

USW Caerleon Environmental Statement

Chapter E: Air Quality

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**WSP
1 Capital Quarter
Tyndall Street
Cardiff
CF10 4BZ**

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E1.0 Introduction

- E1.1 This chapter presents the findings of the assessment of the potential air quality impacts of the proposed development. It considers both the construction of the development and its occupation. For both phases, the type and source of potential impacts and the significance of effects are identified, and the measures that will be employed to minimise these described.
- E1.2 The potential air quality impacts that may arise due to the proposed development relate to:
- 1 During construction:
 - a Dust and particulate matter generated during demolition and construction works; and
 - b Exhaust emissions including nitrogen oxides (NO_x) and particulate matter / dust from on and offsite construction vehicle movements and non-road mobile machinery;
 - 2 During occupation:
 - a Exhaust emissions including nitrogen oxides (NO_x) and particulate matter (PM₁₀ and PM_{2.5}) from development-related traffic on the local road network.
- E1.3 The assessment considers potential exposure to air quality impacts at existing properties alongside the local road network and at future residential properties on the site.

About the Author

- E1.4 This chapter has been prepared by WSP UK Ltd, with lead author Dr. Bethan Tuckett-Jones, Head of Air Quality. Dr. Tuckett-Jones has over 25 years' experience in the provision of advice to public and private clients on pollution and its effects in the environment and is an experienced Expert Witness. She has undertaken well over a hundred air quality assessments, including various redevelopment schemes in Wales ranging in size from less than 100 to over one thousand residential units. She is a member of the Institute for Air Quality Management and a Chartered Environmentalist.

E2.0

Policy Context

Air Quality Legislation

- E2.1 Action to manage and improve air quality in Wales is driven by a combination of European and national legislation which set thresholds for acceptable concentrations of pollutants in ambient air and the roles of local, devolved and national government in ensuring that these thresholds are met.
- E2.2 The UK's Air Quality Strategy (AQS) was first published in 1997 as a requirement of the Environment Act 1995, and underwent revisions in 2000 and 2007. The aim of the AQS is to improve and protect ambient air quality in the UK, and to protect people's health from the adverse effects of air pollution.
- E2.3 The AQS sets air quality 'objectives' for the concentrations of ten key pollutants, and outlines measures to be taken, in order to meet these objectives. The objectives comprise policy targets, expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedances, within a specified timescale. The objectives have been derived from standards which represent minimum or zero risk levels. The standards are set purely with regard to scientific and medical evidence on the effects of the pollutants on health and or impacts on vegetation. The objectives take into account the costs, benefits, feasibility and practicality of achieving the standards, generally by imposing a time limit for achieving the standard.
- E2.4 The objectives for 7 of the pollutants considered in the AQS are set down in UK legislation in the Air Quality (Wales) Regulations 2000 and the Air Quality (Wales) (Amendment) Regulations 2002.
- E2.5 The Environment Act also set out the principles for Local Air Quality Management (LAQM) under which, Local Authorities are required to review current and future air quality within their area against the air quality objectives. Where the air quality objectives are not met, the Local Authority is required to declare an Air Quality Management Area (AQMA) and to produce an Action Plan in order to improve air quality and achieve the objective. Whilst Newport City Council (NCC) has declared AQMAs, including one in Caerleon, their Action Plan is currently being updated.
- E2.6 The European Union Ambient Air Quality Directive also sets thresholds for the concentration of pollutants in air for the protection of health and ecosystems. In the Directive, the thresholds are referred to as 'limit values'. The EU Ambient Air Quality Directive is transcribed into Welsh legislation in the Air Quality Standards (Wales) Regulations 2010 and 2016 amendment ("The Standards Regulations").
- E2.7 The UK Government and Devolved Administrations are responsible for assessing current and future compliance with the limit values set out within the Directive, and making annual compliance returns to the European Commission. The Air Quality Standards (Wales) Regulations place a duty on the Welsh Government to develop an Air Quality Plan that sets out measures to achieve compliance with the limit values in the shortest possible time. The Welsh Government's Plan was published in November 2018, targeted at 5 areas of exceedance of limit values on the strategic road network. In addition, the Welsh Government issued Air Quality Directions to Caerphilly County Borough Council and Cardiff City Council to draw up and implement Air Quality Plans to address exceedances of limit values within their districts. The focus of all of these Plans was on reducing roadside concentrations of NO₂. However, none of these Plans affected or considered roads within Caerleon.

- E2.8 The air quality objectives relevant to the assessment of the proposed development are set out in Table E2.1. For the pollutants of interest, the EU limit values are numerically identical to the UK's objectives. With the exception of the UK's objective for PM_{2.5}, all dates by which compliance with these thresholds should have been achieved have passed.

Table E2.1 National air quality objectives and European limit/target values for the protection of human health

Pollutant	UK	EU Directive		Measured As	Comment
	Objective	Limit Value	Target Value		
Nitrogen Dioxide NO ₂	200µg/m ³	200µg/m ³	-	1 Hour Mean	Not to be exceeded more than 18 times in a calendar year
	40µg/m ³	40µg/m ³	-	Annual Mean	Across calendar year
Particulate Matter PM ₁₀	50µg/m ³	50µg/m ³	-	Daily Mean	Not to be exceeded more than 35 times in a calendar year
	40µg/m ³	40µg/m ³	-	Annual Mean	Across calendar year
Particulate Matter PM _{2.5}	25µg/m ³ (by 2020)		25µg/m ³	Annual Mean	Across calendar year

- E2.9 In January 2019, UK Government published its Clean Air Strategy to run alongside the various statutory Air Quality Plans which considered a broader range of emission sources, including residential properties, farming, industry, and other forms of transport such as shipping, aviation and rail. The Welsh Government is developing a Clean Air Plan for Wales for publication in 2019. For residential properties, the Clean Air Strategy raises awareness of emission sources in the home and identified actions that can be taken at the individual level to reduce emissions without, at this time, placing requirements on developers.

National Planning Policy

- E2.10 Planning Policy Wales (PPW, Edition 10) sets the overarching planning policies for Wales. Section 6.7 of PPW sets out Welsh Government's priorities for air quality.
- E2.11 Para 6.75 states that the "*key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments*".
- E2.12 Para 6.76 places a requirement on developers to address any implications on air quality management areas, not create areas of poor air quality and seek to incorporate measures which reduce overall exposure to air pollution.
- E2.13 Decision makers should be provided with an appropriate level of information on air quality and the proposed development, and on mitigation measures. In particular, para 6.7.13 requires careful consideration of the impacts of increased transport activity associated with development activity.
- E2.14 Para 6.7.8 lists mitigation measures capable of being effectively implemented which include, inter alia:
- 1 Traffic management;

- 2 Ensuring progress towards zero emissions, such as electrical charging points; and
- 3 Providing active travel infrastructure.

- E2.15 PPW states that care should be taken to avoid incremental development that exacerbates health and amenity inequalities through exposure to poor air quality and requires that development should be designed to prevent adverse effects to the environment but, as a minimum, to limit or constrain any effects that do occur.
- E2.16 PPW Technical Advice Note 18: Transport acknowledges that links between road traffic and local air pollution and states that well designed and implemented traffic management measures can help to reduce pollution levels.

Local Policy

- E2.17 The local policies of relevance to air quality and the proposed development are contained within the Newport Local Development Plan, which was adopted in January 2015. Specifically:

GP4: General Development Principles - Highways and Accessibility

Development proposals should:...

- (iii) Be designed to avoid or reduce transport severance, noise and air pollution

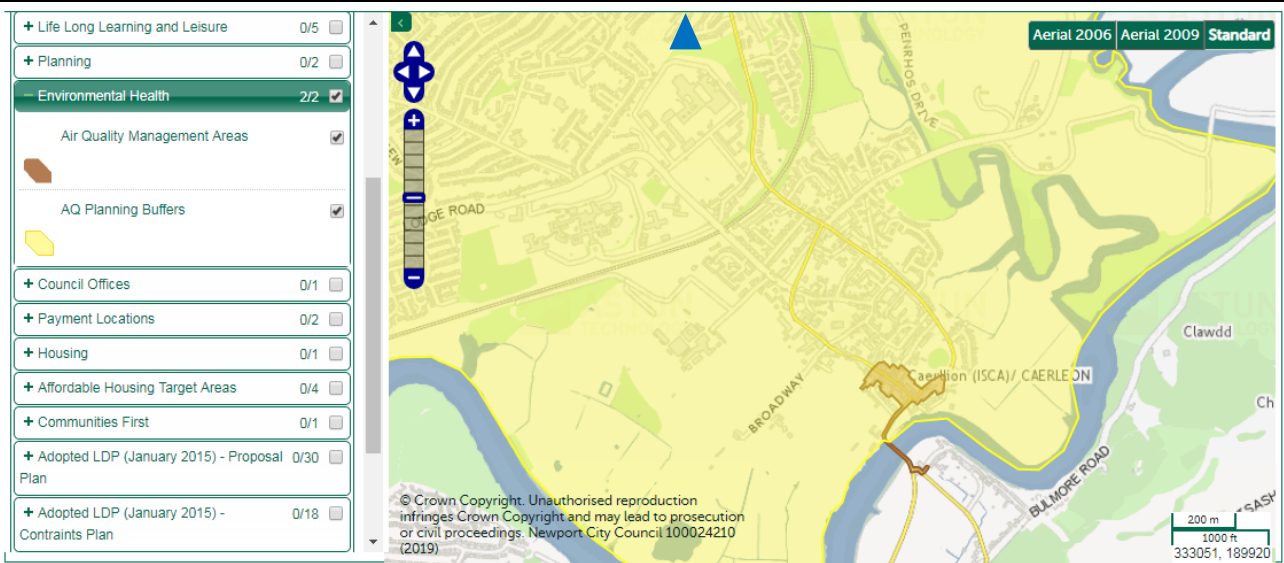
GP7 General Development Principles - Environmental Protection and Public Health

Development will not be permitted which would cause or result in unacceptable harm to health because of land contamination, dust, instability or subsidence, air, heat, noise or light pollution, flooding, water pollution, or any other identified risk to environment, local amenity or public health and safety.

- E2.18 Newport City Council has published Air Quality Supplementary Planning Guidance (February 2018) to sit alongside its Local Plan.
- E2.19 The SPG sets out a framework for deciding when an air quality impact assessment is required for individual developments and introduces the concept of Air Quality Management Area Buffer Zones. These are areas in which the local road network is likely to feed traffic into AQMA. Developments within buffer zones require an air assessment to consider the impacts of changes in road traffic and, in particular, developments over 10 units are required to submit a "Detailed Air Quality Assessment" in support of their planning application that includes:
- 1 The current baseline;
 - 2 The future baseline, without development and cumulative impacts; and
 - 3 The future baseline with the development, across a period of a year, unless it is a phased development and then an appropriate timescale to assess the implication of each phase is required.
- E2.20 Paragraph 4.5.3 states that:
- "Detailed assessments may include future predictions of air quality due to the uptake of new technologies. However, due to the multitude of techno-social-economic uncertainties that influence national/regional/local traffic, this approach cannot be used as sole justification for a planning application at a local level."*
- E2.21 Para 4.6.2 states that relevant factors to consider when determining significance are:
- 1 Number of people affected;

- 2 Whether there is an AQMA, its location and extent and the reasons for it along with any planned mitigatory measures already published;
 - 3 The level of increase in pollutant/traffic concentration in context to the local environment; and
 - 4 Limitations of the data and assessment are clear; to inform a precautionary approach where necessary.
- E2.22 The SPG promotes a hierarchy of Redesign - Mitigate - Offset for proposals that have an impact on air quality.
- E2.23 Redesign is intended to remove or reduce the impact of a development or to reduce the impact of existing pollution on the development.
- E2.24 Innovative mitigation, that is informed by a proposed development's air quality assessment and transport statement, is encouraged, with potential mitigation listed in Section 5 of the SPG as:
- 1 Site specific travel plans;
 - 2 Providing on street / at home electrical vehicle charging points;
 - 3 Infrastructure provision for the installation of mitigation measures such as electric charging points;
 - 4 Road improvements to reduce queues and road surface wear;
 - 5 Cycle Path creation and links to existing network;
 - 6 Public Transport improvements;
 - 7 Integrating air quality improvements to public realm schemes e.g. Green Walls;
 - 8 Landscaping schemes;
 - 9 Any relevant actions from an available AQMA action plan; and
 - 10 HGV routing agreements.
- E2.25 The Caerleon Campus sits within the buffer zone for the Caerleon AQMA (**Error! Reference source not found.**).

Figure E2.1 Newport City Council Caerleon AQMA Buffer Zone



E3.0

Assessment Methodology & Significance Criteria

Assessment Methodology

Guidance

E3.1

In addition to the Newport City Council SPG for air quality, the assessment methodology has been set with reference to the following guidance:

- 1 Defra's and the Devolved Authorities Local Air Quality Management Review and Assessment Technical Guidance TG(16) (2018)

This comprehensive technical guidance, referred to throughout this document as LAQM.TG(16), has been published for use by local authorities in their air quality review and assessment monitoring and modelling work. In particular, the advice on the applicability of the UK's air quality objectives (Box 1.1), and the modelling of impacts from road traffic and the verification of the modelling against local monitoring data (Chapter 7) was applied throughout this assessment.

- 2 Institute of Air Quality Management's Land-use Planning & Development Control: Planning for Air Quality (2017)

This strategic guidance to local authority air quality officers, developers and their consultants has been jointly published by Environmental Protection UK and the Institute of Air Quality Management (IAQM). Of particular relevance to this assessment is the guidance provided in relation to the determination of the significance of air quality impacts associated with a development (Chapter 7 and Table 6.3 of the guidance) and the possible mitigation measures that may be implemented to minimise these impacts.

- 3 Institute for Air Quality Management's Guidance on the Assessment of Dust from Demolition and Construction (2016)

This document, hereafter referred to as IAQM dust guidance, provides guidance to developers, consultants and air quality officers on how to assess the impacts arising from construction activities. It follows a risk based approach to the identification of appropriate mitigation measures.

Study Area

E3.2

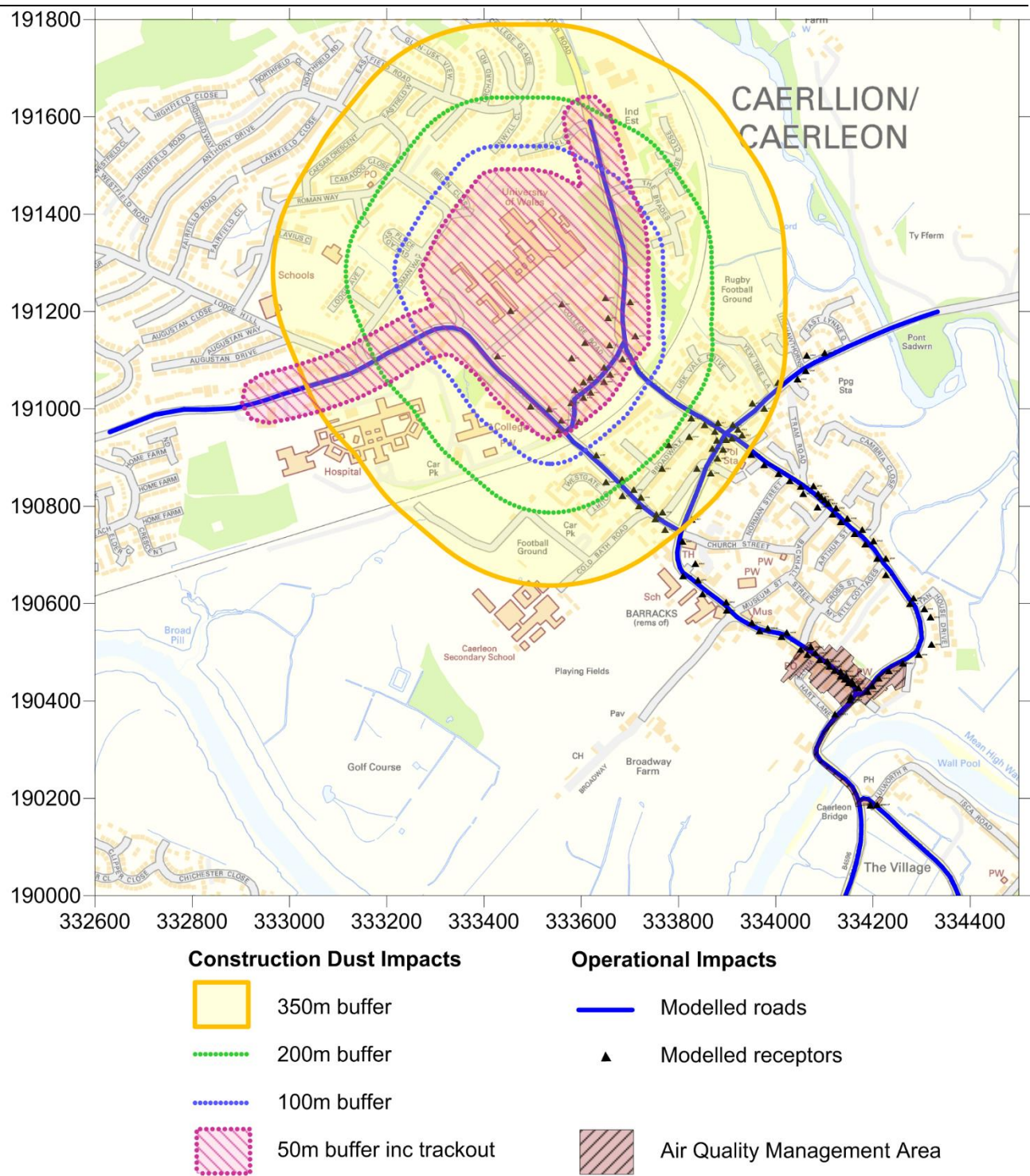
The study area for the air quality assessment was defined as follows:

- 1 For construction, following the IAQM guidance (2016), the area within 350m of the site boundary or within 50m of the route(s) proposed for use by construction vehicles on the public highway up to 500m from the site entrance(s); and
- 2 For operation, the area within 200m of the road network affected by the development traffic. The use of a 200m corridor either side of the road network conforms to advice in the Design Manual for Roads and Bridges.

E3.3

The overall study area is shown in **Error! Reference source not found..**

Figure E3.1 Air Quality Assessment Study Area



Construction Phase

E3.4 Impacts during the construction phase of the proposed development have been assessed qualitatively, using the IAQM guidance (2016), available information provided by the developer, and professional judgement.

- E3.5 Dust comprises particles typically in the size range 1-75 micrometres (μm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited near to the source of emission. Dust, therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.
- E3.6 The smaller particles of dust (less than $10\mu\text{m}$ in aerodynamic diameter) are known as particulate matter (PM₁₀) and represent only a small proportion of total mass of dust released; this includes a finer fraction, known as PM_{2.5} (with an aerodynamic diameter less than $2.5\mu\text{m}$). As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere for a longer period of time than the larger dust particles, and can therefore be transported by wind over a wider area. PM₁₀ and PM_{2.5} are small enough to be drawn into the lungs during breathing, which in sensitive members of the public could have a potential impact on health. However, as set out in IAQM guidance, the majority of fugitive particulate emissions arising from construction sites relate to the coarser fractions (i.e. PM_{2.5-10}) with just 10-15% expected to comprise PM_{2.5}. The IAQM guidance therefore focusses on PM₁₀ for the purposes of assessment.
- E3.7 The IAQM methodology assesses the risk of potential dust and PM₁₀ impacts from the following four construction-related sources: demolition; earthworks; general construction activities and track-out. It takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM₁₀ levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined.
- E3.8 In addition to impacts on local air quality due to on-site construction activities, exhaust emissions from construction vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the Application Site and in the vicinity of the Application Site itself. As detailed information on the number of vehicles and plant associated with the construction phase was not available at the time of writing, a qualitative assessment of their impact on local air quality has been undertaken using professional judgement.
- E3.9 The assessment of the likely impacts on local air quality due to the generation and dispersion of dust and PM₁₀ during the construction phase and the significance of any effects has been undertaken using: the relevant assessment methodology published by the IAQM; the available information for this phase of the proposed development provided by the Client and Project Team; and, professional judgement considering the following:
- 1 The number and type of construction traffic and plant likely to be generated by this phase of the proposed development;
 - 2 The number and proximity of sensitive receptors to the site and along the likely routes to be used by construction vehicles; and
 - 3 The likely duration of the construction phase (~5 years) and the nature of the construction activities undertaken

Operational Phase

- E3.10 The assessment of impacts during the occupation of the proposed development has been undertaken quantitatively using detailed dispersion modelling.

- E3.11 Of the pollutants included in the UK's air quality regulations, road traffic is a significant contributor to ambient concentrations of nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}). This is evidenced by the fact that NO₂ and PM₁₀ are the only pollutants for which AQMAs are currently declared across the UK in relation to road transport (there are 6 AQMAs declared in relation to sulphur dioxide, but these do not relate to emissions from road transport). The assessment is therefore limited to NO₂, PM₁₀ and PM_{2.5}.
- E3.12 The modelling used ADMS-Roads (v 4.1.1.0), developed by CERC. This model uses detailed information on traffic flows on the local road network, which were provided by transport consultancy Vectos, and meteorological conditions to predict the road contribution to ambient pollutant concentrations at specific locations, termed 'receptors' that are determined by the user. For this assessment, 129 receptors were selected across Caerleon, 26 of which were within the Caerleon AQMA (termed AQMA1 to AQMA26, 5 representative of maximum concentrations on the proposed development (PD1 to PD5) and 98 representative of concentrations at existing properties outside of the AQMA (ER1 to ER98). Further details are provided in Appendix E.2.
- E3.13 Meteorological data, such as wind speed, direction and cloud cover, were obtained for Cardiff Wales Airport for 2017. This station provides the most appropriate observed meteorological data for use in the dispersion modelling of the proposed development traffic. The surface roughness parameter for Caerleon (a variable that determines the level of drag exerted as wind blows over the ground and which affects the level of turbulence generated) was set to 0.5m. This is the value recommended by the model developers for parkland and open suburbia, and representative of the environment in the town.

Scenarios Modelled

- E3.14 A summary of the traffic data used in the assessment can be found in Appendix E.1. It includes details of the annual average daily traffic, as a function of vehicle class (car, light goods vehicle, heavy goods vehicle etc), and vehicle speeds for the local road network in all assessment years and scenarios.
- E3.15 The following Scenarios were modelled:
- 1 Baseline 2017;
 - 2 Future Baseline Scenarios for 2022 and 2027;
 - 3 With Development Scenarios 2022 and 2027; and
 - 4 With Development Mitigated Scenarios (termed Mitigated A and Mitigated C) for 2022 (Mitigated A only) and 2027.
- E3.16 The future assessment years, 2022 and 2027, reflect a realistic programme for development of the Site following granting of planning permission, assumed to occur in spring 2020, and a commitment on the part of the Developer to construction of 40 units per year. Under this programme, 2022 is the earliest likely full year of occupation (40 units); 2027 is the earliest year of full occupation, modelled with traffic generated by the proposed 218 units.
- E3.17 The Mitigated Scenarios take account of the impacts of the proposed development Travel Plan. The justification for the parameters is set out in the Transport Statement (see Appendix D1) and the data reflect:
- 1 Mitigated A - includes 12% model shift for proposed development-related traffic only; and
 - 2 Mitigated C - includes 12% model shift for proposed development-related traffic and 2% global reduction associated with the wider benefits of the Travel Plan (personalised travel plans and travel planning for the School and Hospital).

- E3.18 The rationale for the Future Baseline Scenario is set out in the memo, USW Caerleon Site – Fallback / Baseline Position (Lichfields, 26 November 2019), submitted with the Planning Application for the development. It considers traffic generated by a reasonable alternative use for the site that could be developed immediately, without the need for new planning permission. It has been agreed with the NCC for use as a baseline scenario against which to assess the impacts of the proposed development, with traffic flows applicable to both 2022 and 2027.
- E3.19 The assumed level of site activity, and associated traffic generation, in the Future Baseline Scenario ensures that the assessment is robust and applies an appropriate level of conservatism since the scenario equates to only partial occupation (8%) of the available floor space. Importantly, it avoids unrealistic assumptions relating to complete re-use of the site as a university campus or zero use of a sustainable development site.
- E3.20 Insofar as the traffic data take account of the impacts of other developments within Caerleon, including existing and approved development, the assessment of impacts during the operation of the proposed development is inherently a cumulative impact assessment.

Vehicle Emissions

- E3.21 Air pollutant emissions from vehicles are regulated by European Directives in the so-called Euro Emissions Standards. Over time, increasingly stringent standards have been specified, termed Euro 1 to 6 for cars and vans and Euro I to VI for heavy duty vehicles. However, for various reasons including well publicised actions involving particular vehicle manufacturers, in recent years the tightened emissions standards (to Euro 5/V) have failed to bring about expected improvements in ambient air quality alongside roads.
- E3.22 In January 2016, Air Quality Consultants Ltd (AQC) published a report on emissions of nitrogen oxides from modern diesel vehicles (Emissions of Nitrogen Oxides from Modern Diesel Vehicles, 2015, Air Quality Consultants Ltd). The report provided a summary of the latest monitoring of emissions from diesel cars and heavy-duty vehicles undertaken by, amongst others, TU Graz, TNO, Transport for London, University of York and Emissions Analytics. The monitoring studies took into account on-road tests, with emissions monitored in the tail pipe and using remote sensing and, therefore, take into account real world driving conditions. The key messages from the report were that:
- E3.23 Euro 6 diesel cars (that is vehicles entering the fleet from late 2015 onwards) emit, on average, 3.9 times the relevant Euro 6 emission standard. However, on average, the Euro 6 cars perform significantly better than earlier vehicles, achieving 50% to 70% reductions in comparison to Euro 5 cars; and
- E3.24 There is good evidence that Euro VI engine emissions for heavy duty vehicles are consistently better than those for Euro V and earlier vehicles, although as for cars, emissions exceed the Euro standard.
- E3.25 In addition, the Department for Transport (DfT) published their own evidence on vehicle emissions testing in April 2016 (<https://www.gov.uk/government/publications/vehicle-emissions-testing-programme-conclusions>), which also indicates that Euro 6/VI vehicles will emit considerably less than Euro 5/V vehicles.
- E3.26 Legislation is currently being developed within the European Union that would introduce improved and more stringent vehicle emissions testing (Real Drive Emissions, RDE) that is expected to make it much more difficult for manufacturers to distort the results of vehicle emissions testing than under existing procedures. Both the AQC and DfT reports make clear that it is reasonable to expect the introduction of Euro 6c/d (i.e. vehicles subject to RDE test cycle) will further reduce fleet average emissions from existing Euro 6 vehicles (termed Euro

6a/b vehicles). However, there is currently no evidence available to quantify the likely improvements in emissions with RDE over and above the improvements noted by AQC and DfT for the Euro 6 vehicles that are currently available and which have undergone emissions testing.

- E3.27 Defra's Emissions Factor Toolkit (EFT) makes some allowance for the non-compliance of both existing and future diesel vehicles with emissions standards. Notwithstanding this, AQC concluded that the factors in the EFT are likely to underestimate emissions of NO_x from Euro 6 diesel vehicles.
- E3.28 Importantly for the air quality assessment, any disparity between the emissions factors and the real-world emissions from all existing vehicles in the fleet (predominantly Euro 4 and Euro 5 type) is taken into account in the dispersion modelling through the verification of the baseline modelling against monitoring data. If emissions are underestimated, then the modelled pollutant concentrations at the roadside will also be underestimated. The verification process then generates a factor (greater than 1) by which all model results are scaled to achieve agreement between modelled and monitored concentrations. Whilst the verification is undertaken after the dispersion model has been run, the process is entirely equivalent to increasing the emissions from vehicles prior to modelling the dispersion.
- E3.29 The Emissions Factor Toolkit also includes forecasts of the rate of replacement of older vehicles in the fleet with newer, cleaner vehicles. As a result, emissions per vehicle decrease over time. If the emissions from future Euro 6 vehicles are, as concluded by AQC, higher than represented in the toolkit, the rate of improvement in emissions of time could be overestimated.
- E3.30 The AQC report provided the basis for the development of an alternative vehicle emissions factor calculator for sensitivity testing, termed CURED (Calculator Using Realistic Emissions for Diesels, Air Quality Consultants Ltd). CURED provides a more evidenced approach to taking account of the recent data from vehicle emissions testing than simply adjusting the forecast year in the national databases and obviates the need to assume no improvement over time or to make arbitrary assumptions relating to the rate of improvement. CURED generates NO_x emissions only.
- E3.31 The air quality modelling of nitrogen oxides was, therefore, based on the latest version of the CURED calculator (v3A) alone with year-specific CURED emission factors applied to assessment scenarios. If RDE is fully effective, this is potentially a conservative approach.
- E3.32 Following the CURED approach, new (Euro 6) vehicles still emit less pollution than earlier models (Euro 5 and earlier), and so the approach retains an overall improvement in vehicle emissions over time, but this rate of improvement is slower than in the national forecasts.
- E3.33 For particulate matter, Defra's EFT (v8) was used since the CURED approach was developed to address issues relating to the on road performance of vehicles against NO_x emission standards only.

Background Concentrations

- E3.34 The background pollutant concentrations used in the assessment were taken from the national maps provided on the Defra website¹, where background concentrations of those pollutants included within the AQS have been mapped at a grid resolution of 1x1km for the whole of the UK. Estimated concentrations are available for all years between 2015 and 2030. The maps assume that background concentrations will improve (i.e. reduce) over time, in line with the predicted reduction in vehicle emissions and emissions from other sources.

¹<https://uk-air.defra.gov.uk/data/laqm-background-home>

E3.35 The background maps present both the ‘total’ estimated background concentrations and the individual contributions from a range of emission sources (for example, motorways, aircraft, domestic heating etc.). When detailed modelling of an individual sector is required as part of an air quality assessment, the respective contribution can be subtracted from the overall background estimate to avoid the potential for ‘double-counting’ the effects of emission sources. For this assessment, given the limited extent of the modelled network, no road sector contributions have been removed from the mapped background concentrations.

E3.36 AQC Ltd has also published a methodology for deriving more conservative future background concentrations of NO_x and NO₂ for use with the CURED emission factors. AQC produced this methodology as they had found that the Defra background maps tend to under predict concentrations of NO_x and NO₂, again as a result of the disparity between the on-road emissions performance of modern diesel vehicles and emissions standards. The methodology calibrates the background concentrations against recent monitoring data from Automatic Urban and Rural Network sites.

E3.37 For the purposes of the assessment, the 2022 and 2027 Defra NO₂ and NO_x background concentrations (from maps with a 2015 base year) were calibrated as per AQC’s methodology. The background concentrations are provided in Section E4 Baseline.

Model Verification and Data Processing

E3.38 The ADMS Roads dispersion model has been widely validated for this type of assessment and is fit for purpose. However, model validation undertaken by the software developer will not have included validation in the vicinity of the proposed development.

E3.39 Therefore, to determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out within the study area was undertaken. This process of verification aims to minimise modelling uncertainty and systematic error by adjusting modelled results by a factor, called the verification factor, to gain greater confidence in the final results. The verification process was carried out following the methodology specified in Chapter 7, Section 4, of Defra’s LAQM.TG(16).

E3.40 Details of the verification factor calculations are presented in Appendix E.3. The results of the comparison between modelled and monitored concentrations clearly demonstrated that the model performance was spatially varying and dependent on the nature of the location e.g. within street canyons oriented perpendicular to the prevailing wind (High Street) and parallel to the prevailing wind (Castle Street), and outside of the street canyons. Consequently, the model verification was applied on the basis of the following areas:

- 1 Within the AQMA
 - a High Street within the gyratory system – factor = 2.165
 - b Castle Street within the gyratory system – factor = 1.153
 - c AQMA outside of gyratory system – factor = 2.81
- 2 Outside of AQMA – factor = 0.837

E3.41 These factors indicate that the model was under-predicting within the AQMA, most significantly on High Street (within and outwith the gyratory system), and over-predicting outside of the AQMA.

E3.42 The verification factors were applied to the model road- NO_x outputs prior to conversion to annual mean NO₂ concentrations utilising the NO_x to NO₂ calculator (version 6.1, released November 2017) provided by Defra. In the absence of data to verify the dispersion modelling of particulate matter, the NO_x verification factors were used for PM₁₀ and PM_{2.5}.

Significance Criteria

Construction

- E3.43 The IAQM assessment methodology for construction dust recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity with appropriate mitigation measures in place. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.
- E3.44 For the assessment of the impact of exhaust emissions from plant used on-site and construction vehicles accessing and leaving the site on local concentrations of NO₂ and particulate matter, the significance of residual effects have been determined using professional judgement and the principles outlined in the EPUK/IAQM guidance, which are described below

Operation

- E3.45 The EPUK/IAQM guidance on air quality and planning sets out a recommended procedure for evaluating new developments, from an initial screening of whether an air quality assessment is required, through the determination of whether the air quality effects or exposure are significant, to the identification of the need for mitigation.
- E3.46 The EPUK/IAQM guidance provides a framework for describing the air quality impacts and effects of the operation of a proposed development. Their guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change with the development as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table E3.1 presents the suggested criteria for describing the impacts at individual receptors.
- E3.47 The EPUK/IAQM impact descriptors are used as the starting point to make a judgement on significance of effects, since other impacts / effects may be important. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:
- 1 The existing and future air quality in the absence of the development;
 - 2 The extent of current and future population exposure to the impacts; and
 - 3 The influence and validity of any assumptions adopted when undertaking the prediction of impacts.
- E3.48 These factors are consistent with those set out in NCC's Air Quality SPG.
- E3.49 The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the severity of impacts.

Table E3.1 EPUK/IAQM guidance on describing the severity of an air quality impact at an individual receptor

Long term average concentration at receptors in assessment year	% Change in Concentration (Magnitude) relative to Air Quality Assessment Level (AQAL)			
	1%	2-5%	6-10%	>10%
75% of less of AQAL	Negligible	Negligible	Slight	Moderate
76 – 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
Notes AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives. Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration. When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase. Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial				

- E3.50 The guidance effectively sets the level of imperceptibility of impacts at individual receptors at 0.5% of any assessment threshold e.g. $0.2\mu\text{g}/\text{m}^3$ in relation to the assessment of annual mean nitrogen dioxide (threshold = $40\mu\text{g}/\text{m}^3$ limit value/objective). The Design Manual for Roads and Bridges, Interim Advice Note IAN 174/13 states that impacts less than 1% of the objective should be described as imperceptible ($<0.4\mu\text{g}/\text{m}^3$ for annual mean nitrogen dioxide) and the EPUK/IAQM guidance is, therefore, precautionary.
- E3.51 Furthermore, in relation to spatial extent, the guidance explicitly states that "whilst it may be that there are 'slight', 'moderate' or 'substantial' impacts at one of more receptors, the overall effect may not necessarily be judged as being significant in some circumstances" or where moderate or substantial effects are confined to "a very small area" or where it is "not obviously a cause of harm to human health". The latter clause leads to a focussing of the consideration of significant impacts on receptors that exceed the relevant air quality thresholds.
- E3.52 Overall, therefore, the assessment of significance is a matter for professional judgement and assessing this as a policy test requires the air quality specialist to clearly set out their reasoning for reaching a particular conclusion. The reasoning should make reference to factors including, but not be limited to, the magnitude of impacts over the air quality study area, the extent (temporal and spatial) of the future population exposure to poor air quality, the development's ability to detract or support measures set in Air Quality Action Plans and whether the impacts can be mitigated.

Consultation

- E3.53 Consultation was undertaken with Vectos, the transport planners for the development, throughout the assessment period to ensure that the impacts of the proposed development on road traffic were fully incorporated into the air quality assessment.
- E3.54 A meeting with NCC's Air Quality Officer took place on 24th October 2019. The assessment methodology, including the use of AQC Ltd's CURED emission factors, was agreed in principle.

NCC stated that the air quality mitigation for the proposed development should include measures to disseminate information on air quality and the benefits of active transport, such as sponsoring Clean Air Day activities within the local primary school. Such a measure has been included in the mitigation for the development set out in Section E6 of this chapter.

Assumptions and Limitations

- E3.55 In the absence of a detailed construction plan or methodology statement, it has been necessary to estimate the scale of impacts from construction dust based on experience at other sites. This does not place a significant constraint on the assessment since the IAQM methodology has been applied conservatively for the purpose of specifying indicative mitigation measures. The final dust management plan will be developed by the appointed contractor and agreed with NCC prior to the commencement of works.
- E3.56 The most important assumption made in relation to the assessment of operational impacts is that vehicle emissions and background concentrations decrease over time. This assumption has been managed in the assessment through the use of the AQC Ltd's CURED methodology which assumes a slower rate of improvement over time than that modelled at the national level by Defra and Department for Transport. The assessment is, therefore, conservative.
- E3.57 For the dispersion modelling, it is assumed that the same model verification factors apply in the 2017 baseline year and all future years. This is a robust assumption in that the verification factors generated are linked to the presence of street canyons and areas of slow moving traffic. The street canyon effects will not be affected by the proposed development and, given the modest levels of traffic generation associated with the proposed development, no significant changes to traffic conditions between baseline and future years are expected.
- E3.58 The phasing of the operation of the proposed development has been based on an assumed build-out rate of 40 units per year, with first occupation in 2021. This implies that 2022 is the first full year of operation, and 2027 is the year of full development. This assumption is realistic and robust, and based on information received from the Developer.

E4.0

Baseline Conditions

Overview

E4.1

The existing and future baseline air quality in the vicinity of the proposed development is described below with reference to the following resources:

- 1 Ambient air quality monitoring data collected by NCC and reported annually; and
- 2 National mapped projections of roadside and background air quality jointly provided by Defra and Department of Transport.

E4.2

In addition, the results of the dispersion modelling of baseline and future traffic conditions without the proposed development are described.

Existing Conditions

Newport City Council Data

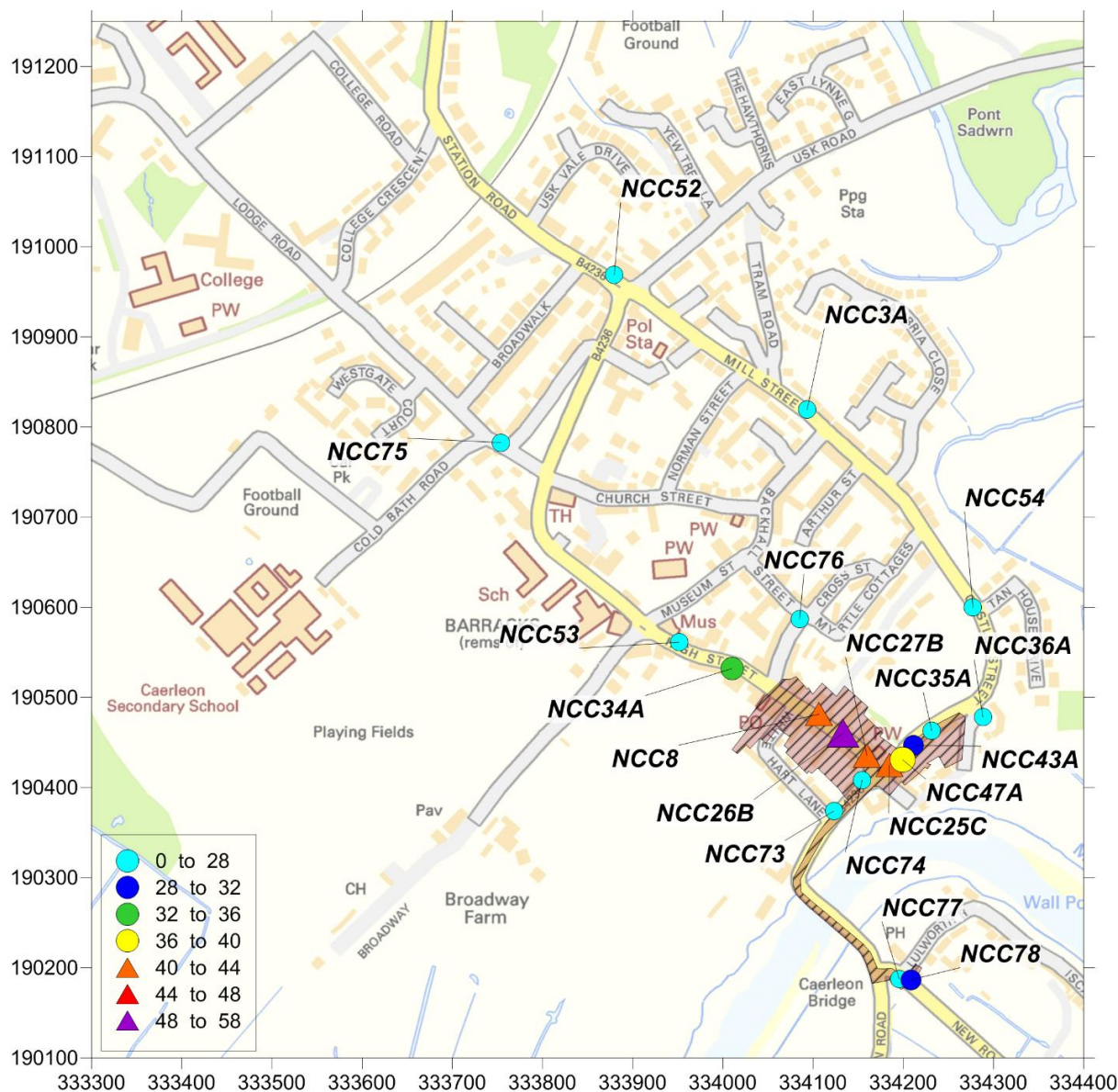
E4.3

The latest air quality data for Caerleon were reported in NCC's 2018 Air Quality Progress Report, published in September 2018 with data available up to 2017. In addition, provisional data for 2018 are available on NCC's website. Table E4.1 shows the data for Caerleon for 2012 to 2018. **Error! Reference source not found.** shows the data for 2017, the baseline year used for the ES air quality assessment.

Table E4.1 Annual mean NO₂ for 2012 – 2018, taken from NCC diffusion tube monitoring in Caerleon (µg/m³)

NCC ID	Location	Annual Mean NO ₂ (µg/m ³)						
		2012	2013	2014	2015	2016	2017	2018
NCC52	9 Station Road	24.0	26.9	24.9	23.7*	25.0*	22.5*	21.0*
NCC3A	13 Mill Street	21.6	23.5	22.9	19.5	20.7	19.5	17.6
NCC34A	35 High St	33.1	37.3	35	34	30.2	32.2	26.7
NCC8	25 High St	47.7	50.5	43.8	43.1*	42.1*	41.3*	38.3*
NCC53	5 High St	24.4	28.4	23.5	24.9*	30.2*	22.0*	19.9
NCC26B	15 High St	57.1	67.5	55.5	56.3*	54.1*	51.1*	50.9*
NCC27B	18 High St	47.7	56.6	49.0	48.0*	49.3*	42.3*	41.6*
NCC25C	High Street	-	-	-	-	44.4	40.6	41.6
NCC43A	7 Castle St	35.4	36.8	33.7	33.6*	32.3*	30.7*	20.7*
NCC35A	6 Castle St	31.9	35.9	31.7	29.5*	27.8*	27.3*	25.6*
NCC36A	1 Castle St	29.2	35.6	30.5	26.7*	26.1*	25.3*	23.6*
NCC54	96 Mill St	19.5	22.3	19.8	19.5*	22.8*	17.7*	16.2*
NCC47A	9 Castle St	39.2	43.4	40.4	38.5*	37.0*	36.4*	34.3*
NCC77	Toll House	-	-	-	-	18.4	18.7*	15.8*
NCC78	Gwent Cottage	-	-	-	-	34.1	29.9	27.0
NCC76	10 Cross Street	-	-	-	-	13.3*	17.0*	14.0*
NCC74	Coach house	-	-	-	-	25.6	25.7	23.5
NCC73	Southgate	-	-	-	-	27.4*	26.2*	25.9*
NCC75	Goldcroft Common	-	-	-	-	17.8	17.5	15.4
Exceedances of the air quality objective are shown in bold italic; Data for 2018 are provisional; Concentrations marked with * have been distance corrected by NCC to the nearest property façade								

- E4.4 NO₂ is the only pollutant of concern and whilst annual mean concentrations at background locations, e.g. NCC76, Cross Street (17.0µg/m³ in 2017), are well within the air quality objective, elsewhere, and specifically on High Street, concentrations exceed the air quality objective by some considerable margin and have done so for several years e.g. NCC8, NCC26B, NCC27B, up to 51.µg/m³ in 2017. Road transport is the primary local source of nitrogen oxides.
- E4.5 NCC declared an Air Quality Management Area (AQMA) for High Street in 2015. The AQMA was expanded in 2017 to include sections of High Street to the south of the town centre and across the River Usk. The current extent of the AQMA is shown in **Error! Reference source not found.** On the basis of the latest data, the extent of the AQMA is conservative in that exceedance of the objective is not ubiquitous within the AQMA.
- E4.6 Where concentrations are highest, the data show an improvement over time although the decrease is not uniform over time since, amongst other things, concentrations are affected by meteorology.

Figure E4.1 Annual mean NO₂ (µg/m³) monitored by Newport City Council in 2017

Defra Mapped Background Concentrations

E4.7 Table E4.2 shows the background pollutant concentrations of NO₂, PM₁₀ and PM_{2.5} for the assessment years (2017, 2022 and 2027). All background concentrations are well below the air quality objectives and decrease over time.

Table E4.2 Mapped background concentrations for Caerleon (µg/m³)

Centre Point of 1km x 1km grid cell	Background Concentration		
	2017	2022	2027
	NO ₂ *		
333500, 190500	14.2	11.9	10.6
333500,191500	12.6	10.5	9.4
334500, 190500	13.2	11.1	9.8
334500, 191500	11.1	9.3	8.2
	PM ₁₀		
333500, 190500	13.0	12.6	12.4
333500,191500	12.9	12.4	12.2
334500, 190500	12.9	12.5	12.3
334500, 191500	12.6	12.2	12.0
	PM _{2.5}		
333500, 190500	8.8	8.4	8.2
333500,191500	8.8	8.4	8.2
334500, 190500	8.7	8.3	8.1
334500, 191500	8.4	8.0	7.9
*Background concentrations of NO ₂ have been adjusted in accordance with the CURED methodology			

Future Baseline

E4.8 As stated above, NO₂ is the only pollutant of concern in Caerleon and the only pollutant at risk of exceeding an air quality objective. As such, the following discussion of the future baseline focuses on NO₂ only. PM₁₀ and PM_{2.5} concentrations are well below their air quality objectives and are provided in Appendix E.4.

E4.9 Table E4.3 provides a summary of the maximum modelled annual mean NO₂ concentrations for the baseline and future baseline scenarios. The model results at the selected receptors are summarised as a function of the broad locations within the study area shown in **Error!**
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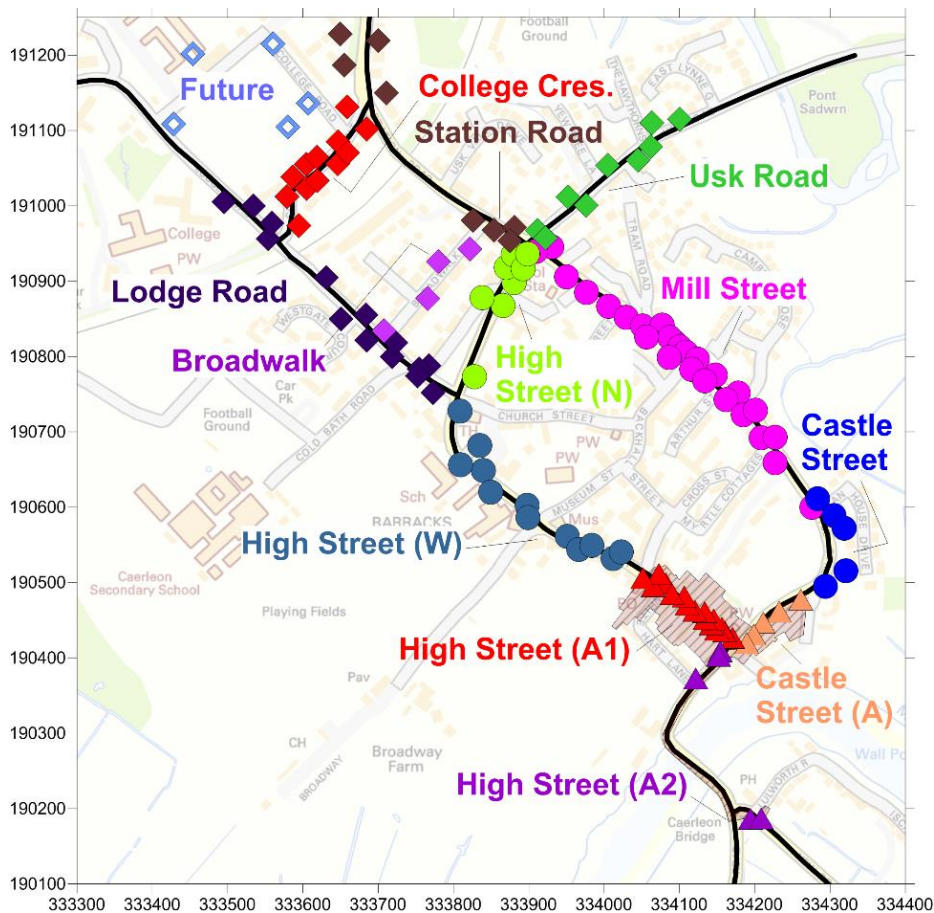
E4.10 Exceedances of the air quality objective for annual mean NO₂ (40µg/m³) are limited to the section of the AQMA on High Street within the gyratory system (High Street (A1)). Of the 128 modelled receptors, 12 exceed the objective in 2017, 6 in 2022 and 0 in 2027.

E4.11 The maximum modelled concentration in the High Street section of the AQMA was 60.3µg/m³ in 2017. In the Future Baseline, the modelled concentrations continue to exceed the objective in 2022 but the maximum falls to 48.5µg/m³. By 2027, the modelled concentrations decrease to within the air quality objective, with a maximum of 39.8µg/m³.

Table E4.3 Summary of modelled baseline 2017 and future baseline (2022, 2027) annual mean NO₂ (µg/m³)

Location	Worst Case Receptor	Maximum modelled concentration		
		2017	2022	2027
AQMA				
High Street (A1)	AQMA15	60.3	48.5	39.8
High Street (A2)	AQMA24	31.7	25.7	21.8
Castle Street (A)	AQMA3	39.2	30.9	25.4
Gyratory (outside AQMA)				
High Street (W)	ER97	27.9	22.4	18.9
High Street (N)	ER73	20.3	17.2	15.4
Mill Street	ER6	25.6	20.3	17.0
Castle Street	ER31	17.7	14.4	12.4
North of Gyratory				
Station Road	ER2	21.8	18.1	15.9
Usk Road	ER81	20.7	16.7	14.4
College Crescent	ER56	16.4	13.7	12.2
Broadwalk	ER93	18.2	15.4	13.6
Lodge Road	ER45	19.1	15.8	13.8

Figure E4.2 Receptor locations used for model results summaries



- E4.13 The elevated concentrations within the AQMA on High Street, and to a lesser extent on Castle Street, are due to the poor dispersion conditions within the street canyon formed by the buildings either side of the narrow, single lane, road. To the north of the AQMA on High Street, the road widens and the height of the buildings decreases. This reduces the canyoning effect and modelled concentrations decrease.
- E4.14 Modelled NO₂ concentrations outside of the AQMA are well within the air quality objective in all years (<30µg/m³), irrespective of the level of site use assumed. The maximum concentrations are 27.9µg/m³ in 2017, 22.4µg/m³ in 2022 and 18.9µg/m³ in 2027 (all recorded on High Street to the north of the AQMA).
- E4.15 The spatial distribution of modelled baseline and future baseline concentrations are shown in **Error! Reference source not found.** for 2017 and **Error! Reference source not found.** for 2022.

Figure E4.3 Modelled 2017 Baseline Annual Mean NO_2 ($\mu\text{g}/\text{m}^3$) Receptors exceeding the air quality objective ($40\mu\text{g}/\text{m}^3$) are labelled

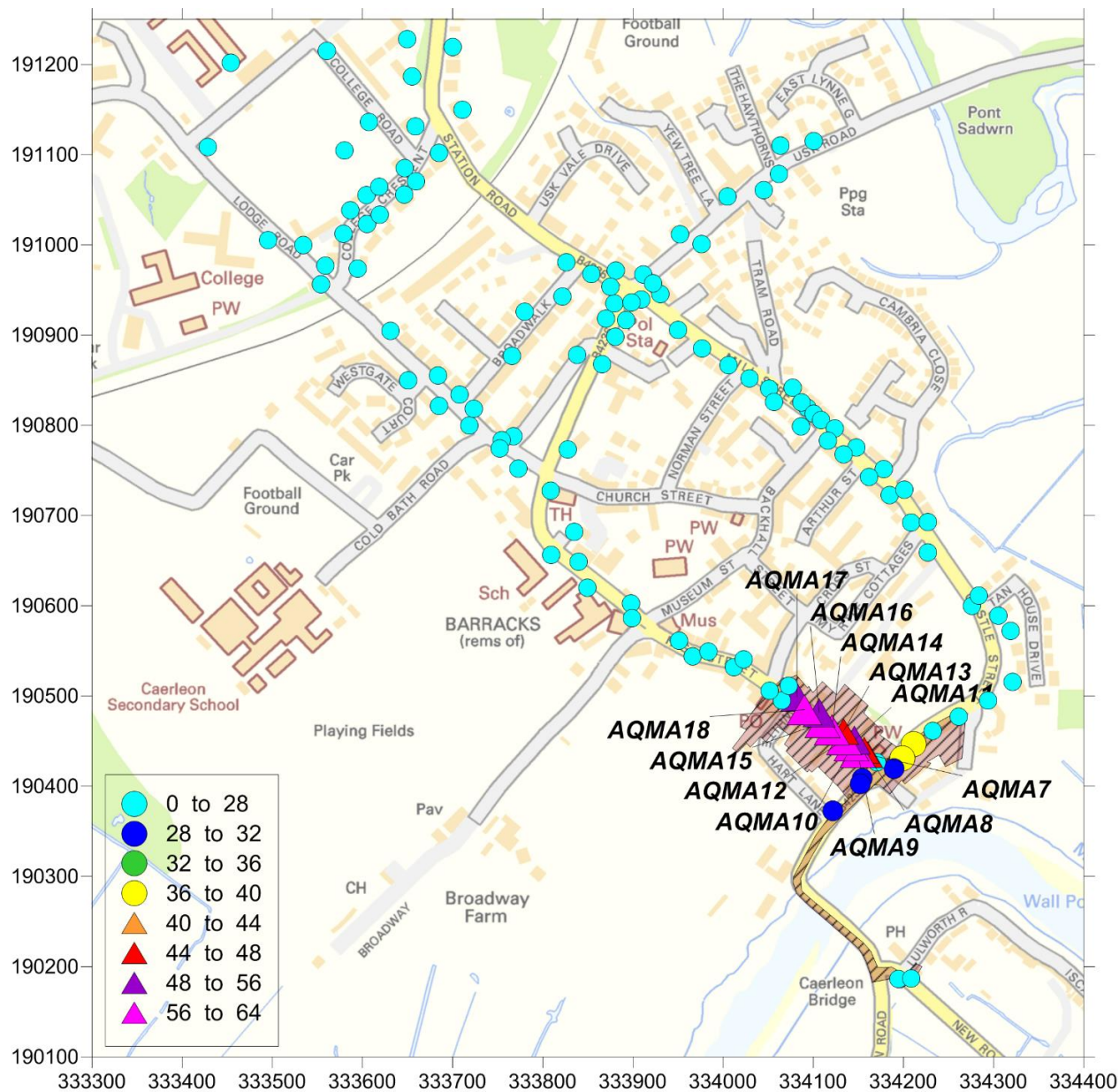
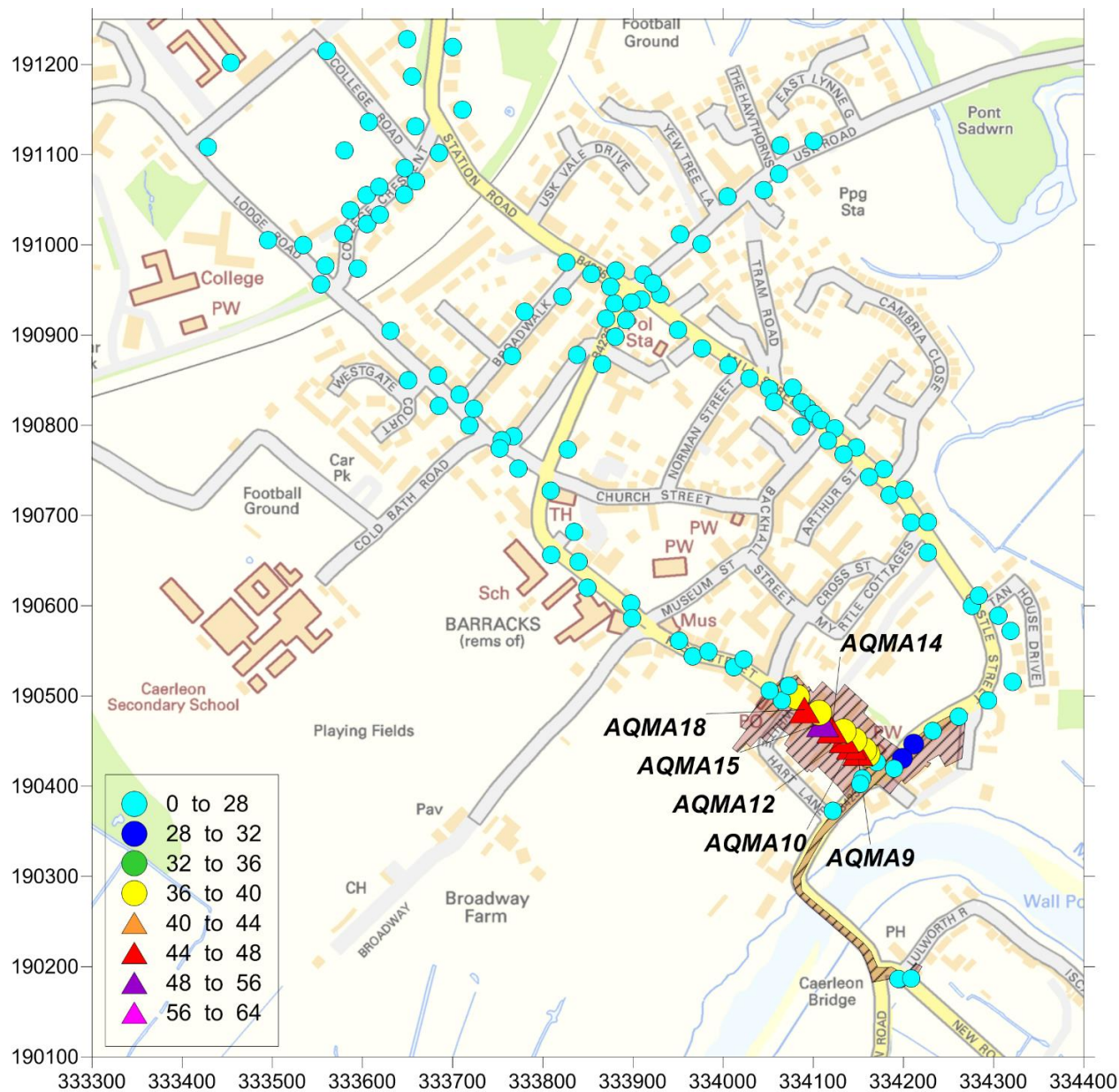


Figure E4.4 Modelled 2022 Future Baseline Annual Mean NO_2 ($\mu\text{g}/\text{m}^3$). Receptors exceeding the air quality objective ($40\mu\text{g}/\text{m}^3$) are labelled



E5.0

Potential Effects

During Construction

E5.1

The potential for impacts during construction has been assessed using the IAQM methodology. The method is used to determine the potential dust emission magnitude, the sensitivity of the area to dust and particulate matter effects and the risk of impacts for the four key aspects of construction works: demolition; earthworks; construction; and track-out. The findings of the assessment are presented below.

E5.2

The potential impacts that could arise from construction dust emissions, in the absence of mitigation, are:

Demolition

E5.3

There are buildings on the site that will be demolished for the proposed development. Table E5.1 below sets out the IAQM risk assessment of construction activities. The estimated dust emission magnitude from demolition works is medium.

Table E5.1 IAQM dust emission magnitude from demolition works

IAQM Dust Emission Magnitude			Proposed Development Assessment
Small	Medium	Large	
<20,000m ³ building demolished, non-dusty material (e.g metal cladding), <10m above ground level, work during wetter months	20,000 - 50,000m ³ building demolished, dusty material (e.g. concrete) 10-20m above ground level	>50,000m ³ building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level	Medium 20,000 – 50,000m³ to be demolished, potential dusty material

Earthworks

E5.4

The site is a large site, over 10ha in area, and the soil is potentially dusty. It is estimated that over the construction period, over 100,000 tonnes of material will be moved around site. As such, the estimated dust emission magnitude from earthworks is potentially large (Table E5.2).

Table E5.2 IAQM dust emission magnitude from earthworks

IAQM Dust Emission Magnitude			Proposed Development Assessment
Small	Medium	Large	
<2,500m ² site area, soil with large grain size (e.g. sand), <5 earth moving vehicles active simultaneously, <4m high bunds, <20,000 tonnes material moved, earthworks during wetter months	2,500 - 10,000m ² site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4m - 8m high bunds, 20,000 - 100,000 tonnes material moved	>10,000m ² site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8m high bunds formed, >100,000 tonnes material moved	Large >10,000m² site area; >100,000 tonnes material moved

Construction

- E5.5 The total volume of buildings to be constructed on the Application Site will be less than 100,000m³ with potentially dusty construction materials being used. In addition, on site concrete batching may occur. Therefore, the potential dust emission magnitude is medium for construction activities (Table E5.3).

Table E5.3 IAQM dust emission magnitude from construction works

IAQM Dust Emission Magnitude			Proposed Development Assessment
Small	Medium	Large	
<25,000m ³ , non-dusty material (e.g. metal cladding or timber)	25,000 - 100,000m ³ building volume, dusty material e.g. concrete, on site concrete batching	>100,000m ³ building volume, on site concrete batching, sandblasting	Medium <100,000m³ of new building, potentially dusty construction material

Track-Out

- E5.6 A detailed construction plan for the proposed development has not yet been development. However it is estimated that the number of HGVs accessing the site will be less than 50 but potentially more than 10 on any given day. Furthermore, during works, less than 100m of unpaved road will be in use. Overall, therefore, the potential dust emission magnitude from track-out is estimated to be medium (Table E5.4).

Table E5.4 IAQM dust emission magnitude from track-out

IAQM Dust Emission Magnitude			Proposed Development Assessment
Small	Medium	Large	
<10 HDVs out / day, non-dusty soil, < 50m unpaved roads	10 - 50 HDVs out / day, moderately dusty surface material (e.g. clay), 50 -100m unpaved roads	>50 HDVs out / day, dusty surface material (e.g. clay), >100m unpaved roads	Medium Typically <50 HGVs per day; unpaved roads 50 – 100m

Area Sensitivity

- E5.7 The potential receptors for construction dust in the study area largely comprise residential properties (within 50m of construction works, and 10m of potential construction traffic routes), but also a hospital and primary school, although these latter facilities are more than 150m from the site boundary and over 50m from construction traffic routes.
- E5.8 Taking into account the numbers of properties potentially affected (<100 properties within 50m of works; >100 properties within 100m of works), the area has medium sensitivity to dust soiling effects for all aspects of construction works.
- E5.9 Background concentrations of PM₁₀ are ≤13µg/m³ (Table E4.2) and, therefore, applying the IAQM guidance, the area has low sensitivity to human health impacts from particulate matter.
- E5.10 There are no designated ecological sites in the study area therefore the area also has low sensitivity to ecological impacts from dust emissions.

Risk of Impacts

- E5.11 The IAQM methodology includes matrices to determine the risk of construction dust impacts based on the dust emission magnitude and the area sensitivity. Table E5.5 shows a summary of the risk of impacts based on the assessments above. The overall risk of impacts is graded medium for dust soiling and low for human health and ecological impacts.

Table E5.5 Summary of IAQM risk of dust impacts

Impact	Metric	Construction Activity			
		Demolition	Earthworks	Construction	Track-Out
Dust Emission Magnitude		Medium	Large	Medium	Medium
Dust Soiling	Area Sensitivity	Medium	Medium	Medium	Medium
	Risk of Impacts	Medium	Medium	Medium	Medium
Human Health	Area Sensitivity	Low	Low	Low	Low
	Risk of Impacts	Low	Low	Low	Low
Ecological Impacts	Area Sensitivity	Low	Low	Low	Low
	Risk of Impacts	Low	Low	Low	Low

- E5.12 The IAQM guidance recommends that the assessment of the significance of any effects from construction dust is made after the application of appropriate mitigation. The risk of impacts set out above is simply used to determine the appropriate level of mitigation. Notwithstanding this, for compatibility with other sections within this Environmental Statement, the potential effects from construction dust are considered minor adverse in significance. This grading reflects the temporary and sporadic nature of construction impacts and their limited spatial extent.

During Operation

- E5.13 Impacts on annual mean NO₂ from the operation of the proposed development were modelled at 129 roadside receptors across Caerleon. The receptors represent all residential properties, schools and hospitals alongside the local road network. NCC's monitoring demonstrates that away from the roadside, pollutant concentrations are low and, therefore, these 129 receptors are sufficient to fully evaluate the potential impacts of the proposed development on air quality.
- E5.14 The full set of modelled concentrations are provided in Appendix E.4 and only a summary is presented here, as a function of the locations shown in **Error! Reference source not found.** The impacts of the proposed development are assessed against, or in relation to, the Future Baseline Scenario.
- E5.15 As set out in Section E4, in the 2017 Baseline, 12 properties exceeded the air quality objective (>40µg/m³), all of which are located within the AQMA on High Street.
- E5.16 By the first year of occupation (2022), with or without the proposed development, pollutant concentrations have decreased substantially such that only 6 properties exceed the air quality objective, all on High Street within the AQMA, whilst a further 6 are at risk of exceeding the objective (>36µg/m³) (both with and without the proposed development) (**Error! Reference source not found.**). All exceeding and at risk properties are within the AQMA and the proposed development does not cause any new exceedances of the air quality objective. Pollutant concentrations on the site are well within the air quality objective.
- E5.17 In the first year of occupation, 2022, the proposed development results in an overall decrease in concentrations in relation to the Future Baseline. This is because the level of traffic generation associated with the occupation of 40 houses is less than that associated with use of the site under the existing permitted development, even when, as set out in *para E3.19*, the latter has

been assessed conservatively. The exception to this is Lodge Road, near the access to the proposed development, where a negligible increase ($0.1\mu\text{g}/\text{m}^3$) is modelled, but total concentrations are well within the standard.

- E5.18 In 2022, the maximum modelled concentration with the proposed development is $47.8\mu\text{g}/\text{m}^3$ at receptor AQMA15 (High Street (A1), Table E5.6). At this receptor, the proposed development results in a small decrease in concentrations ($0.8\mu\text{g}/\text{m}^3$, $<2.0\%$ of the objective) in relation to the Future Baseline. Using the EPUK/IAQM criteria (Table E3.1), this impact is classed as substantial beneficial due to the level of exceedance of the objective. In total, 6 properties experience substantial beneficial impacts with the proposed development, 3 experience moderate beneficial impacts and 2 experience slight beneficial impacts, all of which occur on High Street within the AQMA. All other receptors experience negligible impacts.
- E5.19 By the earliest year of full occupation of the proposed development, 2027, pollutant concentrations have decreased further such that no properties exceed the objective with (or without) the proposed development (**Error! Reference source not found.**). With full occupation, the impact of the proposed development in relation to the Future Baseline is to slightly increase concentrations, but no new exceedances are created. Furthermore, using the EPUK/IAQM criteria (Table E3.1), the increase is negligible at all receptors.
- E5.20 The maximum modelled concentration with the proposed development is $39.9\mu\text{g}/\text{m}^3$, again at AQMA15. In relation to the Future Baseline (2027), the impact of the development at this location is less than $+0.1\mu\text{g}/\text{m}^3$. This is a negligible impact.

Table E5.6 Summary of modelled annual mean NO_2 for the first year of occupation (2022) ($\mu\text{g}/\text{m}^3$) and impact of the development

Location	Worst Case Receptor	Annual Mean NO ₂ (µg/m ³)				
		2017	2022 Future Baseline	2022 With Devel.	Impact of Devel.	IAQM Descriptor
AQMA						
High Street (A1)	AQMA15	60.3	48.5	47.8	-0.8	Substantial Beneficial
High Street (A2)	AQMA24	31.7	25.7	25.4	-0.3	Negligible
Castle Street (A)	AQMA3	39.2	30.9	30.5	-0.4	Negligible
Gyratory (outside AQMA)						
High Street (W)	ER97	27.9	22.4	22.2	-0.2	Negligible
High Street (N)	ER73	20.3	17.2	17.2	0.0	Negligible
Mill Street	ER6	25.6	20.3	20.2	-0.2	Negligible
Castle Street	ER31	17.7	14.4	14.3	-0.1	Negligible
North of Gyratory						
Station Road	ER2	21.8	18.1	18.0	-0.1	Negligible
Usk Road	ER81	20.7	16.7	16.6	0.0	Negligible
College Crescent	ER56	16.4	13.7	13.7	0.0	Negligible
Broadwalk	ER93	18.2	15.4	15.3	-0.1	Negligible
Lodge Road	ER45	19.1	15.8	15.9	0.1	Negligible
Proposed Development						
Future	PD1	14.5	12.0	12.0	-0.1	Negligible

Table E5.7 Summary of modelled annual mean NO₂ for the earliest year of full occupation (2027) (µg/m³) and impact of the development

Location	Worst Case Receptor	Annual Mean NO ₂ (µg/m ³)				
		2017	2027 Future Baseline	2027 With Devel.	Impact of Devel.	IAQM Descriptor
AQMA						
High Street (A1)	AQMA15	60.3	39.8	39.9	0.1	Negligible
High Street (A2)	AQMA24	31.7	21.8	21.8	0.1	Negligible
Castle Street (A)	AQMA3	39.2	25.4	25.5	0.1	Negligible
Gyratory (outside AQMA)						
High Street (W)	ER97	27.9	18.9	18.9	0.0	Negligible
High Street (N)	ER73	20.3	15.4	15.4	0.0	Negligible
Mill Street	ER6	25.6	17.0	17.1	0.1	Negligible
Castle Street	ER31	17.7	12.4	12.5	0.1	Negligible
North of Gyratory						
Station Road	ER2	21.8	15.9	15.9	0.0	Negligible
Usk Road	ER81	20.7	14.4	14.4	0.0	Negligible
College Crescent	ER56	16.4	12.2	12.2	0.0	Negligible
Broadwalk	ER93	18.2	13.6	13.6	0.0	Negligible
Lodge Road	ER45	19.1	13.8	13.8	0.0	Negligible
Proposed Development						
Future	PD1	14.5	10.6	10.6	0.0	Negligible

- E5.23 The discussion above relates to impacts on annual mean NO₂. UK and Devolved Administration technical guidance for air quality, LAQM.TG(16), states that exceedances of the hourly mean standard for NO₂ are unlikely where annual mean concentrations are below 60µg/m³. With the maximum future year annual mean concentrations being well within this indicative criterion, no exceedance of the hourly mean objective is likely at any property in Caerleon with the proposed development in operation.
- E5.24 Modelled impacts on PM₁₀ and PM_{2.5} concentrations are negligible everywhere and no exceedances of the objectives are modelled in any year.
- E5.25 The EPUK/IAQM guidance and NCC's SPG state that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:
- 1 The existing and future air quality in the absence of the development;
 - 2 The extent of current and future population exposure to the impacts; and
 - 3 The influence and validity of any assumptions adopted when undertaking the prediction of impacts.
- E5.26 Specifically, the guidance states that whilst it may be that there are 'slight', 'moderate' or 'substantial' impacts at one of more receptors, the overall effect may not necessarily be judged as being significant in some circumstances" or where moderate or substantial effects are confined to "*a very small area*" or, where adverse, it is "*not obviously a cause of harm to human health*".
- E5.27 Air quality in Caerleon is expected to improve in the future, whether or not the proposed development is in place. In the opening year, the impact of the development is, in relation to the Future Baseline, perceptible and beneficial at a number of properties (12) within the AQMA. In the completion year, the impacts are adverse but negligible at all receptors. No new exceedances are created. Taking into account the natural inter-annual variability in pollutant concentrations,

no delay to achieving compliance with air quality objectives within the Caerleon AQMA is likely to be perceptible in the future and the spatial extent of the AQMA will not be affected.

E5.28

The assessment of impacts has been based on modelling of all roadside sensitive receptors in Caerleon, using the conservative CURED methodology. In relation to the Future Baseline Scenario, this modelling shows

- 1 moderate or substantial beneficial impacts at 9 properties in the first year of occupation, with maximum beneficial impacts that are up to $0.7\mu\text{g}/\text{m}^3$ but which are unlikely to be perceptible in terms of effects on human health, and
- 2 negligible impacts at all receptors at full development.

E5.29

Therefore, it is concluded that, without consideration of measures designed to reduce emissions during the occupation of the development, overall air quality effects resulting from the operation of the proposed development will be minor and 'not significant'. Furthermore, the future occupants of the proposed development will not be exposed to poor air quality.

Chapter E: Air Quality

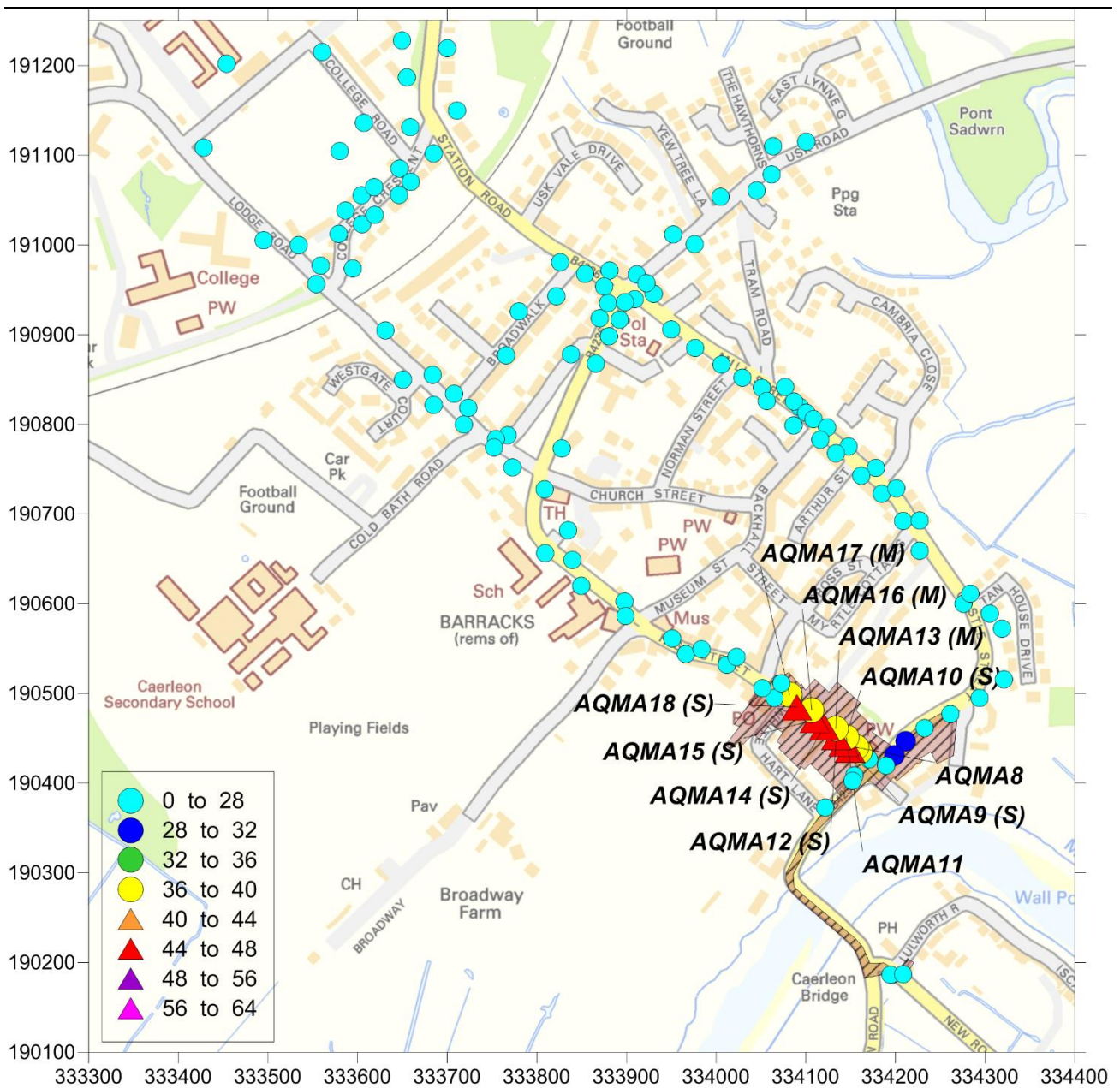
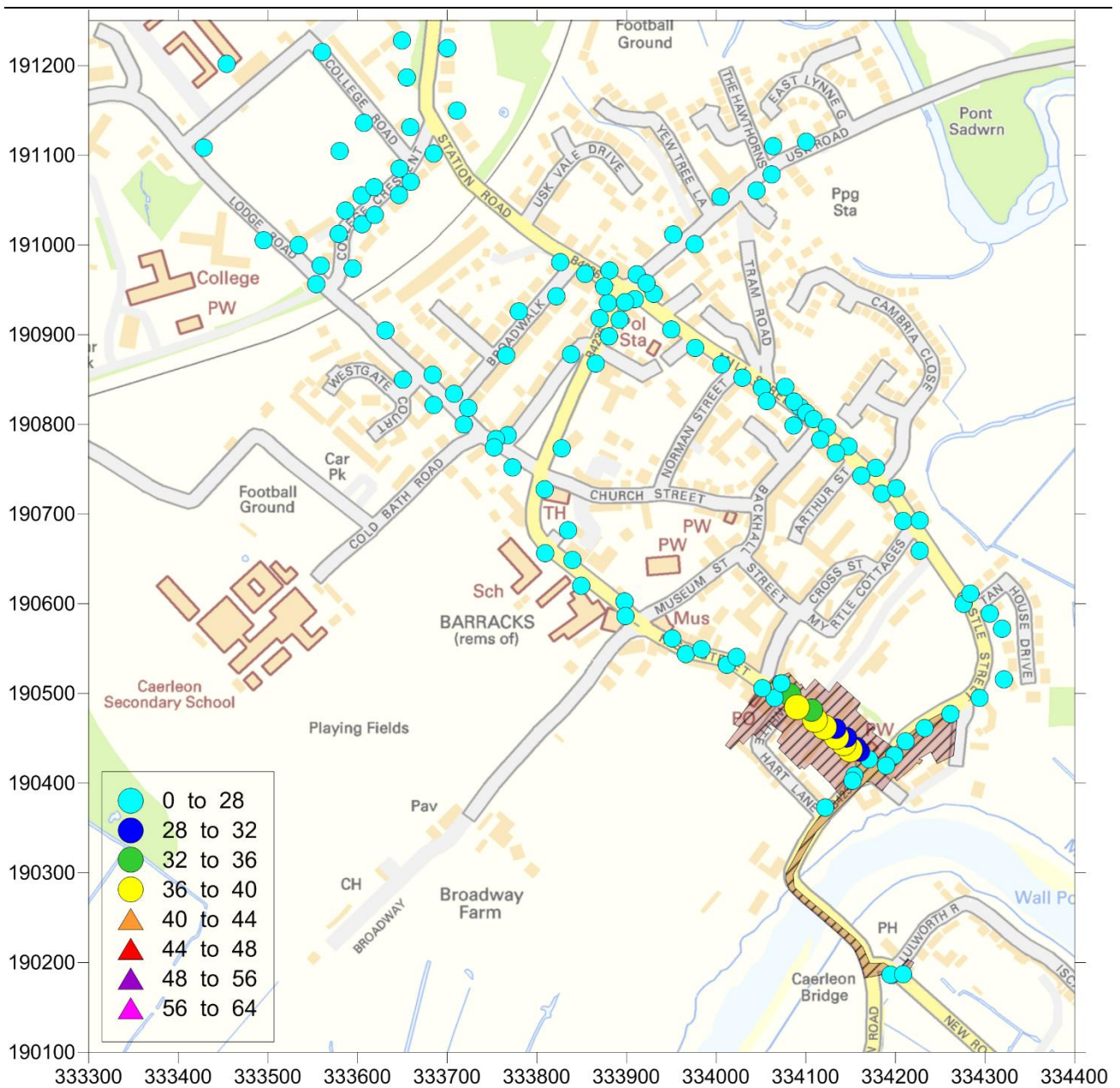


Figure E5.2 Modelled 2027 'With Proposed Development' Annual Mean NO_2 ($\mu\text{g}/\text{m}^3$). All receptors experience negligible impacts in comparison to the Future Baseline



E6.o

Mitigation and Monitoring

E6.1

The overall conclusion of the air quality assessment is that there is a risk of dust effects during construction, but that, with appropriate mitigation, no significant effects are likely. Recommended construction phase mitigation measures are set out below.

E6.2

During operation, impacts will be minor beneficial decreasing to negligible over time, but no significant effects are anticipated and, as such, no mitigation is required. Notwithstanding this, the proposed development incorporates operational measures that comply with the *Redesign – Mitigate – Offset* hierarchy set out in NCC's SPG and Technical Advice Note 18: Traffic (TAN 18).

During Construction

E6.3

The dust risk levels were assessed in the previous section to be medium for dust soiling and low for human health and ecological impacts. The mitigation measures set out below are appropriate for proposed developments where the risk level is medium.

Measures to Reduce Pollution

E6.4

During construction, best practice measures to reduce dust and particulate matter emissions will be secured through the Construction Environmental Management Plan (CEMP) that will be agreed with NCC prior to works. Examples of such measures include:

1 General Communication

- a A **stakeholder communications plan** that includes community engagement before work commences on site should be developed and implemented.
- b The name and contact details of person(s) accountable for air quality and dust issues should be displayed on the site boundary. This may be the environment manager/engineer or the site manager. The head or regional office contact information should also be displayed.

2 General Dust Management

- a A **Dust Management Plan (DMP)**, which may include measures to control other emissions, in addition to the dust and PM10 mitigation measures given in this report, should be developed and implemented, and approved by NCC.

3 Site Management

- a All dust and air quality complaints should be recorded and causes identified. Appropriate remedial action should be taken in a timely manner with a record kept of actions taken including of any additional measures put in-place to avoid reoccurrence.
- b The complaints log should be made available to the local authority on request.
- c Any exceptional incidents that cause dust and/or air emissions, either on- or offsite should be recorded, and then the action taken to resolve the situation recorded in the log book.

4 Monitoring

- a Daily on-site and off-site inspections should be undertaken at nearby receptors and roads. The inspection results should be recorded and made available to NCC when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.

- b Regular site inspections to monitor compliance with the DMP should be carried out, inspection results recorded, and an inspection log made available to NCC when asked.
 - c The frequency of site inspections should be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
 - d Dust deposition or dust flux monitoring and locations should be agreed with NCC. Where possible baseline monitoring should start at least three months before work commences on site or, if it a large site, before work on a phase commences.
- 5 Preparing and maintaining the site
- a Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable.
 - b Where practicable, erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
 - c Where practicable, fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
 - d Avoid site runoff of water or mud.
 - e Keep site fencing, barriers and scaffolding clean using wet methods.
 - f Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover appropriately.
 - g Where practicable, cover, seed or fence stockpiles to prevent wind whipping.
- 6 Operating vehicle/machinery and sustainable travel
- a Ensure all vehicle operators switch off engines when stationary - no idling vehicles.
 - b Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
 - c A maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas should be imposed.
 - d A **Construction Logistics Plan** should be produced to manage the sustainable delivery of goods and materials.
 - e A **Travel Plan** that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing) should be considered.
- 7 Operations
- a Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
 - b Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
 - c Use enclosed chutes and conveyors and covered skips.
 - d Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
 - e Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

8 Waste management

- a Avoid bonfires and burning of waste materials. (highly recommended for all sites)

9 Measures Specific to Demolition

- a Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- b Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- c Bag and remove any biological debris or damp down such material before demolition.

10 Measures Specific to Earthworks

- a Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- b Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- c Where practicable, only remove the cover in small areas during work and not all at once.
- d Stockpile surface areas should be minimised (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up.
- e Where practicable, windbreak netting/screening should be positioned around material stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the site and the surroundings.
- f Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of the prevailing wind direction.
- g During dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up.

11 Measures Specific to Construction

- a Avoid scabbling (roughening of concrete surfaces) if possible.
- b Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- c Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- d For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
- e All construction plant and equipment should be maintained in good working order and not left running when not in use.

12 Measures Specific to Trackout

- a Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being in frequent use during major construction activities close to the site access points.
- b Avoid dry sweeping of large areas.
- c Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- d Where practicable, hard surfaced haul routes should be installed, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- e Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- f Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.

E6.5 The CEMP will incorporate a **Construction Traffic Management Plan** to reduce the requirement for construction traffic use on local roads and seek to minimise the impact of construction traffic on local air quality. Specifically, the proposed development will commit to a requirement that construction-related HDVs will avoid roads within the Caerleon AQMA (and gyratory system) i.e. site access will be limited to Lodge Road and Ponthir Road / Station Road. The CEMP will also include a robust system for monitoring the application and effectiveness of the traffic management plan.

During Operation

Measures to Avoid Pollution by Design

E6.6 The site design promotes the use of active, zero-emission modes of travel. It reflects a user movement hierarchy with pedestrians and cycles at the forefront. In particular it includes:

- 1 Improved pedestrian linkages from the site to Lodge Road;
- 2 Improvement to the existing right of way on the northern boundary of the site with a 3m wide footway/cycleway; and
- 3 A reduction in the quantum of parking on site compared to prescribed NCC guidance.

E6.7 Furthermore, the proposed development commits to funding an enhanced cycle link from the site to the existing National Cycle Network.

E6.8 The proposed development also commits to the provision of electric vehicle charging points on 100% of new residential properties, and opportunities for the provision of communal / on-street electric vehicle charging infrastructure will be explored with the highways authority. Whilst the provision of charging points does not guarantee their use, an extensive and effective network of charging points is key to promoting a step change in the uptake of ultra-low emission vehicles.

Measures to Reduce Pollution

E6.9 The proposed development will have a **Travel Plan** that is both site-specific and inclusive of existing residents, and which promotes an overall reduction in the demand for more polluting forms of transport and a reduction in emissions from transportation. It includes:

- 1 A residential / B1 travel plan;
- 2 Personalised Travel Planning (PTP) for new residents and also existing residents in Caerleon;

- 3 School travel planning for the primary schools (which aligns with the Council and Welsh Government's aspirations for Welsh Network of Healthy School schemes; and
- 4 A commitment to work with St Cadoc's Hospital to provide travel planning as part of a comprehensive package of sustainable benefits for Caerleon.

E6.10 The promotion of modal shift from private to public transport will be facilitated by the provision of new bus stops outside the site.

E6.11 In addition, infrastructure improvements including improvements at the High Street / Station Road junction will reduce emissions from vehicles through a reduction in the duration of queuing.

E6.12 The Developer commits to the provision of **funding for Clean Air Day activities** and presentations, coordinated with International Clean Air Day, for the local primary school to raise awareness of, for example, air quality in Caerleon, the air quality benefits of active travel means, and the actions that can be taken by individuals to reduce personal exposure. The funding will continue for a period of 3 years, at a level to be agreed with NCC and secured through planning condition.

Measures to Mitigate Pollution

E6.13 The modelling undertaken for the proposed development readily demonstrated that future occupants of the proposed development will not be exposed to unacceptable levels of pollution and so mitigation is not required on-site.

E6.14 However, within the Travel Plan information will be provided to residents on travel routes that minimise their exposure to pollution. The provision of information on actions to reduce personal exposure in the wider community will be a key component of Clean Air Day activities at the local primary school.

E7.0

Residual Effects

During Construction

E7.1

The IAQM guidance on construction dust states that:

“For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be ‘not significant’.”

E7.2

There are no site-specific characteristics that would render dust suppression or other mitigation measures ineffective at the site and, therefore, it can be concluded that the residual effects from the generation of dust during the construction of the proposed development will be negligible.

E7.3

This conclusion applies to both construction works and, taking into account routing instructions in the traffic management plan and existing pollution levels, the impacts from construction traffic and non-road mobile construction plant.

During Operation

E7.4

The operational mitigation measures have the potential to reduce the impact of the proposed development on air quality and, with the inclusive nature of the travel planning, have the potential to reduce not only the impact of the proposed development itself but also the impact of existing traffic within Caerleon.

E7.5

The traffic data provided for the assessment included scenarios in which the effects of mitigation are taken into account i.e. as stated in Section 3, a 12% modal shift for development-related traffic (Mitigated A and C scenarios) and a 2% global reduction in traffic flows associated with the wider benefits of the travel plan (Mitigated C scenario only). As set out in the Transport Statement (see Appendix D1), these parameters reflect the performance of similar initiatives across the UK.

E7.6

Since the inclusive measures are likely to take some time to reach maximum effectiveness, only onsite mitigation (Mitigation A) is considered in the first year of occupation (2022), with full mitigation (Mitigation C) being considered by the time of full occupation (2027).

E7.7

Table E7.1 (2022), Table E7.2 and Table E7.3 (both 2027) show the summaries of the impacts of the incorporation of mitigation into the assessment of operational impacts as a function of location.

E7.8

In 2022, with mitigation of development-related traffic (Mitigation A), the beneficial impacts of the proposed development are slightly enhanced. That is, without the traffic mitigation measures, 2, 3 and 6 properties experienced slight, moderate and substantial beneficial impacts respectively. With mitigation, the 2 properties that experienced slight beneficial impacts without mitigation now experience moderate beneficial impacts. The remaining properties see no change in impact classification, although total concentrations reduce very slightly everywhere with mitigation.

E7.9

In 2027, with mitigation of development-related traffic only (Mitigation A), the impact of the proposed development remains negligible at all receptors (as for the unmitigated impact). Taking into account the inclusive effects of the proposed development Travel Plan (Mitigation C), the impacts of the development become slight beneficial at 5 receptors on High Street within the existing AQMA, and remain negligible elsewhere.

Table E7.1 Summary of modelled annual mean NO₂ for the first year of occupation with mitigation (Mitigation A, 2022) (µg/m³) and impact of the development.

Location	Worst Case Receptor	Annual Mean NO ₂ (µg/m ³)				
		2022 Future Baseline	2022 With Devel.	2022 With Devel. Mitigated (A)	Mitigated Impact of Devel.	IAQM Descriptor
AQMA						
High Street (A1)	AQMA15	48.5	47.8	47.8	-0.8	Negligible
High Street (A2)	AQMA24	25.7	25.4	25.4	-0.3	Negligible
Castle Street (A)	AQMA3	30.9	30.5	30.5	-0.4	Negligible
Gyratory (outside AQMA)						
High Street (W)	ER97	22.4	22.2	22.2	-0.2	Negligible
High Street (N)	ER73	17.2	17.2	17.2	0.0	Negligible
Mill Street	ER6	20.3	20.2	20.1	-0.2	Negligible
Castle Street	ER31	14.4	14.3	14.3	-0.1	Negligible
North of Gyratory						
Station Road	ER2	18.1	18.0	18.0	-0.1	Negligible
Usk Road	ER81	16.7	16.6	16.6	0.0	Negligible
College Crescent	ER56	13.7	13.7	13.7	0.0	Negligible
Broadwalk	ER93	15.4	15.3	15.3	-0.1	Negligible
Lodge Road	ER45	15.8	15.9	15.9	0.1	Negligible
Proposed Development						
Future	PD1	12.0	12.0	12.0	-0.1	Negligible

Table E7.2 Summary of modelled annual mean NO₂ for the earliest year of full occupation with mitigation (Mitigation A, 2027) (µg/m³) and impact of the development.

Location	Worst Case Receptor	Annual Mean NO ₂ (µg/m ³)				
		2027 Future Baseline	2027 With Devel.	2027 With Devel. Mitigated (A)	Mitigated Impact of Devel.	IAQM Descriptor
AQMA						
High Street (A1)	AQMA15	39.8	39.9	39.8	0.0	Negligible
High Street (A2)	AQMA24	21.8	21.8	21.8	0.0	Negligible
Castle Street (A)	AQMA3	25.4	25.5	25.4	0.1	Negligible
Gyratory (outside AQMA)						
High Street (W)	ER97	18.9	18.9	18.9	0.0	Negligible
High Street (N)	ER73	15.4	15.4	15.4	0.0	Negligible
Mill Street	ER6	17.0	17.1	17.1	0.0	Negligible
Castle Street	ER31	12.4	12.5	12.4	0.0	Negligible
North of Gyratory						
Station Road	ER2	15.9	15.9	15.9	0.0	Negligible
Usk Road	ER81	14.4	14.4	14.4	0.0	Negligible
College Crescent	ER56	12.2	12.2	12.2	0.0	Negligible

Location	Worst Case Receptor	Annual Mean NO ₂ (µg/m ³)				
		2027 Future Baseline	2027 With Devel.	2027 With Devel. Mitigated (A)	Mitigated Impact of Devel.	IAQM Descriptor
Broadwalk	ER93	13.6	13.6	13.6	0.0	Negligible
Lodge Road	ER45	13.8	13.8	13.8	0.0	Negligible
Proposed Development						
Future	PD1	10.6	10.6	10.6	0.0	Negligible

Table E7.3 Summary of modelled annual mean NO₂ for the earliest year of full occupation with mitigation (Mitigation C, 2027) (µg/m³) and impact of the development.

Location	Worst Case Receptor	Annual Mean NO ₂ (µg/m ³)				
		2027 Future Baseline	2027 With Devel.	2027 With Devel. Mitigated (C)	Mitigated Impact of Devel.	IAQM Descriptor
AQMA						
High Street (A1)	AQMA15	39.8	39.9	39.5	-0.4	Slight Beneficial
High Street (A2)	AQMA24	21.8	21.8	21.7	-0.1	Negligible
Castle Street (A)	AQMA3	25.4	25.5	25.3	-0.1	Negligible
Gyratory (outside AQMA)						
High Street (W)	ER97	18.9	18.9	18.8	-0.1	Negligible
High Street (N)	ER73	15.4	15.4	15.4	0.0	Negligible
Mill Street	ER6	17.0	17.1	17.0	-0.1	Negligible
Castle Street	ER31	12.4	12.5	12.4	0.0	Negligible
North of Gyratory						
Station Road	ER2	15.9	15.9	15.8	0.0	Negligible
Usk Road	ER81	14.4	14.4	14.4	0.0	Negligible
College Crescent	ER56	12.2	12.2	12.1	0.0	Negligible
Broadwalk	ER93	13.6	13.6	13.6	0.0	Negligible
Lodge Road	ER45	13.8	13.8	13.8	0.0	Negligible
Proposed Development						
Future	PD1	10.6	10.6	10.6	0.0	Negligible

E7.13 Table E7.4 shows a summary of the IAQM/EPUK impact descriptors for the proposed development with and without mitigation measures in terms of the number of receptors (residential properties) affected for 2022 and 2027.

E7.14 No adverse impacts (non-negligible) are seen at any receptors in any scenario. The overall beneficial impact of the mitigation measures is evidence in an increase in the numbers of properties experiencing moderate beneficial impacts in 2022 and slight beneficial impacts in 2027.

Table E7.4 Summary of IAQM/EPUK descriptors and numbers of receptors affected by the proposed development, including the effects of mitigation, as a function of year.

IAQM/EPUK Descriptor	2022		2027		
	Without Mitigation	With Mitigation A	Without Mitigation	With Mitigation A	With Mitigation C
Substantial Beneficial	6	6	0	0	0
Moderate Beneficial	3	5	0	0	0
Slight Beneficial	2	0	0	0	5
Negligible	118	118	129	129	125
Slight Adverse	0	0	0	0	0
Moderate Adverse	0	0	0	0	0
Substantial Adverse	0	0	0	0	0

E7.15 In terms of overall significance, returning to the EPUK/IAQM guidance, the overall effects of the proposed development on air quality are likely to be minor beneficial in all years with mitigation. However, with relatively low numbers of properties affected, the health benefits of reduced exposure to pollution may not be perceptible.

E8.0

Summary & Conclusions

Summary

- E8.1 The air quality assessment for the proposed development has considered the impacts of the construction and operation of the proposed development.
- E8.2 It has focussed on a qualitative assessment of dust generation during construction and a quantitative assessment, using dispersion modelling, of impacts from vehicle emissions on roadside NO₂ concentrations during operation.
- E8.3 The assessment methodology has taken into account uncertainties associated with existing vehicle emissions, the future projection of vehicle emissions, realistic build-out rates, and the potential future use of the site.
- E8.4 Air quality in Caerleon currently exceeds the UK's air quality objectives for annual mean NO₂. The exceedances are, however, limited to a short section of High Street within the gyratory system in the town. NCC has declared an AQMA in Caerleon, although its extent is conservative since outwith High Street, monitored concentrations of NO₂ are within the objective. Air quality is expected to improve in the future, whether or not the proposed development is in operation.
- E8.5 The modelling of the impacts of the proposed development shows negligible impacts at the vast majority of receptors (residential properties) within Caerleon, in both the opening year and at the time of full occupation. The proposed development does not create any new exceedances of air quality objectives or significantly worsen existing exceedances.
- E8.6 Within the Caerleon AQMA, the proposed development results in a beneficial impact in comparison to the Future Baseline Scenario in the first year of occupation, since the level of traffic associated with the partial occupation of the development is lower than that generated by a realistic use of site under permitted development. Prior to consideration of mitigation, impacts within the AQMA at the time of full occupation are negligible at all receptors.
- E8.7 The development incorporates many of the mitigation measures recommended within NCC's Supplementary Planning Guidance for Air Quality. Significantly, the Developers are committed to installing electric vehicle charging points at all new residential properties, to preventing construction related HGVs from travelling through the Caerleon AQMA and to funding air quality information dissemination measures to future occupants of the site and the local school. Furthermore, the proposed development incorporates measures to improve access to public transport and links to the national cycle network, and the inclusive Travel Plan will maximise the opportunities to reduce the need to travel by private cars and to encourage active travel.
- E8.8 Taking into account these mitigation measures, the development results in slight beneficial impacts within the AQMA and negligible impacts elsewhere at the time of full occupation.
- E8.9 The development has the potential to cause dust soiling at nearby properties and roads during construction but these effects can be mitigated through the application of best practice dust suppression measures.

Conclusions

- E8.10 Table E8.1 provides a summary of the effects of the proposed development. With mitigation, no significant adverse air quality effects are likely during the construction or operational phases of development.

- E8.11 The assessment has demonstrated that air quality will not present a significant constraint to the proposed development, either offsite or onsite. It will not result in a material deterioration in air quality or harm to health as a result of its construction and occupation, and is compliant with national and local planning policies and guidance.
- E8.12 In comparison to realistic alternative use of the site under permitted development, the development has a beneficial impact on air quality during early years of occupation that is extended to the time of full occupation with mitigation measures.

Table E8.1 Summary of Effects

Receptor / Impact	Effects	Mitigation	Residual Effects
During Construction			
Residential Properties, hospital and schools / Dust Soiling	Minor Adverse	Best practice dust suppression measures applied through CEMP	Negligible
Residential Properties / Human Health	Negligible		Negligible
Ecology / Dust/alkaline deposition	Negligible		Negligible
Residential Properties, hospital and schools / Exposure to roadside pollution from construction traffic	Negligible	Construction traffic management plan inc routing advice for HGVs	Negligible
During Operation			
Residential Properties, hospital and schools / Exposure to roadside pollution from development-related traffic	Negligible at majority of receptors; Beneficial during partial occupation within AQMA in High Street	Development-related and Inclusive Travel Plan; Provision of charging points; Information dissemination	Negligible at majority of receptors; Minor Beneficial within AQMA in High Street
During Decommissioning			
Residential Properties, hospital and schools / Dust Soiling	Minor Adverse	Best practice dust suppression measures	Negligible

E9.0

Abbreviations & Definitions

- 1 AQMA: Air quality management area. Areas identified by local authorities in which the UK's air quality objectives are exceeded. The declaration of an AQMA will include reference to the specific objectives (one or more) likely to be exceeded and the area of likely exceedance of the objective. If the local authority deems that the risk of exceedance of the objective has passed, then the declaration can, with agreement from Defra, be revoked.
- 2 Defra: Department for Environment, Food and Rural Affairs
- 3 Dust: Defined as particles in the size range 1 – 75micrometres (µm) in diameter
- 4 EPUK: Environmental Protection UK
- 5 IAQM: Institute of Air Quality Management. The professional body for air quality in the UK
- 6 LAQM.TG(16): Technical Guidance published by Defra and the Devolved Administrations in relation to local air quality management
- 7 Limit Value: Mandatory air quality thresholds set out in the EU Ambient Air Quality Directive and the UK's Air Quality Standards Regulations
- 8 NCC: Newport City Council
- 9 NO₂: Nitrogen Dioxide
- 10 NO_x: Nitrogen oxides comprising Nitrogen Oxide (NO) and Nitrogen Dioxide (NO₂)
- 11 Objective: Air quality thresholds set out in the UK's Air Quality Strategy and Air Quality Regulations that provide a level of environmental protection whilst recognising the technical feasibility of achieving the standard. They are based on health based standards that take into account impacts of sensitive members of the public
- 12 PM₁₀/PM_{2.5}: Fine particulate matter with an aerodynamic diameter of less than or equal to 10 microns or 2.5 microns respectively (0.00001m / 0.0000025m)
- 13 Receptor: A location where members of the public might be exposed to air pollution, used to assess the air quality impacts of the development. Typically at the façade of residential buildings, schools, hospitals.
- 14 Track-out: The inadvertent transport of material outside the construction site for a development on the body and wheels of vehicles
- 15 µg/m³: micrograms per cubic metre

Appendix E1 – Traffic Data

The following tables provide the traffic flows used in the air quality modelling of operation impacts. The data were provided by Vectos Transport Planners.

Table E1.A: Baseline and Future Baseline Traffic Flows

Link #	Link Name	Direction	Baseline					Future Baseline (2022, 2027)				
			Car	LGV	OGV1	OGV2	Bus	Car	LGV	OGV1	OGV2	Bus
1	Station Road (College Crescent to Broadwalk)	NB	2833	306	62	10	36	2833	306	62	10	36
		SB	4874	502	78	16	31	5254	502	78	16	31
2	Station Road (Broadwalk to Usk Road)	NB	3465	342	62	10	41	3472	342	62	10	41
		SB	3439	399	78	10	31	3713	399	78	10	31
3	Broadwalk	SB	2087	140	5	5	0	2201	140	5	5	0
4	Ponthir Road (College Crescent northwards)	NB	4154	420	62	10	36	4246	420	62	10	36
		SB	4200	399	73	16	26	4306	399	73	16	26
5	College Crescent (College Road to Station Road)	EB	2098	176	0	0	5	2464	176	0	0	5
6	College Crescent (Lodge Road to College Road)	EB	2098	176	0	0	5	2098	176	0	0	5
7	Lodge Road (Broadwalk to College Crescent)	NB	4656	368	36	5	21	5075	368	36	5	21
		SB	2569	176	10	10	31	2569	176	10	10	31
8	Lodge Road (High Street to Broadwalk)	NB	3631	311	31	0	21	3936	311	31	0	21
		SB	3170	228	10	10	31	3170	228	10	10	31
9	Lodge Road (College Crescent to site access)	NB	3475	316	41	5	21	3894	316	41	5	21
		SB	4138	311	16	10	41	4138	311	16	10	41
10	Lodge Road (site access northwards)	NB	3475	316	41	5	21	3776	316	41	5	21
		SB	4133	311	16	10	41	4477	311	16	10	41
11	Usk Road	EB	1196	186	41	16	21	1203	186	41	16	21
		WB	1528	192	41	10	21	1535	192	41	10	21
12	Mill Street	SB	7437	756	104	31	98	7705	756	104	31	98
13	Castle Street	WB	7204	658	119	26	93	7472	658	119	26	93
14	High Street (Castle Street to Broadway)	NB	7779	653	88	26	83	8085	653	88	26	83
15	High Street (Broadway to Lodge Road)	NB	6883	632	114	26	98	7189	632	114	26	98

Link #	Link Name	Direction	Baseline					Future Baseline (2022, 2027)				
			Car	LGV	OGV1	OGV2	Bus	Car	LGV	OGV1	OGV2	Bus
16	HighStreet (Lodge Road to Station Road)	EB	7132	694	93	36	109	7132	694	93	36	109
17	High Street (Castle Street to New Road)	EB	6966	621	104	26	88	7316	621	104	26	88
		WB	6391	596	114	31	83	6656	596	114	31	83
18	New Road	NB	3164	280	41	10	26	3373	280	41	10	26
		SB	3475	274	47	0	5	3633	274	47	0	5
19	Caerleon Road	NB	4200	363	62	5	62	4343	363	62	5	62
		SB	3315	326	52	31	78	3422	326	52	31	78

Table E1.B: With Development Traffic Flows (No Mitigation)

Link #	Link Name	Direction	With Development (40 units) (2022 First Full Year of Occupation)					With Development (218 units) (2027 Earliest Year of Full Occupation)				
			Car	LGV	OGV1	OGV2	Bus	Car	LGV	OGV1	OGV2	Bus
1	Station Road (College Crescent to Broadwalk)	NB	2833	306	62	10	36	2833	306	62	10	36
		SB	4965	502	78	16	31	4954	502	78	16	31
2	Station Road (Broadwalk to Usk Road)	NB	3469	342	62	10	41	3468	342	62	10	41
		SB	3511	399	78	10	31	3502	399	78	10	31
3	Broadwalk	SB	2110	140	5	5	0	2107	140	5	5	0
4	Ponthir Road (College Crescent northwards)	NB	4174	420	62	10	36	4171	420	62	10	36
		SB	4219	399	73	16	26	4217	399	73	16	26
5	College Crescent (College Road to Station Road)	EB	2190	176	0	0	5	2179	176	0	0	5
6	College Crescent (Lodge Road to College Road)	EB	2098	176	0	0	5	2098	176	0	0	5
7	Lodge Road (Broadwalk to College Crescent)	NB	4743	368	36	5	21	4733	368	36	5	21
		SB	2569	176	10	10	31	2569	176	10	10	31
8	Lodge Road (High Street to Broadwalk)	NB	3695	311	31	0	21	3687	311	31	0	21
		SB	3170	228	10	10	31	3170	228	10	10	31
9	Lodge Road (College Crescent to site access)	NB	3563	316	41	5	21	3552	316	41	5	21
		SB	4138	311	16	10	41	4138	311	16	10	41
10	Lodge Road (site access northwards)	NB	3529	316	41	5	21	3523	316	41	5	21
		SB	4184	311	16	10	41	4178	311	16	10	41
11	Usk Road	EB	1200	186	41	16	21	1200	186	41	16	21
		WB	1532	192	41	10	21	1531	192	41	10	21
12	Mill Street	SB	7505	756	104	31	98	7497	756	104	31	98
13	Castle Street	WB	7272	658	119	26	93	7264	658	119	26	93
14	High Street (Castle Street to Broadway)	NB	7844	653	88	26	83	7836	653	88	26	83

Link #	Link Name	Direction	With Development (40 units) (2022 First Full Year of Occupation)					With Development (218 units) (2027 Earliest Year of Full Occupation)				
			Car	LGV	OGV1	OGV2	Bus	Car	LGV	OGV1	OGV2	Bus
15	High Street (Broadway to Lodge Road)	NB	6948	632	114	26	98	6940	632	114	26	98
16	HighStreet (Lodge Road to Station Road)	EB	7132	694	93	36	109	7132	694	93	36	109
17	High Street (Castle Street to New Road)	EB	7030	621	104	26	88	7023	621	104	26	88
		WB	6459	596	114	31	83	6451	596	114	31	83
18	New Road	NB	3199	280	41	10	26	3195	280	41	10	26
		SB	3511	274	47	0	5	3507	274	47	0	5
19	Caerleon Road	NB	4231	363	62	5	62	4227	363	62	5	62
		SB	3346	326	52	31	78	3343	326	52	31	78

Table E1.C: With Development Traffic Flows (With Mitigation)

Link #	Link Name	Direction	With Development (40 units) (2022 First Full Year of Occupation) Travel Plan Mitigation (A)					With Development (218 units) (2027 Earliest Year of Full Occupation) Travel Plan Mitigation (A)					With Development (218 units) (2027 Earliest Year of Full Occupation) Travel Plan Mitigation (C)				
			Car	LGV	OGV1	OGV2	Bus	Car	LGV	OGV1	OGV2	Bus	Car	LGV	OGV1	OGV2	Bus
1	Station Road (College Crescent to Broadwalk)	NB	2833	306	62	10	36	2833	306	62	10	36	2768	306	62	10	36
		SB	4954	502	78	16	31	5289	502	78	16	31	5179	502	78	16	31
2	Station Road (Broadwalk to Usk Road)	NB	3468	342	62	10	41	3482	342	62	10	41	3404	342	62	10	41
		SB	3502	399	78	10	31	3767	399	78	10	31	3688	399	78	10	31
3	Broadwalk	SB	2107	140	5	5	0	2192	140	5	5	0	2147	140	5	5	0
4	Ponthir Road (College Crescent northwards)	NB	4171	420	62	10	36	4246	420	62	10	36	4152	420	62	10	36
		SB	4217	399	73	16	26	4288	399	73	16	26	4193	399	73	16	26
5	College Crescent (College Road to Station Road)	EB	2179	176	0	0	5	2518	176	0	0	5	2472	176	0	0	5
6	College Crescent (Lodge Road to College Road)	EB	2098	176	0	0	5	2098	176	0	0	5	2052	176	0	0	5
7	Lodge Road (Broadwalk to College Crescent)	NB	4733	368	36	5	21	5055	368	36	5	21	4954	368	36	5	21
		SB	2569	176	10	10	31	2569	176	10	10	31	2513	176	10	10	31
8	Lodge Road (High Street to Broadwalk)	NB	3687	311	31	0	21	3925	311	31	0	21	3845	311	31	0	21
		SB	3170	228	10	10	31	3170	228	10	10	31	3101	228	10	10	31
9	Lodge Road (College Crescent to site access)	NB	3552	316	41	5	21	3874	316	41	5	21	3797	316	41	5	21
		SB	4138	311	16	10	41	4138	311	16	10	41	4048	311	16	10	41
10	Lodge Road (site access northwards)	NB	3523	316	41	5	21	3721	316	41	5	21	3644	316	41	5	21
		SB	4178	311	16	10	41	4367	311	16	10	41	4277	311	16	10	41
11	Usk Road	EB	1200	186	41	16	21	1214	186	41	16	21	1185	186	41	16	21
		WB	1531	192	41	10	21	1545	192	41	10	21	1509	192	41	10	21
12	Mill Street	SB	7497	756	104	31	98	7747	756	104	31	98	7579	756	104	31	98
13	Castle Street	WB	7264	658	119	26	93	7514	658	119	26	93	7352	658	119	26	93
14	High Street (Castle Street to Broadway)	NB	7836	653	88	26	83	8074	653	88	26	83	7901	653	88	26	83
15	High Street (Broadway to Lodge Road)	NB	6940	632	114	26	98	7178	632	114	26	98	7023	632	114	26	98
16	HighStreet (Lodge Road to Station Road)	EB	7132	694	93	36	109	7132	694	93	36	109	6970	694	93	36	109

Link #	Link Name	Direction	With Development (40 units) (2022 First Full Year of Occupation) Travel Plan Mitigation (A)					With Development (218 units) (2027 Earliest Year of Full Occupation) Travel Plan Mitigation (A)					With Development (218 units) (2027 Earliest Year of Full Occupation) Travel Plan Mitigation (C)				
			Car	LGV	OGV1	OGV2	Bus	Car	LGV	OGV1	OGV2	Bus	Car	LGV	OGV1	OGV2	Bus
17	High Street (Castle Street to New Road)	EB	7023	621	104	26	88	7261	621	104	26	88	7104	621	104	26	88
		WB	6451	596	114	31	83	6701	596	114	31	83	6557	596	114	31	83
18	New Road	NB	3195	280	41	10	26	3321	280	41	10	26	3250	280	41	10	26
		SB	3507	274	47	0	5	3640	274	47	0	5	3564	274	47	0	5
19	Caerleon Road	NB	4227	363	62	5	62	4338	363	62	5	62	4245	363	62	5	62
		SB	3343	326	52	31	78	3460	326	52	31	78	3384	326	52	31	78

Appendix E2 – Model Receptors

The following table sets out the details of the receptors used in the dispersion modelling of operational impacts. For information on the Verification Zone, see Appendix E3. For information on the Reporting Zone, see Figure E4.2

Table E2.A Model Receptors

Name	X(m)	Y(m)	Z(m)	Verification Zone	Reporting Zone
AQMA					
AQMA1	334261	190477	1.5	4	Castle Street (A)
AQMA2	334233	190461	1.5	4	Castle Street (A)
AQMA3	334211	190447	1.5	4	Castle Street (A)
AQMA4	334199	190431	1.5	4	Castle Street (A)
AQMA5	334190	190419	1.5	4	Castle Street (A)
AQMA6	334170	190427	1.5	1	High Street (A1)
AQMA7	334160	190435	1.5	1	High Street (A1)
AQMA8	334156	190440	1.5	1	High Street (A1)
AQMA9	334149	190437	1.5	1	High Street (A1)
AQMA10	334142	190444	1.5	1	High Street (A1)
AQMA11	334145	190451	1.5	1	High Street (A1)
AQMA12	334134	190451	1.5	1	High Street (A1)
AQMA13	334133	190461	1.5	1	High Street (A1)
AQMA14	334121	190462	1.5	1	High Street (A1)
AQMA15	334110	190470	1.5	1	High Street (A1)
AQMA16	334107	190481	1.5	1	High Street (A1)
AQMA17	334082	190499	1.5	1	High Street (A1)
AQMA18	334090	190485	1.5	1	High Street (A1)
AQMA19	334065	190495	1.5	1	High Street (A1)
AQMA20	334073	190511	1.5	1	High Street (A1)
AQMA21	334051	190506	1.5	1	High Street (A1)
AQMA22	334154	190408	1.5	3	High Street (A2)
AQMA23	334152	190403	1.5	3	High Street (A2)
AQMA24	334122	190373	1.5	3	High Street (A2)
AQMA25	334194	190186	1.5	3	High Street (A2)
AQMA26	334209	190187	1.5	3	High Street (A2)
Future Residential Properties on Proposed Development					
PD1	333429	191109	1.5	2	Future
PD2	333454	191202	1.5	2	Future
PD3	333561	191215	1.5	2	Future
PD4	333607	191136	1.5	2	Future
PD5	333580	191105	1.5	2	Future
Existing Receptors alongside Road Network					

ER1	333534	191000	1.5	2	Lodge Road
ER2	333881	190971	1.5	2	Station Road
ER3	334093	190819	1.5	2	Mill Street
ER4	334012	190532	1.5	2	High Street (W)
ER5	333951	190561	1.5	2	High Street (W)
ER6	334276	190600	1.5	2	Mill Street
ER7	333976	190885	1.5	2	Mill Street
ER8	334006	190867	1.5	2	Mill Street
ER9	334029	190852	1.5	2	Mill Street
ER10	334051	190841	1.5	2	Mill Street
ER11	334077	190842	1.5	2	Mill Street
ER12	334087	190825	1.5	2	Mill Street
ER13	334056	190826	1.5	2	Mill Street
ER14	334100	190813	1.5	2	Mill Street
ER15	334108	190806	1.5	2	Mill Street
ER16	334087	190799	1.5	2	Mill Street
ER17	334124	190796	1.5	2	Mill Street
ER18	334116	190783	1.5	2	Mill Street
ER19	334148	190775	1.5	2	Mill Street
ER20	334178	190752	1.5	2	Mill Street
ER21	334162	190743	1.5	2	Mill Street
ER22	334185	190722	1.5	2	Mill Street
ER23	334201	190729	1.5	2	Mill Street
ER24	334208	190692	1.5	2	Mill Street
ER25	334227	190693	1.5	2	Mill Street
ER26	334227	190659	1.5	2	Mill Street
ER27	334284	190611	1.5	2	Castle Street
ER28	334305	190589	1.5	2	Castle Street
ER29	334319	190572	1.5	2	Castle Street
ER30	334321	190516	1.5	2	Castle Street
ER31	334294	190495	1.5	4	Castle Street
ER32	333931	190946	1.5	2	Mill Street
ER33	333950	190906	1.5	2	Mill Street
ER34	334023	190540	1.5	2	High Street (W)
ER35	334133	190768	1.5	2	Mill Street
ER36	333898	190603	1.5	2	High Street (W)
ER37	333899	190586	1.5	2	High Street (W)
ER38	333840	190649	1.5	2	High Street (W)
ER39	333849	190620	1.5	2	High Street (W)
ER40	333809	190656	1.5	2	High Street (W)
ER41	333835	190682	1.5	2	High Street (W)
ER42	333808	190727	1.5	2	High Street (W)
ER43	333773	190752	1.5	2	Lodge Road
ER44	333767	190788	1.5	2	Lodge Road

ER45	333754	190784	1.5	2	Lodge Road
ER46	333752	190774	1.5	2	Lodge Road
ER47	333719	190800	1.5	2	Lodge Road
ER48	333723	190818	1.5	2	Lodge Road
ER49	333685	190821	1.5	2	Lodge Road
ER50	333684	190855	1.5	2	Lodge Road
ER51	333651	190850	1.5	2	Lodge Road
ER52	333631	190905	1.5	2	Lodge Road
ER53	333554	190956	1.5	2	Lodge Road
ER54	333559	190977	1.5	2	Lodge Road
ER55	333495	191005	1.5	2	Lodge Road
ER56	333595	190974	1.5	2	College Cres
ER57	333605	191023	1.5	2	College Cres
ER58	333619	191033	1.5	2	College Cres
ER59	333586	191039	1.5	2	College Cres
ER60	333579	191012	1.5	2	College Cres
ER61	333604	191055	1.5	2	College Cres
ER62	333619	191065	1.5	2	College Cres
ER63	333646	191056	1.5	2	College Cres
ER64	333647	191085	1.5	2	College Cres
ER65	333659	191071	1.5	2	College Cres
ER66	333685	191102	1.5	2	College Cres
ER67	333659	191131	1.5	2	College Cres
ER68	333655	191187	1.5	2	Station Road
ER69	333650	191228	1.5	2	Station Road
ER70	333711	191150	1.5	2	Station Road
ER71	333700	191219	1.5	2	Station Road
ER72	333828	190773	1.5	2	High Street (N)
ER73	333866	190868	1.5	2	High Street (N)
ER74	333838	190878	1.5	2	High Street (N)
ER75	333881	190898	1.5	2	High Street (N)
ER76	333870	190918	1.5	2	High Street (N)
ER77	333879	190935	1.5	2	High Street (N)
ER78	333892	190916	1.5	2	High Street (N)
ER79	333909	190940	1.5	2	Mill Street
ER80	333898	190936	1.5	2	High Street (N)
ER81	333912	190967	1.5	2	Usk Road
ER82	333875	190954	1.5	2	Station Road
ER83	333854	190968	1.5	2	Station Road
ER84	333922	190957	1.5	2	Usk Road
ER85	333976	191001	1.5	2	Usk Road
ER86	333952	191012	1.5	2	Usk Road
ER87	334005	191054	1.5	2	Usk Road
ER88	334045	191061	1.5	2	Usk Road

ER89	334062	191078	1.5	2	Usk Road
ER90	334064	191110	1.5	2	Usk Road
ER91	334100	191115	1.5	2	Usk Road
ER92	333780	190926	1.5	2	Broadwalk
ER93	333708	190834	1.5	2	Broadwalk
ER94	333766	190877	1.5	2	Broadwalk
ER95	333826	190981	1.5	2	Station Road
ER96	333822	190942	1.5	2	Broadwalk
ER97	333966	190544	1.5	2	High Street (W)
ER98	333984	190549	1.5	2	High Street (W)

Appendix E3 – Model Verification

This appendix considers the verification of the ADMS Road dispersion model using the monitoring data available from Newport City Council. The monitoring data and locations are provided in Table E4.1 and Figure E4.1. The verification is based on monitored data for 2017 and modelling undertaken using Defra's the CURED calculator v3A.

The comparison of modelled concentrations with local monitored concentrations is a process termed 'verification'. Model verification investigates the discrepancies between modelled and measured concentrations, which can arise due to the presence of inaccuracies and/or uncertainties in model input data, modelling and monitoring data assumptions. The following are examples of potential causes of such discrepancy:

1. Estimates of background pollutant concentrations;
2. Meteorological data uncertainties;
3. Traffic data and emissions uncertainties;
4. Model input parameters, such as 'roughness length'; and
5. Overall limitations of dispersion modelling

Most nitrogen dioxide is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of the primary pollutant emissions of nitrogen oxides ($\text{NO}_x = \text{NO} + \text{NO}_2$), in line with the guidance provided within Chapter 7 of Defra's LAQM.TG(16)

After conversion of modelled NO_x concentrations to NO_2 concentrations (using Defra's NO_x to NO_2 calculator), a second verification step may then be applied, if appropriate, based on comparison of monitored and modelled total NO_2 concentrations.

The relationship between monitored and modelled road contribution to NO_x clearly demonstrated that the model was performing differently in certain types of location e.g. AQMA and non-AQMA sites, street canyon and non-street canyon etc. As such, following the recommendations in Defra's LAQM.TG(16) para 7.5.24, the model verification was applied on the basis of the following areas:

1. Area 1: Street canyon on High Street, within the AQMA and gyratory system
2. Area 2: All areas outside the AQMA
3. Area 3: High Street, within AQMA but outside gyratory system
4. Area 4: Street canyon on Castle Street, within the AQMA and gyratory system

Figure E3.A shows the straight line fit to the relationship between monitored and modelled road contribution to NO_x for the four areas.

Following verification on the basis of the road contribution to NO_x , the total modelled and monitored concentrations were compared (Figure E3.B). The figure shows that the majority (69%) of data points lie within the required $\pm 10\%$ accuracy limits (LAQM TG.16), with all except 1 data points lying within the $\pm 25\%$ accuracy limits. At the property which lies outside the $+25\%$ band, the model overestimates concentrations and so is conservative.

The straight line fit between monitored and modelled total NO_2 has a gradient of 1.00, and, as such, no model adjustments for NO_2 were necessary.

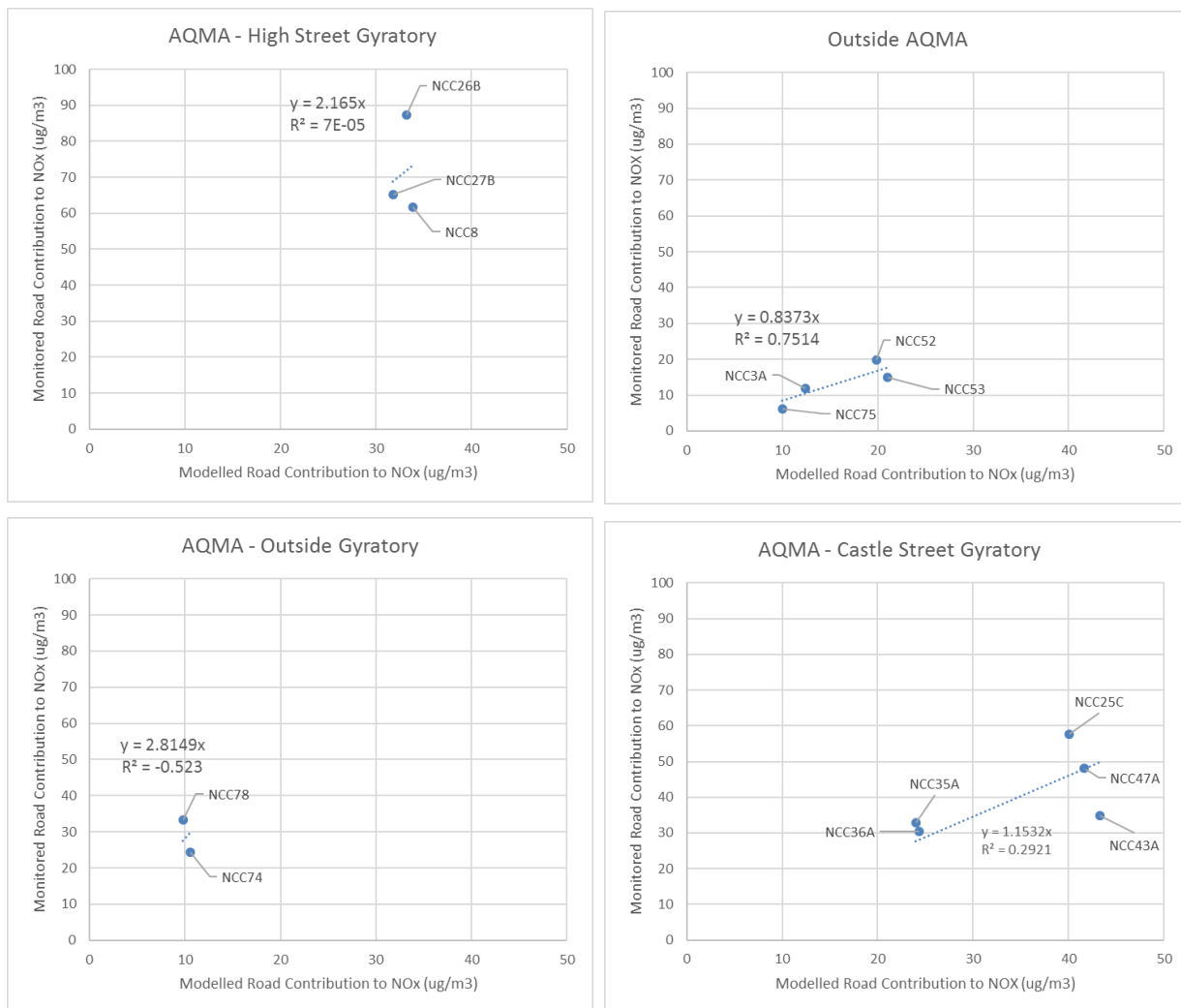


Figure E3.A Comparison of modelled and monitored road contribution to NOx

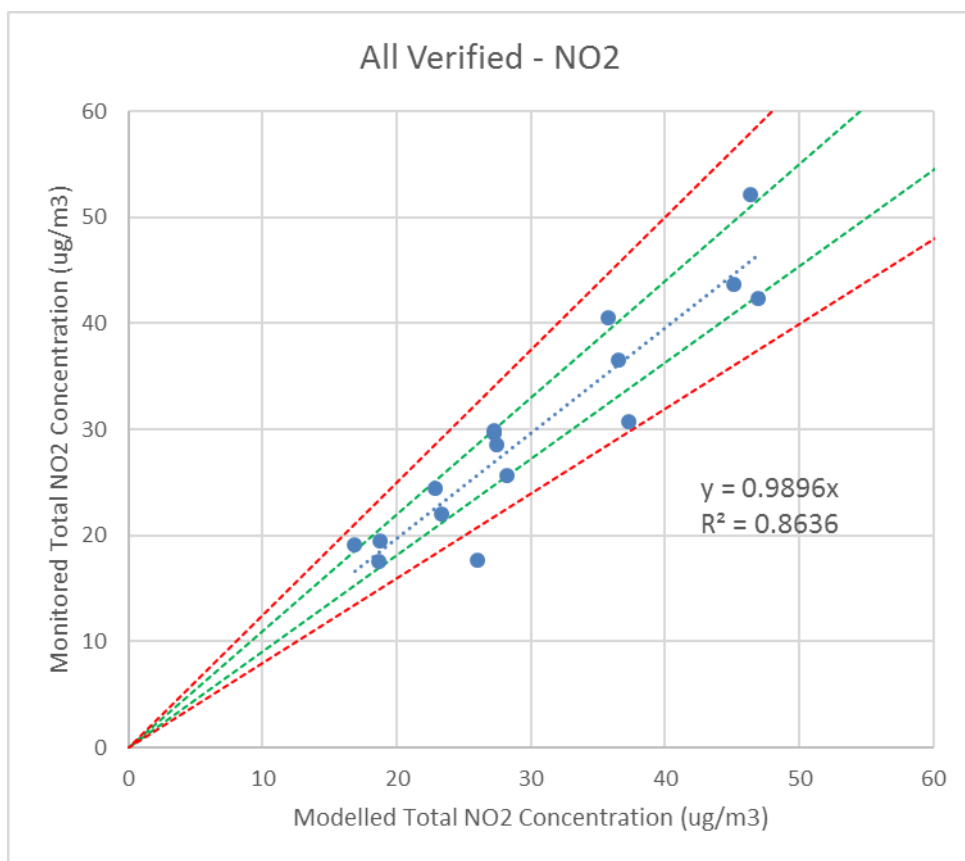


Figure E3.B Comparison of modelled and monitored total NO2

Appendix E4 – Model Results

Table E4.A Baseline and Future Baseline Annual Mean NO₂ (µg/m³)

Receptor	2017 Base	2022 Future Baseline	2027 Future Baseline
AQMA1	27.0	21.4	17.9
AQMA2	26.8	21.2	17.8
AQMA3	39.2	30.9	25.4
AQMA4	38.8	30.6	25.1
AQMA5	29.1	23.1	19.2
AQMA6	23.6	19.1	16.2
AQMA7	47.1	37.7	31.0
AQMA8	47.9	38.3	31.5
AQMA9	56.8	45.6	37.5
AQMA10	58.9	47.4	38.9
AQMA11	48.2	38.6	31.7
AQMA12	58.8	47.3	38.8
AQMA13	48.0	38.4	31.6
AQMA14	58.6	47.2	38.7
AQMA15	60.3	48.5	39.8
AQMA16	49.6	39.7	32.6
AQMA17	48.8	39.1	32.1
AQMA18	59.5	47.9	39.3
AQMA19	19.0	15.5	13.4
AQMA20	22.5	18.2	15.5
AQMA21	19.9	16.2	13.9
AQMA22	29.0	23.3	19.5
AQMA23	31.6	25.3	21.2
AQMA24	31.7	25.7	21.8
AQMA25	24.4	19.7	16.7
AQMA26	27.9	22.7	19.1
PD1	14.5	12.0	10.6
PD2	13.0	14.9	13.2
PD3	13.0	10.9	9.7
PD4	13.2	10.8	9.6
PD5	13.3	11.0	9.8
ER1	17.7	11.1	9.8
ER2	21.7	18.1	15.9
ER3	19.2	15.6	13.4
ER4	23.1	18.7	15.8
ER5	23.6	19.1	16.3
ER6	25.6	20.3	17.0
ER7	23.8	19.1	16.3
ER8	24.4	19.5	16.5
ER9	15.9	13.1	11.5
ER10	21.9	17.6	15.0

Receptor	2017 Base	2022 Future Baseline	2027 Future Baseline
ER11	16.5	13.6	11.8
ER12	19.7	16.0	13.7
ER13	15.3	12.7	11.1
ER14	19.1	15.5	13.4
ER15	19.2	15.6	13.4
ER16	17.8	14.5	12.6
ER17	16.7	13.8	12.0
ER18	16.4	13.5	11.9
ER19	17.4	14.4	12.5
ER20	17.0	14.1	12.3
ER21	16.7	13.8	12.0
ER22	16.5	13.6	11.8
ER23	16.8	13.8	12.1
ER24	16.1	13.2	11.5
ER25	16.6	13.6	11.9
ER26	14.4	12.0	10.6
ER27	14.9	12.3	10.8
ER28	15.5	12.7	11.1
ER29	15.1	12.4	10.9
ER30	15.1	12.4	10.9
ER31	17.7	14.4	12.4
ER32	18.1	14.9	13.0
ER33	23.8	19.1	16.3
ER34	16.8	13.8	12.0
ER35	16.8	13.9	12.2
ER36	21.4	17.5	15.1
ER37	24.6	19.9	17.0
ER38	18.6	15.2	13.3
ER39	16.4	13.6	12.0
ER40	16.8	13.8	12.2
ER41	16.5	13.8	12.2
ER42	22.6	19.3	17.3
ER43	16.9	14.2	12.6
ER44	17.0	14.2	12.5
ER45	19.1	15.8	13.8
ER46	17.7	14.7	12.9
ER47	17.2	14.3	12.6
ER48	17.7	14.8	13.1
ER49	16.2	13.6	12.1
ER50	18.4	15.5	13.8
ER51	16.2	13.7	12.2
ER52	17.4	14.5	12.8
ER53	16.9	14.2	12.5
ER54	18.1	15.3	13.6
ER55	14.6	12.3	10.9
ER56	16.4	13.7	12.2

Receptor	2017 Base	2022 Future Baseline	2027 Future Baseline
ER57	14.1	11.8	10.5
ER58	14.0	11.6	10.3
ER59	13.8	11.5	10.3
ER60	14.3	12.0	10.7
ER61	13.6	11.4	10.1
ER62	13.5	11.3	10.0
ER63	14.0	11.7	10.4
ER64	14.2	11.8	10.4
ER65	14.0	11.6	10.3
ER66	13.9	11.5	10.2
ER67	13.5	11.2	10.0
ER68	13.4	11.1	9.9
ER69	13.3	11.0	9.8
ER70	14.5	12.0	10.5
ER71	14.9	12.3	10.8
ER72	18.2	15.0	13.2
ER73	20.3	17.2	15.4
ER74	17.2	14.5	12.9
ER75	18.2	15.0	13.1
ER76	17.5	14.4	12.7
ER77	17.6	14.5	12.8
ER78	18.0	14.8	13.0
ER79	20.2	16.5	14.3
ER80	19.5	15.9	13.8
ER81	20.7	16.7	14.4
ER82	21.8	17.8	15.3
ER83	21.0	17.2	14.9
ER84	17.4	14.4	12.7
ER85	13.8	11.5	10.2
ER86	13.8	11.4	10.1
ER87	12.3	10.2	9.0
ER88	12.6	10.4	9.1
ER89	13.2	10.8	9.4
ER90	11.7	9.7	8.6
ER91	12.7	10.4	9.1
ER92	15.6	13.0	11.6
ER93	18.2	15.4	13.6
ER94	16.1	13.5	12.0
ER95	16.9	14.0	12.3
ER96	16.1	13.4	11.9
ER97	27.9	22.4	18.9
ER98	24.6	19.9	16.9

Table E4.B Modelled 2022 With Development Annual Mean NO₂ (µg/m³)

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
AQMA1	21.2	-0.2	Negligible	21.2	-0.2	Negligible
AQMA2	21.0	-0.2	Negligible	21.0	-0.2	Negligible
AQMA3	30.5	-0.4	Negligible	30.5	-0.4	Negligible
AQMA4	30.2	-0.4	Negligible	30.2	-0.4	Negligible
AQMA5	22.8	-0.3	Negligible	22.8	-0.3	Negligible
AQMA6	18.9	-0.2	Negligible	18.9	-0.2	Negligible
AQMA7	37.1	-0.6	Negligible	37.1	-0.6	Negligible
AQMA8	37.7	-0.6	Slight Beneficial	37.7	-0.6	Moderate Beneficial
AQMA9	44.9	-0.7	Substantial Beneficial	44.9	-0.7	Substantial Beneficial
AQMA10	46.6	-0.8	Substantial Beneficial	46.6	-0.8	Substantial Beneficial
AQMA11	38.0	-0.6	Slight Beneficial	38.0	-0.6	Moderate Beneficial
AQMA12	46.6	-0.8	Substantial Beneficial	46.5	-0.8	Substantial Beneficial
AQMA13	37.8	-0.6	Moderate Beneficial	37.8	-0.6	Moderate Beneficial
AQMA14	46.4	-0.8	Substantial Beneficial	46.4	-0.8	Substantial Beneficial
AQMA15	47.8	-0.8	Substantial Beneficial	47.8	-0.8	Substantial Beneficial
AQMA16	39.1	-0.6	Moderate Beneficial	39.1	-0.6	Moderate Beneficial
AQMA17	38.5	-0.6	Moderate Beneficial	38.5	-0.6	Moderate Beneficial
AQMA18	47.1	-0.8	Substantial Beneficial	47.1	-0.8	Substantial Beneficial
AQMA19	15.4	-0.1	Negligible	15.4	-0.1	Negligible
AQMA20	18.1	-0.2	Negligible	18.1	-0.2	Negligible
AQMA21	16.1	-0.1	Negligible	16.1	-0.1	Negligible
AQMA22	23.0	-0.3	Negligible	23.0	-0.3	Negligible
AQMA23	25.0	-0.3	Negligible	25.0	-0.3	Negligible
AQMA24	25.4	-0.3	Negligible	25.4	-0.3	Negligible
AQMA25	19.5	-0.2	Negligible	19.5	-0.2	Negligible
AQMA26	22.4	-0.3	Negligible	22.4	-0.3	Negligible
PD1	12.0	-0.1	Negligible	12.0	-0.1	Negligible
PD2	14.8	-0.1	Negligible	14.8	-0.1	Negligible
PD3	10.9	0.0	Negligible	10.9	0.0	Negligible
PD4	10.8	0.0	Negligible	10.8	0.0	Negligible
PD5	11.0	0.0	Negligible	11.0	0.0	Negligible
ER1	11.1	0.0	Negligible	11.1	0.0	Negligible
ER2	18.0	-0.1	Negligible	18.0	-0.1	Negligible
ER3	15.5	-0.1	Negligible	15.5	-0.1	Negligible
ER4	18.5	-0.2	Negligible	18.5	-0.2	Negligible
ER5	19.0	-0.2	Negligible	19.0	-0.2	Negligible

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER6	20.2	-0.2	Negligible	20.1	-0.2	Negligible
ER7	19.0	-0.1	Negligible	18.9	-0.1	Negligible
ER8	19.4	-0.2	Negligible	19.4	-0.2	Negligible
ER9	13.1	0.0	Negligible	13.1	0.0	Negligible
ER10	17.5	-0.1	Negligible	17.5	-0.1	Negligible
ER11	13.5	-0.1	Negligible	13.5	-0.1	Negligible
ER12	15.9	-0.1	Negligible	15.9	-0.1	Negligible
ER13	12.6	0.0	Negligible	12.6	0.0	Negligible
ER14	15.4	-0.1	Negligible	15.4	-0.1	Negligible
ER15	15.5	-0.1	Negligible	15.5	-0.1	Negligible
ER16	14.5	-0.1	Negligible	14.5	-0.1	Negligible
ER17	13.7	0.0	Negligible	13.7	0.0	Negligible
ER18	13.5	0.0	Negligible	13.5	0.0	Negligible
ER19	14.3	-0.1	Negligible	14.3	-0.1	Negligible
ER20	14.0	0.0	Negligible	14.0	-0.1	Negligible
ER21	13.7	0.0	Negligible	13.7	0.0	Negligible
ER22	13.5	-0.1	Negligible	13.5	-0.1	Negligible
ER23	13.8	-0.1	Negligible	13.8	-0.1	Negligible
ER24	13.2	0.0	Negligible	13.2	0.0	Negligible
ER25	13.6	0.0	Negligible	13.6	0.0	Negligible
ER26	12.0	0.0	Negligible	12.0	0.0	Negligible
ER27	12.3	0.0	Negligible	12.3	0.0	Negligible
ER28	12.7	0.0	Negligible	12.7	0.0	Negligible
ER29	12.4	0.0	Negligible	12.4	0.0	Negligible
ER30	12.4	0.0	Negligible	12.4	0.0	Negligible
ER31	14.3	-0.1	Negligible	14.3	-0.1	Negligible
ER32	14.8	0.0	Negligible	14.8	-0.1	Negligible
ER33	19.0	-0.1	Negligible	19.0	-0.1	Negligible
ER34	13.8	-0.1	Negligible	13.8	-0.1	Negligible
ER35	13.9	-0.1	Negligible	13.9	-0.1	Negligible
ER36	17.4	-0.1	Negligible	17.4	-0.1	Negligible
ER37	19.7	-0.2	Negligible	19.7	-0.2	Negligible
ER38	15.2	-0.1	Negligible	15.2	-0.1	Negligible
ER39	13.6	0.0	Negligible	13.6	0.0	Negligible
ER40	13.8	-0.1	Negligible	13.8	-0.1	Negligible
ER41	13.8	0.0	Negligible	13.8	0.0	Negligible
ER42	19.2	-0.1	Negligible	19.2	-0.1	Negligible
ER43	14.2	0.0	Negligible	14.2	0.0	Negligible
ER44	14.2	0.0	Negligible	14.2	0.0	Negligible
ER45	15.9	0.1	Negligible	15.9	0.1	Negligible
ER46	14.7	0.0	Negligible	14.7	0.0	Negligible
ER47	14.3	0.0	Negligible	14.3	0.0	Negligible
ER48	14.8	0.0	Negligible	14.8	0.0	Negligible
ER49	13.6	0.0	Negligible	13.6	0.0	Negligible
ER50	15.4	-0.2	Negligible	15.4	-0.2	Negligible
ER51	13.6	-0.1	Negligible	13.6	-0.1	Negligible

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER52	14.3	-0.2	Negligible	14.3	-0.2	Negligible
ER53	14.1	-0.1	Negligible	14.1	-0.1	Negligible
ER54	15.2	-0.1	Negligible	15.2	-0.1	Negligible
ER55	12.2	0.0	Negligible	12.2	0.0	Negligible
ER56	13.7	0.0	Negligible	13.7	0.0	Negligible
ER57	11.8	0.0	Negligible	11.8	0.0	Negligible
ER58	11.6	0.0	Negligible	11.6	0.0	Negligible
ER59	11.5	0.0	Negligible	11.5	0.0	Negligible
ER60	12.0	0.0	Negligible	12.0	0.0	Negligible
ER61	11.3	0.0	Negligible	11.3	0.0	Negligible
ER62	11.3	0.0	Negligible	11.3	0.0	Negligible
ER63	11.7	0.0	Negligible	11.7	0.0	Negligible
ER64	11.8	0.0	Negligible	11.8	0.0	Negligible
ER65	11.6	0.0	Negligible	11.6	0.0	Negligible
ER66	11.5	0.0	Negligible	11.5	0.0	Negligible
ER67	11.2	0.0	Negligible	11.2	0.0	Negligible
ER68	11.1	0.0	Negligible	11.1	0.0	Negligible
ER69	11.0	0.0	Negligible	11.0	0.0	Negligible
ER70	12.0	0.0	Negligible	12.0	0.0	Negligible
ER71	12.3	0.0	Negligible	12.2	0.0	Negligible
ER72	15.0	0.0	Negligible	15.0	0.0	Negligible
ER73	17.2	0.0	Negligible	17.2	0.0	Negligible
ER74	14.5	0.0	Negligible	14.5	0.0	Negligible
ER75	14.9	0.0	Negligible	14.9	0.0	Negligible
ER76	14.4	0.0	Negligible	14.4	0.0	Negligible
ER77	14.5	0.0	Negligible	14.5	0.0	Negligible
ER78	14.8	0.0	Negligible	14.8	0.0	Negligible
ER79	16.4	-0.1	Negligible	16.4	-0.1	Negligible
ER80	15.9	0.0	Negligible	15.9	0.0	Negligible
ER81	16.6	0.0	Negligible	16.6	0.0	Negligible
ER82	17.6	-0.1	Negligible	17.6	-0.1	Negligible
ER83	17.1	-0.1	Negligible	17.1	-0.1	Negligible
ER84	14.4	0.0	Negligible	14.4	0.0	Negligible
ER85	11.5	0.0	Negligible	11.5	0.0	Negligible
ER86	11.4	0.0	Negligible	11.4	0.0	Negligible
ER87	10.2	0.0	Negligible	10.2	0.0	Negligible
ER88	10.4	0.0	Negligible	10.4	0.0	Negligible
ER89	10.7	0.0	Negligible	10.7	0.0	Negligible
ER90	9.7	0.0	Negligible	9.7	0.0	Negligible
ER91	10.4	0.0	Negligible	10.4	0.0	Negligible
ER92	13.0	0.0	Negligible	13.0	0.0	Negligible
ER93	15.3	-0.1	Negligible	15.3	-0.1	Negligible
ER94	13.4	0.0	Negligible	13.4	0.0	Negligible
ER95	13.9	0.0	Negligible	13.9	0.0	Negligible
ER96	13.4	0.0	Negligible	13.4	0.0	Negligible
ER97	22.2	-0.2	Negligible	22.2	-0.3	Negligible

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER98	19.7	-0.2	Negligible	19.7	-0.2	Negligible

Table E4.C Modelled 2027 With Development Annual Mean NO₂ (µg/m³)

Receptor	2027 With Devel.	Impact v Future Baseline	Impact Severity	2027 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
AQMA1	18.0	0.1	Negligible	17.9	0.0	Negligible
AQMA2	17.8	0.1	Negligible	17.8	0.0	Negligible
AQMA3	25.5	0.1	Negligible	25.4	0.1	Negligible
AQMA4	25.3	0.1	Negligible	25.2	0.1	Negligible
AQMA5	19.3	0.1	Negligible	19.2	0.0	Negligible
AQMA6	16.2	0.0	Negligible	16.2	0.0	Negligible
AQMA7	31.1	0.1	Negligible	31.0	0.0	Negligible
AQMA8	31.6	0.1	Negligible	31.5	0.0	Negligible
AQMA9	37.5	0.1	Negligible	37.4	0.0	Negligible
AQMA10	39.0	0.1	Negligible	38.9	0.0	Negligible
AQMA11	31.8	0.1	Negligible	31.7	0.0	Negligible
AQMA12	38.9	0.1	Negligible	38.8	0.0	Negligible
AQMA13	31.6	0.1	Negligible	31.5	0.0	Negligible
AQMA14	38.8	0.1	Negligible	38.7	0.0	Negligible
AQMA15	39.9	0.1	Negligible	39.8	0.0	Negligible
AQMA16	32.7	0.1	Negligible	32.6	0.0	Negligible
AQMA17	32.2	0.1	Negligible	32.1	0.0	Negligible
AQMA18	39.4	0.1	Negligible	39.3	0.0	Negligible
AQMA19	13.4	0.0	Negligible	13.4	0.0	Negligible
AQMA20	15.5	0.0	Negligible	15.5	0.0	Negligible
AQMA21	13.9	0.0	Negligible	13.9	0.0	Negligible
AQMA22	19.6	0.0	Negligible	19.5	0.0	Negligible
AQMA23	21.3	0.1	Negligible	21.2	0.0	Negligible
AQMA24	21.8	0.1	Negligible	21.8	0.0	Negligible
AQMA25	16.8	0.1	Negligible	16.7	0.0	Negligible
AQMA26	19.2	0.1	Negligible	19.2	0.0	Negligible
PD1	10.6	0.0	Negligible	10.6	0.0	Negligible
PD2	13.2	0.0	Negligible	13.2	0.0	Negligible
PD3	9.7	0.0	Negligible	9.7	0.0	Negligible
PD4	9.6	0.0	Negligible	9.6	0.0	Negligible
PD5	9.8	0.0	Negligible	9.8	0.0	Negligible
ER1	9.8	0.0	Negligible	9.8	0.0	Negligible
ER2	15.9	0.0	Negligible	15.9	0.0	Negligible
ER3	13.4	0.0	Negligible	13.4	0.0	Negligible
ER4	15.8	0.0	Negligible	15.8	0.0	Negligible
ER5	16.4	0.0	Negligible	16.3	0.0	Negligible
ER6	17.1	0.1	Negligible	17.1	0.0	Negligible
ER7	16.3	0.0	Negligible	16.3	0.0	Negligible
ER8	16.5	0.1	Negligible	16.5	0.0	Negligible

Receptor	2027 With Devel.	Impact v Future Baseline	Impact Severity	2027 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER9	11.5	0.0	Negligible	11.5	0.0	Negligible
ER10	15.0	0.0	Negligible	15.0	0.0	Negligible
ER11	11.8	0.0	Negligible	11.8	0.0	Negligible
ER12	13.8	0.0	Negligible	13.7	0.0	Negligible
ER13	11.1	0.0	Negligible	11.1	0.0	Negligible
ER14	13.4	0.0	Negligible	13.4	0.0	Negligible
ER15	13.4	0.0	Negligible	13.4	0.0	Negligible
ER16	12.6	0.0	Negligible	12.6	0.0	Negligible
ER17	12.0	0.0	Negligible	12.0	0.0	Negligible
ER18	11.9	0.0	Negligible	11.9	0.0	Negligible
ER19	12.5	0.0	Negligible	12.5	0.0	Negligible
ER20	12.3	0.0	Negligible	12.3	0.0	Negligible
ER21	12.0	0.0	Negligible	12.0	0.0	Negligible
ER22	11.8	0.0	Negligible	11.8	0.0	Negligible
ER23	12.1	0.0	Negligible	12.1	0.0	Negligible
ER24	11.6	0.0	Negligible	11.5	0.0	Negligible
ER25	11.9	0.0	Negligible	11.9	0.0	Negligible
ER26	10.6	0.0	Negligible	10.6	0.0	Negligible
ER27	10.9	0.0	Negligible	10.8	0.0	Negligible
ER28	11.2	0.0	Negligible	11.2	0.0	Negligible
ER29	10.9	0.0	Negligible	10.9	0.0	Negligible
ER30	10.9	0.0	Negligible	10.9	0.0	Negligible
ER31	12.5	0.0	Negligible	12.4	0.0	Negligible
ER32	13.0	0.0	Negligible	13.0	0.0	Negligible
ER33	16.3	0.0	Negligible	16.3	0.0	Negligible
ER34	12.0	0.0	Negligible	12.0	0.0	Negligible
ER35	12.2	0.0	Negligible	12.2	0.0	Negligible
ER36	15.1	0.0	Negligible	15.1	0.0	Negligible
ER37	17.1	0.0	Negligible	17.0	0.0	Negligible
ER38	13.3	0.0	Negligible	13.3	0.0	Negligible
ER39	12.0	0.0	Negligible	12.0	0.0	Negligible
ER40	12.2	0.0	Negligible	12.2	0.0	Negligible
ER41	12.2	0.0	Negligible	12.2	0.0	Negligible
ER42	17.3	0.0	Negligible	17.3	0.0	Negligible
ER43	12.6	0.0	Negligible	12.6	0.0	Negligible
ER44	12.5	0.0	Negligible	12.5	0.0	Negligible
ER45	13.8	0.0	Negligible	13.8	0.0	Negligible
ER46	12.9	0.0	Negligible	12.9	0.0	Negligible
ER47	12.6	0.0	Negligible	12.6	0.0	Negligible
ER48	13.1	0.0	Negligible	13.1	0.0	Negligible
ER49	12.1	0.0	Negligible	12.1	0.0	Negligible
ER50	13.8	0.0	Negligible	13.8	0.0	Negligible
ER51	12.2	0.0	Negligible	12.2	0.0	Negligible
ER52	12.8	0.0	Negligible	12.8	0.0	Negligible
ER53	12.5	0.0	Negligible	12.5	0.0	Negligible
ER54	13.6	0.0	Negligible	13.6	0.0	Negligible

Receptor	2027 With Devel.	Impact v Future Baseline	Impact Severity	2027 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER55	10.9	0.0	Negligible	10.9	0.0	Negligible
ER56	12.2	0.0	Negligible	12.2	0.0	Negligible
ER57	10.5	0.0	Negligible	10.5	0.0	Negligible
ER58	10.3	0.0	Negligible	10.3	0.0	Negligible
ER59	10.3	0.0	Negligible	10.3	0.0	Negligible
ER60	10.7	0.0	Negligible	10.7	0.0	Negligible
ER61	10.1	0.0	Negligible	10.1	0.0	Negligible
ER62	10.0	0.0	Negligible	10.0	0.0	Negligible
ER63	10.4	0.0	Negligible	10.4	0.0	Negligible
ER64	10.4	0.0	Negligible	10.4	0.0	Negligible
ER65	10.3	0.0	Negligible	10.3	0.0	Negligible
ER66	10.2	0.0	Negligible	10.2	0.0	Negligible
ER67	10.0	0.0	Negligible	10.0	0.0	Negligible
ER68	9.9	0.0	Negligible	9.9	0.0	Negligible
ER69	9.8	0.0	Negligible	9.8	0.0	Negligible
ER70	10.6	0.0	Negligible	10.5	0.0	Negligible
ER71	10.8	0.0	Negligible	10.8	0.0	Negligible
ER72	13.2	0.0	Negligible	13.2	0.0	Negligible
ER73	15.4	0.0	Negligible	15.4	0.0	Negligible
ER74	12.9	0.0	Negligible	12.9	0.0	Negligible
ER75	13.1	0.0	Negligible	13.1	0.0	Negligible
ER76	12.7	0.0	Negligible	12.7	0.0	Negligible
ER77	12.8	0.0	Negligible	12.8	0.0	Negligible
ER78	13.0	0.0	Negligible	13.0	0.0	Negligible
ER79	14.3	0.0	Negligible	14.3	0.0	Negligible
ER80	13.8	0.0	Negligible	13.8	0.0	Negligible
ER81	14.4	0.0	Negligible	14.4	0.0	Negligible
ER82	15.4	0.0	Negligible	15.4	0.0	Negligible
ER83	14.9	0.0	Negligible	14.9	0.0	Negligible
ER84	12.7	0.0	Negligible	12.7	0.0	Negligible
ER85	10.2	0.0	Negligible	10.2	0.0	Negligible
ER86	10.1	0.0	Negligible	10.1	0.0	Negligible
ER87	9.0	0.0	Negligible	9.0	0.0	Negligible
ER88	9.1	0.0	Negligible	9.1	0.0	Negligible
ER89	9.4	0.0	Negligible	9.4	0.0	Negligible
ER90	8.6	0.0	Negligible	8.6	0.0	Negligible
ER91	9.1	0.0	Negligible	9.1	0.0	Negligible
ER92	11.6	0.0	Negligible	11.5	0.0	Negligible
ER93	13.6	0.0	Negligible	13.6	0.0	Negligible
ER94	12.0	0.0	Negligible	12.0	0.0	Negligible
ER95	12.3	0.0	Negligible	12.3	0.0	Negligible
ER96	11.9	0.0	Negligible	11.9	0.0	Negligible
ER97	18.9	0.0	Negligible	18.9	0.0	Negligible
ER98	16.9	0.0	Negligible	16.9	0.0	Negligible

Table E4.C (Cont) Modelled 2027 With Development Annual Mean NO₂ (µg/m³)

Receptor	2027 With Devel. Mitigated (C)	Impact v Future Baseline	Impact Severity
AQMA1	17.8	-0.1	Negligible
AQMA2	17.7	-0.1	Negligible
AQMA3	25.3	-0.1	Negligible
AQMA4	25.0	-0.1	Negligible
AQMA5	19.1	-0.1	Negligible
AQMA6	16.1	-0.1	Negligible
AQMA7	30.7	-0.3	Negligible
AQMA8	31.2	-0.3	Negligible
AQMA9	37.1	-0.4	Negligible
AQMA10	38.5	-0.4	Slight Beneficial
AQMA11	31.4	-0.3	Negligible
AQMA12	38.5	-0.4	Slight Beneficial
AQMA13	31.3	-0.3	Negligible
AQMA14	38.4	-0.4	Slight Beneficial
AQMA15	39.5	-0.4	Slight Beneficial
AQMA16	32.3	-0.3	Negligible
AQMA17	31.8	-0.3	Negligible
AQMA18	38.9	-0.4	Slight Beneficial
AQMA19	13.3	0.0	Negligible
AQMA20	15.4	-0.1	Negligible
AQMA21	13.9	-0.1	Negligible
AQMA22	19.4	-0.1	Negligible
AQMA23	21.1	-0.1	Negligible
AQMA24	21.7	-0.1	Negligible
AQMA25	16.6	-0.1	Negligible
AQMA26	19.1	-0.1	Negligible
PD1	10.6	0.0	Negligible
PD2	13.1	0.0	Negligible
PD3	9.7	0.0	Negligible
PD4	9.6	0.0	Negligible
PD5	9.8	0.0	Negligible
ER1	9.8	0.0	Negligible
ER2	15.8	0.0	Negligible
ER3	13.3	0.0	Negligible
ER4	15.7	-0.1	Negligible
ER5	16.3	-0.1	Negligible
ER6	17.0	-0.1	Negligible
ER7	16.2	-0.1	Negligible
ER8	16.4	-0.1	Negligible
ER9	11.5	0.0	Negligible
ER10	14.9	-0.1	Negligible
ER11	11.8	0.0	Negligible
ER12	13.7	0.0	Negligible
ER13	11.1	0.0	Negligible

ER14	13.3	0.0	Negligible
ER15	13.4	0.0	Negligible
ER16	12.6	0.0	Negligible
ER17	12.0	0.0	Negligible
ER18	11.8	0.0	Negligible
ER19	12.5	0.0	Negligible
ER20	12.3	0.0	Negligible
ER21	12.0	0.0	Negligible
ER22	11.8	0.0	Negligible
ER23	12.0	0.0	Negligible
ER24	11.5	0.0	Negligible
ER25	11.8	0.0	Negligible
ER26	10.6	0.0	Negligible
ER27	10.8	0.0	Negligible
ER28	11.1	0.0	Negligible
ER29	10.9	0.0	Negligible
ER30	10.9	0.0	Negligible
ER31	12.4	0.0	Negligible
ER32	13.0	0.0	Negligible
ER33	16.2	-0.1	Negligible
ER34	12.0	0.0	Negligible
ER35	12.2	0.0	Negligible
ER36	15.1	0.0	Negligible
ER37	17.0	-0.1	Negligible
ER38	13.2	0.0	Negligible
ER39	12.0	0.0	Negligible
ER40	12.2	0.0	Negligible
ER41	12.2	0.0	Negligible
ER42	17.3	0.0	Negligible
ER43	12.6	0.0	Negligible
ER44	12.5	0.0	Negligible
ER45	13.8	0.0	Negligible
ER46	12.9	0.0	Negligible
ER47	12.6	0.0	Negligible
ER48	13.1	0.0	Negligible
ER49	12.1	0.0	Negligible
ER50	13.8	0.0	Negligible
ER51	12.2	0.0	Negligible
ER52	12.8	0.0	Negligible
ER53	12.5	0.0	Negligible
ER54	13.6	0.0	Negligible
ER55	10.9	0.0	Negligible
ER56	12.1	0.0	Negligible
ER57	10.4	0.0	Negligible
ER58	10.3	0.0	Negligible
ER59	10.3	0.0	Negligible
ER60	10.7	0.0	Negligible
ER61	10.1	0.0	Negligible
ER62	10.0	0.0	Negligible
ER63	10.3	0.0	Negligible

ER64	10.4	0.0	Negligible
ER65	10.3	0.0	Negligible
ER66	10.2	0.0	Negligible
ER67	9.9	0.0	Negligible
ER68	9.9	0.0	Negligible
ER69	9.8	0.0	Negligible
ER70	10.5	0.0	Negligible
ER71	10.8	0.0	Negligible
ER72	13.1	0.0	Negligible
ER73	15.4	0.0	Negligible
ER74	12.9	0.0	Negligible
ER75	13.1	0.0	Negligible
ER76	12.7	0.0	Negligible
ER77	12.7	0.0	Negligible
ER78	12.9	0.0	Negligible
ER79	14.2	0.0	Negligible
ER80	13.8	0.0	Negligible
ER81	14.4	0.0	Negligible
ER82	15.3	0.0	Negligible
ER83	14.8	0.0	Negligible
ER84	12.7	0.0	Negligible
ER85	10.2	0.0	Negligible
ER86	10.1	0.0	Negligible
ER87	8.9	0.0	Negligible
ER88	9.1	0.0	Negligible
ER89	9.4	0.0	Negligible
ER90	8.6	0.0	Negligible
ER91	9.1	0.0	Negligible
ER92	11.5	0.0	Negligible
ER93	13.6	0.0	Negligible
ER94	11.9	0.0	Negligible
ER95	12.3	0.0	Negligible
ER96	11.8	0.0	Negligible
ER97	18.8	-0.1	Negligible
ER98	16.8	-0.1	Negligible

Table E4.D Baseline and Future Baseline Annual Mean PM10 (µg/m³)

Receptor	2017 Base	2022 Future Baseline	2027 Future Baseline
AQMA1	12.4	11.9	11.7
AQMA2	13.5	13.0	12.8
AQMA3	14.2	13.6	13.4
AQMA4	14.0	13.4	13.2
AQMA5	12.6	12.2	12.0
AQMA6	11.8	11.4	11.2
AQMA7	16.4	15.7	15.5
AQMA8	17.3	16.6	16.3
AQMA9	18.1	17.2	16.9

Receptor	2017 Base	2022 Future Baseline	2027 Future Baseline
AQMA10	17.7	16.9	16.6
AQMA11	15.9	15.2	14.9
AQMA12	18.0	17.2	16.9
AQMA13	16.3	15.6	15.4
AQMA14	18.1	17.4	17.1
AQMA15	18.7	17.9	17.5
AQMA16	17.3	16.5	16.3
AQMA17	18.6	17.9	17.6
AQMA18	20.0	19.1	18.8
AQMA19	13.2	12.8	12.7
AQMA20	14.0	13.4	13.2
AQMA21	13.3	12.9	12.7
AQMA22	13.5	13.1	12.9
AQMA23	14.2	13.7	13.5
AQMA24	14.5	14.0	13.8
AQMA25	13.0	12.5	12.3
AQMA26	14.4	14.0	13.8
PD1	11.7	11.4	11.2
PD2	15.1	11.8	11.7
PD3	12.0	15.0	15.1
PD4	12.1	11.7	11.6
PD5	12.2	11.8	11.6
ER1	12.1	11.8	11.7
ER2	13.7	13.2	13.1
ER3	14.1	13.7	13.5
ER4	15.2	14.7	14.6
ER5	15.4	14.9	14.7
ER6	15.1	14.5	14.4
ER7	14.1	13.6	13.5
ER8	14.2	13.7	13.5
ER9	12.7	12.3	12.2
ER10	14.2	13.7	13.5
ER11	12.6	12.2	12.1
ER12	12.9	12.5	12.3
ER13	11.7	11.3	11.2
ER14	12.5	12.1	12.0
ER15	12.7	12.3	12.1
ER16	12.7	12.3	12.2
ER17	14.0	13.6	13.5
ER18	12.7	12.3	12.2
ER19	12.6	12.3	12.2
ER20	12.4	12.0	11.9
ER21	14.8	14.4	14.3
ER22	16.9	16.4	16.3
ER23	17.0	16.5	16.4
ER24	17.9	17.4	17.3
ER25	15.9	15.4	15.3

Receptor	2017 Base	2022 Future Baseline	2027 Future Baseline
ER26	14.6	14.2	14.1
ER27	16.1	15.7	15.5
ER28	16.4	15.9	15.8
ER29	15.1	14.6	14.5
ER30	14.8	14.4	14.2
ER31	14.2	13.7	13.6
ER32	12.6	12.2	12.0
ER33	12.9	12.4	12.3
ER34	15.2	15.1	15.3
ER35	12.3	12.0	11.9
ER36	12.2	11.8	11.7
ER37	13.0	12.6	12.5
ER38	13.8	13.4	13.4
ER39	12.8	12.5	12.4
ER40	14.6	14.2	14.1
ER41	14.3	13.9	13.8
ER42	14.4	13.9	13.8
ER43	16.5	16.0	15.8
ER44	16.9	16.4	16.3
ER45	16.4	15.9	15.8
ER46	16.0	15.6	15.4
ER47	14.7	14.3	14.2
ER48	13.3	12.9	12.7
ER49	11.9	11.6	11.5
ER50	12.3	12.0	11.8
ER51	12.1	11.8	11.6
ER52	14.0	13.6	13.5
ER53	12.5	12.1	12.0
ER54	12.1	11.8	11.7
ER55	12.7	12.4	12.3
ER56	12.9	12.5	12.4
ER57	13.5	13.2	13.1
ER58	15.4	15.0	14.9
ER59	13.5	13.2	13.0
ER60	14.4	13.9	13.8
ER61	15.4	14.9	14.8
ER62	14.8	14.4	14.3
ER63	14.9	14.5	14.4
ER64	14.6	14.2	14.1
ER65	13.0	12.6	12.5
ER66	12.8	12.4	12.3
ER67	12.1	11.8	11.6
ER68	11.6	11.2	11.1
ER69	11.3	10.9	10.8
ER70	11.6	11.2	11.1
ER71	12.1	11.8	11.6
ER72	13.2	12.9	12.7

Receptor	2017 Base	2022 Future Baseline	2027 Future Baseline
ER73	13.5	13.2	13.0
ER74	13.3	13.0	12.8
ER75	15.1	14.6	14.5
ER76	14.0	13.6	13.5
ER77	14.4	14.0	13.9
ER78	15.3	14.9	14.8
ER79	15.0	14.5	14.4
ER80	14.3	13.9	13.8
ER81	16.1	15.5	15.4
ER82	13.4	13.0	12.8
ER83	13.5	13.1	13.0
ER84	13.0	12.7	12.7
ER85	11.4	11.1	11.0
ER86	11.5	11.1	11.0
ER87	11.8	11.5	11.3
ER88	13.2	12.9	12.7
ER89	14.5	14.1	14.0
ER90	12.5	12.2	12.0
ER91	14.7	14.3	14.1
ER92	16.1	15.6	15.5
ER93	15.4	15.0	14.9
ER94	13.7	13.3	13.2
ER95	13.0	12.6	12.5
ER96	13.4	13.0	12.9
ER97	15.2	14.7	14.6
ER98	13.6	13.1	13.0

Table E4.E Modelled 2022 With Development Annual Mean PM10 (µg/m³)

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
AQMA1	11.9	-0.04	Negligible	11.9	-0.04	Negligible
AQMA2	12.9	-0.03	Negligible	12.9	-0.04	Negligible
AQMA3	13.5	-0.07	Negligible	13.5	-0.07	Negligible
AQMA4	13.3	-0.07	Negligible	13.3	-0.07	Negligible
AQMA5	12.1	-0.04	Negligible	12.1	-0.04	Negligible
AQMA6	11.4	-0.03	Negligible	11.4	-0.03	Negligible
AQMA7	15.6	-0.11	Negligible	15.6	-0.11	Negligible
AQMA8	16.5	-0.11	Negligible	16.5	-0.12	Negligible
AQMA9	17.1	-0.15	Negligible	17.1	-0.16	Negligible
AQMA10	16.7	-0.16	Negligible	16.7	-0.17	Negligible
AQMA11	15.0	-0.12	Negligible	15.0	-0.12	Negligible
AQMA12	17.1	-0.16	Negligible	17.0	-0.17	Negligible
AQMA13	15.5	-0.12	Negligible	15.5	-0.12	Negligible
AQMA14	17.2	-0.16	Negligible	17.2	-0.16	Negligible

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
AQMA15	17.7	-0.17	Negligible	17.7	-0.17	Negligible
AQMA16	16.4	-0.12	Negligible	16.4	-0.13	Negligible
AQMA17	17.7	-0.12	Negligible	17.7	-0.12	Negligible
AQMA18	18.9	-0.16	Negligible	18.9	-0.17	Negligible
AQMA19	12.8	-0.02	Negligible	12.8	-0.02	Negligible
AQMA20	13.4	-0.03	Negligible	13.4	-0.03	Negligible
AQMA21	12.9	-0.02	Negligible	12.9	-0.02	Negligible
AQMA22	13.0	-0.05	Negligible	13.0	-0.05	Negligible
AQMA23	13.6	-0.05	Negligible	13.6	-0.06	Negligible
AQMA24	13.9	-0.05	Negligible	13.9	-0.05	Negligible
AQMA25	12.5	-0.04	Negligible	12.5	-0.04	Negligible
AQMA26	13.9	-0.06	Negligible	13.9	-0.06	Negligible
PD1	11.4	-0.01	Negligible	11.4	-0.01	Negligible
PD2	11.8	-0.01	Negligible	11.8	-0.01	Negligible
PD3	15.0	0.00	Negligible	15.0	0.00	Negligible
PD4	11.7	0.00	Negligible	11.7	0.00	Negligible
PD5	11.8	0.00	Negligible	11.8	0.00	Negligible
ER1	11.8	0.00	Negligible	11.8	0.00	Negligible
ER2	13.2	-0.02	Negligible	13.2	-0.02	Negligible
ER3	13.7	-0.01	Negligible	13.7	-0.01	Negligible
ER4	14.7	-0.03	Negligible	14.7	-0.03	Negligible
ER5	14.9	-0.03	Negligible	14.9	-0.03	Negligible
ER6	14.5	-0.03	Negligible	14.5	-0.03	Negligible
ER7	13.6	-0.02	Negligible	13.6	-0.02	Negligible
ER8	13.7	-0.03	Negligible	13.7	-0.03	Negligible
ER9	12.3	-0.01	Negligible	12.3	-0.01	Negligible
ER10	13.7	-0.02	Negligible	13.7	-0.02	Negligible
ER11	12.2	-0.01	Negligible	12.2	-0.01	Negligible
ER12	12.5	-0.01	Negligible	12.5	-0.02	Negligible
ER13	11.3	0.00	Negligible	11.3	0.00	Negligible
ER14	12.1	-0.01	Negligible	12.1	-0.01	Negligible
ER15	12.3	-0.01	Negligible	12.3	-0.01	Negligible
ER16	12.3	-0.01	Negligible	12.3	-0.01	Negligible
ER17	13.6	-0.01	Negligible	13.6	-0.01	Negligible
ER18	12.3	-0.01	Negligible	12.3	-0.01	Negligible
ER19	12.3	-0.01	Negligible	12.3	-0.01	Negligible
ER20	12.0	-0.01	Negligible	12.0	-0.01	Negligible
ER21	14.4	-0.01	Negligible	14.4	-0.01	Negligible
ER22	16.4	-0.01	Negligible	16.4	-0.01	Negligible
ER23	16.5	-0.01	Negligible	16.5	-0.01	Negligible
ER24	17.4	-0.01	Negligible	17.4	-0.01	Negligible
ER25	15.4	-0.01	Negligible	15.4	-0.01	Negligible
ER26	14.2	0.00	Negligible	14.2	0.00	Negligible
ER27	15.6	0.00	Negligible	15.6	0.00	Negligible
ER28	15.9	-0.01	Negligible	15.9	-0.01	Negligible
ER29	14.6	0.00	Negligible	14.6	0.00	Negligible

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER30	14.4	0.00	Negligible	14.4	0.00	Negligible
ER31	13.7	-0.01	Negligible	13.7	-0.01	Negligible
ER32	12.2	-0.01	Negligible	12.2	-0.01	Negligible
ER33	12.4	-0.02	Negligible	12.4	-0.02	Negligible
ER34	15.1	-0.01	Negligible	15.1	-0.01	Negligible
ER35	12.0	-0.01	Negligible	12.0	-0.01	Negligible
ER36	11.8	-0.02	Negligible	11.8	-0.02	Negligible
ER37	12.6	-0.03	Negligible	12.6	-0.03	Negligible
ER38	13.4	-0.01	Negligible	13.4	-0.01	Negligible
ER39	12.4	-0.01	Negligible	12.4	-0.01	Negligible
ER40	14.2	-0.01	Negligible	14.2	-0.01	Negligible
ER41	13.9	0.00	Negligible	13.9	0.00	Negligible
ER42	13.9	-0.01	Negligible	13.9	-0.01	Negligible
ER43	16.0	0.00	Negligible	16.0	0.00	Negligible
ER44	16.4	0.00	Negligible	16.4	0.00	Negligible
ER45	15.9	0.01	Negligible	15.9	0.01	Negligible
ER46	15.6	0.01	Negligible	15.6	0.01	Negligible
ER47	14.3	0.00	Negligible	14.3	0.00	Negligible
ER48	12.9	0.00	Negligible	12.9	0.00	Negligible
ER49	11.6	-0.01	Negligible	11.6	-0.01	Negligible
ER50	11.9	-0.03	Negligible	11.9	-0.03	Negligible
ER51	11.8	-0.01	Negligible	11.8	-0.01	Negligible
ER52	13.6	-0.03	Negligible	13.6	-0.03	Negligible
ER53	12.1	-0.01	Negligible	12.1	-0.01	Negligible
ER54	11.8	-0.01	Negligible	11.8	-0.01	Negligible
ER55	12.4	-0.01	Negligible	12.4	-0.01	Negligible
ER56	12.5	-0.01	Negligible	12.5	-0.01	Negligible
ER57	13.2	0.00	Negligible	13.2	0.00	Negligible
ER58	15.0	0.00	Negligible	15.0	0.00	Negligible
ER59	13.2	0.00	Negligible	13.2	0.00	Negligible
ER60	13.9	0.00	Negligible	13.9	0.00	Negligible
ER61	14.9	0.00	Negligible	14.9	0.00	Negligible
ER62	14.4	0.00	Negligible	14.4	0.00	Negligible
ER63	14.5	0.00	Negligible	14.5	0.00	Negligible
ER64	14.2	0.00	Negligible	14.2	0.00	Negligible
ER65	12.6	0.00	Negligible	12.6	0.00	Negligible
ER66	12.4	0.00	Negligible	12.4	0.00	Negligible
ER67	11.8	0.00	Negligible	11.8	0.00	Negligible
ER68	11.2	0.00	Negligible	11.2	0.00	Negligible
ER69	10.9	0.00	Negligible	10.9	0.00	Negligible
ER70	11.2	-0.01	Negligible	11.2	-0.01	Negligible
ER71	11.8	-0.01	Negligible	11.8	-0.01	Negligible
ER72	12.9	0.00	Negligible	12.9	0.00	Negligible
ER73	13.2	0.00	Negligible	13.2	0.00	Negligible
ER74	13.0	0.00	Negligible	13.0	0.00	Negligible
ER75	14.6	0.00	Negligible	14.6	0.00	Negligible

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER76	13.6	0.00	Negligible	13.6	0.00	Negligible
ER77	14.0	0.00	Negligible	14.0	0.00	Negligible
ER78	14.9	0.00	Negligible	14.9	0.00	Negligible
ER79	14.5	-0.01	Negligible	14.5	-0.01	Negligible
ER80	13.9	-0.01	Negligible	13.9	-0.01	Negligible
ER81	15.5	0.00	Negligible	15.5	0.00	Negligible
ER82	13.0	-0.02	Negligible	13.0	-0.02	Negligible
ER83	13.1	-0.02	Negligible	13.1	-0.02	Negligible
ER84	12.7	-0.01	Negligible	12.7	-0.01	Negligible
ER85	11.1	0.00	Negligible	11.1	0.00	Negligible
ER86	11.1	0.00	Negligible	11.1	0.00	Negligible
ER87	11.5	0.00	Negligible	11.5	0.00	Negligible
ER88	12.9	0.00	Negligible	12.9	0.00	Negligible
ER89	14.1	0.00	Negligible	14.1	0.00	Negligible
ER90	12.2	0.00	Negligible	12.2	0.00	Negligible
ER91	14.3	0.00	Negligible	14.3	0.00	Negligible
ER92	15.6	0.00	Negligible	15.6	0.00	Negligible
ER93	14.9	-0.02	Negligible	14.9	-0.02	Negligible
ER94	13.3	-0.01	Negligible	13.3	-0.01	Negligible
ER95	12.6	-0.01	Negligible	12.6	-0.01	Negligible
ER96	13.0	-0.01	Negligible	13.0	-0.01	Negligible
ER97	14.6	-0.04	Negligible	14.6	-0.04	Negligible
ER98	13.1	-0.03	Negligible	13.1	-0.03	Negligible

Table E4.F Modelled 2027 With Development Annual Mean PM10 (µg/m³)

Receptor	2027 With Devel.	Impact v Future Baseline	Impact Severity	2027 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
AQMA1	11.7	0.01	Negligible	11.7	0.01	Negligible
AQMA2	12.8	0.01	Negligible	12.8	0.01	Negligible
AQMA3	13.4	0.03	Negligible	13.4	0.01	Negligible
AQMA4	13.2	0.03	Negligible	13.2	0.01	Negligible
AQMA5	12.0	0.02	Negligible	12.0	0.01	Negligible
AQMA6	11.3	0.01	Negligible	11.2	0.00	Negligible
AQMA7	15.5	0.01	Negligible	15.5	0.00	Negligible
AQMA8	16.3	0.01	Negligible	16.3	0.00	Negligible
AQMA9	16.9	0.02	Negligible	16.9	-0.01	Negligible
AQMA10	16.6	0.02	Negligible	16.6	-0.01	Negligible
AQMA11	14.9	0.01	Negligible	14.9	0.00	Negligible
AQMA12	16.9	0.02	Negligible	16.9	-0.01	Negligible
AQMA13	15.4	0.01	Negligible	15.4	0.00	Negligible
AQMA14	17.1	0.02	Negligible	17.1	-0.01	Negligible
AQMA15	17.5	0.02	Negligible	17.5	-0.01	Negligible
AQMA16	16.3	0.01	Negligible	16.2	-0.01	Negligible
AQMA17	17.6	0.01	Negligible	17.6	-0.01	Negligible

Receptor	2027 With Devel.	Impact v Future Baseline	Impact Severity	2027 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
AQMA18	18.8	0.02	Negligible	18.7	-0.01	Negligible
AQMA19	12.7	0.00	Negligible	12.7	0.00	Negligible
AQMA20	13.2	0.00	Negligible	13.2	0.00	Negligible
AQMA21	12.7	0.00	Negligible	12.7	0.00	Negligible
AQMA22	12.9	0.01	Negligible	12.9	0.00	Negligible
AQMA23	13.5	0.01	Negligible	13.5	0.00	Negligible
AQMA24	13.8	0.01	Negligible	13.8	0.00	Negligible
AQMA25	12.4	0.01	Negligible	12.3	0.00	Negligible
AQMA26	13.8	0.02	Negligible	13.8	0.01	Negligible
PD1	11.2	0.00	Negligible	11.2	0.00	Negligible
PD2	11.7	0.00	Negligible	11.7	0.00	Negligible
PD3	15.1	0.00	Negligible	15.1	0.00	Negligible
PD4	11.6	0.00	Negligible	11.6	0.00	Negligible
PD5	11.6	0.00	Negligible	11.6	0.00	Negligible
ER1	11.7	0.00	Negligible	11.7	0.00	Negligible
ER2	13.1	0.01	Negligible	13.1	0.00	Negligible
ER3	13.5	0.01	Negligible	13.5	0.00	Negligible
ER4	14.6	0.00	Negligible	14.6	0.00	Negligible
ER5	14.7	0.00	Negligible	14.7	0.00	Negligible
ER6	14.4	0.01	Negligible	14.4	0.01	Negligible
ER7	13.5	0.01	Negligible	13.5	0.00	Negligible
ER8	13.5	0.01	Negligible	13.5	0.01	Negligible
ER9	12.2	0.00	Negligible	12.2	0.00	Negligible
ER10	13.5	0.01	Negligible	13.5	0.00	Negligible
ER11	12.1	0.00	Negligible	12.1	0.00	Negligible
ER12	12.3	0.01	Negligible	12.3	0.00	Negligible
ER13	11.2	0.00	Negligible	11.2	0.00	Negligible
ER14	12.0	0.01	Negligible	12.0	0.00	Negligible
ER15	12.1	0.01	Negligible	12.1	0.00	Negligible
ER16	12.2	0.00	Negligible	12.2	0.00	Negligible
ER17	13.5	0.00	Negligible	13.5	0.00	Negligible
ER18	12.2	0.00	Negligible	12.2	0.00	Negligible
ER19	12.2	0.00	Negligible	12.2	0.00	Negligible
ER20	11.9	0.00	Negligible	11.9	0.00	Negligible
ER21	14.3	0.00	Negligible	14.3	0.00	Negligible
ER22	16.3	0.00	Negligible	16.3	0.00	Negligible
ER23	16.4	0.00	Negligible	16.4	0.00	Negligible
ER24	17.3	0.00	Negligible	17.3	0.00	Negligible
ER25	15.3	0.00	Negligible	15.3	0.00	Negligible
ER26	14.1	0.00	Negligible	14.1	0.00	Negligible
ER27	15.5	0.00	Negligible	15.5	0.00	Negligible
ER28	15.8	0.00	Negligible	15.8	0.00	Negligible
ER29	14.5	0.00	Negligible	14.5	0.00	Negligible
ER30	14.2	0.00	Negligible	14.2	0.00	Negligible
ER31	13.6	0.00	Negligible	13.6	0.00	Negligible
ER32	12.1	0.00	Negligible	12.0	0.00	Negligible

Receptor	2027 With Devel.	Impact v Future Baseline	Impact Severity	2027 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER33	12.3	0.01	Negligible	12.3	0.00	Negligible
ER34	15.3	0.00	Negligible	15.3	0.00	Negligible
ER35	11.9	0.00	Negligible	11.9	0.00	Negligible
ER36	11.7	0.00	Negligible	11.7	0.00	Negligible
ER37	12.5	0.00	Negligible	12.5	0.00	Negligible
ER38	13.4	0.00	Negligible	13.4	0.00	Negligible
ER39	12.4	0.00	Negligible	12.4	0.00	Negligible
ER40	14.1	0.00	Negligible	14.1	0.00	Negligible
ER41	13.8	0.00	Negligible	13.8	0.00	Negligible
ER42	13.8	0.00	Negligible	13.8	0.00	Negligible
ER43	15.8	0.00	Negligible	15.8	0.00	Negligible
ER44	16.3	0.00	Negligible	16.3	0.00	Negligible
ER45	15.8	0.00	Negligible	15.8	0.00	Negligible
ER46	15.4	0.00	Negligible	15.4	0.00	Negligible
ER47	14.2	0.00	Negligible	14.2	0.00	Negligible
ER48	12.7	0.00	Negligible	12.7	0.00	Negligible
ER49	11.5	0.00	Negligible	11.5	0.00	Negligible
ER50	11.8	0.00	Negligible	11.8	0.00	Negligible
ER51	11.6	0.00	Negligible	11.6	0.00	Negligible
ER52	13.5	0.00	Negligible	13.5	0.00	Negligible
ER53	12.0	0.00	Negligible	12.0	0.00	Negligible
ER54	11.7	0.00	Negligible	11.7	0.00	Negligible
ER55	12.3	0.00	Negligible	12.3	0.00	Negligible
ER56	12.4	0.00	Negligible	12.4	0.00	Negligible
ER57	13.1	0.00	Negligible	13.1	0.00	Negligible
ER58	14.9	0.00	Negligible	14.9	0.00	Negligible
ER59	13.0	0.00	Negligible	13.0	0.00	Negligible
ER60	13.8	0.00	Negligible	13.8	0.00	Negligible
ER61	14.8	0.00	Negligible	14.8	0.00	Negligible
ER62	14.3	0.00	Negligible	14.3	0.00	Negligible
ER63	14.4	0.00	Negligible	14.4	0.00	Negligible
ER64	14.1	0.00	Negligible	14.1	0.00	Negligible
ER65	12.5	0.00	Negligible	12.5	0.00	Negligible
ER66	12.3	0.00	Negligible	12.3	0.00	Negligible
ER67	11.6	0.00	Negligible	11.6	0.00	Negligible
ER68	11.1	0.00	Negligible	11.1	0.00	Negligible
ER69	10.8	0.00	Negligible	10.8	0.00	Negligible
ER70	11.1	0.00	Negligible	11.1	0.00	Negligible
ER71	11.6	0.00	Negligible	11.6	0.00	Negligible
ER72	12.7	0.00	Negligible	12.7	0.00	Negligible
ER73	13.0	0.00	Negligible	13.0	0.00	Negligible
ER74	12.8	0.00	Negligible	12.8	0.00	Negligible
ER75	14.5	0.00	Negligible	14.5	0.00	Negligible
ER76	13.5	0.00	Negligible	13.5	0.00	Negligible
ER77	13.9	0.00	Negligible	13.9	0.00	Negligible
ER78	14.8	0.00	Negligible	14.8	0.00	Negligible

Receptor	2027 With Devel.	Impact v Future Baseline	Impact Severity	2027 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER79	14.4	0.00	Negligible	14.4	0.00	Negligible
ER80	13.8	0.00	Negligible	13.8	0.00	Negligible
ER81	15.4	0.00	Negligible	15.4	0.00	Negligible
ER82	12.9	0.01	Negligible	12.8	0.00	Negligible
ER83	13.0	0.01	Negligible	13.0	0.00	Negligible
ER84	12.7	0.00	Negligible	12.7	0.00	Negligible
ER85	11.0	0.00	Negligible	11.0	0.00	Negligible
ER86	11.0	0.00	Negligible	11.0	0.00	Negligible
ER87	11.3	0.00	Negligible	11.3	0.00	Negligible
ER88	12.7	0.00	Negligible	12.7	0.00	Negligible
ER89	14.0	0.00	Negligible	14.0	0.00	Negligible
ER90	12.0	0.00	Negligible	12.0	0.00	Negligible
ER91	14.1	0.00	Negligible	14.1	0.00	Negligible
ER92	15.5	0.00	Negligible	15.5	0.00	Negligible
ER93	14.9	0.00	Negligible	14.9	0.00	Negligible
ER94	13.2	0.00	Negligible	13.2	0.00	Negligible
ER95	12.5	0.00	Negligible	12.5	0.00	Negligible
ER96	12.9	0.00	Negligible	12.9	0.00	Negligible
ER97	14.6	0.00	Negligible	14.6	0.00	Negligible
ER98	13.0	0.00	Negligible	13.0	0.00	Negligible

Table E4.F (Cont) Modelled 2027 With Development Annual Mean PM₁₀ (µg/m³)

Receptor	2027 With Devel. Mitigated (C)	Impact v Future Baseline	Impact Severity
AQMA1	11.7	-0.01	Negligible
AQMA2	12.8	-0.01	Negligible
AQMA3	13.3	-0.03	Negligible
AQMA4	13.2	-0.03	Negligible
AQMA5	12.0	-0.02	Negligible
AQMA6	11.2	-0.01	Negligible
AQMA7	15.4	-0.06	Negligible
AQMA8	16.2	-0.07	Negligible
AQMA9	16.8	-0.09	Negligible
AQMA10	16.5	-0.09	Negligible
AQMA11	14.8	-0.07	Negligible
AQMA12	16.8	-0.09	Negligible
AQMA13	15.3	-0.07	Negligible
AQMA14	17.0	-0.09	Negligible
AQMA15	17.4	-0.10	Negligible
AQMA16	16.2	-0.07	Negligible
AQMA17	17.5	-0.07	Negligible
AQMA18	18.7	-0.09	Negligible
AQMA19	12.6	-0.01	Negligible

Receptor	2027 With Devel. Mitigated (C)	Impact v Future Baseline	Impact Severity
AQMA20	13.2	-0.01	Negligible
AQMA21	12.7	-0.01	Negligible
AQMA22	12.8	-0.02	Negligible
AQMA23	13.5	-0.02	Negligible
AQMA24	13.8	-0.02	Negligible
AQMA25	12.3	-0.02	Negligible
AQMA26	13.8	-0.02	Negligible
PD1	11.2	0.00	Negligible
PD2	11.7	0.00	Negligible
PD3	15.1	0.00	Negligible
PD4	11.6	0.00	Negligible
PD5	11.6	0.00	Negligible
ER1	11.7	0.00	Negligible
ER2	13.1	-0.01	Negligible
ER3	13.5	-0.01	Negligible
ER4	14.6	-0.02	Negligible
ER5	14.7	-0.02	Negligible
ER6	14.3	-0.01	Negligible
ER7	13.5	-0.01	Negligible
ER8	13.5	-0.01	Negligible
ER9	12.2	0.00	Negligible
ER10	13.5	-0.01	Negligible
ER11	12.1	0.00	Negligible
ER12	12.3	-0.01	Negligible
ER13	11.2	0.00	Negligible
ER14	12.0	-0.01	Negligible
ER15	12.1	-0.01	Negligible
ER16	12.2	0.00	Negligible
ER17	13.5	0.00	Negligible
ER18	12.2	0.00	Negligible
ER19	12.2	0.00	Negligible
ER20	11.9	0.00	Negligible
ER21	14.3	0.00	Negligible
ER22	16.3	0.00	Negligible
ER23	16.4	0.00	Negligible
ER24	17.3	0.00	Negligible
ER25	15.3	0.00	Negligible
ER26	14.1	0.00	Negligible
ER27	15.5	0.00	Negligible
ER28	15.8	0.00	Negligible
ER29	14.5	0.00	Negligible
ER30	14.2	0.00	Negligible
ER31	13.6	0.00	Negligible
ER32	12.0	0.00	Negligible
ER33	12.3	-0.01	Negligible
ER34	15.3	-0.01	Negligible

Receptor	2027 With Devel. Mitigated (C)	Impact v Future Baseline	Impact Severity
ER35	11.9	0.00	Negligible
ER36	11.7	-0.01	Negligible
ER37	12.4	-0.01	Negligible
ER38	13.3	-0.01	Negligible
ER39	12.4	0.00	Negligible
ER40	14.1	0.00	Negligible
ER41	13.8	0.00	Negligible
ER42	13.8	-0.01	Negligible
ER43	15.8	0.00	Negligible
ER44	16.3	0.00	Negligible
ER45	15.8	-0.01	Negligible
ER46	15.4	-0.01	Negligible
ER47	14.2	0.00	Negligible
ER48	12.7	-0.01	Negligible
ER49	11.5	0.00	Negligible
ER50	11.8	-0.01	Negligible
ER51	11.6	0.00	Negligible
ER52	13.5	-0.01	Negligible
ER53	12.0	0.00	Negligible
ER54	11.7	0.00	Negligible
ER55	12.3	0.00	Negligible
ER56	12.4	0.00	Negligible
ER57	13.1	0.00	Negligible
ER58	14.9	0.00	Negligible
ER59	13.0	0.00	Negligible
ER60	13.8	0.00	Negligible
ER61	14.8	0.00	Negligible
ER62	14.3	0.00	Negligible
ER63	14.4	0.00	Negligible
ER64	14.1	0.00	Negligible
ER65	12.5	0.00	Negligible
ER66	12.3	0.00	Negligible
ER67	11.6	0.00	Negligible
ER68	11.1	0.00	Negligible
ER69	10.8	0.00	Negligible
ER70	11.1	0.00	Negligible
ER71	11.6	-0.01	Negligible
ER72	12.7	-0.01	Negligible
ER73	13.0	-0.01	Negligible
ER74	12.8	0.00	Negligible
ER75	14.5	-0.01	Negligible
ER76	13.5	0.00	Negligible
ER77	13.9	0.00	Negligible
ER78	14.8	-0.01	Negligible
ER79	14.4	-0.01	Negligible
ER80	13.8	-0.01	Negligible

Receptor	2027 With Devel. Mitigated (C)	Impact v Future Baseline	Impact Severity
ER81	15.4	-0.01	Negligible
ER82	12.8	-0.01	Negligible
ER83	13.0	-0.01	Negligible
ER84	12.7	0.00	Negligible
ER85	11.0	0.00	Negligible
ER86	11.0	0.00	Negligible
ER87	11.3	0.00	Negligible
ER88	12.7	0.00	Negligible
ER89	14.0	0.00	Negligible
ER90	12.0	0.00	Negligible
ER91	14.1	0.00	Negligible
ER92	15.5	0.00	Negligible
ER93	14.9	-0.01	Negligible
ER94	13.2	0.00	Negligible
ER95	12.5	0.00	Negligible
ER96	12.9	0.00	Negligible
ER97	14.5	-0.02	Negligible
ER98	12.9	-0.02	Negligible

Table E4.G Baseline and Future Baseline Annual Mean PM_{2.5} (µg/m³)

Receptor	2017 Base	2022 Future Baseline	2027 Future Baseline
AQMA1	8.2	7.7	7.5
AQMA2	8.7	8.3	8.1
AQMA3	9.2	8.6	8.4
AQMA4	9.2	8.6	8.4
AQMA5	8.3	7.9	7.7
AQMA6	7.8	7.4	7.3
AQMA7	10.7	10.0	9.7
AQMA8	11.0	10.3	10.0
AQMA9	11.6	10.8	10.4
AQMA10	11.4	10.5	10.2
AQMA11	10.3	9.6	9.3
AQMA12	11.6	10.7	10.4
AQMA13	10.4	9.7	9.4
AQMA14	11.4	10.6	10.2
AQMA15	12.2	11.3	11.0
AQMA16	11.3	10.5	10.3
AQMA17	12.1	11.3	11.0
AQMA18	12.9	12.0	11.7
AQMA19	8.9	8.5	8.3
AQMA20	9.5	9.0	8.8

AQMA21	8.8	8.4	8.3
AQMA22	9.0	8.5	8.3
AQMA23	9.3	8.7	8.5
AQMA24	9.4	8.9	8.7
AQMA25	8.5	8.1	7.9
AQMA26	9.2	8.8	8.6
PD1	7.8	7.4	7.3
PD2	7.8	7.5	7.4
PD3	8.2	7.9	7.8
PD4	7.5	7.2	7.1
PD5	8.1	7.8	7.7
ER1	8.2	7.8	7.7
ER2	9.3	8.9	8.7
ER3	9.6	9.2	9.0
ER4	10.2	9.7	9.5
ER5	10.2	9.7	9.5
ER6	10.1	9.6	9.4
ER7	9.5	9.0	8.8
ER8	9.5	9.0	8.8
ER9	8.5	8.1	7.9
ER10	9.2	8.7	8.6
ER11	8.3	7.9	7.8
ER12	8.5	8.1	7.9
ER13	7.7	7.4	7.2
ER14	8.3	7.9	7.7
ER15	8.2	7.9	7.7
ER16	8.2	7.8	7.7
ER17	9.3	8.9	8.8
ER18	8.5	8.1	8.0
ER19	8.4	8.0	7.9
ER20	8.2	7.9	7.7
ER21	9.5	9.1	9.0
ER22	11.1	10.6	10.4
ER23	11.2	10.7	10.5
ER24	12.0	11.5	11.3
ER25	10.5	10.1	9.9
ER26	9.7	9.3	9.2
ER27	10.5	10.0	9.9
ER28	10.3	9.9	9.7
ER29	9.5	9.1	9.0
ER30	9.5	9.1	8.9
ER31	9.0	8.6	8.5
ER32	8.2	7.8	7.7
ER33	8.4	8.0	7.8
ER34	8.3	8.1	7.9
ER35	7.8	7.5	7.4
ER36	8.0	7.7	7.5
ER37	8.6	8.2	8.0
ER38	9.2	8.8	8.7
ER39	8.5	8.1	8.0

ER40	9.4	9.0	8.9
ER41	9.3	8.9	8.8
ER42	9.6	9.2	9.0
ER43	11.3	10.8	10.6
ER44	11.8	11.3	11.1
ER45	10.8	10.4	10.2
ER46	10.8	10.4	10.2
ER47	10.0	9.6	9.4
ER48	8.8	8.5	8.3
ER49	7.9	7.6	7.4
ER50	8.2	7.8	7.7
ER51	7.9	7.6	7.5
ER52	8.9	8.6	8.4
ER53	8.1	7.7	7.6
ER54	7.9	7.6	7.5
ER55	8.3	8.0	7.8
ER56	8.6	8.2	8.1
ER57	9.0	8.6	8.5
ER58	9.9	9.5	9.3
ER59	9.0	8.7	8.5
ER60	9.7	9.3	9.1
ER61	10.2	9.8	9.7
ER62	10.0	9.6	9.4
ER63	10.2	9.8	9.7
ER64	9.8	9.4	9.3
ER65	8.7	8.4	8.2
ER66	8.3	8.0	7.9
ER67	7.9	7.6	7.4
ER68	7.6	7.3	7.2
ER69	7.5	7.2	7.1
ER70	7.6	7.3	7.2
ER71	7.9	7.6	7.5
ER72	8.5	8.2	8.1
ER73	8.9	8.5	8.4
ER74	8.7	8.3	8.2
ER75	9.6	9.1	9.0
ER76	9.3	8.9	8.7
ER77	9.6	9.2	9.0
ER78	10.2	9.8	9.6
ER79	9.7	9.3	9.2
ER80	9.4	9.0	8.9
ER81	10.7	10.2	10.0
ER82	8.8	8.4	8.3
ER83	8.7	8.4	8.2
ER84	8.2	7.9	7.8
ER85	7.5	7.2	7.0
ER86	7.5	7.2	7.1
ER87	7.7	7.4	7.3
ER88	8.6	8.3	8.1
ER89	9.3	8.9	8.8

ER90	8.2	7.8	7.7
ER91	9.4	9.0	8.8
ER92	10.1	9.7	9.5
ER93	9.7	9.3	9.2
ER94	8.8	8.5	8.3
ER95	8.5	8.1	8.0
ER96	8.8	8.4	8.3
ER97	9.8	9.4	9.2
ER98	8.9	8.5	8.3

Table E4.H Modelled 2022 With Development Annual Mean PM_{2.5} (µg/m³)

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
AQMA1	7.7	-0.02	Negligible	7.7	-0.02	Negligible
AQMA2	8.2	-0.02	Negligible	8.2	-0.02	Negligible
AQMA3	8.6	-0.04	Negligible	8.6	-0.04	Negligible
AQMA4	8.6	-0.04	Negligible	8.6	-0.04	Negligible
AQMA5	7.8	-0.02	Negligible	7.8	-0.02	Negligible
AQMA6	7.4	-0.02	Negligible	7.4	-0.02	Negligible
AQMA7	10.0	-0.06	Negligible	10.0	-0.07	Negligible
AQMA8	10.2	-0.06	Negligible	10.2	-0.07	Negligible
AQMA9	10.7	-0.09	Negligible	10.7	-0.09	Negligible
AQMA10	10.4	-0.09	Negligible	10.4	-0.09	Negligible
AQMA11	9.5	-0.07	Negligible	9.5	-0.07	Negligible
AQMA12	10.6	-0.09	Negligible	10.6	-0.09	Negligible
AQMA13	9.6	-0.07	Negligible	9.6	-0.07	Negligible
AQMA14	10.5	-0.09	Negligible	10.5	-0.09	Negligible
AQMA15	11.2	-0.09	Negligible	11.2	-0.10	Negligible
AQMA16	10.5	-0.07	Negligible	10.5	-0.07	Negligible
AQMA17	11.3	-0.07	Negligible	11.3	-0.07	Negligible
AQMA18	11.9	-0.09	Negligible	11.9	-0.10	Negligible
AQMA19	8.5	-0.01	Negligible	8.5	-0.01	Negligible
AQMA20	9.0	-0.01	Negligible	9.0	-0.02	Negligible
AQMA21	8.4	-0.01	Negligible	8.4	-0.01	Negligible
AQMA22	8.4	-0.03	Negligible	8.4	-0.03	Negligible
AQMA23	8.7	-0.03	Negligible	8.7	-0.03	Negligible
AQMA24	8.8	-0.03	Negligible	8.8	-0.03	Negligible
AQMA25	8.1	-0.02	Negligible	8.1	-0.02	Negligible
AQMA26	8.8	-0.03	Negligible	8.8	-0.03	Negligible
PD1	7.4	-0.01	Negligible	7.4	-0.01	Negligible
PD3	7.5	-0.01	Negligible	7.5	-0.01	Negligible
PD4	7.9	0.00	Negligible	7.9	0.00	Negligible
PD5	7.2	0.00	Negligible	7.2	0.00	Negligible
ER1	7.8	0.00	Negligible	7.8	0.00	Negligible
PD2	7.8	0.00	Negligible	7.8	0.00	Negligible
ER2	8.8	-0.01	Negligible	8.8	-0.01	Negligible
ER3	9.2	-0.01	Negligible	9.2	-0.01	Negligible
ER4	9.7	-0.02	Negligible	9.7	-0.02	Negligible

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER5	9.7	-0.01	Negligible	9.7	-0.02	Negligible
ER6	9.5	-0.02	Negligible	9.5	-0.02	Negligible
ER7	9.0	-0.01	Negligible	9.0	-0.01	Negligible
ER8	9.0	-0.02	Negligible	9.0	-0.02	Negligible
ER9	8.1	0.00	Negligible	8.1	0.00	Negligible
ER10	8.7	-0.01	Negligible	8.7	-0.01	Negligible
ER11	7.9	0.00	Negligible	7.9	0.00	Negligible
ER12	8.1	-0.01	Negligible	8.1	-0.01	Negligible
ER13	7.4	0.00	Negligible	7.4	0.00	Negligible
ER14	7.9	-0.01	Negligible	7.9	-0.01	Negligible
ER15	7.9	-0.01	Negligible	7.9	-0.01	Negligible
ER16	7.8	-0.01	Negligible	7.8	-0.01	Negligible
ER17	8.9	0.00	Negligible	8.9	0.00	Negligible
ER18	8.1	0.00	Negligible	8.1	0.00	Negligible
ER19	8.0	0.00	Negligible	8.0	0.00	Negligible
ER20	7.9	0.00	Negligible	7.9	0.00	Negligible
ER21	9.1	0.00	Negligible	9.1	0.00	Negligible
ER22	10.6	0.00	Negligible	10.6	0.00	Negligible
ER23	10.7	0.00	Negligible	10.7	0.00	Negligible
ER24	11.5	0.00	Negligible	11.5	0.00	Negligible
ER25	10.1	0.00	Negligible	10.1	0.00	Negligible
ER26	9.3	0.00	Negligible	9.3	0.00	Negligible
ER27	10.0	0.00	Negligible	10.0	0.00	Negligible
ER28	9.9	0.00	Negligible	9.9	0.00	Negligible
ER29	9.1	0.00	Negligible	9.1	0.00	Negligible
ER30	9.1	0.00	Negligible	9.1	0.00	Negligible
ER31	8.6	-0.01	Negligible	8.6	-0.01	Negligible
ER32	7.8	0.00	Negligible	7.8	0.00	Negligible
ER33	8.0	-0.01	Negligible	8.0	-0.01	Negligible
ER34	8.0	-0.01	Negligible	8.0	-0.01	Negligible
ER35	7.5	0.00	Negligible	7.5	0.00	Negligible
ER36	7.6	-0.01	Negligible	7.6	-0.01	Negligible
ER37	8.1	-0.02	Negligible	8.1	-0.02	Negligible
ER38	8.8	-0.01	Negligible	8.8	-0.01	Negligible
ER39	8.1	0.00	Negligible	8.1	0.00	Negligible
ER40	9.0	0.00	Negligible	9.0	0.00	Negligible
ER41	8.9	0.00	Negligible	8.9	0.00	Negligible
ER42	9.2	-0.01	Negligible	9.2	-0.01	Negligible
ER43	10.8	0.00	Negligible	10.8	0.00	Negligible
ER44	11.3	0.00	Negligible	11.3	0.00	Negligible
ER45	10.4	0.01	Negligible	10.4	0.01	Negligible
ER46	10.4	0.00	Negligible	10.4	0.00	Negligible
ER47	9.6	0.00	Negligible	9.6	0.00	Negligible
ER48	8.5	0.00	Negligible	8.5	0.00	Negligible
ER49	7.5	0.00	Negligible	7.5	0.00	Negligible
ER50	7.8	-0.02	Negligible	7.8	-0.02	Negligible

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER51	7.6	-0.01	Negligible	7.6	-0.01	Negligible
ER52	8.5	-0.02	Negligible	8.5	-0.02	Negligible
ER53	7.7	-0.01	Negligible	7.7	-0.01	Negligible
ER54	7.6	-0.01	Negligible	7.6	-0.01	Negligible
ER55	8.0	0.00	Negligible	8.0	0.00	Negligible
ER56	8.2	0.00	Negligible	8.2	0.00	Negligible
ER57	8.6	0.00	Negligible	8.6	0.00	Negligible
ER58	9.5	0.00	Negligible	9.5	0.00	Negligible
ER59	8.7	0.00	Negligible	8.7	0.00	Negligible
ER60	9.3	0.00	Negligible	9.3	0.00	Negligible
ER61	9.8	0.00	Negligible	9.8	0.00	Negligible
ER62	9.6	0.00	Negligible	9.6	0.00	Negligible
ER63	9.8	0.00	Negligible	9.8	0.00	Negligible
ER64	9.4	0.00	Negligible	9.4	0.00	Negligible
ER65	8.4	0.00	Negligible	8.4	0.00	Negligible
ER66	8.0	0.00	Negligible	8.0	0.00	Negligible
ER67	7.6	0.00	Negligible	7.6	0.00	Negligible
ER68	7.3	0.00	Negligible	7.3	0.00	Negligible
ER69	7.2	0.00	Negligible	7.2	0.00	Negligible
ER70	7.3	0.00	Negligible	7.3	0.00	Negligible
ER71	7.6	0.00	Negligible	7.6	0.00	Negligible
ER72	8.2	0.00	Negligible	8.2	0.00	Negligible
ER73	8.5	0.00	Negligible	8.5	0.00	Negligible
ER74	8.3	0.00	Negligible	8.3	0.00	Negligible
ER75	9.1	0.00	Negligible	9.1	0.00	Negligible
ER76	8.9	0.00	Negligible	8.9	0.00	Negligible
ER77	9.2	0.00	Negligible	9.2	0.00	Negligible
ER78	9.8	0.00	Negligible	9.8	0.00	Negligible
ER79	9.3	-0.01	Negligible	9.3	-0.01	Negligible
ER80	9.0	0.00	Negligible	9.0	0.00	Negligible
ER81	10.2	0.00	Negligible	10.2	0.00	Negligible
ER82	8.4	-0.01	Negligible	8.4	-0.01	Negligible
ER83	8.3	-0.01	Negligible	8.3	-0.01	Negligible
ER84	7.9	0.00	Negligible	7.9	0.00	Negligible
ER85	7.2	0.00	Negligible	7.2	0.00	Negligible
ER86	7.2	0.00	Negligible	7.2	0.00	Negligible
ER87	7.4	0.00	Negligible	7.4	0.00	Negligible
ER88	8.3	0.00	Negligible	8.3	0.00	Negligible
ER89	8.9	0.00	Negligible	8.9	0.00	Negligible
ER90	7.8	0.00	Negligible	7.8	0.00	Negligible
ER91	9.0	0.00	Negligible	9.0	0.00	Negligible
ER92	9.7	0.00	Negligible	9.7	0.00	Negligible
ER93	9.3	-0.01	Negligible	9.3	-0.01	Negligible
ER94	8.5	0.00	Negligible	8.5	0.00	Negligible
ER95	8.1	0.00	Negligible	8.1	0.00	Negligible
ER96	8.4	0.00	Negligible	8.4	0.00	Negligible

Receptor	2022 With Devel.	Impact v Future Baseline	Impact Severity	2022 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER97	9.3	-0.02	Negligible	9.3	-0.02	Negligible
ER98	8.4	-0.02	Negligible	8.4	-0.02	Negligible

Table E4.I Modelled 2027 With Development Annual Mean PM_{2.5} (µg/m³)

Receptor	2027 With Devel.	Impact v Future Baseline	Impact Severity	2027 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
AQMA1	7.5	0.01	Negligible	7.5	0.00	Negligible
AQMA2	8.1	0.01	Negligible	8.1	0.00	Negligible
AQMA3	8.4	0.02	Negligible	8.4	0.01	Negligible
AQMA4	8.4	0.02	Negligible	8.4	0.01	Negligible
AQMA5	7.7	0.01	Negligible	7.7	0.00	Negligible
AQMA6	7.3	0.00	Negligible	7.3	0.00	Negligible
AQMA7	9.7	0.01	Negligible	9.7	0.00	Negligible
AQMA8	10.0	0.01	Negligible	10.0	0.00	Negligible
AQMA9	10.5	0.01	Negligible	10.4	0.00	Negligible
AQMA10	10.2	0.01	Negligible	10.2	0.00	Negligible
AQMA11	9.3	0.01	Negligible	9.3	0.00	Negligible
AQMA12	10.4	0.01	Negligible	10.4	0.00	Negligible
AQMA13	9.4	0.01	Negligible	9.4	0.00	Negligible
AQMA14	10.3	0.01	Negligible	10.2	0.00	Negligible
AQMA15	11.0	0.01	Negligible	11.0	0.00	Negligible
AQMA16	10.3	0.01	Negligible	10.3	0.00	Negligible
AQMA17	11.0	0.01	Negligible	11.0	0.00	Negligible
AQMA18	11.7	0.01	Negligible	11.7	0.00	Negligible
AQMA19	8.3	0.00	Negligible	8.3	0.00	Negligible
AQMA20	8.8	0.00	Negligible	8.8	0.00	Negligible
AQMA21	8.3	0.00	Negligible	8.3	0.00	Negligible
AQMA22	8.3	0.01	Negligible	8.3	0.00	Negligible
AQMA23	8.6	0.01	Negligible	8.5	0.00	Negligible
AQMA24	8.7	0.01	Negligible	8.7	0.00	Negligible
AQMA25	7.9	0.01	Negligible	7.9	0.00	Negligible
AQMA26	8.6	0.01	Negligible	8.6	0.00	Negligible
PD1	7.3	0.00	Negligible	7.3	0.00	Negligible
PD3	7.4	0.00	Negligible	7.4	0.00	Negligible
PD4	7.8	0.00	Negligible	7.8	0.00	Negligible
PD5	7.1	0.00	Negligible	7.1	0.00	Negligible
ER1	7.7	0.00	Negligible	7.7	0.00	Negligible
PD2	7.7	0.00	Negligible	7.7	0.00	Negligible
ER2	8.7	0.00	Negligible	8.7	0.00	Negligible
ER3	9.0	0.00	Negligible	9.0	0.00	Negligible
ER4	9.5	0.00	Negligible	9.5	0.00	Negligible
ER5	9.5	0.00	Negligible	9.5	0.00	Negligible
ER6	9.4	0.01	Negligible	9.4	0.00	Negligible
ER7	8.8	0.00	Negligible	8.8	0.00	Negligible

Receptor	2027 With Devel.	Impact v Future Baseline	Impact Severity	2027 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER8	8.8	0.01	Negligible	8.8	0.00	Negligible
ER9	7.9	0.00	Negligible	7.9	0.00	Negligible
ER10	8.6	0.00	Negligible	8.6	0.00	Negligible
ER11	7.8	0.00	Negligible	7.8	0.00	Negligible
ER12	7.9	0.00	Negligible	7.9	0.00	Negligible
ER13	7.2	0.00	Negligible	7.2	0.00	Negligible
ER14	7.7	0.00	Negligible	7.7	0.00	Negligible
ER15	7.7	0.00	Negligible	7.7	0.00	Negligible
ER16	7.7	0.00	Negligible	7.7	0.00	Negligible
ER17	8.8	0.00	Negligible	8.8	0.00	Negligible
ER18	8.0	0.00	Negligible	8.0	0.00	Negligible
ER19	7.9	0.00	Negligible	7.9	0.00	Negligible
ER20	7.7	0.00	Negligible	7.7	0.00	Negligible
ER21	9.0	0.00	Negligible	9.0	0.00	Negligible
ER22	10.4	0.00	Negligible	10.4	0.00	Negligible
ER23	10.5	0.00	Negligible	10.5	0.00	Negligible
ER24	11.3	0.00	Negligible	11.3	0.00	Negligible
ER25	9.9	0.00	Negligible	9.9	0.00	Negligible
ER26	9.2	0.00	Negligible	9.2	0.00	Negligible
ER27	9.9	0.00	Negligible	9.9	0.00	Negligible
ER28	9.7	0.00	Negligible	9.7	0.00	Negligible
ER29	9.0	0.00	Negligible	9.0	0.00	Negligible
ER30	8.9	0.00	Negligible	8.9	0.00	Negligible
ER31	8.5	0.00	Negligible	8.5	0.00	Negligible
ER32	7.7	0.00	Negligible	7.7	0.00	Negligible
ER33	7.8	0.00	Negligible	7.8	0.00	Negligible
ER34	7.9	0.00	Negligible	7.9	0.00	Negligible
ER35	7.4	0.00	Negligible	7.4	0.00	Negligible
ER36	7.5	0.00	Negligible	7.5	0.00	Negligible
ER37	8.0	0.00	Negligible	8.0	0.00	Negligible
ER38	8.7	0.00	Negligible	8.7	0.00	Negligible
ER39	8.0	0.00	Negligible	8.0	0.00	Negligible
ER40	8.9	0.00	Negligible	8.9	0.00	Negligible
ER41	8.8	0.00	Negligible	8.8	0.00	Negligible
ER42	9.0	0.00	Negligible	9.0	0.00	Negligible
ER43	10.6	0.00	Negligible	10.6	0.00	Negligible
ER44	11.1	0.00	Negligible	11.1	0.00	Negligible
ER45	10.2	0.00	Negligible	10.2	0.00	Negligible
ER46	10.2	0.00	Negligible	10.2	0.00	Negligible
ER47	9.4	0.00	Negligible	9.4	0.00	Negligible
ER48	8.3	0.00	Negligible	8.3	0.00	Negligible
ER49	7.4	0.00	Negligible	7.4	0.00	Negligible
ER50	7.7	0.00	Negligible	7.7	0.00	Negligible
ER51	7.5	0.00	Negligible	7.5	0.00	Negligible
ER52	8.4	0.00	Negligible	8.4	0.00	Negligible
ER53	7.6	0.00	Negligible	7.6	0.00	Negligible

Receptor	2027 With Devel.	Impact v Future Baseline	Impact Severity	2027 With Devel. Mitigated (A)	Impact v Future Baseline	Impact Severity
ER54	7.5	0.00	Negligible	7.5	0.00	Negligible
ER55	7.8	0.00	Negligible	7.8	0.00	Negligible
ER56	8.1	0.00	Negligible	8.1	0.00	Negligible
ER57	8.5	0.00	Negligible	8.5	0.00	Negligible
ER58	9.3	0.00	Negligible	9.3	0.00	Negligible
ER59	8.5	0.00	Negligible	8.5	0.00	Negligible
ER60	9.1	0.00	Negligible	9.1	0.00	Negligible
ER61	9.7	0.00	Negligible	9.7	0.00	Negligible
ER62	9.4	0.00	Negligible	9.4	0.00	Negligible
ER63	9.7	0.00	Negligible	9.7	0.00	Negligible
ER64	9.3	0.00	Negligible	9.3	0.00	Negligible
ER65	8.2	0.00	Negligible	8.2	0.00	Negligible
ER66	7.9	0.00	Negligible	7.9	0.00	Negligible
ER67	7.4	0.00	Negligible	7.4	0.00	Negligible
ER68	7.2	0.00	Negligible	7.2	0.00	Negligible
ER69	7.1	0.00	Negligible	7.1	0.00	Negligible
ER70	7.2	0.00	Negligible	7.2	0.00	Negligible
ER71	7.5	0.00	Negligible	7.5	0.00	Negligible
ER72	8.1	0.00	Negligible	8.1	0.00	Negligible
ER73	8.4	0.00	Negligible	8.4	0.00	Negligible
ER74	8.2	0.00	Negligible	8.2	0.00	Negligible
ER75	9.0	0.00	Negligible	9.0	0.00	Negligible
ER76	8.7	0.00	Negligible	8.7	0.00	Negligible
ER77	9.0	0.00	Negligible	9.0	0.00	Negligible
ER78	9.6	0.00	Negligible	9.6	0.00	Negligible
ER79	9.2	0.00	Negligible	9.2	0.00	Negligible
ER80	8.9	0.00	Negligible	8.9	0.00	Negligible
ER81	10.0	0.00	Negligible	10.0	0.00	Negligible
ER82	8.3	0.00	Negligible	8.3	0.00	Negligible
ER83	8.2	0.00	Negligible	8.2	0.00	Negligible
ER84	7.8	0.00	Negligible	7.8	0.00	Negligible
ER85	7.0	0.00	Negligible	7.0	0.00	Negligible
ER86	7.1	0.00	Negligible	7.1	0.00	Negligible
ER87	7.3	0.00	Negligible	7.3	0.00	Negligible
ER88	8.1	0.00	Negligible	8.1	0.00	Negligible
ER89	8.8	0.00	Negligible	8.8	0.00	Negligible
ER90	7.7	0.00	Negligible	7.7	0.00	Negligible
ER91	8.8	0.00	Negligible	8.8	0.00	Negligible
ER92	9.5	0.00	Negligible	9.5	0.00	Negligible
ER93	9.2	0.00	Negligible	9.2	0.00	Negligible
ER94	8.3	0.00	Negligible	8.3	0.00	Negligible
ER95	8.0	0.00	Negligible	8.0	0.00	Negligible
ER96	8.3	0.00	Negligible	8.3	0.00	Negligible
ER97	9.2	0.00	Negligible	9.2	0.00	Negligible
ER98	8.3	0.00	Negligible	8.3	0.00	Negligible

Table E4.J (Cont) Modelled 2027 With Development Annual Mean PM2.5 (µg/m³)

Receptor	2027 With Devel. Mitigated (C)	Impact v Future Baseline	Impact Severity
AQMA1	7.5	-0.01	Negligible
AQMA2	8.1	-0.01	Negligible
AQMA3	8.4	-0.01	Negligible
AQMA4	8.4	-0.01	Negligible
AQMA5	7.7	-0.01	Negligible
AQMA6	7.3	-0.01	Negligible
AQMA7	9.7	-0.04	Negligible
AQMA8	10.0	-0.04	Negligible
AQMA9	10.4	-0.05	Negligible
AQMA10	10.2	-0.05	Negligible
AQMA11	9.3	-0.04	Negligible
AQMA12	10.3	-0.05	Negligible
AQMA13	9.4	-0.04	Negligible
AQMA14	10.2	-0.05	Negligible
AQMA15	10.9	-0.05	Negligible
AQMA16	10.2	-0.04	Negligible
AQMA17	11.0	-0.04	Negligible
AQMA18	11.6	-0.05	Negligible
AQMA19	8.3	0.00	Negligible
AQMA20	8.7	-0.01	Negligible
AQMA21	8.3	-0.01	Negligible
AQMA22	8.3	-0.01	Negligible
AQMA23	8.5	-0.01	Negligible
AQMA24	8.7	-0.01	Negligible
AQMA25	7.9	-0.01	Negligible
AQMA26	8.6	-0.01	Negligible
PD1	7.3	0.00	Negligible
PD3	7.4	0.00	Negligible
PD4	7.8	0.00	Negligible
PD5	7.1	0.00	Negligible
ER1	7.7	0.00	Negligible
PD2	7.7	0.00	Negligible
ER2	8.7	0.00	Negligible
ER3	9.0	0.00	Negligible
ER4	9.5	-0.01	Negligible
ER5	9.5	-0.01	Negligible
ER6	9.4	-0.01	Negligible
ER7	8.8	-0.01	Negligible
ER8	8.8	-0.01	Negligible
ER9	7.9	0.00	Negligible
ER10	8.6	0.00	Negligible
ER11	7.8	0.00	Negligible
ER12	7.9	0.00	Negligible
ER13	7.2	0.00	Negligible

Receptor	2027 With Devel. Mitigated (C)	Impact v Future Baseline	Impact Severity
ER14	7.7	0.00	Negligible
ER15	7.7	0.00	Negligible
ER16	7.7	0.00	Negligible
ER17	8.8	0.00	Negligible
ER18	8.0	0.00	Negligible
ER19	7.9	0.00	Negligible
ER20	7.7	0.00	Negligible
ER21	9.0	0.00	Negligible
ER22	10.4	0.00	Negligible
ER23	10.5	0.00	Negligible
ER24	11.3	0.00	Negligible
ER25	9.9	0.00	Negligible
ER26	9.2	0.00	Negligible
ER27	9.9	0.00	Negligible
ER28	9.7	0.00	Negligible
ER29	9.0	0.00	Negligible
ER30	8.9	0.00	Negligible
ER31	8.5	0.00	Negligible
ER32	7.7	0.00	Negligible
ER33	7.8	-0.01	Negligible
ER34	7.9	0.00	Negligible
ER35	7.4	0.00	Negligible
ER36	7.5	-0.01	Negligible
ER37	8.0	-0.01	Negligible
ER38	8.7	0.00	Negligible
ER39	8.0	0.00	Negligible
ER40	8.9	0.00	Negligible
ER41	8.8	0.00	Negligible
ER42	9.0	0.00	Negligible
ER43	10.6	0.00	Negligible
ER44	11.1	0.00	Negligible
ER45	10.2	0.00	Negligible
ER46	10.2	0.00	Negligible
ER47	9.4	0.00	Negligible
ER48	8.3	0.00	Negligible
ER49	7.4	0.00	Negligible
ER50	7.7	0.00	Negligible
ER51	7.5	0.00	Negligible
ER52	8.4	0.00	Negligible
ER53	7.6	0.00	Negligible
ER54	7.5	0.00	Negligible
ER55	7.8	0.00	Negligible
ER56	8.1	0.00	Negligible
ER57	8.5	0.00	Negligible
ER58	9.3	0.00	Negligible
ER59	8.5	0.00	Negligible

Receptor	2027 With Devel. Mitigated (C)	Impact v Future Baseline	Impact Severity
ER60	9.1	0.00	Negligible
ER61	9.7	0.00	Negligible
ER62	9.4	0.00	Negligible
ER63	9.6	0.00	Negligible
ER64	9.3	0.00	Negligible
ER65	8.2	0.00	Negligible
ER66	7.9	0.00	Negligible
ER67	7.4	0.00	Negligible
ER68	7.2	0.00	Negligible
ER69	7.1	0.00	Negligible
ER70	7.2	0.00	Negligible
ER71	7.5	0.00	Negligible
ER72	8.1	0.00	Negligible
ER73	8.4	0.00	Negligible
ER74	8.2	0.00	Negligible
ER75	9.0	0.00	Negligible
ER76	8.7	0.00	Negligible
ER77	9.0	0.00	Negligible
ER78	9.6	0.00	Negligible
ER79	9.2	0.00	Negligible
ER80	8.9	0.00	Negligible
ER81	10.0	0.00	Negligible
ER82	8.3	0.00	Negligible
ER83	8.2	0.00	Negligible
ER84	7.8	0.00	Negligible
ER85	7.0	0.00	Negligible
ER86	7.1	0.00	Negligible
ER87	7.3	0.00	Negligible
ER88	8.1	0.00	Negligible
ER89	8.8	0.00	Negligible
ER90	7.7	0.00	Negligible
ER91	8.8	0.00	Negligible
ER92	9.5	0.00	Negligible
ER93	9.1	0.00	Negligible
ER94	8.3	0.00	Negligible
ER95	8.0	0.00	Negligible
ER96	8.3	0.00	Negligible
ER97	9.2	-0.01	Negligible
ER98	8.3	-0.01	Negligible