**GE-ENV-01106**	The TII Carbon Tool is used for the calculation of emissions arising from the construction (e.g., embodied carbon in construction materials, energy, and fuel use) and maintenance emissions. The TII Carbon Tool uses a series of calculations, emission factors and assumptions to calculate a carbon footprint for proposed road and light rail projects.

** Please note that in order to get access to the REM and Carbon Tools, prospective users should email climatetools@tii.ie to be set up as an authorised user on the TII Web Application Portal.*

2. Air Quality Regulatory and Policy Framework

Section 2 presents an overview of European and national air quality policy and legislation, environmental impact assessment and how the Guidelines respond to this framework.

2.1 Ambient Air Quality and Cleaner Air for Europe EU Directive 2008/50/EC

European Union (EU) air quality legislation is provided within The Ambient Air Quality and Cleaner Air for Europe (CAFÉ) Directive 2008/50/EC, which is transcribed into Irish legislation by the Air Quality Standards Regulations 2011. The Air Quality Limit Values (AQLVs) are legally binding for Ireland and have been set with the aim of avoiding, preventing, or reducing harmful effects on human health and on the environment.

The European Commission set down the principles to this approach in 1996 with its Air Quality Framework Directive. Four "daughter" directives lay down limits for specific pollutants:

- 1st Daughter Directive: Sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead;
- 2nd Daughter Directive: Carbon monoxide and benzene;
- 3rd Daughter Directive: Ozone; and
- 4th Daughter Directive: Polyaromatic hydrocarbons, arsenic, nickel, cadmium and mercury in ambient air.

CAFÉ replaced the Framework Directive and the first, second and third Daughter Directives. The fourth Daughter Directive (2004/107/EC) will be included in CAFÉ at a later stage. The following sub-section describes how EU legislation on air quality has been transposed into Irish Regulations.

2.2 S.I. No. 180/2011 – Air Quality Standards Regulations 2011

The Air Quality Standard Regulations 2011 implements the European Union Directive 2008/EC/50 on Ambient Air Quality, CAFÉ and designates the Environmental Protection Agency (EPA) as the competent authority responsible for assessing ambient air quality in the territory of the State. The regulations establish legally binding AQLVs and alert thresholds for concentrations of certain pollutants in ambient air, to prevent or reduce harmful effects on human health and the environment. AQLVs were published for seven pollutants, with alert thresholds for an additional five pollutants. National assessments undertaken by the EPA (EPA, 2021a) have demonstrated that there is no risk of carbon monoxide (CO), 1-3 butadiene, benzene, lead and sulphur dioxide (SO_2) concentrations exceeding the limits due to emissions from traffic anywhere in Ireland. The remaining pollutants are nitrogen dioxide (NO_2) and particulate matter in the fractions of equal to or less than 10 µm (PM_{10}) and equal to or less than 2.5 µm ($PM_{2.5}$). The limit values for these pollutants are presented in Table 2.1.

Table 2.1 Relevant Air Quality Standards

Pollutant	Averaging Period	Limit Value
Nitrogen Dioxide (NO_2) Protection of Human Health	1 Hour	200 µg/m³ not to be exceeded more than 18 times a calendar year
	Annual Average	40 µg/m³
Nitrogen Oxides (NO_x) Protection of Vegetation	Annual Average	30 µg/m³
Particulate Matter (PM_{10})	24 Hour	50 µg/m³ not to be exceeded more than 35 times a year
	Annual Average	40 µg/m³
Particulate Matter ($PM_{2.5}$)	Annual Average	20 µg/m³

Source: S.I. No. 180/2011 – Air Quality Standards Regulations 2011

The results of the AQA are compared against these standards to determine if the effect of a proposed scheme will be significant for air quality.

2.3 Air Quality - Revision of EU Rules

In May 2021, the European Commission (EC) adopted the EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil' (EC, 2021), as a key deliverable of the European Green Deal (EC, 2019).

The EU Action Plan sets out the zero pollution vision for 2050; 'a healthy planet for all', where air, water and soil pollution is reduced to levels no longer considered harmful to health and natural ecosystems and that respect the boundaries our planet can cope with, thus creating a toxic-free environment.

To steer the EU towards the 2050 vision, the EU Action Plan sets out key 2030 targets to speed up pollution reduction. Relevant to air quality, the EU should reduce by 2030, more than 55% the health impacts (premature deaths) of air pollution.

The main objective of the EU Action Plan is to provide a compass for including pollution prevention in all relevant EU policies. Although the Action Plan states that the EU has a robust regulatory framework in place to cap ambient air pollution, the number of premature deaths and other diseases attributed to air pollution remains high. This can be attributed to the fact that some EU standards are still less stringent than the guidelines set by the World Health Organisation (WHO) in 2005 and the way the Ambient Air Quality Directives are implemented has only been partially effective.

The Action Plan sets out that the EU plans to adopt limits that are more closely in line with WHO guidance for air quality in 2022. This was scheduled for 2022 to allow for an anticipated WHO update to its air quality guidance.

In September 2021 the World Health Organisation (WHO) updated their air quality guidelines based on the latest scientific evidence for the protection of human health and the environment (WHO, 2021). The guidelines are more stringent than the current Ambient Air Quality Standards.

On 26 October 2022, as part of the European Green Deal, the Commission proposed to revise the Ambient Air Quality Directives. The revision aligns the air quality standards more closely with the recommendations of the World Health Organization. (European Commission (EC), 2022).

Should the Irish Air Quality Standards be updated to reflect new reduced thresholds, then the results of the AQA should be compared against these standards.

2.4 Project Ireland 2040 National Planning Framework

Project Ireland 2040 National Planning Framework (NPF) is the Government's high-level strategic plan for shaping the future growth and development of Ireland to 2040. Air Quality is covered under Objective 64 which states:

> *'Improve air quality and help prevent people being exposed to unacceptable levels of pollution in our urban and rural areas through integrated land use and spatial planning that supports public transport, walking and cycling as more favourable modes of transport to the private car, the promotion of energy efficient buildings and homes, heating systems with zero local emissions, green infrastructure planning and innovative design solutions.'*

The guidance acknowledges that one of the largest sources of emissions to air is from transportation. It is essential that TII schemes support the objectives of Project Ireland 2040 NPF including Objective 64 described above.

2.5 National Investment Framework for Transport in Ireland

The Department of Transport (DoT) published the National Investment Framework for Transport in Ireland (NIFTI) in December 2021 following approval by Government. NIFTI is the DoT's framework for prioritising future investment in the land transport network. The primary goal of NIFTI is to ensure that investment in Ireland's land transport network supports the delivery of Project Ireland 2040 National Strategic Outcomes.

NIFTI establishes a set of Investment Priorities, in addition to Modal and Intervention Hierarchies, which serve to guide land transport investment. During the development of project Strategic Assessment Reports (SARs) and Business Cases, Sponsoring Agencies must demonstrate that a proposed investment aligns with these Priorities and Hierarchies to be considered for funding.

The NIFTI Investment Priorities are (in no particular order) Decarbonisation, Protection and Renewal, Mobility of People and Goods in Urban Areas, and Enhanced Regional and Rural Connectivity.

Under the NIFTI Modal Hierarchy, sustainable modes, starting with active travel (walking, wheeling and cycling) and then public transport, should be considered first before less sustainable modes such as the private car.

The NIFTI document refers to the National Air Pollution Control Programme (NAPCP) and Ireland's requirement, under the EU National Emissions Ceiling Directive (NECD), to produce one every four years. The first NAPCP was prepared and submitted in 2019 and demonstrated the pathway Ireland will follow to achieve compliance with the NECD 2020 and 2030 targets and presents an overview of current and projected 2030 emission levels for five pollutants. The NAPCP recognises that transport is a significant contributor to air pollution in Ireland, particularly nitrogen oxide emissions. NIFTI considers potential investment in transport infrastructure but will be informed by specific sectoral priorities and wider policy objectives including the NAPCP and Clean Air Strategy.

TII schemes should support the objectives of the NIFTI.

2.6 Climate Action Plan 2021

The Climate Action Plan was published by the Government of Ireland in 2021 which sets the roadmap for taking decisive action to halve Ireland's emissions by 2030 and reach net zero no later than 2050. Air Quality is discussed in the Climate Action Plan in the context of decarbonisation of public sector transport (Section 9.3.7). It states that *'emissions from transport account for about 30% of the public sector's overall greenhouse gas emissions. Increased use of electric vehicles by the public sector will help to demonstrate their value to wider society, improve urban air quality and reduce noise pollution, supporting sustainable urban communities in line with the National Planning Framework.'*

2.7 National Development Plan 2021 - 2030

The revised National Development Plan (NDP) published in October 2021 (Government of Ireland, 2021), sets out a ten-year capital expenditure framework that will support Ireland's transition to a low-carbon society over the period to 2030. The NDP review includes an assessment, to determine the impact that each of the exchequer-funded measures contained in the NDP is likely to have on seven climate and environmental outcomes including air quality.

2.8 National Sustainable Mobility Policy

In April 2022, the Government of Ireland published their National Sustainable Mobility Policy which sets out a strategic framework to 2030 for active travel and public transport to help Ireland meet its climate obligations. It is accompanied by an action plan to 2025 which contains actions to improve and expand sustainable mobility options across the country by providing safe, green, accessible and efficient alternatives to car journeys. It also includes demand management and behavioural change measures to manage daily travel demand more efficiently and to reduce the journeys taken by private car.

2.9 TII Sustainability Implementation Plan

As a United Nations (UN) Member State, Ireland has adopted the 2030 Agenda for Sustainable Development (UN, 2022). TII is tasked with improving Ireland's quality of life and national economic competitiveness by developing, maintaining and operating the national road and light rail network in a safe, cost effective and sustainable way. In 2021 TII published its Sustainability Implementation Plan (TII, 2021) which sets the direction for TII, aligns objectives, brings together different workstreams, and harnesses the opportunity each Division/Section has to contribute to sustainability. The plan is guided by the following six key principles:

- Provide effective, efficient and equitable mobility;
- Enable safe and resilient networks and services;
- Collaborate for a holistic approach;
- Deliver end-to-end improvements;
- Transition to net zero; and
- Create total value for society.

Air quality practitioners should be aware of this plan and project managers should ensure proposed schemes align with the six key principles set out above.

2.10 Environmental Impact Assessment

Requirements for Environmental Impact Assessment (EIA) derive from the European Commission Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. Amendments to this initial directive from 1997, 2003, and 2009 were subsequently codified by EIA Directive 2011/92/EU which in turn has been amended by EIA Directive 2014/52/EU (EU, 2014).

Under EIA 'air quality' is identified as one of the environmental factors for which the:

> "…*environmental impact assessment shall identify, describe, and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project*." (Article 3(1) Amending EIA Directive 2014/52/EU).

Proposed road and rail infrastructure developments are defined under the Roads Act 1993 (as amended), and under the Transport (Railway Infrastructure) Act 2001 (as amended). An EIA is a mandatory requirement in respect of certain projects e.g. a motorway, a bridge over 100m in an urban area and 1 km for a rural road.

Where EIA is not a mandatory requirement, Specified Linear Infrastructure projects i.e. National Roads, motorway service areas and toll schemes, light railway, metro railway, and rural cycleways (offline & greenways), are subject to 'Screening for the requirement for EIA' to determine if the project is, or is not likely to have significant effects on the environment. Where likely significant effects are identified the project is subject to a 'Sub-threshold Development EIA' (Department of Housing, Local Government and Heritage, 2022).

Where EIA is a mandatory requirement, or is 'screened in for EIA', the project may seek to undertake optional EIA 'scoping': a process of determining the content and extent of the matters which should be covered in the environmental information to be submitted in an EIA Report. Separately, a scoping opinion may be requested from the planning authority or An Bord Pleanála, as appropriate.

2.10.1 Air Quality Assessments for Projects not requiring EIA

Some projects may not be of a class or scale as to require EIA e.g. road improvement or cycleway project. Nevertheless, even where EIA is not required, individual standalone assessments may still be required to address particular environmental aspects e.g. AQA.

For these projects, the standalone AQA should continue to follow the broad approach and structure outlined in these guidelines. As such, the AQA report should include distinct sections covering baseline, magnitude of impact and significance of effect. The report should be illustrated with figure maps to show any receptors, sensitive designated habitats, air quality constraints and principal features.

2.10.2 Air Quality Assessments as Part of the EIA Process

AQA may be carried out either formally or informally as follows:

- Formally, as part of the preparation of an EIAR, for developments above a certain threshold, or sub-threshold developments, where the competent/consenting authority considers that a development would be likely to have significant effects on the environment.
- Informally, as a contribution to the 'appraisal' of development proposals and consent applications e.g. Part 8 projects or developments of a concept alignment.

AQA should be carried out on sub-threshold/minor projects where there is a possibility of effects at any scale.

3. Application of the Guidelines to Specified Infrastructure Projects

TII's Project Management Guidelines (PMG) provide a framework for a phased approach to the management of the development and delivery of National Road and Public Transport Capital Projects.

This Overarching Technical Document **PE-ENV-01106** sets out the approach of AQA to all TII projects, whilst the Standards Document **PE-ENV-01107** sets out the required standards for proposed National Roads, motorway service areas, and toll schemes. They are applicable to Projects which are funded through TII and/or where TII is the Approving Authority.

The NTA is the Approving Authority for Public Transport Projects, in such cases the Project Approval Guidelines for Projects Funded by the NTA shall apply. Where TII is the Sponsoring Agency, then agreement shall be reached at Project outset with the relevant Approving Authority as to the applicability of these guidelines.

TII and the NTA recognise Projects of different value thresholds and identify different Phases within the delivery of Projects. The different Project Thresholds and Phases are outlined in this Section together and the AQA outputs required for TII Projects.

3.1 Project Thresholds

TII classifies Projects of different value thresholds in Project Appraisal Guidelines as either Minor or Major Projects (refer to Table 3.1). The NTA Project Approval Guidelines detail the Project Bands for public transport projects.

In general, the full extent of these Guidelines do not apply to TII Projects of less than €0.5 million, unless an EIA is required. TII may decide to apply certain sections of the Guidelines to a specific Project below these thresholds.

The complexity of Projects between €0.5 and €20 million can vary considerably. The upgrading of a section of a National Road or light rail may not require the same level of AQA as a new bypass of a town or a new urban bus network. Therefore, the level of AQA should be proportionate to the nature and scale of the Project and baseline air quality. How this is carried out should be recorded in TII's Project Execution Plan (PEP) for that particular Project.

It is considered that the Guidelines will generally apply in full to TII major projects.

Table 3.1 TII Project Thresholds

Project Threshold	TII Project Classification
Up to €0.5 million	Guideline generally not applicable, unless otherwise instructed by TII
€0.5 to €5 million	Minor Projects[1]
€5 to €20 million	
Greater than €20 million	Major Projects

[1] *It should be noted that projects between 0.5 to 5 million will follow the Design Phase Procedure for Road Safety Improvement Schemes, Urban Renewal Schemes and Local Improvement Schemes DN-GEO-03030*

3.2 Project Phases

These Guidelines specifically apply to Project Phases 2 to 4, of the TII Project Management Guidelines (PMG) **PE-PMG-02041** (TII). These Phases address option selection, design, environmental evaluation, and statutory processes.

These Guidelines do not apply to TII Project Phases 0 and 1 (and NTA Project Phase 1), which address project (or pre-project) objectives, establishment, management, and administration.

These Guidelines do not provide detailed guidance for air quality practitioners to TII Project Phases 5 to 7, which relate to procurement, construction and implementation, and closeout and review. However, Phases 5 to 7 may require support from air quality practitioners to help procure, implement and review air quality mitigation and monitoring measures where these are required. Additionally, there may be occasions where the assessments undertaken during Phases 2 and 3 require updating during latter Phases, for example if there was a significant time lag between Phases or due to changes brought about during the statutory procedures. If the assessment requires updating, then the methodology outlined in this OTD should be followed.

While TII and the NTA use slightly different terminology, they both have a multi-phase sequential approach to the delivery of Projects (refer to Table 3.2 below for reference). Some of these Phases may be amalgamated for lower threshold Projects.

Table 3.2 TII and NTA Project Phases

TII PMG Project Phases			NTA Project Phases		
Planning and Design	**Phase 0**	Scope and Pre-Appraisal	**Planning and Design**	**Phase 1**	Scope and Purpose
	Phase 1	Concept & Feasibility			
	Phase 2	Option Selection		**Phase 2**	Concept Development and Option Selection
	Phase 3	Design and Environmental Evaluation		**Phase 3**	Preliminary Design
	Phase 4	Statutory Processes		**Phase 4**	Statutory Processes
Construction / Implementation	**Phase 5**	Enabling and Procurement	**Construction / Implementation**	**Phase 5**	Detailed Design and Procurement
	Phase 6	Construction and Implementation		**Phase 6**	Construction and Implementation
	Phase 7	Closeout and Review		**Phase 7**	Closeout and Review

3.3 Application of the Guidelines to Project Thresholds and Phases

Figure 3.1 and TII's **Project Management Guidelines** (PMG), **Project Manager's Manual for Major National Road Projects** and **Project Manager's Manual for Greenway Projects** provide a framework for a phased approach for the management, development and delivery of National Road and Greenways. The NTA's Project Approval Guidelines provide a framework for a phased approach for the management, development and delivery of Public Transport Projects.

Where TII is the Sponsoring Agency, then agreement shall be reached at Project outset with the relevant Approving Authority as to the applicability of these guidelines.

TII's associated **Project Appraisal Guidelines** (PAG) provide specific guidance on the appraisal of certain aspects of projects on National Roads.

Multi-Criteria Assessments (MCA) are generally used in the ranking of options at options assessment stage. The AQA process for each phase is discussed in further detail in Section 4 of the Guidelines.

Phase 2: Options Selection (Stage 1: Preliminary Options Assessment)

- Determine existing air quality in the study area in relation to NO_2, PM_{10} and $PM_{2.5}$ from available information.
- Identify significant non-road sources.
- Identify and record all sensitive receptor locations (human health and sensitive designated habitats) within 200m of the carriageway of each option that are, or have the potential to be significantly affected by a proposed scheme.
- Discuss any opportunities for mitigation.
- Review relevant previous air quality studies for schemes within the study area.
- Review of planning permissions granted within the study area of relevance from an air quality perspective.

Phase 2: Options Selection
Stage 2: Project Apprasial Matrix

- Update existing air quality in the study area in relation to NO_2, PM_{10} and $PM_{2.5}$ from available information, if further information is available since Stage 1 assessment was undertaken.
- Calculate the Index of Overall Change in Exposure.
- Calculate local scale pollutant (NO_2, PM_{10} and $PM_{2.5}$) concentrations.
- Determine the impacts on sensitive designated habitats.
- Discuss any opportunities for mitigation.

Phase 2: Options Selection
Stage 3: Preferred Option

- Review assessments undertaken at Stage 1 and 2 and update if necessary.
- Lead in the preparation of the air quality section of the Project Appraisal Balance Sheet (PABS).

Phase 3: Design and Environmental Evaiuation

- Undertake walkover of preferred route corridor.
- Update existing air quality in the study area in relation to NO_2 and PM_{10} from available information, if further information is available since Stage 2 was undertaken.
- Obtain existing data with regards to $PM_{2.5}$ concentrations in the study area from available information.
- Install a monitoring campaign, if necessary.
- Participate in the EIA Screening process.
- Re-calculate Index of Overall Change in Exposure if traffic flows or alignments have changed since Stage 2.
- Undertake a local air quality assessment to calculate NO_2, PM_{10} and $PM_{2.5}$ concentrations at representative worse-case human sensitive receptors within the air quality study area.
- Undertake an assessment of NO_x and ammonia concentrations at senistive designated habitats and calculate NO_x deposition and acid deposition.
- Undertake a construction phase assessment.
- Calculate total emissions of NO_x and CO_2e for the existing route and preferred route for the baseline, opening and design years.
- Complete air quality section of EIAR.
- Assist in the preparation of the air quality section of the Project Appraisal Balance Sheet (PABS).

Figure 3.1 AQA framework up to Phase 4 Statutory Process

4. Air Quality Assessment Process

4.1 Introduction

These Guidelines describe the methodology to undertake an AQA. The methodology presented allows practitioners to undertake a proportionate level of assessment, taking into consideration existing air quality and the potential for the proposed option(s) to result in significant air quality effects.

These Guidelines should be applied to National Roads, motorway service areas and toll schemes light rail, metro rail, rural cycleways (offline & greenways), where the proposed scheme results in a significant change in traffic flow/composition or alignment of a road during the operational or construction phase. For each of these proposed schemes, the pollutants of most concern in relation to emissions from road traffic are NO_2, PM_{10} and $PM_{2.5}$. In addition, the effects of ammonia and NO_x should be considered with respect to the potential effects on sensitive designated habitats.

These Guidelines should also be applied to National Roads, motorway service areas and toll schemes, light rail, metro rail, rural cycleways (offline & greenways), where sensitive receptors are located within 200m of the boundary of the site or route used by construction vehicles on the public highway as potential dust effects are of concern. The assessment of potential construction phase effects is outlined in Section 4.9.

4.2 Baseline Air Quality

Box 2: Purpose of Baseline Air Quality Data

Air quality monitoring data forms an important part of each phase of scheme assessment:

- To describe the existing air quality conditions in a study area.
- To provide information on background concentrations (i.e. non road sources) to capture pollutants not explicitly modelled.
- To verify the air quality model (i.e. confirm air quality predictions reproduce baseline conditions).
- To provide baseline concentrations representative of receptors exposure.
- To determine the effectiveness of mitigation measures.

As discussed, the pollutants of most concern in relation to emissions from road traffic are NO_2, PM_{10}, $PM_{2.5}$ and ammonia (with respect to sensitive designated habitats). The gathering of baseline air quality data should focus on these pollutants only.

Baseline air quality data can be gathered from desktop reviews and/or a monitoring survey set up specifically for the proposed scheme (scheme specific monitoring). The approach to be taken for desktop reviews and scheme specific monitoring is described in the following sub-sections. Further detailed air quality monitoring information is presented in SD **PE-ENV-01107**.

Due to the Project programme constraints, scheme specific monitoring is sometimes undertaken prior to receiving final traffic data. This means that a final air quality study area may not be known when monitoring is undertaken. Therefore, the air quality practitioner should use earlier iterations of traffic data (e.g. Phase 2 Options Selection) and professional judgement to determine a likely air quality study area for proposed schemes. This likely air quality study area can then be used to identify the area for which air quality monitoring data should be obtained.

4.2.1 Desktop Reviews

A desktop review should be undertaken using local air quality monitoring data collected as part of national or local government programmes, or as part of AQA related to other development schemes. The air quality practitioner should review the data to ensure it is suitable for use.

The Environmental Protection Agency (EPA) publishes annual reports on *Air Quality in Ireland* that provide statistical summaries of monitoring data. The EPA also provides access to real-time monitoring data. These reports and data can be accessed via the EPA website at Air | Environmental Protection Agency (epa.ie) - https://www.epa.ie/environment-and-you/air/. The EPA also publishes research papers regarding monitoring of pollutants such as Research 193: Ambient Atmospheric Ammonia in Ireland 2013 -2014 (EPA, 2017).

In all cases, regard should be given to the quality assurance and quality control (QA/QC) procedures that have been applied to the operation of the monitoring sites. Where the monitoring stations have been operated and or reported on by the EPA, then it may be assumed that adequate procedures have been applied. Where data is derived from monitoring studies conducted by other parties, then details of the QA/QC procedures should be obtained and described within the assessment report. If no QA/QC details are provided, then the data should not be used in the assessment.

The fundamental aims of a QA/QC programme are (Ricardo-AEA, 2012):

- The data obtained from measurement systems should be representative of ambient concentrations;
- Measurements must be accurate, precise and traceable;
- Data must be comparable and reproducible; and
- Results must be consistent over time.

In order for seasonal or annual averaged air quality pollutant measurements to be meaningful, an appropriate level of data capture is required (refer to Section 4.2.3).

4.2.2 Scheme Specific Monitoring

Scheme specific air quality monitoring should only be undertaken on a proposed scheme where a quantitative local AQA is being undertaken. Furthermore, the need to undertake scheme specific air quality monitoring depends upon the availability of existing air quality data and the complexity of the proposed scheme. For example, a greenway scheme would not, in general, require monitoring as these schemes are not complex and likely to result in no or small changes in traffic flow/composition and therefore air quality effects are likely to be not significant.

As described in Section 4.2, the pollutants of most concern in relation to emissions from road traffic are NO_2 PM_{10}, $PM_{2.5}$ and ammonia (for sensitive designated habitats). Therefore, scheme specific monitoring should focus on these pollutants only.

4.2.3 Short-Term Monitoring

Unless data is obtained from fixed monitoring stations, it is unlikely that the period of monitoring will extend over a full calendar year. Where data from short-term monitoring campaigns is used, the results may be adjusted to an equivalent annual mean concentration by comparison with fixed automatic monitoring stations. Where continuous monitoring methods e.g. gravimetric or chemiluminescent methods, are used the duration of the monitoring campaign should be for at least 6 months; however, for practical reasons, the monitoring period may be shorter, but, wherever possible, should extend for at least 3 months and should not be less than 1 month. Specifically in relation to nitrogen dioxide monitoring using passive diffusion tubes, a minimum of six months duration is required. If the monitoring campaign is less than 6 months, a justification should be provided.

If data capture for the calendar year is less than 75% but greater than 25%[2], annualisation will need to be completed. This process will enable the air quality monitoring results to be compared with relevant air quality standards. Further details of how to undertake the annualisation process can be found in SD **PE-ENV-01107**.

4.2.4 Monitoring for NO_2

Concentrations of NO_2 may be measured using passive diffusion tubes. These provide a simple, cost-effective means of monitoring at a number of locations providing greater spatial distribution of information than would be possible with an automatic analyser. Diffusion tubes with a wind protection cap are also available, where the cap is intended to reduce the potential positive bias resulting from the effect of wind turbulence (Bureau Veritas (BV), 2021).

Where diffusion tubes are used, it is essential that the data is adjusted for laboratory 'bias'. This is dependent on the laboratory that prepared the tubes, and the method of preparation that was used. Suitable bias adjustment factors may be derived locally (by collocating tubes with an automatic analyser) or national biased adjustment factors may be obtained from the following website https://laqm.defra.gov.uk/air-quality/air-quality-assessment/national-bias/, for some of the laboratories that may be used. The assessment report should explicitly state what bias adjustment factors have been applied.

4.2.5 Monitoring for PM_{10} and $PM_{2.5}$

Generally, PM_{10} and $PM_{2.5}$ monitoring will not be required unless there is a risk of exceedances, i.e. within 10% of relevant Irish Air Quality Standards and alternative data is not available to confirm this. In terms of PM_{10}, this means that if concentrations are > 36 µg/m^3 then monitoring should be undertaken, unless alternative representative sources of PM_{10} data are available. This type of location is most likely to be in urban environments.

There is a wide range of methods that may be used to determine concentrations of PM_{10} and $PM_{2.5}$, including manual gravimetric samplers and continuous analysers. $PM_{2.5}$ monitoring is not specifically recommended, as monitoring for PM_{10} can be utilised to infer $PM_{2.5}$ concentrations.

Monitoring concentrations of PM in ambient air is not straightforward, due to the variable nature and composition of the particles. There can be significant problems with the loss of semi-volatile components such as ammonium nitrate and the absorption and retention of water vapour. The method that is selected for the collection and determination of PM mass has an influence on the PM concentration that is subsequently reported.

QA/QC procedures are particularly important for PM monitoring and especially where gravimetric samplers and subsequent laboratory weighing is used. Guidance on QA/QC procedures for PM monitoring is given in Annex 1 to LAQM.TG(22) (Department for the Environment, Food & Rural Affairs (DEFRA), 2021).

4.2.5.1 Monitoring for Ammonia

The following methods can be used for sampling ammonia at sensitive designated habitat sites:

- DELTA active samplers (DEnuder for Long-Term Atmospheric sampling).
- ALPHA samplers (Adapted Low-cost Passive High Absorption).
- Diffusion tubes.

[2] Defra LAQM.TG(22) Box 7.14 states that 3 months or 25 % of data for the calendar year is the minimum to undertake annualisation.

It is recommended that when diffusion tubes are used, a co-location study is undertaken with either an ALPHA or DELTA sampler to improve the performance of the diffusion tubes.

4.3 Study Area

Box 3: Study Area

The study area, within which the AQA is undertaken, needs to be defined. It should include all areas where a significant change in pollutant concentration at sensitive receptors may occur.

The study area is determined based on the proximity of sensitive receptors to roads where a significant change in traffic flow, composition and/or road alignments associated with the proposed scheme is predicted to occur.

4.3.1 Traffic Study Area

Prior to determining the air quality study area, following the stepped approach outlined below, the Traffic Study Area (TSA) should be determined. For the local air quality assessment, the TSA is the area of traffic identified as reliable for inclusion in an environmental assessment i.e. the data had undergone a level of analysis/sense checking to assess traffic model 'noise', location of zone connecters and the level of calibration/validation in the model. The competent practitioners from traffic and air quality teams should define the TSA and ensure it covers areas that are likely to be sensitive to changes in air quality e.g. where there are monitored exceedances of the air quality thresholds.

It should be noted that the TSA for the local air quality assessment may differ from the traffic dataset applied to the regional assessment. Further information regarding the study area for the regional assessment is provided in Section 4.8.

4.3.2 Stepped Approach

The study area is determined for the two assessments which are required; Index of Overall Change in Exposure and local AQA. The index of Overall Change in Exposure is undertaken to compare the overall impact on people for each of the options and/or preferred option (sum of residential properties multiplied by change in emission rate for each link). While the local AQA is undertaken to determine the absolute pollutant concentrations and change in concentration at sensitive receptors. The outcome of the local AQA informs the significance of the proposed scheme for air quality. The study areas are determined for each assessment as described below.

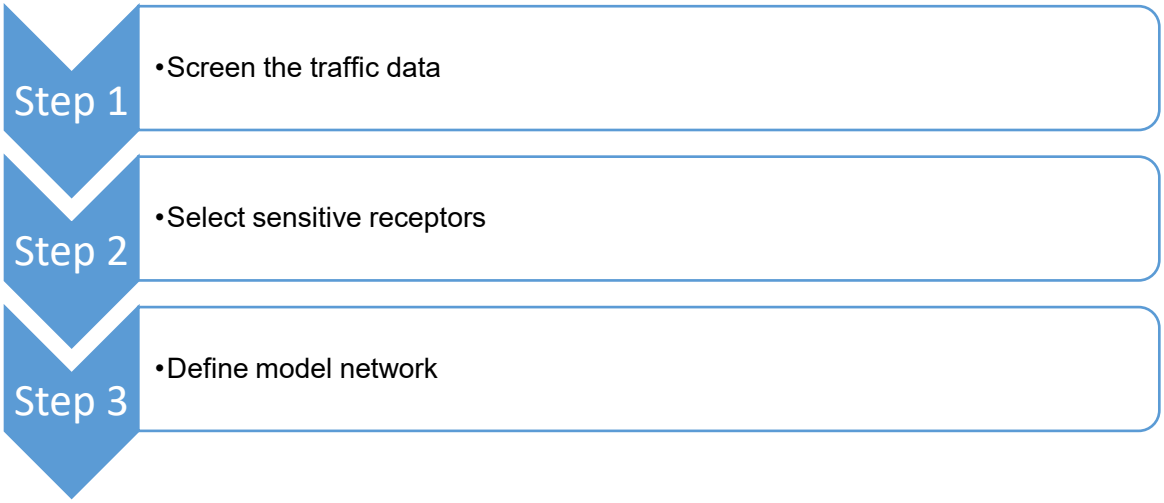

Figure 4.1 Steps to define the air quality study area

4.3.3 Step 1: Screen the Traffic Data

The traffic data should be screened to establish if traffic changes are expected due to a proposed scheme and if these changes may affect air quality. The screening is done using the following criteria to determine the affected road network (ARN). The criteria are based on the changes between the Do-Something (DS) traffic compared to the Do-Minimum (DM) traffic in the year of opening:

- Road alignment will change by 5 meters (m) or more; or
- Annual average daily traffic (AADT) flows will change by 1,000 or more; or
- Heavy duty vehicle (HDV) (vehicles greater than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more; or
- Daily average speed change by 10 kph or more; or
- Peak hour speed will change by 20 kph or more.

The above criteria should be applied to the traffic study area (TSA) only. A statement should be included in the AQA detailing how the study area was defined and that the TSA is appropriate for the AQA.

To ensure a balanced comparison between the options, the same study area should be used for the existing route and each option.

4.3.4 Step 2 – Select Sensitive Receptors

A list of receptors sensitive to air quality are described in Sections 4.6.1 and 4.7 including both human receptors and sensitive designated habitats.

For the Index of Overall Change in Exposure assessment all sensitive human receptors, located within 50 m of the ARN should be included in the assessment.

Steps 1 and 2 then defines the study area for the Index of Overall Change in Exposure.

For the local AQA, worse-case sensitive receptors should be selected up to 200 m from the ARN. Both human and sensitive designated habitats should be selected as applicable. This larger study area is proposed for the local assessment (compared to 50 m for the Index of Overall Change as described above), to allow for changes in pollutant contributions from multiple roads to be captured in the assessment.

4.3.5 Step 3 – Define Model Network

For the local AQA all roads within 200 m of the selected receptors, for which traffic data is available, should be included in the study area.

Steps 1, 2 and 3 then define the study area for the local AQA.

It is recommended that, following a review of the results of the local AQA, the competent air quality practitioner should consider if any likely significant effects could have been missed from the assessment with particular focus on the edges of the study area. If so, then the air quality practitioner should undertake a detailed level assessment in these areas if traffic data is available to check if there are any significant effects. If traffic data is not available a risk-based review should be undertaken using professional judgement to determine whether likely significant effects may occur (e.g. areas of poor air quality with likely perceptible changes).

4.4 Index of Overall Change in Exposure

Box 4: Index of Overall Change in Exposure

The index of Overall Change in Exposure is undertaken to compare the overall impact on people for each of the options and/or preferred options. The impact of each option and/or preferred option is calculated by comparing the DS scenario/s with the DM scenario/s.

The Index is based on identifying the number of sensitive receptor locations within 50 m of the carriageway for all road links with a significant change in traffic for each of the options. Justification for the 50 m distance criteria is drawn from the two reports published by the UK Air Quality Expert Group (AQEG, 2004, 2005). Figures 4.2 and 4.3 have been taken from these reports and demonstrate that both NO_2 and PM_{10} concentrations decline rapidly with increasing distance from the carriageway, such that levels beyond 50 m distance are unlikely to be distinguishable from the background in most situations[3].

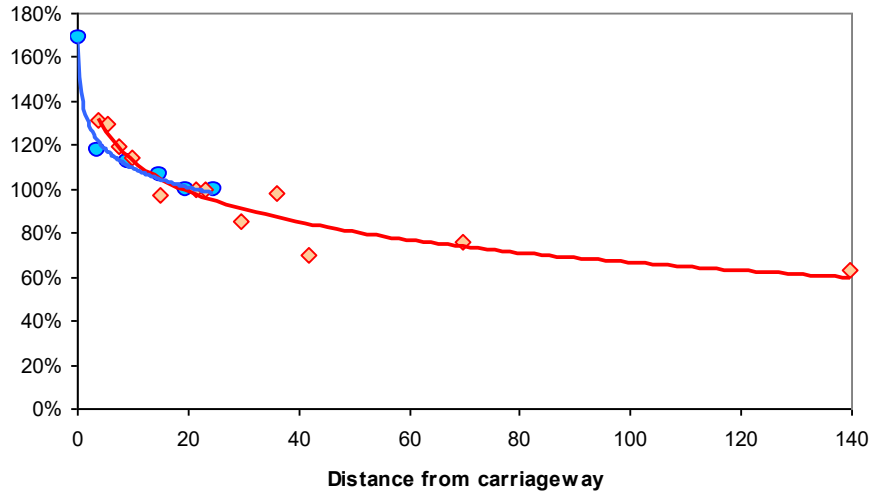

Figure 4.2 NO_2 concentrations measured on a transect away from a busy central London road (red) and a motorway (blue), normalised to 100% at about 20m distance from the edge of the carriageway*. The data points have been fitted using a logarithmic relationship.

Source: AQEG (2004) Nitrogen Dioxide in the United Kingdom

[3] Exceptions may occur in areas with very low background concentrations and extremely high traffic flows or in areas where dispersion is influenced by the presence of a street canyon

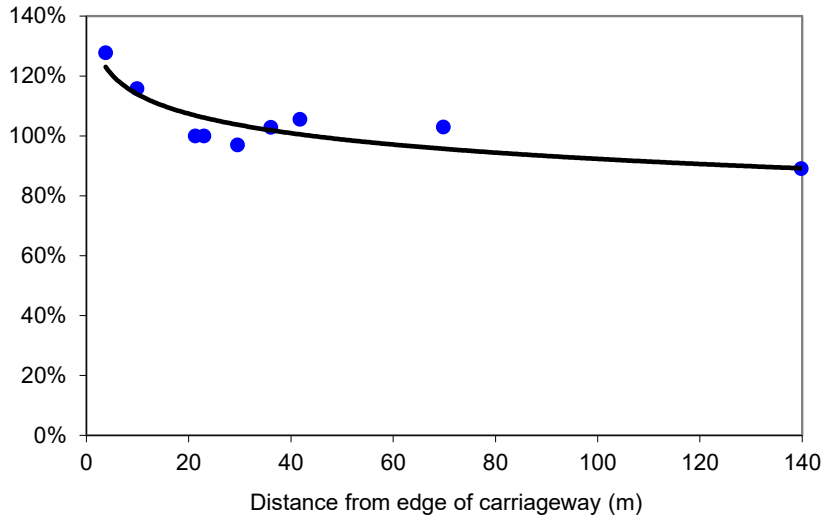

Figure 4.3 PM_{10} gravimetric concentrations measured on transects away from the M25 motorway, normalised to 100% at about 20 m from the edge of the carriageway*. The data points have been fitted using a logarithmic relationship.

Source: AQEG (2005) Particulate Matter in the United Kingdom

The various steps required to calculate the Index of Overall Change in Exposure are summarised in Figure 4.4. A worked example is provided in the SD **PE-ENV-01107**.

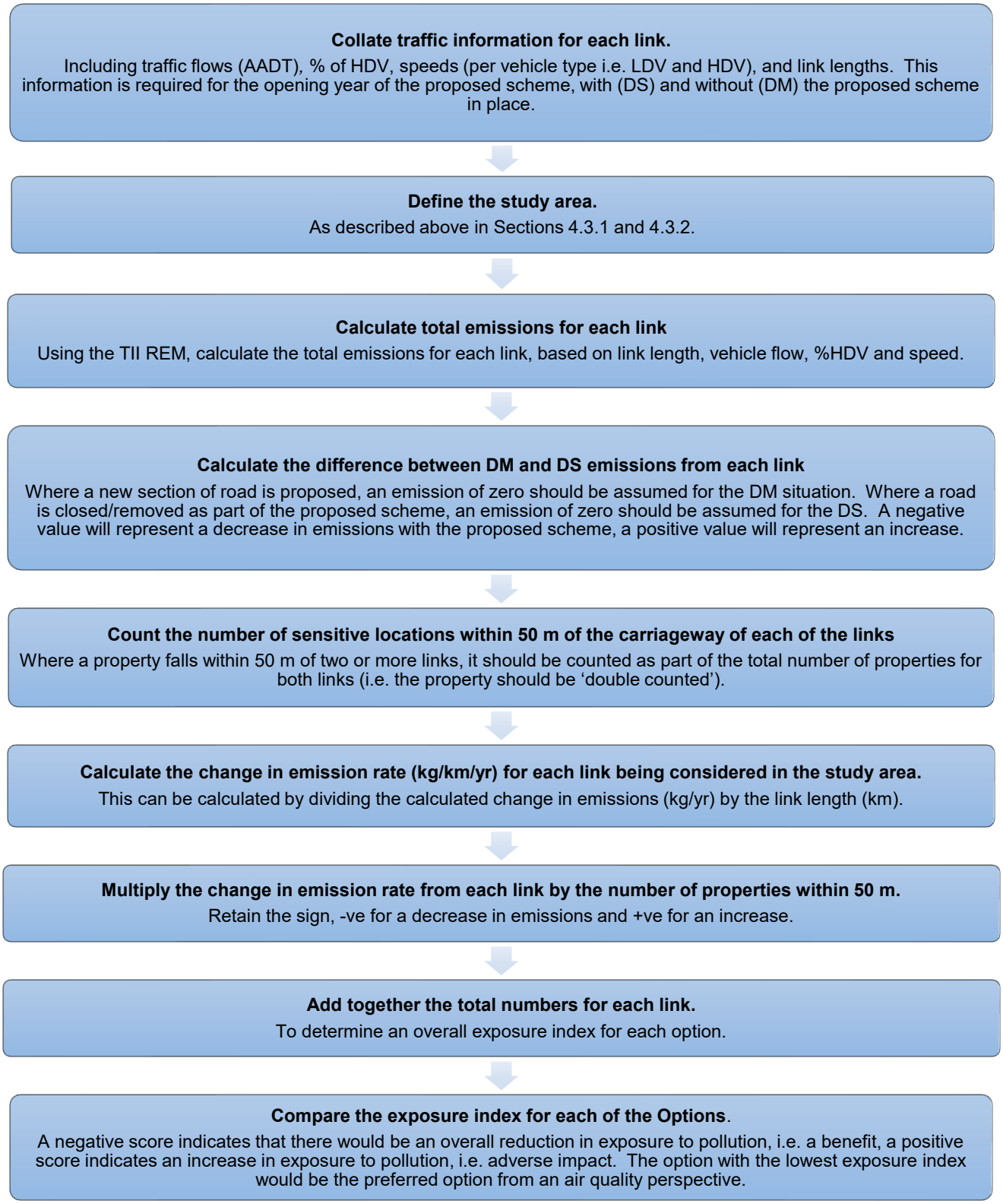

Figure 4.4 Summary of steps to calculate the Index of Overall Change in Exposure

4.5 Local Air Quality Assessment Overview

Box 5: Local Air Quality Assessment

The local AQA is undertaken to determine the absolute pollutant concentrations and change in concentration at sensitive receptors. The outcome of the local AQA informs the significance of the proposed scheme for air quality.

The local AQA assessment is undertaken using a tool such as TII REM or detailed dispersion modelling software such as ADMS-Roads (CERC, 2022).

The TII REM has been developed using R programming language in a user-friendly R shiny application. TII REM is a modular tool consisting of four main elements: traffic data, a fleet mix database, an emission rate database and an ambient air quality model (Figure 4.5). TII should be contacted by the project team to request access to the TII REM. A user manual with instructions on how to use TII REM is embedded in the TII REM tool to assist the air quality practitioner in the use of the tool.

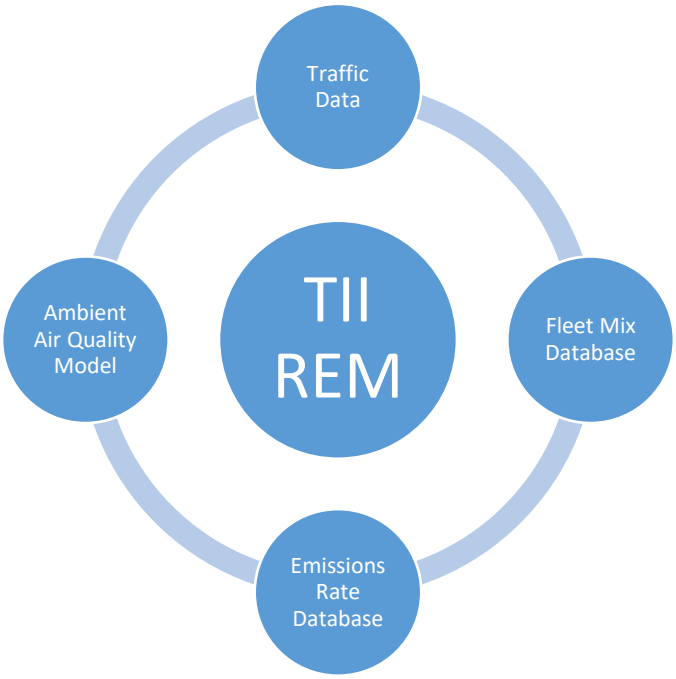

Figure 4.5 TII REM Structure

The decision on the most appropriate modelling software to use is based on existing air quality and the complexity of the proposed scheme. See Table 4.1 for further details on model selection.

Table 4.1 Criteria to determine modelling software to use for the local air quality assessment

Model Type to Use	Criteria
Detailed dispersion modelling e.g. ADMS	• If existing air quality exceeds 90% of the standard (e.g. for annual mean NO_2 standards, >36 µg/m^3); or • Where sensitive receptors exist within 50 m of a complex road layout e.g. grade separated junctions or hills with gradients > 2.5%
TII REM	• If existing air quality is less than 90% of the standard (e.g. for annual mean NO_2 standards, <36 µg/m^3; and • For simple schemes such as small junction improvements and signalling changes.

In the event that an alternate modelling approach is proposed this should be discussed with TII (e.g. use of TII REM for schemes with complex road layouts).

4.6 Human Health

The following section describes the process to undertake an AQA to predict pollutant concentrations at receptors sensitive to human health. The pollutants of most concern in relation to emissions from road traffic are NO_2, PM_{10} and $PM_{2.5}$ for human health. Therefore, the AQA should focus on these pollutants only (see Section 2.2 for further discussion on the selection of pollutants).

4.6.1 Receptor Locations

Table 4.2 presents all receptors which are sensitive to potential human health effects and should be included in the local AQA if present within the study area. Table 4.2 also provides information on the air quality standard that would be expected to be relevant for each receptor. If additional receptor types are selected, then a justification should be provided in the AQA for which standards apply.

Table 4.2 Human Receptors

Receptor	Pollutant	Standard Type
Residential Properties	NO_2, PM	Annual, 24-hour, 1-hour
Hospitals	NO_2, PM	Annual, 24-hour, 1-hour
Schools	NO_2, PM	Annual, 24-hour, 1-hour
Care Homes	NO_2, PM	Annual, 24-hour, 1-hour
Gardens of residential properties	NO_2, PM	24-hour, 1 hour
Hotels and B&Bs	NO_2, PM	Annual, 24-hour, 1 hour
Place of Worship*	NO_2	1 hour
Sports Centres*	NO_2	1 hour
Shopping Areas*	NO_2	1 hour
Playing Fields*	NO_2	1 hour
Cyclists[4]*	NO_2	1 hour
Outdoor locations including:		
• Car Parks*	NO_2	1 hour
• Bus Stations*, including park and rides	NO_2	1 hour
• Railway Stations*	NO_2	1 hour

**where members of the public are not likely to spend 24 hours, the pollutant of concern at these locations is NO_2 only for the 1 hour standard.*

Air quality practitioners should model specific worse-case receptors and include all receptors where they may contribute to the overall evaluation of significance for a proposed scheme. If a scheme is considered to be significant then mitigation will be required, that enables the overall significant adverse effect to be removed.

In addition, receptor points will need to be included in the modelling exercise to represent monitoring sites that are to be used in model verification.

4.6.2 Background Information

The following presents the background information which is applicable to all AQA.

[4] Pollutant concentrations at a point on a cycle route should be predicted and compared with the 1-hour NO_2 standard. This will, however, likely result in an overestimation of concentrations and exposure. The use of a 1-hour thresholds should be adopted as a precautionary approach. In the event of any 1-hour exceedance the likely realistic level of exposure should then be considered within the overall evaluation of significance.

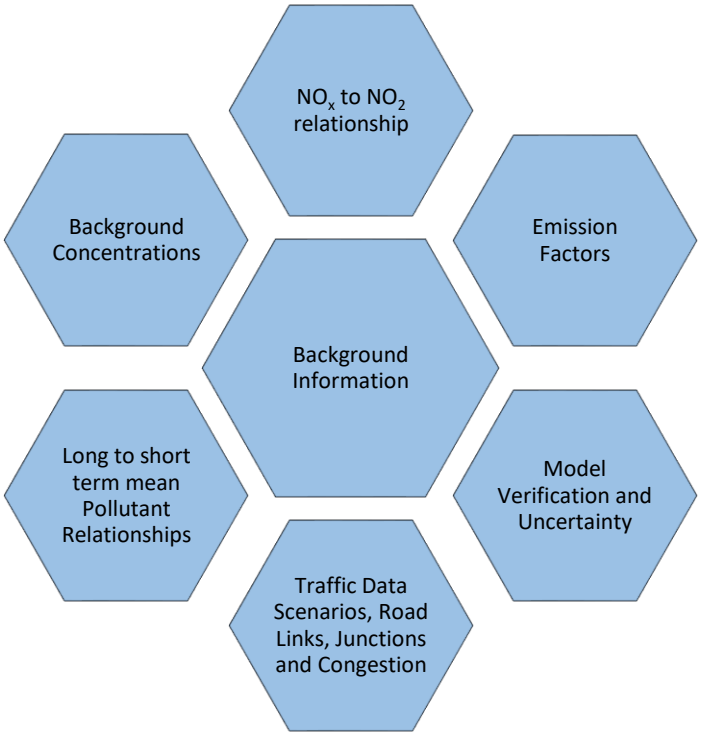

Figure 4.6 Background Information

The NO_x to NO_2 Relationship

Nitrogen oxides, NO_x (NO + NO_2), are predominantly emitted from road vehicle exhausts in the form of nitric oxide (NO) which is then transformed to NO_2 via a series of complex chemical processes in the atmosphere. The dominant pathway for NO_2 formation is via the reaction of NO with ozone (O_3).

The UK's Department for Environment, Food and Rural Affairs (DEFRA) have published an approach for predicting NO_2 from NO_x concentrations at roadsides, which takes account of the difference between fresh emissions of NO_x and background NO_x, the concentration of O_3, and the different proportions of primary NO_2 emissions in different years. The approach was incorporated into a simple spreadsheet calculator which allows the calculation of NO_2 from NO_x and vice versa. Air quality practitioners are advised to use the latest version of the tool. The tool and User Guide are available here https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/.

The calculator was designed for local authorities in the UK and provides default input data for the regional background concentrations of O_3, NO_x and NO_2 via a "local authority selection tab". For detailed modelling assessments in Ireland, it can be assumed that regional concentrations are characterised by a local authority in Northern Ireland, 'Armagh, Banbridge and Craigavon' is recommended, as the average NO_x, NO_2 and O_3 concentrations in Ireland are reasonably well represented by this area. This approach has the advantage that concentrations in future years will be automatically calculated within TII REM, which would be needed to assess the opening year of the scheme.

For assessment where the TII REM is being used the NO_x to NO_2 conversion is undertaken by the model when the user imports a receptor file to calculate NO_2 concentrations that can be compared to air quality standards.

Relationship between the Annual Mean and 1-Hour Mean Nitrogen Dioxide Standard

The air quality standards for NO_2 are expressed in terms of both the annual mean and the number of hours above 200 µg/m^3. Research suggest that the hourly mean standard is unlikely to be exceeded at roadside locations unless the annual mean is above 60 µg/m^3 (DEFRA, 2021). This relationship can be used to consider whether short term air quality standards for NO_2 are expected to be met.

Relationship between the Annual Mean and 24-Hour Mean PM_{10} Standard

The air quality standards for PM_{10} are expressed as the annual mean and the number of days above 50 µg/m^3. Dispersion models are inherently less accurate at predicting exceedances of the 24-hour mean PM_{10} standard than for the annual mean standard. An empirical relationship between the annual mean concentration and the number of days >50 µg/m^3 PM_{10} was derived in LAQM.TG(22) and takes the form:

No. 24-hour mean exceedances = -18.5 + 0.00145 x annual mean^3 + (206/annual mean)

This relationship can be used to consider whether short term air quality standards for PM_{10} are expected to be met.

Emission Factors

Emission factors were developed for the UK National Atmospheric Emissions Inventory (NAEI) and have been incorporated into the TII REM. This allows users to calculate emission rates in terms of grams per vehicle-kilometre for all years up until 2050.

The TII REM uses county-based Irish fleet composition for different road types, for different European emission standards from pre-Euro to Euro 6/VI with scaling factors to reflect improvements in fuel quality, retrofitting, and technology conversions. The TII REM also includes emission factors for PM_{10} emissions associated with brake and tyre wear.

The toolkit allows users to calculate vehicle emissions for multiple road links based on vehicle fleet composition, traffic speeds and road type.

The emission rates for detailed modelling should also be taken from the TII REM. Air quality practitioners can export these ready for use in detailed modelling packages from a download feature in the TII REM tool.

Background Pollutant Concentrations

Dispersion models only directly account for those sources that are explicitly included within the air quality model (for example, the local road network). It is therefore usually necessary to account for emissions arising from other sources by including the local background contribution. This local background may represent a significant or dominant proportion of the total pollutant concentration, it is important that careful consideration is given to background levels and how they may change in future years.

For AQA, monitored background concentrations should be used for the base year. This data should be derived from EPA monitoring from the appropriate zone, council monitoring data or scheme specific monitoring campaigns. To determine the most appropriate approach to the projection of background concentrations for the opening year of the proposed scheme, trends in background concentrations should be examined. This will determine the most appropriate concentration to use as well as whether the factors contained in a tool developed in the UK for National Highways gap analysis, calculating Long Term Trends (LTT) may be appropriate to use.

For example, where the trend in monitored background concentrations indicates no marked decrease in background concentration then it would be appropriate to use the base year background concentration to represent the opening year concentration. Where a reduction in background concentrations is observed then the use of the factors contained within the LTT tool may be appropriate or a rate of improvement could be based on monitored trends.

Traffic Data Scenarios

AQA should consider cumulative effects to ensure the predicted concentrations include emissions from existing traffic as well as committed Schemes. It is recognised that AQA will usually be inherently cumulative as traffic growth associated with other developments will need to have been incorporated within the traffic data utilised within the AQA. The air quality practitioner should confirm with the project transportation consultants that the traffic data provided for the environmental assessments includes committed schemes (i.e. schemes which have planning approval and funding approval) as part of the DM and DS scenarios.

In some limited circumstances it may be necessary to undertake additional modelling scenarios to ensure cumulative effects are considered in further detail, for example if a number of TII schemes are being delivered in the same geographical area and the construction and/or the commencement of operations are anticipated to take place concurrently.

The traffic growth assumptions utilised in the AQA should be set out in the AQA report. It is recommended that the 'high' growth traffic scenario is used to ensure a reasonably foreseeable worse-case scenario is assessed in terms of environmental impacts. This is in accordance with the EPA EIA Guidance (EPA, 2022). The details of the traffic data should be discussed with the traffic and noise consultants to ensure the same scenario(s) are used in both the air quality and noise assessments.

The air quality practitioner should also ensure committed receptors (e.g. a new housing development) that are anticipated to be in place by either the construction or operational phases are included in the assessment, as sensitive receptors, as appropriate. This information should be available from the EIA and/or planning team.

Road Links

The road network should be divided into separate links, describing sections of road where traffic conditions are homogenous (in terms of traffic composition, speed, and flow). Care should be taken to assign an appropriate number of road links particularly where there are sensitive receptors in close proximity to the road.

The assessment should include all roads expected to make a significant contribution to air quality. In practice, it should not be necessary to include any road more than 200 metres away from a sensitive receptor.

Junctions and Congested Traffic

Consideration should be given to sections of road where emissions may be higher, for example, due to congested traffic or road junctions. It is recommended that the simple approach outlined in LAQM.TG(22) is applied where local information with regard to congestion and associated speeds is not available. The assumptions need to be manually applied to the traffic data before it is inputted to the TII REM for use directly or in order to use REM to generate emission rates for use in a detailed dispersion model. Table 4.3 outlines the assumptions that can be made.

Table 4.3 Junctions and Congested Traffic Assumptions

Junction Types	Assumptions
Busy Junctions	Assume that traffic approaching the junction slows to an average of 20 kph. This should allow for a junction, which suffers from a lot of congestion and stopping traffic. In general, these speeds are relevant for approach distances of approximately 25 m.
Other Junctions	For other junctions (non-motorway) and roundabouts where some slowing of traffic occurs, assume that the speed is 10 kph slower than the average free flowing speed.
Motorways	For motorway or trunk slip roads, assume average speeds of 40–45 kph close to the junction.

Alternate approaches may be utilised if sufficient information is available, with clear justification provided and a full explanation of any approach taken.

Model Verification

Models selected for use in the assessment of proposed schemes should be fit for purpose and should have some form of published validation assessment and/or technical methodology report available. However, the validation reports prepared by model developers are unlikely to be specific to the assessment area being considered and a comparison between modelled concentrations and local monitoring data should be carried out. This process is referred to as model verification and should be carried out for all dispersion modelling studies.

Discrepancies between modelled and measured concentrations may arise for a number of reasons, depending on the model being used, for example:

- Uncertainties in traffic data (flows, speeds, vehicle mix);
- Emission factors assumed for each vehicle type;
- Assumptions regarding background concentrations;
- Meteorological data;
- Model input parameters e.g. roughness length, minimum Monin-Obukhov length etc. and
- Model parameters that are fixed, e.g. initial dispersion, but which may in practice vary according to local conditions.

In all cases, every attempt should be made to minimise any discrepancies. This may involve further scrutiny of the model input assumptions, or the parameterisation of the model itself. Where discrepancies remain, the model should be adjusted to account for any systematic errors. The AQA report should provide full details of the model verification process and explicitly define any adjustment factors that have been used. Guidance on model verification is provided in DEFRA's LAQM.TG(22) and as also shown in Figure 4.7. A worked example of model verification being applied to a proposed scheme is provided in the SD **PE-ENV-01107.**

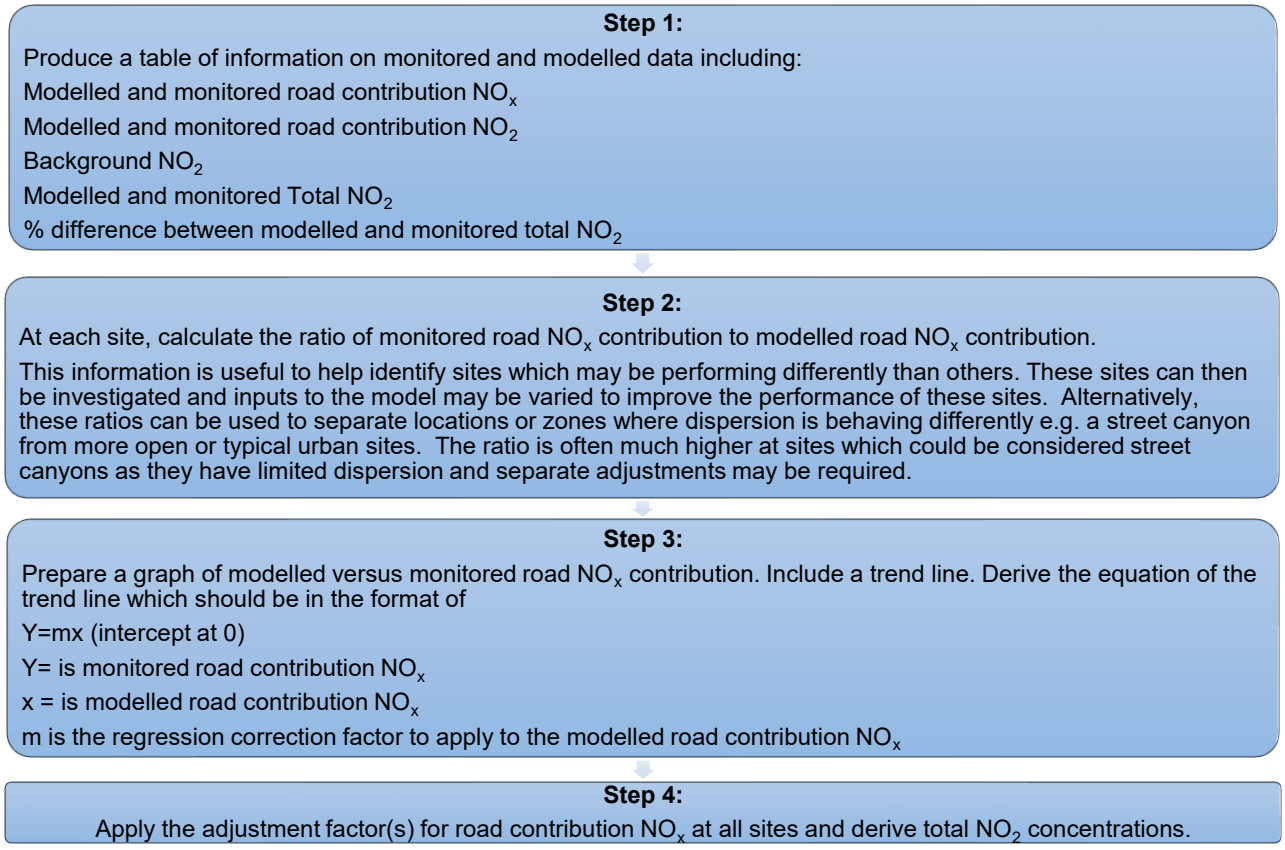

Figure 4.7 Summary of steps to model verification

Model Uncertainty

Statistical procedures are available to evaluate model performance and assess the uncertainties. The statistical parameters listed in Table 4.4 should be calculated prior to and after adjustment and provided in the AQA report in line with LAQM.TG(22).

Table 4.4 Model Uncertainty Statistics

Statistics	Ideal Value
The correlation coefficient.	1.0
Fractional bias.	0.0
Root Mean Square Error (RMSE).	0.0 If the RMSE is higher than ± 25% of the objective being assessed, it is recommended that the model inputs and verification are revisited in order to make improvements

Further information in relation to the calculation of these statistical procedures are provided in DEFRA's LAQM.TG(22).

4.6.3 TII REM

The TII REM provides a simple and straightforward means of predicting pollutant concentrations associated with road traffic emissions. Table 4.5 outlines the criteria for when the TII REM should be used.

Also note that a user guide is included with the tool.

TII REM Inputs and Outputs

The specific input requirements when using the TII REM are described in Table 4.5. Table 4.5 also describes the outputs that are provided by TII REM.

Table 4.5 TII REM Model Inputs and Outputs

Input	Description
Road type and Traffic data	The TII REM input file is used to define the AADT for each link for light and heavy vehicles, speed and county. The user should also define the road type as urban, rural or motorway, and may also define links as part of the National Road Network (NRN). The link length is defined where total annual emissions are required as an output. There is also the option use 'advanced' inputs, which allows the user to define the traffic database used to perform the calculations (see fleet database below) and omit certain vehicle euro class types from the fleet prior to the calculations being performed.
Fleet Database	The TII REM user must select one of three fleet projections that define the projected changes in fuel technology and vehicle age. TII REM has three fleet projections known as: Business as Usual (BaU), Climate Action Plan (CAP) (Government of Ireland, 2021), or Intermediate. The BaU fleet projection assumes that the same current trends in vehicle registrations continues into the future. The CAP projection assumes that the policies set out in the CAP are implemented resulting in increased zero emission vehicles. The intermediate fleet projection has been interpolated between the BaU and CAP. The intermediate fleet projection provides a conservative fleet for future predictions in the event that the full changes in the vehicle fleet intended in the CAP do not occur at the rate expected. The intermediate fleet projections should be included in the main assessment and used to inform the significance of the proposed scheme. The results of the local AQA using the BaU and CAP projections should be included in appendices.
TII REM Output	The TII REM predicts annual mean emission rates and total annual emissions of NO_X, PM_{10} and $PM_{2.5}$, and concentrations of NO_2, PM_{10} and $PM_{2.5}$ at selected receptor locations. The tool also predicts acidity and N-deposition at selected receptor locations.

4.6.4 Detailed Dispersion Models

Where existing environmental concentrations exceed 90% of the relevant air quality standard, or where there are complex or unusual features of the proposed scheme, a detailed dispersion modelling assessment would normally be carried out. It should be noted that it is usually only necessary to carry out detailed dispersion modelling in the immediate area of the complex feature, such as a specific junction, and not for the proposed scheme as a whole, although practitioners may find it simpler to use a single approach for the proposed scheme assessment.

There are a range of dispersion models that can be used for the assessment of proposed schemes and it is not within the scope of this document to advise on the selection of one model or another. However, "new-generation" models that rely on an improved understanding of the boundary layer meteorology are now in common use and are strongly preferred above those models that are based on the simpler Pasquill parameterisations.

A justification for the selection of a particular dispersion model should always be provided, setting out, for example, how the features and capabilities of the model are suited to the proposed scheme in question.

Detailed Dispersion Modelling Inputs

The specific input requirements when using detailed dispersion models are described in Table 4.6.

Table 4.6 Detailed Dispersion Modelling Inputs

Input	Description
Emissions activity data	Includes traffic flows, speeds and vehicle composition for each of the road links. Traffic data used for dispersion modelling are frequently derived from transport models which may only forecast peak hour flows and speeds, which then need to be adjusted to provide the required input data for the dispersion model. It is important that the approach used for such adjustments is described, or adequately referenced. The input data required for the model is AADT flows to assess proposed scheme at Phase 2 and period data (AM, inter peak, PM and off peak) when undertaking a Phase 3 assessment for the preferred option.
Complex topography	Different terrain heights and the relative elevation of road-link emission sources and receptors in different situations e.g. road cuttings and flyovers should be considered. Some models will allow for different heights to be modelled explicitly or monitoring data can be gathered around these types of features which can then be used in model verification to adjust model outputs to reflect the different dispersion characteristics of these types of roads. Some models allow complex topographical features (such as hills and valleys) to be included using digital terrain files. However, it is not normally necessary to consider such effects where the gradient in slope is less than 10%. Additional considerations are: • is the modelling domain sufficiently extensive to justify the inclusion of terrain effects? Where single route corridors are under evaluation, significant effects are unlikely to extend more than 200 m from the line of the carriageway. In addition, the resolution of the terrain file e.g. 100 m, may not be sufficient to reflect terrain changes over such small distances, • what level of detail does the model use for terrain modelling? Some models interpolate terrain files to a lower resolution to reduce model run times, and • guidance from Cambridge Environmental Research Consultants (CERC) and Dispersion Modellers User Group (DMUG) on the tools available to replicate these environments should be followed if ADMS-Roads is used.
Street canyons	Street canyons occur when buildings on both sides of the road can lead to the formation of vortices and recirculation of air flow that can trap pollutants and restrict dispersion (DEFRA, 2021). Street canyons are generally defined as narrow streets where the height of buildings on both sides of the road is greater than the road width, however, there are occasions where broader streets may also be considered as street canyons. If using ADMS-Roads for example, there are two modules for modelling street canyons; the basic street canyon module based on the Danish Operational Street Pollution Model (OSPM) developed by Hertel and Berkowicz (1989) and the advanced street canyon module developed by Hood et al. (CERC, 2022). Further guidance on the selection and use of the different modules is provided in the CERC User Guide (CERC, 2018).
Meteorological data	In most cases, the user should select the nearest meteorological site to the study area, but account should be taken of any local effects that may make the data unsuitable, for example, coastal effects or complex topography. The year of meteorological data should correspond with the year of baseline traffic and monitoring data that is to be used for the subsequent model verification. In addition, the same year of baseline background pollution and emissions data should be used. When purchasing meteorological data it is important to confirm with the supplier that the proper QA/QC has been undertaken. Users should confirm whether the data provided are hourly, sequential, as measured or whether missing hours have been filled. It is important that full details of the meteorological data used are reported e.g. the location of the meteorological recording site and its relation to the study area.

Input	Description
Other Inputs	Within the detailed dispersion model, the surface roughness length and minimum Monin-Obukhov length for the monitoring station and study area should be selected.The minimum Monin-Obukhov length is used to limit stable stratification in an urban area i.e. the height at which turbulence is generated more by buoyancy than by wind shear.
Assessment of individual traffic lanes	In certain circumstances it may prove beneficial to assess separate lanes of traffic (moving in different directions). This can be particularly useful where, for example, the characteristics of traffic on one side of the carriageway are different to those on the other, or where there are wide roads with physically separated lanes (such as dual-carriageways or motorways).
Cold starts	Cold starts emissions are the additional tailpipe emissions that occur when a car is cold at the start of a journey. The drive cycle data used to inform emissions modelling includes a proportion of cold starts, although this is considered to occur for only a very short period of a journey. Under circumstances where road links may be associated with a significant proportion of vehicles running with cold engines, it will be necessary to account for the excess emissions associated with these “cold start” movements. Such considerations are only likely to apply in specific circumstances such as car parks and in most circumstances are unlikely to affect assessments for the proposed schemes.

4.6.5 Modelling Uncertainties and Sensitivity Testing

The AQA should provide a robust assessment of the potential impacts of proposed schemes. The AQA should address the uncertainties associated with the data inputs and show what steps have been taken to minimise these uncertainties. Any residual assumptions and limitations or uncertainties should be clearly outlined in the AQA.

As discussed in Section 4.6.2, model verification should be undertaken to adjust modelled concentrations and reduce discrepancies when compared with the monitoring concentrations. The procedure to do so is outlined in Figure 4.7. Verification statistics should be used to inform confidence in the baseline and model input factors, such as meteorology surface roughness. The same model inputs should be used in future scenarios unless there is a specific reason not to do so.

Predicting pollutant concentrations in a future year will always be subject to greater uncertainty. It is necessary to rely on a series of projections of background pollutant concentrations and vehicle emissions. These are based on emission factors which consider projections of the fleet mix in each year.

Air quality practitioners may wish to carry out sensitivity tests using a range of parameters at a limited number of receptor locations.

The purpose of which would be to evidence confidence in the assessment outcome where the effects are sufficiently close to the air quality standards, that changes in outputs could lead to a potentially different outcome (i.e. significant vs not significant). In all cases the model input parameters used should be clearly set out in the AQA. Sensitivity testing for the future scenario should focus on the main sources of uncertainty with regard to air quality; i.e. pollutant background contribution. Additional sensitivity testing may focus on the modelled traffic flow data with tests for core or low growth, where high growth has been used for the main assessment in the AQA.

4.7 Sensitive Designated Habitats

Internationally, nationally and locally designated sites of ecological importance (known as designated habitats) need to be included in the AQA. Designated habitats include:

- Ramsar Sites
- Special Protected Areas (SPA) and proposed sites (pSPA)
- Special Areas of Conservation (SAC) and proposed sites (pSAC)
- Nature Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA)
- Ancient woodland
- Veteran trees
- Nature Reserves
- National Parks
- Refuge for Fauna and Flora
- Wildfowl Sanctuaries
- Biogenetic Reserves
- UNESCO Biosphere Reserves

Only sites that are sensitive to nitrogen (i.e. sensitive designated habitats) should be included in the assessment, it is not necessary to include sites, for example, that have been designated as a geological feature or a water course.

4.7.1 Collaborative Working

Collaborative working between the competent practitioner for biodiversity and air quality is essential when undertaking AQA for sensitive designated habitats at all phases. The project's biodiversity practitioner should advise on the following:

- Scoping sensitive designated habitats to be included in the assessment. The biodiversity practitioner should confirm which sites are sensitive to nitrogen and acid deposition and therefore, should be included in the assessment;
- The location of modelled transects within each sensitive designated habitat;
- The most appropriate habitat to model within each of the sensitive designated habitats; and
- The results of the AQA at sensitive designated habitats confirming if the impacts are significant or not.

It is also essential that references to the air quality impacts discussed in the biodiversity chapter and NIS are reviewed by the project's competent practitioner for air quality.

4.7.2 Methodology

The following sets out the assessment methodology to consider the potential impacts from NO_x, nitrogen (N) deposition, acid deposition and ammonia (NH_3) at sensitive designated habitats.

Where pollutant concentrations are sufficiently below the standards (taken to be <90% of the standard) and where there are no complex or unusual features, then a screening approach using the TII REM is appropriate. Where pollutant concentrations are above 90% of the standards, then detailed modelling should be used in the AQA (refer to Table 4.6).

The assessment of NO_x and N deposition will be based on the methodology set out in DMRB LA 105 (Highways England, 2019). The assessment will be undertaken as a stepped approach. The steps used to calculate concentrations of NOx and NH_3 are presented in Figure 4.8. The steps used to calculate N deposition and acid deposition are presented in Figure 4.9. A worked example of the steps involved in the calculation of NOx, NH_3, N deposition and acid deposition is provided in the Air Quality SD PE-ENV-01107.

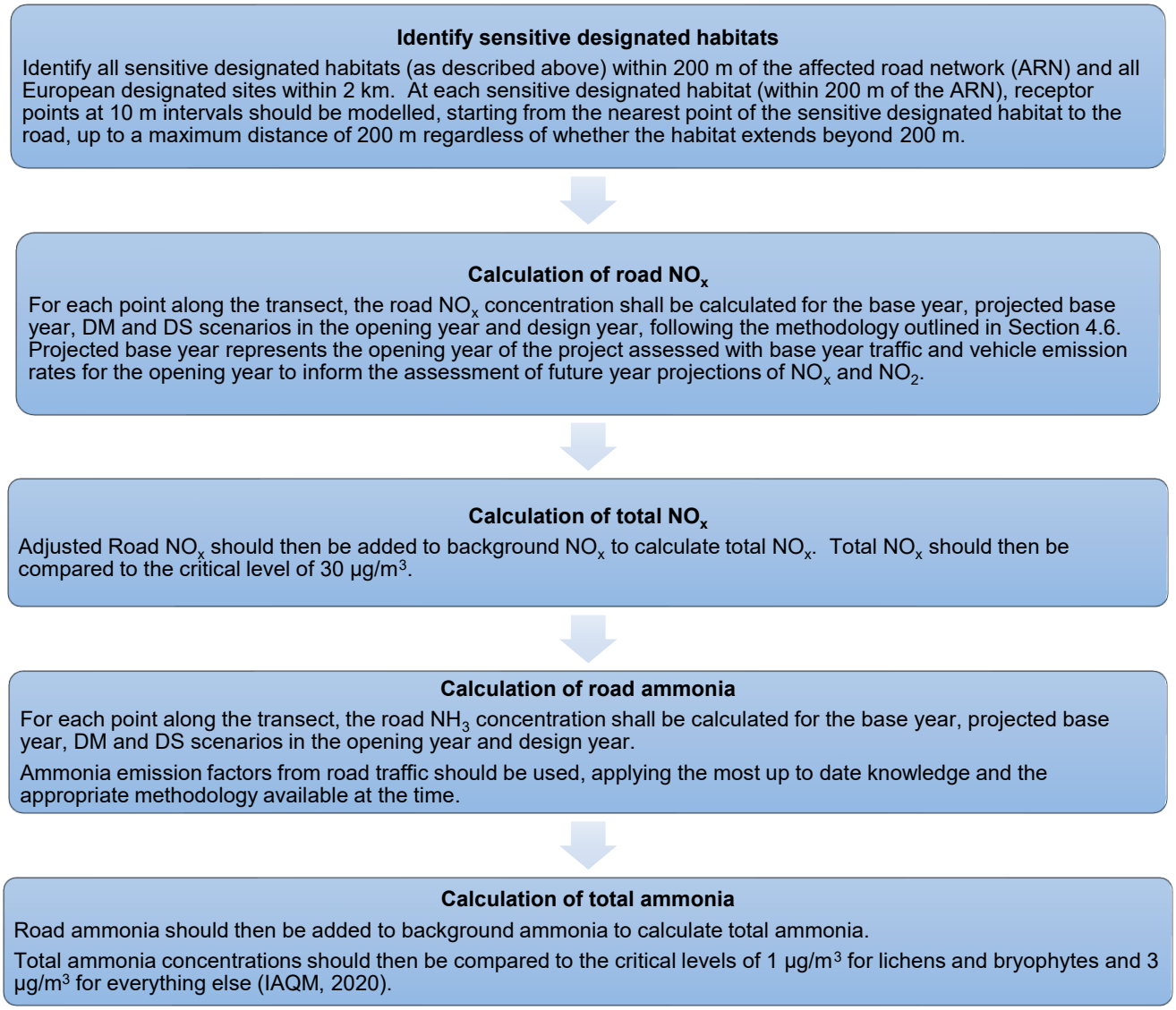

Figure 4.8 Summary of steps to calculate road contribution and total NO_x and NH_3

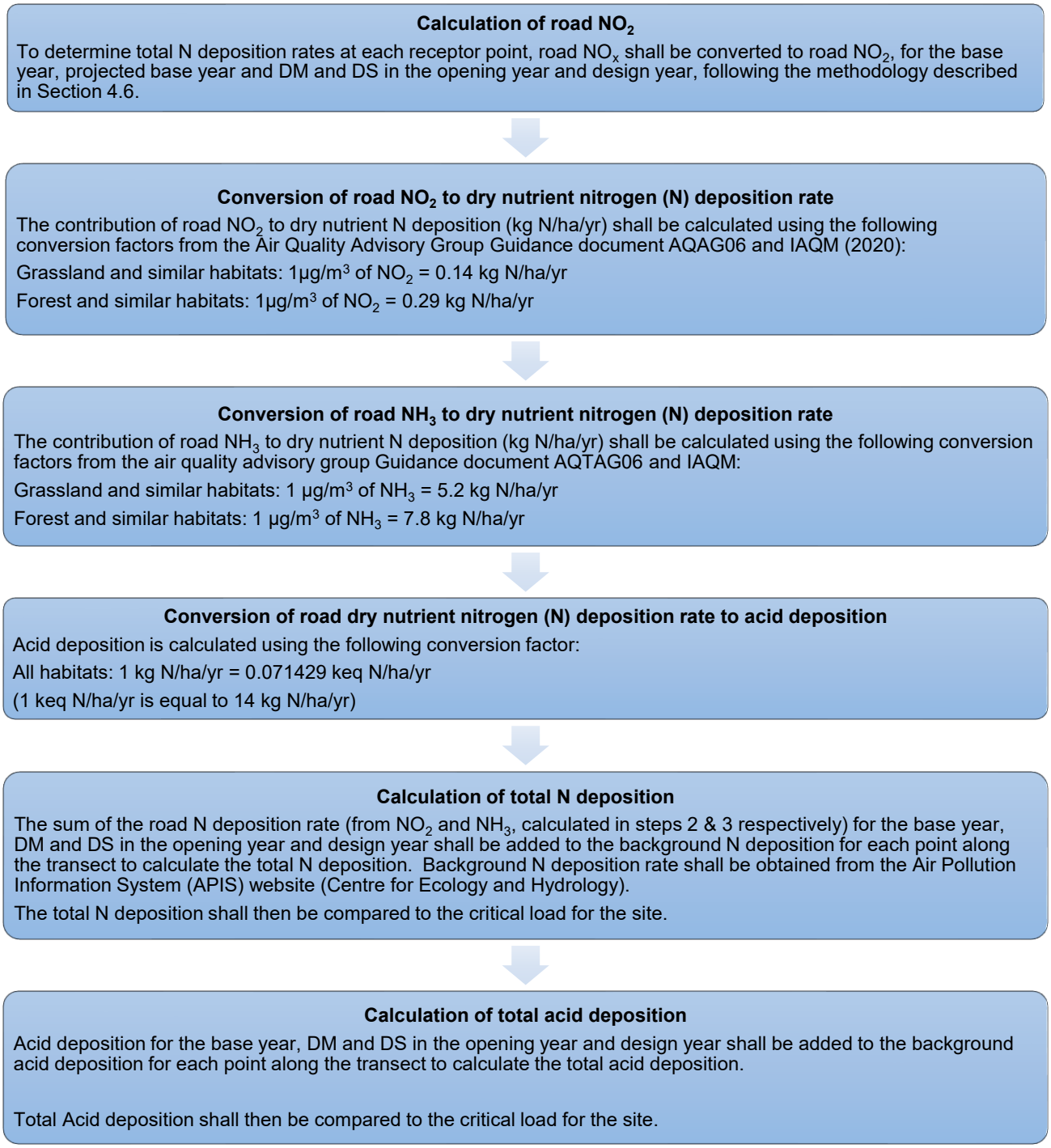

Figure 4.9 Summary of steps to calculate N deposition and acid deposition

The competent practitioner for air quality and biodiversity will review the latest information regarding critical loads, background nitrogen and acid deposition and ammonia at the time of the assessment. At the time of writing the Guidance, the EPA's research papers 'Research 323: Critical Loads and Soil-Vegetation Modelling' (EPA, 2020) and 'Research 390: Nitrogen-Sulfur Critical Loads: Assessment of the Impacts of Air Pollution on Habitats' (EPA, 2021b) provide information regarding background concentrations and critical loads. If appropriate information is not available in these documents, then the air quality practitioner should refer to the Air Pollution Information System (APIS) which provides critical loads for different habitats.

4.7.3 In Combination Assessment

Natura 2000 is a network of sites selected to ensure the long-term survival of Europe's most valuable and threatened species and habitats. Sites included are the SAC, SPA and Ramsar sites. At these sites it is necessary to consider not only the effects of the proposed scheme in isolation, but also 'in combination' effects i.e. the effects of the proposed scheme when considered cumulatively with all forecast traffic growth on the road network.

In combination assessment does not normally require the modelling of any additional scenarios. It does require the project competent practitioner for biodiversity not to consider the impact of the proposed scheme in isolation, but to compare the DS scenario with the projected base year scenario (which assumes no growth in traffic flow from the base year to the opening year) to take full account of the effects of traffic growth without the obscuring effect of improved vehicle emission factors.

4.8 Regional Assessment

Box 6: Regional Assessment

The regional assessment is undertaken to determine the potential air quality effects of the proposed scheme at a regional level. Pollutants of concern on a regional scale are nitrogen oxides (NO_x) and carbon dioxide (CO_2e).

The assessment of the national/international level impacts of the preferred route should focus on the change in emissions of nitrogen oxides (NO_x) and carbon dioxide (CO_2e) in the current (baseline), opening and design years.

The study area for the regional assessment should be discussed with the project transportation consultants to ensure roads with changes in traffic flows/composition attributed to the scheme are included. If there is a fully calibrated scheme traffic model then the outputs from the whole model may be included in the regional assessment.

The TII REM can be used to estimate total NO_x and CO_2e emissions from the road network. The wider-scale impacts should be described principally by comparing the incremental change in emissions between the DM and DS options.

4.9 Construction Air Quality Assessment

Box 7: Construction Air Quality Assessment

Potential air quality effects during the construction phase can occur due to dust emissions and from construction traffic movements.

A semi-quantitative approach is recommended to determine the likelihood of a significant impact from dust (nuisance), PM_{10} and $PM_{2.5}$ on human health and on vegetation. The approach should be combined with an assessment of the proposed mitigation measures.

The pollutants of most concern in relation to emissions from construction road traffic are nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) and NO_X and ammonia on sensitive designated habitats.

4.9.1 Approach and Processes

A 5-step procedure should be followed to screen potential effects, based on the proximity of receptors and baseline conditions in accordance with the Institute of Air Quality Management (IAQM) procedures published in their latest construction dust Guidance. In the IAQM guidance trackout (i.e. mud on roads) are included as a specific dust generating activity, as well as demolition, construction and earthworks. The risk of likely significant effects will be higher in urban areas, where existing PM_{10} concentrations are likely to be higher and due to the number of receptors which may experience potential dust effects.

Figure 4.10 sets out the steps to be taken in the assessment. The latest version of the IAQM guidance is 'Guidance on the assessment of dust from demolition and construction (V1.1)' (IAQM, 2014).

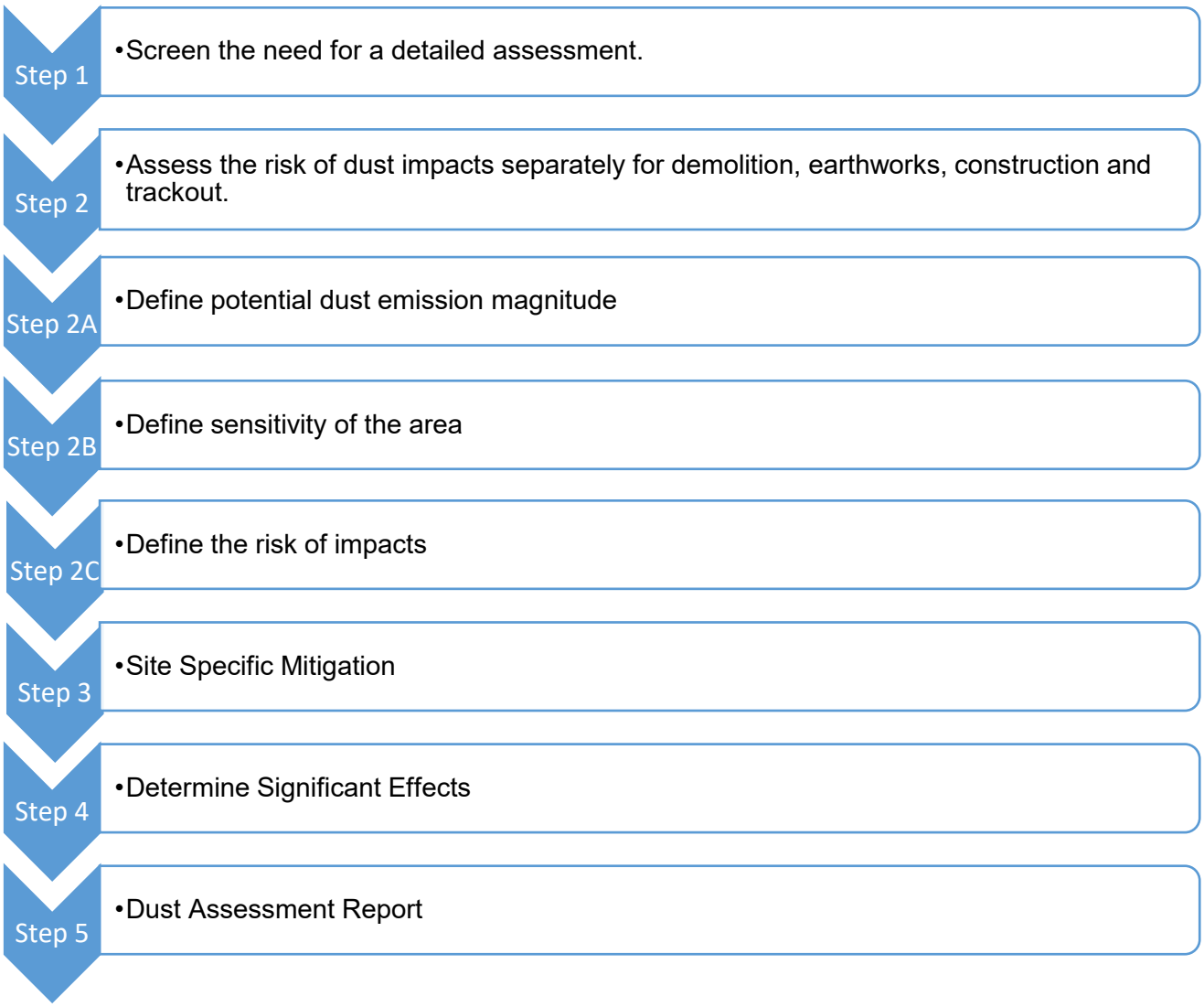

Figure 4.10 Steps to perform a Construction Phase Dust Assessment

Step 1: Screen the Need for a Detailed Assessment

An assessment will be required where there are sensitive receptors located within 200 m of the boundary of the site or route used by construction vehicles on the public highway. Table 4.7 provides a list of receptors which are sensitive to potential dust effects and to human health effects of PM_{10}. Over a distance of up to 200 m significant effects on human receptors (nuisance and human health) as well as vegetation may occur.

Table 4.7 Receptors sensitive to dust and PM_{10}

Receptors	Receptor Type
Residential Properties	Amenity
Hospitals	Amenity
Schools	Amenity
Care Homes	Amenity
Playing Fields	Amenity
Parks	Amenity
Footpaths	Amenity
Cultural Heritage Collections- Museums and Galleries	Amenity
Vehicle Showrooms	Amenity
Food manufacturers	Amenity
Hi-tech manufacturing	Amenity
Horticultural operations	Amenity
Car Parks	Amenity
Farmland	Amenity
Roads	Amenity
Places of work	Amenity
Ramsar	Sensitive Designated Habitat
SPA	Sensitive Designated Habitat
SAC	Sensitive Designated Habitat
NHA	Sensitive Designated Habitat
pNHA	Sensitive Designated Habitat
Nature Reserves	Sensitive Designated Habitat

If no detailed assessment is required, then the report can note that no significant effects are likely.

Step 2: Assess the Risk of Dust Impacts.

The risk of potential dust impacts occurring is determined separately for each of the four activities (demolition; earthworks; construction; and trackout) and takes account of:

- The scale and nature of the works, which determines the potential dust emission magnitude (Step 2A); and
- The sensitivity of the area (Step 2B).

These factors are combined within a matrix in Step 2C to give the risk of dust impacts.

Step 3: Site Specific Mitigation

Site-specific mitigation is determined for each of the four activities (demolition; earthworks; construction; and trackout) and is based on the risk of dust impacts occurring, as defined in Step 2.

Step 4: Determine Significant Effects

This step examines the residual effects and determines whether or not these are significant. Further details with regards to Step 4 are provided in Section 4.10.4.

Step 5: Dust Assessment Report

Prepare a dust assessment report.

4.9.2 Other Considerations

The following should be considered when undertaking a construction dust assessment.

Borrow pits and Large Plant Installations

Borrow pits are a specific dust-generating activity that should be given a 'high dust emission magnitude' as part of the Earthworks category, rather than being given a specific additional assessment. Similarly, Concrete Batching Plant, Asphalt Plant, Crushing and Screening Plant shall also be given a high dust magnitude for the construction or earthworks categories as appropriate.

Aspergillus Spores

Where relevant, the dust assessment should consider fungus, specifically *Aspergillus spp.*, as an elevated risk factor option for proposed schemes. The risk assigned to proposed schemes where *Aspergillus spp.* may be present, should be assigned a high dust emission magnitude e.g. demolition category, to trigger the need for greater mitigation where immunosuppressed receptors are identified.

Aspergillus spp. may be present in soil, compost and rotting leaves, plants, trees and crops, and dust, and so spores may be released during earthworks or demolition of older buildings. It does not normally affect healthy individuals but may have adverse repository effects for individuals with immunosuppressed or low immunity. Therefore, the specific consideration should be made for works near locations where immunosuppressed individuals may be present; i.e. hospitals, medical centres, etc.

For proposed schemes where *Aspergillus spp.* may be present, then the level of risk and appropriate mitigation measures should be discussed with the project ecologists and human health practitioners. If necessary, microbiologists could be used to determine whether *Aspergillus spp.* is present.

Non-Road Mobile Machinery (NRMM) and Small Plant

Experience of assessing the exhaust emissions from on-site plant machinery (e.g. excavators) and generators (also known as non-road mobile machinery or NRMM) suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant machinery, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur (IAQM, 2014).

4.9.3 Construction Traffic

The following outlines a risk-based approach to determining the need for a construction phase traffic AQA for a proposed scheme. A stepped approach is recommended as illustrated below.

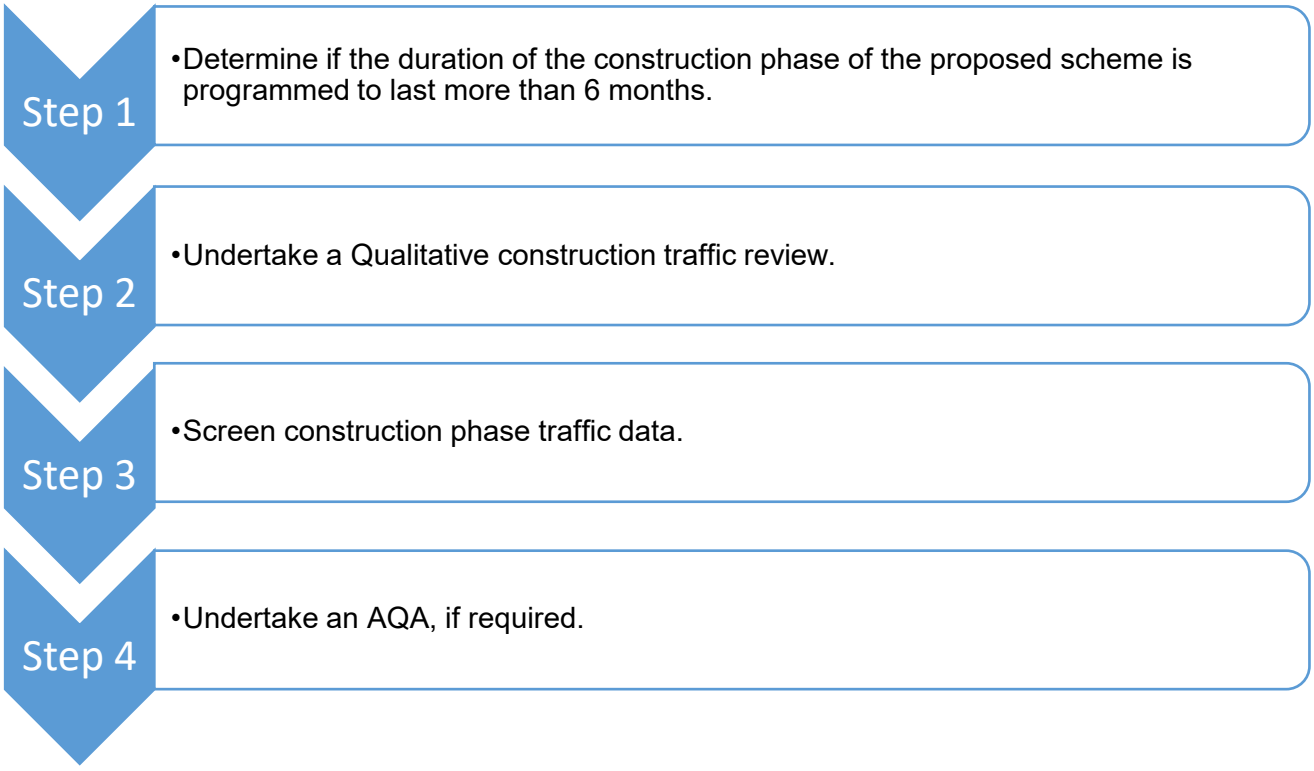

Figure 4.11 Steps to perform a Construction Phase Assessment

4.9.3.2 Step 1 - Duration

Assessment of construction phase traffic impacts will be required where construction activities are programmed to last for a duration of 6 months or more. If the construction phase is programmed to last less than 6 months, then the construction activities are unlikely to constitute a significant air quality effect and can be scoped out of the assessment. Six months is proposed as over this period a change in concentration can affect the annual concentration, which is the period that air quality standards have been set for.

4.9.3.3 Step 2 – Phase 2 Stage 3 Qualitative Construction Traffic Review

The air quality practitioner should liaise with the project manager and traffic practitioner to update the assumptions and risk assessment for the TII Phase 2, Stage 3 Preferred Option Selection construction traffic review. The update should consider any new information (e.g. emerging information on traffic management) that was not previously available and check that assumptions and baseline air quality conditions are as previously understood.

For those schemes that it was concluded likely significant air quality effects were not expected, the purpose of the review is to confirm that is still the case or not. Conversely the review is also an opportunity to check that those scheme that were considered to have a risk of likely significant air quality effects are still considered to pose a risk or not.

If the update concludes that likely significant effects are not anticipated, taking into account any new information, a qualitative statement should be included in the EIAR to set out why no likely significant effects are anticipated. The qualitative statement should set out the rationale for this conclusion.

Should the update conclude that there is a risk of likely significant air quality effects, the air quality practitioner should progress to step 3.

4.9.3.4 Step 3 – Screen the Traffic

Where step 2 has identified the potential for likely significant air quality effects, construction phase traffic data should be screened against the following criteria. The screening criteria are based on the changes between the DS traffic (i.e. with construction) compared to the DM traffic:

- Road alignment will change by 5 m or more; or
- Annual average daily traffic (AADT) flows will change by 1,000 or more; or
- Heavy duty vehicle (HDV) (vehicles greater than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more; or
- Daily average speed change by 10 kph or more; or
- Peak hour speed will change by 20 kph or more.

This approach is consistent with the operational phase assessment.

If the criteria are not met, then a quantitative assessment of construction traffic can be scoped out and the effects are considered to be not significant. If the criteria are met a local AQA is required.

4.9.3.5 Step 4 – Assessment

The construction phase traffic assessment should follow the assessment methodology described for the operational phase assessment. A detailed level assessment should be undertaken where existing concentrations are within 90% of the threshold. For all other areas an assessment using the TII REM should be undertaken (Table 4.1).

The evaluation of significance for the construction phase assessment of traffic emissions should be undertaken following the steps outlined in Section 4.10.

4.10 Evaluation of Significance

Box 8: Evaluation of Significance

The evaluation of significance in terms of air quality for effects during the construction and operational phases should be undertaken.

Determining the significance of air quality effects during the construction phase is based on IAQM latest guidance. For the operational phase effects, the significance is based on the Institute of Air Quality Management (IAQM, 2017) Guidance which ensures consistency with the terminology contained within Table 3.3 of the EPA's 'Guidelines on the information to be contained in the EIAR' (EPA, 2022).

Determination of significance in relation to air quality effects on sensitive designated habitats should be undertaken in consultation with the project biodiversity practitioner.

The evaluation of significance for the operational phase should be undertaken for the opening year only, as the design year is likely to show lower total pollutant concentrations and change in concentration.

4.10.1 Human Health

To describe the air quality effects of the proposed scheme at sensitive human health receptors, the following should be considered in the AQA as defined in the EPA's Guidelines on the information to be contained in the EIAR' (EPA, 2022) including:

- Quality of Effects;

- Describing the Extent and Context of Effects;
- Describing the Probability of Effects;
- Describing the Duration and Frequency of Effects; and
- Describing the significance of Effects.

4.10.1.1 Quality of Effects

The results of the AQA should be interpreted to determine the magnitude of change in pollutant concentration at each of the modelled receptors. It should be noted that AQLV for NO_2 and particulates (PM_{10} and $PM_{2.5}$) have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. As such the sensitivity of receptors was considered when setting the AQLV and therefore no additional subdivision of human health receptors on the basis of building or location type is necessary.

The magnitude of change should be used to describe the quality of the effect as positive, negative or neutral using the criteria in the table below.

Table 4.8 Quality of Effect Criteria

Quality of Effect	Description
Positive effect	Where there is a decrease in annual mean concentration at a receptor which does not constitute a neutral effect.
Neutral effect	Where there is a change in concentration at a receptor of: • 5% or less where the opening year, without the proposed scheme annual mean concentration is 75% or less of the standard; or • 1% or less where the opening year, without the proposed scheme annual mean concentration is 94% or less of the standard.
Negative effect	Where there is an increase in annual mean concentration at a receptor which does not constitute a neutral effect.

4.10.1.2 Extent and Context of Effects

The extent of an effect is considered within the overall evaluation step (step 2), as described below in 4.10.1.5, in the determination of whether an effect is considered to be significant, as described above.

The context of an effect for air quality will focus on the duration of an effect as described in 4.10.1.5.

4.10.1.3 Probability of Effects

The AQA should consider a reasonably foreseeable worse-case and utilise the most up to date information and tools available to minimise the uncertainty in the AQA. Where a significant air quality effect is predicted this is considered a ‘likely effect’. Where an effect is evaluated to be not significant, such as following the implementation of mitigation, it is considered to be ‘unlikely’ that an effect could be significant.

4.10.1.4 Duration and Frequency of Effects

The focus of an evaluation of the significance of an air quality effect, for ambient air quality, is on the potential effect of changes in air quality on the pollutant standards. These standards are defined as concentration limits or exceedances averaged over annual timescales.

Only durations of time that an impact on annual averages are considered to be potentially significant in most incidences. Durations include:

- Momentary (seconds to minutes) are not considered significant as they are unlikely to affect air quality standards;
- Brief (less than a day) is the shortest period of time considered within AQA for road traffic for consideration of short-term standards;
- Temporary (less than a year);
- Short term effects (1 to 7 years);
- Long term effects (15 to 60 years); and
- Permanent effects (over sixty years) should be considered for example for operational phase.

For a construction phase the effects align with the duration of works and any associated changes in traffic. These effects are considered reversable once works cease. For the operational phase of the proposed scheme the AQA focuses on the worse-case year of operation, which is the opening year. Thereafter, as air quality improves, effects are considered to reduce over time. Air quality is anticipated to improve over the next 15 years (long-term) with improvements in vehicle technology and increased penetration of electric vehicles into the vehicle fleet. Further improvements beyond to 60 years, albeit at reduced rates of improvement, will further reduce air quality effects (permanent effects) with reduced numbers of combustion vehicles and further increases in electric vehicles.

4.10.1.5 Significance of the Effects

The significance of the air quality effect at receptors should be determined. A two stepped approach is recommended as illustrated in Figure 4.12.

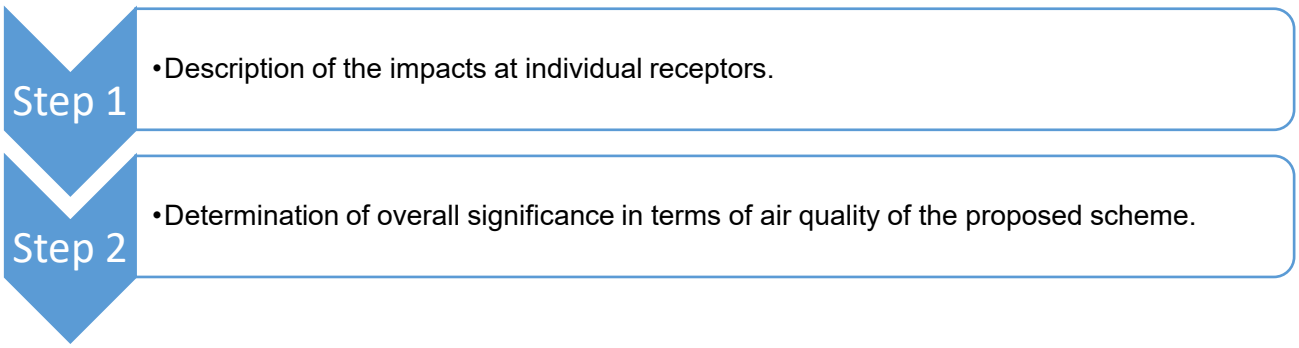

Figure 4.12 Determining the significance of the effect

The impact descriptors in Table 4.9 should be used to describe the impact at each receptor location, which takes into consideration the percentage change in concentration relative to the air quality standards of the pollutant. The impacts are described as neutral, slight, moderate or substantial.

Table 4.9 Impact Descriptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Standard Value (AQLV)			
	1	2-5	6-10	>10
75% or less of AQLV	Neutral	Neutral	Slight	Moderate
76 – 94% of AQLV	Neutral	Slight	Moderate	Moderate
95 – 102% of AQLV	Slight	Moderate	Moderate	Substantial
103 – 109% of AQLV	Moderate	Moderate	Substantial	Substantial
110% or more of AQLV	Moderate	Substantial	Substantial	Substantial

Should the Irish Air Quality Standards be updated to reflect new reduced thresholds, for example for PM_{10} and $PM_{2.5}$, the new thresholds should be adopted and the same % bands and % change criteria as set out in Table 4.9 used.

Step 2 is to determine the significance of the impacts, and this should align with the terminology in the EPA guidelines (EPA, 2022). Whilst the outcome of Step 1 may determine that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors the overall effect may not necessarily be judged as being significant in some circumstances. The factors in Table 4.10 should be used to determine an overall judgement of whether the proposed scheme is 'significant' or 'not significant' in terms of air quality.

Impacts which are described as neutral or slight i.e. of local importance only, are considered to be 'not significant'. Impacts described as moderate or substantial should be considered in the overall evaluation of significance of a proposed scheme. For these impacts, the factors in Table 4.10 should be applied to determine if the effects are significant or not significant. The additional terms set out in the EPA Guidance e.g. very significant or profound, are not considered to be required within an AQA, as an effect which is significant requires the identification of suitable mitigation measures.

Table 4.10 Factors to consider when determining the overall significance of the proposed scheme

Factors
The number of people affected by increases and/or decreases in concentrations and a judgement on the overall balance.
The number of people exposed to levels above the standard.
Whether or not the exceedance of a standard is predicted to arise in the study area where none existed before, or the size of an exceedance area is substantially increased.
Whether or not the study area exceeds a standard and this exceedance is removed, or the size of the exceedance area is reduced.
Uncertainty, including the extent to which worse-case assumptions have been made.
The extent to which a standard is exceeded e.g. an annual mean NO_2 of 41 µg/m^3 should attract less weight in the determination of significance than an annual mean of 51 µg/m^3.

4.10.2 Sensitive Designated Habitats

The results of the assessment for NO_x, NH_3, N deposition and acid deposition should be discussed with the competent practitioner for biodiversity who will determine if the results are significant. The significance of effects at sensitive designated habitats are described in the Biodiversity OTD PE-ENV-01106 and SD PE-ENV-01107.

Table 4.11 describes the process to determine if the results of the assessment are significant or not.

Table 4.11 Significance of effects at Sensitive Designated Habitats

Description of results	Significance
Total N deposition and acid deposition are more than 1% of the critical load.	Discuss further with project biodiversity practitioners (see below).
The total N deposition and acid deposition are less than 1% of the critical load.	Not significant.

To determine if the air quality impacts at a sensitive designated habitat are significant, the project biodiversity practitioner should consider:

- Factors such as the nature of site management;
- Other factors such as regular flooding in maintaining a suitable habitat;
- The degree of sensitivity to fauna to relatively subtle changes in botanical composition;
- Whether nitrogen or phosphorus is the key limiting nutrient; and
- The extent of the sensitive designated site that is negatively affected should be taken into consideration.

Where significant effects are determined, site survey information is required to determine if the sensitive habitat of relevance is actually present in the affected area and to inform potential mitigation measures that may be required.

4.10.3 Project Appraisal Guidelines Unit 7.0 Seven Point Scoring Scale

The PAG Unit 7.0 document sets out a seven-point scale upon which each option should be assigned an appropriate score (1 to 7) at TII Phase 2 Options Selection, Stages 1 and 2. Table 4.12 below sets out in air quality terms how each of the scores (1 to 7) should be assigned.

It should be noted that the scores should be assigned based on the overall potential air quality effects on human health receptors and sensitive designated habitats during the operational phase only. Practitioners should consider the overall effects of an option to determine whether the balance of improvements and deterioration result in a positive, neutral or negative outcome. The overall evaluation is important, and options may include a mixture of positive, neutral or negative outcomes. The biodiversity practitioner should be consulted with when determining an appropriate score for air quality impacts at sensitive designated habitats.

At Stage 1, a qualitative assessment will be undertaken as outlined in Figure 3.1. Table 4.12 should be followed to assign a score to each option using the definitions provided in the 'Stage 1: Local Air Quality (qualitative)' column. The Stage 1 MCA should be completed for each option with the assigned score and qualitative comments added.

At Stage 2, a quantitative assessment will be undertaken, with outputs from both the local AQA and index of overall change used to inform the score assigned to each option (Table 4.12). The outcome of the local AQA should be used as the primary indicator to assign a score to an option, with the outcome from the index of overall change used to support the decision. The Stage 2 MCA should be completed for each option with the assigned score and comments added.

For both Stage 1 and 2, a score of 1 or 7 would signify that the potential air quality effects from an option would be significant. A score of 7 would indicate a positive significant outcome, while a score of 1 would indicate a negative significant outcome. If a score of 1 is assigned to an option, then it would be considered a show-stopper and further work to consider whether the potential significant effects could be mitigated should be undertaken. If the potentially significant effects cannot be mitigated appropriately then the option should not be taken forward to the next stage. Whether each option meets the scheme objectives should also be considered. Please see Table 4.9 for further guidance on the terms described within Table 4.12 (e.g. slight and moderate).

Table 4.12 PAG Seven-Point Scale

Seven Point Scale	Stage 1: Local Air Quality (qualitative)	Stage 2: Local Air Quality (quantitative)	Stage 2: Index of Overall Change in Exposure (quantitative)
7 – Major or highly positive	Based on professional judgement the option would result in potentially significant positive improvements overall in an area of identified poor air quality.	Overall significant positive air quality effects are predicted at either human health receptors or sensitive designated habitats.	Negative index value
6 – Moderately positive	Based on professional judgement it is anticipated that the option would not result in potentially significant air quality improvements overall in an area of identified poor air quality. However, the option has the potential to result in large/moderate decreases in pollutant concentrations at human health receptors or sensitive designated habitats.	Overall significant positive air quality effects are not predicted at either human health receptors or sensitive designated habitats. However, the option has a higher potential for significant positive effects e.g. moderate impacts at individual receptors.	Negative index value

Seven Point Scale	Stage 1: Local Air Quality (qualitative)	Stage 2: Local Air Quality (quantitative)	Stage 2: Index of Overall Change in Exposure (quantitative)
5 – Minor or slightly positive	Based on professional judgement it is anticipated that the option would not result in potentially significant air quality improvements overall in an area of identified poor air quality. However, option has the potential to result in small decreases in pollutant concentrations at human health receptors or sensitive designated habitats.	Overall significant air quality effects are not predicted at either human health receptors or sensitive designated habitats. Only positive effects that are at worst slight at individual locations are predicted.	Negative index value
4 – Not significant or neutral	Based on professional judgement it is anticipated that the option would not result in potentially significant air quality changes overall in an area of identified poor air quality.	Overall significant air quality effects are not predicted at either human health receptors or sensitive designated habitats. Only effects that are Neutral at individual locations are predicted.	Low positive or negative index value (less than 100 for NO_X and PM_{10})
3 – Minor or slightly negative	Based on professional judgement it is anticipated that the option would not result in a potentially significant deterioration overall in air quality in an area of identified as poor air quality. However, the option has the potential for small increases in pollutant concentrations at human health receptors or sensitive designated habitats.	Overall significant air quality effects are not predicted at either human health receptors or sensitive designated habitats. Only negative effects that are at worst slight at individual locations are predicted.	Positive index value
2 – Moderately negative	Based on professional judgement it is anticipated that the option would not result in a potentially significant deterioration overall in air quality in an area of identified as poor air quality.	Overall significant air quality effects are not predicted at either human health receptors or sensitive designated habitats. However, the option has a higher risk of significant effects e.g. moderate impacts at individual receptors.	Positive index value

Seven Point Scale	Stage 1: Local Air Quality (qualitative)	Stage 2: Local Air Quality (quantitative)	Stage 2: Index of Overall Change in Exposure (quantitative)
	However, the option has the potential for large/moderate increases in pollutant concentrations at human health receptors or sensitive designated habitats.		
1 – Major or highly negative	Based on professional judgement the option would result in potentially significant negative changes overall in an area of identified poor air quality. This would be a show-stopper and mitigation would be required for an option to progress.	Overall significant adverse air quality effects are predicted at either human health receptors or sensitive designated habitats. This would be a show-stopper and mitigation would be required for a scheme/option to progress.	Positive index value

4.10.4 Construction Dust

Following the determination of the risk of dust impacts and appropriate mitigation measures identified, Step 4 in Figure 4.10, is to determine whether there are significant effects arising from the construction phase of the proposed scheme.

As described in the IAQM Guidance, for almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. In most circumstances this is possible and therefore the residual effects will normally be 'not significant'.

There may be a few exceptions to this, for example where there is inadequate access to water for dust suppression to be effective and, even with other mitigation measures in place, there may be a significant effect. Therefore, it is important to consider the specific characteristics of the site and the surrounding area to ensure that the conclusion of no significant effect is robust.

4.11 Mitigation

Box 9: Mitigation

Where a competent practitioner for air quality has determined that the proposed scheme is likely to be significant for air quality during either the construction or operational phase, mitigation measures should be recommended as required by the EIA directive 2014/52/EU.

Monitoring should then be carried out to determine the effectiveness of the measures. The level of mitigation and monitoring should be proportionate to the level of significance.

4.11.1 Construction Phase

For the construction phase, mitigation and monitoring actions will be intrinsically linked to risk level, as defined in the latest IAQM Guidance and as determined for proposed schemes using the IAQM approach (Section 4.9). Appropriate mitigation measures are outlined in IAQM Guidance on the assessment of dust from demolition and construction (IAQM, 2014).

Implementation of mitigation measures and monitoring to ensure the measures are effective should be outlined in the EIAR, with further details provided in a Construction Environmental Management Plan (CEMP) or similar document and implemented during Phases 5 to 7. The level of construction mitigation and monitoring should be agreed with TII.

4.11.2 Operational Phase

For the operational phase, if significant effects are predicted, appropriate mitigation measures and monitoring should be outlined in the EIAR which set out the measures that are required to mitigate the effects of the projects and a monitoring regime to determine the effectiveness of the measures. The level of operational mitigation and monitoring should be agreed with TII.

At sensitive designated habitats, where significant effects are determined, site survey information is required to determine if the sensitive habitat of relevance is actually present in the affected area and to inform on any potential mitigation measures that may be required. Similarly, appropriate mitigation measures and monitoring should be included in the EIAR with these agreed with TII and may include:

- Speed limits adjusted for air quality;
- Changes in road alignment;
- Wider route restraint measures to reduce traffic flows; or
- High vertical barriers.

5. Air Quality Assessment through the Project Phases and Stages

5.1 Introduction

Section 3 of these Guidelines outlines *where* AQA applies in the different Project Phases and Stages of TII Specified Infrastructure Projects. The following section details *how* the AQA process is applied to these Phases and Stages.

The following describes the AQA approach and process for each of the Project Phases, which are broadly outlined as:

- TII Phase 2 Options Selection (NTA Phase 2)
- TII Phase 3 Design and Assessment (NTA Phase 3)
- TII Phase 4 Statutory Process (NTA Phase 4)

These Phases are outlined in Figure 3.1.

5.2 TII Phase 2 (Options Selection)

The Project Appraisal Guidelines for National Roads Unit 7.0 – MCA is an appraisal tool used during the Phase 2 Options Selection process to evaluate and rank project options against a set of criteria on the basis of a scoring procedure. For all major national road projects an MCA must be undertaken at Stages 1 and 2. A 3-stage process is detailed in the Project Appraisal Guidelines (TII, 2022) (Figure 5.1).

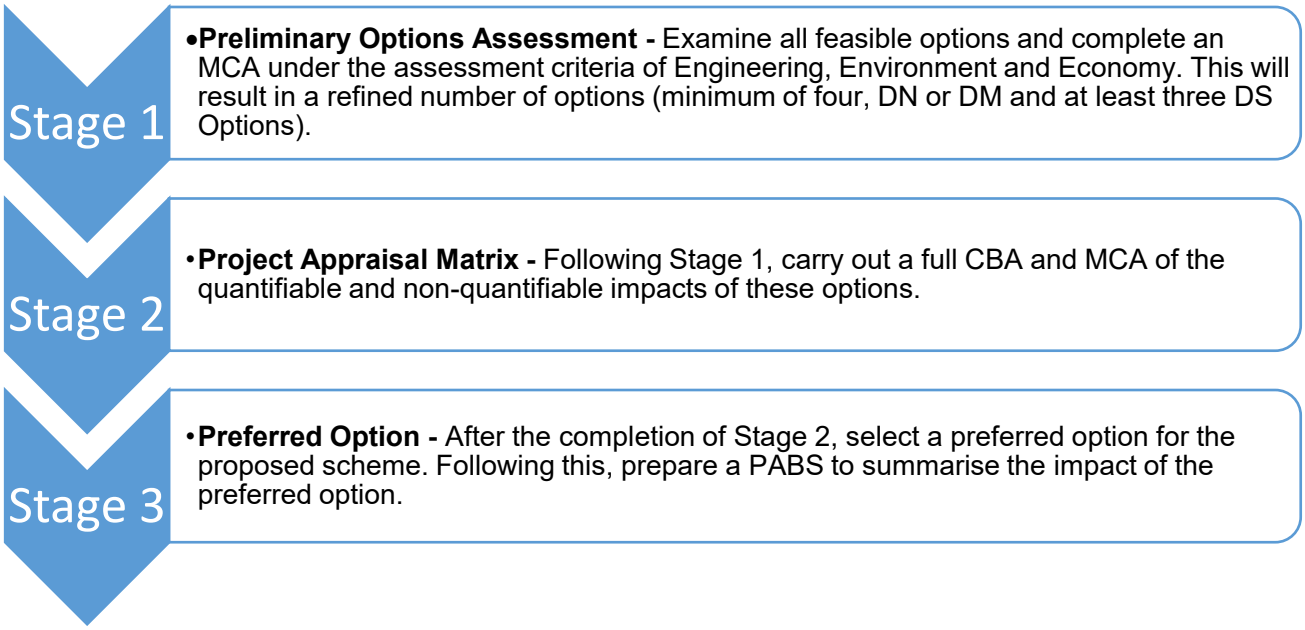

Figure 5.1 Stepped Approach detailed in the Project Appraisal Guidelines

The following sub-sections provide further Guidance on the air quality work required for Phase 2 Options Selection Stages 1 to 3.

5.2.2 Stage One - Preliminary Options Assessment

The Stage 1 Preliminary Options Assessment in the Option Selection process is to identify the nature and extent of significant constraints within a defined study area. These constraints should be documented and mapped so that feasible options can be designed to avoid such constraints, where possible. The first part of this data collection should be based on desk-based research studies. All known constraints relevant to air quality should be identified e.g. existing monitored concentrations exceeding the AQLV and recorded on suitably scaled maps.

The specific objectives of the air quality input to the Stage 1 Preliminary Options Assessment are to characterise existing ambient air quality in a study area and to identify all sensitive receptor locations within the study area that are likely to be impacted before feasible options are identified.

5.2.2.1 Stage One – AQA Approach and Process

The AQA approach and process for the Stage 1 preliminary option assessment includes the tasks in Table 5.1.

Table 5.1 AQA approach and process for Stage 1

AQA approach and process for the Stage 1
Definition of the purpose and scope of the assessment.
A review of the local air quality within the study area (See Section 4.2).
A review of non-road sources of pollution which could lead to elevated background concentrations or higher incidences of exceedance of short-term standards. This should consider potential sources of NO_2, PM_{10} and $PM_{2.5}$. Non-road sources include industrial sources (both point sources and fugitive emissions), ports and areas with a high density of domestic solid-fuel combustion. Sources within 1 km of the study corridor should be identified; this should be extended to 3 km in the case of large industrial sources such as power stations.
Identify on a suitably scaled map, the number of sensitive human receptor locations within 200 m of the carriageway of each option that have the potential to be significantly affected by the preliminary options. European designated sites within 2 km of the route options and all sensitive designated habitats within 200 m of the route options should also be identified.
A discussion of any opportunities for mitigation.
A review of previous studies, local AQA or reports, and any other air quality work undertaken by TII, EPA or local authorities and provide a qualitative statement on what any studies indicate.
A review of future developments which have been granted planning permissions within the study area of relevance for air quality e.g. sensitive receptors and developments likely to impact air quality. Provide a qualitative statement on the air quality implications of any committed receptors.

5.2.2.2 Stage One – AQA Outputs

Box 10: Stage One Outputs

The outputs will include:

- Detailed air quality mapping, identifying the location of receptors for both human health and sensitive designated habitats, within 200 m of the carriageway of each option that have the potential to be significantly affected by the proposed options;
- Stage 1 report including a description of existing local air quality conditions in relation to NO_2, PM_{10} and $PM_{2.5}$ and identification of non-road sources within the study area, a discussion of any opportunities for mitigation and a review of previous air quality studies and future planning applications which have been granted approval within the study area;
- Completion of the Stage 1 MCA to score each of the options relative to their potential air quality effects; and
- Record that receipt of the outputs has been acknowledged by the overall Project Manager for a scheme.

5.2.3 Stage Two - Project Appraisal Matrix

Following an examination of the Stage 1 Preliminary Options Assessment of the Option Selection process, option selection continues. The design team develops feasible options in accordance with the Project Appraisal Matrix.

The air quality input for the feasible route options should consider the relative impacts of each of the route options on exposure to air pollution at sensitive locations. The assessment should focus on NO_2, PM_{10} and $PM_{2.5}$ which are the pollutants of greatest concern with respect to road traffic emissions and human health. The assessment should also consider air quality impacts for sensitive designated habitats.

For Stage 2 there are four steps that should be completed in the route options selection (Figure 5.2).

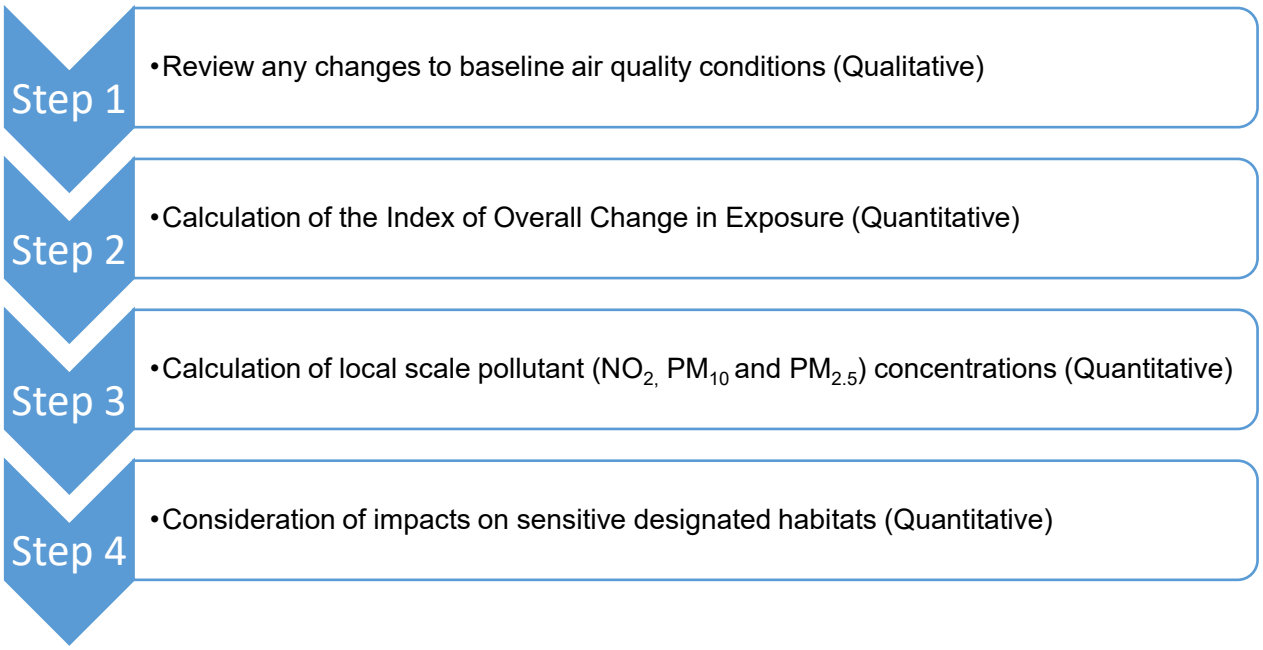

Figure 5.2 Air Quality steps for assessing the route options selection

5.2.3.2 Step 1: Changes to Baseline Air Quality Conditions

The air quality practitioner should review and update where necessary the baseline conditions reported in the Stage One assessment. This review should include:

- Any available monitoring data from the EPA or local authorities for NO_2, PM_{10} and $PM_{2.5}$ concentrations;
- Information about existing non-road pollution sources; and
- Location of sensitive human receptors and sensitive designated habitats.

5.2.3.3 Step 2: Calculation of the Index of Overall Change in Exposure

The Calculation of the Index of Overall Change in Exposure allows the overall impact of each route option in terms of NO_2 and PM_{10} to be compared. It is based on the number of properties within 50 m of the carriageway of all road links that will experience a significant change in traffic. The Index of Overall Change in Exposure methodology is set out in Section 4.4.

5.2.3.4 Step 3: Calculation of Local Scale Pollutant (NO_2, PM_{10} and $PM_{2.5}$) Concentrations

The air quality practitioner should undertake a quantitative assessment to determine NO_2, PM_{10} and $PM_{2.5}$ concentrations in the base year, opening and design year (15 years after the opening year of the scheme) of the proposed route options, with and without the options operational. This assessment shall be undertaken at a few worse-case receptors. These locations should represent the maximum likely impact of each of the route options. They should cover locations where air quality is expected to improve as well as those where it is expected to deteriorate. Predictions should be carried out using the TII REM or detailed dispersion modelling, as appropriate, as described in Section 4.5.

The magnitude of change in NO_2, PM_{10} and $PM_{2.5}$ concentrations at each receptor should be calculated to determine the most preferred to least preferred option in terms of air quality. The predicted concentrations should also be compared with the air quality standards. If concentrations are predicted to exceed or approach (defined as greater than 90%) the standards for any of the options, this should be identified in the Options Selection report.

5.2.3.5 Step 4: Consideration of Impacts on Sensitive Designated Habitats

Any assessment of air quality impacts on designated habitats should be discussed and agreed with the project biodiversity practitioner. The potential impact of the route options on sensitive designated habitats is limited to the local level. Consideration should therefore be given to all sensitive designated habitats that are within 200 m of the affected road network, during operation. The assessment methodology is described in Section 4.7.

The TII REM or detailed modelling should be used as appropriate, to predict concentrations of NO_x. Concentrations of ammonia should be predicted using the best available method at the time of undertaking the assessment e.g. Calculator for Road Emissions of Ammonia (CREAM) Tool developed by Air Quality Consultants. Following this, N deposition and acid deposition should be calculated and evaluated as described in Section 4.7.

5.2.3.6 Stage Two – AQA Approach and Process

The AQA approach and process for the Stage 2 selected options assessment includes the tasks set out in Table 5.2.

Table 5.2 AQA approach and process for the Stage 2

AQA approach and process for the Stage 2
Review Stage 1 Report
Definition of the purpose and scope of the assessment which should include a discussion of which parts of the operational AQA have been undertaken (i.e. Index of Overall Change in Exposure, local assessment) and if some parts of the assessment have not been undertaken, justification shall be provided.
An update on any changes to the location of sensitive receptors or local emissions sources since the preparation of the Stage 1 Report was undertaken.
Refine the map to identify the number of sensitive human receptor locations within 200 m of the carriageway of each option that are or have the potential to be significantly affected by a proposed scheme. European designated sites within 2 km of the proposed scheme routes and all sensitive designated habitats within 200 m of the route options should also be identified.
A review of any additional monitoring data that have become available following preparation of the Stage 1 Report.
Prepare a Stage 2 report, including: • A description of the methodology used; • Air quality baseline; • A table showing the Index of Overall Change in Exposure for each of the Options; • The results of the local AQA with predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations reported at a few worse-case relevant locations; • Identification of any locations where concentrations are likely to exceed, or are above 90% of the standards; • A table illustrating the calculated NO_x and ammonia concentrations which should be used to calculate N deposition and acid deposition at sensitive designated habitats for comparison with the relevant standards; and • A discussion of opportunities for mitigation for each option. If likely significant effects are predicted, appropriate mitigation measures shall be developed for proposed options to be progressed.

5.2.4 Stage Two – AQA Output

Box 11: Stage Two Outputs

The outputs will include:

- Further refined mapping to illustrate the location of air quality receptors for both human health and sensitive designated habitats;
- Stage 2 report outlining the inputs and outputs of the Index of Overall Change in Exposure and local AQA;
- Completion of the Stage 2 MCA to score each of the options relative to their potential air quality effects;
- For Major Projects input to the CBA, if required; and
- Record that receipt of the outputs has been acknowledged by the overall Project Manager.

5.2.5 Stage Three - Preferred Option

The purpose of Stage 3 is to select the preferred option and to outline the likely environmental effects, including the air quality effects.

Further project detail may or may not be available for the preferred option. Where available any additional detail should be reflected in the Stage 3 report.

5.2.5.1 Stage Three - AQA Approach and Process

The AQA approach and process for the Stage 3 preferred option selection includes the tasks set out in Table 5.3.

Table 5.3 AQA approach and process for the Stage 3

AQA approach and process for the Stage 3
Review of the Stage 2 Report
Definition of the purpose and scope of the assessment
The air quality practitioner should review and update where necessary the baseline conditions reported in the Stage 2 Report. This should include: • any available monitoring data from the EPA or local authorities with regards to NO_2, PM_{10} and $PM_{2.5}$ concentrations; • information about existing non-road pollution sources; and • location of human receptors and sensitive designated habitats.
Recalculate the Index of Overall Change in Exposure for the preferred option if there are any changes to the traffic data, alignment of the proposed scheme or number or location of sensitive receptors since Stage 2.
Assist, where necessary, the Design team in preparing the air quality section of the PABS.

AQA approach and process for the Stage 3
Undertake a review with the project manager and traffic practitioner, to consider the air quality risks associated with the construction of the emerging preferred option with respect to the change in road traffic e.g. additional vehicle trips and traffic management. The intention of the review is to establish the likely level of traffic data that would be required for the air quality practitioner to undertake a proportionate AQA of the construction phase. The focus of the review will be to determine the risk of a likely significant air quality effect. Where a risk of likely significant effect is determined through this review, traffic data suitable for use in air quality screening and assessment would be required (see Section 4.9.3.3). It is recommended that a precautionary approach is taken, and that traffic data is created if there is considered to be a risk of a likely significant air quality effect to avoid later delays to the assessment process.

5.2.6 Stage Three – AQA Output

Box 13: Stage Three Outputs

The outputs will include:

- Further refined mapping to illustrate the location of air quality receptors for both human health and sensitive designated habitats if the route alignment has been updated since Stage 2.
- Input to the Stage 3 Report to include the inputs and outputs of the Index of Overall Change in Exposure (if undertaken);
- Input into the PABS to summarise the impact of the preferred option; and
- Record when the receipt of the outputs has been acknowledged by the overall Project Manager.

5.3 TII Phase 3 (Design and Environmental Evaluation)

This phase of project delivery allows for the iterative design and environmental assessment, where required, of the project. The environmental assessment will include AQA as part of the EIAR where EIA is required, otherwise AQA may be undertaken where air quality effects are considered sufficiently relevant to be assessed in its own right. In the latter situation the AQA will either form a standalone report or be compiled within a project specific environmental report.

Significant detail will emerge through this iterative design and assessment phase of the project. This detail will address construction and operation stages as well as the detailed design of all aspects of the project. Phasing of construction may also be a relevant consideration.

As the design and assessments progress the detail of proposed mitigation measures for all environmental factors assessed, will also evolve.

All of this detail must be reflected and assessed in the AQA where it is relevant to the determination of likely significant effects. The process for identifying, assessing, and mitigating significant air quality effects is set out in detail in Section 4 of these Guidelines. However, some further aspects of the process and outputs for this phase are outlined in the following.

5.3.1 TII Phase 3 – Air Quality Assessment Process

Following the identification of the preferred option as outlined in Phase 2, the air quality practitioner should participate in the tasks listed in Table 5.4.

Table 5.4 Phase 3 – Air Quality Assessment Processes

Phase 3 – Air Quality Assessment Processes
Site Walkover: Undertake a walkover survey of the air quality study area to confirm that all significant features e.g. non-road pollution sources, sensitive receptors, have been identified and properly assessed in the Phase 2 options selection process.
Baseline air quality conditions: Review and update where necessary the baseline conditions reported in the Stage 3 assessment. This should include: • any available monitoring data from the EPA or local authorities with regards to NO_2, PM_{10} and $PM_{2.5}$ concentrations; • information about existing non-road pollution sources; and • location of sensitive human and ecological receptors.
EIA Screening: Participate in the EIA Screening process to ascertain whether there is a likelihood of significant environmental effects for air quality.
EIA Scoping: Scope the AQA for the EIAR and, in particular, establish the extent of any new monitoring surveys.
Monitoring Survey: It may be necessary to carry out air quality monitoring within the air quality study area, depending upon the availability of existing data and the complexity of the proposed scheme i.e. a Greenway Scheme would not require monitoring. Monitoring should only be undertaken for proposed schemes where a quantitative local AQA will be undertaken. The project programme should take into account the timescales required to complete baseline monitoring surveys; as a minimum, three months monitoring should be undertaken. Further details regarding the monitoring campaign are provided in Section 4.2.2.

5.3.1.1 Environmental Impact Assessment Report (EIAR)

In preparing the EIAR, regard should be given to the EPA's Guidelines on the Information to be Contained in the EIAR's (EPA, 2022) and NRA's EIA of National Road Schemes – A Practical Guide (NRA, 2008).

The air quality input for the EIAR should follow on from the work carried out for the Phase 2 Option Selection phase. The input to the EIAR should include the information listed in Table 5.5.

Table 5.5 Inputs to the EIAR

Input to the EIAR
Definition of the purpose and scope of the AQA.
An update on any changes to the location of sensitive receptors or local emissions sources following preparation of the Phase 2 Options Selection.
Any additional monitoring data that will have become available following preparation of the Phase 2 Option Selection. If monitoring has been carried out, then precise details of the methodology (see Section 4.2), period and annualised concentrations and comparisons with the relevant standards should be provided.

Input to the EIAR
A table showing the recalculated Index of Overall Change in Exposure for the existing route and the preferred option. This should include information about the number of properties within 50 m of each link considered.
A description of the local air quality modelling methodology. This should include: • A description of the model used (including a version number); • a justification for the model selection; • the source of any input data such as background concentrations; • traffic data[5]; • meteorological data; and • the methodology used to verify any detailed dispersion modelling (see Section 4.6).
A suitably scaled map showing the locations of the receptors used in the air quality modelling and the preferred option.
Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at worse-case receptors within 200 m of the ARN in the current (baseline), opening and design years with and without the preferred route in place.
A discussion of the modelling results, including comparison with the air quality standards and any local monitoring data.
An assessment of the significance of the predicted concentrations using the criteria set out in Section 4.10, taking account of the modelling uncertainties.
Proposed mitigation measures, where appropriate. If significant air quality effects are predicted following mitigation, then TII should be contacted to discuss.
A table presenting total emissions of NO_x and CO_2e for the existing route and the preferred route in the current (baseline), opening and design years.
Predictions of NO_x and ammonia concentrations at sensitive designated habitats and calculations of N deposition and acid deposition. A discussion of results prepared with biodiversity practitioners should be presented to determine if the impacts are significant.
Discussion of any impacts during the construction phase, proposed mitigation measures and residual impacts, as required.
Where dealing with European sites, reference to the results included in the NIS prepared for the purpose of Appropriate Assessment. Further information is provided in Section 4.7.

[5] It is important that the traffic data be either reproduced in the Air Quality Chapter of the EIAR, or a specific reference provided as to where they can be found (in the format that was used for the assessment).

5.3.2 TII Phase 3 – Air Quality Outputs

Box 12: Stage Three Outputs

The outputs will include:

- Detailed air quality mapping, identifying the location of sensitive receptors and description of the baseline air quality in the study area;
- An assessment of likely significant air quality effects;
- Compilation of the above information into the formal AQA Chapter of the EIAR
- Where EIA is required, or into the project specific environmental report or standalone AQA report where EIA is not required;
- A separate Non-Technical Summary (NTS) of the AQA, where EIA is required;
- Update the PABS to summarise the impact of the preferred option; and
- Record that receipt of the outputs has been acknowledged by the overall Project Manager.

5.4 TII Phase 4 (Statutory Processes)

This phase is focused on securing approval for the project from the consenting authority e.g. the Local Authority or An Bord Pleanála. Air Quality-related inputs in phase 4 are likely to include those listed in Table 5.6.

Depending on the outcome of the statutory process, other specific mitigation measures, and conditions of consent may need to be incorporated into the design and schedule of mitigation commitments. The appropriateness of mitigation measures to reduce impacts to levels not considered to be significant shall be determined through air quality modelling. It is essential that the modelling is proportionate in approach.

Table 5.6 Phase 4 Air Quality Inputs

Phase 4 Air Quality Inputs
Reviewing and drafting responses, where warranted, to air quality issues raised in submissions to the consenting process.
Reviewing and drafting responses to any air quality requests for further information issued by the consenting authority.
Reviewing and updating, if necessary, any aspect of the AQA, and documenting same.
Drafting an Air Quality Brief of Evidence, where a public oral hearing is to be held, in relation to air quality aspects, including the AQA and responses to submissions *etc.*
Taking part in oral hearing preparation meetings.
Finalising the Air Quality Brief of Evidence.
Presenting the Statement of Evidence at the public oral hearing and responding to any questions on air quality aspects direct from the public, other bodies, or the Inspector for the consenting authority.
Review and report on any air quality aspects addressed in the decision of the consenting authority (and Planning Inspector's report).

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Appendix A:

Sample Air Quality Chapter Headings (Phase 3)

The following is a sample of a suitable structure to include in the EIAR air quality chapter.

Introduction

- Scope of the air quality assessment.
- Air quality practitioner (include information regarding the competency and qualifications of the air quality practitioner).

Relevant Legislation and Policy

- Relevant European and national legislation.
- Relevant national planning policies.
- Relevant local planning policies.

Methodology

- Overall approach.
- Study Area (define how the study area for the construction and operational phases have been determined).
- Input data e.g. traffic data and sensitive receptors.
- Describe the methodology for the Index of Overall Change in Exposure, local AQA, regional assessment and include version numbers of tools, and spreadsheets used.
- Assessing the significance of effects.
  - Human health.
  - Sensitive designated habitats.
  - Construction impacts.

Baseline Conditions

- Desk-based air quality monitoring reviews.
- Scheme specific monitoring.
- Background air pollution.

Limitations and Assumptions

Assessment of Air Quality Effects

- Construction Phase.
  - Construction Dust Assessment.
  - Construction traffic assessment.
- Operational Phase
  - Index of Overall Change in Exposure.
  - Local air quality assessment.
    - Human health.
    - Sensitive designated habitats.
  - Regional Assessment.

Significance of the Air Quality Effects

- Construction Phase.
- Operational Phase.

Mitigation Measures

- Construction Phase.
- Operational Phase.

Residual Effects

- Construction Phase.
- Operational Phase.

Cumulative Impacts

Summary and Conclusion

Appendix B:

Competent Air Quality Practitioner

Recital 33 of the Preamble to Directive 2011/92/EU, as amended by Directive 2014/52/EU, states, inter alia, *'Experts involved in the preparation of environmental impact assessment reports should be qualified and competent.' Article 5(3)(a) of the amended EIA Directive states 'the developer shall ensure that the environmental impact assessment report is prepared by competent experts'.* It is therefore reasonable to surmise that Air Quality Professionals who carry out AQA on TII projects (which require EIA) must be expert, qualified and competent. Furthermore, it is the responsibility of the developer e.g. the road authority, to ensure that this is the case. To assist developers in meeting this responsibility, the following recommendations are made.

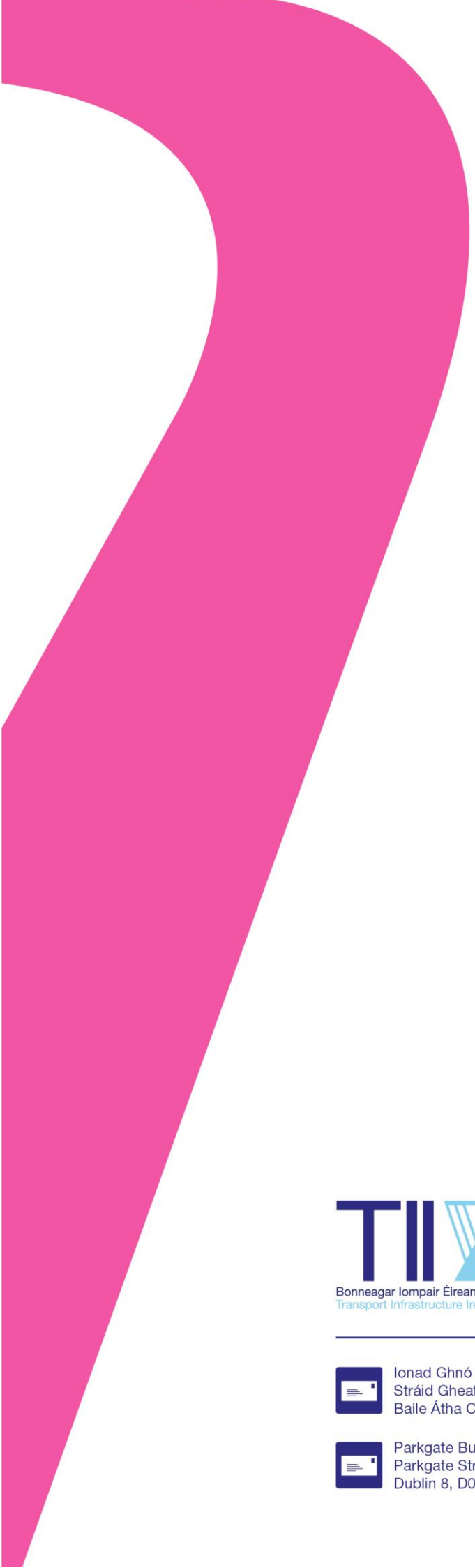
It is recommended that the Air Quality Technical Lead involved in the preparation of environmental impact assessment reports and/or the carrying out of AQA in respect of TII projects have the following qualifications:

- Chartership of a professional body;
- Honours degree (National Framework of Qualifications (NFQ) Level 8 (or equivalent level)) in a relevant subject e.g. environmental science (or equivalent discipline); and/or, a
- Master's degree (NFQ Level 9 (or equivalent level)) in a relevant subject e.g. environmental science (or equivalent discipline).

Furthermore, it is recommended that the Air Quality Technical Lead has at least 10 years' relevant post-graduate experience. It is important to note that the minimum number of years' relevant post-graduate experience may change (upwards or downwards) depending on the size, nature, complexity, etc., of the project in question. Furthermore, it is essential to carefully lay down further criteria defining what post-graduate experience is considered relevant in the context of the project at hand.

The developer must document the criteria (along with the underlying rationale) it has devised to ensure that its Air Quality Technical Lead are qualified, competent and expert. The developer shall also document how these criteria have been applied in the selection of its Air Quality Technical Lead.

Again, it is essential to note that it is the developer's responsibility to ensure that its Air Quality Technical Lead, who carry out the AQA on TII projects (which require EIA), are qualified, competent and expert.



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