Malton and Norton Air Quality Assessment 15/05/2017

Reference number 003

LOCAL PLAN ASSESSMENT AND AIR QUALITY ACTION PLAN RECOMMENDATIONS

SYSTRA

MALTON AND NORTON AIR QUALITY ASSESSMENT

LOCAL PLAN ASSESSMENT AND AIR QUALITY ACTION PLAN RECOMMENDATIONS

IDENTIFICATION TABLE	
Client/Project owner	Ryedale District Council
Project	Malton and Norton Air Quality Assessment
Study	Local Plan Assessment and Air Quality Action Plan Recommendations
Type of document	Report Final
Date	15/05/2017
File name	Systra Ryedale AQA Report
Reference number	003
Number of pages	119

APPROVAL

Version	Name		Position	Date	Modifications
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	Checked by	Helen Cumiskey	Principal Consultant	08/02/2017	
	Approved by	Peter Black	Associate	09/02/2017	
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	Checked by	Helen Cumiskey	Principal Consultant	04/04/2017	
	Approved by	Peter Black / David Connolly	Associate/ Director	10/04/2017	
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	Checked by	Helen Cumiskey	Principal Consultant	15/05/2017	
	Approved by	Peter Black /	Associate/ Director	15/05/2017	

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1.1.1 SYSTRA has been commissioned by Ryedale District Council (RDC) to undertake an assessment of the air quality impacts of a range of development scenarios on the Malton Air Quality Management Area (AQMA).

1.1.2 The Air Quality Assessment (AQA) will inform the allocation of land in the Local Plan (LP) and provide recommendations for inclusion in the Council's Air Quality Action Plan.

1.2 Background

Ryedale District Council (RDC)

1.2.1 RDC is in the process of identifying new development sites as part of the production of the development plan for the District. As such, the twin towns, Malton and Norton, will experience further development and growth which will take place up to 2027.

1.2.2 The Towns are adjacent to each other and lie on either side of the River Derwent and the railway line between Scarborough and York. Access between the Towns is limited and as a result, the central road network in and between the towns experiences significant congestion at peak periods of the day.

1.2.3 The expected level of development is to be coupled with an increase of traffic flows. RDC is therefore concerned with how this increase will impact on the local air quality particularly within the Malton AQMA.

Malton Air Quality Management Area

1.2.4 The Malton AQMA was declared in 2009 in response to Nitrogen Dioxide levels and encompasses properties along the B1248 (Castlegate and Yorkersgate, between Sheepfoot Hill and Market Street) and the B1257 (Wheelgate and Old Maltongate, between Finkle Street and 20m east of the junction with East Mount), and includes part of Church Hill.

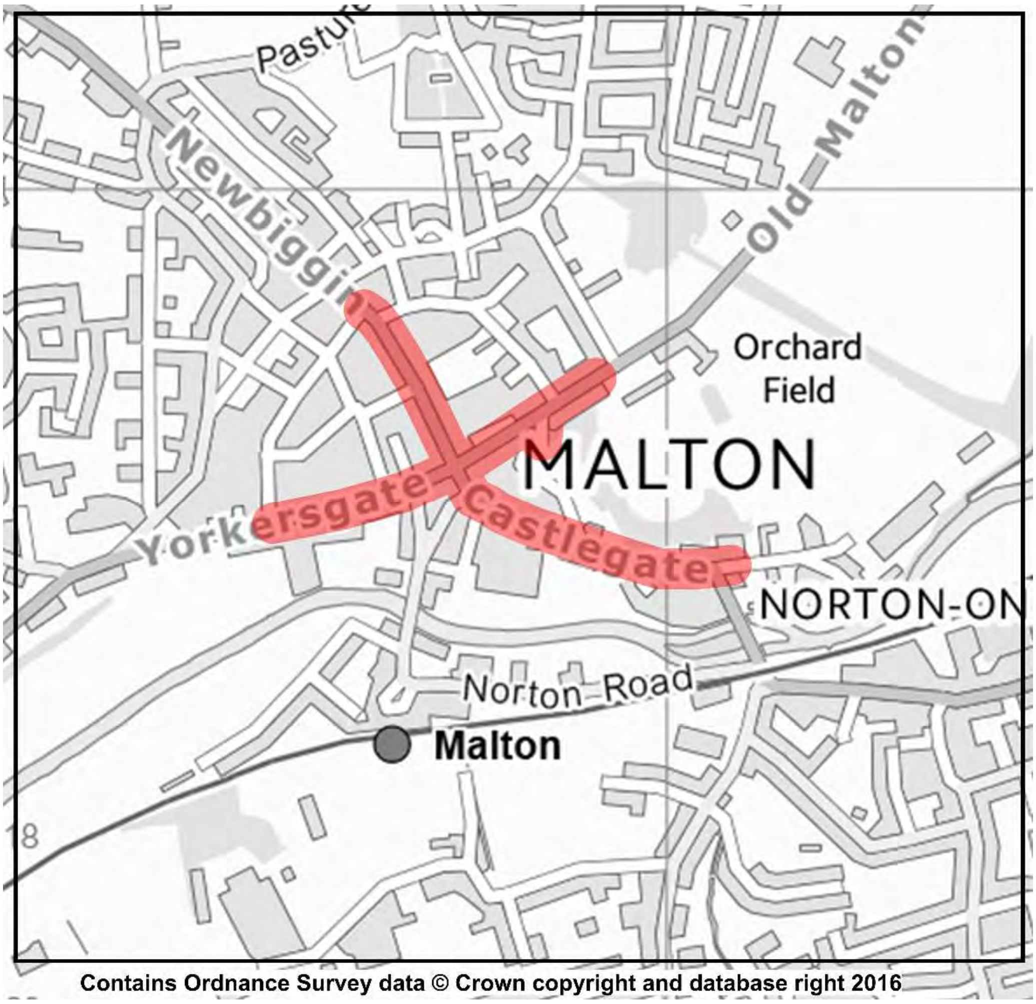
1.2.5 The roads in the AQMA are narrow and are confined by buildings. The effects of heavy traffic and peak hour congestion along the arms of the traffic light controlled junction at the centre of the AQMA (known locally as 'Butcher Corner') are increased by the twice hourly queues that back up into the AQMA as a result of the railway level crossing just outside Malton station.

1.2.6 Source apportionment, done as part of a further assessment of air quality undertaken after the designation of the AQMA indicated that local road traffic accounted for over 75% of the annual mean NO_2 concentration in the AQMA.

1.2.7 Whilst the AQMA is in Malton, the traffic considerations are inextricably linked to the highway movements of Malton and Norton.

1.2.8 **Figure 1** indicates the location of the Malton AQMA.

Figure 1. Malton and Norton Air Quality Management Area



Local Plan Development and Highway Mitigation Measures

Highway Modelling

1.2.9 Local highway modelling has been undertaken to identify the implications of a series of future potential development scenarios on the highway network, including key junctions in the network and to identify highway mitigation measures.

1.2.10 This work has been undertaken by Jacobs Consultancy (JC) and included a revalidation of the Malton and Norton highway model. This highway modelling has provided a key starting point for the AQA.

1.2.11 In total, seven development scenarios have been modelled by Jacobs to assess highway impacts. The scenarios combine a range of development options focused on Malton, Norton or a combination of development at both towns. In agreement with the Council Officers involved in the study, two of these scenarios have been taken forward for consideration and assessment in the air quality modelling. These two scenarios (3 and 7), are similar in development terms - Scenario 7 differing from 3 only by some changes in employment land allocations. Both focus development in Norton, with Site 10a accounting for most of the housing need and includes a new link road[1] to Scarborough Road (encouraging traffic to route to A64 to east).

1.2.12 The highway modelling incorporates a number of highway measures designed to encourage vehicular traffic travelling thorough the central road network to use full movement junctions on the A64 to avoid travelling through the central road network and the AQMA. These have been identified by the Highway Authority (North Yorkshire County Council) and are known collectively as the 'Brambling Fields Complementary measures'.

1.2.13 Brambling Fields is a grade separated junction on the A64 which was improved in 2012 to allow full movement. The addition of a new eastbound slip was designed to provide an alternative route for traffic travelling on the A64 from the west to gain access to Norton and destinations to the south of Malton and Norton without having to travel through the AQMA.

1.2.14 The complementary measures, none of which are in place or committed schemes at this time, included in the highway modelling include:

- HGV restrictions at the Malton/ Norton level crossing*
- One-way restriction on Norton Road
- Additional pedestrian phase at Butcher Corner traffic signals
- Reduction of lane capacity at Castlegate (removal of right turn to Old Maltongate)

** The HGV restriction has had analysis by the council to assess the removal of 18 tonne or 7.5 tonnes vehicles or both. At the time of writing the Local Highway Authority had consulted on the introduction of a 7.5tonne weight restriction.*

1.2.15 As part of the air quality study, SYSTRA accessed the highway modelling produced by Jacobs in order to provide further traffic analysis for input into the air quality modelling, as follows:

- The addition of a scenario for a 7.5 tonne HGV restriction at the Malton/Norton level crossing (*this was based on outputs from Automatic Number Plate Recognition video survey commissioned as part of the air quality study – see Section 5)*.
- The facilitation of the railway bridge crossing to be down four times rather than two times an hour within the traffic model.
- The requirement to disaggregate the various complementary measures for assessment to allow the determination of the 'HGV restriction at the Malton / Norton level crossing' and the 'Do Nothing' options to be assessed in isolation, as only the full set of complementary measures are included as output from the Jacobs modelling work.

[1] *Site 10a link road is included in all scenarios tested.*

1.2.16 The assessment scenarios included in the AQA are outlined in **Table 1.**

Table 1. Air Quality Assessment – Scenarios Tested

Development Scenario	Highway Intervention Measures	Further Assessment
Scenario 3 2027	The full package of all four complementary measures	Sensitivity test to consider the potential implication for reduced future trends in NO_2 concentrations.
	A HGV (7.5 tonne and 18 tonne i.e. OGV 1 and OGV2) restriction at the Malton / Norton level crossing only	
	A HGV restriction (18 tonne only i.e. OGV2) at the Malton / Norton level crossing only	
	Do Nothing	
Scenario 7 2027	All complementary measures	
	A HGV restriction (7.5 tonne and 18 tonne i.e. OGV 1 and OGV2) at the Malton / Norton level crossing only	
	A HGV restriction (18 tonne only i.e. OGV2) at the Malton / Norton level crossing only	
	Do nothing	

1.3 Scope of Air Quality Assessment

1.3.1 The aim of the study is to assess the air quality impacts of two development scenarios in the context of the highway interventions (i.e. the complementary measures), which have been identified to reduce impacts of the future development in the area.

1.3.2 The Air Quality Assessment has the following objectives:

- To identify the development scenario which would result in the least impact in terms of air quality in general and NO_2 emissions in particular within the Malton AQMA.
- To include also a focus on other transport related pollutants such as Particulate Matter: PM_{10} and $PM_{2.5}$.
- To identify any implications of the complementary measures on air quality within the Malton AQMA.
- To provide clear recommendations from the development scenarios tested and also wider recommendations for improving air quality in the AQMA (*which will inform the council's forthcoming revised Air Quality Action Plan*).

1.3.3 The study has utilised Atmospheric Dispersion Modelling System (ADMS-Roads Extra) and has been calibrated (through the verification process) using local air quality monitoring data supplied by the Council. A sensitivity test for the ADMS modelling has also been undertaken to consider the potential implications for reduced future trends in projected Nitrogen Dioxide NO_2 concentrations.

1.3.4 The ADMS modelling has been supplemented by an Automatic Number Plate Recognition (ANPR) survey at the intersection of Castlegate and Sheepfoot Hill in Malton which has provided data for input into ENEVAL (Environmental Evaluation software). The ANPR survey has been undertaken to provide a detailed and representative breakdown of the local traffic by engine size, fuel type and Euro Class. The vehicle age and emissions category profiles are useful indicators of how emissions are likely to change over time, whilst the vehicle fleet information (by Euro category) provides an additional insight into the apportionment of the emissions between specific subsets of the traffic, both of which are invaluable to the conclusions and recommendations of the study. In addition, the ENEVAL analysis allows further assessment in terms of the cumulative change in emissions levels across all links in the AQMA for each scenario.

1.3.5 The scope of work was set out in the original 'Invitation to Quote' brief provided by the Council and subsequently agreed at the project inception meeting attended by SYSTRA employees and Ryedale District Council Officers (Jill Thompson (Planning Officer Ryedale District Council) and Steve Richmond (Environmental Health Officer Ryedale District Council) (referred to as the EHO)).

1.4 Air Quality Assessment Structure

1.4.1 Following this introductory section the structure of this report is as follows:

- Air quality policy and legislative context at a national, regional and local level
- Baseline air quality conditions prevailing throughout the local area
- Assessment methodology
- Model Verification
- Assessment results
- Automated Number Plate Recognition Surveys
- ENEVAL Analysis
- Conclusions and Recommendations

1.5 Report Credibility

1.5.1 This Air Quality Assessment has been undertaken utilising Atmospheric Dispersion Modelling Software (ADMS-Roads), which is a comprehensive tool for investigating air pollution problems due to networks of roads for instance small towns or rural road networks.

1.5.2 The ADMS models have been extensively used in local air quality management. ADMS-Urban, on which ADMS-Roads is based, is used across the world for air quality management and assessment studies of complex situations in towns, cities, motorways, counties and large industrial areas.

1.5.3 Here in the UK, over 70 local authorities used ADMS software to help with their review and assessment and in developing recent air pollution action plans and remedial strategies.

1.5.4 The science of ADMS-Roads is significantly more advanced than that of most other air dispersion models (such as CALINE, ISC and R91) in that it incorporates the latest understanding of the boundary layer structure, and goes beyond the simplistic Pasquill-Gifford stability categories method with explicit calculation of important parameters. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

1.5.5 The Volkswagen scandal raised awareness over the higher levels of pollution being emitted by all vehicles built by a wide range of car makers, which under real world driving conditions are prone to exceed legal emission limits. A study conducted by The International Council on Clean Transportation (ICCT) and Allgemeiner Deutscher Atomobil-Club (ADAC) showed the biggest deviations from Volvo, Renault, Jeep, Hyundai, Citroën and Fiat, resulting in investigations opening into other potential Diesel emissions scandals.

1.5.6 In the UK, the government is looking at ways to decrease emissions of the harmful pollutants emitted from diesel and has spent over £2 billion on cleaner vehicles since 2011. They are also looking at NO_x emissions from diesel generators and provide periodic updates to underlying data including emissions factors to appropriately assess air quality implications of new developments.

1.5.7 DEFRA has recently published a note on projecting NO_2 concentrations to address concerns that background concentrations and vehicle emissions were not reducing with time at the rate the LAQM.TG(09) had estimated. Due to the optimistic projections of NOx, a sensitivity test has been undertaken in this AQA considering the potential implications for reduced future trends in NO_2 concentrations Our employed methodology included the current Emission Factor Toolkit (EFT) 7.0, basing future year emissions on the base year (2016) emission factor.

1.5.8 Furthermore, the ADMS has been set up to provide the worst case results and thus the model included a range of worst case data inputs including, queuing traffic, advanced street canyons and congestion.

1.5.9 The emissions modelling used within the ADMS model has also been checked using a 2nd approach, using SYSTRA's well-established ENEVAL software to estimate the traffic emissions directly from the outputs from the local traffic model.

2. POLICY CONTEXT

2.1 National Policy

Environmental Act 1995

2.1.1 Part IV of the Environment Act 1995 (the Act) requires UK government and devolved administrations to produce a national air quality strategy containing standards, objectives and measures for ameliorating poor ambient air quality and to continually review these policies.

2.1.2 The Act also provides a legislative framework for a system of Local Air Quality Management (LAQM). This system is an integral part of delivering the UK's air quality obligations.

2.1.3 Under the LAQM regime, 'responsible' authorities are required to carry out a regular review and assessment (R&A) of air quality in their area against defined national objectives, which have been prescribed in regulations for the purposes of LAQM. Where it is found these objectives are unlikely to be met, responsible authorities must designate Air Quality Management Areas (AQMA's) and implement Air Quality Action Plans (AQAP's) to tackle the problems.

2.1.4 Provisions in the Act are largely enabling and give responsible authorities the power to take forward local policies to suit their own needs. Local circumstance will also determine the content of the local air quality policy, designation of AQMA's and the content of AQAP's.

The National Air Quality Strategies

2.1.5 Due to the trans-boundary nature of air pollution, it is appropriate to have an overarching strategy with common aims covering all parts of the UK. For this reason, the National Air Quality Strategy (NAQS) is presented as a joint UK Government and devolved administrations document.

2.1.6 Air quality in the UK has generally continued to improve since the first NAQS, entitled 'The United Kingdom Air Quality Strategy', was adopted in 1997. This was later superseded by 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland' published in 2000.

2.1.7 The 2000 NAQS established a framework for further improvements in ambient air quality in the UK to 2003 and beyond. It identified actions at local, national and international levels to improve air quality. It was followed by an Addendum in February, 2003.

2.1.8 There are a wide range of terms and concepts used in international, national and local air quality policy and legislation and the NAQS discusses air quality in terms of Standards and Objectives. These terms are defined below:

- Standards are the concentrations of pollutants in the atmosphere which can be broadly taken to indicate a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive sub groups and ecosystems.

- Objectives are policy targets often expressed as a maximum ambient concentration not to be exceeded either without exception or with a permitted number of exceedances within a given timescale.

2.1.9 The main pollutants of concern in the UK and addressed in the NAQS are:

- Particulate Matter (PM_{10} and $PM_{2.5}$)
- Nitrogen Dioxide (NO_2)
- Ozone (O_3)
- Sulphur Dioxide (SO_2)
- Polycyclic Aromatic Hydrocarbons (PAH's)
- Benzene
- 1,3-Butadiene
- Carbon Monoxide
- Lead (Pb)
- Ammonia

The National Air Quality Strategy 2007

2.1.10 The most recent National Air Quality Strategy (NAQS) was published in July, 2007 and established a framework for further air quality improvements across the UK. The NAQS sets out Standards and Objectives to help quantify the improvement in air quality.

2.1.11 The NAQS is a statement of Policy targets and as such there is no legal requirement to meet these Objectives except in so far as these mirror an equivalent legally binding 'limit value' in EU legislation.

2.1.12 This latest Strategy does not remove any of the Objectives set out in previous versions, apart from replacing the provisional 2010 PM_{10} Objective in England, Wales and Northern Ireland with the exposure reduction approach for $PM_{2.5}$. In Scotland, the $PM_{2.5}$ Objective is an addition to the retained 2010 PM_{10} Objective.

2.1.13 The NAQS Objectives have generally been met across the UK for all pollutants except Particulate Matter (PM_{10}) and Nitrogen Dioxide (NO_2). These pollutants are directly related to road traffic pollution and many of the areas that breach the NAQS Objectives – and as such, are designated as Air Quality Management Areas (AQMA's) – are located close to major roads.

Air Quality (England) (Standards) Regulations 2010

2.1.14 The UK has a legislative requirement to meet air quality 'Limit Values' for key pollutants defined at a European level by European Council Directives:

- Directive 2008/50/EC on ambient air quality and cleaner air for Europe; and
- Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and PAH.

2.1.15 These Directives are transposed into UK legislation by the Air Quality (Standards) Regulations 2010.

Table 2 summarises the NAQS Objectives and European 'limit value' obligations for NO_2, $PM_{2.5}$ and PM_{10}, the key transport-related pollutants of concern at the majority of UK AQMA's.

Table 2. Summary of NAQS and EU Obligations Applicable in England

Pollutant	Measured as	NAQS Objective	Achieved by	European Obligations	Achieved by
Nitrogen Dioxide (NO_2)	Annual Mean	40µgm^{-3}	31-Dec-05	40µgm^{-3}	01-Jan-10
	1 hour Mean	200µgm^{-3} not to be exceeded more than 18 times a year	31-Dec-05	200µgm^{-3} not to be exceeded more than 18 times a year	01-Jan-10
Particulate Matter ($PM_{2.5}$)	Annual Mean	25µgm^{-3}	2020	25µgm^{-3}	2010
Particulate Matter (PM_{10})	Annual Mean	40µgm^{-3}	31-Dec-04	40µgm^{-3}	01-Jan-05
	24 hour Mean	50µgm^{-3} not to be exceeded more than 35 times a year	31-Dec-04	50µgm^{-3} not to be exceeded more than 35 times a year	01-Jan-05

Source: The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1), 2007

National Planning Policy Framework (NPPF)

2.1.16 The NPPF is the 2012 Spatial Planning Policy guidance document which covers all areas of strategic and spatial planning. It states in paragraph 109, that:

> "The planning system should contribute to and enhance the natural and local environment by, 'preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability"

2.1.17 With regard to the development of planning policies, the NPPF suggests that polices should sustain compliance with and contribute towards meeting obligations under EU limit values or National Objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions need to ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.

2.2 Local Policy

Local Air Quality Management, Technical Guidance, 2009 / 2016

2.2.1 Local Air Quality Management, Technical Guidance (LAQM.TG (09/16)) requires Local Authorities to undertake a regular Review and Assessment (R&A) of air quality. Current guidance dictates that there are three types of assessment that a Local Authority can undertake.

2.2.2 The first is an Updating and Screening Assessment (U&SA), which is undertaken every three years. The U&SA considers the changes that have occurred in pollutant emissions and sources since the last round of R&A that may affect air quality. The U&SA is then followed by either a Detailed Assessment (DA) or a Progress Report (PR).

2.2.3 A Detailed Assessment is required when the U&SA identifies a risk of exceeding an air quality objective at a location of relevant public exposure and the objective is to determine whether it is necessary to declare an AQMA. If the U&SA does not identify any risk, then a Progress Report is prepared annually in the intervening years between U&SA's.

Land-Use Planning & Development Control: Planning For Air Quality, 2015

2.2.4 Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) has produced this guidance to ensure that air quality is adequately considered in the land-use planning and development control process.

2.2.5 This guidance sets out why the spatial planning system has an important role to play in improving air quality and reducing exposure to air pollution. This guidance focuses on development control and also stresses the importance of having good air quality policies within local authority planning frameworks.

2.2.6 The guidance has been developed for local authorities, developers and consultants involved in the preparation of development proposals and planning application, and provides them with a means of reaching sound decisions, having regard to the air quality implications of development proposals.

2.2.7 Moreover, this guidance is particularly applicable to assessing the effect of changes in exposure of members of the public resulting from residential and mixed-use development, particularly those within urban areas where air quality is poorer. Therefore, this guidance has been applied to this AQA.

2016 Air Quality Annual Status Report

2.2.8 The Air Quality Status Report (ASR) include measures the Council has implemented to ensure air quality within the district is not only sustained, but improved.

2.2.9 Datasets included within this report are able to evidence that with regard to Nitrogen Dioxide (NO_2), there is downward trend in concentrations of this pollutant. Since the Malton Air Quality Management Area (AQMA) was declared in December 2009, there has only been an annual exceedance of the air quality objective at one monitoring location within the Malton AQMA.

2.2.10 Ryedale District Council will continue to work closely with service partners to ensure that the objectives laid out in the Malton Air Quality Action Plan are delivered and air quality within the district is continually improved.

2012 Malton Air Quality Action Plan for Ryedale District Council

2.2.11 LAQM forms a key part of the Government's strategies to achieve air quality objectives under the Air Quality (England) Regulations 2000 and 2002. As part of its duties RDC has undertaken reviews and assessments and publish reports of local air quality on a regular basis since 1999.

2.2.12 This Air Quality Action Plan has been developed in accordance with the Councils statutory duty under Section 84(1) of the Environmental Act 1995, to identify measures to be taken to improve air quality in the AQMA in pursuit of compliance with the Air Quality Objectives.

2.2.13 This document contains the action plan for the Malton AQMA. The Action Plan was approved by the Commissioning Board for Ryedale District council on 26 January 2012 and presents an evaluation of the range of air quality improvement measures that have been considered.

2.2.14 A number of measures have been identified for inclusion in the Action Plan and include a range from a major junction improvement scheme to reduce the flow of traffic through the AQMA, to measures that seek to promote less polluting forms of travel, for example school travel plans and awareness raising.

2.2.15 Measures that were proposed for implementation include:

- Action 1 – A64 Brambling Fields Interchange – Junction Improvements
- Action 2a – Heavy Duty Vehicle Restrictions
- Action 2b – One-Way traffic flow restriction with Bus Contra Flow on Norton Road
- Action 2c – A change in the signal timings at Butcher Corner junction traffic lights
- Action 3 – Town Centre 20 mph speed restriction zone
- Action 4 – Travel plans and smarter travel choices campaigns
- Action 5 – School travel – promotion of active travel
- Action 6 – Public Transport improvements
- Action 7 – Provision of Air Quality information
- Action 8 – Planning policy will provide for the protection of air quality
- Action 9 – Idling/ Cut engine/ Cut pollution signage
- Action 10 – Reduce emission from RDC Vehicle Fleet

2.2.16 Other measures have also been identified for further evaluation and possible inclusion in future revisions of the Action Plan. The Council recognised an importance of an ongoing air quality monitoring and periodic reviews of the measures required to achieve acceptable air quality form an important element of the Action Plan.

3. BASELINE CONDITIONS

3.1 Local Highways Network

3.1.1 Malton and Norton are located mid-way between York and Scarborough on the A64, to the south of its junction with the A169. The River Derwent and York to Scarborough railway bisects the twin towns, limiting access between them to County Bridge, located to the North of the railway level crossing. Taken together, Malton and Norton form the largest settlement in the Ryedale District.

3.1.2 There are a number of main roads leading into Malton and Norton. All movement access to the A64 Bypass from York Road west of Malton is not provided. There is no connection provided where the B1257 from Hovingham crosses over the A64 Malton Bypass.

3.1.3 These factors lead to additional traffic travelling through the town centres adding to congestion on the local highway network, for instance:

- Traffic travelling west on the A64 destined for the York Road area of Malton has to exit the A64 at Scagglethorpe or Old Malton and continue through Malton town centre;
- Traffic travelling in either direction on the B1257, accessing the A64, has to travel down Newbiggin/Wheelgate and via either Yorkersgate or Old Maltongate;

3.1.4 Traffic congestion occurs on most days in the two towns, particularly during the weekday peak hours, on market days and Saturday mornings.

3.1.5 Furthermore, freight movement in the area was identified as one of the major activities that contributes to traffic congestion on the local highway network.

3.1.6 Roads and junctions affected by the traffic congestion and thus included within the study area of the AQA are shown in **Figure 2**.

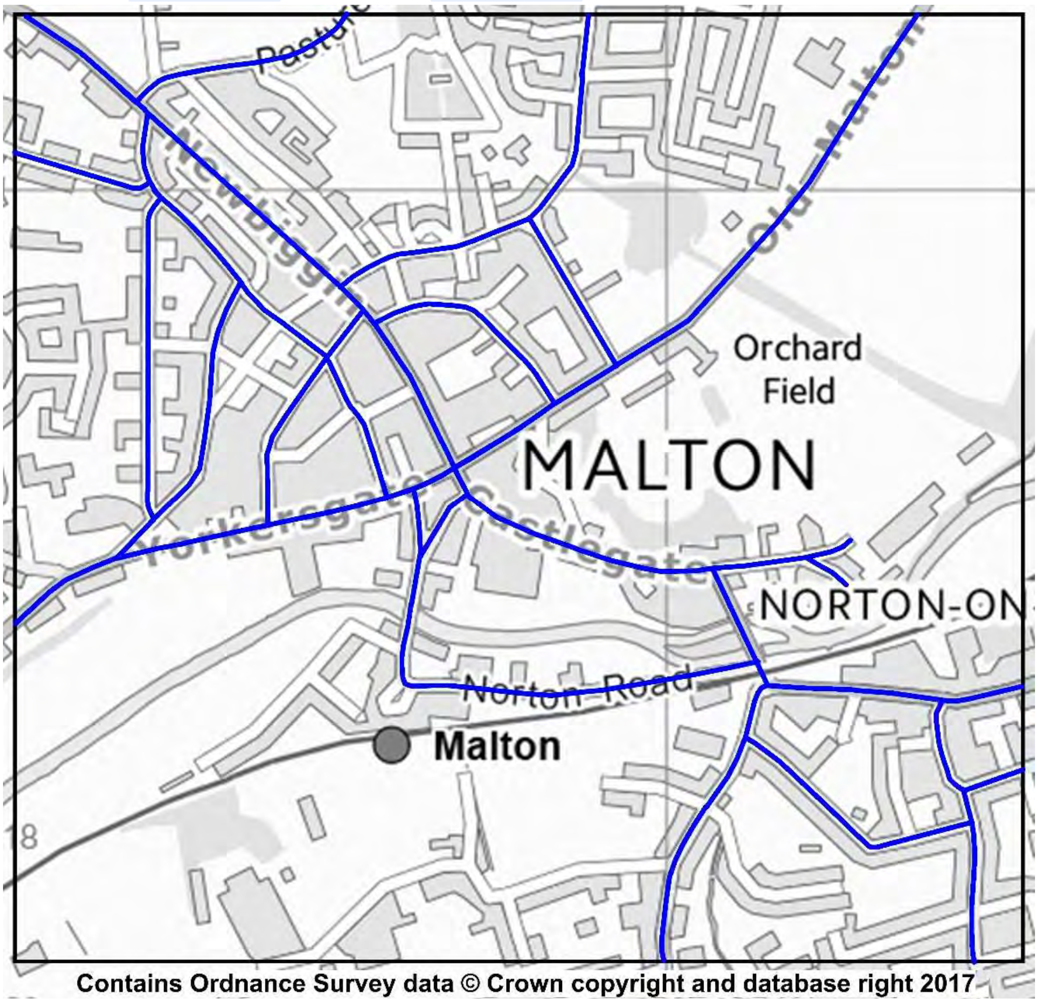


Figure 2. Air Quality Study Area

3.2 Local Air Quality

2016 Air Quality Annual Status Report

Nitrogen Dioxide

3.2.1 RDC is committed to improving air quality within its district. The Annual Status Report (ASR) details measures the Council has implemented to ensure that air quality within the district is improved. Datasets included within this report are able to evidence that with regard to Nitrogen Dioxide, there is downward trend in concentrations of this pollutant.

3.2.2 Since the Malton AQMA was declared in 2009, there has been an annual exceedance of the air quality Objective at one monitoring location within the Malton AQMA - Site NAS9 Yorkersgate. The Annual Mean at this site was 44µg/m^3 in 2015. Levels at eight of the nine sites within AQMA were below the air quality Objective levels.

3.2.3 In 2015, there was a reduction in Annual Mean concentrations at five of the nine sites within the AQMA. An annual mean concentration increase has been noted at the exceedance location (NAS9) within the AQMA, however this was only a marginal increase of 1µg/m^3 on the Annual Mean concentration from the data reported in 2014. The remaining three locations within the AQMA presented no change in Annual Mean concentrations in 2015 when compared to 2014.

3.2.4 All relevant locations outside of the AQMA were all well below the air quality Objective levels.

3.2.5 Details of monitoring data for 2011 to 2015 for Nitrogen Dioxide is shown in Table 3.

Table 3. Annual Mean NO² Monitoring Results (in µgm-³)

Site ID	Site Location	Monitoring Type	Site Within AQMA?	2011	2012	2013	2014	2015
NAS1	Yorkersgate – Castlegate, Butcher Corner	Roadside	Yes	42	41	39	37	37
NAS2	Wheelgate 1	Roadside	Yes	44	42	38	37	37
NAS3	Wheelgate 2	Kerbside	Yes	28	30	27	25	25
NAS4	Old Maltongate 1	Roadside	Yes	38	41	39	n/a	31
NAS5	Old Maltongate 2	Roadside	Yes	41	41	36	36	34
NAS6	Castlegate 1	Roadside	Yes	35	35	32	31	28
NAS7	Castlegate 2	Roadside	Yes	49	48	41	40	38
NAS8	Castlegate 3	Roadside	Yes	41	47	41	39	39
NAS9	Yorkersgate 1	Kerbside	Yes	46	46	43	43	44
NAS10	Yorkersgate 2	Roadside	Yes	31	34	35	30	28
NAS11	Newbiggin	Roadside	No	24	24	22	20	20
NAS12	Church Street	Kerbside	No	24	23	23	24	22
NAS13	Scarborough Road	Roadside	No	25	26	26	27	25
NAS14	Pickering	Roadside	No	27	27	28	26	25
NAS15	Sherburn	Roadside	No	30	31	30	32	30
NAS16	Helmsley	Kerbside	No	22	22	22	22	17
NAS17	Rillington	Roadside	No	22	23	23	24	20
NAS18	Norton	Roadside Urban Background	No	n/a	n/a	n/a	n/a	10

3.2.6 The monitoring data indicates a clear reduction in pollutant concentrations at monitoring sites outside of the AQMA area. This is most likely due to a combination of vehicle improvements and the increased use of the Brambling Fields A64 junction.

Air Quality Management Area

3.2.7 As set out above, the Malton AQMA Order relates to projected levels of Nitrogen Dioxide that breach, or are likely to breach the Nitrogen Dioxide Annual Mean air quality Objective of 40µgm^{-3}.

3.2.8 The order identifies the area designated as an AQMA, which is described as the roads or stretches of roads and includes all the properties, whether residential or commercial, with facades on these roads.

3.2.9 The properties within the AQMA are a mixture of residential and commercial occupancy. However, many of the high street retail outlets and offices within the area have occupied residential flats above ground level. In total, there are an estimated 160 occupied residential units in the AQMA. There are no schools, day nurseries, hospitals or residential care homes within the AQMA.

Particulate Matter ($PM_{2.5}$ and PM_{10})

3.2.10 RDC does not undertake any local monitoring of Particulate Matter.

4. AIR QUALITY ASSESSMENT METHODOLOGY

4.1.1 The setup of an air quality model requires the input of detailed information specifying the baseline conditions, meteorological conditions and required output. This section provides the approach to the AQA and details the assessment methodology.

4.2 Atmospheric Dispersion Modelling

4.2.1 ADMS-Roads has been developed by Cambridge Environmental Research Consultants (CERC) and is used to predict air pollution related to small networks of roads.

4.2.2 The software is currently used by a large number of consultants in the UK and throughout the world, and the methodology is widely accepted within the UK by the Environment Agency and DEFRA.

4.3 ENEVAL (Environmental Evaluation Software)

4.3.1 ENEVAL is an Environmental Assessment Tool, which has been developed by SYSTRA Ltd. The current version is consistent with DEFRA's Emissions Factors Toolkit Version 6.0.2.

4.3.2 ENEVAL can take link and junction-based outputs from a range of different traffic modelling platforms and estimate the likely transport emissions generated by this traffic on a link-by-link basis.

4.3.3 It is primarily designed to work with traffic networks, but can also be used to calculate emissions from public transport networks.

4.3.4 The outputs from ENEVAL can be summarised and reported by road link and disaggregated by vehicle type (e.g. petrol car, diesel car) and fleet type (e.g. petrol car Euroclass VI) giving detailed information on the source of emissions.

4.4 Differences between ADMS and ENEVAL

4.4.1 The ADMS model uses its internal estimates of emissions on all of the different links and its dispersal modelling to predict the air quality concentrations at specific locations, while ENEVAL provides estimates of the changes in emissions on each individual road link.

4.4.2 In theory, both of these sets of model outputs are consistent, apart from:

- the differences between the national average fleet assumptions used in ADMS and the local ANPR-based fleet splits used in ENEVAL – see Chapter 8 for details; and
- *the version of the Emissions Factor Toolkit emissions rates used to predict vehicle emissions as a function of speed in ADMS (EFT V7.0) and ENEVAL (EFT V6.02).*

4.5 Sensitive Receptors

4.5.1 DMRB 11.3.1 notes that, for the purpose of an AQA, sensitive Receptors can be areas within 200m of the roadside where people may be subject to change in air quality. Beyond 200m from the roadside, atmospheric dispersion and chemistry render emissions from road traffic as negligible.

4.5.2 Sensitive Receptors have been selected as robust examples of the worst case pollutant hotspots and include existing properties proximate to modelled roads and properties located within the AQMA .

4.5.3 The Receptor locations are shown in **Figure 3**, further information on each Receptor is provided in **Table 4**.

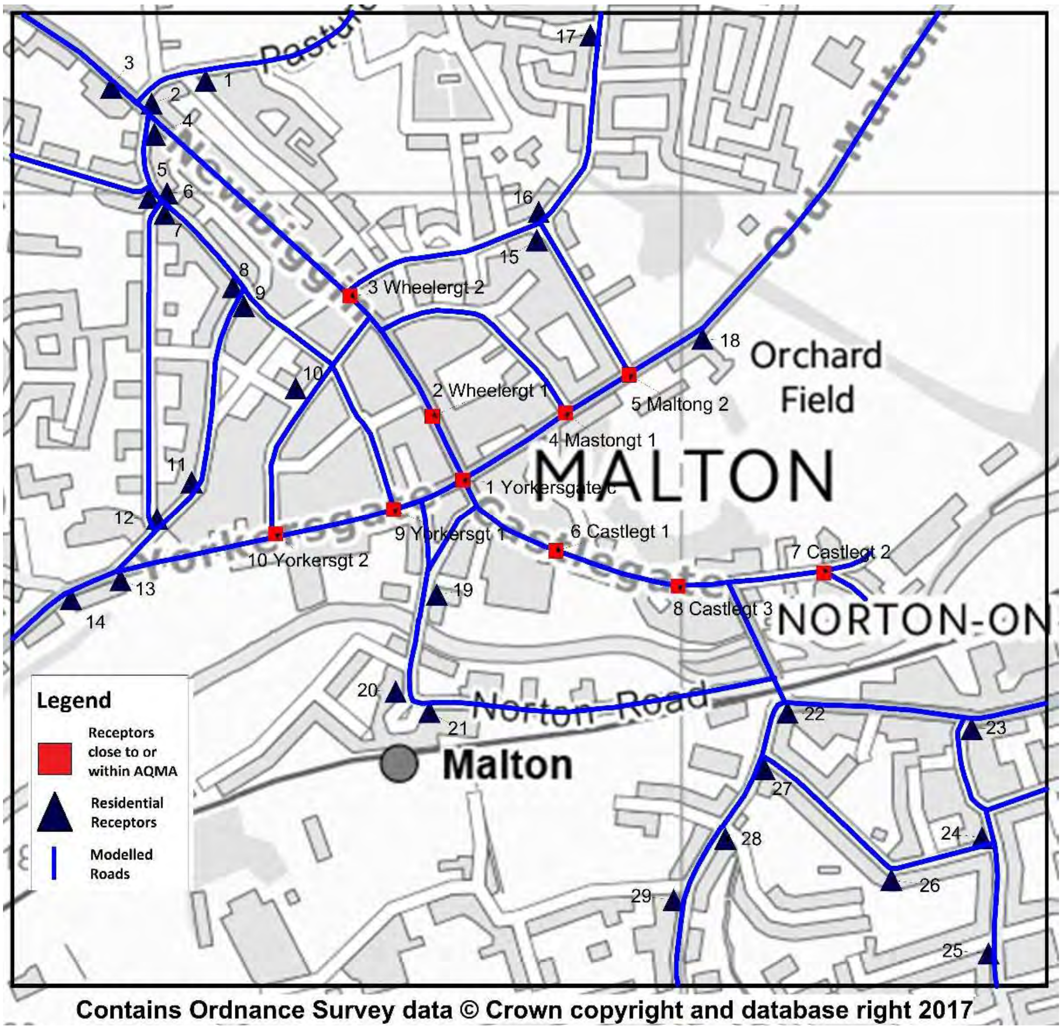


Figure 3. Sensitive Receptor Locations

Table 4. Details of Sensitive Receptor Locations

NAME	LOCATIONS	X COORDINATE	Y COORDINATE
Sensitive Receptors close to/within AQMA			
1 Yorkersgate	Yorgersgate	478742	471663
2 Wheelergt 1	Wheelergate	478706	471738
3 Wheelergt 2	Wheelergate	478609	471880
4 Maltongt 1	Mastongate	478863	471742
5 Maltong 2	Maltonage	478938	471787
6 Castlegt 1	Castlegate	478852	471579
7 Castlegt 2	Castlegate	479168	471553
8 Castlegt 3	Castlegate	478996	471537
9 Yorkersgt 1	Yorkersgate	478660	471628
10 Yorkersg 2	Yorkersage	478521	471599
Existing Residential Properties			
1	Pasture Lane	478429	472141
2	Newbiggin	478364	472108
3	Broughton Rd	478338	472121
4	Middlecave Rd	478374	472083
5	Middlecave Rd	478371	472002
6	Middlecave Rd	478388	471998
7	Middlecave Rd/ The Mount	478366	471998
8	Middlecave Rd	478476	471889
9	Victoria Rd/ Spital Field Ct	478484	471877

NAME	LOCATIONS	X COORDINATE	Y COORDINATE
10	Market Pl	478551	471758
11	Horsemarket Rd	478423	471655
12	Horsemarket Rd/ The Mount	478830	471612
13	Yorkersgate/ Horsemarket Rd	478337	471549
14	Yorkersgate	478278	471527
15	Princess Rd/ E Mount	478828	471957
16	Princess Rd	478834	471975
17	Peasey Hills Rd	478898	472187
18	Old Malton Rd	479029	471839
19	Railway St/ Wells Ln	478700	471537
20	Railway St	478674	471409
21	Railway St/ Norton Rd	478694	471396
22	Church St/ Welham Rd	479123	471392
23	Commercial St/ Wold St	479335	471376
24	Langton Rd St. Nicholas St	479361	471238
25	Langton Rd	479365	471115
26	St. Nicholas St	479245	471201
27	St. Nicholas St/ Welham Rd	479098	471329
28	Welham Rd	479049	471246
29	Welham Rd/ Park Rd	479000	471176

4.6 Model Inputs

Road Sources Information

4.6.1 In order to predict transport related pollution concentrations using ADMS–Roads, the following information was inputted into the model:

- Traffic data
- Vehicle speeds
- Road widths
- Roads elevation
- Street canyons
- Queues
- Time varying emission

4.6.2 Traffic data was obtained from JC and further assessed by SYSTRA's traffic modelling team in order to derive all scenarios required for assessment.

4.6.3 Vehicle speeds were based on the 2015 traffic data, as well as estimated based on the local road network. Due to the presence of pedestrian crossings, junctions and bus stops on local road network, vehicle speeds were reduced in the model to reflect the local road conditions.

4.6.4 Road widths, elevation and street canyons were based on measurements undertaken in Google Maps.

4.6.5 ADMS – Roads 'Advanced street canyon' modelling option was utilised to modify the dispersion of pollutants from a road source according to the presence and properties of canyon walls on one or both sides of the road.

4.6.6 The 'Advance street canyon' differs from the 'basic canyon' modelling in the following ways:

- The model has been formulated to consider a wide range of canyon geometries, including the effect of tall canyons and of canyon asymmetry;
- The concentrations predicted by the model vary with height within the canyon;
- Emissions may be restricted to a subset of the canyon width so that they may be specified only on road lanes and not on pedestrian areas;
- Concentrations both inside and outside a particular street canyon are affected when running this model option.

4.6.7 The study also included queuing effects on affected road sources. Queuing information was based on traffic modelling undertaking by JC. Queues were incorporated into the model for the following roads:

- Yorkersgate
- Market Street
- Old Maltongate
- Newbiggin (north of Pasture Lane)
- Pasture Lane (east of Wentworth Street)

4.6.8 Two sets of time varying emissions were inputted to take account of the following:

- The variation in traffic during the AM and PM peaks – for the whole area.
- The variation in queuing traffic through the day – for queuing traffic data.

4.6.9 Data inputs are included in **Appendix A**.

Meteorological Data

4.6.10 Meteorological data provides hourly sequential data including wind direction, wind speed, temperature, precipitation and the extent of cloud cover for each hour of a given year. As a minimum, ADMS-Road requires wind speed, wind direction, and cloud cover.

4.6.11 Meteorological data has been purchased for 2015 Base Year from the Met Office. Given the location of the study area, the Linton On Ouse Meteorological Station is the most representative. It is located within a built up area and located 14m above sea level (ASL).

4.6.12 A wind rose from the Linton On Ouse station is shown in **Figure 4.**

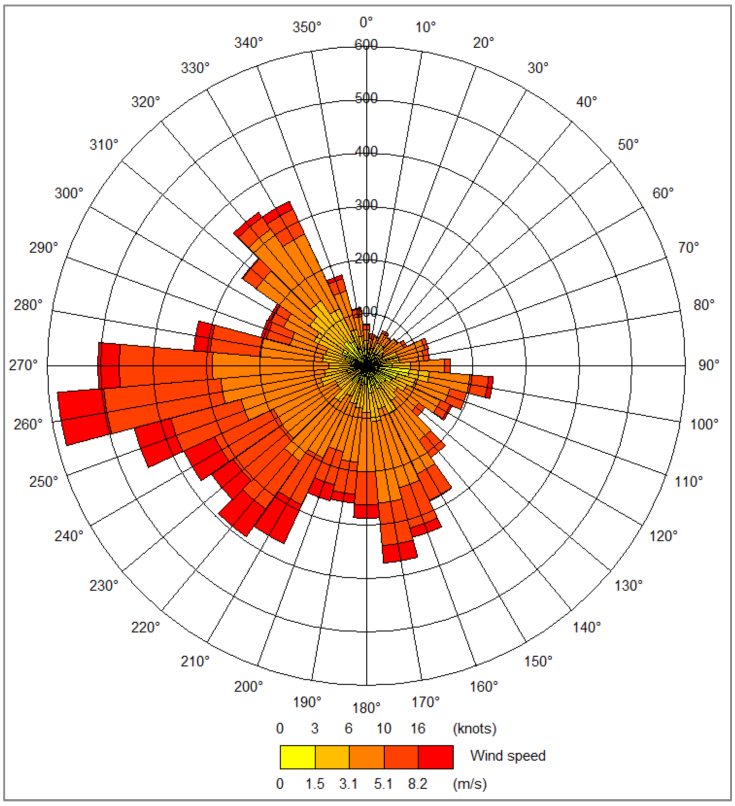


Figure 4. Wind Rose (2015), Linton On Ouse Meteorological Station

4.6.13 There are a number of other parameters that are used within the ADMS-Roads model, as follows:

- The model requires a surface roughness value to be inputted. A value of 1 has been used, which is representative of cities and woodlands.
- The model requires the Monin-Obukhov length (a measure of the stability of the lower atmosphere) to be input. A value of 10m (representative of small towns <50,000) has been used.

Background Concentrations

4.6.14 The ADMS-Roads model requires background pollutant concentration data that corresponds to the year of the assessment.

4.6.15 Local background pollutant concentration data has been obtained from DEFRA, who provide maps to show estimated UK background concentrations of NO_x, NO_2, PM_{10} and $PM_{2.5}$ for each year from 2010 to 2030. Background data is available for each 1km by 1km grid square in each Local Authority area.

4.6.16 In order to illustrate pollution concentrations within the area surrounding the proposed development, background concentrations have been obtained for each sensitive receptor.

4.6.17 **Table 5** provides background concentrations used in the study.

Table 5. Background Concentrations, in 2027 (in μgm^{-3})

RECEPTOR	NO_X	PM_{10}	$PM_{2.5}$
1 Yorkersgate	8.25	12.82	8.84
2 Wheelergt 1	8.25	12.82	8.84
3 Wheelergt 2	8.25	12.82	8.84
4 Maltongt 1	8.25	12.82	8.84
5 Maltong 2	8.25	12.82	8.84
6 Castlegt 1	8.25	12.82	8.84
7 Castlegt 2	9.31	12.90	9.05
8 Castlegt 3	8.25	12.82	8.84
9 Yorkersgt 1	8.25	12.82	8.84
10 Yorkersg 2	8.25	12.82	8.84

1	8.25	13.33	9.05
2	8.25	13.33	9.05
3	8.25	13.33	9.05
4	8.25	13.33	9.05
5	8.25	13.33	9.05
6	8.25	12.82	8.84
7	8.25	12.82	8.84
8	8.25	12.82	8.84
9	8.25	12.82	8.84
10	8.25	12.82	8.84
11	8.25	12.82	8.84
12	8.25	12.82	8.84
13	8.25	12.82	8.84
14	8.25	12.82	8.84
15	8.25	12.82	8.84
16	8.25	12.82	8.84
17	8.25	13.33	9.05
18	9.31	12.90	9.05
19	8.25	12.82	8.84
20	8.25	12.82	8.84
21	8.25	12.82	8.84
22	9.31	12.90	9.05
23	9.31	12.90	9.05

24	9.31	12.90	9.05
25	9.31	12.90	9.05
26	9.31	12.90	9.05
27	9.31	12.90	9.05
28	9.31	12.90	9.05
29	9.31	12.90	9.05

ANPR SURVEYS / ENEVAL METHODOLOGY

4.6.18 An Automatic Number Plate Recognition (ANPR) Survey was undertaken at the intersection of Castlegate and Sheepfoot Hill in Malton, to provide a detailed breakdown of the relevant traffic by engine size, fuel type, age and Euro Class.

4.6.19 The survey period covered four days from the 4th to 7th November, comprising two weekdays and a Saturday and Sunday. The data was collected at a single location, namely the Castlegate/Sheepfoot Hill junction, shown in Figure 5. The use of only one location assumes that there is no significant variation in the vehicle age or engine size mix in different areas of the air quality study area.

Figure 5. Location of ANPR Survey Site

4.6.20 The survey captured over 38,000 vehicles over the four-day period and the data was combined to provide traffic data for an average day of the week (including weekends). Each vehicle is allocated a vehicle type, fuel type and emissions Euro Class rating based on its number plate.

4.6.21 The fleet splits determined from the ANPR survey serve two purposes.

4.6.22 Firstly, the local fleet make-up provides information to make recommendations based on the current situation.

4.6.23 Secondly, the vehicle age and emissions category profiles have been used to update the 2016 fleet type data splits and to determine how they change over time within ENEVAL. ENEVAL applies the local fleet splits to the traffic volumes provided via the SATURN highway models providing a detailed breakdown of local emissions across the modelled network.

5. ADMS MODEL VERIFICATION

5.1 Verification Methodology

5.1.1 Model verification involves the process of comparing monitored and modelled pollutant concentrations for the same year and at the same locations. Model verification is necessary in order to identify any required adjustment factor to apply to the modelled results.

5.1.2 The verification process was undertaken in line with the LAQM,TG(09/16) methodology included in Annex 3: Modelling (A3.223).

5.1.3 As documented within the LAQM.TG(09/16), differences between the modelled and monitored concentrations may arise for a number of reasons:

- Background concentration estimates;
- Meteorological data uncertainties;
- Traffic data uncertainties;
- Model input parameters such as roughness length, minimum Monin-Obukhov and overall model limitations; and
- Monitoring data uncertainties, particularly diffusion tubes.

5.1.4 For the purpose of the verification process, four diffusion tube sites have been selected as representative for the study area and the local road network, as set out in **Table 6**.

Table 6. Diffusion Tubes Included in the Model Verification Exercise

Site ID	Site Location	Monitoring Type	Site Within AQMA?	2015 Annual Mean NO_2
NAS1	Yorkersgate – Castlegate, Butcher Corner	Roadside	Yes	37
NAS6	Castlegate 1	Roadside	Yes	28
NAS8	Castlegate 3	Roadside	Yes	39
NAS9	Yorkersgate 1	Kerbside	Yes	44

5.1.5 The verification process has been undertaken for the Base Year 2015. Predicted road-based NO_x concentrations were calculated from the ADMS dispersion model, and these were converted to NO_2 concentrations using the DEFRA NO_x/NO_2 spreadsheet calculator. The resultant NO_2 modelled concentrations are compared with the 2015 monitored concentrations from the diffusion tubes at four selected sites in **Table 7**.

Table 7. Model Verification Result for Annual Mean NO_2 (2015)

Site ID	Total Monitored NO_2	Total Modelled NO_2	% Difference
NAS1	37	45.16	22.1
NAS6	28	30.11	-2.9
NAS8	39	40.05	17.8
NAS9	44	34.69	23.9

5.1.6 The results indicate that the modelled concentrations over predict at three sites (NAS1, NAS9 and NAS9) and under-predict slightly at one site (NAS6). LAQM.TG (09/16) suggests that the majority of the modelled results should be within 25%. Since the modelled results fall within 25% of the monitored results, no adjustment factor is required for application to the model.

6. ADMS MODELLING ASSESSMENTS RESULTS

6.1 Introduction

6.1.1 This section of the report discusses the assessment results derived using the ADMS dispersion model. The results indicate the modelled calculated pollutant concentrations at the specific Receptor locations within the study area for each development scenario set out in **Table 1**. A copy of all results are included at **Appendix B**.

6.1.2 The results should be compared with the NAQS Objectives listed in **Table 2** and summarised below as follows,

- NO_2 Annual Mean not to exceed 40µgm^{-3} by 31st December 2005
- PM_{10} Annual Mean not to exceed 40µgm^{-3} by 31st December 2004
- PM_{10} average daily concentrations not to exceed 50µgm^{-3} more than 35 times per year by 31st December, 2004
- $PM_{2.5}$ Annual Mean not to exceed 25µgm^{-3} by 2020.

6.2 Comparison of Scenario 3 and 7 Development Scenarios in 2027

6.2.1 **Tables 8 – 11** provide a comparison of the two development Scenarios (3 and 7) for all pollutants (PM_{10}, $PM_{2.5}$, NO_2) against each of the complementary measure scenarios – 'Do-Nothing', 'OGV 1/2 Ban', 'OGV2 Ban' and 'All Complementary Measures', respectively.

General

6.2.2 The modelled pollutant concentrations are all well within the Objective levels, even within the AQMA area. This indicates that whichever Scenario comes to fruition, there are no air quality concerns with regards to the anticipated Local Plan development allocations to 2027.

Receptors Outside the AQMA

6.2.3 It is evident that for all modelled complementary measure scenarios in 2027, there is negligible difference in the air quality pollutant results between Scenario 3 and Scenario 7 (the most realistic and robust combination of development that will come forward by 2027). This can be expected given that the two scenarios are similar in development terms, both focussing on development in Norton.

6.2.4 The general reduction in pollutant concentrations at Receptors outside the AQMA area compared to those within the AQMA area are consistent with the area monitoring site data outlined in **Table 3**.

Receptors Within the AQMA

6.2.5 The generally higher concentrations modelled at Receptors in the AQMA area can be expected due to the following reasons:

- The AQMA Receptors are located on streets flanked by building on both sides i.e. street canyons. Street canyons result in increased concentrations of emissions due to reduced ventilation and dispersion.
- The urban topography and microclimate of the AQMA area contribute to the creation of poor air quality dispersion conditions giving rise to contamination hotspots.
- For robustness, the Receptors have been modelled at ground level where concentrations of pollutants are greatest, thus accentuating pollutant concentrations.
- The AQMA area, specifically includes links with significant traffic queues, and therefore modelled receptors will be exposed to the poorest air quality within the ADMS model.

6.2.6 The specifically higher pollutant concentrations evident at Receptors 1, 9 and 10 in the AQMA area, particularly for Nitrogen Dioxide, are most likely due to an accentuated combination of the factors outlined above at these locations.

6.2.7 It is evident that within the AQMA, the Particulate Matter concentrations vary slightly between Scenario 3 and Scenario 7, with several more notable differences in results for Nitrogen Dioxide.

6.2.8 Overall, the differences in Particulate Matter concentrations between Scenarios 3 and 7 are not significant enough to support the selection of one development scenario over the other.

6.2.9 In terms of Nitrogen Dioxide, the Scenario preference varies on a Receptor by Receptor and highway intervention basis. This can be expected given that each development scenario will alter traffic distribution and thus effect pollutant concentrations at specific Receptors differently. The 'Do-Nothing' and 'OGV2 Ban' results indicate an overall preference for Scenario 7, whereas the 'OGV1 and 2 Ban' results indicate an overall preference for Scenario 3. However, there is no significant distinction to determine the preferred development scenario.

Table 8. 2027 'Do Nothing' Modelled Annual Mean Concentration of Pollutants (in µgm^{-3})

Receptor	Do Nothing								
	S3 PM_{10}	**S7 PM_{10}**	S7-S3 Diff.	S3 $PM_{2.5}$	**S7 $PM_{2.5}$**	S7 – S3 Diff.	S3 NO_2	**S7 NO_2**	S7-S3 Diff.
1 Yorkersgate	18.25	**18.45**	0.20	11.82	**11.93**	0.11	22.31	**22.90**	0.59
2 Wheelergt 1	14.23	**14.43**	0.20	9.61	**9.72**	0.11	9.72	**10.42**	0.70
3 Wheelergt 2	16.19	**16.22**	0.04	10.66	**10.68**	0.02	13.11	**13.18**	0.07
4 Maltongt 1	14.14	**15.30**	1.16	9.56	**10.21**	0.65	9.49	**14.43**	4.94
5 Maltong 2	15.44	**15.33**	-0.11	10.26	**10.21**	-0.06	12.65	**12.50**	-0.15
6 Castlegt 1	15.48	**15.51**	0.02	10.28	**10.30**	0.01	11.86	**12.05**	0.19
7 Castlegt 2	14.04	**14.04**	-0.00	9.68	**9.68**	0.00	10.12	**10.14**	0.02
8 Castlegt 3	16.06	**16.05**	-0.01	10.60	**10.60**	0.00	14.02	**14.08**	0.06
9 Yorkersgt 1	16.82	**17.33**	0.51	11.03	**11.32**	0.29	18.43	**20.79**	2.36
10 Yorkersg 2	16.21	**16.08**	-0.13	10.69	**10.62**	-0.07	16.50	**16.28**	-0.22
1	14.65	**14.28**	-0.38	9.79	**9.58**	-0.21	11.03	**9.52**	-1.51
2	15.05	**15.05**	-0.00	9.99	**9.99**	0.00	10.63	**10.65**	0.02
3	15.31	**15.32**	0.01	10.14	**10.14**	0.00	11.89	**11.92**	0.03
4	14.14	**14.14**	-0.00	9.49	**9.49**	0.00	8.07	**8.08**	0.01
5	13.94	**13.95**	0.01	9.38	**9.39**	0.01	7.52	**7.56**	0.04
6	13.22	**13.23**	0.01	9.06	**9.07**	0.00	7.05	**7.08**	0.03
7	13.26	**13.27**	0.01	9.08	**9.08**	0.01	7.12	**7.15**	0.03
8	13.28	**13.29**	0.01	9.09	**9.10**	0.01	7.19	**7.23**	0.04
9	13.08	**13.09**	0.01	8.98	**8.99**	0.01	6.73	**6.78**	0.05
10	13.06	**13.08**	0.02	8.97	**8.99**	0.01	6.91	**7.02**	0.11
11	13.02	**13.03**	0.01	8.95	**8.96**	0.01	6.61	**6.68**	0.07
12	13.09	**13.16**	0.07	8.99	**9.03**	0.04	6.79	**7.12**	0.33
13	13.73	**13.73**	0.00	9.33	**9.33**	0.00	7.89	**7.92**	0.03
14	13.95	**13.98**	0.03	9.45	**9.46**	0.02	8.26	**8.32**	0.06
15	13.08	**13.10**	0.03	8.98	**8.99**	0.01	6.70	**6.79**	0.09
16	13.31	**13.34**	0.03	9.11	**9.13**	0.02	7.22	**7.33**	0.11
17	13.70	**13.71**	0.01	9.25	**9.26**	0.01	6.94	**6.97**	0.03
18	13.51	**13.49**	-0.02	9.38	**9.37**	-0.01	8.23	**8.21**	-0.02
19	14.06	**14.08**	0.02	9.51	**9.52**	0.01	9.12	**9.26**	0.14
20	13.29	**13.28**	-0.00	9.10	**9.09**	0.00	7.28	**7.30**	0.02
21	13.67	**13.64**	-0.03	9.31	**9.29**	-0.02	8.41	**8.36**	-0.05
22	13.79	**13.75**	-0.04	9.53	**9.51**	-0.02	8.67	**8.60**	-0.07
23	14.08	**14.09**	0.00	9.69	**9.69**	0.00	9.28	**9.30**	0.02
24	13.51	**13.45**	-0.06	9.38	**9.35**	-0.03	8.08	**7.93**	-0.15
25	13.29	**13.28**	-0.01	9.26	**9.26**	0.00	7.54	**7.53**	-0.01
26	13.28	**13.20**	-0.08	9.26	**9.22**	-0.04	7.57	**7.38**	-0.19
27	13.61	**13.51**	-0.10	9.44	**9.39**	-0.05	8.62	**8.32**	-0.30
28	13.29	**13.24**	-0.04	9.26	**9.24**	-0.02	7.52	**7.44**	-0.08
29	13.21	**13.18**	-0.03	9.22	**9.20**	-0.02	7.34	**7.27**	-0.07

Table 9. 2027 'OGV1/2 Ban' Modelled Annual Mean Concentration of Pollutants (in μgm-3)

Receptor	HGV Ban OGV1 and OGV2								
	S3 PM_{10}	S7 **PM_{10}**	S7-S3 Diff.	S3 $PM_{2.5}$	S7 **$PM_{2.5}$**	S7-S3 Diff.	S3 NO_2	S7 **NO_2**	S7-S3 Diff.
1 Yorkersgate	18.47	**18.44**	-0.03	11.95	**11.93**	-0.02	24.01	**23.67**	-0.34
2 Wheelergt 1	14.23	**14.31**	0.08	9.61	**9.65**	0.05	9.81	**10.10**	0.29
3 Wheelergt 2	15.86	**16.04**	0.17	10.48	**10.58**	0.09	12.61	**12.92**	0.31
4 Maltongt 1	14.35	**14.48**	0.13	9.67	**9.74**	0.07	10.14	**10.56**	0.42
5 Maltong 2	16.20	**16.12**	-0.08	10.67	**10.63**	-0.04	14.19	**14.01**	-0.18
6 Castlegt 1	14.84	**14.83**	-0.01	9.94	**9.94**	-0.01	10.98	**10.96**	-0.02
7 Castlegt 2	13.87	**13.87**	-0.01	9.59	**9.59**	0.00	9.82	**9.81**	-0.01
8 Castlegt 3	15.18	**15.15**	-0.03	10.13	**10.12**	-0.02	12.41	**12.34**	-0.07
9 Yorkersgt 1	17.17	**17.41**	0.24	11.23	**11.36**	0.13	19.79	**20.88**	1.09
10 Yorkersg 2	17.10	**16.23**	-0.86	11.19	**10.71**	-0.48	19.93	**16.66**	-3.27
1	14.66	**14.58**	-0.08	9.79	**9.75**	-0.04	10.93	**10.58**	-0.35
2	15.10	**15.05**	-0.05	10.02	**9.99**	-0.03	10.75	**10.62**	-0.13
3	15.47	**15.17**	-0.30	10.23	**10.06**	-0.17	12.47	**11.35**	-1.12
4	14.15	**14.14**	-0.01	9.50	**9.49**	0.00	8.09	**8.07**	-0.02
5	13.93	**13.93**	0.00	9.38	**9.38**	0.00	7.50	**7.51**	0.01
6	13.22	**13.22**	0.00	9.06	**9.06**	0.00	7.04	**7.04**	0.00
7	13.25	**13.25**	0.00	9.07	**9.07**	0.00	7.10	**7.11**	0.01
8	13.28	**13.29**	0.01	9.09	**9.10**	0.00	7.23	**7.24**	0.01
9	13.09	**13.09**	0.00	8.99	**8.99**	0.00	6.78	**6.78**	0.00
10	13.09	**13.09**	0.00	8.99	**8.99**	0.00	7.05	**7.04**	-0.01
11	13.03	**13.02**	-0.01	8.96	**8.95**	-0.01	6.70	**6.66**	-0.04
12	13.13	**13.14**	0.00	9.01	**9.02**	0.00	7.10	**7.11**	0.01
13	13.68	**13.68**	0.01	9.30	**9.31**	0.00	7.80	**7.82**	0.02
14	13.82	**13.87**	0.05	9.37	**9.40**	0.03	7.99	**8.10**	0.11
15	13.10	**13.09**	-0.01	8.99	**8.99**	0.00	6.79	**6.78**	-0.01
16	13.34	**13.33**	-0.01	9.12	**9.12**	0.00	7.32	**7.31**	-0.01
17	13.72	**13.71**	0.00	9.26	**9.26**	0.00	6.98	**6.97**	-0.01
18	13.71	**13.70**	-0.01	9.49	**9.49**	-0.01	8.67	**8.64**	-0.03
19	13.98	**13.97**	-0.01	9.47	**9.47**	-0.01	9.16	**9.13**	-0.03
20	13.23	**13.22**	-0.01	9.07	**9.06**	0.00	7.24	**7.21**	-0.03
21	13.56	**13.54**	-0.02	9.25	**9.24**	-0.01	8.26	**8.19**	-0.07
22	13.67	**13.61**	-0.06	9.47	**9.44**	-0.03	8.50	**8.36**	-0.14
23	13.99	**13.96**	-0.03	9.65	**9.63**	-0.02	9.18	**9.11**	-0.07
24	13.41	**13.34**	-0.07	9.33	**9.29**	-0.04	7.85	**7.68**	-0.17
25	13.28	**13.26**	-0.02	9.26	**9.25**	-0.01	7.52	**7.49**	-0.03
26	13.16	**13.08**	-0.08	9.19	**9.15**	-0.04	7.29	**7.09**	-0.20
27	13.50	**13.39**	-0.11	9.38	**9.32**	-0.06	8.23	**7.88**	-0.35
28	13.28	**13.23**	-0.05	9.26	**9.23**	-0.02	7.51	**7.40**	-0.11
29	13.21	**13.17**	-0.04	9.22	**9.20**	-0.02	7.35	**7.26**	-0.09

Table 10. 2027 'OGV2 Ban Only' Modelled Annual Mean Concentration of Pollutants (in µgm^{-3})

Receptor	OGV2 Ban								
	S3 PM_{10}	S7 PM_{10}	S7-S3 Diff.	S3 $PM_{2.5}$	S7 $PM_{2.5}$	S7-S3 Diff.	S3 NO_2	S7 NO_2	S7-S3 Diff.
1 Yorkersgate	18.50	**18.96**	0.46	11.96	**12.21**	0.25	23.70	**24.39**	0.69
2 Wheelergt 1	14.20	**14.42**	0.21	9.60	**9.71**	0.12	9.86	**10.39**	0.53
3 Wheelergt 2	16.07	**16.14**	0.07	10.60	**10.63**	0.04	12.98	**13.03**	0.05
4 Maltongt 1	14.54	**15.90**	1.36	9.78	**10.53**	0.75	11.13	**16.31**	5.18
5 Maltong 2	15.74	**14.83**	-0.90	10.43	**9.93**	-0.49	13.34	**11.14**	-2.20
6 Castlegt 1	15.33	**15.31**	-0.02	10.20	**10.19**	-0.01	11.74	**11.70**	-0.04
7 Castlegt 2	14.00	**13.99**	0.00	9.66	**9.66**	0.00	10.06	**10.05**	-0.01
8 Castlegt 3	15.84	**15.81**	-0.03	10.49	**10.47**	-0.02	13.63	**13.55**	-0.08
9 Yorkersgt 1	16.92	**17.04**	0.11	11.10	**11.16**	0.06	19.75	**20.30**	0.55
10 Yorkersg 2	15.88	**15.71**	-0.16	10.52	**10.43**	-0.09	15.83	**15.40**	-0.43
1	14.49	**14.44**	-0.05	9.70	**9.67**	-0.03	10.35	**10.09**	-0.26
2	15.04	**14.98**	-0.06	9.99	**9.95**	-0.04	10.62	**10.38**	-0.24
3	15.40	**15.04**	-0.37	10.19	**9.99**	-0.21	12.28	**10.83**	-1.45
4	14.14	**14.14**	0.00	9.49	**9.49**	0.00	8.07	**8.05**	-0.02
5	13.95	**13.95**	0.01	9.39	**9.39**	0.00	7.54	**7.56**	0.02
6	13.23	**13.23**	0.00	9.06	**9.06**	0.00	7.06	**7.07**	0.01
7	13.26	**13.26**	0.01	9.08	**9.08**	0.00	7.13	**7.15**	0.02
8	13.30	**13.30**	-0.01	9.10	**9.10**	0.00	7.26	**7.25**	-0.01
9	13.10	**13.09**	0.00	8.99	**8.99**	0.00	6.79	**6.78**	-0.01
10	13.09	**13.08**	-0.01	8.99	**8.98**	-0.01	7.05	**7.02**	-0.03
11	13.03	**13.02**	-0.01	8.96	**8.95**	0.00	6.69	**6.66**	-0.03
12	13.15	**13.16**	0.01	9.02	**9.03**	0.01	7.11	**7.14**	0.03
13	13.73	**13.72**	0.00	9.33	**9.33**	0.00	7.90	**7.90**	0.00
14	13.94	**13.96**	0.03	9.44	**9.45**	0.01	8.23	**8.30**	0.07
15	13.10	**13.10**	0.00	8.99	**8.99**	0.00	6.79	**6.79**	0.00
16	13.34	**13.34**	0.00	9.12	**9.12**	0.00	7.32	**7.32**	0.00
17	13.72	**13.71**	-0.01	9.26	**9.26**	0.00	6.98	**6.96**	-0.02
18	13.57	**13.55**	-0.02	9.42	**9.40**	-0.01	8.38	**8.34**	-0.04
19	13.31	**13.30**	-0.01	9.11	**9.10**	-0.01	7.46	**7.41**	-0.05
20	13.28	**13.26**	-0.02	9.09	**9.08**	-0.01	7.31	**7.26**	-0.05
21	13.66	**13.62**	-0.05	9.30	**9.28**	-0.03	8.44	**8.31**	-0.13
22	13.76	**13.73**	-0.04	9.52	**9.50**	-0.02	8.65	**8.55**	-0.10
23	14.07	**14.07**	0.00	9.68	**9.69**	0.00	9.28	**9.28**	0.00
24	13.49	**13.43**	-0.06	9.37	**9.34**	-0.03	8.03	**7.90**	-0.13
25	13.29	**13.28**	-0.01	9.26	**9.26**	0.00	7.55	**7.53**	-0.02
26	13.26	**13.18**	-0.08	9.25	**9.21**	-0.04	7.52	**7.34**	-0.18
27	13.59	**13.50**	-0.09	9.43	**9.38**	-0.05	8.53	**8.26**	-0.27
28	13.29	**13.24**	-0.05	9.26	**9.24**	-0.02	7.54	**7.43**	-0.11
29	13.21	**13.17**	-0.04	9.22	**9.20**	-0.02	7.36	**7.27**	-0.09

Table 11. 2027 'All Schemes' Modelled Annual Mean Concentration of Pollutants (in µgm-3)

Receptor	All Schemes								
	S3 PM_{10}	**S7 PM_{10}**	S7-S3 Diff.	S3 $PM_{2.5}$	**S7 $PM_{2.5}$**	S7-S3 Diff.	S3 NO_2	**S7 NO_2**	S7-S3 Diff.
1 Yorkersgate	17.90	**17.86**	-0.04	11.63	**11.62**	-0.02	22.28	**22.28**	0.00
2 Wheelergt 1	13.93	**13.84**	-0.10	9.45	**9.40**	-0.05	9.08	**8.97**	-0.11
3 Wheelergt 2	15.81	**15.88**	0.07	10.45	**10.49**	0.04	12.44	**12.56**	0.12
4 Maltongt 1	13.96	**14.01**	0.05	9.46	**9.49**	0.03	9.05	**9.19**	0.14
5 Maltong 2	15.68	**15.53**	-0.16	10.39	**10.30**	-0.08	12.94	**12.57**	-0.37
6 Castlegt 1	14.99	**14.99**	-0.01	10.03	**10.02**	0.00	11.31	**11.29**	-0.02
7 Castlegt 2	13.89	**13.88**	-0.01	9.60	**9.60**	0.00	9.86	**9.84**	-0.02
8 Castlegt 3	15.33	**15.31**	-0.02	10.22	**10.21**	-0.01	12.81	**12.76**	-0.05
9 Yorkersgt 1	16.83	**16.68**	-0.15	11.04	**10.96**	-0.08	18.88	**18.48**	-0.40
10 Yorkersg 2	19.20	**19.00**	-0.20	12.37	**12.26**	-0.11	28.78	**28.27**	-0.51
1	14.84	**14.71**	-0.13	9.89	**9.82**	-0.07	11.74	**11.10**	-0.64
2	15.08	**15.07**	-0.01	10.00	**10.00**	0.00	10.70	**10.67**	-0.03
3	15.07	**15.07**	-0.01	10.00	**10.00**	0.00	10.94	**10.92**	-0.02
4	14.16	**14.15**	-0.00	9.50	**9.50**	0.00	8.13	**8.12**	-0.01
5	13.93	**13.93**	-0.00	9.38	**9.38**	0.00	7.51	**7.52**	0.01
6	13.22	**13.22**	-0.00	9.06	**9.06**	0.00	7.06	**7.05**	-0.01
7	13.25	**13.25**	-0.00	9.07	**9.07**	0.00	7.12	**7.12**	0.00
8	13.28	**13.28**	0.00	9.09	**9.09**	0.00	7.24	**7.22**	-0.02
9	13.09	**13.09**	0.00	8.99	**8.99**	0.00	6.81	**6.79**	-0.02
10	13.12	**13.11**	-0.01	9.01	**9.00**	-0.01	7.21	**7.17**	-0.04
11	13.10	**13.07**	-0.03	8.99	**8.98**	-0.02	7.01	**6.88**	-0.13
12	13.12	**13.12**	0.00	9.01	**9.01**	-0.00	7.03	**7.04**	0.01
13	13.68	**13.67**	-0.01	9.30	**9.30**	-0.00	7.86	**7.83**	-0.03
14	13.80	**13.84**	0.03	9.37	**9.39**	0.02	8.00	**8.06**	0.06
15	13.13	**13.12**	0.00	9.01	**9.01**	0.00	6.85	**6.84**	-0.01
16	13.34	**13.32**	-0.02	9.12	**9.11**	-0.01	7.30	**7.26**	-0.04
17	13.65	**13.64**	-0.01	9.23	**9.22**	0.00	6.82	**6.81**	-0.01
18	13.68	**13.66**	-0.01	9.47	**9.47**	-0.01	8.57	**8.54**	-0.03
19	14.00	**13.98**	-0.01	9.48	**9.48**	-0.01	9.22	**9.18**	-0.04
20	13.24	**13.24**	-0.01	9.07	**9.07**	-0.01	7.30	**7.27**	-0.03
21	13.58	**13.56**	-0.02	9.26	**9.25**	-0.01	8.33	**8.27**	-0.06
22	13.67	**13.62**	-0.05	9.47	**9.44**	-0.03	8.50	**8.37**	-0.13
23	14.00	**13.96**	-0.05	9.65	**9.63**	-0.02	9.19	**9.09**	-0.10
24	13.39	**13.33**	-0.06	9.32	**9.28**	-0.03	7.80	**7.65**	-0.15
25	13.27	**13.26**	-0.01	9.25	**9.25**	-0.01	7.51	**7.49**	-0.02
26	13.14	**13.07**	-0.07	9.18	**9.14**	-0.04	7.23	**7.05**	-0.18
27	13.47	**13.38**	-0.09	9.36	**9.31**	-0.05	8.11	**7.84**	-0.27
28	13.27	**13.23**	-0.05	9.25	**9.23**	-0.03	7.51	**7.39**	-0.12
29	13.20	**13.17**	-0.04	9.22	**9.20**	-0.02	7.35	**7.25**	-0.10

6.3 Comparison of Highway Interventions (Complementary Measures)

6.3.1 **Tables 12 – 17** provide a comparison of the results for all pollutants (PM_{10}, $PM_{2.5}$, NO_2) for each of the modelled complementary measure scenarios – 'Do-Nothing', 'OGV 1/2 Ban', 'OGV2 Ban' and 'All Complementary Measures', respectively. The comparison is undertaken for each Development Scenario (3 and 7) in isolation.

Scenario 3

6.3.2 **Tables 12-14** show the change in pollution concentration levels at Receptors for each complementary measure against the 'Do-Nothing' for Scenario 3.

Receptors Outside the AQMA

6.3.3 It is evident that generally, for all modelled complementary measures in 2027, there is negligible difference in the air quality pollutant results in comparison to the 'Do-nothing' scenario. This means the highway intervention measures will not have a significant effect on air quality at Receptors outside the AQMA area.

Receptors Within the AQMA

6.3.4 Within the AQMA, the complementary measures generally create a mixture of slight improvements or slight deteriorations in Nitrogen Dioxide and Particulate Matter concentrations at the various Receptors. This variation is because of the net effect of the trade-off between the traffic reduction and the lower speeds (due to the reduced road capacity) which differ by location.

6.3.5 The exception to this pattern of 'small ±change' is at Receptor 10 (Yorkersgate 2), where the 'All Measures' combination of measures is predicted to increase NO_2 concentrations by 74%, from around 16.5µgm^{-3} to 28.8µgm^{-3}, which would give this location the poorest NO_2-related air quality (and is significantly worse than any location in the Do Nothing scenario). (*There is also a notable slight increase in Particulate Matter concentrations at Receptor 10 in the 'All Measures' scenario*). This increase is because the traffic speeds close to this location are slowed down significantly by the reduction in junction capacity, resulting in an increase in NO_X emissions due to the additional congestion far outweighing the benefits from the reduction in traffic at these locations.

6.3.6 This predicted increase in NO_2 concentrations (*and slight increase in Particulate Matter)* at this one location is sufficient to outweigh the small net benefits created elsewhere by the 'All Measures' package. For this reason, it would be inadvisable to implement the full set of traffic management measures included in this package. It may, however, be possible to identify a subset of these measures which performs better than this full package.

6.3.7 The tables below show that the two versions of the proposed HGV ban result in small reductions or increases in concentrations of Particulate Matter and Nitrogen Dioxide at each Receptor, suggesting that in no significant benefit of introducing either version of the HGV ban. Neither version of the HGV ban should therefore be taken forward in the form modelled here.

Table 12. Change in NO_2 Pollutant Level Compared to Do-Nothing – Scenario 3 (in μgm-3)

Scenario 3				
Receptor	Do-Nothing	NO_2 Results		
		OGV1/2 Ban	OGV2 Ban	All Schemes
1 Yorkersgate c	22.31	1.70	1.39	-0.03
2 Wheelergt 1	9.72	0.09	0.14	-0.64
3 Wheelergt 2	13.11	-0.50	-0.13	-0.67
4 Maltongt 1	9.49	0.65	1.64	-0.44
5 Maltong 2	12.65	1.54	0.69	0.29
6 Castlegt 1	11.86	-0.88	-0.12	-0.55
7 Castlegt 2	10.12	-0.30	-0.06	-0.26
8 Castlegt 3	14.02	-1.61	-0.39	-1.21
9 Yorkersgt 1	18.43	1.36	1.32	0.45
10 Yorkersgt 2	16.50	3.43	-0.67	12.28
1	11.03	-0.10	-0.68	0.71
2	10.63	0.12	-0.01	0.07
3	11.89	0.58	0.39	-0.95
4	8.07	0.02	0.00	0.06
5	7.52	-0.02	0.02	-0.01
6	7.05	-0.01	0.01	0.01
7	7.12	-0.02	0.01	0.00
8	7.19	0.04	0.07	0.05
9	6.73	0.05	0.06	0.08
10	6.91	0.14	0.14	0.30
11	6.61	0.09	0.08	0.40
12	6.79	0.31	0.32	0.24
13	7.89	-0.09	0.01	-0.03
14	8.26	-0.27	-0.03	-0.26
15	6.70	0.09	0.09	0.15
16	7.22	0.10	0.10	0.08
17	6.94	0.04	0.04	-0.12
18	8.23	0.44	0.15	0.34
19	9.12	0.04	-1.66	0.10
20	7.28	-0.04	0.03	0.02
21	8.41	-0.15	0.03	-0.08
22	8.67	-0.17	-0.02	-0.17
23	9.28	-0.10	0.00	-0.09
24	8.08	-0.23	-0.05	-0.28
25	7.54	-0.02	0.01	-0.03
26	7.57	-0.28	-0.05	-0.34
27	8.62	-0.39	-0.09	-0.51
28	7.52	-0.01	0.02	-0.01
29	7.34	0.01	0.02	0.01

Table 13. Change in PM_{10} Pollutant Level Compared to Do-Minimum – Scenario 3 (in μgm^{-3})

Scenario 3				
Receptor	Do-Minimum	PM_{10} Results		
		OGV1/2 Ban	OGV2 Ban	All Schemes
1 Yorkersgate c	18.25	0.22	0.25	-0.35
2 Wheelergt 1	14.23	0.00	-0.03	-0.29
3 Wheelergt 2	16.19	-0.32	-0.11	-0.38
4 Maltongt 1	14.14	0.21	0.40	-0.18
5 Maltong 2	15.44	0.76	0.30	0.24
6 Castlegt 1	15.48	-0.64	-0.15	-0.49
7 Castlegt 2	14.04	-0.16	-0.04	-0.15
8 Castlegt 3	16.06	-0.88	-0.22	-0.74
9 Yorkersgt 1	16.82	0.35	0.11	0.01
10 Yorkersgt 2	16.21	0.89	-0.33	2.99
1	14.65	0.00	-0.16	0.18
2	15.05	0.05	-0.01	0.02
3	15.31	0.15	0.09	-0.24
4	14.14	0.01	0.00	0.01
5	13.94	-0.01	0.00	-0.01
6	13.22	-0.01	0.00	0.00
7	13.26	-0.01	0.00	-0.01
8	13.28	0.00	0.02	0.00
9	13.08	0.01	0.01	0.01
10	13.06	0.03	0.03	0.06
11	13.02	0.01	0.01	0.08
12	13.09	0.04	0.06	0.03
13	13.73	-0.05	0.00	-0.05
14	13.95	-0.13	-0.01	-0.14
15	13.08	0.03	0.02	0.05
16	13.31	0.03	0.03	0.02
17	13.70	0.02	0.02	-0.04
18	13.51	0.21	0.06	0.17
19	14.06	-0.08	-0.75	-0.06
20	13.29	-0.05	-0.01	-0.04
21	13.67	-0.11	-0.01	-0.09
22	13.79	-0.12	-0.02	-0.12
23	14.08	-0.09	-0.01	-0.08
24	13.51	-0.10	-0.02	-0.12
25	13.29	-0.01	0.00	-0.01
26	13.28	-0.12	-0.02	-0.14
27	13.61	-0.11	-0.03	-0.14
28	13.29	-0.01	0.00	-0.01
29	13.21	0.00	0.00	0.00

Table 14. Change in $PM_{2.5}$ Pollutant Level Compared to Do-Minimum – Scenario 3 (in μgm^{-3})

Scenario 3				
Receptor	Do-Minimum	$PM_{2.5}$ Results		
		OGV1/2 Ban	0GV 2 Ban	All Schemes
1 Yorkersgate c	11.82	0.13	0.14	-0.18
2 Wheelergt 1	9.61	0.00	-0.01	-0.16
3 Wheelergt 2	10.66	-0.17	-0.06	-0.20
4 Maltongt 1	9.56	0.11	0.22	-0.10
5 Maltong 2	10.26	0.41	0.16	0.13
6 Castlegt 1	10.28	-0.34	-0.08	-0.26
7 Castlegt 2	9.68	-0.09	-0.02	-0.08
8 Castlegt 3	10.60	-0.47	-0.12	-0.39
9 Yorkersgt 1	11.03	0.19	0.06	0.01
10 Yorkersgt 2	10.69	0.50	-0.18	1.67
1	9.79	0.00	-0.09	0.10
2	9.99	0.03	0.00	0.01
3	10.14	0.09	0.05	-0.14
4	9.49	0.00	0.00	0.01
5	9.38	-0.01	0.00	-0.01
6	9.06	0.00	0.00	0.00
7	9.08	-0.01	0.00	-0.01
8	9.09	0.00	0.01	0.00
9	8.98	0.00	0.01	0.01
10	8.97	0.02	0.02	0.03
11	8.95	0.01	0.01	0.04
12	8.99	0.03	0.03	0.02
13	9.33	-0.03	0.00	-0.03
14	9.45	-0.07	-0.01	-0.08
15	8.98	0.01	0.01	0.03
16	9.11	0.02	0.02	0.01
17	9.25	0.01	0.01	-0.02
18	9.38	0.11	0.03	0.09
19	9.51	-0.04	-0.40	-0.03
20	9.10	-0.03	0.00	-0.02
21	9.31	-0.06	0.00	-0.05
22	9.53	-0.06	-0.01	-0.06
23	9.69	-0.05	-0.01	-0.04
24	9.38	-0.06	-0.01	-0.06
25	9.26	-0.01	0.00	-0.01
26	9.26	-0.07	-0.01	-0.08
27	9.44	-0.06	-0.01	-0.08
28	9.26	0.00	0.00	-0.01
29	9.22	0.00	0.00	0.00

Scenario 7

6.3.8 **Tables 15-17** show the change in pollution concentration levels at Receptors for each complementary measure against the 'Do-Nothing' for Scenario 7.

Receptors Outside the AQMA

6.3.9 It is evident that generally, for all modelled complementary measures in 2027, as indicated tor Scenario 3, there is negligible difference in the air quality pollutant results in comparison to the 'Do-Nothing' scenario. This means the highway intervention measures will not have a significant effect on air quality at Receptors outside the AQMA area.

Receptors Within the AQMA

6.3.10 The same pattern is evident as that in Scenario 3, with a mix of small ±changes at most receptors, except from Receptor 10 (Yorkersgate 2), where the 'All Schemes' package significantly increases $N0_2$-related air quality, with a 12 μgm^{-3} (74%) increase in predicted Nitrogen Dioxide concentrations at this location and notable increases in Particulate Matter.

6.3.11 These increases again outweigh the small benefits created elsewhere in the town by the package of traffic management measures, suggesting strongly that this full package of traffic management measures should not be introduced in the form tested here.

6.3.12 The tables below show that the two versions of the proposed HGV ban result in small reductions or increases in concentrations of Particulate Matter and Nitrogen Dioxide at each Receptor, suggesting that in no significant benefit of introducing either version of the HGV ban. Neither version of the HGV ban should therefore be taken forward in the form modelled here.

Table 15. Change in NO_2 Pollutant Level Compared to Do-Minimum – Scenario 7 (in µgm[-3])

Scenario 7				
Receptor	Do-Minimum	NO_2 Results		
		OGV1/2 Ban	OGV2 Ban	All Schemes
1 Yorkersgate c	22.90	0.77	1.49	-0.62
2 Wheelergt 1	10.42	-0.32	-0.03	-1.45
3 Wheelergt 2	13.18	-0.26	-0.15	-0.62
4 Maltongt 1	14.43	-3.87	1.88	-5.24
5 Maltong 2	12.50	1.51	-1.36	0.07
6 Castlegt 1	12.05	-1.09	-0.35	-0.76
7 Castlegt 2	10.14	-0.33	-0.09	-0.30
8 Castlegt 3	14.08	-1.74	-0.53	-1.32
9 Yorkersgt 1	20.79	0.09	-0.49	-2.31
10 Yorkersgt 2	16.28	0.38	-0.88	11.99
1	9.52	1.06	0.57	1.58
2	10.65	-0.03	-0.27	0.02
3	11.92	-0.57	-1.09	-1.00
4	8.08	-0.01	-0.03	0.04
5	7.56	-0.05	0.00	-0.04
6	7.08	-0.04	-0.01	-0.03
7	7.15	-0.04	0.00	-0.03
8	7.23	0.01	0.02	-0.01
9	6.78	0.00	0.00	0.01
10	7.02	0.02	0.00	0.15
11	6.68	-0.02	-0.02	0.20
12	7.12	-0.01	0.02	-0.08
13	7.92	-0.10	-0.02	-0.09
14	8.32	-0.22	-0.02	-0.26
15	6.79	-0.01	0.00	0.05
16	7.33	-0.02	-0.01	-0.07
17	6.97	0.00	-0.01	-0.16
18	8.21	0.43	0.13	0.33
19	9.26	-0.13	-1.85	-0.08
20	7.30	-0.09	-0.04	-0.03
21	8.36	-0.17	-0.05	-0.09
22	8.60	-0.24	-0.05	-0.23
23	9.30	-0.19	-0.02	-0.21
24	7.93	-0.25	-0.03	-0.28
25	7.53	-0.04	0.00	-0.04
26	7.38	-0.29	-0.04	-0.33
27	8.32	-0.44	-0.06	-0.48
28	7.44	-0.04	-0.01	-0.05
29	7.27	-0.01	0.00	-0.02

Table 16. Change in PM_{10} Pollutant Level Compared to Do-Minimum – Scenario 7 (in μgm^{-3})

Scenario 7				
Receptor	Do-Minimum	PM_{10} Results		
		OGV1/2 Ban	OGV2 Ban	All Schemes
1 Yorkersgate c	18.45	-0.01	0.51	-0.59
2 Wheelergt 1	14.43	-0.12	-0.02	-0.60
3 Wheelergt 2	16.22	-0.19	-0.08	-0.35
4 Maltongt 1	15.30	-0.83	0.59	-1.29
5 Maltong 2	15.33	0.79	-0.49	0.20
6 Castlegt 1	15.51	-0.68	-0.20	-0.52
7 Castlegt 2	14.04	-0.17	-0.04	-0.15
8 Castlegt 3	16.05	-0.90	-0.25	-0.74
9 Yorkersgt 1	17.33	0.08	-0.29	-0.65
10 Yorkersgt 2	16.08	0.15	-0.37	2.92
1	14.28	0.30	0.16	0.43
2	15.05	-0.01	-0.08	0.01
3	15.32	-0.15	-0.28	-0.25
4	14.14	0.00	-0.01	0.01
5	13.95	-0.02	0.00	-0.02
6	13.23	-0.01	0.00	-0.01
7	13.27	-0.02	0.00	-0.02
8	13.29	0.00	0.00	-0.01
9	13.09	0.00	0.00	0.00
10	13.08	0.00	0.00	0.03
11	13.03	-0.01	-0.01	0.04
12	13.16	-0.02	0.00	-0.04
13	13.73	-0.05	-0.01	-0.06
14	13.98	-0.11	-0.02	-0.14
15	13.10	-0.01	0.00	0.02
16	13.34	-0.01	-0.01	-0.03
17	13.71	0.00	0.00	-0.07
18	13.49	0.22	0.06	0.18
19	14.08	-0.11	-0.78	-0.09
20	13.28	-0.06	-0.02	-0.05
21	13.64	-0.10	-0.02	-0.08
22	13.75	-0.14	-0.02	-0.13
23	14.09	-0.12	-0.01	-0.13
24	13.45	-0.11	-0.02	-0.12
25	13.28	-0.02	0.00	-0.02
26	13.20	-0.12	-0.02	-0.13
27	13.51	-0.12	-0.02	-0.14
28	13.24	-0.01	0.00	-0.02
29	13.18	-0.01	0.00	-0.01

Table 17. Change in $PM_{2.5}$ Pollutant Level Compared to Do-Minimum – Scenario 7 (in µgm[-3])

Scenario 7				
Receptor	Do-Minimum	$PM_{2.5}$ Results		
		OGV1/2 Ban	OGV2 Ban	All Schemes
1 Yorkersgate c	11.93	-0.01	0.28	-0.32
2 Wheelergt 1	9.72	-0.07	-0.01	-0.32
3 Wheelergt 2	10.68	-0.10	-0.04	-0.19
4 Maltongt 1	10.21	-0.47	0.32	-0.72
5 Maltong 2	10.21	0.42	-0.27	0.10
6 Castlegt 1	10.30	-0.36	-0.10	-0.27
7 Castlegt 2	9.68	-0.09	-0.02	-0.08
8 Castlegt 3	10.60	-0.48	-0.13	-0.39
9 Yorkersgt 1	11.32	0.04	-0.16	-0.36
10 Yorkersgt 2	10.62	0.09	-0.20	1.64
1	9.58	0.17	0.09	0.24
2	9.99	0.00	-0.04	0.01
3	10.14	-0.08	-0.16	-0.14
4	9.49	0.00	0.00	0.01
5	9.39	-0.01	0.00	-0.01
6	9.07	-0.01	0.00	-0.01
7	9.08	-0.01	0.00	-0.01
8	9.10	0.00	0.00	-0.01
9	8.99	0.00	0.00	0.00
10	8.99	0.00	0.00	0.02
11	8.96	0.00	0.00	0.02
12	9.03	-0.01	0.00	-0.02
13	9.33	-0.03	0.00	-0.03
14	9.46	-0.06	-0.01	-0.08
15	8.99	0.00	0.00	0.01
16	9.13	-0.01	0.00	-0.02
17	9.26	0.00	0.00	-0.04
18	9.37	0.12	0.03	0.09
19	9.52	-0.06	-0.42	-0.05
20	9.09	-0.03	-0.01	-0.02
21	9.29	-0.05	-0.01	-0.04
22	9.51	-0.07	-0.01	-0.07
23	9.69	-0.06	-0.01	-0.07
24	9.35	-0.06	-0.01	-0.06
25	9.26	-0.01	0.00	-0.01
26	9.22	-0.06	-0.01	-0.07
27	9.39	-0.07	-0.01	-0.08
28	9.24	-0.01	0.00	-0.01
29	9.20	0.00	0.00	-0.01

7. ADMS MODELLING SENSITIVITY TEST

7.1 Overview

7.1.1 As part of the air quality modelling assessment, a sensitivity test for Nitrogen Dioxide has been undertaken for all Scenario 3 assessments in order to consider the potential implication for no reduced future trends in NO_2 concentrations versus the official projected reductions built into the ADMS model. Given the similarity between Scenario 3 and 7 results, here we report the results of this sensitivity test applied to Scenario 3 only.

7.1.2 The sensitivity test was undertaken by modelling the 2027 Scenario 3 assessments set to 2016 in the ADMS model rather than 2027.

7.1.3 **Tables 18 – 20** indicate the results of the Nitrogen Dioxide sensitivity test, for each of the complementary measures scenarios modelled for Scenario 3.

Table 18. Scenario 3 'Do Nothing' Nitrogen Dioxide Sensitivity Test **(in µgm^{-3})**

Receptor	Do Nothing		
	Original NO_2 Results	Sensitivity Test NO_2 Results	Difference
1 Yorkersgate	22.31	**64.11**	**41.80**
2 Wheelergt 1	9.72	20.56	+10.84
3 Wheelergt 2	13.11	33.33	+20.22
4 Maltongt 1	9.49	20.57	+11.08
5 Maltong 2	12.65	33.39	+20.74
6 Castlegt 1	11.86	26.46	+14.60
7 Castlegt 2	10.12	19.15	+9.03
8 Castlegt 3	14.02	35.57	+21.55
9 Yorkersgt 1	18.43	**56.50**	**+38.07**
10 Yorkersg 2	16.50	**50.36**	**+33.86**
1	11.03	22.83	+11.80
2	10.63	20.96	+10.33
3	11.89	25.33	+13.44
4	8.07	12.75	+4.68
5	7.52	11.67	+4.15
6	7.05	10.03	+2.98
7	7.12	10.10	+2.98
8	7.19	11.86	+4.67
9	6.73	9.32	+2.59
10	6.91	10.13	+3.22

11	6.61	8.82	+2.21
12	6.79	9.15	+2.36
13	7.89	13.72	+5.83
14	8.26	14.29	+6.03
15	6.70	8.56	+1.86
16	7.22	10.45	+3.23
17	6.94	9.44	+2.50
18	8.23	13.26	+5.03
19	9.12	18.24	+9.12
20	7.28	10.67	+3.39
21	8.41	14.71	+6.30
22	8.67	14.32	+5.65
23	9.28	15.86	+6.58
24	8.08	11.22	+3.14
25	7.54	9.50	+1.96
26	7.57	9.61	+2.04
27	8.62	13.88	+5.26
28	7.52	9.98	+2.46
29	7.34	9.29	+1.95

Table 19. Scenario 3 'OGV 1 and 2 Ban' Nitrogen Dioxide Sensitivity Test (in **μgm^{-3}**)

Receptor	**OGV1/2 Ban**		
	Original NO_2 Results	**Sensitivity Test NO_2 Results**	**Difference**
1 Yorkersgate	24.01	**72.45**	**+48.44**
2 Wheelergt 1	9.81	23.10	+13.29
3 Wheelergt 2	12.61	30.58	+17.97
4 Maltongt 1	10.14	25.47	+15.33
5 Maltong 2	14.19	**44.47**	**+30.28**
6 Castlegt 1	10.98	19.75	+8.77
7 Castlegt 2	9.82	16.56	+6.74
8 Castlegt 3	12.41	23.19	+10.78
9 Yorkersgt 1	19.79	**61.77**	**+41.98**
10 Yorkersg 2	19.93	**60.40**	**+40.47**
1	10.93	21.21	+10.28
2	10.75	21.91	+11.16
3	12.47	27.92	+15.45

4	8.09	12.97	+4.88
5	7.50	11.58	+4.08
6	7.04	9.95	+2.91
7	7.10	10.04	+2.94
8	7.23	11.94	+4.71
9	6.78	9.51	+2.73
10	7.05	10.67	+3.62
11	6.70	9.23	+2.53
12	7.10	10.54	+3.44
13	7.80	13.52	+5.72
14	7.99	13.62	+5.63
15	6.79	8.97	+2.18
16	7.32	10.94	+3.62
17	6.98	9.74	+2.76
18	8.67	17.25	+8.58
19	9.16	16.94	+7.78
20	7.24	9.42	+2.18
21	8.26	11.78	+3.52
22	8.50	12.58	+4.08
23	9.18	14.51	+5.33
24	7.85	10.42	+2.57
25	7.52	9.42	+1.90
26	7.29	8.64	+1.35
27	8.23	12.23	+4.00
28	7.51	9.87	+2.36
29	7.35	9.27	+1.92

Table 20. Scenario 3 'OGV 2 Ban' Nitrogen Dioxide Sensitivity Test (in µgm^{-3})

Receptor	OGV 2 Ban		
	Original NO_2 Results	**Sensitivity Test NO_2 Results**	**Difference**
1 Yorkersgate	23.70	**68.87**	**+45.17**
2 Wheelergt 1	9.86	21.33	+11.47
3 Wheelergt 2	12.98	32.40	+19.42
4 Maltongt 1	11.13	27.63	+16.50
5 Maltong 2	13.34	37.72	+24.38
6 Castlegt 1	11.74	25.22	+13.48

7 Castlegt 2	10.06	18.61	+8.55
8 Castlegt 3	13.63	32.74	+19.11
9 Yorkersgt 1	19.75	**62.23**	**+42.48**
10 Yorkersg 2	15.83	**48.30**	**+32.47**
1	10.35	20.13	+9.78
2	10.62	20.94	+10.32
3	12.28	26.61	+14.33
4	8.07	12.78	+4.71
5	7.54	11.78	+4.24
6	7.06	10.13	+3.07
7	7.13	10.20	+3.07
8	7.26	12.27	+5.01
9	6.79	9.65	+2.86
10	7.05	10.82	+3.77
11	6.69	9.23	+2.54
12	7.11	10.62	+3.51
13	7.90	13.87	+5.97
14	8.23	14.38	+6.15
15	6.79	8.97	+2.18
16	7.32	10.93	+3.61
17	6.98	9.75	+2.77
18	8.38	14.46	+6.08
19	7.46	12.17	-4.71
20	7.31	10.62	+3.31
21	8.44	14.45	+6.01
22	8.65	14.01	+5.36
23	9.28	15.68	+6.40
24	8.03	11.04	+3.01
25	7.55	9.53	+1.98
26	7.52	9.44	+1.92
27	8.53	13.35	+4.82
28	7.54	10.04	+2.50
29	7.36	9.36	+2.00

Table 21. Scenario 3 'All Schemes' Nitrogen Dioxide Sensitivity Test (in µgm^{-3})

Receptor	All Schemes		
	Original NO_2 Results	Sensitivity Test NO_2 Results	Difference
1 Yorkersgate	22.28	**65.10**	**+42.82**
2 Wheelergt 1	9.08	20.06	+10.98
3 Wheelergt 2	12.44	31.09	+18.65
4 Maltongt 1	9.05	20.53	+11.48
5 Maltong 2	12.94	**40.00**	**+27.06**
6 Castlegt 1	11.31	20.49	+9.18
7 Castlegt 2	9.86	15.99	+6.13
8 Castlegt 3	12.81	20.51	+7.70
9 Yorkersgt 1	18.88	**58.11**	**+39.23**
10 Yorkersg 2	28.78	**89.45**	**+60.67**
1	11.74	25.91	+14.17
2	10.70	22.23	+11.53
3	10.94	23.28	+12.34
4	8.13	13.19	+5.06
5	7.51	11.70	+4.19
6	7.06	10.10	+3.04
7	7.12	10.14	+3.02
8	7.24	12.20	+4.96
9	6.81	9.76	+2.95
10	7.21	11.48	+4.27
11	7.01	10.79	+3.78
12	7.03	10.10	+3.07
13	7.86	13.84	+5.98
14	8.00	13.70	+5.70
15	6.85	9.32	+2.47
16	7.30	11.05	+3.75
17	6.82	9.24	+2.42
18	8.57	16.85	+8.28
19	9.22	17.19	+7.97
20	7.30	9.71	+2.41
21	8.33	12.06	+3.73

22	8.50	12.49	+3.99
23	9.19	14.63	+5.44
24	7.80	10.37	+2.57
25	7.51	9.40	+1.89
26	7.23	8.54	+1.31
27	8.11	11.71	+3.60
28	7.51	9.84	+2.33
29	7.35	9.28	+1.93

7.2 Results and Current Status of Projected Nitrogen Oxide / Dioxide Emissions

7.2.1 The results of the Nitrogen Dioxide sensitivity test for all complementary scenarios indicate a significant difference in results, when assuming no future reduction in Nitrogen Dioxide i.e. 2027 traffic modelled as 2016 in the ADMS model. However, generally, the pollutant concentrations remain well below the Objective level at the majority of Receptors.

7.2.2 The sensitivity test indicates that specific Nitrogen Dioxide Objective exceedances occur at Receptors 1, 5, 9 and 10 in the AQMA area. These Receptors also indicate high Nitrogen Dioxide concentrations in the general ADMS modelling. The presence of street canyons, queuing traffic and the urban topography and microclimate of the AQMA contribute to the creation of poor air quality dispersion conditions and higher pollutant concentrations. Therefore, the high concentrations at these Receptors are accentuated further in the sensitivity test due to the 2027 traffic scenarios (with traffic growth) being modelled in 2016 (and thus using current emission factors) in the ADMS model.

7.2.3 DEFRA has recently published a note on projecting NO_2 concentrations to address concerns that background concentrations and vehicle emissions were not reducing with time at the rate the LAQM.TG(09) had estimated. Recent analysis of historical monitoring data has identified a disparity between the measured concentrations and the projected decline in concentrations associated with the emissions forecasts. Trends in ambient concentrations of NO_x and NO_2 in the UK have generally shown two characteristics: a decrease in concentration from around 1996 to 2002/2004, followed by a period of more stable concentrations from 2002/2004 up until 2009.

7.2.4 As a whole, urban roadside sites show evidence that NO_x concentrations have declined very weakly over the past six to eight years. NO_x concentrations at urban background sites broadly reflect the same trend, and have been close to stable over this same period. For NO_2, levels have largely remained stable at urban roadside and background sites, but show a slight upward trend in inner London. At monitoring sites close to motorways and dual-carriageways, there is evidence that NO_x concentrations have fallen at some, but not all locations, while NO_2 concentrations have levelled off.

7.2.5 In all cases there are differences between individual sites (with some showing upward or downward trends) but overall, there is little evidence of a consistent downward trend in either NO_x or NO_2 concentrations, that would be suggested by emission inventory estimates.

7.2.6 This disparity is thought to be related to the actual on-road performance of diesel road vehicles when compared with 'factory tests' of the Euro 5/V standards. Preliminary studies suggest that:

- NO_x emissions from petrol vehicles appear to be in line with current projections and have decreased by 96% since the introduction of the 3 way catalysts in 1993;
- NO_x emissions from diesel cars, under urban driving conditions, do not appear to have declined substantially, up to and including Euro 5. There is limited evidence that the same pattern may occur for motorway driving conditions.
- The proportion of NO_2 within the overall NOx emissions has increased over time, so that a decrease in NO_X emissions does not automatically lead to a reduction in the concentration of roadside NO_2.
- NO_x emissions from HGV vehicles equipped with SCR reduction are much higher than expected when driving at low speeds.

7.2.7 The note indicates that it may be appropriate to use a combination of assumptions about both background concentrations and emissions factors where, both background and roadside monitoring data do not appear to be declining. However, this approach is likely to be overly conservative especially beyond 2017. Methodologies commonly employed include maintaining background concentrations at current year levels, and/or basing future year vehicle emissions on current year emissions factors.

7.2.8 On the basis of the recent DEFRA note and the fact that local monitoring data for Ryedale District indicates a general reduction in pollutant levels in the AQMA (see **Table 3**), the fact that the sensitivity test reveals pollutant exceedances at four specific Receptor points in the AQMA is not considered an issue, particularly given the likely exacerbation of key contributors to pollution at these points. The ADMS model was set up to provide the worst case results in terms of queuing, low road speeds, an assumed average vehicle length of 6m, advanced street canyons etc. (see Section 4.5); hence this coupled with the 2027 Scenarios run in 2016 (Emissions Factor Toolkit 7.0 - assuming no improvements in vehicle technology or vehicle renewal from the current position) means the model has provided an extremely robust sensitivity assessment, which is overly conservative. This has increased the emissions significantly at specific worst-case Receptor points, in some cases over-predicting, particularly at street canyon locations where the ventilation and dispersion of pollutants is reduced.

8. ANPR SURVEY OUTPUTS

8.1 Introduction

8.1.1 This chapter assesses the results of the ANPR survey and their implications both for current year recommendations and for use in ENEVAL to generate forecast emissions. The chapter is split into two sections

- Key results of the ANPR survey; and
- How the fleet splits from the ANPR survey change over time.

8.2 ANPR Output Analysis

8.2.1 The ANPR survey captured over 38,000 vehicles over the course of the four-day duration. These records have been expanded to represent an average day of the week.

8.2.2 Over 80% of the total number of vehicles were cars, predominantly petrol or diesel, with a very small number of electric cars recorded. LGVs make up a further 14.5%, with these being almost all diesel (99%). HGVs make up less than 1% of the total number of vehicles recorded, with buses a further 0.3%.

8.2.3 **Table 22** and **Figure 6** show the vehicle splits from the ANPR survey.

Table 22. ANPR Vehicle Splits

VEHICLE TYPE	SHARE OF TOTAL
Petrol Car	43.9%
Diesel Car	40.5%
Electric Car	0.1%
LGV	14.5%
HGV	0.8%
Buses	0.3%

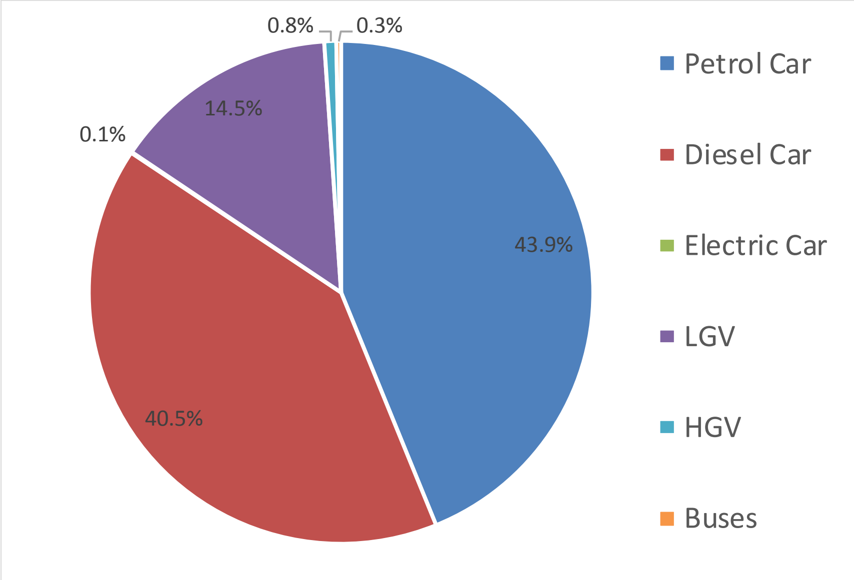


Figure 6. ANPR Vehicle Splits

8.2.4 **Table 23** shows the main vehicles types split by Euro Class rating. Vehicles that are pre-Euro Class V contribute the most per vehicle to emissions. **Table 23** shows that that:

- 15% of car, 17% of LGVs and 15% of all vehicles are pre Euro Class IV; and
- 51% of car, 47% of LGVs and 51% of all vehicles are pre Euro Class V.

Table 23. Euro Class Splits by Vehicle Type

CLASS	CAR	LGV	HGV	TOTAL	CAR	LGV	HGV	TOTAL
Pre-Euro	78	11	0	89	0%	0%	0%	0%
Euro I	147	47	0	193	0%	0%	0%	0%
Euro II	1,044	76	4	1,123	2%	1%	1%	2%
Euro III	7,151	1,569	44	8,763	13%	16%	9%	13%
Euro IV	20,561	2,902	133	23,596	36%	30%	26%	35%
Euro V	19,946	4,929	321	25,196	35%	51%	63%	38%
Euro VI	7,472	167	5	7,643	13%	2%	1%	11%
Total	56,397	9,699	506	66,601	100%	100%	100%	100%

8.2.5 Therefore, any Euro Class-based ban or restrictions would have to be considered with the number of vehicles affected in mind. Banning all pre Euro Class V vehicles from the centre of Malton would have a large impact on emissions and air quality, but would prove unpopular.

8.2.6 **Table 24** shows the splits by fuel type from the ANPR survey. The diesel figures include cars, LGVs and HGVs, whereas the petrol figures only include cars and LGVs.

8.2.7 Overall, there are more diesel vehicles in the ANPR survey than petrol. The difference can largely be attributed to the LGV's which are mostly diesel-based (99%). 7% of the total fleet are pre-Euro Class IV diesel vehicles and 24% are pre-Euro Class V. These are likely to represent the most polluting vehicles, in terms of NO_2 and PM_{10}s.

Table 24. Euro Class Splits by Fuel Type

CLASS	PETROL	DIESEL	TOTAL	PETROL	DIESEL	TOTAL	PETROL	DIESEL	TOTAL
	Number of Vehicles			Percentage of Total Vehicles			Percentage of Fuel Type		
Pre-Euro	47	7	53	0%	0%	0%	0%	0%	0%
Euro I	86	107	193	0%	0%	0%	0%	0%	0%
Euro II	741	383	1,123	1%	1%	2%	3%	1%	2%
Euro III	4,453	4,310	8,763	7%	6%	13%	15%	12%	13%
Euro IV	11,941	11,655	23,596	18%	18%	35%	41%	31%	35%
Euro V	8,857	16,339	25,196	13%	25%	38%	30%	44%	38%
Euro VI	3,224	4,419	7,643	5%	7%	11%	11%	12%	11%
Total	29,348	37,218	66,566	44%	56%	100%	100%	100%	100%

8.3 ANPR-Based 2014 And 2027 Fleet Splits

8.3.1 The 2016 ANPR-based vehicle splits have been used, in combination with the fleet split trends within the Emissions Factor Toolkit (EFT), to estimate the fleet split in Malton in 2014[2] and 2027. These fleet splits have been input to ENEVAL and applied to the predicted traffic conditions in 2014 and 2027, to form the basis of the detailed emissions analysis in Chapter 9.

8.3.2 This section looks at how the ANPR fleet splits are likely to have changed since 2014 and how they are predicted to change by 2027 and the potential impacts of these changes for Malton and Norton.

8.3.3 The fleet changes between 2016 and 2014 are relatively small, consisting primarily of the removal of Euro 6/VI vehicles (which started to appear in the fleet in late 2014).

8.3.4 **Table 25** shows the vehicle type splits derived from the ANPR-survey, compared to those in the EFT v6.0.2. The figures for the ANPR-based splits for 2027 have been interpolated by applying trends within the EFT v6.0.2 to the 2016 ANPR-based splits.

[2] 2014 was the available Base Year of the traffic model used here

8.3.5 The key differences between the two datasets (ANPR versus EFT) are:

- A slightly higher proportion of petrol and diesel cars in the Ryedale District compared to the national average;
- A slightly higher proportion of diesel LGVs, appearing to compensate for a lower share of both rigid and articulated HGVs;
- A lower proportion of electric vehicles, both cars and LGVs;
- A lower proportion of buses.

Table 25. Vehicle Type Split Comparison – EFT vs ANPR

ID	VEHICLE TYPE	2016			2027		
		EFT v6.0.2	ANPR-Based	Difference	EFT v6.0.2	ANPR-Based	Difference
1	Electric Car	0.1%	0.1%	0.0%	0.7%	0.9%	0.2%
2	Petrol Car	43.1%	43.9%	0.8%	39.9%	37.1%	-2.8%
3	Diesel Car	39.9%	40.5%	0.7%	41.8%	46.0%	4.2%
4	Electric LGV	0.1%	0.0%	-0.1%	0.5%	0.0%	-0.5%
5	Petrol LGV	0.3%	0.1%	-0.2%	0.2%	0.0%	-0.2%
6	Diesel LGV	13.0%	14.4%	1.4%	13.5%	15.0%	1.5%
7	Rigid HGV	1.7%	0.7%	-1.0%	1.6%	0.7%	-0.9%
8	Articulated HGV	0.4%	0.0%	-0.4%	0.4%	0.0%	-0.4%
9	Buses	1.4%	0.3%	-1.1%	1.2%	0.3 %	-1.0%

8.3.6 The more detailed fleet type splits, disaggregating into Euro Class groupings, show more variation, with Ryedale District typically having a slightly more polluting fleet mix than the national average. For example, the percentage of petrol cars that are pre-Euro Class V in 2016 is 44% in the EFT v6.0.2 and 59% in Ryedale District (determined from the ANPR survey).

8.3.7 However, by 2027 both datasets show a similar profile, with around 95% of all petrol cars being Euro Class VI. This is due to the fact that although the 2027 Ryedale proportions are based on the ANPR surveys, the EFT changes through time for petrol cars are such that the shift to improved Euro Class vehicles results in a similar end point by 2027, regardless of the starting proportions.

8.3.8 0 shows the Euro Class splits for Petrol Car for 2016 and 2027 from the EFT and the ANPR surveys. Figure 7 shows how the same proportions change over time graphically, highlighting that by 2027 almost all of the fleet is predicted to be made up of Euro Class VI vehicles.

Table 26. Petrol Car Fleet Mix Comparison

VEHICLE TYPE	2016			2027		
	EFT v6.0.2	ANPR-Based	Difference	EFT v6.0.2	ANPR-Based	Difference
Pre Euro Class	0%	0%	0%	0%	0%	0%
Euro Class I	0%	0%	0%	0%	0%	0%
Euro Class II	2%	3%	1%	0%	0%	0%
Euro Class III	15%	15%	0%	0%	0%	0%
Euro Class IV	27%	41%	14%	0%	1%	1%
Euro Class V	36%	30%	-6%	4%	6%	2%
Euro Class VI	20%	11%	-9%	96%	93%	-3%
Euro Class 0 – IV	44%	59%	15%	0%	1%	1%
Euro Class V - VI	56%	41%	-15%	100%	99%	-1%

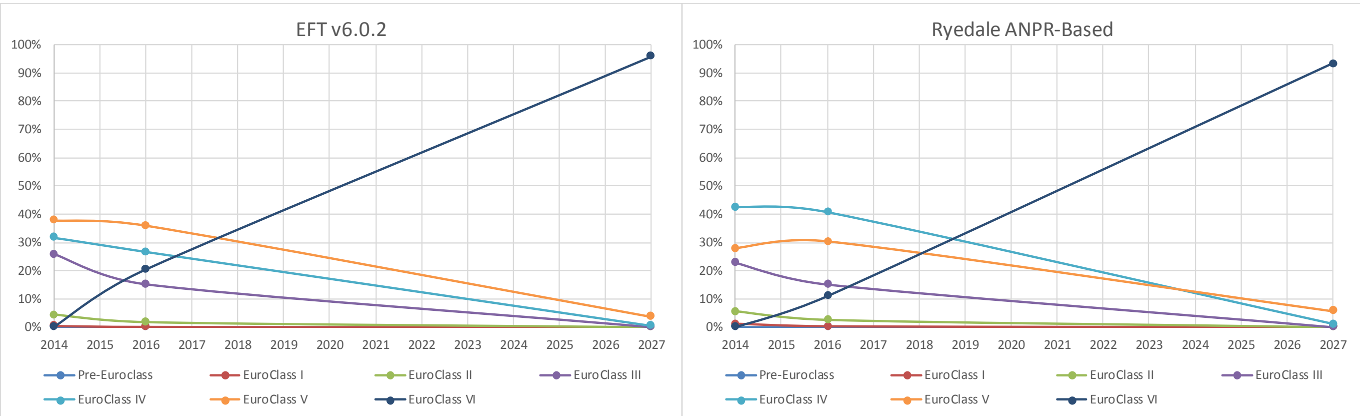


Figure 7. Petrol Car Fleet Mix

8.3.9 However, other vehicle types show a large enough variation from the National data in 2016 that it is still present in 2027. This affects the light and heavy goods vehicles and could potentially be due to the low number of these vehicles captured by the survey.

8.3.10 Figure 8 shows the evolution of the fleet mix in both datasets for diesel LGVs. By 2027, 97% of all diesel LGVs are Euro Class VI in the EFT data compared to only 78% in the Ryedale District (determined from the ANPR survey). These differences in fleet mix will have an impact on the ENEVAL results, particularly for diesel vehicles due to the large share of Nitrogen Dioxide and Particulate Matter they are responsible for.

8.3.11 **Table 27** shows the Euro Class splits for Diesel LGV for 2016 and 2027 from the EFT and the ANPR surveys.

Table 27. Diesel LGV Fleet Mix Comparison

VEHICLE TYPE	2016			2027		
	EFT v6.0.2	ANPR-Based	Difference	EFT v6.0.2	ANPR-Based	Difference
Pre Euro Class	0%	0%	0%	0%	0%	0%
Euro Class I	0%	0%	0%	0%	0%	0%
Euro Class II	0%	1%	0%	0%	0%	0%
Euro Class III	4%	16%	12%	0%	0%	0%
Euro Class IV	20%	30%	9%	0%	4%	4%
Euro Class V	58%	51%	-7%	3%	18%	16%
Euro Class VI	17%	2%	-15%	97%	78%	-20%
Euro Class 0 – IV	25%	47%	22%	0%	4%	4%
Euro Class V - VI	75%	53%	-22%	100%	96%	-4%

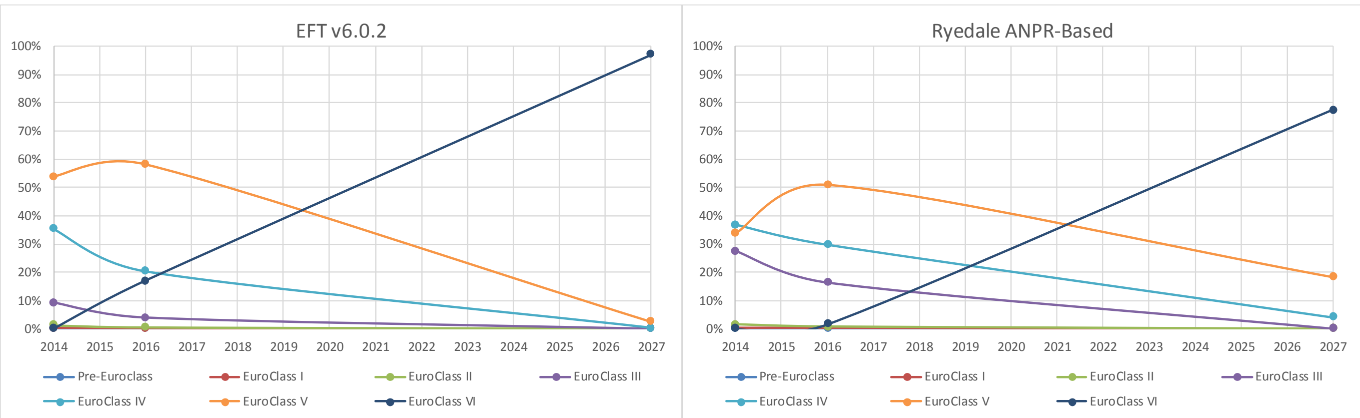


Figure 8. Diesel LGV Fleet Mix

8.3.12 Full details of the Euro Class splits for each vehicle type are provided in **Appendix C**.

8.4 Conclusions

8.4.1 The key points from this Chapter are:

- Petrol and diesel cars make up the majority of the current fleet;

- 99% of LGVs are diesel;
- In 2016, 51% of all vehicles are pre-Euro Class V and 24% of diesel vehicles are pre-Euro Class V;
- The ANPR survey suggests that vehicles in Malton and Norton are typically more polluting than the default national fleet mix in the EFT – particularly for heavy goods vehicles.
- This final point will impact on the ENEVAL analysis below in comparison to the ADMS modelling using EFT – with the ENEVAL emissions likely to be slightly higher i.e. due to the fact that the ANPR survey suggests a more polluting vehicle split than that used in the EFT / ADMS modelling (which assume the UK national average fleet proportions).

9. ENEVAL ANALYSIS

9.1 Introduction

9.1.1 SYSTRA's ENEVAL software has been applied to the outputs from the traffic model (with the predicted future-year emissions category distributions derived from the ANPR survey as described in the previous chapter) to estimate the emissions of the main pollutants on a link-by-link basis for each of the main future-year scenarios.

9.1.2 This Chapter is split into three sections, to provide analysis of the following using the ENEVAL tool:

- Analysis of the Baseline test, showing change in emissions from 2014[3] to 2027 based on the results of the ANPR surveys;
- Comparison of scenarios, by vehicle type in the AQMA area – including a review of the total cumulative change in emissions across the AQMA area – to supplement and provide additional insight to the findings of the ADMS modelling;
- Comparison of scenarios, by road link in the AQMA area – to provide additional insight into how the various scenarios impact on particular links in terms of emissions in the AQMA area.

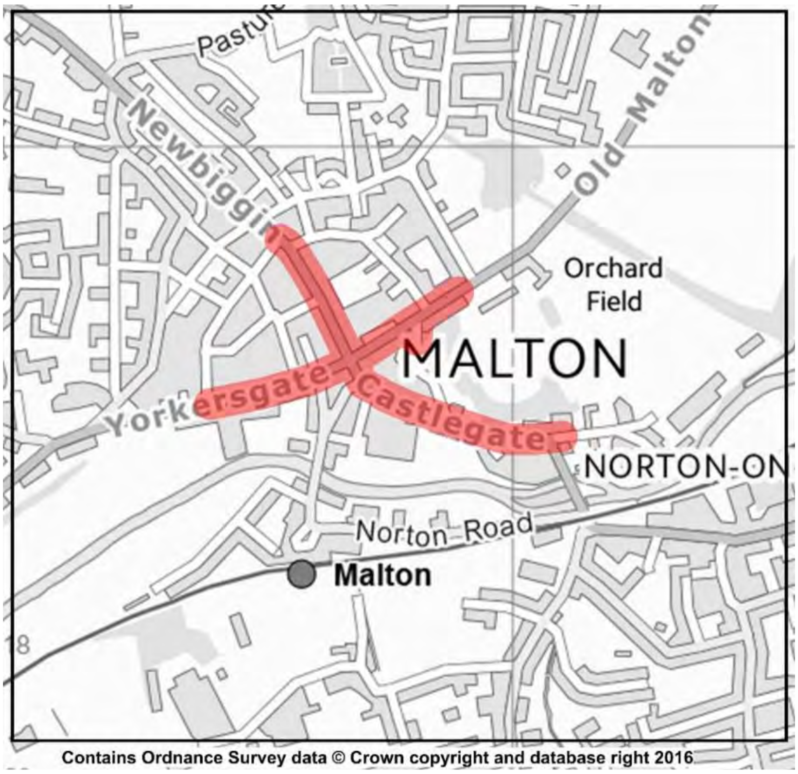
9.1.3 For the comparison of scenarios – by vehicle type and by road link - ENEVAL has been run for the Baseline, the Do Nothing and All Highway Scheme (complementary measure) tests for both planning scenarios (3 and 7), to demonstrate the impacts of the developments and the highway schemes in the AQMA area, as set out in Figure 9.

9.1.4 Within this chapter, the outputs from the ENEVAL analysis are summarised, which has been calibrated to reflect the local fleet splits derived from the ANPR survey, as discussed in the previous chapter. The ENEVAL tool has been run using an AM peak hour highway assignment, with the outputs converted to an Annual Average Daily Traffic value using a factor of 13.75 (based on several sources of local continuous traffic count data). Bus flows were not included in the associated 2027 Saturn Model highway network assignment, and therefore have not been included in the ENEVAL scenario testing analysis. The ANPR survey data suggests that the age profile of buses were again more-polluting (i.e. older) that the national average fleet profile assumed in the EFT. However, buses represent less than a third of 1% of the observed traffic in the ANPR survey, so there is limited scope to use improvements to the bus fleet to reduce future-year emissions in the AQMA.

9.1.5 The analysis in this chapter concentrates on NO_2 and PM_{10} emissions.

[3] These were the two years for which traffic flows were available from the traffic model

Figure 9. Malton and Norton Air Quality Management Area



9.2 ANPR Baseline Traffic: Comparison from 2014 to 2027 – AQMA Area

9.2.1 The Baseline scenario represents a no-development scenario. It is useful here to demonstrate the changes in emissions in the Malton and Norton AQMA area over time.

9.2.2 The ENEVAL emissions model has been run for the 2014 Base (*Base Year from traffic model*) and 2027 Baseline traffic scenarios to show the impact of the improvement in engine and emissions technology between the two years.

9.2.3 Table 28 shows the number of vehicles and the amount of NO_2 and PM_{10} emissions for each year and for each vehicle type, for roads within the AQMA. It also shows the proportion of the total emissions produced by each vehicle type.

Table 28. Baseline Vehicles & Emissions (2014, 2027)

		Vehicles		NO_2		PM_{10}	
	Vehicle Type	**2014**	**2027**	**2014**	**2027**	**2014**	**2027**
1	Electric Car	18	894	-	-	-	-
2	Petrol Car	43,775	40,819	13	5	5.3	2.5
3	Diesel Car	34,100	37,706	1,161	478	59	8
5	Petrol LGV	83	47	0	0	0	0
6	Diesel LGV	13,167	14,561	639	296	36	5
7	Rigid HGV	6,239	6,434	354	151	33	9
8	Articulated HGV	171	193	13	3	1	0
	All Car	77,893	79,419	1,174	483	65	10
	All LGV	13,249	14,608	639	296	36	5
	All HGV	6,410	6,627	367	154	34	9
	All Vehicles	97,552	100,654	2,180	933	134	25
1	Electric Car	0%	1%	0%	0%	0%	0%
2	Petrol Car	45%	41%	1%	1%	4%	10%
3	Diesel Car	35%	37%	53%	51%	44%	32%
5	Petrol LGV	0%	0%	0%	0%	0%	0%
6	Diesel LGV	13%	14%	29%	32%	27%	22%
7	Rigid HGV	6%	6%	16%	16%	24%	35%
8	Articulated HGV	0%	0%	1%	0%	1%	1%
	All Car	80%	79%	54%	52%	48%	42%
	All LGV	14%	15%	29%	32%	27%	22%
	All HGV	7%	7%	17%	17%	25%	36%
	All Vehicles	100%	100%	100%	100%	100%	100%

9.2.4 Cars represent 80% of the vehicles, but are only responsible for 53% of the NO_2 emissions and 44% of PM_{10} emissions. Both light and heavy goods vehicles are responsible for the remaining emissions, at rates around double their vehicle split proportions.

9.2.5 In general, diesel vehicles are the largest producer of both pollutants, with diesel car, diesel LGV and Rigid HGV responsible for 99% of NO_2 emissions and 96% of PM_{10} emissions in 2014.

9.2.6 Figure 10 shows two graphs. The first shows the absolute totals of NO_2 for each vehicle type, highlighting that the total amount of NO_2 reduces dramatically between 2014 and 2027, for all vehicle types. Across all vehicle types there is a **60%** reduction in NO_2 emissions between 2014 and 2027.

9.2.7 The second graph shows the proportion of NO_2 emissions produced by each vehicle type, highlighting the types discussed above.

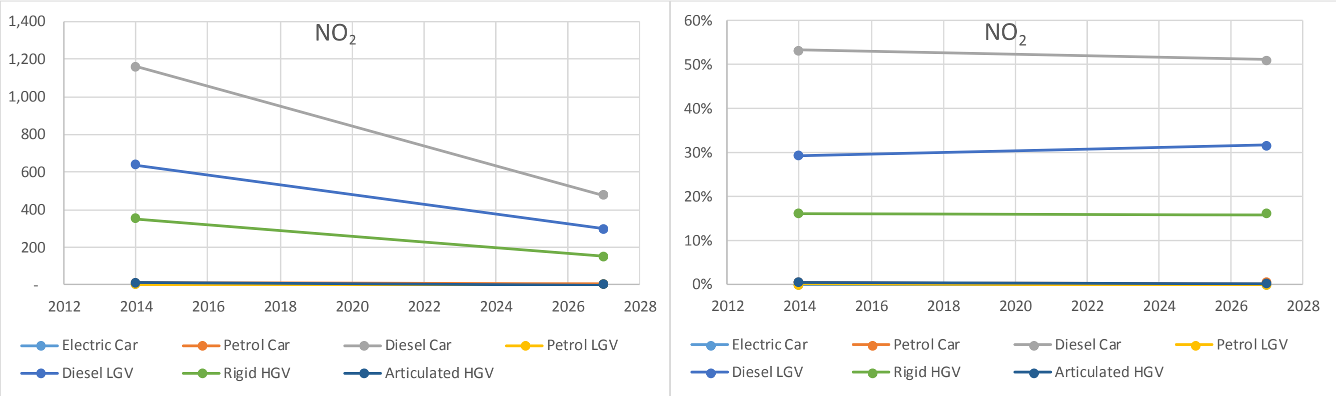


Figure 10. Baseline NO_2 Emissions (2014, 2027)

9.2.8 The same three vehicle types (diesel car, diesel LGV and Rigid HGV) are responsible for the majority of PM_{10} emissions also, though by 2027 petrol cars are also contributing an increasing share.

9.2.9 **Figure 11** shows the proportion of PM_{10} emissions produced by each vehicle type and the absolute total grams of PM_{10}. As with NO_2, the total amount of the pollutant reduces over time, reducing by **80%** in 2027. The predicted drop in particulate emissions from diesel cars is particularly striking, falling from around 55 grams per day in 2014 to under 10 grams per day by 2027, so that rigid HGVs are predicted to take over from diesel cars as the main contributor of this pollutant by around 2018.

9.2.10 PM_{10} emissions from petrol cars are predicted to remain virtually unchanged across all years, and since the emissions from diesel vehicles is predicted to fall rapidly over time, this leads to the percentage of the emissions from these petrol cars rising over time, though still very much lower that their corresponding percentage share of the vehicle fleet.

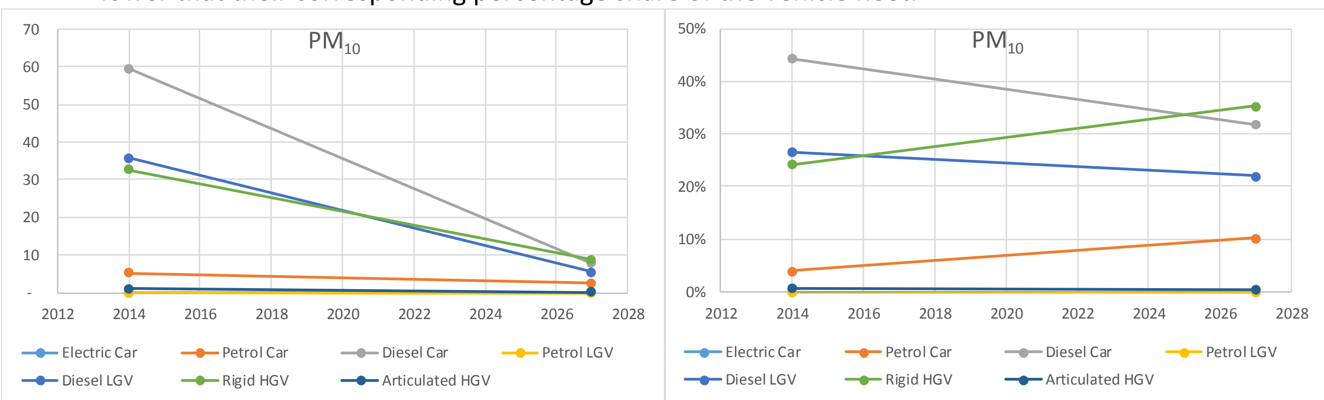


Figure 11. Baseline PM10 Emissions (2014, 2027)

Conclusions

9.2.11 The key points from this section are

- Diesel cars, diesel LGVs and rigid HGVs contribute the most NO_2 and PM_{10} emissions in the AQMA area.
- In 2014, these three vehicle types produce 99% of NO_2 emissions and 96% of PM_{10} emissions from only 58% of the vehicles;
- There is little change in the most polluting vehicle types by 2027, though petrol cars represent an increasing proportion of PM_{10}; and
- The overall reduction in NO_2 and PM_{10} by 2027 is large – 60% and 80% respectively.

9.3 Development and Complementary Measure Scenario Comparisons

9.3.1 The ADMS modelling provided the pollutant concentrations at each Receptor in each 2027 assessment scenario. It has been determined that whilst all pollutant concentrations in the 2027 assessment year are within the Objective levels, the impact of each development scenario and complementary measure varies by Receptor – i.e. the impacts are not uniform across all AQMA Receptors.

9.3.2 To supplement the ADMS modelling, a comparison of scenarios has been undertaken using SYSTRA's ENEVAL Software – this facilitates the calculation of the total cumulative change in emissions across all links within the AQMA and provides further cumulative insight into the preferred development scenario and benefits of the complementary measures.

9.3.3 The 2027 Baseline scenario can be used to compare the impact of both the development and highway intervention scenarios i.e. to establish the impact of the extra traffic volume and also the impacts of the highway mitigation measures.

9.3.4 **Figure 12** shows the change in vehicle flow, by vehicle types for roads within the AQMA. It also includes the vehicle flow from the 2014 Base Year for comparison.

9.3.5 In both development Scenarios (3 and 7), the additional development adds around 19,000 daily trips to the 2027 Baseline, predominantly cars and light goods vehicles. Scenario 3 shows a larger increase in HGV traffic, increasing by 9% from the Baseline compared to 5% in Scenario 7.

9.3.6 It should be noted that the figures here are aggregations of network links and as such single vehicles will be counted multiple times within the stated vehicle totals. For example, a car travelling north along Castlegate, Wheelgate and New Biggin will traverse five links and so will be counted five times in these totals. The graphs therefore provide a representation of the change in total traffic (and hence total emissions), rather than the traffic flow at any specific location. The changes in traffic on specific links is reported in the next section of this report.

9.3.7 The addition of the complementary highway measures reduces the total traffic flows for 2027 Scenarios 3 and 7 (i.e. with development) in the AQMA compared to the Do Nothing. The addition of the complementary measures to both Scenarios shows an increase in traffic of 4% compared to the Baseline.

9.3.8 Compared to the 2027 Baseline both development scenarios result in a 3% reduction in HGV traffic within the AQMA when combined with the highway measures.

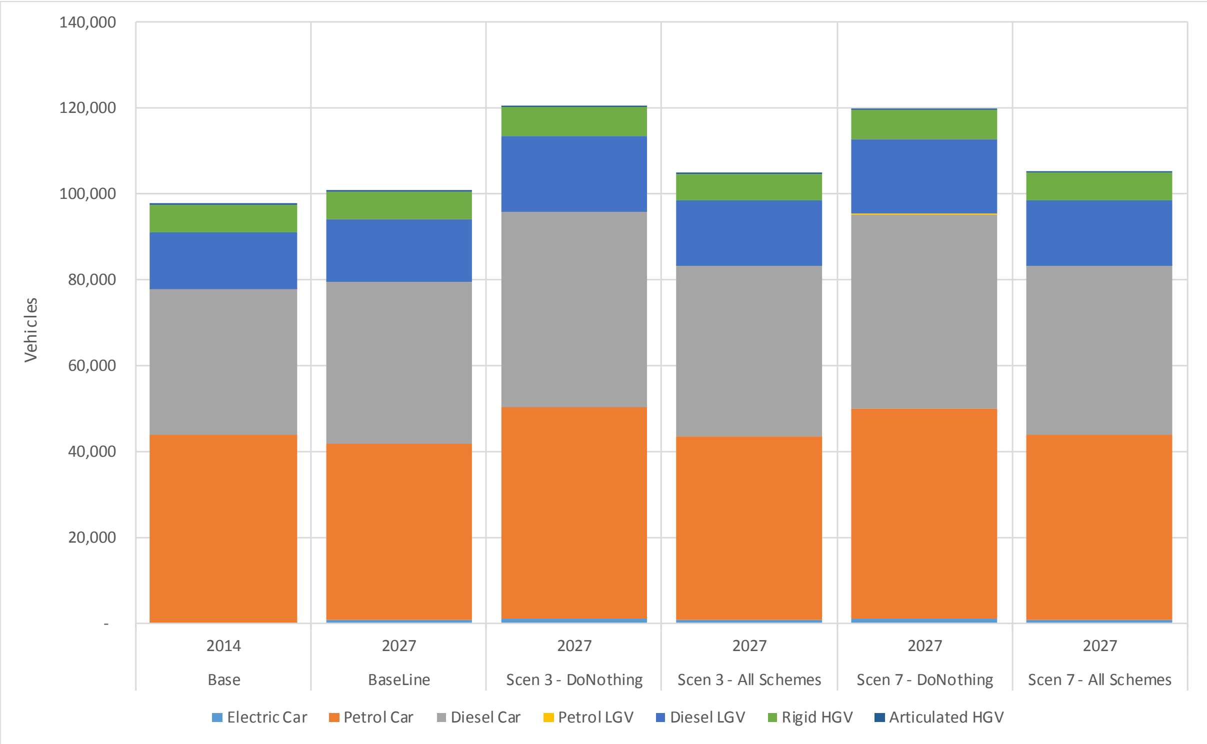


Figure 12. Vehicle Flows by Scenario

9.3.9 **Figure 13** shows the NO_2 emissions for each scenario. As discussed above, the level of NO_2 produced reduces from 2014 to 2027 due to changes in the fleet towards more efficient, less polluting vehicles. In addition, the majority of NO_2 emissions are due to diesel cars and LGVs and rigid HGVs.

9.3.10 The addition of either development scenario increases NO_2 emissions slightly, though Scenario 3 has a larger increase from the Baseline 2027 than Scenario 7, 13% compared to 5%, respectively.

9.3.11 Scenario 3 shows a large increase (+15%) in NO_2 emissions from light vehicles and almost no change from heavy vehicles. Scenario 7 shows a smaller increase in NO_2 emissions from light vehicles (8%), plus a large reduction in heavy vehicles in the AQMA (-17%).

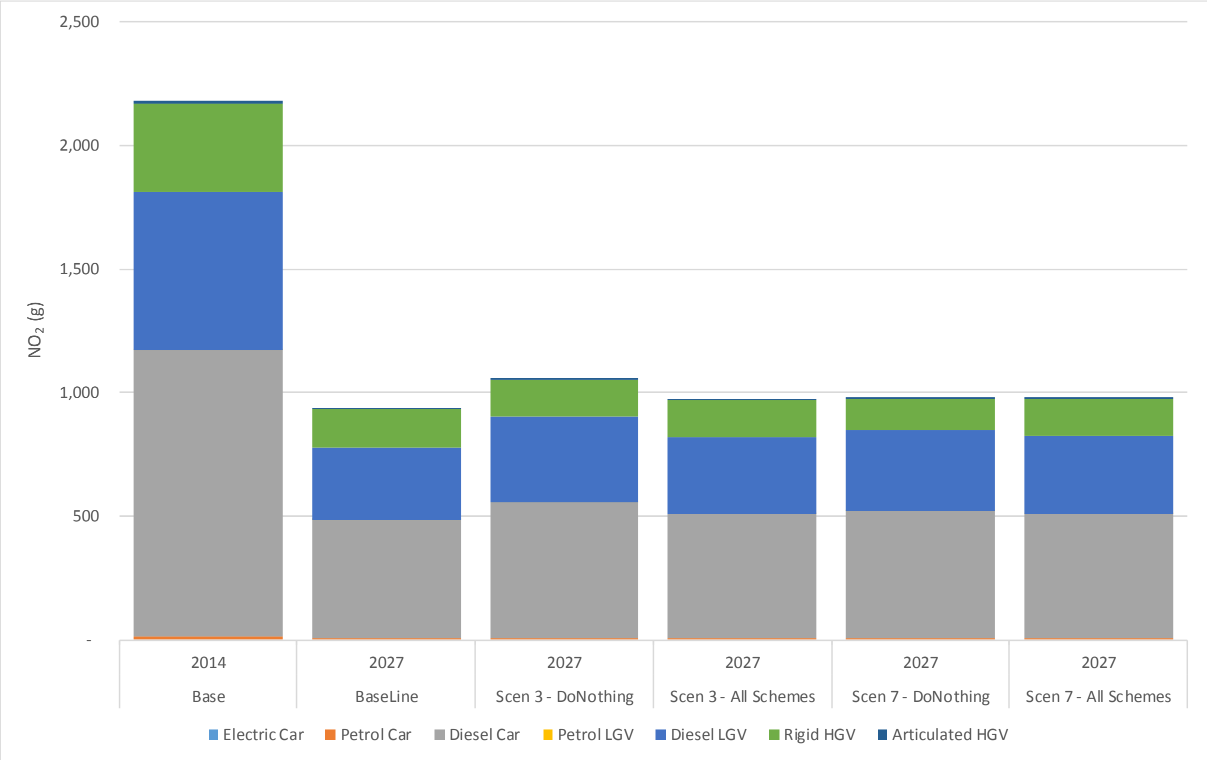


Figure 13. Daily NO_2 Emissions by Scenario

9.3.12 Interestingly, the inclusion of the complementary highway schemes results in a similar increase in NO_2 emissions compared to the 2027 Baseline for both development scenarios. However, the highway measures reduce the NO_2 for Scenario 3, but have little impact in Scenario 7.

9.3.13 **Table 29** shows the NO_2 emission impact of each development scenario and the inclusion of the highway measures in 2027.

Table 29. Impact of Development Scenarios and Highway Schemes on NO_2 Emissions in 2027

	SCENARIO 3	SCENARIO 7
Baseline -> Do Nothing	+13%	+5%
Impact of Highway Schemes	-9%	0%
Baseline -> All Schemes	+4%	+5%

9.3.14 **Figure 14** shows the PM_{10} emissions for each scenario. The outcomes are similar to those described above for NO_2, with both development Scenarios causing an increase in PM_{10}, but with the highway measures then reducing them. Again, the highway measures have more of an impact in Scenario 3 than Scenario 7.

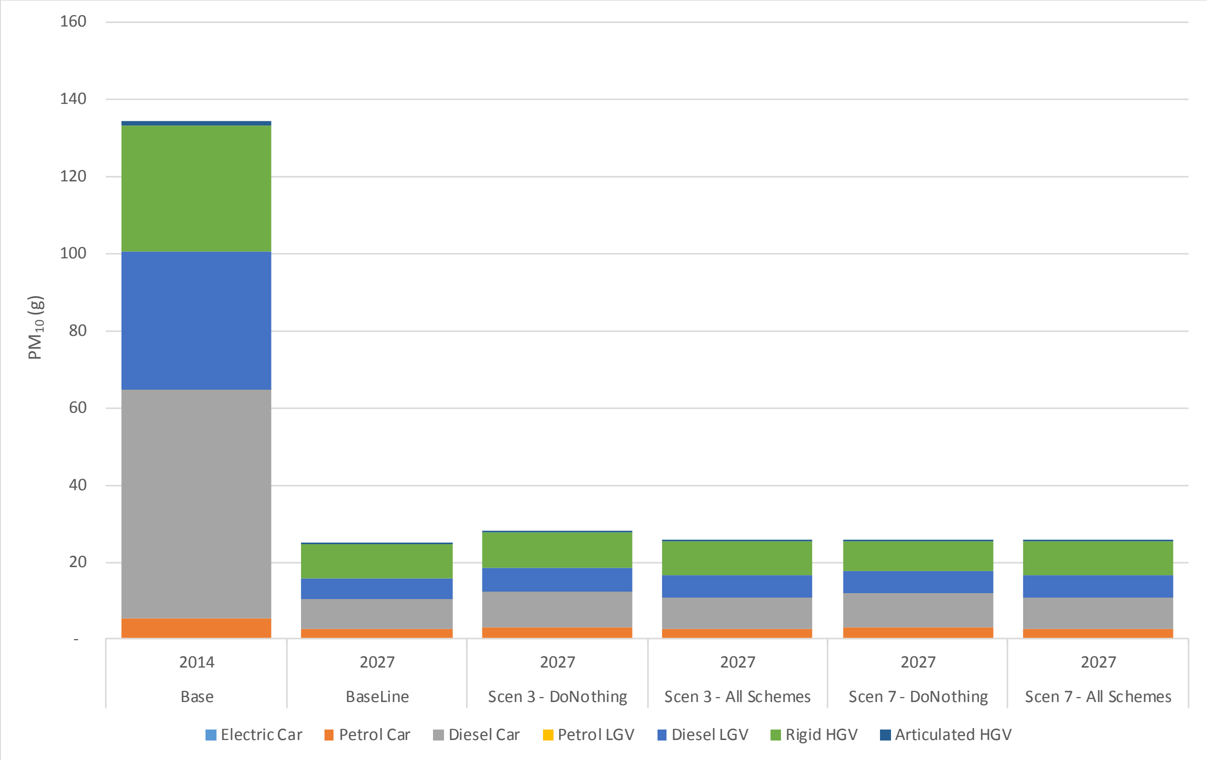


Figure 14. Daily PM_{10} Emissions by Scenario

Key Points

9.3.15 This analysis using the ENEVAL Software is an informative supplement to the ADMS modelling, providing a further comparison of scenarios – ENEVAL facilitates the calculation of the total cumulative change in emissions across all links within the AQMA and thus provides further cumulative insight into the preferred development scenario and the benefit of introducing any of the complementary measures.

9.3.16 The key points from this section are:

- Large decreases in NO_2 and PM_{10} (by 65% and 82% respectively) from 2014 Base to 2027 Baseline due to the fleet containing a greater proportion of cleaner modern(EURO 6) vehicles;
- In both development scenarios the developments lead to an increase in both total traffic and total emissions, with Scenario 3 showing the larger increase (13% compared to 4%);
- The complementary highway measures have a large impact in Scenario 3, reducing the increase in emissions from 13% to 4%;
- The highways schemes are predicted to have little effect on the total emissions in Development Scenario 7 (0%).

  - This suggests that Scenario 7 is preferred to Scenario 3 in air quality terms, in the absence of any of the complementary measures; and
  - if Scenario 3 is the chosen development strategy, then implementing the combined package of highway schemes has a large impact. However, if

Scenario 7 is chosen, - then the highway schemes are predicted to have negligible net impacts on the total daily emissions.

9.4 Scenario Comparisons – By AQMA Links

9.4.1 ENEVAL provides detailed emissions information on a link-by-link basis. These results can be used to identify locations within the AQMA that are particularly affected by the developments and highway measures.

9.4.2 A potential limitation of this analysis arises from the use of an AM assignment only. The AM traffic flows are likely to be heavily influenced by commuting traffic travelling from home to work, which may be using certain links more frequently or in a certain direction than is the case at other times of the day.

9.4.3 Table 30 to Table 32 show the changes in traffic flow, NO_2 and PM_{10}, respectively, for both development scenarios, with and without the highway schemes. All numbers are compared to the Baseline 2027 figures. The links have been ordered in such as a way as to reflect the order of the links within the Saturn network, allowing trends to be identified.

9.4.4 The traffic flow changes are similar between both development scenarios. Almost all links show an increase in demand, with the South-North movement along Castlegate and Wheelgate showing the largest increases. The impact of the highway schemes (complementary measures) is to reduce the number of vehicles, particularly the Castlegate-Wheelgate corridor. The east-west movements through Malton also see a reduction.

9.4.5 The change in traffic along Castlegate and Wheelgate highlights the issue of summing the traffic flows on the AQMA links. Of the 19,000 extra vehicles around 9,000 are on these four links. The likelihood is that there are in fact 2,000 extra vehicles making this full movement from south to north. However, the table still serves a useful purpose of highlighting links with large increases in traffic flow, and therefore the likely increases in emissions.

Table 30. Change in Traffic Flow by AQMA Road

LinkID	Vehicles RoadName	Dir	BaseLine 2027	Scen 3 - Do Nothing 2027	Scen 3 - All Schemes 2027	Scen 7 - Do Nothing 2027	Scen 7 - All Schemes 2027	Scen 3 - Do Nothing 2027	Scen 3 - All Schemes 2027	Scen 7 - Do Nothing 2027	Scen 7 - All Schemes 2027
587_586	Yorkersgate E1	W->E	4,801	1,109	428	922	159	23%	9%	19%	3%
586_553	Yorkersgate E2		4,766	- 314	426	- 372	159	-7%	9%	-8%	3%
553_554	Old Maltongate SW		6,723	854	33	418	- 619	13%	0%	6%	-9%
554_555	Old Maltongate NE		6,666	790	- 24	387	- 641	12%	0%	6%	-10%
555_554	Old Maltongate NE	E->W	3,384	1,084	- 277	1,012	- 97	32%	-8%	30%	-3%
554_553	Old Maltongate SW		3,437	1,145	- 272	1,062	- 86	33%	-8%	31%	-3%
553_586	Yorkersgate E2		2,512	1,040	- 1,356	1,069	- 541	41%	-54%	43%	-22%
586_587	Yorkersgate E1		10,483	195	- 1,361	17	- 682	2%	-13%	0%	-7%
578_577	Newbiggin NW	N->S	8,678	567	141	201	- 198	7%	2%	2%	-2%
577_553	Wheelgate N		7,351	1,573	573	1,268	500	21%	8%	17%	7%
553_3652	Wheelgate SE		7,417	481	1,339	552	1,233	6%	18%	7%	17%
3652_552	Castlegate SE		8,165	711	1,354	773	1,245	9%	17%	9%	15%
552_551	Castlegate E		8,732	857	1,465	913	1,300	10%	17%	10%	15%
551_552	Castlegate E	S->N	2,293	2,317	451	2,747	587	101%	20%	120%	26%
552_3652	Castlegate SE		2,954	2,341	94	2,736	426	79%	3%	93%	14%
3652_553	Wheelgate SE		3,378	2,194	- 36	2,569	340	65%	-1%	76%	10%
553_577	Wheelgate N		2,280	2,222	676	2,488	840	97%	30%	109%	37%
577_578	Newbiggin NW		6,635	722	565	381	464	11%	9%	6%	7%
	Total AQMA		100,654	19,889	4,219	19,144	4,389	20%	4%	19%	4%

9.4.6 The NO_2 and PM_{10} changes largely reflect the changes in traffic flow shown above, with Castlegate and Wheelgate showing large increases due to the additional development traffic, with reductions following the introduction of the highway measures.

9.4.7 Interestingly, the western end of Yorkersgate shows a reduction in both pollutants, despite a slight increase in traffic flow. This could be due to changes in the fleet mix on the link, or a change in the speed.

Table 31. Change in NO_2 (g) by AQMA Road – Average Day

LinkID	NO2 RoadName	Dir	BaseLine 2027	Scen 3 - Do Nothing 2027	Scen 3 - All Schemes 2027	Scen 7 - Do Nothing 2027	Scen 7 - All Schemes 2027	Scen 3 - Do Nothing 2027	Scen 3 - All Schemes 2027	Scen 7 - Do Nothing 2027	Scen 7 - All Schemes 2027
587_586	Yorkersgate E1	W->E	105	19	7	13	-0	18%	6%	13%	0%
586_553	Yorkersgate E2		35	-3	2	-4	-0	-8%	6%	-12%	0%
553_554	Old Maltongate SW		54	5	0	1	-5	8%	0%	2%	-9%
554_555	Old Maltongate NE		32	3	-0	1	-3	8%	-1%	2%	-10%
555_554	Old Maltongate NE	E->W	15	5	-1	4	-0	31%	-8%	28%	-2%
554_553	Old Maltongate SW		57	16	-3	14	0	28%	-6%	25%	0%
553_586	Yorkersgate E2		8	3	-4	3	-2	40%	-54%	42%	-19%
586_587	Yorkersgate E1		190	-51	-25	-77	-7	-27%	-13%	-41%	-3%
578_577	Newbiggin NW	N->S	24	-1	0	-2	-3	-4%	1%	-8%	-11%
577_553	Wheelgate N		145	25	25	18	24	17%	18%	12%	16%
553_3652	Wheelgate SE		12	1	2	1	2	8%	18%	9%	16%
3652_552	Castlegate SE		61	7	10	7	9	11%	17%	12%	15%
552_551	Castlegate E		73	9	12	10	11	12%	17%	13%	15%
551_552	Castlegate E	S->N	19	20	4	24	5	106%	20%	126%	26%
552_3652	Castlegate SE		48	35	1	-4	6	73%	3%	-9%	12%
3652_553	Wheelgate SE		13	5	-0	7	0	42%	-4%	52%	4%
553_577	Wheelgate N		25	24	8	27	9	96%	31%	107%	35%
577_578	Newbiggin NW		17	2	1	1	1	11%	9%	6%	7%
	Total AQMA		933	124	39	45	48	13%	4%	5%	5%

Table 32. Change in PM10s (g) by AQMA Road – Average Day

LinkID	PM10 RoadName	Dir	BaseLine 2027	Scen 3 - Do Nothing 2027	Scen 3 - All Schemes 2027	Scen 7 - Do Nothing 2027	Scen 7 - All Schemes 2027	Scen 3 - Do Nothing 2027	Scen 3 - All Schemes 2027	Scen 7 - Do Nothing 2027	Scen 7 - All Schemes 2027
587_586	Yorkersgate E1	W->E	3.2	0.4	0.1	0.2	-0.1	13%	4%	6%	-4%
586_553	Yorkersgate E2		1.0	-0.1	0.0	-0.2	-0.0	-10%	4%	-16%	-4%
553_554	Old Maltongate SW		1.9	-0.2	-0.0	-0.3	-0.2	-11%	-2%	-17%	-10%
554_555	Old Maltongate NE		1.1	-0.1	-0.0	-0.2	-0.1	-12%	-3%	-18%	-10%
555_554	Old Maltongate NE	E->W	0.4	0.1	-0.0	0.1	0.0	22%	-5%	19%	1%
554_553	Old Maltongate SW		1.6	0.4	-0.1	0.3	0.1	23%	-4%	18%	3%
553_586	Yorkersgate E2		0.2	0.1	-0.1	0.1	-0.0	35%	-53%	37%	-9%
586_587	Yorkersgate E1		4.5	-1.0	-0.6	-1.6	0.1	-22%	-13%	-35%	1%
578_577	Newbiggin NW	N->S	0.6	-0.1	-0.0	-0.1	-0.1	-9%	-2%	-13%	-12%
577_553	Wheelgate N		3.4	0.5	0.5	0.3	0.5	14%	16%	8%	15%
553_3652	Wheelgate SE		0.3	0.0	0.0	0.0	0.0	18%	17%	18%	15%
3652_552	Castlegate SE		1.4	0.4	0.2	0.4	0.2	31%	16%	30%	15%
552_551	Castlegate E		1.7	0.6	0.3	0.6	0.2	35%	16%	34%	14%
551_552	Castlegate E	S->N	0.4	0.6	0.1	0.7	0.1	149%	20%	176%	26%
552_3652	Castlegate SE		1.3	0.8	0.0	-0.1	0.1	64%	2%	-7%	9%
3652_553	Wheelgate SE		0.4	0.1	-0.0	0.1	-0.0	21%	-6%	30%	-2%
553_577	Wheelgate N		0.7	0.6	0.3	0.7	0.2	83%	39%	92%	25%
577_578	Newbiggin NW		0.5	0.1	0.0	0.0	0.0	13%	10%	10%	10%
	Total AQMA		25	3.2	0.8	1.1	1.0	13%	3%	4%	4%

9.4.8 **Figure 15** shows the percentage change in NO_2 emissions compared to the Baseline for Scenario 3. The left-hand image is before the highway schemes, whilst the image on the right includes all schemes.

9.4.9 The plots highlight the large increase in emissions on south-north movements, with only a couple of links showing a reduction in emissions. Following the implementation of the highway schemes the increases are much lower, with the majority of the Yorkersgate and Old Maltongate links showing a reduction in NO_2 emissions.

9.4.10 **Figure 14** shows the same information as **Figure 13**, but for Scenario 7. The overall pattern is similar, but there are some key differences. Overall, the increase on Castlegate and Wheelgate is reduced, largely due to one link on Castlegate where NO_2 emissions actually reduce.

9.4.11 Whilst the highway schemes have no overall impact on the total emissions in Scenario 7 there are improvements in the Castelgate-Wheelgate corridor. However, compared to Scenario 3 the reductions in emissions are smaller, leading to a slight increase in emissions compared to the Baseline due to the highway schemes.

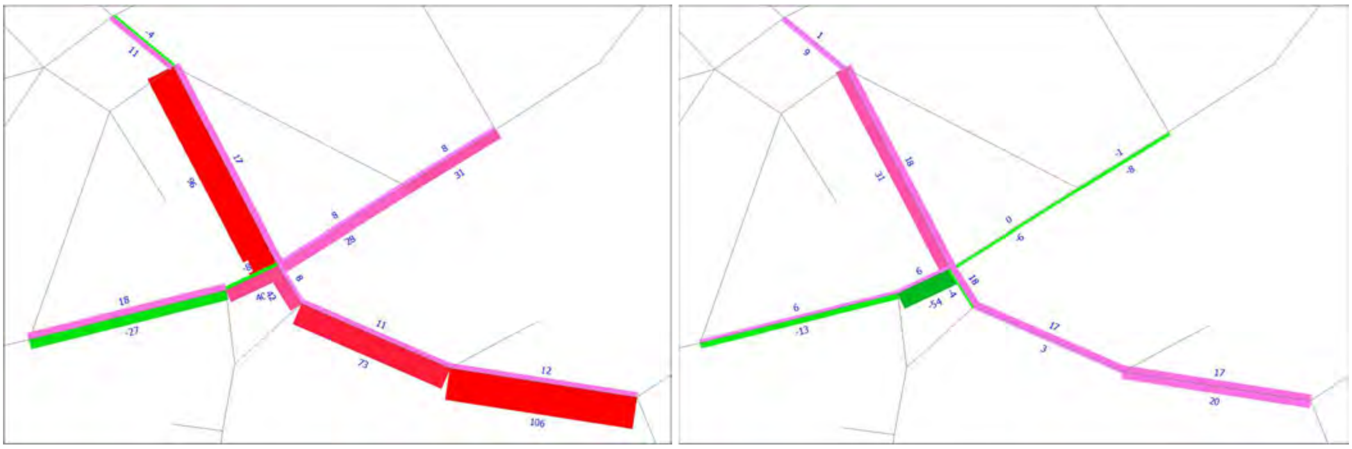


Figure 15. % Change in NO2: Scenario 3 vs Baseline – Impact of Highway Schemes

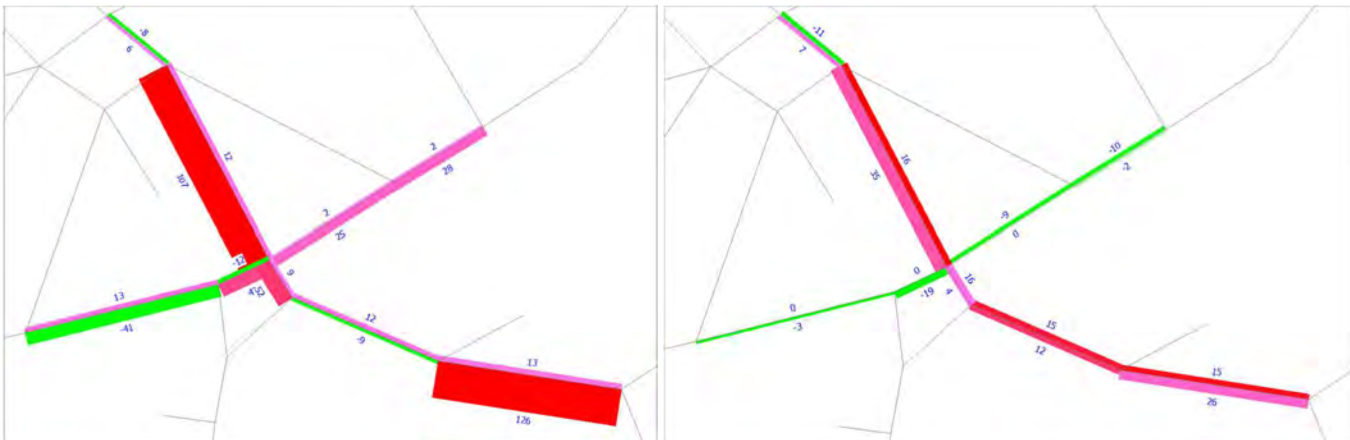


Figure 16. % Change in NO2: Scenario 7 vs Baseline – Impact of Highway Schemes

9.4.12 **Table 33** lists the changes between NO_2 emissions in the All Schemes and Do Nothing Scenarios and highlights which of the road links in the AQMA are contributing most to the predicted changes in the overall emissions. The table also highlights the difference between the impact of the highway schemes between the two development scenarios, with Scenario 3 showing an 8% decrease from the Do Nothing and Scenario 7 showing no change from the Do Nothing.

9.4.13 **Figure 17** illustrates the change between the various scenarios.

Table 33. Change in NO_2 Emissions between Scenarios (g)

	NO2		Scen 3 - All Schemes - Do Nothing		Scen 7 - All Schemes - Do Nothing		Scen 7 - Scen 3
LinkID	RoadName	Dir	2027	2027	2027	2027	2027
587_586	Yorkersgate E1		- 12	-10%	- 13	-11%	-1%
586_553	Yorkersgate E2	W->E	5	16%	4	13%	-3%
553_554	Old Maltongate SW		- 5	-8%	- 6	-11%	-3%
554_555	Old Maltongate NE		- 3	-8%	- 4	-11%	-3%
555_554	Old Maltongate NE		- 6	-29%	- 5	-24%	5%
554_553	Old Maltongate SW	E->W	- 20	-27%	- 14	-20%	7%
553_586	Yorkersgate E2		- 8	-67%	- 5	-43%	24%
586_587	Yorkersgate E1		26	19%	71	63%	43%
578_577	Newbiggin NW		1	5%	- 1	-4%	-9%
577_553	Wheelgate N		0	0%	6	4%	3%
553_3652	Wheelgate SE	N->S	1	9%	1	7%	-2%
3652_552	Castlegate SE		3	5%	2	3%	-2%
552_551	Castlegate E		3	4%	1	2%	-2%
551_552	Castlegate E		- 17	-42%	- 19	-44%	-2%
552_3652	Castlegate SE		- 33	-41%	10	22%	63%
3652_553	Wheelgate SE	S->N	- 6	-32%	- 6	-32%	1%
553_577	Wheelgate N		- 16	-33%	- 18	-35%	-2%
577_578	Newbiggin NW		- 0	-2%	0	1%	3%
	Total AQMA		- 85	-8%	3	0%	8%

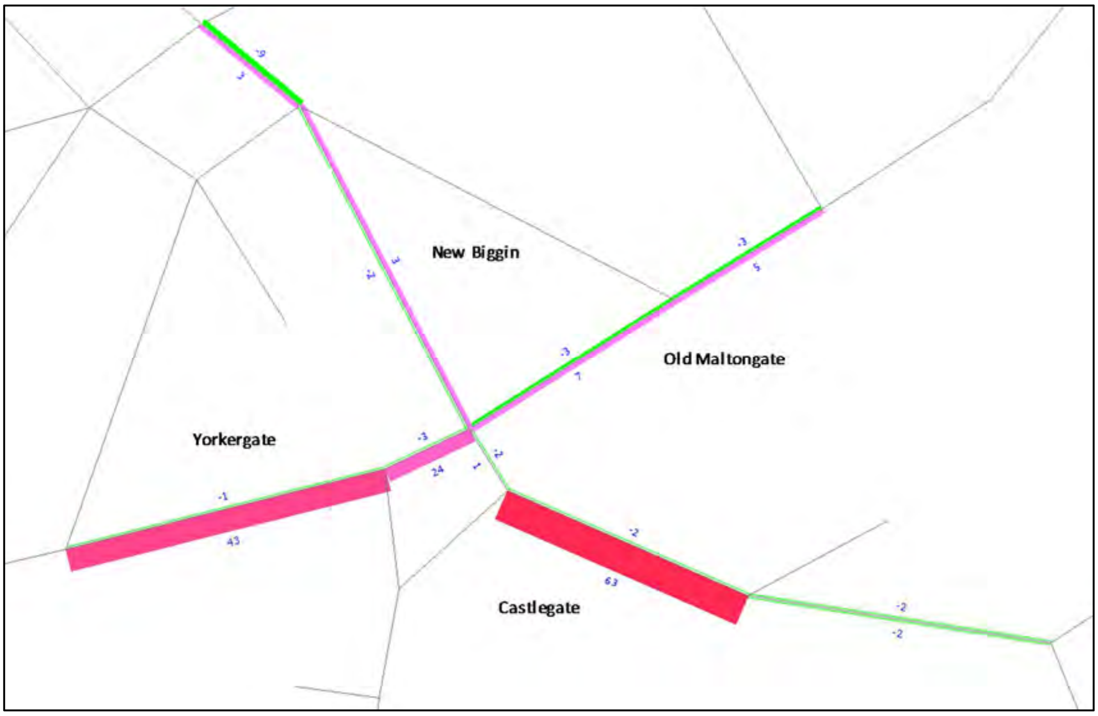


Figure 17. Change in NO_2 Emissions between Scenarios

9.4.14 The link showing the largest difference between the two development scenarios is Castlegate, just south of Wells Lane. The demand changes between the two scenarios, shown in Table 34, are similar, with the road schemes producing a reduction of around 2,300 vehicles in each case, from over 5,000 vehicles in the Do Nothing to around 3,000 in the All Schemes test.

Table 34. Castlegate Traffic Flow and Speeds by Scenario

SCENARIO	TRAFFIC FLOW	SPEED (KPH)
Scenario 3: Do Nothing	5,295	7.4
Scenario 3: All Schemes	3,048	3.1
Scenario 7: Do Nothing	5,690	47.4[4]
Scenario 7: All Schemes	3,380	4.8

9.4.15 However, the most-significant change is in predicted level of congestion on this link. The absence of congestion on this link in the Scenario 7 Do Nothing model leads to a significant reduction in the predicted emissions for this scenario. However, the congestion returns in the 'All Schemes' version of the model, which eliminates the emissions benefits of the overall reduction in traffic elsewhere in the town. Scenario 3 does not create this 'free-flow' in the Do Nothing network and therefore the reduction in traffic leads to a net reduction in the overall emissions on this link.

9.4.16 This change in speeds on this link is caused by the length of the queue on the downstream link. In three of the scenarios, the queue is predicted to extend back into the link being reported here, but in Scenario 7 Do Nothing, the queue is entirely contained within the downstream link. This is essentially a reporting anomaly, since the majority of the queuing occurs on the downstream link in all four scenarios. This anomaly has knock-on impacts on the reporting of the NO_2 emissions on this link.

Key Points

9.4.17 The key points from this sections are:

- South-North movements drive the majority of emissions increases in the Do Nothing scenarios;
- The inclusion of the highway measures reduces these increases; and
- The length of the queue approaching the junction at the north end of the Castlegate has a significant impact on the predicted average speed on the upstream link, leading to significant variation in the predicted emissions on this upstream link.

4 1 The speed on this link is affected by the length of the queue on the downstream link – in Scenario 7 Do Nothing this queue is predicted to be entirely contained on the downstream link and therefore the link reported here appears as 'free-flow' – this reporting anomaly has knock-on effects on the predicted emissions on this link for Scenario 7

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 ADMS Modelling

10.1.1 The ADMS modelling has indicated that all 2027 scenarios indicate pollutant levels well below Objective levels and there is a notable improvement in air quality in 2027 compared to current pollutant levels.

10.1.2 There is a drop off in pollutant concentrations as we move to receptors outside the AQMA (consistent with monitoring data).

Comparison of Development Scenarios 3 and 7:

10.1.3 Scenarios 3 and 7 represent the most realistic and robust combination of development that will come forward by 2027. The ADMS modelling has indicated the following:

- At receptors outside the AQMA - the difference in results between Scenarios 3 and 7 are generally negligible.
- At receptors within the AQMA -
  - The differences in Particulate Matter concentrations at Receptors between Scenarios 3 and 7 are not explicit enough to declare a preferred development scenario.
  - In terms of Nitrogen Dioxide, the Scenario preference varies on a Receptor by Receptor and highway intervention basis. This can be expected given that each Scenario will alter traffic distribution and thus effect pollutant concentrations at Receptors differently. The 'Do-Nothing' and 'OGV2 Ban' results indicate an overall preference for Scenario 7, whereas the 'OGV1/2 Ban' results indicate an overall preference for Scenario 3. However, there is no significant distinction to determine the preferred development scenario.

Comparison of Highway Interventions

10.1.4 At receptors outside the AQMA – the difference between the highway intervention measures are generally negligible in both Scenarios 3 and 7.

10.1.5 Within the AQMA, the complementary measures for both scenarios generally create a mixture of slight improvements or slight deteriorations in Nitrogen Dioxide and Particulate Matter concentrations at the various Receptors. This can be expected given that each measure will alter traffic distribution and thus effect pollutant concentrations at Receptors differently. The variation is therefore due to the net effect of the trade-off between the traffic reduction and the lower speeds (due to the reduced road capacity) which differ by location.

10.1.6 The exception to this pattern of 'small ±change' is at Receptor 10 (Yorkersgate 2), where the 'All Measures' combination of measures is predicted to increase NO_2 concentrations significantly in both scenarios (*in addition to some notable increases to Particulate Matter*), which would give this location the poorest NO_2-related air quality (and is significantly worse than any location in the Do Nothing scenario). These increases outweigh the small benefits created elsewhere in the town by the package of traffic management measures, suggesting strongly that the package of traffic management measures tested here should not be introduced in the form that has been tested here.

10.1.7 The two versions of the proposed HGV ban result in small reductions or increases in concentrations of Particulate Matter and Nitrogen Dioxide at each Receptor for both planning scenarios, suggesting that in no significant benefit of introducing either version of the HGV ban. Neither version of the HGV ban should therefore be taken forward in the form modelled here.

10.2 ANPR / ENEVAL

10.2.1 Diesel Cars/LGVs and HGVs are responsible for most of the current NO_2 and PM_{10} traffic emissions in the study area and these therefore represent the most effective targets for any emissions reduction strategies. In particular, local 'Hearts and Minds campaigns' which discourage use of older diesel vehicles in the town centre, particularly during congested periods, are likely to help reduce concentrations of these two main types of traffic-related pollutant.

10.2.2 However, the modelling also suggests that there will be a significant reduction in emissions over time, as the Euro 6/VI emission standard becomes more prevalent in the relevant vehicle fleets. This reduction over time is much more significant than the modest increases created by the new developments or the changes created by the proposed highway schemes.

10.2.3 The ENEVAL analysis has provided additional insight into the relative contribution which the different vehicle sub-are likely to make to the overall traffic emissions on the various road links and to the impact which changes in congestion will have on these predicted emissions.

10.2.4 The results for Development Scenario 3 suggests that the proposed Highway schemes would further reduce NO_2 emissions by around 9% and PM_{10} emissions by around 10%, relative to the 2027 Baseline. The predictions of the impacts of these highway schemes for Development Scenario 7 are broadly similar, apart from the emissions of NO_2 on Castlegate, which are affected by changes in the predicted length of the modelled queues on the downstream link, which resulted in a prediction of free-flow speed on this upstream link in the future-year Do Nothing scenario, reverting to congested speeds in the Do Something.

10.2.1 It should be noted that the ENEVAL analysis reported here has only had access to results from an AM peak traffic model, which is likely to be more-congested that the 'average' conditions throughout the day. This is likely to have under-estimated the average speeds (and hence over-estimated emission levels) on the most-congested links.

10.2.2 Buses were not included in the traffic model provided by Jacobs, thus could not be included in the ENEVAL analysis. The buses which were observed in the ANPR surveys were relatively old (and hence 'dirty'), but they represent less than 0.5% of the total traffic on the relevant links, so do not offer significant scope for emissions reduction strategies.

10.3 Wider Recommendations for Ryedale's Air Quality Action Plan

10.3.1 The Transport Strategy for Malton and Norton was produced in 2005, four years before the Norton and Malton Air Quality Management Area (AQMA) was declared (2009). As the AQMA was established due to exceedances of transport-related pollutants (Nitrogen Dioxide levels), with local road traffic accounting for just over 75% of the NO_2 in the AQMA, it is crucial that the Transport Strategy is updated to include measures to encourage sustainable transport and reduce emissions and levels of poor air quality.

10.3.2 Additional work should be undertaken by appropriate Council Departments (i.e. Highways) to quantify the impact of the time spent by vehicles searching for parking spaces and/or visiting drivers using inefficient routes through the town due to lack of adequate signage'. Such analysis can provide useful evidence to inform appropriate transport and aligned air quality strategies.

10.3.3 Ryedale District Council should work with key partners, (for example bus companies, transport authorities and taxi operators) to provide a transport system that supports economic growth while delivering reductions in the emissions of the main pollutants.

10.3.4 However, the modelling reported here has shown that it is difficult it identify traffic management schemes which significantly reduce traffic without creating additional congestion in the town centre, which would cancel out much of the emissions benefit from the traffic reduction.

10.3.5 Ryedale District Council's Air Quality Action Plan should therefore focus on removing the most-polluting vehicles from the town centres while avoiding significant reduction in road capacity.

10.3.6 The Strategy should include local 'Hearts and Minds campaigns' which discourage car use, particularly the use of older diesel vehicles in the town centre. This could include highlighting the merits of replacing short car trips by active modes and encouraging the drivers of these older diesel vehicles to 'park and stride' from the edge of town, where & when possible.

10.3.7 The Council should encourage the uptake of electric vehicles in the area by ensuring that there is sufficient recharging infrastructure in the area, particularly in areas where there is high demand for parking in the town centres.

10.3.8 The Council should also monitor the availability of Defra/DfT funding for vehicle scrappage schemes, which could be used to encourage the owners of the dirtiest vehicles to upgrade to cleaner vehicles as soon as possible. Any initiative focussed on this approach should target vehicles which spend the most time driving in the relevant town centre areas, as this will generate the most cost-effective impact from each replaced vehicle. It would therefore be beneficial to identify the owners of businesses within the relevant town centres which are likely to be operating vehicles which come in this intersection between 'old diesel' and 'high frequency use' in the town centre area.

10.3.9 The Council should also explore the scope for 'Eco Driving' training for the owners/operators of these high-frequency 'dirty' vehicles, particularly for vehicle types where the cost of upgrading to newer vehicles is likely to be prohibitive in the short term.

10.3.10 The Council might also wish to consider a program of roadside monitoring of tail-pipe emissions which could explicitly identify the individual vehicles which are adding most to the emissions of NO_X and particulate matter at the selected location, which would allow additional refinement of the targeting of any scrappage/behavioural change schemes. A number of organisations, including the Institute of Transport Studies at Leeds University and Ricardo (Energy & Environment), offer this roadside emission monitoring service.

Report Appendix A

Data Inputs

Traffic Data

Base Traffic Data

				Base							
Link No	**Nodes**	**Road Name / Direction**	**Speed**	**AF**	**AF factored**	**HGV**	**% HGV**	**LDV**	**HGV**	**LDV/HR**	**HGV/HR**
1	7002 - 579	Broughton Road / Newbiggin S	48	405	5563	12%	12	4895	668	204	28
2	579 - 578	Newbiggin S	43	192	2639	8%	8	2428	211	101	9
3	577 - 578	Newbiggin NW	48	426	5854	21%	21	4625	1229	193	51
4	553 - 577	Wheelgate N	48	376	5176	15%	15	4400	776	183	32
5	553 - 3652	Wheelgate SE	48	498	6847	9%	9	6231	616	260	26
6	3652 - 552	Castlegate SE	48	584	8032	11%	11	7149	884	298	37
7	552 - 551	Castlegate E	48	627	8628	12%	12	7592	1035	316	43
8	551 - 2551	Sheepfoot Hill E	10	268	3680	3%	3	3570	110	149	5
9	588 - 589	Horsemarket Road NE	71	746	10254	12%	12	9024	1231	376	51
10	588 - 2588	Yorkersgate E	48	527	7254	17%	17	6021	1233	251	51
11	2588 - 587	Yorkersgate E	48	527	7254	17%	17	6021	1233	251	51
14	554 - 553	Old Maltongate SW	48	310	4258	13%	13	3704	553	154	23
15	554 - 555	Old Maltongate NE	48	258	3545	13%	13	3084	461	129	19
16	555 - 557	Old Maltongate NE	48	239	3291	11%	11	2929	362	122	15
17	579 - 601	Mount Crescent S	44	266	3661	5%	5	3478	183	145	8
18	601 - 602	Middlecave Road NW	44	180	2479	9%	9	2256	223	94	9
19	601 - 2578	Middlecave Road SE	32	95	1302	25%	25	976	325	41	14
19	2578 - 2578	Middlecave Road SE	32	95	1302	25%	25	976	325	41	14
20	598 - 2578	Newgate / Spital Field Court NW	34	87	1202	19%	19	973	228	41	10
21	587 - 598	Market Street / Market Place N	10	277	3813	25%	25	2860	953	119	40
22	2578 - 599	Victoria Road / Horsemarket Road S	10	0	0	-		0	0	0	0
23	599 - 588	Horsemarket Road SW	44	84	1161	0%	0	1161	0	48	0
24	599 - 601	The Mount N	22	35	476	25%	25	357	119	15	5
20	598 - 586	Newgate / Spital Field Court NW	34	87	1202	19%	19	973	228	41	10
25	598-577	Finkle The same as 587-598	10	277	3813	25%	25	2860	953	119	40
26	579-580	Pasture Lane	40	237	3258	12%	12	2867	391	119	16
27	580 - 581	Pasture Lane E	40	302	4148	16%	16	3484	664	145	28
28	581 - 7106	Pasture Lane E	40	237	3258	12%	12	2867	391	119	16
29	578 - 562	Princess Road E	44	130	1790	13%	13	1557	233	65	10
30	562 - 563	Princess Road E	44	30	413	7%	7	384	29	16	1
32	563 - 555	East Mount S	44	14	190	21%	21	150	40	6	2
31	563 - 564	Princess Road / Peasey Hills Road N	44	92	1262	14%	14	1085	177	45	7
33	564 - 571	Peasey Hills Road N	44	45	624	18%	18	511	112	21	5
34	577 - 554	Greengate SE	34	0	0	-		0	0	0	0
35	3651 - 586	Railway Street N	36	493	6783	8%	8	6241	543	260	23
36	3651 - 3652	Wells Lane N	30	163	2244	15%	15	1908	337	79	14
37	2586 - 3651	Railway Street N	36	656	9028	10%	10	8125	903	339	38
38	585 - 2586	Railway Street N	36	505	6952	5%	5	6604	348	275	14
39	550 - 585	Norton Road W	26	537	7380	6%	6	6938	443	289	18
40	551 - 550	Castlegate S	48	529	7270	16%	16	6107	1163	254	48
41	501 - 518	Welham Road S	44	170	2331	20%	20	1865	466	78	19
42	518 - 542	Welham Road S	48	174	2390	18%	18	1960	430	82	18
43	542 - 544	Welham Road S	48	151	2080	14%	14	1789	291	75	12
44	501 - 502	Church Street E	48	520	7156	14%	14	6154	1002	256	42
45	502 - X	Church Street E	48	520	7156	14%	14	6154	1002	256	42
46	502 - 521	Wold Street S	44	334	4593	8%	8	4225	367	176	15
47	521 - 520	Langton Road S	44	286	3933	7%	7	3657	275	152	11
48	520 - 536	Langton Road S	48	265	3651	6%	6	3432	219	143	9
49	521 - 522	Wood Street E	26	53	728	12%	12	641	87	27	4
50	520 - 519	St Nicholas Street W	44	15	208	14%	14	179	29	7	1
51	519 - 2518	St Nicholas Street NW	44	15	208	14%	14	179	29	7	1
52	2518 - 518	St Nicholas Street NW	10	27	371	13%	13	322	48	13	2
12	587 - 586	Yorkersgate E	48	351	4832	11%	11	4300	531	179	22
53	586-586	Yorkersgate E	44	296	4076	11%	11	3628	448	151	19
13	586 - 553	Yorkersgate E	44	296	4076	11%	11	3628	448	151	19

Scenario 3 – Traffic Data

															Scenario 3																
DM	AADT	%HGV	HGV	LDV	HGV	LDV/HR	HGV/HR	HGV ban	AADT	%HGV	HGV	LDV	HGV	LDV/HR	HGV/HR	7.5 ton ban	AADT	%HGV	HGV	LDV	HGV	LDV/HR	HGV/HR	All schemes	AADT	%HGV	HGV	LDV	HGV	LDV/HR	HGV/HR
1010	13891	6%	6	13058	833	544	35	1014	13946	7%	7	12970	976	540	41	1002	13778	6%	6	12951	827	540	34	969	13330	8%	8	12264	1066	511	44
748	10287	5%	5	9773	514	407	21	740	10177	6%	6	9566	611	399	25	746	10254	5%	5	9741	513	406	21	704	9678	7%	7	9001	677	375	28
519	7139	15%	15	6068	1071	253	45	482	6627	13%	13	5766	862	240	36	508	6982	14%	14	6004	977	250	41	450	6182	15%	15	5255	927	219	39
289	3972	10%	10	3575	397	149	17	235	3229	16%	16	2712	517	113	22	261	3593	10%	10	3234	359	135	15	171	2346	17%	17	1947	399	81	17
539	7418	8%	8	6825	593	284	25	491	6755	3%	3	6553	203	273	8	523	7199	7%	7	6695	504	279	21	541	7438	3%	3	7215	223	301	9
613	8425	10%	10	7582	842	316	35	544	7479	2%	2	7329	150	305	6	591	8134	8%	8	7483	651	312	27	589	8102	2%	2	7940	162	331	7
671	9223	11%	11	8208	1015	342	42	593	8151	2%	2	7988	163	333	7	647	8903	9%	9	8101	801	338	33	638	8780	2%	2	8604	176	358	7
315	4338	4%	4	4164	174	174	7	311	4283	4%	4	4111	171	171	7	315	4325	4%	4	4152	173	173	7	304	4186	4%	4	4018	167	167	7
754	10366	14%	14	8915	1451	371	60	622	8559	16%	16	7189	1369	300	57	727	9991	15%	15	8492	1499	354	62	607	8353	16%	16	7016	1336	292	56
619	8516	22%	22	6643	1874	277	78	610	8387	22%	22	6542	1845	273	77	618	8504	22%	22	6633	1871	276	78	596	8192	22%	22	6390	1802	266	75
619	8516	22%	22	6643	1874	277	78	610	8387	22%	22	6542	1845	273	77	618	8504	22%	22	6633	1871	276	78	596	8192	22%	22	6390	1802	266	75
331	4554	12%	12	4007	546	167	23	301	4145	17%	17	3440	705	143	29	326	4489	13%	13	3906	584	163	24	215	2952	16%	16	2480	472	103	20
520	7153	14%	14	6152	1001	256	42	569	7825	23%	23	6026	1800	251	75	544	7477	17%	17	6206	1271	259	53	450	6188	25%	25	4641	1547	193	64
488	6704	11%	11	5967	737	249	31	546	7505	22%	22	5854	1651	244	69	502	6909	14%	14	5941	967	248	40	512	7034	23%	23	5416	1618	226	67
417	5728	6%	6	5384	344	224	14	408	5616	6%	6	5279	337	220	14	413	5678	6%	6	5338	341	222	14	421	5790	6%	6	5442	347	227	14
225	3100	6%	6	2914	186	121	8	209	2876	7%	7	2674	201	111	8	221	3045	6%	6	2862	183	119	8	209	2872	6%	6	2700	172	112	7
135	1856	25%	25	1392	464	58	19	137	1884	23%	23	1451	433	60	18	136	1873	25%	25	1405	468	59	20	124	1710	26%	26	1266	445	53	19
135	1856	25%	25	1392	464	58	19	137	1884	23%	23	1451	433	60	18	136	1873	25%	25	1405	468	59	20	124	1710	26%	26	1266	445	53	19
36	490	14%	14	421	69	18	3	43	586	12%	12	516	70	21	3	41	561	13%	13	488	73	20	3	45	612	12%	12	539	73	22	3
339	4656	20%	20	3725	931	155	39	380	5223	15%	15	4439	783	185	33	350	4811	19%	19	3897	914	162	38	410	5634	17%	17	4676	958	195	40
2	32	100%	100	0	32	0	1	2	32	100%	100	0	32	0	1	2	32	100%	100	0	32	0	1	2	33	100%	100	0	33	0	1
127	1742	2%	2	1708	35	71	1	130	1786	2%	2	1750	36	73	1	127	1741	2%	2	1706	35	71	1	134	1839	2%	2	1802	37	75	2
36	494	25%	25	370	123	15	5	21	289	13%	13	252	38	10	2	32	440	23%	23	339	101	14	4	20	282	13%	13	245	37	10	2
36	490	14%	14	421	69	18	3	43	586	12%	12	516	70	21	3	41	561	13%	13	488	73	20	3	45	612	12%	12	539	73	22	3
339	4656	20%	20	3725	931	155	39	380	5223	15%	15	4439	783	185	33	350	4811	19%	19	3897	914	162	38	410	5634	17%	17	4676	958	195	40
44	612	2%	2	599	12	25	1	46	631	6%	6	593	38	25	2	44	610	3%	3	592	18	25	1	55	755	7%	7	702	53	29	2
38	516	5%	5	490	26	20	1	25	339	3%	3	329	10	14	0	26	357	4%	4	343	14	14	1	87	1190	6%	6	1118	71	47	3
44	612	2%	2	599	12	25	1	46	631	6%	6	593	38	25	2	44	610	3%	3	592	18	25	1	55	755	7%	7	702	53	29	2
295	4060	5%	5	3857	203	161	8	299	4107	6%	6	3861	246	161	10	298	4093	5%	5	3889	205	162	9	315	4330	9%	9	3941	390	164	16
262	3596	5%	5	3416	180	142	7	265	3643	5%	5	3461	182	144	8	264	3635	5%	5	3453	182	144	8	279	3841	8%	8	3534	307	147	13
71	979	12%	12	862	118	36	5	94	1298	6%	6	1220	78	51	3	80	1094	11%	11	973	120	41	5	146	2002	9%	9	1822	180	76	8
326	4488	11%	11	3994	494	166	21	330	4541	12%	12	3996	545	167	23	336	4626	12%	12	4071	555	170	23	274	3764	13%	13	3275	489	136	20
286	3938	10%	10	3544	394	148	16	293	4029	11%	11	3585	443	149	18	298	4091	11%	11	3641	450	152	19	228	3131	12%	12	2755	376	115	16
0	0	-		0	0	0	0	0	0	-		0	0	0	0	0	0	-	0	0	0	0	0	0	0	-		0	0	0	0
539	7417	10%	10	6675	742	278	31	553	7598	6%	6	7142	456	298	19	546	7513	9%	9	6837	676	285	28	569	7827	7%	7	7279	548	303	23
123	1687	16%	16	1417	270	59	11	112	1546	5%	5	1469	77	61	3	118	1628	13%	13	1416	212	59	9	100	1371	2%	2	1343	27	56	1
662	9105	11%	11	8103	1002	338	42	665	9144	6%	6	8595	549	358	23	118	1628	13%	13	1416	212	59	9	669	9198	6%	6	8646	552	360	23
425	5841	8%	8	5374	467	224	19	428	5889	0%	0	5889	0	245	0	425	5844	6%	6	5493	351	229	15	424	5827	0%	0	5827	0	243	0
611	8406	7%	7	7817	588	326	25	626	8613	0%	0	8613	0	359	0	624	8585	6%	6	8070	515	336	21	633	8707	0%	0	8707	0	363	0
746	10260	11%	11	9132	1129	380	47	691	9502	0%	0	9502	0	396	0	729	10026	9%	9	9123	902	380	38	725	9973	0%	0	9973	0	416	0
280	3852	13%	13	3351	501	140	21	281	3865	12%	12	3402	464	142	19	282	3880	12%	12	3415	466	142	19	276	3790	12%	12	3335	455	139	19
295	4061	12%	12	3574	487	149	20	295	4057	12%	12	3570	487	149	20	295	4062	12%	12	3575	487	149	20	290	3985	12%	12	3507	478	146	20
250	3443	10%	10	3099	344	129	14	250	3440	10%	10	3096	344	129	14	251	3445	10%	10	3101	345	129	14	246	3380	10%	10	3042	338	127	14
771	10598	10%	10	9538	1060	397	44	766	10539	5%	5	10012	527	417	22	768	10557	9%	9	9607	950	400	40	759	10443	5%	5	9921	522	413	22
771	10598	10%	10	9538	1060	397	44	766	10539	5%	5	10012	527	417	22	768	10557	9%	9	9607	950	400	40	759	10443	5%	5	9921	522	413	22
404	5552	6%	6	5219	333	217	14	410	5637	5%	5	5355	282	223	12	404	5562	6%	6	5228	334	218	14	417	5738	6%	6	5394	344	225	14
365	5022	6%	6	4720	301	197	13	374	5141	6%	6	4832	308	201	13	366	5036	6%	6	4733	302	197	13	382	5252	6%	6	4937	315	206	13
331	4554	5%	5	4326	228	180	9	326	4488	5%	5	4264	224	178	9	331	4546	5%	5	4319	227	180	9	323	4445	5%	5	4222	222	176	9
52	715	12%	12	629	86	26	4	48	661	3%	3	641	20	27	1	51	700	10%	10	630	70	26	3	47	644	3%	3	625	19	26	1
307	4226	4%	4	4057	169	169	7	186	2551	3%	3	2475	77	103	3	282	3879	3%	3	3762	116	157	5	153	2108	4%	4	2024	84	84	4
325	4469	4%	4	4290	179	179	7	198	2726	3%	3	2644	82	110	3	299	4110	4%	4	3946	164	164	7	165	2272	4%	4	2181	91	91	4
332	4572	4%	4	4389	183	183	8	200	2750	1%	1	2723	28	113	1	305	4195	3%	3	4069	126	170	5	167	2298	1%	1	2275	23	95	1
471	6472	18%	18	5307	1165	221	49	470	6458	19%	19	5231	1227	218	51	335	4604	21%	21	3637	967	152	40	407	5601	19%	19	4537	1064	189	44
330	4535	20%	20	3628	907	151	38	339	4658	23%	23	3586	1071	149	45	335	4604	21%	21	3637	967	152	40	343	4721	19%	19	3824	897	159	37
330	4535	20%	20	3628	907	151	38	339	4658	23%	23	3586	1071	149	45	335	4604	21%	21	3637	967	152	40	343	4721	19%	19	3824	897	159	37

Scenario 7 – Traffic Data

Scenario 7

DM	AADT	%HGV	HGV	LDV	HGV	LDV/HR	HGV/HR	HGV ban	AADT	%HGV	HGV	LDV	HGV	LDV/HR	HGV/HR	7.5 HGV b	AADT	%HGV	HGV	LDV	HGV	LDV/HR	HGV/HR	All scheme	AADT	%HGV	HGV	LDV	HGV	LDV/HR	HGV/HR
1011	13899	6%	6	13066	834	544	35	977	13438	7%	7	12497	941	521	39	989	13605	6%	6	12789	816	533	34	961	13216	8%	8	12159	1057	507	44
748	10285	5%	5	9771	514	407	21	727	9994	6%	6	9394	600	391	25	729	10031	5%	5	9529	502	397	21	694	9539	7%	7	8872	668	370	28
516	7092	16%	16	5957	1135	248	47	505	6939	14%	14	5968	972	249	40	501	6890	16%	16	5788	1102	241	46	461	6346	15%	15	5394	952	225	40
323	4437	10%	10	3993	444	166	18	275	3786	12%	12	3332	454	139	19	314	4322	10%	10	3890	432	162	18	182	2497	9%	9	2272	225	95	9
546	7514	7%	7	6988	526	291	22	489	6729	3%	3	6527	202	272	8	516	7090	7%	7	6593	496	275	21	540	7420	3%	3	7198	223	300	9
621	8535	9%	9	7767	768	324	32	540	7427	2%	2	7278	149	303	6	583	8022	8%	8	7381	642	308	27	588	8089	2%	2	7927	162	330	7
678	9327	10%	10	8395	933	350	39	586	8052	2%	2	7891	161	329	7	638	8772	9%	9	7982	789	333	33	633	8711	2%	2	8536	174	356	7
317	4354	4%	4	4179	174	174	7	314	4319	4%	4	4146	173	173	7	318	4372	4%	4	4197	175	175	7	305	4192	4%	4	4024	168	168	7
771	10600	14%	14	9116	1484	380	62	675	9277	15%	15	7885	1392	329	58	763	10489	14%	14	9020	1468	376	61	648	8918	15%	15	7580	1338	316	56
607	8352	21%	21	6598	1754	275	73	605	8324	21%	21	6576	1748	274	73	611	8399	21%	21	6635	1764	276	73	580	7979	22%	22	6224	1755	259	73
607	8352	21%	21	6598	1754	275	73	605	8324	21%	21	6576	1748	274	73	611	8399	21%	21	6635	1764	276	73	580	7979	22%	22	6224	1755	259	73
339	4665	12%	12	4105	560	171	23	320	4403	18%	18	3611	793	150	33	481	6611	16%	16	5553	1058	231	44	235	3227	17%	17	2678	549	112	23
498	6846	13%	13	5956	890	248	37	557	7663	23%	23	5901	1763	246	73	332	4564	19%	19	3697	867	154	36	417	5734	25%	25	4301	1434	179	60
463	6362	10%	10	5726	636	239	27	529	7277	23%	23	5603	1674	233	70	484	6653	14%	14	5721	931	238	39	502	6909	23%	23	5320	1589	222	66
415	5714	6%	6	5371	343	224	14	412	5662	6%	6	5322	340	222	14	419	5767	6%	6	5421	346	226	14	419	5762	6%	6	5416	346	226	14
231	3182	6%	6	2991	191	125	8	217	2981	6%	6	2802	179	117	7	230	3166	6%	6	2976	190	124	8	215	2960	6%	6	2782	178	116	7
135	1854	25%	25	1390	463	58	19	137	1882	24%	24	1430	452	60	19	140	1924	24%	24	1462	462	61	19	126	1733	26%	26	1283	451	53	19
135	1854	25%	25	1390	463	58	19	137	1882	24%	24	1430	452	60	19	140	1924	24%	24	1462	462	61	19	126	1733	26%	26	1283	451	53	19
32	436	16%	16	366	70	15	3	45	612	12%	12	539	73	22	3	40	550	11%	11	489	60	20	3	43	594	13%	13	517	77	22	3
306	4211	23%	23	3242	968	135	40	363	4991	18%	18	4093	898	171	37	314	4317	22%	22	3368	950	140	40	400	5496	18%	18	4506	989	188	41
2	31	100%	100	0	31	0	1	2	31	100%	100	0	31	0	1	1	18	100%	100	0	18	0	1	2	32	100%	100	0	32	0	1
119	1638	2%	2	1606	33	67	1	122	1675	2%	2	1641	33	68	1	118	1629	1%	1	1612	16	67	1	126	1730	2%	2	1695	35	71	1
40	551	24%	24	418	132	17	6	23	311	13%	13	271	40	11	2	37	509	22%	22	397	112	17	5	21	292	13%	13	254	38	11	2
32	436	16%	16	366	70	15	3	45	612	12%	12	539	73	22	3	40	550	11%	11	489	60	20	3	43	594	13%	13	517	77	22	3
306	4211	23%	23	3242	968	135	40	363	4991	18%	18	4093	898	171	37	314	4317	22%	22	3368	950	140	40	400	5496	18%	18	4506	989	188	41
44	606	1%	1	600	6	25	0	46	636	6%	6	597	38	25	2	45	619	3%	3	600	19	25	1	54	738	7%	7	687	52	29	2
22	301	4%	4	289	12	12	1	26	354	2%	2	346	7	14	0	31	430	3%	3	417	13	17	1	86	1178	4%	4	1131	47	47	2
44	606	1%	1	600	6	25	0	46	636	6%	6	597	38	25	2	45	619	3%	3	600	19	25	1	54	738	7%	7	687	52	29	2
305	4194	6%	6	3942	252	164	10	297	4080	6%	6	3835	245	160	10	300	4125	5%	5	3919	206	163	9	313	4300	9%	9	3913	387	163	16
277	3816	5%	5	3625	191	151	8	266	3651	5%	5	3469	183	145	8	268	3683	5%	5	3499	184	146	8	278	3818	8%	8	3513	305	146	13
83	1147	13%	13	998	149	42	6	76	1044	8%	8	960	84	40	3	82	1128	12%	12	992	135	41	6	151	2072	10%	10	1865	207	78	9
346	4755	10%	10	4280	476	178	20	336	4627	11%	11	4118	509	172	21	341	4687	10%	10	4218	469	176	20	253	3482	12%	12	3064	418	128	17
303	4173	9%	9	3797	376	158	16	298	4104	10%	10	3694	410	154	17	298	4095	10%	10	3685	409	154	17	221	3035	12%	12	2671	364	111	15
0	0	-		0	0	0	0	0	0	-		0	0	0	0	0	0	-		0	0	0	0	0	0	-		0	0	0	0
533	7324	9%	9	6665	659	278	27	556	7642	6%	6	7183	459	299	19	542	7453	9%	9	6782	671	283	28	566	7786	7%	7	7241	545	302	23
122	1682	17%	17	1396	286	58	12	105	1438	2%	2	1409	29	59	1	118	1618	13%	13	1408	210	59	9	100	1372	1%	1	1358	14	57	1
655	9006	11%	11	8016	991	334	41	660	9080	6%	6	8535	545	356	23	118	1618	13%	13	1408	210	59	9	666	9157	6%	6	8608	549	359	23
422	5807	7%	7	5400	406	225	17	425	5849	0%	0	5849	0	244	0	418	5755	6%	6	5410	345	225	14	423	5812	0%	0	5812	0	242	0
596	8195	6%	6	7703	492	321	20	605	8321	0%	0	8321	0	347	0	597	8211	5%	5	7800	411	325	17	620	8533	0%	0	8533	0	356	0
748	10289	11%	11	9157	1132	382	47	649	8920	0%	0	8920	0	372	0	710	9770	9%	9	8890	879	370	37	702	9655	0%	0	9655	0	402	0
243	3340	14%	14	2873	468	120	19	241	3310	13%	13	2880	430	120	18	244	3360	14%	14	2890	470	120	20	235	3232	13%	13	2812	420	117	18
253	3473	13%	13	3021	451	126	19	253	3475	13%	13	3023	452	126	19	254	3493	13%	13	3039	454	127	19	247	3395	13%	13	2953	441	123	18
207	2853	11%	11	2539	314	106	13	208	2856	11%	11	2542	314	106	13	209	2870	11%	11	2555	316	106	13	203	2791	11%	11	2484	307	104	13
753	10355	10%	10	9320	1036	388	43	721	9916	5%	5	9421	496	393	21	751	10326	9%	9	9397	929	392	39	709	9745	5%	5	9258	487	386	20
753	10355	10%	10	9320	1036	388	43	721	9916	5%	5	9421	496	393	21	751	10326	9%	9	9397	929	392	39	709	9745	5%	5	9258	487	386	20
423	5819	6%	6	5470	349	228	15	419	5768	5%	5	5479	288	228	12	425	5845	6%	6	5495	351	229	15	417	5740	6%	6	5396	344	225	14
384	5286	6%	6	4969	317	207	13	385	5300	6%	6	4982	318	208	13	388	5332	6%	6	5012	320	209	13	384	5278	6%	6	4961	317	207	13
327	4494	5%	5	4270	225	178	9	324	4451	4%	4	4273	178	178	7	328	4516	5%	5	4290	226	179	9	318	4376	5%	5	4157	219	173	9
51	702	12%	12	618	84	26	4	46	639	2%	2	626	13	26	1	50	689	10%	10	620	69	26	3	46	639	3%	3	620	19	26	1
216	2971	4%	4	2853	119	119	5	90	1234	7%	7	1148	86	48	4	203	2788	3%	3	2704	84	113	3	76	1050	7%	7	976	73	41	3
234	3216	4%	4	3088	129	129	5	106	1456	6%	6	1369	87	57	4	220	3030	4%	4	2908	121	121	5	92	1268	6%	6	1191	76	50	3
242	3329	4%	4	3196	133	133	6	108	1487	1%	1	1473	15	61	1	227	3123	4%	4	2998	125	125	5	94	1294	1%	1	1281	13	53	1
454	6238	17%	17	5177	1060	216	44	476	6547	17%	17	5434	1113	226	46	332	4564	19%	19	3697	867	154	36	389	5352	18%	18	4389	963	183	40
327	4490	18%	18	3682	808	153	34	337	4632	22%	22	3613	1019	151	42	332	4564	19%	19	3697	867	154	36	325	4474	18%	18	3669	805	153	34
327	4490	18%	18	3682	808	153	34	337	4632	22%	22	3613	1019	151	42	332	4564	19%	19	3697	867	154	36	325	4474	18%	18	3669	805	153	34

Queues

Base

			Base						
		AF	AADT	HGV	% HGV	LDV	HGV	LDV/HR	HGV/HR
1	7002 - 579	Broughton Road / New	15000		12	13200	1800	550	75
14	554 - 553	Old Maltongate SW	15000		13	13050	1950	544	81
13	586 - 553	Yorkersgate E	15000		11	13350	1650	556	69

Scenario 3

			Scenario 3 - DM						
		AF	AADT	HGV	% HGV	LDV	HGV	LDV/HR	HGV/HR
1	7002 - 579	Broughton Road / New	15000		6	14100	900	588	38
14	554 - 553	Old Maltongate SW	15000		12	13200	1800	550	75
27	580 - 581	Pasture Lane E	15000		5	14250	750	594	31
33	564 - 571	Peasey Hills Road N	15000		10	13500	1500	563	63
12	587 - 586	Yorkersgate E	15000		18	12300	2700	513	113
13	586 - 553	Yorkersgate E	15000		20	12000	3000	500	125
			Scenario 3 - HGV						
		AF	AADT	HGV	% HGV	LDV	HGV	LDV/HR	HGV/HR
1	7002 - 579	Broughton Road / New	15000		7	13950	1050	581	44
14	554 - 553	Old Maltongate SW	15000		17	12450	2550	519	106
21	587 - 598	Market Street / Marke	15000		15	12750	2250	531	94
27	580 - 581	Pasture Lane E	15000		3	14550	450	606	19
33	564 - 571	Peasey Hills Road N	15000		11	13350	1650	556	69
12	587 - 586	Yorkersgate E	15000		19	12150	2850	506	119
13	586 - 553	Yorkersgate E	15000		23	11550	3450	481	144
			Scenario 3 - 7.5 HGV						
		AF	AADT	HGV	% HGV	LDV	HGV	LDV/HR	HGV/HR
1	7002 - 579	Broughton Road / New	15000		6	14100	900	588	38
11	2588 - 587	Yorkersgate E	15000		22	11700	3300	488	138
14	554 - 553	Old Maltongate SW	15000		13	13050	1950	544	81
27	580 - 581	Pasture Lane E	15000		4	14400	600	600	25
33	564 - 571	Peasey Hills Road N	15000		11	13350	1650	556	69
12	587 - 586	Yorkersgate E	15000		21	11850	3150	494	131
13	586 - 553	Yorkersgate E	15000		21	11850	3150	494	131
			Scenario 3 - All Scheme						
		AF	AADT	HGV	% HGV	LDV	HGV	LDV/HR	HGV/HR
1	7002 - 579	Broughton Road / New	15000		8	13800	1200	575	50
11	2588 - 587	Yorkersgate E	15000		22	11700	3300	488	138
14	554 - 553	Old Maltongate SW	15000		16	12600	2400	525	100
21	587 - 598	Market Street / Marke	15000		17	12450	2550	519	106
27	580 - 581	Pasture Lane E	15000		6	14100	900	588	38
33	564 - 571	Peasey Hills Road N	15000		12	13200	1800	550	75
12	587 - 586	Yorkersgate E	15000		19	12150	2850	506	119
13	586 - 553	Yorkersgate E	15000		19	12150	2850	506	119

Scenario 7

			Scenario 7 - DM						
		AF	AADT	HGV	% HGV	LDV	HGV	LDV/HR	HGV/HR
1	7002 - 579	Broughton Road / New	15000		6	14100	900	588	38
14	554 - 553	Old Maltongate SW	15000		12	13200	1800	550	75
27	580 - 581	Pasture Lane E	15000		4	14400	600	600	25
33	564 - 571	Peasey Hills Road N	15000		9	13650	1350	569	56
12	587 - 586	Yorkersgate E	15000		17	12450	2550	519	106
13	586 - 553	Yorkersgate E	15000		18	12300	2700	513	113
			Scenario 7 - HGV						
		AF	AADT	HGV	% HGV	LDV	HGV	LDV/HR	HGV/HR
1	7002 - 579	Broughton Road / New	15000		7	13950	1050	581	44
14	554 - 553	Old Maltongate SW	15000		18	12300	2700	513	113
27	580 - 581	Pasture Lane E	15000		2	14700	300	613	13
33	564 - 571	Peasey Hills Road N	15000		10	13500	1500	563	63
12	587 - 586	Yorkersgate E	15000		17	12450	2550	519	106
13	586 - 553	Yorkersgate E	15000		22	11700	3300	488	138
			Scenario 7 - 7.5 HGV						
		AF	AADT	HGV	% HGV	LDV	HGV	LDV/HR	HGV/HR
1	7002 - 579	Broughton Road / New	15000		6	14100	900	588	38
14	554 - 553	Old Maltongate SW	15000		16	12600	2400	525	100
27	580 - 581	Pasture Lane E	15000		3	14550	450	606	19
33	564 - 571	Peasey Hills Road N	15000		10	13500	1500	563	63
12	587 - 586	Yorkersgate E	15000		19	12150	2850	506	119
13	586 - 553	Yorkersgate E	15000		19	12150	2850	506	119
			Scenario 7 - All Scheme						
		AF	AADT	HGV	% HGV	LDV	HGV	LDV/HR	HGV/HR
1	7002 - 579	Broughton Road / New	15000		8	13800	1200	575	50
11	2588 - 587	Yorkersgate E	15000		22	11700	3300	488	138
14	554 - 553	Old Maltongate SW	15000		17	12450	2550	519	106
21	587 - 598	Market Street / Marke	15000		18	12300	2700	513	113
27	580 - 581	Pasture Lane E	15000		4	14400	600	600	25
33	564 - 571	Peasey Hills Road N	15000		12	13200	1800	550	75
12	587 - 586	Yorkersgate E	15000		18	12300	2700	513	113
13	586 - 553	Yorkersgate E	15000		18	12300	2700	513	113

Background Concentrations

			Background Concentrations all receptors							
Site ID/ Receptor	OS Grid Reference		2015				2027			
	X	Y	NO2	NOx	PM10	PM2.5	NO2	NOx	PM10	PM2.5
1 Yorkersgate	478742	471663	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
2 Wheelergt 1	478706	471738	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
3 Wheelergt 2	478609	471880	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
4 Mastongt 1	478863	471742	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
5 Maltong 2	478938	471787	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
6 Castlegt 1	478852	471579	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
7 Castlegt 2	479168	471553	10.09	13.72	13.64	13.72	7.04	9.31	12.90	9.05
8 Castlegt 3	478996	471537	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
9 Yorkersgt 1	478660	471628	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
10 Yorkersg 2	478521	471599	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
1	478429	472141	9.55	12.89	14.06	9.69	6.29	8.25	13.33	9.05
2	478364	472108	9.55	12.89	14.06	9.69	6.29	8.25	13.33	9.05
3	478338	472121	9.55	12.89	14.06	9.69	6.29	8.25	13.33	9.05
4	478374	472083	9.55	12.89	14.06	9.69	6.29	8.25	13.33	9.05
5	478371	472002	9.55	12.89	14.06	9.69	6.29	8.25	13.33	9.05
6	478388	471998	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
7	478366	471998	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
8	478476	471889	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
9	478484	471877	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
10	478551	471758	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
11	478423	471655	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
12	478830	471612	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
13	478337	471549	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
14	478278	471527	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
15	478828	471957	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
16	478834	471975	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
17	478898	472187	9.55	12.89	14.06	9.69	6.29	8.25	13.33	9.05
18	479029	471839	10.09	13.72	13.64	13.72	7.04	9.31	12.90	9.05
19	478700	471537	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
20	478674	471409	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
21	478694	471396	9.36	12.62	13.57	9.50	6.30	8.25	12.82	8.84
22	479123	471392	10.09	13.72	13.64	13.72	7.04	9.31	12.90	9.05
23	479335	471376	10.09	13.72	13.64	13.72	7.04	9.31	12.90	9.05
24	479361	471238	10.09	13.72	13.64	13.72	7.04	9.31	12.90	9.05
25	479365	471115	10.09	13.72	13.64	13.72	7.04	9.31	12.90	9.05
26	479245	471201	10.09	13.72	13.64	13.72	7.04	9.31	12.90	9.05
27	479098	471329	10.09	13.72	13.64	13.72	7.04	9.31	12.90	9.05
28	479049	471246	10.09	13.72	13.64	13.72	7.04	9.31	12.90	9.05
29	479000	471176	10.09	13.72	13.64	13.72	7.04	9.31	12.90	9.05

Street Canyon

	Left							Right						
Link	Width_L	Ave Height_L	Min Height_L	Max Height_L	Canyon Length_L	End Length_L	Build Length_L	Width_R	Ave Height_R	Min Height_R	Max Height_R	Canyon Length_R	End Length_R	Build Length_R
553 - 577	5	6.75	4.5	9	209	0	202	7	6.25	4.5	8	191	0	186
577 - 578	7	6.25	4.5	8	41	0	40	1.7	6.25	4.5	8	59	0	59
578 - 579	7	5.75	4.5	7	221	0	212	6.2	6	4	8	295	0	247
577 - 598	4	5	3	7	54	0	53	0	0	0	0	0	0	0
598 - 586	6	10.5	6	15	171	0	161	3	11	7	15	99	0	97
598 - 587	4.1	6.5	6	7	70	0	70	4.2	8	6	10	220	0	213
586 - 3651	4.8	5.1	2.2	8	40	0	40	4.3	6.5	3	10	84	0	84
3651 - 3652	4.3	12.5	4.5	8	31	0	31	4.4	6.5	6	7	84	0	79
586 - 586	4	5.5	4	7	39	0	38	6	7.5	5	10	47	0	46
586 - 587	4	8	6	10	160	0	163	7	9	6	12	169	0	165
601 - 2578	4.3	5	2	8	97	0	77	10	8	4	12	110	0	78
2578 - 2578	4.2	5	4	6	41	0	41	0	0	0	0	0	0	0
2578 - 599	4.6	5.5	3	8	237	0	155	6	8	4	12	349	0	269
578 - 562	3.6	4	3	5	39	0	39	3.6	5	2	8	41	0	41
562 - 563	4.4	6.5	6	7	21	0	21	4.6	6.5	6	7	97	0	97
550 - 555	5.2	4	2	6	161	0	161	0	0	0	0	0	0	0
555 - 554	4	4	2	6	104	0	104	5	6	6	6	52	0	52
554 - 553	5	8	4	6	101	0	101	0	0	0	0	0	0	0
2551 - 551	0	0	0	0	0	0	0	0	0	0	0	0	0	0
551 - 552	5	6.5	5	8	145	0	131	4	5.5	2	9	163	0	163
552 - 3652	5.5	6.5	6	7	154	0	88	4.5	6.5	6	7	133	0	111
3652 - 553	4.6	7.7	7	8	30	0	30	0	0	0	0	0	0	0

Report Appendix B

Assessment Results

Comparison of Scenario 3 and 7 Development Scenarios in 2027

2027 'Do Nothing' Modelled Annual Mean Concentration of Pollutants (in µgm-[3])

Receptor	Do Nothing								
	S3	S7	Diff.	S3	S7	Diff.	S3	S7	Diff.
	PM_{10}	**PM_{10}**		$PM_{2.5}$	**$PM_{2.5}$**		NO_2	**NO_2**	
1 Yorkersgate	18.25	**18.45**	-0.20	11.82	**11.93**	-0.11	22.31	**22.90**	-0.59
2 Wheelergt 1	14.23	**14.43**	-0.20	9.61	**9.72**	-0.11	9.72	**10.42**	-0.70
3 Wheelergt 2	16.19	**16.22**	-0.04	10.66	**10.68**	-0.02	13.11	**13.18**	-0.07
4 Mastongt 1	14.14	**15.30**	-1.16	9.56	**10.21**	-0.65	9.49	**14.43**	-4.94
5 Maltong 2	15.44	**15.33**	0.11	10.26	**10.21**	0.06	12.65	**12.50**	0.15
6 Castlegt 1	15.48	**15.51**	-0.02	10.28	**10.30**	-0.01	11.86	**12.05**	-0.19
7 Castlegt 2	14.04	**14.04**	0.00	9.68	**9.68**	0.00	10.12	**10.14**	-0.02
8 Castlegt 3	16.06	**16.05**	0.01	10.60	**10.60**	0.00	14.02	**14.08**	-0.06
9 Yorkersgt 1	16.82	**17.33**	-0.51	11.03	**11.32**	-0.29	18.43	**20.79**	-2.36
10 Yorkersg 2	16.21	**16.08**	0.13	10.69	**10.62**	0.07	16.50	**16.28**	0.22
1	14.65	**14.28**	0.38	9.79	**9.58**	0.21	11.03	**9.52**	1.51
2	15.05	**15.05**	0.00	9.99	**9.99**	0.00	10.63	**10.65**	-0.02
3	15.31	**15.32**	-0.01	10.14	**10.14**	0.00	11.89	**11.92**	-0.03
4	14.14	**14.14**	0.00	9.49	**9.49**	0.00	8.07	**8.08**	-0.01
5	13.94	**13.95**	-0.01	9.38	**9.39**	-0.01	7.52	**7.56**	-0.04
6	13.22	**13.23**	-0.01	9.06	**9.07**	0.00	7.05	**7.08**	-0.03

7	13.26	**13.27**	-0.01	9.08	**9.08**	-0.01	7.12	**7.15**	-0.03
8	13.28	**13.29**	-0.01	9.09	**9.10**	-0.01	7.19	**7.23**	-0.04
9	13.08	**13.09**	-0.01	8.98	**8.99**	-0.01	6.73	**6.78**	-0.05
10	13.06	**13.08**	-0.02	8.97	**8.99**	-0.01	6.91	**7.02**	-0.11
11	13.02	**13.03**	-0.01	8.95	**8.96**	-0.01	6.61	**6.68**	-0.07
12	13.09	**13.16**	-0.07	8.99	**9.03**	-0.04	6.79	**7.12**	-0.33
13	13.73	**13.73**	0.00	9.33	**9.33**	0.00	7.89	**7.92**	-0.03
14	13.95	**13.98**	-0.03	9.45	**9.46**	-0.02	8.26	**8.32**	-0.06
15	13.08	**13.10**	-0.03	8.98	**8.99**	-0.01	6.70	**6.79**	-0.09
16	13.31	**13.34**	-0.03	9.11	**9.13**	-0.02	7.22	**7.33**	-0.11
17	13.70	**13.71**	-0.01	9.25	**9.26**	-0.01	6.94	**6.97**	-0.03
18	13.51	**13.49**	0.02	9.38	**9.37**	0.01	8.23	**8.21**	0.02
19	14.06	**14.08**	-0.02	9.51	**9.52**	-0.01	9.12	**9.26**	-0.14
20	13.29	**13.28**	0.00	9.10	**9.09**	0.00	7.28	**7.30**	-0.02
21	13.67	**13.64**	0.03	9.31	**9.29**	0.02	8.41	**8.36**	0.05
22	13.79	**13.75**	0.04	9.53	**9.51**	0.02	8.67	**8.60**	0.07
23	14.08	**14.09**	0.00	9.69	**9.69**	0.00	9.28	**9.30**	-0.02
24	13.51	**13.45**	0.06	9.38	**9.35**	0.03	8.08	**7.93**	0.15
25	13.29	**13.28**	0.01	9.26	**9.26**	0.00	7.54	**7.53**	0.01
26	13.28	**13.20**	0.08	9.26	**9.22**	0.04	7.57	**7.38**	0.19
27	13.61	**13.51**	0.10	9.44	**9.39**	0.05	8.62	**8.32**	0.30
28	13.29	**13.24**	0.04	9.26	**9.24**	0.02	7.52	**7.44**	0.08
29	13.21	**13.18**	0.03	9.22	**9.20**	0.02	7.34	**7.27**	0.07

2027 'OGV 1 and 2 Ban' Modelled Annual Mean Concentration of Pollutants (in µgm-³)

Receptor	OGV1/2 Ban								
	S3	S7	Diff.	S3	S7	Diff.	S3	S7	Diff.
	PM_{10}	**PM_{10}**		$PM_{2.5}$	**$PM_{2.5}$**		NO_2	**NO_2**	
1 Yorkersgate	18.47	**18.44**	0.03	11.95	**11.93**	0.02	24.01	**23.67**	0.34
2 Wheelergt 1	14.23	**14.31**	-0.08	9.61	**9.65**	-0.05	9.81	**10.10**	-0.29
3 Wheelergt 2	15.86	**16.04**	-0.17	10.48	**10.58**	-0.09	12.61	**12.92**	-0.31
4 Mastongt 1	14.35	**14.48**	-0.13	9.67	**9.74**	-0.07	10.14	**10.56**	-0.42
5 Maltong 2	16.20	**16.12**	0.08	10.67	**10.63**	0.04	14.19	**14.01**	0.18
6 Castlegt 1	14.84	**14.83**	0.01	9.94	**9.94**	0.01	10.98	**10.96**	0.02
7 Castlegt 2	13.87	**13.87**	0.01	9.59	**9.59**	0.00	9.82	**9.81**	0.01
8 Castlegt 3	15.18	**15.15**	0.03	10.13	**10.12**	0.02	12.41	**12.34**	0.07
9 Yorkersgt 1	17.17	**17.41**	-0.24	11.23	**11.36**	-0.13	19.79	**20.88**	-1.09
10 Yorkersg 2	17.10	**16.23**	0.86	11.19	**10.71**	0.48	19.93	**16.66**	3.27
1	14.66	**14.58**	0.08	9.79	**9.75**	0.04	10.93	**10.58**	0.35
2	15.10	**15.05**	0.05	10.02	**9.99**	0.03	10.75	**10.62**	0.13
3	15.47	**15.17**	0.30	10.23	**10.06**	0.17	12.47	**11.35**	1.12
4	14.15	**14.14**	0.01	9.50	**9.49**	0.00	8.09	**8.07**	0.02
5	13.93	**13.93**	0.00	9.38	**9.38**	0.00	7.50	**7.51**	-0.01
6	13.22	**13.22**	0.00	9.06	**9.06**	0.00	7.04	**7.04**	0.00
7	13.25	**13.25**	0.00	9.07	**9.07**	0.00	7.10	**7.11**	-0.01
8	13.28	**13.29**	-0.01	9.09	**9.10**	0.00	7.23	**7.24**	-0.01
9	13.09	**13.09**	0.00	8.99	**8.99**	0.00	6.78	**6.78**	0.00
10	13.09	**13.09**	0.00	8.99	**8.99**	0.00	7.05	**7.04**	0.01
11	13.03	**13.02**	0.01	8.96	**8.95**	0.01	6.70	**6.66**	0.04
12	13.13	**13.14**	0.00	9.01	**9.02**	0.00	7.10	**7.11**	-0.01

13	13.68	**13.68**	-0.01	9.30	**9.31**	0.00	7.80	**7.82**	-0.02
14	13.82	**13.87**	-0.05	9.37	**9.40**	-0.03	7.99	**8.10**	-0.11
15	13.10	**13.09**	0.01	8.99	**8.99**	0.00	6.79	**6.78**	0.01
16	13.34	**13.33**	0.01	9.12	**9.12**	0.00	7.32	**7.31**	0.01
17	13.72	**13.71**	0.00	9.26	**9.26**	0.00	6.98	**6.97**	0.01
18	13.71	**13.70**	0.01	9.49	**9.49**	0.01	8.67	**8.64**	0.03
19	13.98	**13.97**	0.01	9.47	**9.47**	0.01	9.16	**9.13**	0.03
20	13.23	**13.22**	0.01	9.07	**9.06**	0.00	7.24	**7.21**	0.03
21	13.56	**13.54**	0.02	9.25	**9.24**	0.01	8.26	**8.19**	0.07
22	13.67	**13.61**	0.06	9.47	**9.44**	0.03	8.50	**8.36**	0.14
23	13.99	**13.96**	0.03	9.65	**9.63**	0.02	9.18	**9.11**	0.07
24	13.41	**13.34**	0.07	9.33	**9.29**	0.04	7.85	**7.68**	0.17
25	13.28	**13.26**	0.02	9.26	**9.25**	0.01	7.52	**7.49**	0.03
26	13.16	**13.08**	0.08	9.19	**9.15**	0.04	7.29	**7.09**	0.20
27	13.50	**13.39**	0.11	9.38	**9.32**	0.06	8.23	**7.88**	0.35
28	13.28	**13.23**	0.05	9.26	**9.23**	0.02	7.51	**7.40**	0.11
29	13.21	**13.17**	0.04	9.22	**9.20**	0.02	7.35	**7.26**	0.09

2027 'OGV2 Ban' Modelled Annual Mean Concentration of Pollutants (in µgm-^{3})

Receptor	OGV2 Ban								
	S3	S7	Diff.	S3	S7	Diff.	S3	S7	Diff.
	PM_{10}	**PM_{10}**		$PM_{2.5}$	**$PM_{2.5}$**		NO_2	**NO_2**	
1 Yorkersgate	18.50	**18.96**	-0.46	11.96	**12.21**	-0.25	23.70	**24.39**	-0.69
2 Wheelergt 1	14.20	**14.42**	-0.21	9.60	**9.71**	-0.12	9.86	**10.39**	-0.53
3 Wheelergt 2	16.07	**16.14**	-0.07	10.60	**10.63**	-0.04	12.98	**13.03**	-0.05
4 Mastongt 1	14.54	**15.90**	-1.36	9.78	**10.53**	-0.75	11.13	**16.31**	-5.18
5 Maltong 2	15.74	**14.83**	0.90	10.43	**9.93**	0.49	13.34	**11.14**	2.20

6 Castlegt 1	15.33	**15.31**	0.02	10.20	**10.19**	0.01	11.74	**11.70**	0.04
7 Castlegt 2	14.00	**13.99**	0.00	9.66	**9.66**	0.00	10.06	**10.05**	0.01
8 Castlegt 3	15.84	**15.81**	0.03	10.49	**10.47**	0.02	13.63	**13.55**	0.08
9 Yorkersgt 1	16.92	**17.04**	-0.11	11.10	**11.16**	-0.06	19.75	**20.30**	-0.55
10 Yorkersg 2	15.88	**15.71**	0.16	10.52	**10.43**	0.09	15.83	**15.40**	0.43
1	14.49	**14.44**	0.05	9.70	**9.67**	0.03	10.35	**10.09**	0.26
2	15.04	**14.98**	0.06	9.99	**9.95**	0.04	10.62	**10.38**	0.24
3	15.40	**15.04**	0.37	10.19	**9.99**	0.21	12.28	**10.83**	1.45
4	14.14	**14.14**	0.00	9.49	**9.49**	0.00	8.07	**8.05**	0.02
5	13.95	**13.95**	-0.01	9.39	**9.39**	0.00	7.54	**7.56**	-0.02
6	13.23	**13.23**	0.00	9.06	**9.06**	0.00	7.06	**7.07**	-0.01
7	13.26	**13.26**	-0.01	9.08	**9.08**	0.00	7.13	**7.15**	-0.02
8	13.30	**13.30**	0.01	9.10	**9.10**	0.00	7.26	**7.25**	0.01
9	13.10	**13.09**	0.00	8.99	**8.99**	0.00	6.79	**6.78**	0.01
10	13.09	**13.08**	0.01	8.99	**8.98**	0.01	7.05	**7.02**	0.03
11	13.03	**13.02**	0.01	8.96	**8.95**	0.00	6.69	**6.66**	0.03
12	13.15	**13.16**	-0.01	9.02	**9.03**	-0.01	7.11	**7.14**	-0.03
13	13.73	**13.72**	0.00	9.33	**9.33**	0.00	7.90	**7.90**	0.00
14	13.94	**13.96**	-0.03	9.44	**9.45**	-0.01	8.23	**8.30**	-0.07
15	13.10	**13.10**	0.00	8.99	**8.99**	0.00	6.79	**6.79**	0.00
16	13.34	**13.34**	0.00	9.12	**9.12**	0.00	7.32	**7.32**	0.00
17	13.72	**13.71**	0.01	9.26	**9.26**	0.00	6.98	**6.96**	0.02
18	13.57	**13.55**	0.02	9.42	**9.40**	0.01	8.38	**8.34**	0.04
19	13.31	**13.30**	0.01	9.11	**9.10**	0.01	7.46	**7.41**	0.05
20	13.28	**13.26**	0.02	9.09	**9.08**	0.01	7.31	**7.26**	0.05
21	13.66	**13.62**	0.05	9.30	**9.28**	0.03	8.44	**8.31**	0.13

22	13.76	**13.73**	0.04	9.52	**9.50**	0.02	8.65	**8.55**	0.10
23	14.07	**14.07**	0.00	9.68	**9.69**	0.00	9.28	**9.28**	0.00
24	13.49	**13.43**	0.06	9.37	**9.34**	0.03	8.03	**7.90**	0.13
25	13.29	**13.28**	0.01	9.26	**9.26**	0.00	7.55	**7.53**	0.02
26	13.26	**13.18**	0.08	9.25	**9.21**	0.04	7.52	**7.34**	0.18
27	13.59	**13.50**	0.09	9.43	**9.38**	0.05	8.53	**8.26**	0.27
28	13.29	**13.24**	0.05	9.26	**9.24**	0.02	7.54	**7.43**	0.11
29	13.21	**13.17**	0.04	9.22	**9.20**	0.02	7.36	**7.27**	0.09

2027 'All Schemes' Modelled Annual Mean Concentration of Pollutants (in µgm-[3])

Receptor	All Schemes								
	S3	S7	Diff.	S3	S7	Diff.	S3	S7	Diff.
	PM_{10}	**PM_{10}**		$PM_{2.5}$	**$PM_{2.5}$**		NO_2	**NO_2**	
1 Yorkersgate	17.90	**17.86**	0.04	11.63	**11.62**	0.02	22.28	**22.28**	0.00
2 Wheelergt 1	13.93	**13.84**	0.10	9.45	**9.40**	0.05	9.08	**8.97**	0.11
3 Wheelergt 2	15.81	**15.88**	-0.07	10.45	**10.49**	-0.04	12.44	**12.56**	-0.12
4 Mastongt 1	13.96	**14.01**	-0.05	9.46	**9.49**	-0.03	9.05	**9.19**	-0.14
5 Maltong 2	15.68	**15.53**	0.16	10.39	**10.30**	0.08	12.94	**12.57**	0.37
6 Castlegt 1	14.99	**14.99**	0.01	10.03	**10.02**	0.00	11.31	**11.29**	0.02
7 Castlegt 2	13.89	**13.88**	0.01	9.60	**9.60**	0.00	9.86	**9.84**	0.02
8 Castlegt 3	15.33	**15.31**	0.02	10.22	**10.21**	0.01	12.81	**12.76**	0.05
9 Yorkersgt 1	16.83	**16.68**	0.15	11.04	**10.96**	0.08	18.88	**18.48**	0.40
10 Yorkersg 2	19.20	**19.00**	0.20	12.37	**12.26**	0.11	28.78	**28.27**	0.51
1	14.84	**14.71**	0.13	9.89	**9.82**	0.07	11.74	**11.10**	0.64
2	15.08	**15.07**	0.01	10.00	**10.00**	0.00	10.70	**10.67**	0.03
3	15.07	**15.07**	0.01	10.00	**10.00**	0.00	10.94	**10.92**	0.02

4	14.16	**14.15**	0.00	9.50	**9.50**	0.00	8.13	**8.12**	0.01
5	13.93	**13.93**	0.00	9.38	**9.38**	0.00	7.51	**7.52**	-0.01
6	13.22	**13.22**	0.00	9.06	**9.06**	0.00	7.06	**7.05**	0.01
7	13.25	**13.25**	0.00	9.07	**9.07**	0.00	7.12	**7.12**	0.00
8	13.28	**13.28**	0.00	9.09	**9.09**	0.00	7.24	**7.22**	0.02
9	13.09	**13.09**	0.00	8.99	**8.99**	0.00	6.81	**6.79**	0.02
10	13.12	**13.11**	0.01	9.01	**9.00**	0.01	7.21	**7.17**	0.04
11	13.10	**13.07**	0.03	8.99	**8.98**	0.02	7.01	**6.88**	0.13
12	13.12	**13.12**	0.00	9.01	**9.01**	0.00	7.03	**7.04**	-0.01
13	13.68	**13.67**	0.01	9.30	**9.30**	0.00	7.86	**7.83**	0.03
14	13.80	**13.84**	-0.03	9.37	**9.39**	-0.02	8.00	**8.06**	-0.06
15	13.13	**13.12**	0.00	9.01	**9.01**	0.00	6.85	**6.84**	0.01
16	13.34	**13.32**	0.02	9.12	**9.11**	0.01	7.30	**7.26**	0.04
17	13.65	**13.64**	0.01	9.23	**9.22**	0.00	6.82	**6.81**	0.01
18	13.68	**13.66**	0.01	9.47	**9.47**	0.01	8.57	**8.54**	0.03
19	14.00	**13.98**	0.01	9.48	**9.48**	0.01	9.22	**9.18**	0.04
20	13.24	**13.24**	0.01	9.07	**9.07**	0.01	7.30	**7.27**	0.03
21	13.58	**13.56**	0.02	9.26	**9.25**	0.01	8.33	**8.27**	0.06
22	13.67	**13.62**	0.05	9.47	**9.44**	0.03	8.50	**8.37**	0.13
23	14.00	**13.96**	0.05	9.65	**9.63**	0.02	9.19	**9.09**	0.10
24	13.39	**13.33**	0.06	9.32	**9.28**	0.03	7.80	**7.65**	0.15
25	13.27	**13.26**	0.01	9.25	**9.25**	0.01	7.51	**7.49**	0.02
26	13.14	**13.07**	0.07	9.18	**9.14**	0.04	7.23	**7.05**	0.18
27	13.47	**13.38**	0.09	9.36	**9.31**	0.05	8.11	**7.84**	0.27
28	13.27	**13.23**	0.05	9.25	**9.23**	0.03	7.51	**7.39**	0.12
29	13.20	**13.17**	0.04	9.22	**9.20**	0.02	7.35	**7.25**	0.10

Comparison of Highway Interventions (Complementary Measures) SCENARIO 3

Change in NO_2 Pollutant Level Compared to Do-Nothing – Scenario 3 (in µgm-3)

Scenario 3				
Receptor	Do-Nothing	NO_2 Results		
		OGV1/2 Ban	OGV2 Ban	All Schemes
1 Yorkersgate c	22.31	1.70	1.39	-0.03
2 Wheelergt 1	9.72	0.09	0.14	-0.64
3 Wheelergt 2	13.11	-0.50	-0.13	-0.67
4 Mastongt 1	9.49	0.65	1.64	-0.44
5 Maltong 2	12.65	1.54	0.69	0.29
6 Castlegt 1	11.86	-0.88	-0.12	-0.55
7 Castlegt 2	10.12	-0.30	-0.06	-0.26
8 Castlegt 3	14.02	-1.61	-0.39	-1.21
9 Yorkersgt 1	18.43	1.36	1.32	0.45
10 Yorkersgt 2	16.50	3.43	-0.67	12.28
1	11.03	-0.10	-0.68	0.71
2	10.63	0.12	-0.01	0.07
3	11.89	0.58	0.39	-0.95
4	8.07	0.02	0.00	0.06
5	7.52	-0.02	0.02	-0.01
6	7.05	-0.01	0.01	0.01
7	7.12	-0.02	0.01	0.00
8	7.19	0.04	0.07	0.05
9	6.73	0.05	0.06	0.08

10	6.91	0.14	0.14	0.30
11	6.61	0.09	0.08	0.40
12	6.79	0.31	0.32	0.24
13	7.89	-0.09	0.01	-0.03
14	8.26	-0.27	-0.03	-0.26
15	6.70	0.09	0.09	0.15
16	7.22	0.10	0.10	0.08
17	6.94	0.04	0.04	-0.12
18	8.23	0.44	0.15	0.34
19	9.12	0.04	-1.66	0.10
20	7.28	-0.04	0.03	0.02
21	8.41	-0.15	0.03	-0.08
22	8.67	-0.17	-0.02	-0.17
23	9.28	-0.10	0.00	-0.09
24	8.08	-0.23	-0.05	-0.28
25	7.54	-0.02	0.01	-0.03
26	7.57	-0.28	-0.05	-0.34
27	8.62	-0.39	-0.09	-0.51
28	7.52	-0.01	0.02	-0.01
29	7.34	0.01	0.02	0.01

Change in PM_{10} Pollutant Level Compared to Do-Minimum – Scenario 3 (in μgm-3)

Scenario 3				
Receptor	Do-Minimum	PM_{10} Results		
		OGV1/2 Ban	OGV2 Ban 7.5	All Schemes
1 Yorkersgate c	18.25	0.22	0.25	-0.35
2 Wheelergt 1	14.23	0.00	-0.03	-0.29
3 Wheelergt 2	16.19	-0.32	-0.11	-0.38
4 Mastongt 1	14.14	0.21	0.40	-0.18
5 Maltong 2	15.44	0.76	0.30	0.24
6 Castlegt 1	15.48	-0.64	-0.15	-0.49
7 Castlegt 2	14.04	-0.16	-0.04	-0.15
8 Castlegt 3	16.06	-0.88	-0.22	-0.74
9 Yorkersgt 1	16.82	0.35	0.11	0.01
10 Yorkersgt 2	16.21	0.89	-0.33	2.99
1	14.65	0.00	-0.16	0.18
2	15.05	0.05	-0.01	0.02
3	15.31	0.15	0.09	-0.24
4	14.14	0.01	0.00	0.01
5	13.94	-0.01	0.00	-0.01
6	13.22	-0.01	0.00	0.00
7	13.26	-0.01	0.00	-0.01
8	13.28	0.00	0.02	0.00
9	13.08	0.01	0.01	0.01
10	13.06	0.03	0.03	0.06
11	13.02	0.01	0.01	0.08
12	13.09	0.04	0.06	0.03

13	13.73	-0.05	0.00	-0.05
14	13.95	-0.13	-0.01	-0.14
15	13.08	0.03	0.02	0.05
16	13.31	0.03	0.03	0.02
17	13.70	0.02	0.02	-0.04
18	13.51	0.21	0.06	0.17
19	14.06	-0.08	-0.75	-0.06
20	13.29	-0.05	-0.01	-0.04
21	13.67	-0.11	-0.01	-0.09
22	13.79	-0.12	-0.02	-0.12
23	14.08	-0.09	-0.01	-0.08
24	13.51	-0.10	-0.02	-0.12
25	13.29	-0.01	0.00	-0.01
26	13.28	-0.12	-0.02	-0.14
27	13.61	-0.11	-0.03	-0.14
28	13.29	-0.01	0.00	-0.01
29	13.21	0.00	0.00	0.00

Change in $PM_{2.5}$ Pollutant Level Compared to Do-Minimum – Scenario 3 (in µgm-³)

Scenario 3				
Receptor	Do-Minimum	$PM_{2.5}$ Results		
		OGV1/2 Ban	OGV2 Ban	All Schemes
1 Yorkersgate c	11.82	0.13	0.14	-0.18
2 Wheelergt 1	9.61	0.00	-0.01	-0.16
3 Wheelergt 2	10.66	-0.17	-0.06	-0.20

4 Maltongt 1	9.56	0.11	0.22	-0.10
5 Maltongt 2	10.26	0.41	0.16	0.13
6 Castlegt 1	10.28	-0.34	-0.08	-0.26
7 Castlegt 2	9.68	-0.09	-0.02	-0.08
8 Castlegt 3	10.60	-0.47	-0.12	-0.39
9 Yorkersgt 1	11.03	0.19	0.06	0.01
10 Yorkersgt 2	10.69	0.50	-0.18	1.67
1	9.79	0.00	-0.09	0.10
2	9.99	0.03	0.00	0.01
3	10.14	0.09	0.05	-0.14
4	9.49	0.00	0.00	0.01
5	9.38	-0.01	0.00	-0.01
6	9.06	0.00	0.00	0.00
7	9.08	-0.01	0.00	-0.01
8	9.09	0.00	0.01	0.00
9	8.98	0.00	0.01	0.01
10	8.97	0.02	0.02	0.03
11	8.95	0.01	0.01	0.04
12	8.99	0.03	0.03	0.02
13	9.33	-0.03	0.00	-0.03
14	9.45	-0.07	-0.01	-0.08
15	8.98	0.01	0.01	0.03
16	9.11	0.02	0.02	0.01
17	9.25	0.01	0.01	-0.02
18	9.38	0.11	0.03	0.09
19	9.51	-0.04	-0.40	-0.03

20	9.10	-0.03	0.00	-0.02
21	9.31	-0.06	0.00	-0.05
22	9.53	-0.06	-0.01	-0.06
23	9.69	-0.05	-0.01	-0.04
24	9.38	-0.06	-0.01	-0.06
25	9.26	-0.01	0.00	-0.01
26	9.26	-0.07	-0.01	-0.08
27	9.44	-0.06	-0.01	-0.08
28	9.26	0.00	0.00	-0.01
29	9.22	0.00	0.00	0.00

Comparison of Highway Interventions (Complementary Measures) SCENARIO 7

Change in NO_2 Pollutant Level Compared to Do-Minimum – Scenario 7 (in µgm-3)

Scenario 7				
Receptor	Do-Minimum	NO_2 Results		
		OGV1/2 Ban	OGV2 Ban	All Schemes
1 Yorkersgate c	22.90	0.77	1.49	-0.62
2 Wheelergt 1	10.42	-0.32	-0.03	-1.45
3 Wheelergt 2	13.18	-0.26	-0.15	-0.62
4 Mastongt 1	14.43	-3.87	1.88	-5.24
5 Maltong 2	12.50	1.51	-1.36	0.07
6 Castlegt 1	12.05	-1.09	-0.35	-0.76
7 Castlegt 2	10.14	-0.33	-0.09	-0.30
8 Castlegt 3	14.08	-1.74	-0.53	-1.32
9 Yorkersgt 1	20.79	0.09	-0.49	-2.31

10 Yorkersgt 2	16.28	0.38	-0.88	11.99
1	9.52	1.06	0.57	1.58
2	10.65	-0.03	-0.27	0.02
3	11.92	-0.57	-1.09	-1.00
4	8.08	-0.01	-0.03	0.04
5	7.56	-0.05	0.00	-0.04
6	7.08	-0.04	-0.01	-0.03
7	7.15	-0.04	0.00	-0.03
8	7.23	0.01	0.02	-0.01
9	6.78	0.00	0.00	0.01
10	7.02	0.02	0.00	0.15
11	6.68	-0.02	-0.02	0.20
12	7.12	-0.01	0.02	-0.08
13	7.92	-0.10	-0.02	-0.09
14	8.32	-0.22	-0.02	-0.26
15	6.79	-0.01	0.00	0.05
16	7.33	-0.02	-0.01	-0.07
17	6.97	0.00	-0.01	-0.16
18	8.21	0.43	0.13	0.33
19	9.26	-0.13	-1.85	-0.08
20	7.30	-0.09	-0.04	-0.03
21	8.36	-0.17	-0.05	-0.09
22	8.60	-0.24	-0.05	-0.23
23	9.30	-0.19	-0.02	-0.21
24	7.93	-0.25	-0.03	-0.28
25	7.53	-0.04	0.00	-0.04

26	7.38	-0.29	-0.04	-0.33
27	8.32	-0.44	-0.06	-0.48
28	7.44	-0.04	-0.01	-0.05
29	7.27	-0.01	0.00	-0.02

Change in PM_{10} Pollutant Level Compared to Do-Minimum – Scenario 7 (in µgm-3)

Scenario 7				
Receptor	Do-Minimum	PM_{10} Results		
		OGV1/2 Ban	OGV2 Ban	All Schemes
1 Yorkersgate c	18.45	-0.01	0.51	-0.59
2 Wheelergt 1	14.43	-0.12	-0.02	-0.60
3 Wheelergt 2	16.22	-0.19	-0.08	-0.35
4 Mastongt 1	15.30	-0.83	0.59	-1.29
5 Maltong 2	15.33	0.79	-0.49	0.20
6 Castlegt 1	15.51	-0.68	-0.20	-0.52
7 Castlegt 2	14.04	-0.17	-0.04	-0.15
8 Castlegt 3	16.05	-0.90	-0.25	-0.74
9 Yorkersgt 1	17.33	0.08	-0.29	-0.65
10 Yorkersgt 2	16.08	0.15	-0.37	2.92
1	14.28	0.30	0.16	0.43
2	15.05	-0.01	-0.08	0.01
3	15.32	-0.15	-0.28	-0.25
4	14.14	0.00	-0.01	0.01
5	13.95	-0.02	0.00	-0.02

6	13.23	-0.01	0.00	-0.01
7	13.27	-0.02	0.00	-0.02
8	13.29	0.00	0.00	-0.01
9	13.09	0.00	0.00	0.00
10	13.08	0.00	0.00	0.03
11	13.03	-0.01	-0.01	0.04
12	13.16	-0.02	0.00	-0.04
13	13.73	-0.05	-0.01	-0.06
14	13.98	-0.11	-0.02	-0.14
15	13.10	-0.01	0.00	0.02
16	13.34	-0.01	-0.01	-0.03
17	13.71	0.00	0.00	-0.07
18	13.49	0.22	0.06	0.18
19	14.08	-0.11	-0.78	-0.09
20	13.28	-0.06	-0.02	-0.05
21	13.64	-0.10	-0.02	-0.08
22	13.75	-0.14	-0.02	-0.13
23	14.09	-0.12	-0.01	-0.13
24	13.45	-0.11	-0.02	-0.12
25	13.28	-0.02	0.00	-0.02
26	13.20	-0.12	-0.02	-0.13
27	13.51	-0.12	-0.02	-0.14
28	13.24	-0.01	0.00	-0.02
29	13.18	-0.01	0.00	-0.01

Change in $PM_{2.5}$ Pollutant Level Compared to Do-Minimum – Scenario 7 (in µgm-^{3})

Scenario 7

Receptor	Do-Minimum	PM2.5 Results		
		OGV1/2 Ban	OGV2 Ban	All Schemes
1 Yorkersgate c	11.93	-0.01	0.28	-0.32
2 Wheelergt 1	9.72	-0.07	-0.01	-0.32
3 Wheelergt 2	10.68	-0.10	-0.04	-0.19
4 Mastongt 1	10.21	-0.47	0.32	-0.72
5 Maltong 2	10.21	0.42	-0.27	0.10
6 Castlegt 1	10.30	-0.36	-0.10	-0.27
7 Castlegt 2	9.68	-0.09	-0.02	-0.08
8 Castlegt 3	10.60	-0.48	-0.13	-0.39
9 Yorkersgt 1	11.32	0.04	-0.16	-0.36
10 Yorkersgt 2	10.62	0.09	-0.20	1.64
1	9.58	0.17	0.09	0.24
2	9.99	0.00	-0.04	0.01
3	10.14	-0.08	-0.16	-0.14
4	9.49	0.00	0.00	0.01
5	9.39	-0.01	0.00	-0.01
6	9.07	-0.01	0.00	-0.01
7	9.08	-0.01	0.00	-0.01
8	9.10	0.00	0.00	-0.01
9	8.99	0.00	0.00	0.00
10	8.99	0.00	0.00	0.02
11	8.96	0.00	0.00	0.02
12	9.03	-0.01	0.00	-0.02
13	9.33	-0.03	0.00	-0.03
14	9.46	-0.06	-0.01	-0.08

15	8.99	0.00	0.00	0.01
16	9.13	-0.01	0.00	-0.02
17	9.26	0.00	0.00	-0.04
18	9.37	0.12	0.03	0.09
19	9.52	-0.06	-0.42	-0.05
20	9.09	-0.03	-0.01	-0.02
21	9.29	-0.05	-0.01	-0.04
22	9.51	-0.07	-0.01	-0.07
23	9.69	-0.06	-0.01	-0.07
24	9.35	-0.06	-0.01	-0.06
25	9.26	-0.01	0.00	-0.01
26	9.22	-0.06	-0.01	-0.07
27	9.39	-0.07	-0.01	-0.08
28	9.24	-0.01	0.00	-0.01
29	9.20	0.00	0.00	-0.01

ADMS Modelling Sensitivity Test

Scenario 3 'Do Nothing' Nitrogen Dioxide Sensitivity Test (in µgm-3)

Receptor	Do Minimum		
	Original NO_2 Results	Sensitivity Test NO_2 Results	Difference
1 Yorkersgate	22.31	**64.11**	**41.80**
2 Wheelergt 1	9.72	20.56	+10.84
3 Wheelergt 2	13.11	33.33	+20.22
4 Mastongt 1	9.49	20.57	+11.08
5 Maltong 2	12.65	33.39	+20.74
6 Castlegt 1	11.86	26.46	+14.60
7 Castlegt 2	10.12	19.15	+9.03
8 Castlegt 3	14.02	35.57	+21.55
9 Yorkersgt 1	18.43	**56.50**	**+38.07**
10 Yorkersgt 2	16.50	**50.36**	**+33.86**
1	11.03	22.83	+11.80
2	10.63	20.96	+10.33
3	11.89	25.33	+13.44
4	8.07	12.75	+4.68
5	7.52	11.67	+4.15
6	7.05	10.03	+2.98
7	7.12	10.10	+2.98
8	7.19	11.86	+4.67
9	6.73	9.32	+2.59
10	6.91	10.13	+3.22
11	6.61	8.82	+2.21
12	6.79	9.15	+2.36
13	7.89	13.72	+5.83

14	8.26	14.29	+6.03
15	6.70	8.56	+1.86
16	7.22	10.45	+3.23
17	6.94	9.44	+2.50
18	8.23	13.26	+5.03
19	9.12	18.24	+9.12
20	7.28	10.67	+3.39
21	8.41	14.71	+6.30
22	8.67	14.32	+5.65
23	9.28	15.86	+6.58
24	8.08	11.22	+3.14
25	7.54	9.50	+1.96
26	7.57	9.61	+2.04
27	8.62	13.88	+5.26
28	7.52	9.98	+2.46
29	7.34	9.29	+1.95

Scenario 3 'OGV1/2 Ban' Nitrogen Dioxide Sensitivity Test (in µgm-³)

Receptor	**OGV1/2 Ban**		
	Original NO_2 Results	**Sensitivity Test NO_2 Results**	**Difference**
1 Yorkersgate	24.01	**72.45**	**+48.44**
2 Wheelergt 1	9.81	23.10	+13.29
3 Wheelergt 2	12.61	30.58	+17.97
4 Mastongt 1	10.14	25.47	+15.33
5 Maltong 2	14.19	**44.47**	**+30.28**
6 Castlegt 1	10.98	19.75	+8.77
7 Castlegt 2	9.82	16.56	+6.74

8 Castlegt 3	12.41	23.19	+10.78
9 Yorkersgt 1	19.79	**61.77**	**+41.98**
10 Yorkersgt 2	19.93	**60.40**	**+40.47**
1	10.93	21.21	+10.28
2	10.75	21.91	+11.16
3	12.47	27.92	+15.45
4	8.09	12.97	+4.88
5	7.50	11.58	+4.08
6	7.04	9.95	+2.91
7	7.10	10.04	+2.94
8	7.23	11.94	+4.71
9	6.78	9.51	+2.73
10	7.05	10.67	+3.62
11	6.70	9.23	+2.53
12	7.10	10.54	+3.44
13	7.80	13.52	+5.72
14	7.99	13.62	+5.63
15	6.79	8.97	+2.18
16	7.32	10.94	+3.62
17	6.98	9.74	+2.76
18	8.67	17.25	+8.58
19	9.16	16.94	+7.78
20	7.24	9.42	+2.18
21	8.26	11.78	+3.52
22	8.50	12.58	+4.08
23	9.18	14.51	+5.33
24	7.85	10.42	+2.57

25	7.52	9.42	+1.90
26	7.29	8.64	+1.35
27	8.23	12.23	+4.00
28	7.51	9.87	+2.36
29	7.35	9.27	+1.92

Scenario 3 'OGV2 Ban' Nitrogen Dioxide Sensitivity Test (in µgm-3)

Receptor	OGV2 Ban		
	Original NO_2 Results	Sensitivity Test NO_2 Results	Difference
1 Yorkersgate	23.70	**68.87**	**+45.17**
2 Wheelergt 1	9.86	21.33	+11.47
3 Wheelergt 2	12.98	32.40	+19.42
4 Mastongt 1	11.13	27.63	+16.50
5 Maltong 2	13.34	37.72	+24.38
6 Castlegt 1	11.74	25.22	+13.48
7 Castlegt 2	10.06	18.61	+8.55
8 Castlegt 3	13.63	32.74	+19.11
9 Yorkersgt 1	19.75	**62.23**	**+42.48**
10 Yorkersgt 2	15.83	**48.30**	**+32.47**
1	10.35	20.13	+9.78
2	10.62	20.94	+10.32
3	12.28	26.61	+14.33
4	8.07	12.78	+4.71
5	7.54	11.78	+4.24
6	7.06	10.13	+3.07
7	7.13	10.20	+3.07

8	7.26	12.27	+5.01
9	6.79	9.65	+2.86
10	7.05	10.82	+3.77
11	6.69	9.23	+2.54
12	7.11	10.62	+3.51
13	7.90	13.87	+5.97
14	8.23	14.38	+6.15
15	6.79	8.97	+2.18
16	7.32	10.93	+3.61
17	6.98	9.75	+2.77
18	8.38	14.46	+6.08
19	7.46	12.17	-4.71
20	7.31	10.62	+3.31
21	8.44	14.45	+6.01
22	8.65	14.01	+5.36
23	9.28	15.68	+6.40
24	8.03	11.04	+3.01
25	7.55	9.53	+1.98
26	7.52	9.44	+1.92
27	8.53	13.35	+4.82
28	7.54	10.04	+2.50
29	7.36	9.36	+2.00

Scenario 3 'All Schemes' Nitrogen Dioxide Sensitivity Test (in µgm-³)

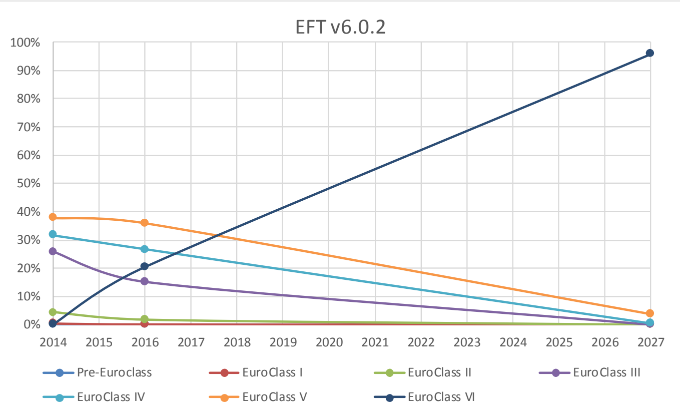
Receptor	All Schemes		
	Original NO_2 Results	Sensitivity Test NO_2 Results	Difference
1 Yorkersgate	22.28	**65.10**	**+42.82**
2 Wheelergt 1	9.08	20.06	+10.98
3 Wheelergt 2	12.44	31.09	+18.65
4 Mastongt 1	9.05	20.53	+11.48
5 Maltong 2	12.94	**40.00**	**+27.06**
6 Castlegt 1	11.31	20.49	+9.18
7 Castlegt 2	9.86	15.99	+6.13
8 Castlegt 3	12.81	20.51	+7.70
9 Yorkersgt 1	18.88	**58.11**	**+39.23**
10 Yorkersg 2	28.78	**89.45**	**+60.67**
1	11.74	25.91	+14.17
2	10.70	22.23	+11.53
3	10.94	23.28	+12.34
4	8.13	13.19	+5.06
5	7.51	11.70	+4.19
6	7.06	10.10	+3.04
7	7.12	10.14	+3.02
8	7.24	12.20	+4.96
9	6.81	9.76	+2.95
10	7.21	11.48	+4.27
11	7.01	10.79	+3.78
12	7.03	10.10	+3.07
13	7.86	13.84	+5.98

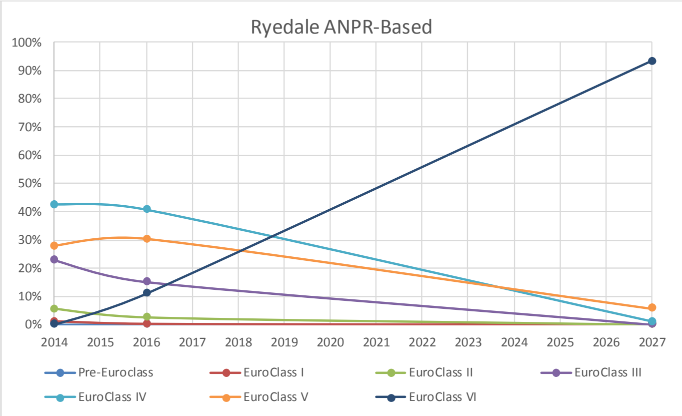
14	8.00	13.70	+5.70
15	6.85	9.32	+2.47
16	7.30	11.05	+3.75
17	6.82	9.24	+2.42
18	8.57	16.85	+8.28
19	9.22	17.19	+7.97
20	7.30	9.71	+2.41
21	8.33	12.06	+3.73
22	8.50	12.49	+3.99
23	9.19	14.63	+5.44
24	7.80	10.37	+2.57
25	7.51	9.40	+1.89
26	7.23	8.54	+1.31
27	8.11	11.71	+3.60
28	7.51	9.84	+2.33
29	7.35	9.28	+1.93

Report Appendix C

Petrol Car

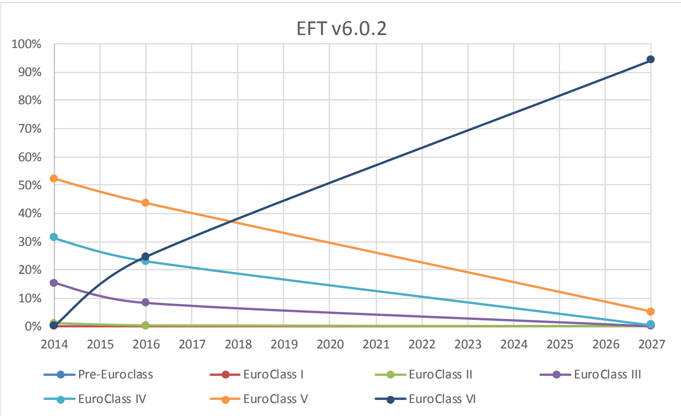
Vehicle Type	2016			2027		
	EFT v6.0.2	ANPR-Based	Difference	EFT v6.0.2	ANPR-Based	Difference
Pre Euro Class	0%	0%	0%	0%	0%	0%
Euro Class I	0%	0%	0%	0%	0%	0%
Euro Class II	2%	3%	1%	0%	0%	0%
Euro Class III	15%	15%	0%	0%	0%	0%
Euro Class IV	27%	41%	14%	0%	1%	1%
Euro Class V	36%	30%	-6%	4%	6%	2%
Euro Class VI	20%	11%	-9%	96%	93%	-3%
Euro Class 0 – IV	44%	59%	15%	0%	1%	1%
Euro Class V - VI	56%	41%	-15%	100%	99%	-1%

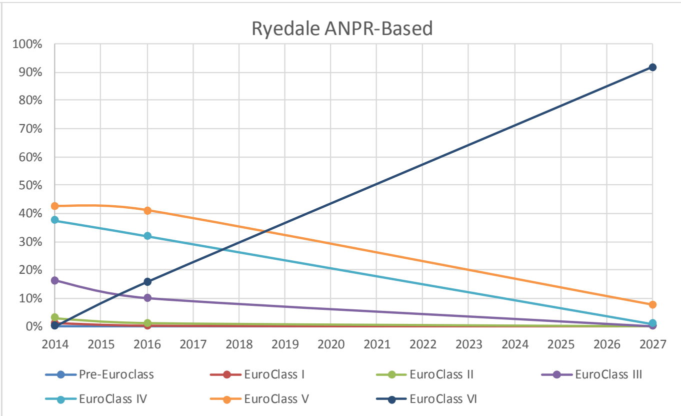




Diesel Car

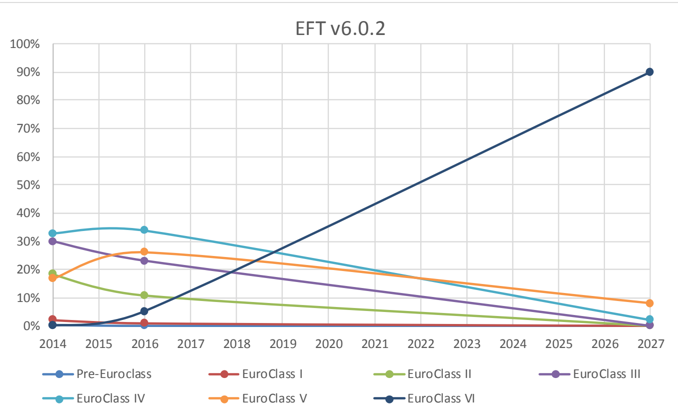
Vehicle Type	2016			2027		
	EFT v6.0.2	ANPR-Based	Difference	EFT v6.0.2	ANPR-Based	Difference
Pre Euro Class	0%	0%	0%	0%	0%	0%
Euro Class I	0%	0%	0%	0%	0%	0%
Euro Class II	0%	1%	1%	0%	0%	0%
Euro Class III	8%	10%	2%	0%	0%	0%
Euro Class IV	23%	32%	9%	0%	1%	0%
Euro Class V	44%	41%	-3%	5%	8%	2%
Euro Class VI	25%	16%	-9%	94%	92%	-3%
Euro Class 0 – IV	32%	43%	12%	0%	1%	0%
Euro Class V - VI	68%	57%	-12%	100%	99%	0%

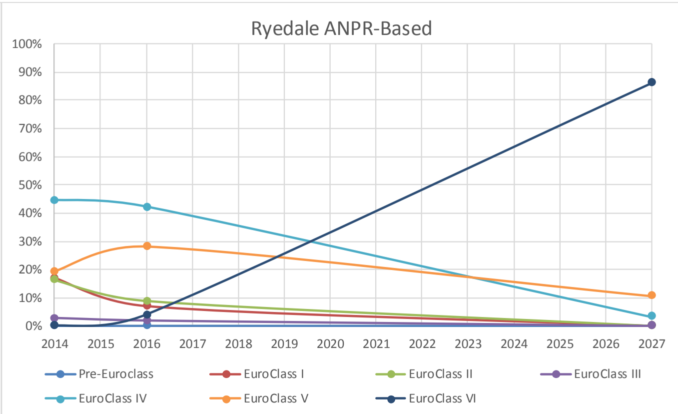




Petrol LGV

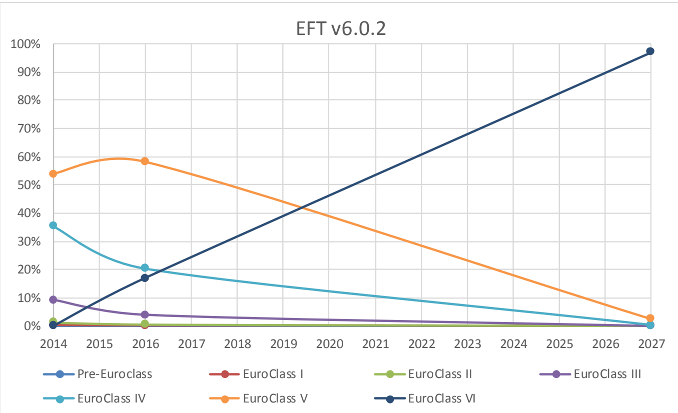
Vehicle Type	2016			2027		
	EFT v6.0.2	ANPR-Based	Difference	EFT v6.0.2	ANPR-Based	Difference
Pre Euro Class	0%	8%	8%	0%	0%	0%
Euro Class I	1%	7%	6%	0%	0%	0%
Euro Class II	11%	9%	-2%	0%	0%	0%
Euro Class III	23%	2%	-21%	0%	0%	0%
Euro Class IV	34%	42%	8%	2%	3%	1%
Euro Class V	26%	28%	2%	8%	11%	3%
Euro Class VI	5%	4%	-1%	90%	86%	-4%
Euro Class 0 – IV	69%	68%	-1%	2%	3%	1%
Euro Class V - VI	31%	32%	1%	98%	97%	-1%

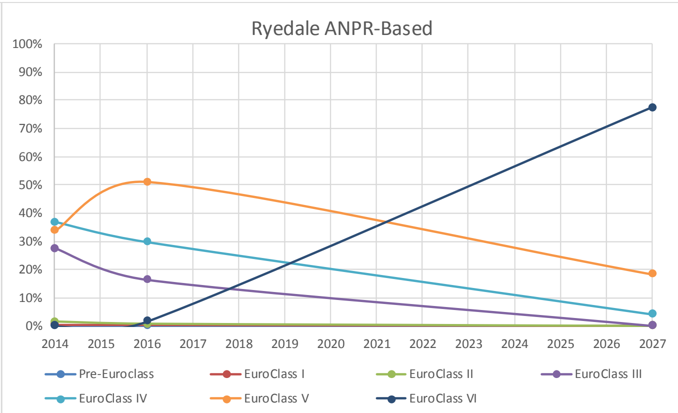




Diesel LGV

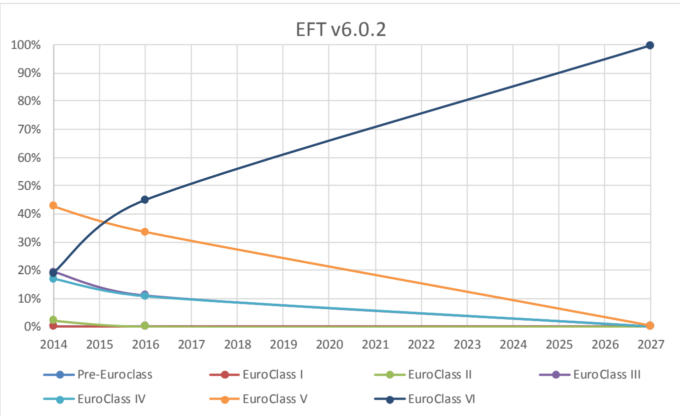
Vehicle Type	2016			2027		
	EFT v6.0.2	ANPR-Based	Difference	EFT v6.0.2	ANPR-Based	Difference
Pre Euro Class	0%	0%	0%	0%	0%	0%
Euro Class I	0%	0%	0%	0%	0%	0%
Euro Class II	0%	1%	0%	0%	0%	0%
Euro Class III	4%	16%	12%	0%	0%	0%
Euro Class IV	20%	30%	9%	0%	4%	4%
Euro Class V	58%	51%	-7%	3%	18%	16%
Euro Class VI	17%	2%	-15%	97%	78%	-20%
Euro Class 0 – IV	25%	47%	22%	0%	4%	4%
Euro Class V - VI	75%	53%	-22%	100%	96%	-4%

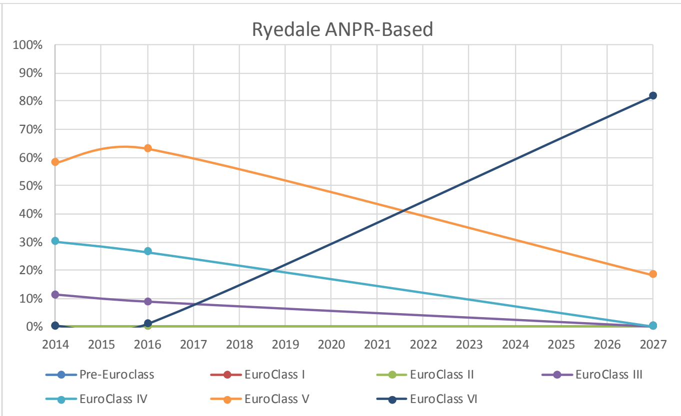




Rigid HGV

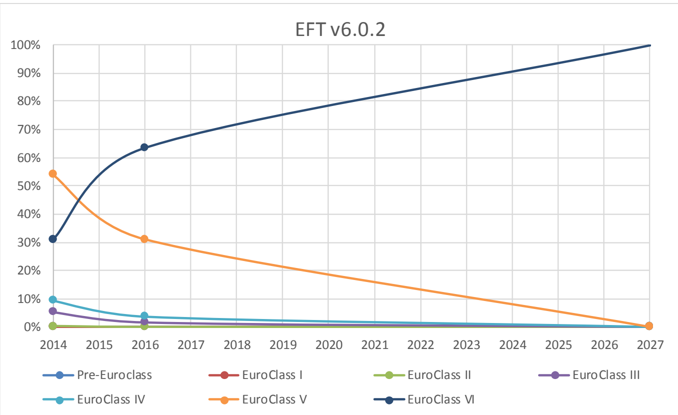
Vehicle Type	2016			2027		
	EFT v6.0.2	ANPR-Based	Difference	EFT v6.0.2	ANPR-Based	Difference
Pre Euro Class	0%	0%	0%	0%	0%	0%
Euro Class I	0%	0%	0%	0%	0%	0%
Euro Class II	0%	1%	1%	0%	0%	0%
Euro Class III	11%	9%	-2%	0%	0%	0%
Euro Class IV	11%	26%	16%	0%	0%	0%
Euro Class V	34%	63%	30%	0%	18%	18%
Euro Class VI	45%	1%	-44%	100%	82%	-18%
Euro Class 0 – IV	22%	36%	14%	0%	0%	0%
Euro Class V - VI	78%	64%	-14%	100%	100%	0%

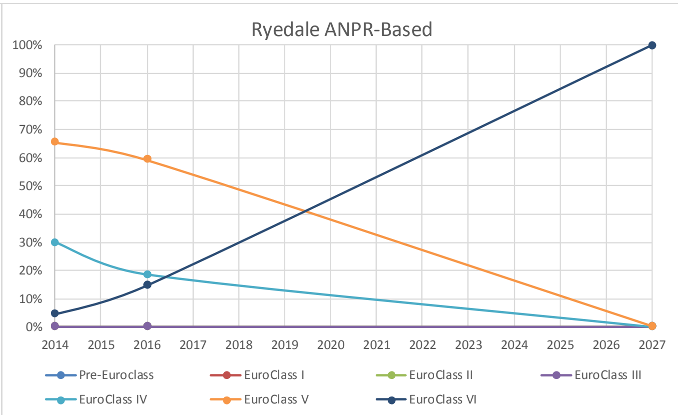




Articulated HGV

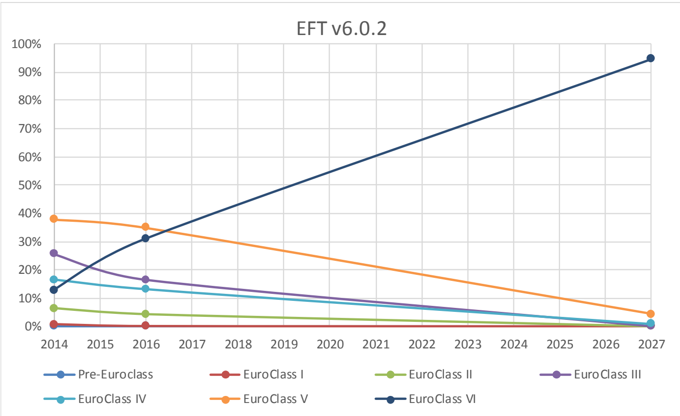
Vehicle Type	2016			2027		
	EFT v6.0.2	ANPR-Based	Difference	EFT v6.0.2	ANPR-Based	Difference
Pre Euro Class	0%	0%	0%	0%	0%	0%
Euro Class I	0%	0%	0%	0%	0%	0%
Euro Class II	0%	7%	7%	0%	0%	0%
Euro Class III	2%	0%	-2%	0%	0%	0%
Euro Class IV	4%	19%	15%	0%	0%	0%
Euro Class V	31%	59%	28%	0%	0%	0%
Euro Class VI	64%	15%	-49%	100%	100%	0%
Euro Class 0 – IV	5%	26%	21%	0%	0%	0%
Euro Class V - VI	95%	74%	-21%	100%	100%	0%

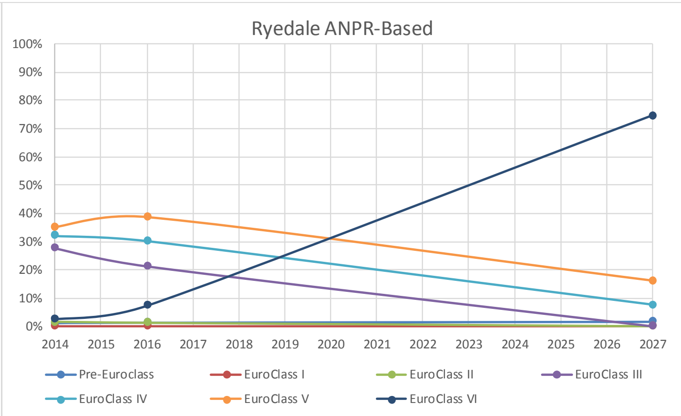




Buses

Vehicle Type	2016			2027		
	EFT v6.0.2	ANPR-Based	Difference	EFT v6.0.2	ANPR-Based	Difference
Pre Euro Class	0%	1%	1%	0%	2%	2%
Euro Class I	0%	0%	0%	0%	0%	0%
Euro Class II	4%	1%	-3%	0%	0%	0%
Euro Class III	16%	21%	5%	0%	0%	0%
Euro Class IV	13%	30%	17%	1%	7%	7%
Euro Class V	35%	39%	4%	4%	16%	12%
Euro Class VI	31%	7%	-24%	95%	75%	-20%
Euro Class 0 – IV	34%	54%	20%	1%	9%	8%
Euro Class V - VI	66%	46%	-20%	99%	91%	-8%





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