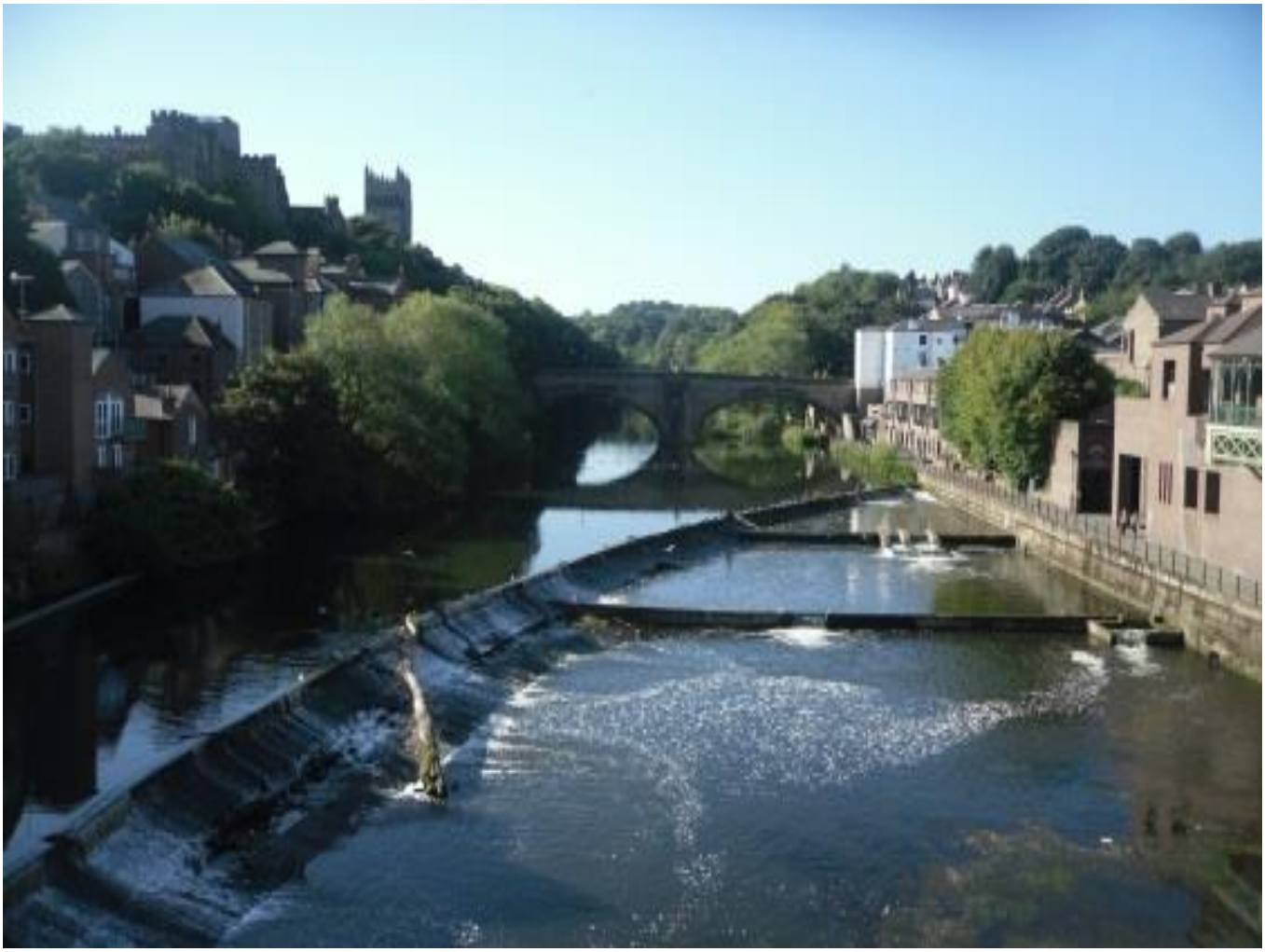
Durham County Council Air Quality Action Plan for Durham City



Non-Technical Summary

Durham County Council has declared an AQMA in Durham City due to elevated concentrations of nitrogen dioxide (NO_2) near to major roads, in excess of the annual mean air quality objective. The necessity for the AQAP was demonstrated by projecting road traffic emissions, which showed that with no action, improvements to vehicle emissions over time may achieve the level of reduction estimated to be required to achieve the air quality objective by 2020, but would be insufficient to achieve the air quality objective along the most significantly affected roads by this date. Furthermore, with the population of Durham set to rise there will be pressure on the current transport infrastructure. Whether there is potential for housing to be concentrated around Durham city or a more dispersed settlement patterns, traffic volumes in Durham City are expected to increase. Therefore, going forward, it is important in the early stages in the design of new developments that opportunities are taken to minimise any impacts on air quality that may arise by the incorporation of proportionate mitigation measures. While in the longer term there may be the potential for new infrastructure on the periphery of the city that could take a proportion of the traffic away from the route through the city centre. There is still however a need for solutions in the shorter term to improve air quality within the declared Air Quality Management Area (AQMA).

The publication of an Air Quality Action Plan (AQAP) is a statutory requirement of Defra's Local Air Quality Management (LAQM) regime for local authorities that have declared Air Quality Management Areas (AQMAs) for areas that are not expected to achieve the Government's objectives for ambient air quality and so require local action to improve air quality. An Action Plan must include a review of the formal plans which currently exist in relation to air quality, and develop a clear, robust and meaningful set of actions which will deliver real changes in terms of air quality improvements.

Detailed dispersion modelling was used to predict pollutant concentrations and to inform emission source apportionment. The results of this modelling has been used to estimate the vehicle types leading to the greatest contributions to emissions on key roads and the emission reductions that would be required on roads within the AQMA to achieve the annual mean air quality objective.

Two 'baseline' years were considered; an 'existing' 2013 baseline, and a future 'business as usual' 2017 baseline. The existing baseline is a recent year which was modelled using accurate recorded traffic flow information and compared with corresponding monitoring data and meteorological data, in order to verify the model and ensure a high level of confidence in the results. The 2017 future baseline was used to represent the conditions that are expected to occur with no specific action taken to improve air quality, taking account of committed developments and expected changes to the local vehicle fleet. The 2017 future assessment year was chosen for this study as this would allow sufficient time for some of the short-term options considered in the action plan to be implemented, whilst being close enough to the present to ensure good confidence in the projected values.

Options to improve air quality in the AQMA were identified by the Council and AECOM through discussions with the Technical Working Group, who supported the development of potential options to improve local air quality and provided essential information needed to undertake the appraisal. These preliminary options were then discussed with the parallel Corporate Steering Group, who approved those options to be taken forward to the initial appraisal and the subsequent development of the Actions.

The options were modelled to calculate the change in pollutant concentrations that could theoretically be achieved on each road in the AQMA, and to determine those options that would have the most beneficial local air quality effects.

A scoring system was used to identify options that should be taken forward for inclusion in the AQAP, which considered predicted changes in air quality at sensitive locations, overall acceptability, cost, timescales, as well as other related potential effects, such as noise, climate change and social inclusion.

A number of options were not taken forward to be developed as Actions due to low overall appraisal scores or significant constraints.

The highest scoring options were developed into Actions that will be used to improve air quality in the city in accordance with an implementation and monitoring plan. These Actions are summarised in the following table.

Action
The introduction of a UTMC or SCOOT system to coordinate traffic through a network of junctions within Durham City and reduce congestion.
The retrofitting of emissions abatement systems on diesel engines on buses using routes within the declared AQMA
Encourage the operation of hybrid buses using routes within the declared AQMA.
Ensuring the park and ride buses are compliant with the Euro VI emission standard.
The development of cycle-ways to encourage modal shift across Durham city that link into national and county cycle routes in accordance with the draft Durham City Sustainable Transport Strategy.
The promotion of Smarter Choices with businesses in the city to encourage large employers within the city to implement car sharing and pooling or the use of alternative forms of travel
To undertake detailed dispersion modelling of air quality emissions from any development growth and infrastructure that may potentially have an impact on air quality within and on the periphery of the declared AQMA. The outcome of this will enable opportunities to mitigate any detrimental impacts and potential benefits to be identified.
The establishment of the current Air Quality and Planning Guidance Note as a Supplementary Planning Document (SPD). This sets out the requirements on developers when proposing new development within the city and its environs set out in the emerging Local Plan.
The establishment of an Air Quality Strategy that will integrate the strategic policies covering air quality in the emerging Local Plan, the measures detailed within the LTP, the draft Durham City Sustainable Transport Strategy and the carbon reduction strategy in focusing and addressing air quality issues in Durham City.
To raise awareness of air quality by undertaking a campaign that will integrate with and will involve other campaigns elsewhere in the Council to improve air quality.
Variable message and car park direction signing system to direct traffic to available parking
Explore the provision of travel and driver information integrated with the UTMC and to explore the provision of information on air quality through the use of texts, email alerts and social networking.
To explore whether it is viable or not to progress the introduction of variable charges for residential parking permits with preferential rates for low polluting vehicles (with regard to local air quality effects).
To explore whether it is viable or not to extend existing park and ride routes and /or the provision of further park and ride sites, taking into consideration the emerging County Durham Plan and Sustainable Travel Strategy for Durham City.
Explore the options for additional highway infrastructure in line with the Durham Sustainable Transport Strategy, taking into account environmental, financial and planning considerations to enable the removal of through traffic from the City Centre and contribute to the overall reduction of traffic emissions.

Glossary

AQAP:	Air Quality Action Plan
AQMA:	Air Quality Management Area
DCC:	Durham County Council
DPF:	Diesel Particulate Filter, fine particulates emissions reduction technology
EFT:	Emission Factor Toolkit, Defra vehicle emission model used in this study
EGR:	Exhaust Gas Recirculation, emissions reduction technology
EV:	Electric engine vehicle, typically using battery as the main power source instead of an internal combustion engine.
Euro 1 to 6:	Engine emission standards for cars, labelled as number digits
Euro I to VI:	Engine emission standards for buses and HGVs, labelled as roman numerals
HGV:	Heavy Goods Vehicle weighing over 3.5 tonnes
HDV:	Heavy Duty Vehicle over 3.5 tonnes, including buses and HGVs
LAQM:	Local Air Quality Management
LDV:	Light Duty Vehicle weighing less than 3.5 tonnes, such as light vans
NO_2:	Nitrogen Dioxide, the key pollutant in this study due to high levels of exposure in some parts of the city
NO_X:	Oxides of Nitrogen, modelled as emissions in this study
PSV:	Public Service Vehicle such as buses
SCR:	Selective Catalytic Reduction, emissions reduction technology
UTMC:	Urban Traffic Management System

Table of Contents

1 Introduction

The following document is the Air Quality Action Plan (AQAP).

Durham County Council (DCC) has produced this Air Quality Action Plan (AQAP) to develop a clear, robust and meaningful set of actions which will deliver real changes in terms of air quality improvements.

Publication of this Plan is a statutory requirement as part of Defra's Local Air Quality Management (LAQM) regime for local authorities that have declared Air Quality Management Areas (AQMAs) for areas that are not expected to achieve the Government's objectives for ambient air quality and so require local action to improve air quality.

The AQMA was declared in the City of Durham due to high concentrations of NO_2 resultant from road traffic emissions. Therefore, this report presents Actions to achieve reductions of NO_2 along key roads and at locations of relevant exposure.

This report considers an appraisal of options to improve air quality within the Durham City Air Quality Management Area (AQMA), and then prioritises the most beneficial options within the framework of DCC policy and strategic development. This is an important process in the development of an Air Quality Action Plan (AQAP), which is required to improve air quality and thereby health. The most favourable options have been identified and implemented through the Air Quality Action Plan (AQAP) as defined Actions.

This draft Plan has been further revised following the conclusion of the consultation on 14th December 2015 as detailed below:

i) The inclusion of a further action to explore whether it is feasible to progress the suggestions made in response to the consultation. These are the introduction of variable residential parking charges, the extension of the Park and Ride routes and the provision of new Park and Ride facilities.

ii) The inclusion of the outcome of the consultation as detailed in Section 9 (Consultation) of the Plan. and

iii) The deletion and rewording of sections in the Plan that are extracts from or refer to the draft County Durham Plan or to proposed strategic development and infrastructure that was covered by the draft County Durham Plan.

1.1 Report Structure

This AQAP initially considers the existing (using the 2013 baseline) and future (2017) baseline conditions in the City of Durham, and specifically the roads within the AQMA. The first part of the report is divided into the following Sections:

- Section 2, legislation and guidance
- Section 3, outlining the local air quality issues facing Durham and the reasons for this Plan
- Section 4, local air quality management in Durham

The following Sections outline the modelling and appraisal of the scenarios agreed during the internal consultation:

- Section 5, definition and discussion of the baseline assessment scenarios
- Section 6, modelled appraisal scenarios
- Section 7, modelled scenario results

Details of the modelling assessment methodology are provided in **Appendix C**.

The following Sections present the scenarios that were developed as Actions and will be taken forward as part of this Plan:

- Section 8, scoring and prioritisation of modelled scenarios
- Section 9, consultation programme for appraising and implementing Actions
- Section 10, implementation of Actions
- Section 11, Monitoring Achievements and Effects
- Section 12, summary and conclusions

1.2 Option Development

The options appraised were developed through liaison and a series of meetings between key stakeholders within the Council.

The Durham County Council pollution control team, within the environment, health, consumer and public protection department, coordinate an air quality Technical Working Group which aims to identify options to improve air quality and reduce emissions, and which provided the essential information needed to undertake the appraisal.

The options were then discussed with the parallel Corporate Steering Group, who considered the technical commentary, and further refined the potential options and approved the options to be taken forward to the initial appraisal, and the subsequent development of the Actions.

2 Policy Context

2.1 Regulatory / Policy Framework

2.1.1 European Air Quality Directives

The Air Quality Framework Directive (96/62/EC) on ambient air quality assessment and management defines the policy framework for 12 air pollutants known to have a harmful effect on human health and the environment. The limit values for the specific pollutants are set through a series of Daughter Directives:

Following the above Directives, Council Directive 2008/50/EC on ambient air quality and cleaner air for Europe came into force in 2008, and was transposed into national legislation in 2010 (The Air Quality Standards Regulations 2010). Key points to note are that it:

- Consolidated existing air quality legislation apart from the 4th Daughter Directive, which will be brought within the new Directive at a later date;
- Provided a new regulatory framework for $PM_{2.5}$; and
- Made provision under Article 22 for Member States to postpone attainment deadlines and allow an exemption from the obligation to limit values for certain pollutants, subject to strict conditions and assessment by the European Commission (EC).

2.1.2 National Air Quality Legislation

The provisions of Part IV of the Environment Act 1995 establish a national framework for air quality management, which requires all Local Authorities in England, Northern Ireland, Scotland and Wales to conduct local air quality reviews. Section 82(1) of the Act requires these reviews to include an assessment of the current air quality in the area and the predicted air quality in future years. Should the reviews indicate that the objectives prescribed in the UK Air Quality Strategy (Defra, 2007) and the Air Quality (England) Regulations 2010 (Defra, 2010) (henceforth referred to as the "Air Quality Regulations") will not be met, the Local Authority is required to designate an Air Quality Management Area (AQMA). Action must then be taken at a local level to ensure that air quality in the area improves.

The Air Quality Regulations replaced the previous Regulations that gave effect to the provisions of Air Quality Framework; First; Second; and Third Air Quality Directives; and also give effect to the latest Fourth Air Quality Daughter Directive. The Air Quality Regulations apply to England with the exception of Regulations 3(a), 23, 24, 25(4) and 32 which extend to the United Kingdom.

2.1.3 UK Air Quality Strategy

The UK Air Quality Strategy (AQS) (Defra, 2007) identifies nine ambient air pollutants that have the potential to cause harm to human health. These pollutants are associated with local air quality problems, with the exception of ozone, which is instead considered to be a regional problem. Similarly, the Air Quality Regulations set objectives, but for just seven of the pollutants that are associated with local air quality. These objectives aim to reduce the health effects of the pollutants to negligible levels.

2.1.4 Air Quality Objectives and Limit Values

The air quality objectives and limit values currently applicable to the UK can therefore be split into two groups. Each has a different legal status and is therefore handled differently within the framework of UK air quality policy. These are:

- UK air quality objectives set down in regulations for the purposes of local air quality management; and
- European Union (EU) limit values transcribed into UK legislation for which compliance is mandatory.

2.1.5 Nitrogen Dioxide

The Government and the Devolved Administrations adopted two Air Quality Objectives for nitrogen dioxide (NO_2) which were to be achieved by the end of 2005. In 2010, mandatory EU air quality limit values on pollutant concentrations were to apply in the UK, however the UK Government has applied for derogation. For some parts of the UK the application has been refused, and for major cities a decision has yet to be reached. The EU limit values for NO_2 are the same as the national objectives (HMSO, 2007):

- An annual mean concentration of 40 µg/m^3; and
- An hourly mean concentration of 200 µg/m^3, to be exceeded no more than 18 times per year.

In practice, meeting the annual mean objective has been, and is expected to remain, considerably more demanding than achieving the 1-hour objective. The annual mean objective of 40 µg/m^3 is currently exceeded at many roadside sites throughout the UK, with exceedances also reported at urban background locations in major conurbations. Exceedances are associated almost exclusively with road emissions.

There is considerable year-to-year variation in the number of exceedances of the hourly objective, driven by meteorological conditions which give rise to winter episodes of poor dispersion and summer oxidant episodes. Analysis of the relationship between 1-hour and annual mean NO_2 concentrations at roadside and kerbside monitoring sites indicate that exceedances of the 1-hour objective are unlikely where the annual mean is below 60 µg/m^3 (AEA, 2008).

NO_2 and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as NO_X. All combustion processes produce NO_X emissions, largely in the form of NO, which is then converted to NO_2, mainly as a result of its reaction with ozone in the atmosphere. Therefore the ratio of NO_2 to NO is primarily dependent on the concentration of ozone and the distance from the emission source.

NO_2 Projections

Over the past five years it has been noted that NO_2 concentrations have typically not been falling, particularly at roadside monitoring sites nationwide, despite emissions of NO_X falling. At the end of September 2010 Defra released a brief FAQ note on the issue (Defra, 2010), acknowledging that NO_2 concentrations have not fallen as projected.

One of the reasons for this is because vehicle emissions factors for diesel vehicles have underestimated NO_X and NO_2 emissions in '*real-world*' conditions, with a specific 'direct-NO_2' component from diesel vehicles that had previously been underestimated.

Therefore, the models used in this assessment were based on the most recent tools and guidance published by Defra and, where appropriate, the projections have been interpreted carefully to ensure that values are not over, or under, estimated.

2.2 Health Costs

The health burden due to poor air quality is estimated as an effect on annual mortality in the UK equivalent to around 29,000 deaths (based on 2008 figures). This mortality effect of air pollution is now included as an indicator in the national Public Health Outcomes Framework.

As well as the human cost of emissions, there is an indirect impact on the economy as a whole as health problems affect the ability to work and contribute to low productivity. The 'National Air Quality Strategy' (DEFRA 2007) stated that poor air quality costs UK society between approximately £8.5 billion and £20.2 billion a year.

2.3 Air Quality Action Plans

The Durham City AQMA was declared in 2011, and has recently been amended to incorporate a larger area. The Council has a statutory responsibility under the LAQM reporting requirements to publish an AQAP in order to improve air quality.

The Council has formulated a timetable, whereby the AQAP will be published in March 2016.

2.3.1 LAQM.PG(09) Chapter 4

The requirement to produce an AQAP is discussed in LAQM.PG(09), which states that it should include the following items:

1. Quantification of the source contributions to the predicted exceedences of the relevant objectives; this will allow the Action Plan measures to be effectively targeted;
2. Evidence that all available options have been considered;
3. How the local authority will use its powers and also work in conjunction with other organisations in pursuit of the air quality objectives;
4. Clear timescales in which the authority and other organisations and agencies propose to implement the measures within its plan;

5. Where possible, quantification of the expected impacts of the proposed measures and an indication as to whether the measures will be sufficient to meet the air quality objectives. Where feasible, data on emissions could be included as well as data on concentrations where possible; and
6. How the local authority intends to monitor and evaluate the effectiveness of the plan.

2.4 Durham County Council Local Transport Plan 3

LTP3 is Durham County Council's third Local Transport Plan for the period 2011 onwards.

A specific objective of the LTP3 is to 'reduce social and economic costs of transport to public health, including air quality impacts in line with the UK's European obligations' with the establishment of an Air Quality Management Plan in support of the Air Quality Action Plan. This is one of the objectives to achieve a LTP3 goal of 'Safer and Healthier Travel'. The LTP3 aims to reduce the social and economic cost of transport and the over-reliance on the private car by promoting and encouraging walking and cycling, which themselves have benefits in term of the individual's health. However, the LTP3 acknowledges that poor air quality has health implications and therefore it is critical that air quality improves, particularly in the AQMA, to ensure the health benefits of walking and cycling are experienced.

In relation to the above objective, Policy 19 of the LTP3 has been developed to pursue improved air quality through:

- Implementing action plans for any Air Quality Management Area declared
- Traffic reduction and encouraging alternatives to the private car where appropriate
- Encouraging increased use of cleaner fuels / low emission vehicles in the County's fleet and provision of charging points for electric vehicles.
- Encouraging organisations that operate vehicle fleets, buses and taxis to use only cleaner fuels and low emission vehicles.

2.5 County Durham Local Plan and the City of Durham Local Plan

The new Local Plan will set out the new development that is planned for the County. It will contain allocations which show where development will take place and how it will be managed. It is the Council's intention to progress this new Plan as quickly as possible and project planning is ongoing. Nevertheless, the policies of the City of Durham Local Plan (see below) remain relevant to decision making until the new Plan is prepared.

Along with the new Local Plan, planning decisions are also guided by the policies of the City of Durham Local Plan (2004). This Plan is the primary planning policy document until replaced by the new Local Plan when finalised. The Plan includes three policies that can be used when considering proposals in relation to pollution. These will be relevant in relation to the development of the Supplementary Planning Document:

Policy U5: Planning permission for development that may generate pollution will not be granted if the proposal:

1. *Will have an unacceptable adverse impact upon the quality of the local environment.*
2. *Will have an unacceptable adverse impact upon the amenity of nearby and adjoining land and property.*
3. *Will unnecessarily constrain the development of neighbouring land.*

Policy U6: Developments aimed at preventing pollution from an existing or proposed source will be permitted provided that the proposal:

1. *Will not have an unacceptable adverse impact upon the quality of the local environment; and*
2. *Will not have an unacceptable adverse impact upon the amenity of nearby and adjoining land and property.*

Policy U7: Developments which are sensitive to pollution will not be permitted on land which is subject to unacceptable levels of contamination, pollution, noise or vibration

2.6 Durham County Planning Guidance Note

Durham County Council has published an Air Quality and Planning Guidance Note for Developers (DCC, 2013), which outlines the baseline air quality conditions in the County, the potential effects of new developments, and the standard requirements that should be considered when submitting new applications.

In line with Government guidance set out in the National Planning Policy Framework (DCLG, 2012), the Council particularly encourage applications that adhere to sustainable development principles, part of which is minimising environmental impact. However, the information gained on the impacts on air quality from major planned developments is an important tool to help show that environmental impacts are being considered and where possible mitigated.

By offering guidance on Air Quality and Planning the Council is positively welcoming development by: -

- Adopting a professional and transparent approach to planning.
- Seeking to speed up early planning application decisions by avoiding delays whilst additional information is prepared by developer's agents.
- Drawing attention to information that may assist a developer.

3 The Problem

3.1 Local Air Quality

Durham County Council has declared an Air Quality Management Area (AQMA) in Durham City due to elevated concentrations of NO_2 near to major roads, in excess of the annual mean air quality objective. The AQMA was declared in May 2011, and subsequently extended to incorporate a larger area to the west in July 2014.

There is potential for increased development with the associated growth in population around Durham City that may generate additional traffic and contribute to congestion. The emerging Local Plan is therefore important in achieving ways of mitigating the impacts of proposed new development that may occur.

Furthermore, future projections of emissions improvements are not predicted to be sufficient to achieve compliance with national air quality objectives if no other definite action is taken to reduce emissions.

3.2 Legal Requirements

3.2.1.1 Local Air Quality Management

The publication of an Air Quality Action Plan (AQAP) is a statutory requirement of Defra's Local Air Quality Management (LAQM) regime for local authorities that have declared Air Quality Management Areas (AQMAs) for areas that are not expected to achieve the Government's objectives for ambient air quality and so require local action to improve air quality.

Preparation of the Action Plan should involve undertaking a review of the formal plans which currently exist in relation to air quality, and to develop a clear, robust and meaningful set of actions which will deliver real changes in terms of air quality improvements.

3.3 Future Road Vehicle Emissions Projections

The air quality emission model used in this assessment (the Emission factor Toolkit, see Appendix C), uses data published by Defra to estimate emissions from the UK vehicle fleet, and the reduction in emissions that are expected to occur with increasingly stringent vehicle emissions legislation and new technologies. However, there has been some uncertainty in the past few years regarding the effects of Euro emission standards, whereby engines have been tuned for test cycles that do not reflect real-life uses, and so the anticipated improvements in emissions have not been fully realised.

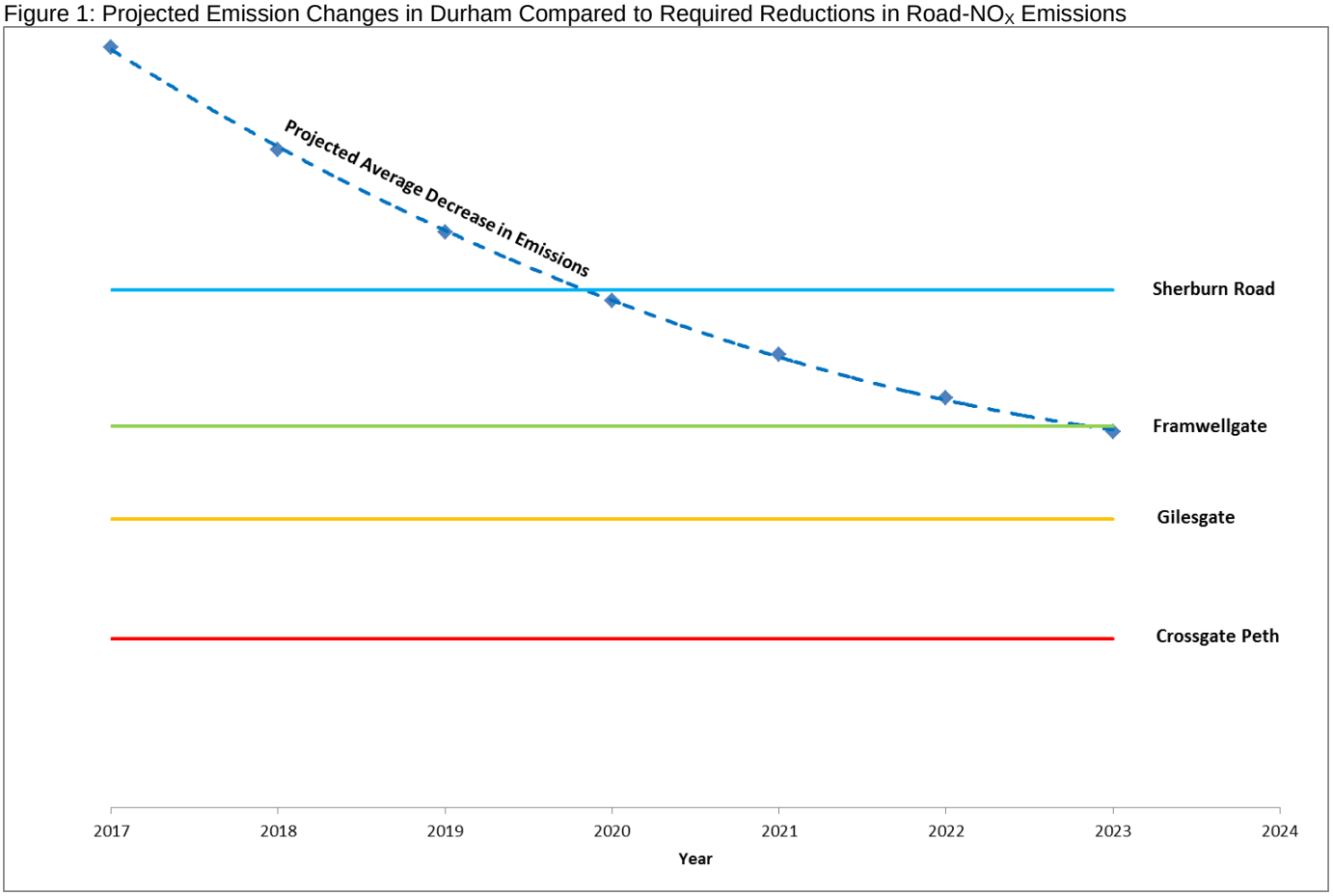
Furthermore, background pollutant concentrations, which are typically associated with regional emission sources, are generally expected to decrease in the future. However, as with exhaust improvements, background air quality monitoring data in many urban settings has not reflected the predicted decreases in emissions.

The necessity for implementing an Action Plan is demonstrated in Figure 1. The plot shows that that with no action, improvements to vehicle emissions may achieve the predicted reduction targets on some roads by 2020, but would be insufficient to achieve the targets on the most significantly affected roads.

The projection in Figure 1 uses generic regional vehicle growth rates from the TEMPRO traffic model for the period 2017 to 2025. Growth in the TEMPRO traffic model takes account of the increases in traffic levels associated with population growth. Whilst housing above TEMPRO traffic model growth is unlikely within the timeframe of the air quality analysis it is essential that the air quality effects can be mitigated in the longer term should additional growth occur in the future. These effects of additional growth on local air quality and mitigation of these will be considered in periodic progress reports on the effectiveness of the Action Plan

Therefore, whilst it is likely that pollutant concentrations will decrease in the future, it is uncertain whether decreases will be experienced within a short time-frame (i.e. 5 years or less), and so it is considered extremely unlikely that a do-nothing approach will be sufficient to achieve the UK air quality objectives or EU limit values in all locations before 2025.

Figure 1: Projected Emission Changes in Durham Compared to Required Reductions in Road-NO_X Emissions



Note: Examples are given for roads where exceedences were predicted, and do not represent all roads in the AQMA

4 Local Air Quality Management

Durham County Council has declared two Air Quality Management Areas (AQMAs) that include the major roads in Durham City and part of the B6313 to the west of Chester-le-Street. The Durham AQMA is the focus of this AQAP.

4.1 Durham City AQMA

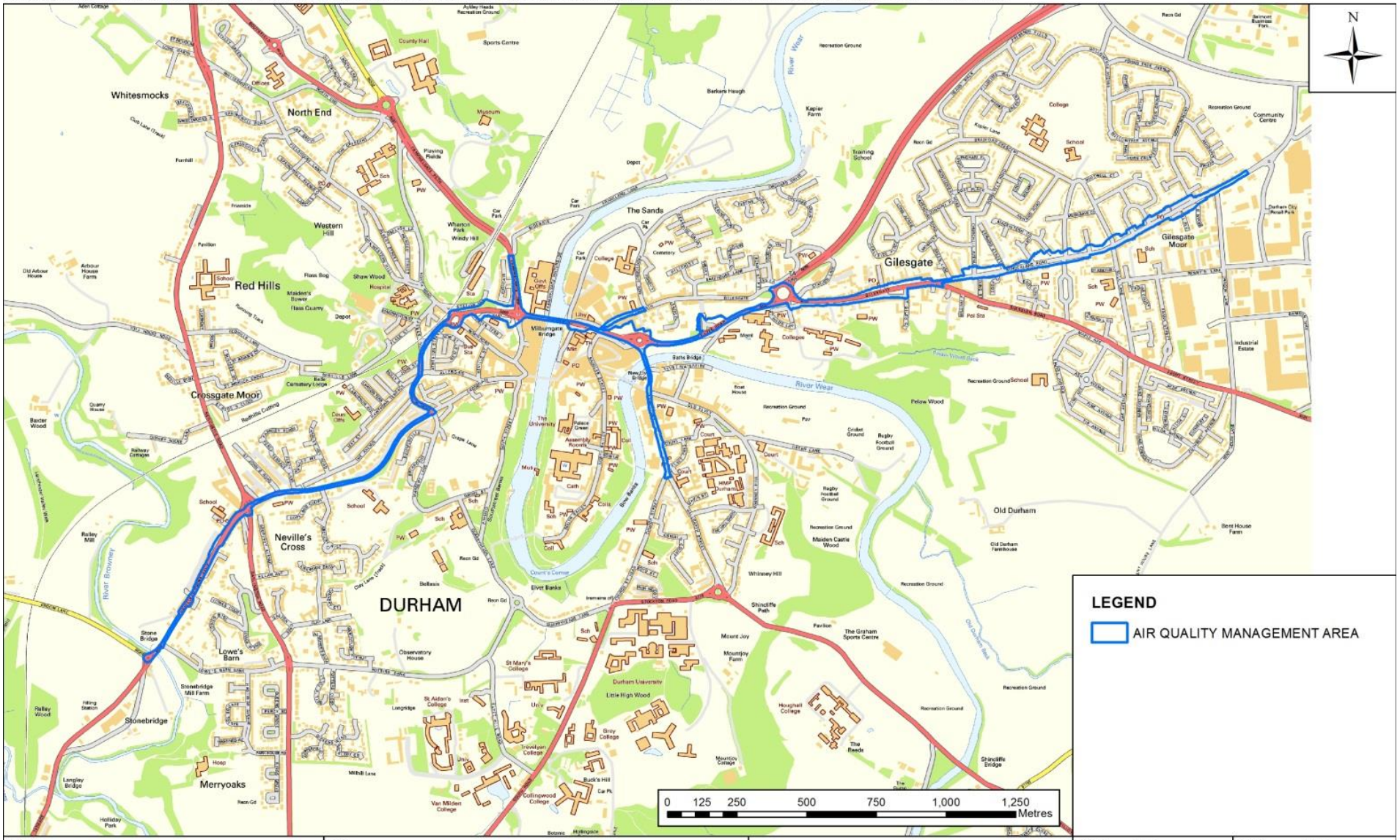
The AQMA for Durham City was first declared in May 2011, following a period of monitoring and detailed modelling assessment that identified exceedences of the NO_2 annual mean objective. The extent of the AQMA incorporated the west end of the city at the Highgate Development, the Millburngate Bridge, Gilesgate to the junction with Sherburn Road, and Sunderland Road up to Dragon Lane in east of the city.

However, following the initial declaration, a significantly increased monitoring network indicated exceedences of the objective outside the AQMA. Detailed Assessments undertaken in 2011 and 2013 recommended that the AQMA be extended to include the following roads, mostly to the west of the original AQMA around Crosgate Peth and Nevilles Cross:

- Properties at the western end of Claypath;
- Nevilles Cross Bank as far as Broom Lane, which is at the bottom of the steep hill and marks the edge of this residential area;
- Nevilles Cross junction, including the row of properties to the north-east on Newcastle Road;
- Crossgate Peth;
- Crossgate junction;
- Alexandria Crescent;
- Sutton Street; and
- Castle Chare, where it joins with the existing AQMA.

The extent of the 'amended' AQMA was accepted by Defra and therefore the AQMA was extended in July 2014. This is shown in Figure 2, below.

Figure 2: Durham City AQMA



Client: DURHAM CITY COUNCIL	Title: AIR QUALITY MANAGEMENT AREA	AECOM	Design: ARP / Drawn: ARP
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4.2 Monitoring

Durham County Council operates a passive diffusion tube monitoring network throughout the County, as well as an automatic continuous monitoring station in Durham City.

In Durham City monitoring is undertaken at 59 locations using passive NO_2 diffusion tubes, as well as one continuous chemiluminescent NO_2 monitor at New Elvet (DUR3; operational since January 2014). The continuous monitor is co-located with triplicate diffusion tubes that are used to calculate a local bias adjustment factor. The continuous monitoring site at Gilesgate (DUR1) was closed in 2012, and at Crossgate Lights (DUR2) in December 2013.

The Council are also in the process of undertaking a co-location and verification procedure with Air Mesh automatic NO_2 monitoring units.

The annual mean objective was exceeded at 14 monitoring sites in 2013, and 25 sites in 2014. Exceedences are indicated in bold in Table 1, below.

Table 1: Local Air Quality Monitoring in Durham City, Passive Diffusion Tubes

Site ID	Location	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3)					
				2009	2010	2011	2012	2013	2014
D1	Dragon Lane	Kerbside	Y	**52.5**	**41.6**	**41.9**	**43.3**	**48.8**	**47.0**
D2	121 Gilesgate	Roadside	Y	-	35.1	36.7	29.8	35.0	36.6
D3	Claypath	Kerbside	N	34.2	31.4	32.1	30.7	29.8	32.1
D4	39 Claypath	Roadside	N	-	37.6	33.8	35.4	36.8	**42.4**
D5	Milburngate	Kerbside	Y	28.0	34.5	23.6	26.6	26.1	27.6
D6	Site Closed	Roadside	N	-	35.0	29.4	26.5	-	-
D7	Highgate South	Roadside	Y	36.1	38.2	35.5	36.6	39.6	**42.9**
D8	Highgate North	Kerbside	Y	**44.3**	**43.7**	**42.9**	**44.8**	**47.6**	**51.2**
D9	Site closed	Kerbside	N	-	31.6	29.2	25.2	-	
D10	North Road	Roadside	N	39.3	38.4	33.2	39.0	34.8	33.1
D11	Crossgate Lights	Kerbside	Y	-	**41.5**	**40.0**	**43.5**	**42.1**	**46.3**
D12	Colpitts Terrace	Kerbside	Y	**56.0**	**47.2**	**45.5**	**49.5**	**54.5**	**55.9**
D13	Hawthorn Terrace	Roadside	Y	-	33.3	28.7	33.5	29.7	34.5
D14	The Gates	Roadside	Y	-	**43.2**	35.5	36.6	37.7	39.7
D15	New Elvet	Kerbside	Y	**41.6**	38.8	36.8	33.9	37.2	**40.3**
D16	Church Street	Kerbside	N	35.9	32.4	33.2	32.4	33.8	38.0
D17	Church Street Head	Roadside	N	-	35.3	31.0	36.4	35.1	**40.5**
D18	Hallgarth St east	Roadside	N	-	28.9	27.8	29.5	29.1	-
D19	Hallgarth St west	Kerbside	Y	-	**43.2**	**47.7**	**52.8**	**53.9**	**61.9**
D20	Gilesgate	Roadside	Y	**47.6**	**45.4**	**43.4**	**42.2**	**48.8**	**49.3**
D21	Sherburn Road	Kerbside	N	25.4	29.0	25.2	24.4	25.9	32.0
D42	Claypath	Roadside	Y	-	38.9	37.7	37.9	48.0	50.4
D43	The Peth	Roadside	N	-	**57.0**	**50.7**	**55.3**	**58.5**	**-**
D44	Site Closed	Kerbside	N	-	23.3	20.4	-	-	-
D45	Young Street	Roadside	N	-	27.4	28.2	27.3	25.1	-
D46	Adolphus Place	Roadside	N	-	34.7	34.2	29.3	30.3	-
D56	56 McKintosh Court	Roadside	Y	-	-	18.4	18.3	18.7	-
D57	56 McKintosh Court kerbside	Kerbside	Y	-	-	19.7	25.8	15.4	-
D58	49 Sunderland Road	Roadside	Y	-	-	18.3	18.9	20.6	-
D59	The Sands	Background	N	-	-	-	-	-	21.9
D60	Site Closed	Roadside	Y	-	-	22.2	27.1	-	-
D61	Site Closed	Roadside	Y	-	-	21.8	27.6	-	-
D62	Site Closed	Roadside	Y	-	-	21.8	27.1	-	-
D69	1 Alexandria Crescent	Roadside	Y	-	-	38.3	35.2	34.0	38.1
D70	The Peth south	Roadside	Y	-	-	36.4	35.9	41.1	**60.4**

Site ID	Location	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3)					
				2009	2010	2011	2012	2013	2014
D71	Opp EBGB	Kerbside	Y	-	-	**56.4**	36.8	39.8	**40.8**
D72	Opp Hawthorn Terrace lamppost 42	Kerbside	Y	-	-	**43.3**	**50.5**	**55.9**	**57.5**
D73	6 Sutton Street	Kerbside	Y	-	-	36.2	38.9	**41.3**	**44.3**
D74	Elvet Crescent	Roadside	Y	-	-	**41.7**	34.9	36.3	**44.2**
D75	Nevilledale Terrace	Roadside	Y	-	-	25.4	25.0	23.7	25.3
D76	The Peth	Suburban	Y	-	-	19.7	26.2	22.4	21.6
D77	Archery Rise	Roadside	Y	-	-	**50.8**	**53.6**	**56.4**	**57.3**
D78	Nevilles cross out	Roadside	Y	-	-	41.4	35.2	36.2	**41.8**
D79	Nevilles cross bank	Roadside	Y	-	-	**55.8**	**56.5**	**57.2**	**59.3**
D80	Stone bridge	Kerbside	Y	-	-	**40.9**	**45.1**	39.4	34.7
D81	Claypath	Kerbside	Y	-	-	35.3	**40.8**	**41.1**	**45.8**
D82	Claypath	Kerbside	N	-	-	32.6	36.6	33.2	39.6
D83	Boyd Street	Kerbside	N	-	-	-	23.3	25.9	23.0
D84	Hallgarth Street middle	Kerbside	Y	-	-	-	29.9	31.9	-
D91	Crossgate Monitor	Roadside	Y	-	-	-	38.5	**43.1**	**-**
D92	Crossgate Monitor	Roadside	Y	-	-	-	35.3	**44.1**	**-**
D93	Crossgate Monitor	Roadside	Y	-	-	-	32.5	**45.3**	**-**
D96	2 Anns Place	Roadside	N	-	-	-	22.3	21.5	24.3
D97	Orchard House	Roadside	Y	-	-	-	22.9	26.8	32.9
D98	62 Claypath	Kerbside	N	-	-	-	32.0	33.8	37.5
D99	65 Claypath	Roadside	N	-	-	-	34.7	34.2	38.2
D101	Durham County Cricket Ground	Background	N	-	-	-	11.6	14.8	14.5
D102	High St, Langley Moor	Kerbside	N	-	-	-	-	36.1	36.5
D103	High St Langley Moor	Kerbside	N	-	-	-	-	34.6	37.4
D104	38 High St, Meadowfield	Kerbside	N	-	-	-	-	38.7	**45.9**
D105	80 High St, Meadowfield	Kerbside	N	-	-	-	-	33.6	39.9
D106	6 Belle Vue Terrace, Dragonville lights	Kerbside	Y	-	-	-	-	**51.0**	**49.5**
D107	115 High St, Meadowfield	Kerbside	N	-	-	-	-	35.3	37.0
D110	New Elvet Monitor (started Jan)	kerbside	N	-	-	-	-	-	36.2
D111	New Elvet Monitor (started Jan)	kerbside	Y	-	-	-	-	-	35.9
D112	New Elvet Monitor (started Jan)	kerbside	Y	-	-	-	-	-	35.6
D113	58 Gilesgate	Roadside	Y	-	-	-	-	-	**46.3**
D114	George Street lamp post	kerbside	N	-	-	-	-	-	37.7
D115	Auton House (up to Nevilles cross)	Roadside	N	-	-	-	-	-	**58.1**
D116	3 Church Street	Roadside	Y	-	-	-	-	-	**65.1**
D117	33 Church Street	Roadside	Y	-	-	-	-	-	**68.3**
D118	Heaviside Road Lamp post	Roadside	N	-	-	-	-	-	24.5
D119	12 George Street	Roadside	N	-	-	-	-	-	33.4

Table 2: Local Air Quality Monitoring in Durham City, Continuous Monitoring

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3)				
			2009	2010	2011	2012	2013
DUR1	Roadside	Y	-	-	23.6	25.3	-
DUR2	Roadside	N	-	-	-	**52.0**	**43.6**

4.3 Source Apportionment

The proportions of road traffic emissions attributed to each component source on each of the major roads in the study area are shown in Table 3, where source contributions >25% have been highlighted.

The most significant emission source on almost all roads in the AQMA is predicted to be diesel cars, which is due to emissions from diesel cars being much higher than from petrol cars. This is compounded by a high proportion of this vehicle type, which will be predicted to comprise ~50% of cars in 2017.

Light Goods Vehicles (LGVs) and rigid Heavy Goods Vehicles (HGVs) are significant on a few roads (Alexandria Crescent, Margery Lane, Potters Bank, Elvet Hill Road), whilst articulated HGVs were not predicted to be significant on any roads.

Buses are the remaining significant component on several roads, including a maximum 60% contribution on North Road as this is near the bus station. It should be noted that there are a number of small streets in the City with relatively low traffic flows, and where small numbers of buses were recorded by the count data (including non-service vehicles) and this may account for an unexpectedly large proportion of the overall flows, such as Silver Street, Hallgarth Street and Margery Lane (which have no service bus routes), whilst Old Elvet and Stockton Road have regular bus services that may not have been accurately recognised in the traffic data.

The average background contribution was calculated for the key roads in the AQMA where monitoring and modelling data was available, and indicates that the contribution from roads sources was typically between 40-60%. However, for specific locations of high pollutant concentrations, such as in discrete areas where there are street canyons, the road contribution is likely to be much higher.

Table 3: Source Emission Apportionment, 2017

Road	Components of Road Vehicle Emissions							Background Contribution
	Cars		LGV[A]	Rigid HGV	Artic HGV	Bus	Total Road Contribution	
	Petrol	Diesel						
Sunderland Road	8%	52%	8%	20%	4%	6%	65%	45%
Sherburn Road	7%	44%	5%	12%	3%	29%	48%	52%
Gilesgate	6%	41%	8%	19%	4%	22%	61%	39%
A690	8%	52%	6%	13%	3%	17%	48%	52%
Leazes Road	7%	47%	6%	15%	3%	21%	61%	39%
Claypath	4%	31%	13%	1%	0%	50%	43%	57%
Silver Street	5%	33%	15%	1%	0%	45%	-	-
Millburngate Bridge	8%	51%	6%	8%	2%	25%	72%	28%
New Elvet	5%	36%	5%	18%	4%	31%		-
Old Elvet	13%	86%	0%	0%	0%	0%	47%	53%
Church Street	6%	38%	16%	19%	4%	17%	44%	56%
Quarryhead lane	13%	87%	0%	0%	0%	0%	-	-
Stockton Road	13%	86%	0%	0%	0%	0%	-	-
Hallgarth Street	7%	41%	20%	14%	3%	15%	69%	71%
Willow Tree Avenue	14%	86%	0%	0%	0%	0%	-	-
Framwellgate	7%	48%	5%	12%	3%	24%	59%	41%
Castle Chare	5%	33%	4%	25%	6%	26%	-	-
Alexandria Crescent	4%	28%	14%	30%	7%	16%	66%	44%
Margery Lane	6%	41%	33%	9%	2%	8%	-	-
Crossgate Peth	6%	41%	5%	22%	5%	21%	67%	53%
Nevilles Cross Bank	8%	53%	6%	16%	3%	13%	41%	59%
Newcastle Road	9%	54%	7%	19%	4%	8%	28%	72%
Darlington Road	9%	54%	16%	13%	2%	6%	25%	75%
Potters Bank	10%	60%	16%	8%	2%	5%	-	-
South Road (North of Elvet Hill)	14%	86%	0%	0%	0%	0%	-	-
Elvet Hill Road	7%	48%	37%	5%	1%	2%	-	-
South Road (north of P&R)	9%	58%	17%	4%	1%	10%	-	-
South Road (south of P&R)	9%	56%	10%	14%	3%	9%	-	-
Darlington Road	9%	57%	11%	14%	3%	6%	25%	75%
Dragon Lane	7%	48%	7%	22%	5%	11%	63%	27%

Road	Components of Road Vehicle Emissions							Background Contribution
	Cars		LGV[A]	Rigid HGV	Artic HGV	Bus	Total Road Contribution	
	Petrol	Diesel						
Nevilles Cross Bank	9%	55%	6%	16%	3%	11%	41%	59%
Sutton Street South	8%	52%	0%	0%	0%	40%	-	-
Sutton Street North	8%	54%	0%	0%	0%	37%	-	-
North Road South of Bus Station	5%	30%	0%	0%	0%	65%	-	-
North Road North of Sutton Street	6%	36%	0%	0%	0%	58%	-	-
North Road South of Sutton Street	2%	9%	1%	23%	4%	60%	-	-

Note: Contributions >25% highlighted.

[A] A small proportion of LGVs will be petrol.

5 Baseline Appraisal Scenarios

Two ‘baseline’ years have been considered; an ‘existing’ baseline, and a future ‘business as usual’ baseline:

- 2013; the existing baseline is a recent year which has been modelled using accurate recorded traffic flow information and compared with corresponding monitoring data and meteorological data, in order to verify the model and ensure a high level of confidence in the results.
- 2017, the future baseline has been used to represent the conditions that are expected to occur with no specific action taken to improve air quality, taking account of committed developments and other changes to the vehicle fleets (including organic growth and anticipated improvements to exhaust emission standards), background pollutant concentrations and other environmental conditions that may affect air quality, which were projected using Defra tools, as discussed in Section 7.

The 2017 future assessment year was chosen for this study as this would allow sufficient time for some of the short-term options considered to be implemented, whilst being close enough to the present to ensure good confidence in the projected values (the further into the future that we attempt to project, the greater the uncertainty).

The SCOOT traffic management system is a ‘committed development’ that is expected to be operational by 2017, so it is expected to be in-place before the future baseline scenario. It has the potential to have a notable local air quality benefit due to improvements in congestion and vehicle flow. However, the extent of the air quality benefit is uncertain as it has not been assessed as a discrete scheme prior to this study, and the cumulative effects may also be dependent on how SCOOT interacts with the other effects of the other options. The following scenario was included in the appraisal as a discrete option:

- 2017, future baseline incorporating the SCOOT traffic management system, whereby congestion is reduced sufficiently to increase average speeds and reduce queuing at the major junctions.

The assessment has used two different techniques: dispersion modelling to predict concentrations, and emission modelling to appraise the composition and magnitude of emissions of air quality pollutants. This is discussed further in Appendix D.

6 Appraisal Options

6.1 Option Development

As discussed in Section 1.2, DCC have developed options that may be implemented as potential Actions to improve air quality in the AQMA through an AQAP. The following model options were agreed to be taken forward to the appraisal, to assess their potential effect.

As discussed in Section 2.3, a requirement of the AQAP defined by Defra is to include '***evidence that all available options have been considered***'. Therefore, whilst a number of the options were not expected to be developed as Actions, they were appraised to ensure that they were properly considered and assessed for local air quality effects.

The appraisal of the options is a necessary stage when formulating the draft AQAP. Modelling parameters have been selected for indicative purposes only, enabling options to be prioritised and where appropriate, formulated into the actions to be included in the draft AQAP.

Appraised Options

A series of options have been identified to appraise the effects on emissions due to changes to the three main components of traffic: HGVs, buses and cars. The potential resultant local air quality effect due to changes to the vehicle fleet has been modelled using the Emission Factor Toolkit (EFT) and compared to the emission reduction required to achieve the annual mean objectives on those roads where it was predicted to be exceeded for NO_2 (discussed in Section 7.1)

The **committed infrastructure options** comprise a SCOOT / Urban Traffic Management Control system (UTMC), which will be implemented by 2015-2017. It will incorporate changes to the roundabouts at Leazes Bowl and Gilesgate with signalised junctions introduced. Whilst the scheme has been appraised separately, given that it is committed and is to be implemented by 2017, its effects should be combined with the effects of all the other options considered (however, the cumulative effects may be dependent on the scenario, whereby changes to speed and/or congestion may not necessarily be cumulative).

Several **transport engineering options** have been proposed by the DCC transportation team as projects that are unrelated to the AQAP, but likely to have an effect on local air quality. Where schemes are expected to be completed before 2017, they have been appraised as specific scenarios in order to identify the effects they may have on local air quality.

The **hard improvement options** are based on policies and measures that will alter the vehicle fleet to specifically achieve improved air quality.

The **soft improvement options** have not been modelled, as the effects will be very difficult to differentiate from other options. However, they have been included here to demonstrate the overall approach that is proposed and are discussed subjectively in Section 8.

It should be noted that the predicted variables are simply estimates of what could be achieved and are for comparison purposes only. The estimates of what could be achieved, as shown as percentage reduction in air quality pollutant in Table 7, for both the development of cycle-ways (Option 5 in Table 4) and the promotion of 'smarter' travel choices (Option 6 in Table 4) should be considered individually and not the cumulative effect of both of these options.

Several **additional options** which were raised during the process of undertaking this work have not received support from the AQAP working groups. However, they have been appraised here in order to properly consider the potential benefits or costs, and to determine whether they should be reconsidered.

Table 4: Appraised Options

Option ID		Description	Model Variables
Committed Infrastructure Scenarios			
1		The introduction of an Urban Traffic Control or SCOOT System to coordinate traffic through a network of junctions within Durham City and reduce congestion. Includes replacement of the roundabout at North Road, Gilesgate and Leazes Bowl with a signalised junction.	Remove queue sections and increase average speed by 5 km/hr throughout the study area
Note: This scheme will be implemented before 2017, and so the effects may be cumulative with the following options			
Hard Improvement Options			
2	2a	The retrofitting of emissions abatement systems on diesel engines on buses using routes within the declared AQMA, using SCR exhaust catalysts and DPF.	Retrofit all buses to minimum Euro IV standard
	2b		Retrofit all buses to minimum Euro V standard
	2c		Retrofit all buses to minimum Euro VI standard
3	3a	The operation of hybrid buses using routes within the declared AQMA.	5% of all buses hybrid
	3b		10% of all buses hybrid
	3c	Increase use of Ev (electric) buses	Reduce bus movements by assuming 5% will be electric by 2017
4	4a	Ensuring the park and ride buses are compliant with Euro VI	All P&R buses to be Euro VI
	4b	Ensuring the park and ride buses are Ev (i.e. zero NO_X emission)	P&R buses to be Ev
5		The development of cycle-ways / modal shift across Durham city that link into national and county cycle routes.	7-10% modal shift from existing travel options (i.e. cars and buses) to reduce cars and buses - 7%
6	6a	The promotion of 'smarter' travel choices and options with businesses in the city. Encourage large employers within the city to implement car sharing and pooling or the use of alternative forms of travel.	Reduce cars by 5%
	6b		Reduce cars by 10%
7		Maximise the utilisation of the existing and proposed additional parking spaces at the Howlands Farm Park and Ride Sniperley Park and Ride.	Reduce cars by 5% and assume that bus movements are not increased.
8	8a	The development of a bus lane network throughout Durham City Centre to improve the public transport network. This may not be feasible in all locations, and so the effects on individual roads should be considered where it is conceivable that an extension to the bus lane network can be undertaken.	Increase bus speeds by 5 km/hr
	8b		Also allow HGVs to use the bus lane to increase bus and HGV speed by 5 km/hr
Additional Options			
9	9a	Variable parking charges to encourage low-emission cars (e.g. Electric, hybrid, or small petrol in favour of large diesel). This would be linked to the Park and Ride improvements and the UTC signs so overall parking provision is not affected.	5% hybrid electric cars replacing existing diesel and petrol cars
	9b	*Or* Workplace Parking Levy to encourage use of low-emission vehicles, alternative transport and the improved capacity and services at the Park and Ride sites.	Re-allocate all cars to < 2 litre engines
	9c	*Or* Low Emission Zone for cars	Change all diesel cars to petrol

Option ID		Description	Model Variables
Transport Engineering Options			
10	10a	Potential major infrastructure changes, such as new link roads	Reduce traffic flow by 5%
	10b		Reduce traffic flow by 10%
11		**This option has been deleted**	
Soft Improvement Options			
12		The establishment of the current Air Quality and Planning Guidance Note as a Supplementary Planning Document (SPD). This sets out the requirements on developers when proposing new development within the city and its environs.	
13		The establishment of a Low Emission Strategy (LES) that will integrate the strategic policies covering air quality in the emerging Local Plan, the measures detailed within the LTP, the draft Sustainable Transport Strategy and the carbon reduction strategy in focusing and addressing air quality issues in Durham City.	
14		To raise awareness of air quality by undertaking a campaign that will integrate with and will involve other campaigns elsewhere in the Council to improve air quality.	
15		Variable message and car park direction signing system to direct traffic to available parking.	
16		Provision of travel and driver information integrated with the UTMC.	

The following sections contain additional relevant information about the appraised options and the way in which the model was used to represent the effects on traffic flow.

6.2 Bus Improvement Options

6.2.1 Option 2

The buses operated on Services 20/20a/20X on the Gilesgate Moor corridor by Go North East were retrofitted with SCR (selective catalytic reduction) and DPF (diesel particulate filter) abatement systems in August 2014 with financial support from a DfT grant.

The retrofitted abatement technology fitted in 2014 to GoNE (Go North-east) buses operating on the Gilesgate corridor demonstrated significant improvements in emissions, as indicated in Millbrook tests using TfL operating cycles, where results obtained by the Eminox retrofit were considered to be materially better than those indicated in Figure 8 for Euro V SCR.

However, the emission profiles used in the assessment and presented in Figure 8 were the most recent available from the Defra EFT, which is based on the COPERT 4 (v10) emission model. It has been generally recognised that there is uncertainty and variation in the level of NO_X emission reduction that may be achieved with SCR. It is dependent on the type of SCR system employed and how well optimised for the usage cycle (compared to the type approval cycle), where some SCR systems may not perform well under low load (i.e. slow moving urban conditions) where the catalyst remains at too low a temperature to function efficiently.

According to the NAEI report in 2013, retrofit systems optimised for urban applications in London for buses operating in London over urban cycles is based on the 70% reduction rate, based on Euro III buses retrofitted with SCR. For buses operating in other towns and cities a more conservative 50% reduction is advised.

6.2.2 Option 3

Hybrid buses are already operating on some routes going into Durham City (e.g. Service 21 Durham to Newcastle route), although they are not operating on any cross-city routes within Durham.

There are currently high levels of uncertainty in the emission factors for hybrid vehicles, but since these vehicles generally use Euro V/VI engines to drive the wheels (except new hybrid buses in London), they may not have significant local air quality benefits compared to contemporary engine technologies without complementary driver training (NAEI, 2013).

6.3 Additional Options

The additional options were raised during the process of undertaking this work, although discussion in the AQMA Working Group recognised they may well be challenging to implement.However, the following examples have been successfully implemented in other cities and are considered to be potential means of changing the vehicle fleet composition.

6.3.1 UTC and Parking Charges

Examples of parking regulations that are currently in force or proposed elsewhere include:

- Nottingham operates a workplace parking levy that applies to city centre businesses, whereby business are charged per parking space.
- Milton Keynes operates a 'green' parking permit for drivers of vehicles which are in tax band A (i.e. CO_2 emissions of 100g/km or less), which includes a discount when using standard-rate parking spaces operated by the Council.
- Edinburgh residents' parking permits are graded according to engine size or CO_2 emission levels, with those in the highest bands paying substantially more than those in the lowest band.
- London Borough of Richmond offers free residents' parking permits to owners vehicles in tax band A.
- York has introduced low-emission vehicle parking permits which give discounts of up to 50% on residents' parking.
- Bremen has a system of environmental loading points for low-emission delivery vehicles.
- Madrid is studying the possibility of a parking charge differential of 20% from one area to another, depending on parking demand and the level of NO_X emissions.

Variable parking charges could be considered. However, the majority of the parking supply within the town centre is run privately. The carparks within County Council control account for around 400 spaces, a fraction of the overall supply. Therefore this is not considered a viable option for Durham city.

6.3.2 Workplace Parking Charges

Workplace Parking Levies may be charged to businesses that operate parking spaces in the City to discourage the use of private cars. However, the levy may be reduced or dropped if they take part in a coordinated workplace travel programme, offer electric charging points and/or encourage the use of low-emission vehicles and public transport

Nottingham City Council has implemented a levy on workplace parking spaces, where car parks with more than 10 spaces are required to pay the levy of £253 p.a. per workplace parking space, rising to around £350 p.a. by 2015. The funds raised are used to fund enhancements to public transport.

The amount of private workplace parking in the City Centre is extremely small at only 250 spaces, and even these will be lost with the planned redevelopment of Milburngate House. If workplace parking is considered on the outskirts of the City the only significant supply of parking places lies with the County Council and the University, with to a lesser extent the Land Registry.

The pollution problems in Durham City are as a result of external journeys using the A690 for the purpose for which it was constructed, as a "through road" carrying 40,000 trips per day. The activities which occur within the City itself play only a minor part in the use of the transport network. Therefore this is not considered a viable option for Durham City.

6.3.3 Low Emission Zones

The UK government is currently undertaking a review of national Low Emission Zones (LEZ) policy, which is intended to standardise the actions, policies and procedures that currently being assessed or implemented on a local or regional basis.

Furthermore, LEZs have also received significant press coverage recently due to the announcement regarding the London Ultra Low Emission Zone (ULEZ), which would introduce a fee of £20 per day for diesel-fuelled cars achieving emission standards lower the Euro VI by 2020. This proposal has significantly increased awareness and acceptance of the potential regulation of diesel cars through LEZs.

6.4 Proposed Transport Engineering Schemes

The emerging Local Plan will identify infrastructure schemes that may be dependent on the provision of Government support. Where any such schemes are proposed, a detailed assessment using dispersion modelling of the impact of the proposed

schemes on air quality will need to be undertaken within the planning regime. An action (Action 7) has been included to ensure this is carried out.

6.4.1 Option 10: Sherburn Road Retail Park

The Sherburn Road Retail Park link road has been discussed as a potential future project, but at this stage has not been developed to a formal scheme. Therefore, this scheme has not been considered in this report.

7 Model Results

7.1 Modelled Receptors – Baseline concentrations

Annual mean NO_2 concentrations were predicted at selected sensitive receptor locations. The concentrations are presented along with an upper estimate (i.e. including the maximum range of predicted concentrations based on the confidence associated with the model), as the complex street canyon characteristics in several locations meant that the model under-predicted at some locations where monitoring recorded exceedences (similarly the model also over predicted at some locations).

The predicted concentrations were used to determine the maximum NO_X emission reduction that is required to achieve the annual mean objectives for NO_2 in 2017. The required reduction for each receptor and the location are provided in Table 5.

Plots of the predicted annual mean NO_2 concentrations are also shown at the residential properties within the AQMA in **Appendix E**, **Figure 18** and Figure 19.

The table includes an adjusted modelled value and an upper estimate, based on the verification calculations presented in **Appendix D**. The upper estimate accounts for the uncertainty in the model resultant from comparing modelled and monitored data, and in particular considers the areas where monitored locations in proximity to each other record very different values, such as in the Crossgate area. By including this upper estimate, this ensures that the locations exposed to the highest concentrations are recognised.

The pollutant concentrations at sensitive receptor locations are presented as annual mean NO_2 concentrations in order to be compared directly with the UK air quality objective and EU limit value (40 µg/m^3). The amount of pollutant that is released from an emission source is presented as NO_X, and in Table 5 it refers to the reductions in emissions from road sources that are required to achieve the annual mean NO_2 objective.

The required emissions reductions also include an upper estimate to demonstrate the potential maximum level of reduction that is required at each location.

Table 5: Predicted Annual Mean NO_2 Concentrations in 2017 and Required NO_X Emission Reduction to Achieve Objective

ID	Location	Annual Mean NO_2 2013 (µg/m^3)			Annual Mean NO_2 2017 (µg/m^3)		2017 Required NO_X Emission Reduction	
		Monitored	Modelled	Upper Estimate	Modelled	Upper Estimate	Modelled	Upper Estimate
1	Newcastle Road	-	28.5	31.9	26.8	30.3		
2	Nevilles Cross Bank	-	30.5	33.8	27.2	30.7		
3	Darlington Road	-	27.5	30.9	25.7	29.2		
4	Crossgate Peth 1	-	37.8	**47.3**	34.2	**42.9**		13%
5	Crossgate Peth 2	-	34.3	**43.8**	31.2	39.9		
6	Crossgate Peth 3	-	32.0	**41.5**	28.6	37.2		
7	Sutton St	-	40.0	**49.5**	32.5	**41.1**		5%
8	Atherton St	-	**40.5**	**50.0**	33.5	**42.1**		10%
9	Crossgate Lights	-	**49.3**	**58.8**	**40.8**	**49.4**	3%	35%
10	Highgate	-	**43.6**	**53.1**	**40.4**	**49.1**	2%	34%
11	Gvmnt Offices, Milburngate Brdg *	-	**62.3**	**70.0**	**56.6**	**63.1**	43%	65%
12	School, Church St	-	35.4	**41.8**	32.5	38.4		
13	New Elvet/Old Elvet Junction	-	34.4	**40.8**	32.3	38.3		
14	Hallgarth	-	30.2	36.6	30.2	36.2		
15	Claypath	-	33.6	38.8	29.9	34.8		
16	Gilesgate Roundabout	-	37.0	**44.7**	38.0	**44.5**		39%
17	Gilesgate Hill	-	29.9	37.6	28.6	35.0		
18	Bradford Crescent, A690	-	21.7	29.4	21.8	28.3		
19	Dean's Walk	-	22.9	30.6	23.5	30.0		

ID	Location	Annual Mean NO_2 2013 ($\mu g/m^3$)			Annual Mean NO_2 2017 ($\mu g/m^3$)		2017 Required NO_X Emission Reduction	
		Monitored	Modelled	Upper Estimate	Modelled	Upper Estimate	Modelled	Upper Estimate
20	Sunderland Road	-	23.6	31.3	21.6	28.1		
21	Claypath	-	34.5	39.7	31.5	36.4		
22	Leazes Road	-	32.5	**40.2**	31.6	38.0		
23	Leazes Road	-	**42.2**	**49.9**	**43.2**	**49.7**	12%	30%
24	Leazes Road	-	**50.9**	**58.6**	**46.4**	**52.9**	21%	36%
25	Gilesgate Roundabout	-	25.2	32.9	23.7	30.2		
26	Gilesgate	-	22.4	30.1	22.1	28.6		
27	Sunderland Road	-	34.2	**41.9**	33.3	39.8		
28	Sunderland Road	-	24.0	31.7	23.3	29.8		
29	Sunderland Road	-	19.5	27.2	18.2	24.7		
30	Sunderland Road	-	21.6	29.3	20.7	27.2		
31	Sunderland Road	-	**43.3**	**51.0**	32.2	38.7		
32	Sunderland Road	-	38.3	**46.0**	32.1	38.6		
D1	Dragon Lane	**48.8**	**47.4**	**55.1**	36.5	**42.9**		11%
D2	121 Gilesgate	35.0	34.1	**41.8**	33.9	**40.4**		2%
D3	Claypath	29.8	37.8	**43.0**	35.0	40.0		
D4	39 Claypath	36.8	36.3	**41.5**	31.7	36.7		
D5	Milburngate	26.1	30.5	38.2	28.7	35.2		
D7	Highgate south	39.6	33.4	**41.1**	30.6	37.1		
D8	Highgate north	**47.6**	28.0	35.7	28.0	34.4		
D10	North Road	34.8	39.9	**49.4**	37.0	**45.7**		24%
D11	Crossgate lights	**42.1**	**48.2**	**57.7**	**40.7**	**49.4**	3%	34%
D12	EDGB Music, Colpitts Terrace	**54.5**	**44.3**	**53.9**	35.9	**44.6**		20%
D13	56 Hawthorn Terrace	29.7	**44.6**	**54.1**	38.0	**46.7**		27%
D14	The Gates	37.7	**48.4**	**56.1**	**44.6**	**51.1**	16%	33%
D15	New/Old Elvet junction	37.2	**48.8**	**58.3**	**45.9**	**54.5**	24%	46%
D16	10 Church Street	33.8	38.0	**44.4**	33.3	39.2		
D17	New Inn, Church Street Head	35.1	38.5	**44.9**	34.2	**40.2**		0%
D18	51 Hallgarth Street East	29.1	28.7	35.1	28.0	33.9		
D19	2 Church Street	**53.9**	**45.5**	**51.9**	**41.3**	**47.2**	6%	28%
D20	80 Gilesgate	**48.8**	28.2	35.9	27.5	33.9		
D21	Sherburn Road	25.9	23.0	30.7	22.8	29.2		
D42	93 Claypath	**48.0**	**42.2**	**47.4**	37.8	**42.7**		12%
D43	The Peth south	**58.5**	**45.3**	**54.8**	39.1	**47.8**		30%
D45	20 Young Street	25.1	38.0	**47.5**	38.1	**46.8**		27%
D46	Gilesgate Moor Hotel, Dragon Lane	30.3	**40.7**	**48.4**	33.7	**40.2**		1%
D56	56 McKintosh Court	18.7	20.7	28.4	20.1	26.6		
D57	56 McKintosh Court Kerbside	15.4	32.7	**40.4**	32.7	39.2		
D58	49 Sunderland Road	20.6	28.5	36.2	27.8	34.3		
D70	The Peth north	**41.1**	**43.9**	**53.4**	**40.3**	**48.9**	1%	33%
D71	opp EBGB Music, Colpitts Terrace	39.8	**59.5**	**69.0**	**45.6**	**54.3**	23%	45%
D72	opp Lampost 42	**55.9**	**50.0**	**59.5**	**42.2**	**50.8**	10%	38%

ID	Location	Annual Mean NO_2 2013 (µg/m^3)			Annual Mean NO_2 2017 (µg/m^3)		2017 Required NO_X Emission Reduction	
		Monitored	Modelled	Upper Estimate	Modelled	Upper Estimate	Modelled	Upper Estimate
D73	6 Sutton Street	**41.3**	**55.5**	**65.1**	**43.8**	**52.4**	17%	42%
D74	Elvet Crescent	36.3	35.3	**41.7**	33.1	39.0		
D75	Nevilledale Terrace	23.7	29.5	39.1	26.8	35.4		
D76	The Peth	22.4	28.3	37.9	25.5	34.2		
D77	Archery Rise	**56.4**	**50.5**	**60.0**	**42.6**	**51.2**	12%	39%
D78	Nevilles Cross out	36.2	**53.2**	**62.7**	**46.6**	**55.3**	27%	47%
D79	Nevilles Cross bank	**57.2**	**42.9**	**52.4**	37.8	**46.5**		26%
D80	Stonebridge	39.4	35.2	38.6	32.7	36.2		
D81	Claypath	**41.1**	34.9	**40.1**	30.9	35.9		
D82	Claypath	33.2	38.5	**43.7**	34.2	39.2		
D83	Boyd Street	25.9	35.4	**41.8**	32.0	37.9		
D84	Hallgarth Street	31.9	28.4	34.8	27.8	33.7		
D91	Crossgate monitor	**44.2**	39.5	**49.0**	34.4	**43.1**		14%
D96	1 Anns Place	21.5	30.0	33.4	28.4	31.9		
D97	Orchard House	26.8	34.2	**40.6**	32.1	38.0		
D98	62 Claypath	33.8	35.4	**40.6**	31.1	36.0		
D99	65 Claypath	34.2	33.7	38.9	30.1	35.0		
D102	High Street, Langley Moor	36.1	38.3	**41.7**	34.5	38.0		
D103	High Street, Langley Moor	34.6	35.8	39.2	32.5	36.0		
D104	38 High Street, Meadowfield	38.7	35.9	39.3	32.5	36.0		
D105	80 High Street, Meadowfield	33.6	38.4	**41.8**	34.9	38.4		
D106	6 Belle Vue Terrace, Dragonville	**51.0**	**41.6**	**49.3**	33.9	**40.3**		1%
D107	115 High Street, Meadowfield	35.3	31.0	34.4	28.5	32.0		
DUR2	Crossgate Lights	**49.6**	**40.3**	**49.8**	34.6	**43.3**		15%

Note: * The Government Offices, Milburngate Bridge were modelled for potential sensitivity to the hourly mean objective

7.2 Relevant Exposure – Baseline

The model was used to predict the number of residential properties within the AQMA that would be exposed to concentrations of NO_2 greater than the annual mean objective. The range of values takes account of the upper estimate of the model.

The number of properties was predicted to decrease in the future, although it would still include a significant number.

Table 6: Properties Exceeding EU Limit Value

	2013	2017
No of Properties >Objective	217-430	59-318

7.3 Option Appraisal Results

The emission reductions predicted to be achieved from each of the modelled options are presented in Table 7. These results are also plotted to demonstrate the emission reductions in **Appendix F**.

7.3.1 Option 1: SCOOT and Committed Infrastructure Changes

A SCOOT system is intended to reduce congestion and increase average vehicle speed by smoothing the flow and achieving a more constant speed (i.e. reduced stop/start or idling).

The potential effect of SCOOT was modelled by assuming an average 5 km/hr speed increase. This was predicted to achieve an average 13% emissions reduction, with a maximum benefit of 39% on Castle Chare, 49% on Claypath and 35% on Gilesgate, which was mainly linked to the reduced queuing (a 5 km/hr change at lower speeds results in very significant emissions changes).

SCOOT should reduce the existing queues from the key roundabout junctions and increase the overall traffic speed. The extent that these effects are realised is uncertain, but given that it is committed and is to be implemented by 2017, its effects should be combined with the effects of all the other options considered, although as noted earlier the cumulative effects may be dependent on the option, and how the SCOOT system effects interact with the other options' effects.

7.3.2 Option 2: Retrofitting Abatement on Buses

Three different options were appraised to consider the effects of retrofitting the oldest components of the bus fleet with SCR to achieve the equivalent minimum standards:

- Euro IV, Option 2a
- Euro V, Option 2b
- Euro VI, Option 2c

Option 2a and 2b were predicted to achieve an average 2% reduction. Some roads demonstrated greater improvements with Euro IV, compared to Euro V, due to the way in which the retrofitted abatement technology operates at different speeds, as shown in **Appendix C**, Figure 9, where a Euro V SCR bus has higher emissions than a Euro IV at speeds <35 km/hr. The retrofitted SCR system would be tuned to eliminate this effect.

With all buses replaced with new Euro VI vehicles, this was predicted to achieve a significant average emissions reduction of 16%, with a maximum reduction of ~45% on roads with high bus volumes.

Individually, Option 2c was predicted to achieve the required emissions reduction on Claypath, Sherburn Road and North Road, although significant benefits were identified on several roads with all three Options.

7.3.3 Option 3: Hybrid Buses Within the AQMA

Introducing new diesel-hybrid buses was not predicted to achieve significant benefits, with either 5% or 10% of the oldest vehicles replaced with new hybrids.

This Option was predicted to achieve an average 1% reduction of emissions, and up to 3-5% reduction on roads with high bus flows, such as near the station. Clearly, had a greater proportion of the existing buses been assumed to convert to hybrid vehicles then greater benefits would have been predicted.

7.3.4 Option 4: Park & Ride Buses

The Park and Ride sites have approximately 74 bus journeys per day in each direction, and so these are potentially very significant sources on bus route roads. The routes are shown in Appendix B, **Figure 4**.

Replacing the Park and Ride buses with minimum Euro VI vehicles was predicted to achieve an average emission reduction of 2%.

Electric buses have no exhaust emissions, and so Option 4b effectively removes part of the bus fleet as an emission source and would be beneficial on all roads where existing vehicles are replaced by electric vehicles. This Option considers the effect of removing 5% of the buses on all roads, which would achieve a maximum reduction of 7%.

Whilst this does not affect all roads, it does demonstrate that reducing the emissions from the bus fleet can have a direct and noticeable effect, and that replacing more buses with electric or zero-emission vehicles may be highly beneficial.

7.3.5 Option 5: Develop Cycle-ways

A long term objective is to achieve a significant modal shift away from the use of road vehicles of 7-10% and the introduction of a coordinated network of cycle-ways is integral to this. Within the Durham Integrated Transport Approach (DITA) details are provided of cycleway networks to support the new proposed development areas, although this is a long term objective and will not be achieved by 2017. The impact and the likelihood to achieve the 7 to 10 % modal shift will increase with the combined effect of other options such as the encouragement of the implementation of Travel Plans by businesses within Durham City and the undertaking of an air quality campaign. However it is recognised that commitment to accomplish behavioural change to alternative forms of travel to the private motor car will be required.

The effect of reducing car and bus AADT by 7% was predicted to achieve an average benefit of 5%, within a range of 4-7% on all roads.

7.3.6 Option 6: Smarter Choices

Smarter Choices are intended to reduce car use in favour of public or alternative transport.

An option that reduces car use by 5% (Option 6a) was predicted to achieve an average emissions reduction of 3%, whilst doubling the reduction to 10% (Options 6b) would also double the average emissions reduction to 6%.

7.3.7 Option 7: Increase Park and Ride Spaces

Option 7 was expected to reduce cars in a broadly similar way as Option 6. The values presented in Table 7 are an average of Options 6a and 6b.

This Option did not consider the effect of increasing the number of buses that may be needed to service increased parking demand. However, if additional buses were electric, as appraised in Option 4, they would not add any additional emissions and so the overall effects would be beneficial.

It is recognised that this action in isolation is limited and therefore to achieve the benefits will be dependent on the implementation of other options that will maximise the utilisation of the Park and Ride facilities.

7.3.8 Option 8: Additional Bus Lanes & Improved HGV Access

Opening new bus lanes to reduce congestion was modelled as increased speed for only buses of one EFT speed category (i.e. 5 km/hr) in the same way as Option 1. This Option did not consider the feasibility of creating new bus lanes, as it is recognised that many roads could not support these, but this option may be integrated with SCOOT (Option 1) along with revised junction layouts to prioritise buses. Furthermore, it did not consider the potential effect of modal shift due to encouraging more people to use buses instead of cars. Regardless of the assumptions applied, Option 8a was predicted to achieve an average emission reduction of 2%.

Allowing HGVs to use the new bus lanes and thereby increase their average speed (Option 8b) was predicted to achieve additional benefits, with an average reduction of 3%, but up to 9% on roads with high HGV flows. This is consistent with the speed / emission graphs shown in Figure 8 in Appendix C, where HDV emissions decrease with increasing speed, and with greater effects at lower speeds such as those that apply in the City.

7.3.9 Option 9: Various Car Fleet Improvements

Option 9 incorporates three detailed options for changing the car fleet.

Option 9a increased the proportion of hybrid petrol-electric cars to 5% of the fleet. These cars would still have emissions, although they are typically much lower at urban speeds and overall emissions were predicted to decrease by 3%.

Option 9b limited the size of diesel and petrol car engines to less than 2 litres. This was predicted to have a similar effect as introducing hybrid cars, which typically have small petrol engines to complement the electric motor.

Option 9c replaced all diesel cars with petrol. As shown in Section 4.3, Table 3, diesel car are the most significant emission source on most roads, and so this would reduce average emissions by 42%. Whilst this option may not be feasible, these results demonstrate that tackling diesel cars can have very significant benefits.

7.3.10 Option 10: Transport Engineering Schemes

The appraisal of transport engineering schemes considered the effects of reduced traffic flows and increased speeds. Reducing total vehicles flows would have a directly proportional effect on emissions.

7.3.11 Option 11: Future Transport Engineering Schemes

The appraisal of transport engineering schemes proposed to take place after 2017 was undertaken separately, and presented in Section **Error! Reference source not found.**, below.

7.3.12 Option 12-16: Soft Improvements

The soft improvement options were not modelled and have been appraised subjectively in Section 8 for the purposes of scoring and prioritisation.

7.4 Option Scores

The number of residential properties affected by each Option was calculated in emissions reductions bands, as shown in Table 8.

The change in emissions considers each road as a discrete area, and the required emissions reduction includes all of the modelled receptors on that road. Therefore, where a range of required emissions reduction has been presented, this considers the range of modelled concentrations predicted at sensitive locations in different locations along each road.

The number of properties in each band was then multiplied by a factor of between 1 and 5 to calculate an overall score. The score was considered to represent the magnitude of the predicted change in air quality at locations of relevant exposure.

The highest scoring option was Option 9c, with all properties experiencing an emissions reduction >20%.

Table 7: Predicted NO_X Emission Reductions for Appraisal Options

Road	SCOOT	Bus Improvements						P&R Buses		Modal Shift				Bus & HGV Flows		Improve Car Fleet			Required NO_X Emission Reduction
	1	2a	2b	2c	3a	3b	3c	4a	4b	5	6a	6b	7	8a	8b	9a	9b	9c	
Sunderland Road	9%	1%	1%	6%	0%	0%	0%	0%	0%	5%	3%	6%	5%	1%	5%	3%	3%	46%	10%
Sherburn Road	10%	4%	3%	25%	1%	1%	0%	0%	0%	6%	3%	5%	4%	4%	6%	2%	3%	38%	22%
Gilesgate	35%	3%	1%	19%	0%	1%	4%	4%	4%	5%	2%	5%	4%	2%	5%	2%	3%	37%	31-43%
A690	28%	3%	3%	16%	0%	1%	5%	5%	5%	5%	3%	5%	4%	1%	1%	3%	3%	36%	
Leazes Road	29%	3%	3%	18%	0%	1%	2%	2%	2%	5%	3%	6%	5%	1%	2%	2%	3%	48%	1-31%
Claypath	49%	7%	1%	42%	1%	3%	10%	10%	11%	6%	2%	5%	4%	3%	4%	2%	2%	41%	13%
Silver Street	10%	5%	3%	40%	1%	2%	0%	0%	0%	6%	2%	6%	4%	6%	6%	2%	2%	44%	
Millburngate Bridge	33%	3%	2%	21%	1%	1%	6%	6%	7%	6%	3%	5%	4%	2%	3%	3%	3%	39%	46-67%
New Elvet	13%	4%	0%	27%	1%	2%	5%	5%	6%	5%	2%	4%	3%	5%	9%	2%	2%	27%	
Old Elvet	8%	0%	0%	0%	0%	0%	0%	0%	0%	7%	5%	4%	5%	0%	0%	4%	5%	30%	32-51%
Church Street	9%	2%	1%	15%	0%	1%	0%	0%	0%	4%	2%	6%	4%	2%	5%	2%	2%	43%	7%
South Road (North of Elvet Hill)	5%	0%	0%	0%	0%	0%	0%	0%	0%	7%	5%	6%	6%	0%	0%	4%	5%	46%	
Quarryhead lane	8%	0%	0%	0%	0%	0%	0%	0%	0%	7%	5%	4%	5%	0%	0%	4%	5%	32%	
Stockton Road	7%	0%	0%	0%	0%	0%	0%	0%	0%	7%	5%	4%	5%	0%	0%	4%	5%	30%	
Hallgarth Street	7%	2%	2%	13%	0%	1%	0%	0%	0%	4%	2%	5%	4%	2%	3%	2%	3%	35%	
Stockton Road	7%	0%	0%	0%	0%	0%	0%	0%	0%	7%	5%	10%	8%	0%	0%	4%	5%	75%	
Willow Tree Avenue	5%	0%	0%	0%	0%	0%	0%	0%	0%	7%	5%	4%	5%	0%	0%	4%	5%	34%	
North Road South	9%	9%	11%	60%	2%	3%	0%	0%	0%	5%	0%	10%	5%	6%	9%	0%	0%	73%	
Framwellgate	29%	3%	2%	21%	1%	1%	3%	3%	3%	6%	3%	10%	7%	2%	3%	3%	3%	75%	4-35%
Castle Chare	39%	3%	0%	22%	1%	1%	6%	6%	7%	5%	2%	10%	6%	3%	6%	2%	2%	75%	
Alexandria Crescent	11%	2%	1%	17%	0%	1%	0%	0%	0%	4%	2%	5%	4%	3%	8%	2%	2%	36%	30-49%
Margery Lane	5%	0%	0%	2%	0%	0%	0%	0%	0%	4%	3%	10%	7%	0%	1%	2%	3%	75%	
Crossgate Peth	12%	3%	1%	23%	1%	1%	0%	0%	0%	5%	2%	10%	6%	4%	9%	2%	2%	73%	39-54%
Nevilles Cross Bank	8%	1%	1%	9%	0%	1%	0%	0%	0%	5%	3%	0%	2%	1%	4%	3%	3%	3%	23%
Newcastle Road	3%	2%	0%	15%	0%	1%	0%	0%	0%	5%	3%	6%	5%	1%	2%	2%	3%	44%	
Darlington Road	5%	1%	2%	7%	0%	0%	0%	0%	0%	5%	3%	5%	4%	1%	2%	3%	3%	41%	
Quarryhead lane	8%	0%	0%	0%	0%	0%	0%	0%	0%	7%	5%	4%	5%	0%	0%	4%	5%	32%	
Potters Bank	7%	0%	0%	2%	0%	0%	0%	0%	0%	4%	2%	4%	3%	0%	1%	2%	3%	29%	
Elvet Hill Road	7%	0%	0%	2%	0%	0%	0%	0%	0%	3%	2%	4%	3%	0%	1%	2%	3%	30%	
South Road (North of Elvet Hill)	5%	0%	0%	0%	0%	0%	0%	0%	0%	7%	5%	4%	5%	0%	0%	4%	5%	27%	
South Road (north of P&R)	6%	1%	2%	9%	0%	1%	0%	0%	0%	5%	3%	8%	6%	1%	3%	3%	3%	56%	
South Road (south of P&R)	5%	1%	1%	6%	0%	0%	0%	0%	0%	6%	4%	2%	3%	1%	1%	4%	4%	17%	
Dragon Lane	8%	1%	1%	8%	0%	0%	0%	0%	0%	4%	2%	5%	4%	1%	4%	2%	3%	39%	10-29%
Sutton Street South	9%	4%	3%	30%	1%	2%	0%	0%	0%	6%	3%	4%	4%	4%	6%	2%	3%	34%	
Sutton Street North	9%	4%	3%	28%	1%	2%	0%	0%	0%	6%	3%	4%	4%	4%	5%	2%	3%	32%	
North Road	10%	6%	5%	45%	1%	3%	0%	0%	0%	5%	1%	6%	4%	6%	8%	1%	2%	45%	21-36%
North Road North	10%	6%	4%	41%	1%	2%	0%	0%	0%	6%	2%	6%	4%	5%	8%	2%	2%	43%	

Note: Options 10a-10b have not been presented, as these achieve emissions reductions proportional to the reduction in traffic flows (i.e. 5% and 10%, respectively).

Table 8: Change of NO_X Emissions at Relevant Exposure (Residential Properties) in the AQMA

Emission Reduction	Score Multiplier	Number of Residential Properties in Emission Change Band																			
		1	2a	2b	2c	3a	3b	3c	4a	4b	5	6a	6b	7	8a	8b	9a	9b	9c	11a	11b
<1%	1	13	164	234	22	775	506	0	601	601	0	0	0	0	299	24	0	775	0	0	0
>1%	2	90	1096	1082	4	0	538	1550	32	0	844	1508	582	1045	798	868	1550	0	0	550	0
>5%	3	1584	189	0	924	0	0	0	468	327	1059	63	1389	726	231	831	0	0	0	1500	762
>10%	4	756	0	0	776	0	0	0	8	260	0	0	84	42	0	160	0	0	12	0	2084
>20%	5	0	0	0	1245	0	0	0	0	0	0	0	0	0	0	0	0	0	3860	0	0
Score Using Multiplier		2443	1449	1316	2971	775	1044	1550	1109	1188	1903	1571	2055	1813	1571	1883	1550	775	3872	2050	2846

7.5 Results Summary

The average emissions reductions achieved by each of the appraised options are ranked in Table 9. The scores, and associated descriptions, were based on the change in relevant exposure discussed in Section 7.4, and presented in Table 8.

7.5.1 Large Benefits

The most beneficial option was predicted to be Option 9c (replace all diesel cars with petrol cars). This targeted the most significant emission source, although this would be very difficult to implement. It does give a good indication of the effects that could be achieved with a gradual shift to petrol over diesel.

7.5.2 Medium Benefits

Medium benefits were predicted for 5 options.

Option 2 was nearly categorised as Large. Although this targeted a specific portion of the fleet, it demonstrated that significant improvements to buses can have a significant effect on exposure to pollution.

Option 10b also scored highly within the medium category, which was expected to occur as this arbitrarily reduces all emissions.

Option 1 scored highly, and was particularly important as this is a committed scheme that will contribute to the baseline.

Options 6b and 10a achieved similar scores, and were similar in reducing movements from all or part of the vehicle fleet.

7.5.3 Small Benefits

Small benefits were predicted to be achieved by the majority of options.

7.5.4 Negligible Benefits

Negligible benefits were predicted for only two options, 3a and 9b. These considered changes to the car and bus fleets that may not be feasible due to cost or support.

Table 9: Ranking of Predicted Emission Reductions

Rank	Change at Relevant Exposure			Score Description
	Option		Score	
1	9c	Change all diesel cars to petrol	3872	Large
2	2c	Buses to Euro VI	2971	Medium
3	10b	Reduce traffic flow -10%	2846	
4	1	SCOOT / UTMS	2443	
5	6b	Smarter choices, cars -10%	2055	
6	10a	Reduce traffic flow - 5%	2050	
7	5	7% modal shift to cycling	1903	Small
8	8b	Increase bus and HGV speed +5 km/hr	1883	
9	7	Additional P&R parking	1571	
10	6a	Smarter choices, cars -5%	1571	
11	3c	Reduce buses by 5%	1550	
12	9a	5% hybrid electric cars	1550	
13	2a	Buses to Euro IV	1449	
14	8a	Increase bus speed +5km/hr	1328	
15	2b	Buses to Euro V	1316	
16	4b	P&R buses to be Ev	1188	
17	4a	All P&R buses to be Euro VI	1109	
18	3b	10% hybrid	1044	
19	3a	5% hybrid	775	Negligible
20	9b	Change all cars to <2litre	775	

8 Action Prioritisation

8.1 Prioritisation

The appraisal options were scored based on the criteria in Table 10 (Air Quality, Cost, Acceptability, Timescale, Noise, Climate Change and Social) in order to determine the overall ranking presented in Table 12.

The scoring system includes a 3-point scale for most of the factors, but a 4-point scale for the air quality effect, as this has been modelled in this assessment and reflects the higher significance attributed to air quality as the main driver for this report.

8.1.1 Air Quality Change

The modelled change was ranked according to the thresholds defined in Table 8,, which takes account of the change in pollutant concentrations and the population affected.

8.1.2 Cost

The financial costs were bracketed into three categories. Options that would have negligible cost, or would benefit from other ring-fenced budgets received the highest score. These included the website improvement option and the UTMC system (as this was an existing project with allocated funding).

Options with significant associated costs were bracketed within ranges of either £25,000 - £250,000, or >£250,000, with higher costs being attributed a lower score.

8.1.3 Acceptability

The level of public acceptability was subjectively awarded a score based on whether it would be generally opposed, supported with reservations, or generally supported. The subjective score awarded to each Option was based on discussion and agreement within the Corporate Steering Group.

8.1.4 Timescale

The time required to fully implement each Option was awarded a score based on short, medium and long timescales.

The shortest timescale was awarded the highest score, and was allocated to those Options which could be implemented within 12-months of the Plan being published. Options that could be implemented within the appraised period (i.e. before 2017) were considered to have a medium timescale.

Options that were unlikely to be achieved before 2017 were awarded the lowest score, since these would also be subject to uncertainty due to the effects of the Local Plan and future budgets, or other planning restrictions/opportunities.

8.1.5 Other Environmental or Health Co-Benefits

Some of the Options would also achieve other environmental or health co-benefits. These were not primary driving considerations for this appraisal, and so only two score categories were used in each case, and the values were averaged to ensure the score was not biased away from the key criteria. These criteria included:

- Noise, such as engine and tyre noise due to changes in traffic flows or idling vehicles.
- Climate, due to changes in emissions of greenhouse gases (i.e. carbon), which may also be linked to the DCC climate change commitments and targets.
- Social, which may affect mobility and access to public transport, or improved health due to increased exercise through cycling.

8.1.6 Score Tables and Prioritisation

The scores for each of the criteria were multiplied together to determine an overall comparison score.

Table 10: Option Scoring Criteria

Score Multiplier	Score Criteria						
	AQ Change	Cost	Acceptability	Timescale	Noise	Climate	Social
4	Large Score >3000	-	-	-	-	-	-
3	Medium Score 2000-3000	Free or negligible (or paid from allocated budgets)	Supported, or no opposition	Within 12-months	-		-
2	Small Score 1000-2000	<£25,000 - £250,000	Some support, but with reservations	1-3 years (i.e. before 2017)	Reduced noise	Significant reduced emissions that will support DCC policies	Improved access or other social benefit
1	Negligible Score <1000	>£250,000	Unpopular or opposed	>3 years (after 2017)	No change, or disbenefits		

Table 11: Option Scores and Overall Prioritisation

Rank	Option		AQ Change	Cost	Acceptability	Timescale	Noise	Climate	Social	Score	
1	1	SCOOT UTMC	2-3	3	3	3	2	2	1	90-135	Highest Priority
2	2a	Buses to Euro IV	2	3	3	2	1	2	1	48	
3	2b	Buses to Euro V	2	3	3	2	1	2	1	48	
4	7	Additional P&R parking	2	3	1	3	2	2	2	36	
5	12	Publish AQ SPD	1	3	3	3	1	2	1	36	
6	13	Establish LES	1	3	3	3	1	2	1	36	
7	14	Improve DCC AQ web information	1	3	3	3	1	1	2	36	
8	6a	Smarter choices, cars -5%	2	2	2	2	2	2	2	32	
9	4a	All P&R buses to be Euro VI	2	3	1	3	1	2	2	30	
10	5	7% modal shift to cycling	2	3	2	1	2	2	2	24	
11	2c	Buses to Euro VI	3	1	3	2	1	2	1	24	
12	3a	5% hybrid	1	2	3	2	2	2	1	20	
13	3b	10% hybrid	2	1	3	2	2	2	1	20	
14	8a	Increase bus speed +5km/hr	2	2	2	2	1	1	1	16	
15	9c	Change all diesel cars to petrol	4	2	1	2	1	1	1	16	
16	15	Variable parking message signage	1	2	3	2	1	1	2	16	
17	16	UTMC live travel information	1	2	3	2	1	1	2	16	
18	6b	Smarter choices, cars -10%	3	1	1	2	2	2	2	12	
19	4b	P&R buses to be EV	2	3	1	1	2	2	1	10	
20	3c	Reduce buses by 5%	2	1	3	1	2	2	1	10	
21	10a	Reduce traffic flow -5%	3	1	2	1	2	2	1	10	
22	10b	Reduce traffic flow -10%	3	1	2	1	2	2	1	10	
23	8b	increase bus and HGV speed +5 km/hr	2	2	1	2	1	1	1	8	
24	9a	5% hybrid electric cars	2	1	1	2	2	2	1	7	Lowest Priority
25	9b	Change all cars to <2litre	1	1	1	2	1	1	1	2	

8.1.7 High Priority Options

Option 1 is a committed scheme. It ranked highly based on cost, acceptability and timescale, and so it scored relatively lower only for social inclusion, since it would not have any immediate benefit in this category. Due to the uncertainty of the air quality effect, the 'AQ Change' score was ranged between 2 and 3.

A number of other options also clearly scored highly. The highest priority score in Table 12 was predicted to be Option 2a/2b, for the improvement of buses up to Euro IV/V standard.

The provision of additional car park spaces in the Park and Ride car parks along with improved shuttle services to encourage uptake and reduce car use in the City scored highly, although this was not taken forward as an Action (see below).

Several soft improvement options, such as the Supplementary Planning Document (Option 12) and the Low Emission Strategy (Option 13), are presented in Table 4, although they were not modelled as the effects will be very difficult to differentiate from other options. Therefore, the predicted air quality changes would likely be low, and were scored as 1 in Table 12. However, due to the relatively low cost and straight-forward implementation of these options, they achieved an overall score up to 36, which was moderately high, and demonstrated that they should certainly be considered for inclusion in the AQAP.
Publishing the Supplementary Policy Document (Option 12) and the Low Emission Strategy (Option 13) had low air quality effect scores, but relatively high scores in the other categories, so they were ranked 5 and 6, respectively.

Option 6a was an optimistic implementation of the Smarter Choices initiative to reduce the number of private cars and promote alternative travel methods. It was notable that this scored more highly than 6b, as this would require significant additional drivers to reduce movements by 10%.

8.1.8 Medium Priority Options

The majority of options were scored below 30. These options were still considered to be suitable for inclusion in the AQAP, but cost vs. air quality benefits were carefully considered, as was as the level of acceptability. For example, Option 6b was scored as 1 for acceptability and cost, and is unlikely to be progressed.

8.1.9 Low Priority Options

Option 8b, 9a and 9b were all scored below 10 and were not considered suitable for inclusion in the AQAP..

8.2 Summary of Priority Actions

The SCOOT traffic management scheme may have significant air quality benefits by reducing congestion and increasing the average speed of vehicles. If the projected changes to traffic flow are achieved, then the effects from this will significantly improve the future baseline conditions, which may increase the cumulative benefits from the other appraised options. However, this may be tempered by the way in which different options affect traffic flows, so in areas where the SCOOT system reduces congestion and improves traffic flow, the effects of individual options may be less significant.

One of the highest scoring options was the increased capacity and use of the Park and Ride sites to reduce car use in the City. This would utilise the increased parking capacity at these sites to reduce car parking in the City, and link with improving the emissions standards on public bus services and particularly the Park and Ride so increased bus movements do not introduce a new, different, emission source. As the current Park and Ride sites are not currently operating at capacity further work will be required to examine the mechanism by which people currently parking in the City could be encouraged to use the additional resource should it be provided

It was recognised that the prioritisation scoring has also favoured a number of relatively cheap, acceptable and quick options, not necessarily those which have a significant effect on local air quality.

Options that would reduce the number of vehicle movements were also scored favourably, although the mechanism to achieve these reductions would likely require several different options to be implemented in conjunction with soft measures, which scored in the middle of the table and notably scored more favourably than many of the harder measures.

It is recommended that further modelling work is undertaken to holistically examine the impacts on local air quality from proposed infrastructure schemes identified that emerge from the preparation of the Local Plan. The outcome of such work may be used to establish a more detailed traffic management plan that will determine how the proposed schemes can be used to provide additional capacity for traffic as an alternative to using the route through the city. The SPD (Option 12) and the LES (Option 13)

should be used to ensure the effects on local air quality from any new development are assessed and any identified detrimental impacts are mitigated.

The following Options will be implemented as Actions

1	Introduce SCOOT/ UTMS
4a	Ensure all P&R buses to be Euro VI
2a/b/c	Improve all buses to Euro IV, Euro V or Euro VI
12	Publish AQ SPD
13	Establish LES
14	Air quality campaign to include improved DCC AQ web information
6a	Smarter Choices scheme to reduce cars by 5%
5	7% modal shift to cycling
3a/b	5-10% of buses to be hybrid

8.3 Options Not Implemented

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The Options and sub-options 9a/9b/9c considered the effects of converting the diesel car fleet to petrol or alternative fuel, and Option 9c achieved the highest local air quality score for improving air quality on all roads. However, Option 9c was ranked at only 15 out of 25 in the prioritisation table due to the low acceptability score, and Options 9a/9b were ranked last. Therefore, whilst they will not be progressed as individual Actions, due to the clear local air quality benefits of discouraging diesel car use in the city it will be incorporated as much as possible into the implementation of the other committed Actions.

Option 7 was ranked 4 in the prioritisation. However, this would be dependent on financial and policy drivers to discourage use of the city centre car parking in favour of the park and ride facilities, such as workplace parking levy, and it was not considered to be feasible to pursue this option.

Therefore, the following options will not be implemented as Actions:

- Maximise the utilisation of the existing and proposed additional parking spaces at the Howlands Farm Park and Ride Sniperley Park and Ride.
- Variable parking charges to encourage low-emission cars (e.g. Electric, hybrid, or small petrol in favour of large diesel).
- Workplace Parking Levy to encourage use of low-emission vehicles, alternative transport and the improved capacity and services at the Park and Ride sites.
- Ensure all P&R buses to be EV

9 Consultation

A consultation exercise to obtain the views of stakeholders including the public on the identified and prioritised actions put forward to improve air quality is a key stage in developing the Action Plan. This was carried out over a twelve week period between 21st September and 14th December 2015 and invited views on the proposed actions for improving air quality and also provided an opportunity for respondents to put forward alternative ideas or suggestions for consideration.

The consultation process enabled the Council to engage with stakeholders and the public concerning the existing air quality within the city together with explaining what is involved with each of the proposed air quality action measures and the benefits they will achieve. It is important that stakeholders including the public have a sense of involvement in air quality within the city and the consultation contributed to the ongoing process of raising the profile of air quality.

In going forward, the effectiveness of the air quality action measures to improve air quality will be dependent on the participation of stakeholders. Therefore this consultation should not be considered as a single exercise but instead further ways of engaging and enabling participation of stakeholders will be progressed and followed as the Air Quality Action Plan is developed during the implementation stage.

9.1 Consultation

9.1.1 Launch Meeting

A preliminary launch meeting was presented by DCC Environment, Health and Consumer Protection on Wednesday 12 June 2013 to launch the Action Plan and implement the appraisal and consultation process. Key organisations and individuals were invited to join the consultation groups and to support the development of the AQAP.

The following representatives attended the launch meeting:

- Durham County Council
    - Joanne Waller, Head of Environment, Health and Consumer Protection (EHCP)
    - Denyse Holman, Pollution Control Manager
    - David Gribben, Senior Air Quality Officer
    - Adrian White, Head of Transport and Contract Services
    - Gavin Scott, Spatial Policy Team.
    - Tammy Morris Hale, Senior Ecologist
- Highways Agency
    - Bill Sanderson, Safety, Health and Environment Manager
    - Ken Moody, Environmental Adviser
- Bus Companies Operating in Durham
    - John Greaves, Engineering Director Arriva Bus Company
    - Andy Gamblin, Go North East
- Public Health England
    - Kevin Manley, Chemicals, Radiation and Environmental Hazards Team
- AECOM Consultants
    - Duncan Urquhart, Senior Air Quality Consultant

9.1.2 Technical Working and Corporate Steering Groups

As discussed in Section 1.2, the Durham County Council pollution control team within the environmental health, consumer and public protection department coordinated an air quality Technical Working Group to identify potential options and a parallel Corporate Steering Group to approve the options that have been developed into this draft AQAP.

These two groups have been an essential component of the internal review and discussion in developing the list of assessed options, and further refining and prioritising them to determine the final Actions.

9.1.3 Options Appraisal and Modelling

The initial appraisal study was submitted to the Working and Steering Groups for comments, where options were considered and, where appropriate, incorporated into this draft AQAP.

A list of draft options for modelling was submitted by AECOM to DCC for approval in June 2014. These options were discussed with the Technical Working Group to agree the model parameters to be used in the modelling appraisal.

The modelling appraisal report was submitted to DCC by AECOM in January 2015. Additional comments were then received from the Technical Working Group and Corporate Steering Group, which were incorporated into this report.

9.2 Public Consultation

The draft AQAP was approved by the Council and the Air Quality Corporate Steering Group to progress to public consultation in accordance with the prepared Consultation Strategy and Plan. The Consultation Strategy is included as Appendix H. Initially letters were sent out to all stakeholders including the public with an invitation to complete a consultation survey that was made available both online and in paper form. A copy of the survey that was used for the consultation is included as Appendix I.

Following this a display that included details of the proposed air quality action measures and, at which, leaflets and the consultation survey were made available was set up at six public information 'drop-in' sessions at different venues across the city. Officers were on hand at these sessions to engage with the public and to encourage participation by the completion of the consultation survey.

In addition, a workshop event took place on 12th October 2015 at Durham Town Hall in the centre of the city. This involved a presentation that highlighted where in the city existing elevated levels of nitrogen dioxide had been measured or assessed together with an explanation of each of the proposed air quality action measures and the benefits they will provide in reducing levels in these areas. There was opportunity for participation, following the presentation, in the form of discussion groups with the focus on obtaining views on each of the proposed air quality action measures.

Once the consultation concluded on 14th December 2015 the responses to the survey questions were analysed and a report compiled that is included with a summary of the outcome of the consultation as Appendix I. A scoring matrix was devised of different response categories for each of the proposed air quality action measures. The report shows the number of responses received and the percentage response for each of the categories.

There were also a number of more detailed responses received and it was not considered possible to score these. They have been reproduced and included in the report in full since they do raise important comments on the proposed air quality action measures together with suggestions for alternative improvements or ways in which the benefits from the proposed measures can be maximised.

As well as inviting views on each of the proposed air quality action measures the survey also made provision for respondents to put forward alternative suggestions. A number of suggestions were therefore made for alternative air quality action measures. It is noted that some of these relate more to ways of maximising the benefits of some of the air quality action measures that had already been proposed and to suggestions that were previously considered by both the Air Quality Technical Working and the Corporate Steering Groups but were not progressed for the reasons detailed in this Action Plan. The alternative suggestions made are as detailed below:

- The extension of the existing Park & Ride routes within the city to provide better integration with areas of employment.
- The provision of new Park & Ride sites.
- The provision of improved cycling infrastructure to provide continuity of cycle-ways across the city and that link with County and National cycle routes.
- The introduction of variable residential parking charges within the city with preferential rates for parking of vehicles with a lower NOx emissions specification.
- The restriction of specified categories of vehicles from sections of the declared Air Quality Management Area routes through the city i.e. a designated Low Emission Zone or Clean Air Area. An example of this was a suggestion to divert HGV traffic away from Gilesgate and therefore to use the alternative A690 to access Dragonville and Belmont Industrial Estates.

Since some of the suggestions for alternative measures were not progressed as options that have been previously appraised a further action has been included that, in the first instance, will be to explore the feasibility of progressing these as further air quality action measures. The action will apply to i) the extension of the existing Park & Ride and the potential for the provision of new Park & Ride sites and ii) the introduction of variable residential car park charging.

As the implementation of the proposed air quality action measures progresses the participation of stakeholders including the public will be instrumental in maximising the potential benefits of the actions on air quality. To achieve this ongoing consultation with public participation will be required..

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9.3 Further Development and Implementation of the Air Quality Action Plan

The intention to implement an air quality campaign, as a discrete action on the AQAP, will also provide the opportunity for future on- going discussion and consultation. An objective of the campaign will be to raise the profile of air quality issues and to encourage the public together with other groups to participate in ways that may assist in improving the air quality across the city. This will also involve developing the web pages on air quality so that they are more inviting and interactive to users and the undertaking of promotional events or projects.

The Council will also be required to undertake a further detailed consultation exercise if it decides to review and revise the AQAP at some stage in the future

10 Implementation of Actions

A list of the actions and sub-actions that have been taken forward from the Options Appraisal are detailed in Appendix G. This list also identifies an 'owner' for each action i.e. the Department who will be responsible for the delivery of each action. To complement the AQAP, the intention is to produce an implementation plan .The purpose of this plan will be to regularly monitor the progress of each of the individual actions, assess any achievements and determine whether any further action or local interventions are necessary.

The implementation plan will identify, for each action, the Department with responsibility, a lead officer and a timescale. Overall the responsibility for coordinating the implementation of each of the actions will be with the Pollution Control Team through the Senior Air Quality Officer. To achieve this, the plan will also provide clarification on the method and frequency of reporting on the progress of each of the actions. The implementation plan will therefore facilitate the ongoing process of communication between the responsible sections within the Council and with external partners, as the AQAP is delivered and developed.

The implementation of some of the actions and the way they are developed or progressed in the future will be dependent on the availability of funding. Therefore the list of actions should not be considered as 'cast in stone' since it is recognised that changes occur over time. However, wherever possible, opportunities will be taken to develop and progress the actions to maximise the benefits to local air quality.

The actions and sub-actions that are detailed in Appendix G may be broadly categorised as either Infrastructure or Policy, based on the means of implementation.

A further action has been included to take into consideration the suggestions made for alternative air quality action measures from the consultation undertaken. In the first instance, it will be necessary to explore whether it is feasible to progress the suggestions as air quality action measures and this is detailed as a separate action under Section 10.3: Policy Actions.

10.1 Infrastructure Actions

The actions listed in Appendix G that fall into the category of infrastructure actions are:

(i) Action 1: The introduction of a UTMC or SCOOT system;

(ii) Action 5: The development of cycle-ways to encourage modal shift across Durham city that link into national and county cycle routes

(iii) Action 7: Ensure that local air quality is a key consideration in assessing the impacts arising from proposed new development and infrastructure schemes,

(iv) Action 11: The installation of variable messaging and a car park direction signage system; and

(v) Action 12: Explore the provision of travel and driver information integrated to the UTMC system.

(vi) Action 14: To explore whether it is viable or not to extend existing park and ride routes and/or the provision of further park and ride sites, taking into consideration the emerging County Durham Plan and Sustainable Travel Strategy for Durham City.

(vii) Action 15: Explore the options for additional highway infrastructure in line with the Durham Sustainable Transport Strategy, taking into account environmental, financial and planning considerations to enable the removal of through traffic from the City Centre and contribute to the overall reduction of traffic emissions.

These are detailed in Tables 12 to 18 below:

Table 12: UTMC

Action 1	Description	Owner	Completion Date
Installation of an Urban Traffic Management and Control (UTMC) or SCOOT system	The introduction of a UTMC system to coordinate traffic through a network of junctions within Durham City and reduce congestion. Includes replacement of the roundabouts at, Gilesgate and Leazes Bowl with signalised junctions.	DCC Traffic Management Team	2017

Table 13: Variable Messaging System

Action 11	Description	Owner	Completion Date
Variable message and car park direction signing system to direct traffic to available parking	Active road signs will be used to direct traffic to available parking and to provide incidental travel and driver information integrated with the UTMC system.	DCC Traffic Management Team	2017

Table 14: Active Messaging Alerts

Action 12	Description	Owner	Completion Date
Explore provision of travel and driver information integrated with the UTMC and mobile or email alerts.	The UTMC may be further developed to provide automated alert systems using text and social networking (e.g. Twitter) to forward information from Defra, Public Health England and/or the Met Office. The feasibility therefore will be explored of using the UTMC system to provide this information. This may be linked to the improvements to the Council air quality website.	DCC Traffic Management Team	To explore the development and where feasible, the use of the system to provide air quality information. Linking with items on the improved web page or online portal may take a while longer to become operational. In the interim, whilst the signs themselves may become operational, the system can be continued to be improved and developed in the future. The utilisation of the UTMC system to provide travel and driver information to be completed by 2017.

Table 15: Cycle-Ways

Action 5	Description	Owner	Completion Date
The development of cycle-ways to encourage modal shift across Durham city that link into national and county cycle routes	The expansion of the cycle-way network across Durham City is identified as necessary to promote alternative forms of travel to the private motor vehicle in the draft Durham City Sustainable Transport Strategy. This will provide improved connectivity of routes across the city with links to the already established national and county cycle-ways. Although it will have a beneficial effect, it will not achieve the predicted emissions savings by 2017, and so it will be a long-term measure to ensure that the local air quality benefits of the network are properly recognised.	DCC Sustainable Transport Team	Ongoing

10.2 Development Proposals and Infrastructure Schemes

Table 16: Development Proposals and Infrastructure Schemes

Action 7	Description	Owner	Completion Date
To undertake detailed dispersion modelling of air quality emissions from any development growth and infrastructure in and around Durham City as a result of the emerging Local Plan that may potentially have an impact on air quality within and on the periphery of the declared AQMA. The outcome of this will enable opportunities to mitigate any detrimental impacts and potential benefits to be identified.	This will be achieved by ensuring that a detailed air quality dispersion modelling assessment is undertaken that fully determines the impacts on local air quality from any new infrastructure scheme and/or any development growth. This may potentially identify further traffic management measures across the city. This will be undertaken at the scoping stage of the new infrastructure scheme and/or proposed development.	DCC Traffic Management Team	On going

Table 17: Viability Assessment of the Extension of the Park & Ride Routes and the Provision of Further Park & Ride Sites

Action 14	Description	Owner	Completion Date
To explore whether it is or not viable to extend existing park and ride routes and/or the provision of further park and ride sites, taking into consideration the emerging Local Durham Plan and Sustainable Travel Strategy for Durham City.	This will involve an assessment of whether or not it is feasible to extend existing park and ride routes within the city with improved connections to areas of employment and or the potential provision of new park and ride sites.	DCC Traffic Management	To be confirmed

Table 18: Additional Highway Infrastructure Schemes

Action 15	Description	Owner	Completion Date
Explore the options for additional highway infrastructure in line with the Durham Sustainable Transport Strategy, taking into account environmental, financial and planning considerations to enable the removal of through traffic from the City Centre and contribute to the overall reduction of traffic emissions.	It is identified that a major contributing factor to increased levels of air quality is the existing volume of traffic using routes through Durham city centre. To reduce the volume of existing traffic that would improve air quality and promote alternative sustainable transport opportunities, then the additional provision of highway infrastructure should be explored. This is supported by the Durham Sustainable Transport Strategy.	DCC Traffic Management Team	To be confirmed

10.3 Policy Actions

The actions listed in Appendix G that fall into the category of policy actions are:

(i) Action 2: The retrofitting of SCR and DPF to the exhaust systems of buses;

(ii) Action 3: Encourage the operation of ‘hybrid’ buses;

(iii) Action 4: The operation of Park & Ride buses that comply with Euro VI emission standard;

(iv) Action 6: The promotion of ‘smarter choices’ of travel across the city;

(v) Action 8: The establishment and development of an SPD on Planning & Air Quality;

(vi) Action 9: The establishment and development of an Air Quality Strategy; and

(vii) Action 10: An air quality campaign

(viii) Action 13: A viability assessment on the introduction of variable charges for residential parking permits.

These are detailed in Tables 19 to 26.

10.3.1 Bus Fleet Improvements

The bus fleets are outside the direct control of the Council, but may be managed using bus quality partnerships on specific routes, or through joint funding opportunities (such as the low emission bus fund).

The operation of electric/diesel 'hybrid' buses operating within the AQMA are currently solely on the Newcastle to Durham route, although these were linked to regional funding opportunities for use on long-distance express routes. These buses do not operate on the routes from east to west across the city and so the majority of the' hybrid' buses spend only a short time in the city. Therefore, there is scope for the expansion of the operation of 'hybrid' buses within the AQMA and additional funding opportunities for new or upgraded buses from central and regional government will be identified and wherever possible utilised to achieve potential air quality benefits across the AQMA.

Furthermore, the bus operators will be encouraged to use vehicles with lowest emissions preferentially instead of older vehicles, and to particularly use these vehicles in the AQMA and at pollution hotspots to ensure that the greatest benefits are achieved. The operation of electric powered buses is not an option at the current time but may be explored further in the future but it is recognised will be dependent on the provision of an electric charging infrastructure across the city.

This is an ongoing Action that will be linked to funding opportunities.

Table 19: Retrofitting Bus Exhaust Abatement

Action 2	Description	Owner	Completion Date
The retro-fitting of abatement systems on diesel engines on buses using routes within the declared AQMA.	The action will prioritise the retrofitting of buses with SCR and DPF on routes operating within the declared AQMA using funding opportunities wherever available and to achieve a minimum Euro IV emission standard.	DCC Sustainable Transport Team	This is an ongoing Action that will be linked to funding opportunities.

Table 20: Increase Use of Hybrid Buses

Action 3	Description	Owner	Completion Date
Encourage the operation of 'hybrid' buses using routes within the declared AQMA.	The action will prioritise the expansion of the operation of 'hybrid' buses across the AQMA. The focus will be on achieving the operation of two hybrid bus routes through Gilesgate to the bus station. Wherever possible hybrid buses will be operated in a way that will achieve the maximum benefit in reducing emissions including the preferential method of operating solely on electric power within the AQMA.	DCC Sustainable Transport Team	This is an ongoing Action that will be linked to funding opportunities

10.3.2 Park and Ride Buses

The Council will ensure that park and ride buses will be compliant with a minimum emission standard by defining a procurement requirement when the existing buses are replaced.

Where new vehicles are purchased, these will be compliant with the newest emission standards available for the type of vehicle. The latest contract was renewed in October 2014 with a requirement that vehicles servicing the Park and Ride sites will comply with a Euro VI specification standard.

There are likely to be additional opportunities to reduce emissions further by specifying after-market technology such as ancillary equipment management (e.g. intelligent cooling fans and pumps). Therefore, the product suppliers will be requested to demonstrate that additional engine or exhaust controls have been considered for installation on the vehicles being offered so the emissions are as low as possible.

Further opportunities for reducing emissions from the operation of buses serving the Park & Ride sites will be explored in the future including the operation of electrically powered vehicles.

Table 21: Park and Ride Buses

Action 4	Description	Owner	Completion Date
Ensuring the park and ride buses are compliant with Euro VI	Park and ride buses will be replaced with Euro VI compliant vehicles	DCC Sustainable Transport Team	2015

10.3.3 Policy Development

The combination of the SPD and AQS will ensure that Council policies are properly coordinated and air quality will be a standard consideration in the planning and development framework.

Table 22: Supplementary Planning Document

Action 8	Description	Owner	Completion Date
The establishment and development of the current AQ and Planning Guidance Note as a Supplementary Planning Document.	The SPD will set out the latest requirements for developers in assessing and addressing the impacts on local air quality when proposing new development within the city and its environs.. By including this guidance within the council planning regime it will increase awareness of air quality issues and ensure that it is properly considered at all levels of the planning process.	DCC Pollution Control	Autumn 2018

Table 23: Air Quality Strategy

Action 9	Description	Owner	Completion Date
The establishment and development of an Air Quality Strategy.	The establishment of an Air Quality Strategy that will integrate the strategic policies covering air quality in the emerging Local Plan, the measures detailed within the LTP, the draft Sustainable Transport Strategy and the carbon reduction strategy in focusing and addressing air quality issues in Durham City	DCC Pollution Control	2017

10.3.4 Marketing and Awareness

'Smarter Choices' is an overarching term for campaigns, promotions and education to encourage employers, employees and individuals within the city to implement car sharing and pooling, or to use alternative forms of travel such as cycling and public transport. This is intended to be a way of directly improving air quality by reducing car use, and also as a way of influencing people's behaviour. This will be implemented as a series of sub-Actions.

The air quality pages on the Council website will be improved to make it more useful, and potentially provide a portal to a dedicated local air quality resource containing promotional material, interactive air quality information, live air quality data from Defra and the DCC automatic monitoring equipment, and show progress on all of the council air quality Actions, as well providing a central location from which air quality Actions can be coordinated. For example, it can provide an access point for companies and individuals using the Smarter Choices scheme, and also by schools or community groups that need to easily access information.

Table 24: Smarter Choices

Action 6	Description	Owner	Completion Date
The promotion of Smarter Choices with businesses in the city to encourage large employers within the city to implement car sharing and pooling or the use of alternative forms of travel.	This will involve the identification of Travel Plans and car sharing programmes that are already in place. These can then be rolled out as 'best practice' with other businesses within the city.	DCC Sustainable Transport	2017
	The scheme will be increased to include other businesses and individuals.		Ongoing

Table 25: Air Quality Campaign

Action 10	Description	Owner	Completion Date
To raise awareness of air quality by undertaking a campaign that will integrate with and will involve other campaigns elsewhere in the Council to improve air quality.	There is a recognised need to raise awareness of local air quality and the undertaking of an air quality campaign is a means of achieving this. This will involve the development of the web pages on air quality to make them inviting to children or to relate it to the health impacts of 'poor air quality'.	DCC Pollution Control	2017
	This will include the establishment and development of an online portal providing information, resources and tied-into the Smart Choices scheme.		2017

Table 26: Viability Assessment for the Introduction of Variable Residential Car Parking Permits

Action 13	Description	Owner	Completion Date
To explore whether it is viable or not to progress the introduction of variable residential car parking permits with preferential rates for low polluting vehicles (with regard to local air quality effects).	This will involve an assessment of whether it is viable or not to progress additional air quality action measures to introduce variable residential car parking permits within Durham City with preferential rates for vehicles that have a lower NOx emissions specification.	DCC Traffic Management	To be confirmed

10.4 Timescales

Some Actions will be implemented, or put into motion, immediately, such as the procurement policy for new park and ride buses or the initial improvements to the air quality web pages. The further Action for the publication of the current Air Quality and Planning Guidance document as an SPD may take longer as this will be dependent on the progression of the new Local Plan.

The majority of the Actions are planning and policy regulations and have medium-term time-scales so whilst they may be subject to a short delay, they should be in-place before the 2017 future appraisal year.

The remaining Actions each require commitment to new infrastructure, such as funding to improve the bus fleet, and extending the cycle routes. Therefore, although some of these items may be started soon after the publication of this AQAP, it is likely they will not be fully implemented until beyond 2017.

11 Monitoring Achievements and Effects

It is important to focus the further monitoring of nitrogen dioxide levels within the city, to determine the impact on air quality following the implementation of individual actions. For some of the actions, the impact may also be assessed by an appropriate indicator or measure e.g. traffic flow counts .Where this is the case, it is identified for the individual action in the tables below

The responsibility for the measurement and reporting of the relevant indicator will also be identified in the implementation plan. This will enable the reporting of progress to the relevant committees within the Council and also externally to DEFRA by way of submission of the annual Air Quality Status Report.

The following Section outlines how the measure for each Action will be collated and assessed.

11.1 Ambient Air Quality Monitoring

The Council operate an extensive air quality monitoring network throughout the City, including key areas within the AQMA. This network will continue to operate and to be reported annually through the Local Air Quality Management regime.

The monitoring data may indicate whether the Actions are having an effect on the key outcome; annual mean NO_2, although it is important to note that concentrations will fluctuate from year to year due to many factors outside the control of DCC, such as meteorological conditions.

11.2 Traffic Flow and Fleet Composition

The air quality options modelling study used projected traffic flows and fleet composition data to appraise the future options, including the baseline (i.e. do-nothing) scenario. Any variation from the baseline scenario may entail a change in pollutant concentrations, so a record of traffic flows will be used to assess how the traffic changes in the future and to compare it to the model projections.

For Actions that are intended to reduce traffic flows, this will be monitored using Automatic Traffic Counters (ATC) in locations throughout the city.

11.3 Bus Fleet Upgrades

Table 27: Measuring Traffic Flow and Fleet Composition

Actions 2,3 and 4	Measure
The retrofitting of abatement systems on diesel engines on buses using routes within the declared AQMA.	The composition of the bus fleets will be requested by the Council to be reported annually by the major operators using a standard form. This will be used to track the number of vehicles that satisfy each emission standard, as well as new vehicles, those removed from the fleet, or those that have been upgraded or retrofitted with exhaust abatement.
Encourage the operation of hybrid buses using routes within the declared AQMA.	
Ensuring the park and ride buses are compliant with Euro VI	

11.4 Achieving Individual Actions

Several Actions entail a single item with a key milestone. Once this has been achieved, the Action will be completed.

11.4.1 UTMC

The introduction of an Urban Traffic Management and Control (UTMC) or SCOOT system was appraised as Option 1, whereby it was assumed to reduce queuing at major junctions and increase average speeds throughout the study area. Whilst it was predicted that this option would achieve local air quality benefits, this was not a key driver for installing the scheme, and so there is some uncertainty about the magnitude of the actual air quality benefits that will be achieved.

Table 28: Measuring UTMC

Action 1	Measure
The introduction of a UTMC or SCOOT system to coordinate traffic through a network of junctions within Durham city and reduce congestion.	The effects of this scheme will be monitored using traffic flow count data, as well as subjective analysis of the queuing times, and compared with the modelled option to indicate whether the predicted emission reductions may be achieved.

11.4.2: Policy Development

Table 29: Policy Development

Actions 8 & 9	Measure
The establishment and development of the current Air Quality and Planning Guidance Note as a Supplementary Planning Document (SPD).	Policy-based Actions will entail a single point of implementation, and so these will have a definite milestone for completion. The establishment of the SPD and AQS, which will initially be published in draft form before being finalised. These documents will be subject to review and where necessary they will be revised, although for the purposes of this plan it is not considered as a key milestone.
The establishment of an Air Quality Strategy (AQS) that will integrate the strategic policies covering air quality in the emerging Local Plan, the measures detailed within the LTP, the draft Sustainable Transport Strategy and the carbon reduction strategy in focusing and addressing air quality issues in Durham City.	

11.4.3: Air Quality Campaign

The Council will undertake an air quality campaign focussed on raising the profile of local air quality within Durham city. An Air Quality Campaign Plan will be established that will set out a timetable for the implementation of the different elements of the campaign. One of the main focus points will be to improve the information that is currently available on the existing air quality webpages.

Table 30: Air Quality Campaign

Action 10	Measure
To raise awareness of air quality by undertaking a campaign that will integrate with and will involve other campaigns elsewhere in the Council to improve air quality.	The sub-actions identified are the publication of air quality documents, marketing material associated with the Smarter Choices programme, and access to real-time air quality information on the air quality website. Additional Actions are the creation of an LAQM portal that will encompass online tools for the Smarter Choices programme, with possibly automated links with the roadside active signage, and a registration point for personal alerts using texts or social media. The completion of the identified different elements of the campaign in accordance with an established timetable.

11.4.4 Smarter Choices

Smarter Choices is an overarching term for campaigns, promotions and education to reduce car use and influence people's behaviour. These sub-Actions are unlikely to be measureable, as they are based on increasing mindshare and awareness.

Table 31: Smarter Choices

Action 6	Measure
The promotion of Smarter Choices with businesses in the city to encourage large employers within the city to implement car sharing and pooling or the use of alternative forms of travel.	The Smarter Choices travel planning scheme will initially involve membership and commitment from only a few of the major employers in the city, including the Council. This is a key milestone that will enable the establishment of Travel Planning and Car Sharing schemes that can be used as 'best practice' and rolled out with other businesses in the city. . Subsequent expansion of the programme will allow smaller businesses and individuals to register.

11.4.5 Cycle Network

The length of new cycle way constructed over an annual period will be monitored in the context of the objectives of the draft Durham City Sustainable Transport Strategy. This may be approximate, and the target may change year-on-year, but an indicative number will be used to demonstrate progress.

Table 32: Cycle Network

Action 5	Measure
The development of cycle-ways to encourage modal shift across Durham city that link into national and county cycle routes in accordance with the draft Durham City Sustainable Transport Strategy.	This will be monitored based on the length of new cycle routes constructed in each annual reporting period compared to the objective outlined in the draft Durham City Sustainable Transport Strategy.. This may be approximate, and the target may change year-on-year, but an indicative number will be used to demonstrate progress.

11.4.6 Viability Assessments

Table 33: Viability Assessment for the Introduction of Variable Residential Car Parking Permits

Action 13	Measure
To explore whether it is viable or not to progress the introduction of variable residential car parking charges with preferential rates for low polluting vehicles (with regard to local air quality effects).	The completion of the viability assessment will have a single point of implementation and so there will be a definite milestone for completion. The outcome of the viability assessment will determine whether or not to progress the suggestions made for the alternative action measures from the consultation exercise. Therefore the action will be reviewed following the completion of the viability assessment.

Table 34: Viability Assessment of the Extension of the Park & Ride Routes and the Provision of Further Park & Ride Sites

Action 14	Measure
To explore whether it is viable or not to extend existing park and ride routes and/or the provision of further park and ride sites, taking into consideration the emerging County Durham Plan and Sustainable Travel Strategy for Durham City.	The completion of the viability assessment will have a single point of implementation and so there will be a definite milestone for completion. The outcome of the viability assessment will determine whether or not to progress the suggestions made for the alternative action measures from the consultation exercise. Therefore the action will be reviewed following the completion of the viability assessment.

11.4.7: Provision of Highway Infrastructure

Table 35: Options for Additional Highway Infrastructure

Action 15	Measure
Explore the options for additional highway infrastructure in line with the Durham Sustainable Transport Strategy, taking into account environmental, financial and planning considerations to enable the removal of traffic from the City Centre and contribute to the overall reduction of traffic emissions.	The Sustainable Transport Strategy will identify potential highway infrastructure options and these will then be explored further as individual schemes. This will involve an assessment of whether it is viable or not to progress specific infrastructure schemes taking into account environmental, financial and planning considerations. The completion of the viability assessment will have a single point of implementation for each specific infrastructure scheme and so there will be a definite milestone for completion. Therefore the action will be reviewed following the outcome of the viability assessment for each specific infrastructure scheme as this will determine whether they will go ahead or not.

11.5 Reporting

The AQAP is not a rigid document and is expected to change in the future in response to significant development schemes or policy changes. Similarly, although the targets and objectives have been defined, where unexpected delays or opportunities occur then these may be altered accordingly.

An annual AQAP Status Report will be published to demonstrate how the Actions have been implemented, which ones have been completed, and where possible to show the effects on emissions and concentrations.

The Annual Status Reports will also include updates to national policies or new funding opportunities that may be used to improve completed or ongoing Actions.

12 Summary

This document constitutes the draft Air Quality Action Plan for Durham City, which incorporates an appraisal study of options to improve air quality within the Air Quality Management Area (AQMA), and to identify Actions that will be implemented to achieve this.

The necessity for the AQAP was demonstrated by projecting road traffic emissions based on the use of generic vehicle growth rates for the period 2017 to 2025, that showed that with no action, improvements to vehicle emissions may achieve the required estimated reduction in levels to comply with the national air quality objective along some roads by 2020, but would be insufficient to achieve the objective along the most significantly affected roads.

Options to improve air quality in the AQMA were identified by the Council and AECOM through discussion with a Technical Working Group and Corporate Steering Group.

Detailed dispersion modelling was used to predict pollutant concentrations, undertake emission source apportionment, and determine the emission reductions that would be required on roads within the AQMA to achieve the annual mean air quality objective. The Emission Factor Toolkit, published by Defra, was used to determine the change in emissions that may be achieved by each option.

The effects of each option were scored and prioritised, based on the change in air quality, cost, acceptability, timescale for implementation, and other factors. The options were then used as the basis for developing Actions.

12.1 Conclusions of Modelling Appraisal

The key conclusions from the dispersion modelling were:

- With no action, up to 318 residential properties would be exposed to concentrations of NO_2 in excess of the national air quality objective in 2017.
- The most significant NOx emission source on almost all roads was predicted to be diesel cars, which is partly due to the high proportion of this vehicle type, and which were predicted to comprise ~50% of cars in 2017, and relatively higher emissions from Euro 5/V diesel engines.
- Buses, LGVs and rigid HGVs are significant on a few roads (North Road, Alexandria Crescent).

The key conclusions from the options appraisal were:

- The options that are targeted at reducing the proportion of diesels in the fleet would achieve the most significant benefits.
- Increasing the average speed through reduced congestion has the most significant improvement in all areas, and is particularly beneficial for HGVs and buses that may currently be operating at low speeds.
- The benefits of achieving the Euro V standard for buses with SCR retrofit was dependent on the speed of the vehicles, as lower speeds are substantially less efficient if the engine has not been tuned carefully.
- The UTMC system is a committed scheme that may have significant air quality benefits by reducing congestion and increasing the average speed of vehicles. Many of the options assessed will have cumulative benefits when considered alongside the UTMC system.

12.2 Air Quality Actions

A scoring system was used to identify options that should be taken forward for inclusion in the AQAP.

- The scoring considered predicted changes in air quality at sensitive locations, acceptability, cost, timescales, as well as other related benefits, such as noise, climate change and social inclusion.
- Improving the emissions standards on public bus services were predicted to be highly favourable options to take forward for inclusion in the AQAP.

- Options that would reduce the number of vehicle movements scored favourably, although the mechanism to achieve these reductions would likely require several different options to be implemented.

The following options will not be implemented as Actions due to unacceptable financial or policy considerations:

- Maximise the utilisation of the existing and proposed additional parking spaces at the Howlands Farm Park and Ride Sniperley Park and Ride. This in isolation was considered to have minimal benefit without the implementation of other measures to encourage the use of the Park and Ride such as the variable parking charges and the introduction of workplace levies.
- Workplace Parking Levy to encourage use of low-emission vehicles, alternative transport and the improved capacity and services at the Park and Ride sites.
  The number of existing car parking spaces allocated to private workplaces within the city is not at a level that, if workplace parking levies are to be introduced, would have a significant impact on traffic flows at locations within the AQMA including Milburngate bridge. Consequently, it is considered the introduction of a workplace levy will be inconsequential on traffic flows and therefore on the addressing air quality within the city.
- Variable parking charges to encourage low-emission cars (eg electric, hybrid or small petrol in favour of large diesel).
  The majority of the parking provision within the city is privately owned with only a minor number of spaces that are under the control of the County Council. With the small proportion of car parking spaces provided by the Council within the city, again the introduction of variable parking will be inconsequential on traffic flows and therefore on addressing air quality within the city.
- Ensure all P&R buses to be EV

The following options will be implemented as Actions:

ID	Action
1	The introduction of a UTMC or SCOOT system to coordinate traffic through a network of junctions within Durham City and reduce congestion.
2	The retrofitting of emissions abatement systems on diesel engines on buses using routes within the declared AQMA
3	Encourage the operation of hybrid buses using routes within the declared AQMA.
4	Ensuring the park and ride buses are compliant with the Euro VI emission standard
5	The development of cycle-ways to encourage modal shift across Durham city that link into national and county cycle routes in accordance with the draft Durham City Sustainable Transport Strategy.
6	The promotion of Smarter Travel Choices with businesses in the city to encourage large employers within the city to implement car sharing and pooling or the use of alternative forms of travel
7	To undertake detailed dispersion modelling of air quality emissions from any development growth and infrastructure in and around Durham City as shown in the emerging Local Plan that may potentially have an impact on air quality within and on the periphery of the declared AQMA. The outcome of this will enable opportunities to mitigate any detrimental impacts and potential benefits..
8	The establishment of the current Air Quality and Planning Guidance Note as a Supplementary Planning Document (SPD). This sets out the requirements on developers when proposing new development within the city and its environs set out in the emerging Local Plan.
9	The establishment of an Air Quality Strategy that will integrate the strategic policies covering air quality in the emerging Local Plan, the measures detailed within the LTP, the draft Durham City Sustainable Transport Strategy and the carbon reduction strategy in focusing and addressing air quality issues in Durham City.
10	To raise awareness of air quality by undertaking a campaign that will integrate with and will involve other campaigns elsewhere in the Council to improve air quality.
11	Variable message and car park direction signing system to direct traffic to available parking
12	Explore the provision of travel and driver information integrated with the UTMC and to explore the provision of information on air quality through the use of texts, email alerts and social networking.

ID	Action
13	To explore whether it is viable or not to progress the introduction of variable changes for residential parking permits with preferential rates for low polluting vehicles (with regard to local air quality effects).
14	To explore whether it is viable or not to extend existing park and ride routes and/or the provision of further park and ride sites, taking into consideration the emerging County Durham Plan and Sustainable Travel Strategy for Durham City.
15	Explore the options for additional highway infrastructure in line with the Durham Sustainable Transport Strategy, taking into account environmental, financial and planning considerations to enable the removal of through traffic from the City centre and contribute to the overall reduction of traffic emissions.

13 References

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Air Quality Action Plan Appendices

Appendix A: Modelled Receptor Locations

Appendix B: Park and Ride Bus Routes

Appendix C: Model Assessment Methodology

Appendix D: Model Verification

Appendix E: Model Baseline Results

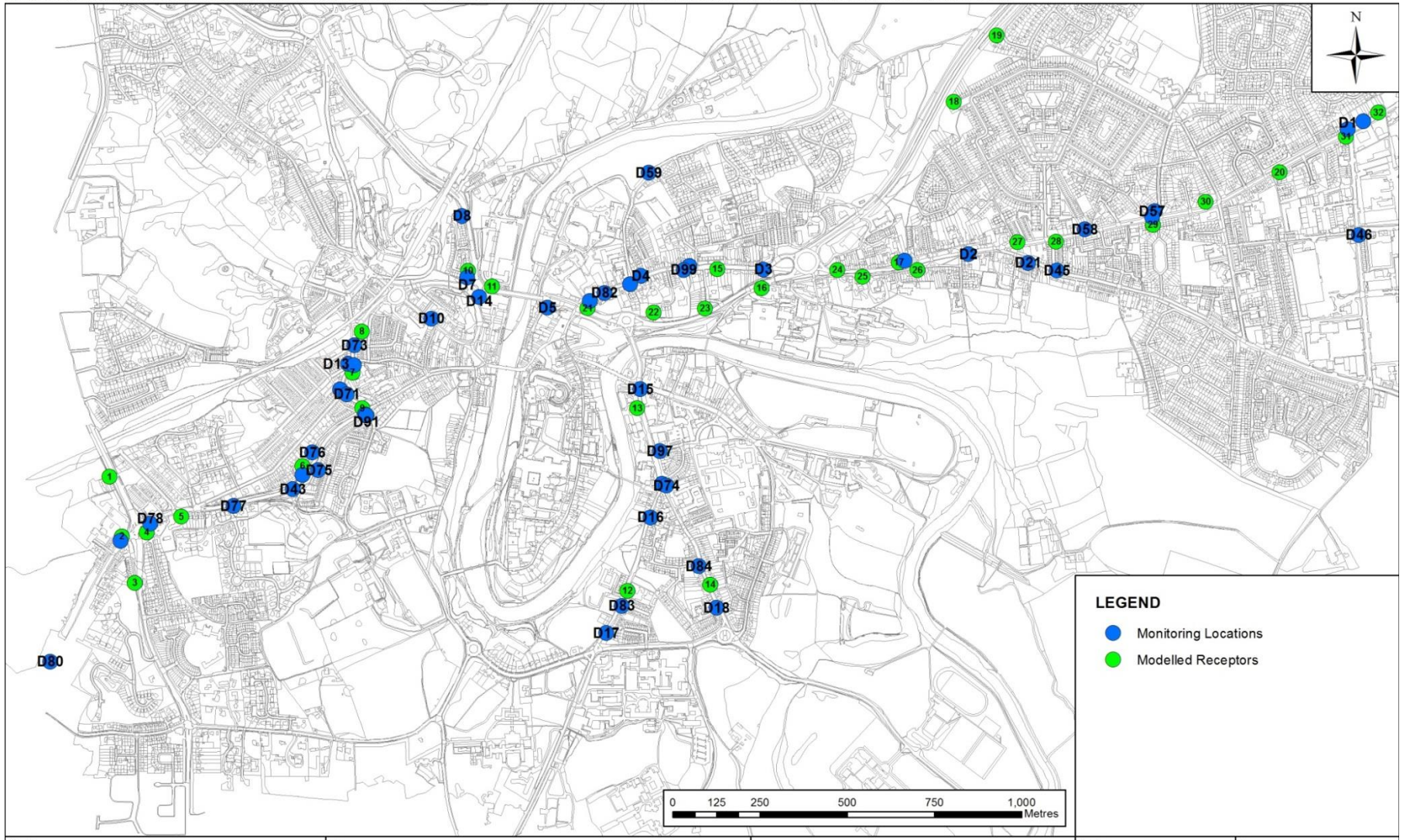
Appendix F: Model Appraisal Results

Appendix G: Actions

Appendix H: Durham City Air Quality Action Plan Consultation Strategy

Appendix A: Modelled Receptor Locations

Figure 3: Map of DCC Air Quality Monitoring Locations and Modelled Sensitive Receptors



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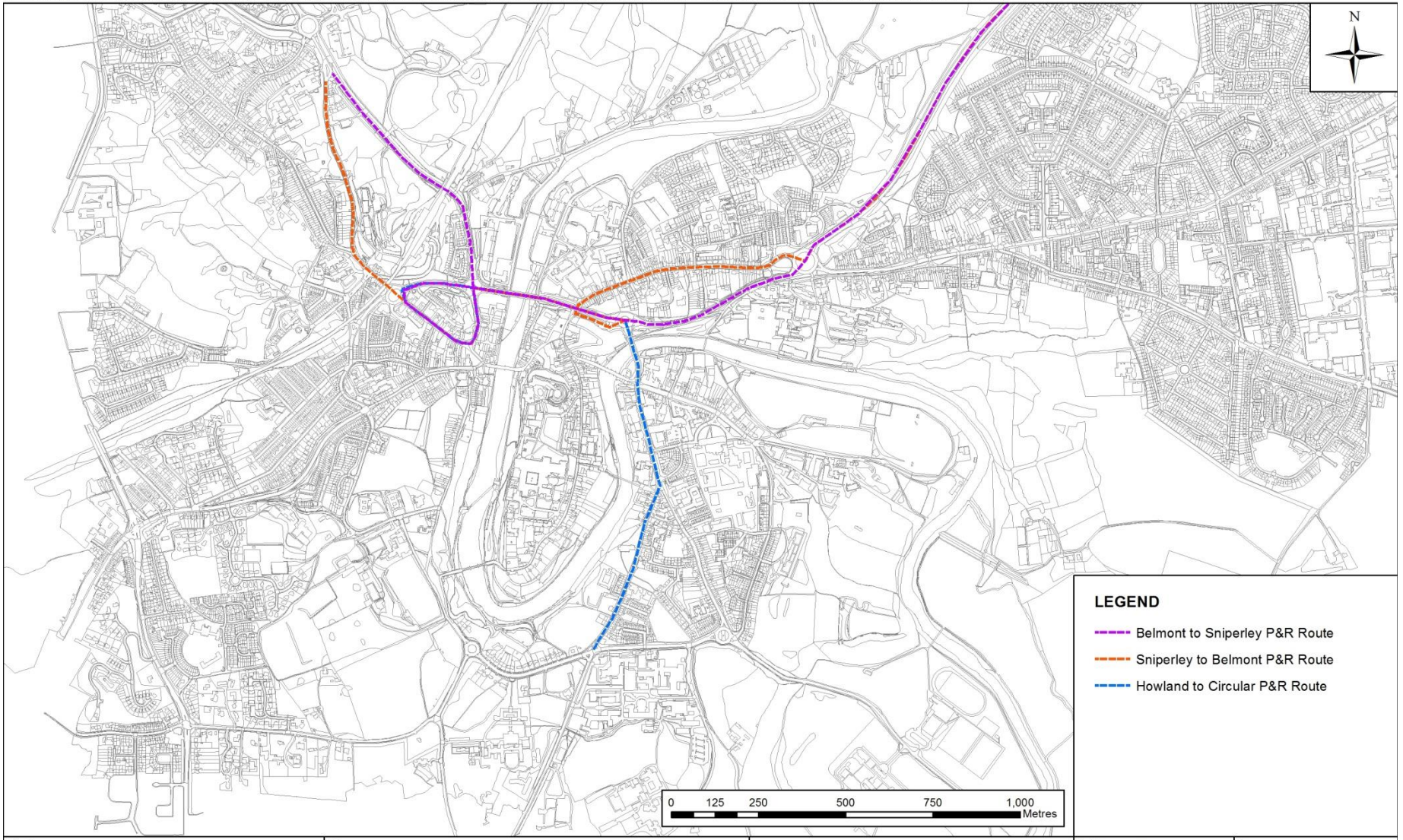
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU / App'd: TS Date: 20/04/2015 / Scale at A3: 1:10,000m Drawing Number: 60297500 / A3

Appendix B: Park and Ride Bus Routes

Figure 4: Map of Park and Ride Bus Routes



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Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
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Appendix C: Model Assessment Methodology

The modelling assessment was undertaken in accordance with the methodology defined in technical guidance LAQM.TG(09) (Defra, 2009b). The study area was defined by the Durham City AQMA and major connecting roads.

The Defra Emission Factor Toolkit (EFT) was used to create a local emission database, taking consideration of the composition of the local and default bus fleets. This database was used by the AAQuIRE detailed dispersion model to predict pollutant concentrations.

The EFT was used to identify the emissions from each model road link and for each vehicle component.

Dispersion Modelling Software

The AAQuIRE dispersion modelling software is a system developed by AECOM that predicts Ambient Air Quality in Regional Environments and comprises a regional air quality model and statistical package. AAQuIRE uses the CALINE4 model for the dispersion of road-traffic emissions. The model is fully validated and has been extensively used worldwide.

AAQuIRE was developed by AECOM to meet three requirements in predictive air quality studies. The first requirement was an immediate need for a system that produced results that could be interpreted easily by non-air quality specialists to allow for proper informed inclusion of air quality issues in wider fora, the main example being to allow consideration of air quality issues in planning processes. This was achieved by allowing results to be generated over a sufficiently large study area, and at an appropriate resolution, for the issue being considered.

The second requirement was for a system to be based, initially, on existing and well-accepted and validated dispersion models. This has two advantages. The primary one is that it avoids the need to prove a new model against the accepted models and therefore enhances acceptability. The second advantage is that when appropriate new models are developed they can be included in AAQuIRE and be compared directly with the existing models, and sets of measured data, using the most appropriate statistics.

The final primary requirement for AAQuIRE was a consideration of quality assurance and control. An important aspect of modelling is proper record keeping ensuring repeatability of results. This is achieved within AAQuIRE by a set of log files, which record all aspects of a study and allow model runs to be easily repeated. The ways in which AAQuIRE and the models currently available within it operate are discussed below.

The following data are used for the year and pollutant to be modelled:

meteorological data expressed as occurrence frequencies for specified combinations of wind speed, direction, stability and boundary layer height;
road system layout and associated traffic data within and immediately surrounding the study area;
a grid of model prediction locations (receptors).

The modelling was carried out to give annual average results from which appropriate shorter period concentrations can be derived.

Emissions Factor Toolkit

The dispersion modelling study used a modified version of the emission database published by Defra in the Emission Factors Toolkit (EFT) (v6.0.2, November 2014) (http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#eft). The EFT is a calculation tool designed to determine emissions from road vehicles, taking account of vehicle flow, speeds and vehicle composition. The emission rates are updated periodically to incorporate updated NO_X emissions factors and vehicle fleet information based on current measurements and projections, and are currently based on the European Environment Agency (EEA, 2013) COPERT 4 (v10) emission calculation tool, which includes data for all vehicle categories from Pre-Euro 1 to Euro 6.

In addition to building a local emission database for the dispersion model, the EFT was also used calculate the road vehicle emission source apportionment.

Emissions and Exposure

The assessment procedure uses the following terms:

Exposure: The concentration of pollutant at a sensitive receptor location. This is presented as annual mean NO_2 concentration in order to be compared directly with the UK air quality objectives and EU limit values. Exposure is predicted using dispersion modelling software.

Emissions: The amount of pollutant that is released from an emission source (expressed as g/km or g/km/s). This is presented as NO_X, which is partially converted to NO_2 as discussed in Section 3.2, and so the emissions of NO_X are proportional to the resultant exposure (although the proportion of NO_2 in NOx is dependent on several factors).

For the purposes of this study, the NO_2 concentration is used to identify areas of concern. The NO_2 is converted to NO_X for the purposes of the emission modelling study, such as determining the required emission reduction required to achieve the limit values.

Traffic Data

Traffic data in the form of Annual Average Daily Traffic (AADT) flows, bus and Heavy Duty Vehicle (HDV; vehicles greater than 3.5t, including buses) percentages and average vehicle speeds were included in the dispersion model to predict pollutant concentrations arising from traffic, and also used in the EFT to determine emissions from each road link.

Detailed traffic data, including categorisation of vehicle type, for the major roads in the city were provided by DCC as Automatic Traffic Count (ATC) data. The traffic count data was categorised into 4 bins (<5.2m, 5.2-6.5m, 6.5-11.5m and >11.5) in order to determine car, LGV and HDV flows whilst bus proportions were scaled up from 2010 and 2011 bus flows.

Traffic Growth

The future baseline traffic flows were projected from 2013 to 2017 using the DfT forecasts of road traffic. The factor for all traffic was compared with 2013 National Road Traffic Forecasts and found to be very similar for the period 2013-2017. Separate projection factors were determined for cars, LGVs and HGVs, whilst buses were not predicted to grow during this period as it was assumed that bus timetables would not change significantly.

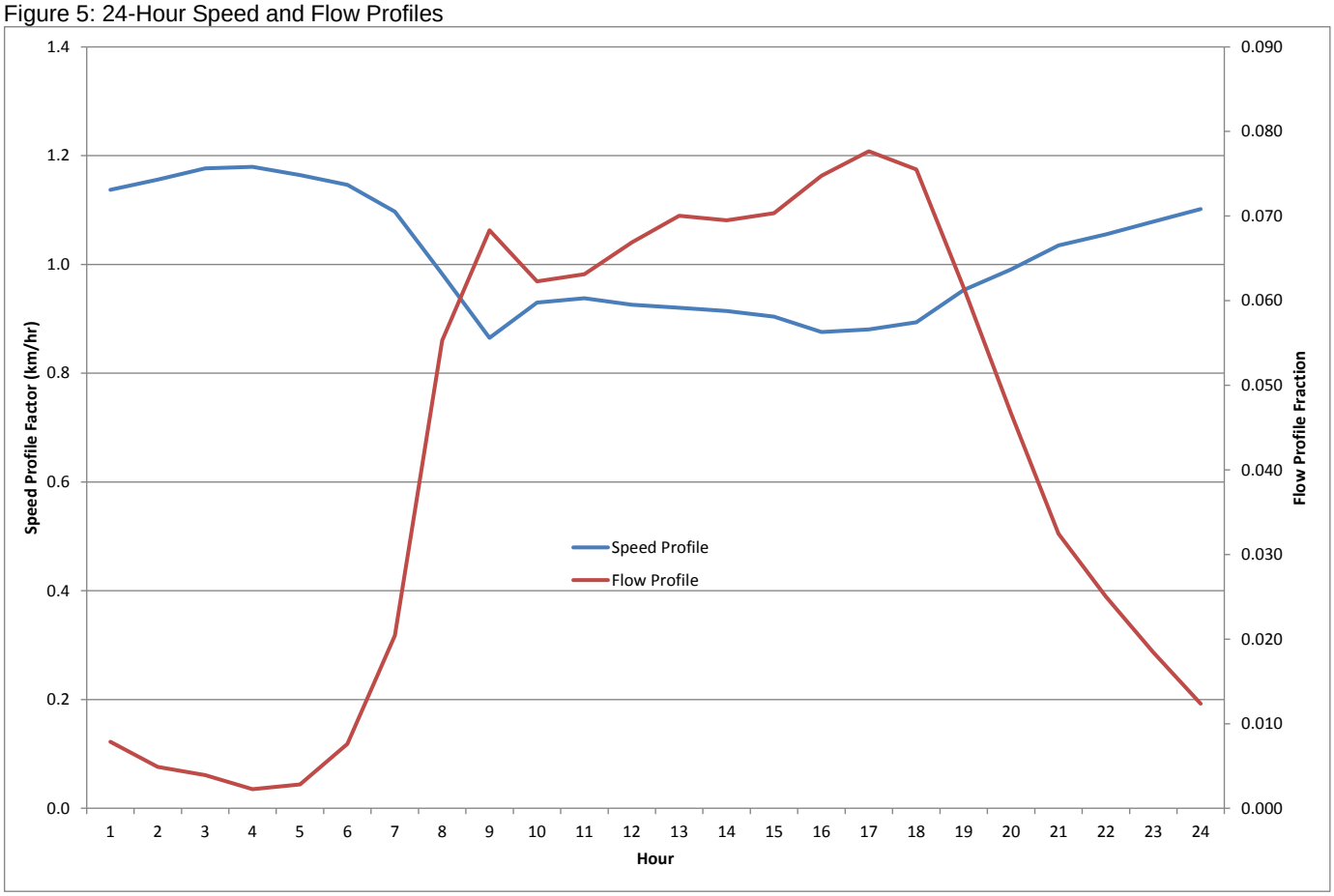
The use of national growth factors was agreed with the DCC traffic unit and considered to be a suitable approach, as no strategic developments or road infrastructure projects, excluding the SCOOT system, were anticipated to be completed before 2017 that would significantly alter the flow composition or pattern.

The local growth forecasts take account of organic development. Significant local and regional development growth is not expected to occur until after 2017, which was partly why this was used for the future assessment year.

Diurnal Profiles

Diurnal speed and flow profiles were calculated from 24-hour ATC data and applied to all roads.

Figure 5: 24-Hour Speed and Flow Profiles



Euro Composition

The emission contributions from HGVs (Heavy Goods Vehicles over 3.5 tonnes) and buses are often disproportionally higher than the flow contribution, and so these vehicles are often a significant emission source.

The projected (to 2025) 'default' Euro compositions were published by Defra within the EFT. For Durham, the actual fleet information for 2013 and information from the bus operators was used to help determine the future 2017 projections.

The data in Table demonstrate that the 2013 bus fleet profile in Durham has proportionately more Euro II or older ((30% compared with 9%), but also had proportionately more new buses in Euro V /VI (54% against 43%). In 2017, the bus fleet is expected to improve through replacement and retrofitting to include predominantly Euro V, and a small proportion of Euro VI, standard vehicles reflecting that that standard only became a requirement for new buses from 31 Dec 2013.

It should be noted that commercial confidentiality is understood to mean that bus operators have not been able to reveal detailed plans, so the actual 2017 fleet may be better than the projected 2017 fleet used here.

Table 36: Projected UK Default Compared to Durham Bus Fleet Euro Compositions

	Default Bus Fleet Euro Proportions	Durham Bus Fleet Euro Proportions
2013		
Pre-Euro I	0.00	0.00
Euro I	0.01	0.00
Euro II	0.08	0.30
Euro III	0.30	0.11
Euro IV	0.18	0.06
Euro V_EGR	0.10	0.13
Euro V_SCR	0.29	0.40
Euro VI	0.04	0.00
2017		
Pre-Euro I	0.00	0.00
Euro I	0.00	0.00
Euro II	0.03	0.06
Euro III	0.13	0.15
Euro IV	0.11	0.14
Euro V_EGR	0.08	0.13
Euro V_SCR	0.25	0.40
Euro VI	0.40	0.12

EFT Emission Profiles

The speed vs. NO_X emission profiles for HDVs (buses and HGVs) and LDVs (cars and light vans) in 2017 are provided in Figure 6 to Figure 9, in order to demonstrate the differences between the standards and how they affect NO_X emissions. The emissions are categorised by the EFT into 5 km/hr brackets and show that higher Euro standards will generally achieve lower emissions. The emission profiles for LDVs are split into petrol and diesel.

The following points should be noted:

For petrol cars, Euro 5 and 6 are identical, and very similar to Euro 3 and 4. Pre-Euro 3 emissions were significantly higher.
For HDVs, Euro IV achieves lower emissions than Euro V at speeds below 35 km/hr, whereas for Diesel cars/LDVs Euro 5 fared worse than Euro 4 at all speeds.
For buses, Euro V with Selective Catalytic Reduction (SCR) has higher emissions than Euro IV at speeds <40 km/hr.

It should also be noted that the Copert NO_X emission functions used in the EFT are only applicable for speeds of 10 km/hr and above (approx.12 km/hr for some HGVs) so at lower speeds than 10 km/h it will calculate the emission rate assuming a speed of 10 km/hr.

Figure 6: Speed / NO_X Emission Profile for Petrol Cars/LDVs in 2017

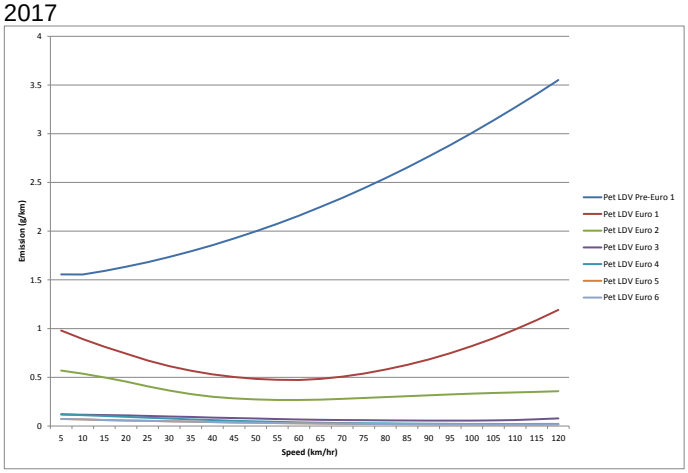


Figure 7: Speed / NO_X Emission Profile for Diesel Cars/LDVs in 2017

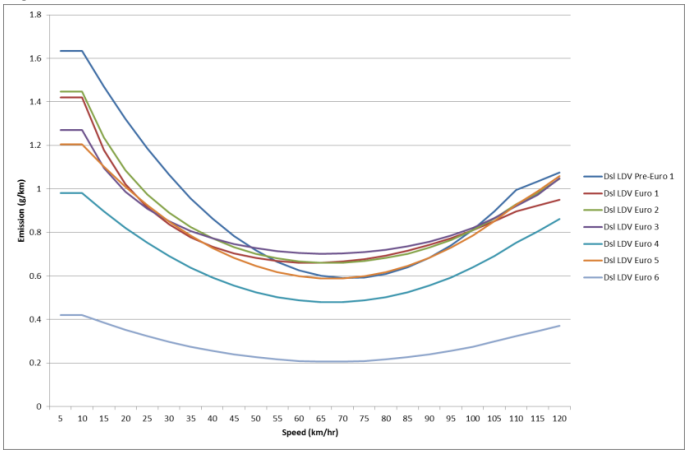


Figure 8: Speed / NO_X Emission Profile for HDVs (HGVs and Buses) in 2017

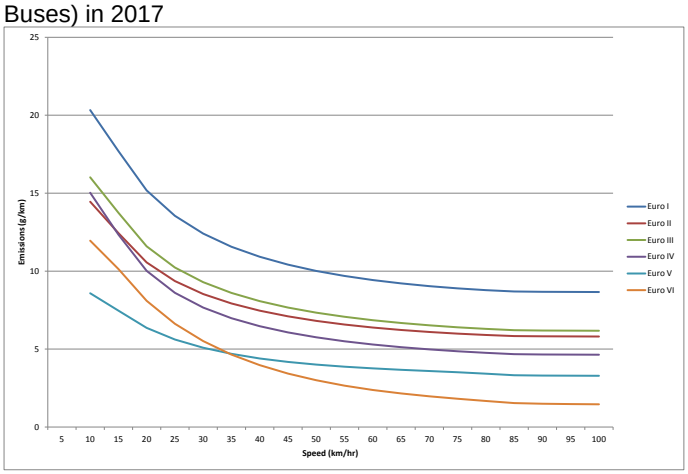
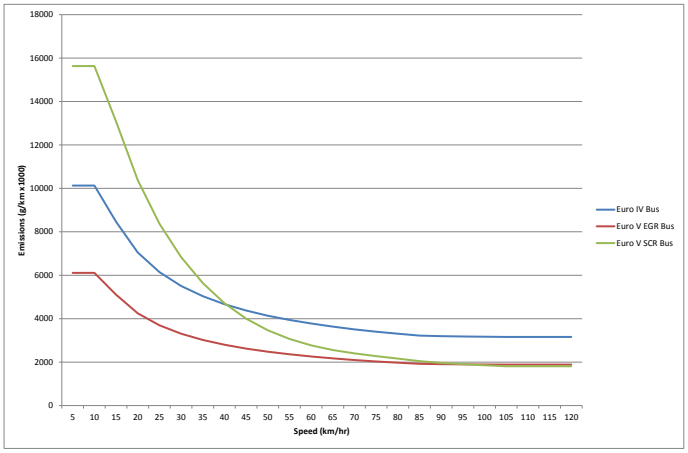


Figure 9: Comparison of Speed / NO_X Emission Profile for Euro IV and Euro V Buses



Modelled Receptors

A large number of residential properties were selected as sensitive receptors and are presented in Table. Receptors were selected as those anticipated to be exposed to the highest concentrations of road vehicle emissions, due to proximity to areas of congestion and high flows, and based on previous modelling studies.

The Council undertakes air quality monitoring at locations throughout the City. Many of the monitoring sites are considered to be representative of relevant exposure, and so they have also been used as sensitive receptor locations.

In addition to the receptors in Table, concentrations were also predicted at all sensitive locations adjacent to roads within the AQMA, based on address-point data. This was undertaken so as to best present the results of the appraisals visually.

Table 37: Modelled Receptor Locations

ID	Sensitive Receptors	X	Y
1	Newcastle Road	426106	542118
2	Nevilles Cross Bank	426141	541947
3	Darlington Road	426178	541814
4	Crossgate Peth 1	426213	541959
5	Crossgate Peth 2	426312	542004
6	Crossgate Peth 3	426660	542149
7	Sutton St	426803	542417
8	Atherton St	426829	542535
9	Crossgate Lights	426831	542315
10	Highgate	427134	542709
11	Govmnt. Offices, Milburngate Br	427203	542664
12	School, Church Street	427592	541791
13	New Elvet/Old Elvet Junction	427620	542315
14	Hallgarth	427829	541809
15	Claypath	427849	542714
16	Gilesgate Roundabout	427976	542660
17	Gilesgate Hill	428370	542733
18	Bradford Crescent, A690	428527	543194
19	Dean's Walk	428651	543384
20	Sunderland Road	429462	542992
21	Claypath	427477	542602
22	Leazes Road	427667	542590
23	Leazes Road	427814	542601
24	Leazes Road	428193	542712
25	Gilesgate Roundabout	428266	542693
26	Gilesgate	428424	542711
27	Sunderland Road	428710	542792
28	Sunderland Road	428821	542793
29	Sunderland Road	429099	542841
30	Sunderland Road	429250	542907
31	Sunderland Road	429653	543094
32	Sunderland Road	429746	543163

ID	DCC Monitoring Locations	X	Y
D1	Dragon Lane	429658	543115
D2	121 Gilesgate	428569	542757
D3	Claypath	427982	542713
D4	39 Claypath	427630	542695
D5	Milburngate	427362	542603
D7	Highgate south	427132	542690
D8	Highgate north	427116	542867
D10	North Road	427029	542572
D11	Crossgate lights	426839	542298
D12	EDGB Music, Colpitts Terrace	426768	542368
D13	56 Hawthorn Terrace	426790	542442
D14	The Gates	427166	542634
D15	New/Old Elvet junction	427629	542370
D16	10 Church Street	427658	542002
D17	New Inn, Church Street Head	427531	541670
D18	51 Hallgarth Street East	427847	541742
D19	2 Church Street	427690	542098
D20	80 Gilesgate	428386	542738
D21	Sherburn Road	428741	542732
D42	93 Claypath	427484	542623
D43	The Peth south	426632	542083
D45	20 Young Street	428824	542710
D46	Gilesgate Moor Hotel, Dragon Ln	429690	542812
D56	56 McKintosh Court	429104	542881
D57	56 McKintosh Court Kerbside	429096	542864
D58	49 Sunderland Road	428903	542828
D59	The Sands	427652	542991
D70	The Peth north	426659	542123
D71	opp EBGB Music, Colpitts Terrace	426786	542355
D72	opp Lampost 42	426807	542439
D73	6 Sutton Street	426808	542495
D74	Elvet Crescent	427703	542093
D75	Nevilledale Terrace	426704	542137
D76	The Peth	426687	542188
D77	Archery Rise	426461	542034
D78	Nevilles Cross out	426222	541984
D79	Nevilles Cross bank	426138	541934
D80	Stonebridge	425936	541588
D81	Claypath	427599	542671
D82	Claypath	427526	542646
D83	Boyd Street	427575	541748
D84	Hallgarth Street	427796	541862
D91	Crossgate monitor	426842	542294
D96	1 Anns Place	425455	540908
D97	Orchard House	427684	542192
D98	62 Claypath	427769	542723
D99	65 Claypath	427753	542712
D102	High Street, Langley Moor	425349	540649
D103	High Street, Langley Moor	425330	540640
D104	38 High Street, Meadowfield	425225	540479
D105	80 High Street, Meadowfield	425132	540337
D106	6 Belle Vue Trc, Dragonville lights	429702	543138
D107	115 High Street, Meadowfield	425033	540223
DUR2	Crossgate Lights	426842	542295

Background Pollutant Concentrations

Monitored Background

A large number of sources of air pollutants exist which individually may not be significant, but collectively, over a large area, need to be considered. The concentrations calculated by the modelling due to vehicle emissions can then be added to these background concentrations to give the total concentration.

It was noted that the three kerbside and roadside sites on Gilesgate at D56, D57 and D58 recorded concentrations similar or lower than those recorded at The Sands urban background site (D59) for the past three years. The three roadside sites are near the top of a hill and in a relatively open area, whereas The Sands is closer to the City Centre in a more sheltered area, and so these roadside site may be exposed to lower background concentrations from outside the City.

Table 38: Durham Monitored Background Pollutant Concentrations

ID	Location	Type	Annual Mean NO_2 Concentration ($\mu g/m^3$)		
			2011	2012	2013
D59	The Sands	Urban Background	17.7	18.9	20.6
D101	Durham County Cricket Ground	Urban Background	-	11.6	14.8

Defra Estimated Background

In addition to the monitored background data recorded by DCC, modelled estimations of background air quality concentrations are provided by Defra (http://www.defra.gov.uk/environment/quality/air/air-quality/lagm/) for each 1 km square in the UK for each year between 2010 and 2030. For the purpose of modelling, the road sources must be discounted from the total background pollutant concentrations to give 'adjusted' values.

Estimated background concentrations are shown in Table for the Ordnance Survey grid squares containing The Sands background monitoring site near the Durham City centre.

Table 39: Defra Estimated Background Pollutant Concentrations, Durham City (The Sands)

	2013		2017		2021	
	Total	Adjusted	Total	Adjusted	Total	Adjusted
NO_X	25.7	19.4	21.8	16.7	19.0	14.5
NO_2	17.4	13.6	15.1	11.9	13.4	10.4

Background Summary

It is preferable to use monitoring data to determine background pollutant concentrations, and so the monitoring site at The Sands was used to represent the majority of locations in the model. However, as discussed above, some of the roadside and intermediate monitoring locations near Gilesgate recorded concentrations similar or lower than those recorded at The Sands. Therefore, the estimated Defra pollutant concentrations were used for receptors on this road.

The 2013 concentration estimated by Defra in the grid square containing the background sites at The Sands were compared with the DCC monitoring data at this site in 2013. This comparison was used to determine an adjustment that was applied to the Defra values for the projected future years.

Table 40: Background NO_2 Concentrations Used in the Model

	2013	2017	2021
Monitored & Projected Data from D59	20.6	18.6	16.5
Estimated Defra Data	11.6	10.5	9.3

Appendix D: Model Verification

The model generally under-estimated concentrations when compared to the monitoring undertaken at the nearby roadside monitoring sites. Due to the observed model under-estimation (for NO_2), the modelled results for NO_2 were adjusted in accordance with the procedure detailed in technical guidance LAQM.TG(09).

There is significant variability of monitored concentrations, including between sites that are very close together or on opposite sides of the road. This has been discussed in previous LAQM reporting and been attributed to street-canyon effects. Therefore, in order to accurately represent the pollutant concentrations that have been monitored, the model adjustment procedure has determined three different factors that apply to the two AQMAs in this study, and to areas outside the AQMA.

Table 41: Comparison of Modelled and Monitored NO_2 Concentrations, 2013

ID	Monitored Total NO_2	Modelled Total NO_2 (Un-adjusted)	% Difference [(mod-mon)/mon]	Area
D1	48.8	22.6	-46%	Gilesgate
D2	35.0	18.1	-52%	Gilesgate
D3	29.8	27.1	-91%	Claypath
D4	36.8	26.4	-72%	Claypath
D5	26.1	17.0	-65%	Gilesgate
D7	39.6	17.9	-45%	Gilesgate
D8	47.6	16.2	-34%	Gilesgate
D10	34.8	26.0	-75%	Crossgate
D11	42.1	28.7	-68%	Crossgate
D12	54.5	27.4	-50%	Crossgate
D13	29.7	27.5	-93%	Crossgate
D14	37.7	23.0	-61%	Gilesgate
D15	37.2	28.8	-78%	Crossgate
D16	33.8	25.6	-76%	Elvet
D17	35.1	25.7	-73%	Elvet
D18	29.1	22.9	-78%	Elvet
D19	53.9	28.0	-52%	Elvet
D20	48.8	16.3	-33%	Gilesgate
D21	25.9	14.7	-57%	Gilesgate
D42	48.0	28.9	-60%	Claypath
D43	58.5	27.7	-47%	Crossgate
D45	25.1	25.4	101%	Crossgate
D46	30.3	20.2	-67%	Gilesgate
D56	18.7	14.1	-75%	Gilesgate
D57	15.4	17.6	114%	Gilesgate
D58	20.6	16.3	-79%	Gilesgate
D59	20.6	22.0	107%	Background
D70	41.1	27.2	0%	Crossgate
D71	39.8	32.6	-82%	Crossgate
D72	55.9	29.2	-52%	Crossgate
D73	41.3	31.2	-75%	Crossgate
D74	36.3	24.8	-68%	Elvet
D75	23.7	23.0	-97%	Crossgate
D76	22.4	22.7	101%	Crossgate
D77	56.4	29.4	-52%	Crossgate
D78	36.2	30.3	-84%	Crossgate
D79	57.2	26.9	-47%	Crossgate
D80	39.4	27.3	-69%	Nevilles Cross Bank
D81	41.1	25.9	-63%	Claypath
D82	33.2	27.3	-82%	Claypath
D83	25.9	24.8	-96%	Elvet
D84	31.9	22.8	-71%	Elvet
D91	44.2	25.9	-59%	Crossgate
D96	21.5	24.9	116%	Nevilles Cross Bank
D97	26.8	24.4	-91%	Elvet
D98	33.8	26.1	-77%	Claypath
D99	34.2	25.5	-74%	Claypath
D102	36.1	28.9	-80%	Nevilles Cross Bank
D103	34.6	27.6	-80%	Nevilles Cross Bank
D104	38.7	27.7	-72%	Nevilles Cross Bank
D105	33.6	28.9	-86%	Nevilles Cross Bank

ID	Monitored Total NO_2	Modelled Total NO_2 (Un-adjusted)	% Difference [(mod-mon)/mon]	Area
D106	51.0	20.5	-40%	Gilesgate
D107	35.3	25.3	-72%	Nevilles Cross Bank
DUR2	49.6	26.1	-53%	Crossgate

Figure 10: Total Modelled versus Monitored NO_2

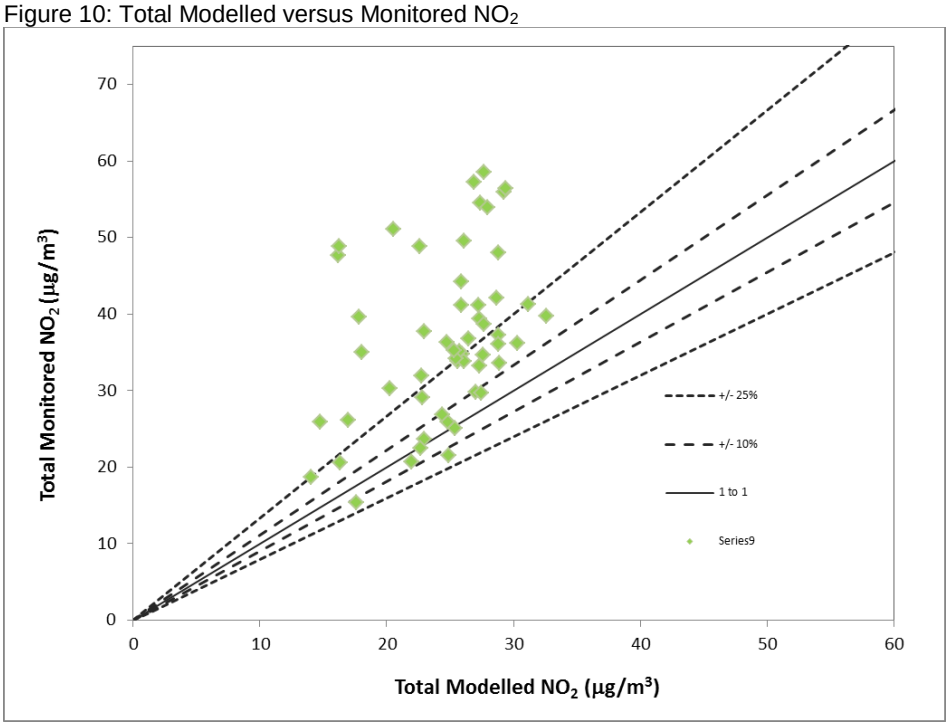


Table 42: Determination of Modelled and Monitored Rd NO_2 and Modelled Rd NO_X

Site ID	Monitored Total NO_2	Monitored Road NO_X	Adj Bknd NO_2	Monitored Road Contribution NO_2 (tot-bgd)	Monitored Road Contribution NO_X (tot-bgd)	Modelled Road Contribution NO_X (excl bgd)	Area
D1	48.8	86.7	11.6	37.2	86.7	22.0	Gilesgate
D2	35.0	50.5	11.6	23.4	50.5	12.6	Gilesgate
D3	29.8	19.2	20.6	9.2	19.2	13.2	Claypath
D4	36.8	35.1	20.6	16.1	35.1	11.9	Claypath
D5	26.1	29.7	11.6	14.5	29.7	10.4	Gilesgate
D7	39.6	62.5	11.6	28.0	62.5	12.2	Gilesgate
D10	34.8	30.4	20.6	14.1	30.4	10.9	Crossgate
D11	42.1	48.4	20.6	21.5	48.4	16.6	Crossgate
D12	54.5	83.4	20.6	33.8	83.4	13.9	Crossgate
D14	37.7	57.4	11.6	26.1	57.4	22.8	Gilesgate
D15	37.2	36.1	20.6	16.6	36.1	17.0	Crossgate
D16	33.8	28.1	20.6	13.2	28.1	10.1	Elvet
D17	35.1	31.2	20.6	14.5	31.2	10.4	Elvet
D18	29.1	17.6	20.6	8.5	17.6	4.4	Elvet
D19	53.9	81.7	20.6	33.3	81.7	15.1	Elvet
D21	25.9	29.1	11.6	14.2	29.1	6.0	Gilesgate
D42	48.0	64.4	20.6	27.4	64.4	17.0	Claypath
D43	58.5	96.1	20.6	37.9	96.1	14.5	Crossgate
D56	18.7	13.9	11.6	7.1	13.9	4.7	Gilesgate
D70	41.1	45.9	20.6	20.5	45.9	13.5	Crossgate
D72	55.9	87.7	20.6	35.2	87.7	17.8	Crossgate
D73	41.3	46.3	20.6	20.6	46.3	22.1	Crossgate
D74	36.3	33.9	20.6	15.6	33.9	8.3	Elvet
D75	23.7	6.2	20.6	3.1	6.2	4.7	Crossgate
D76	22.4	3.6	20.6	1.8	3.6	4.1	Crossgate
D77	56.4	89.2	20.6	35.7	89.2	18.2	Crossgate
D80	39.4	41.5	20.6	18.8	41.5	13.7	Nevilles Cross Bank

Site ID	Monitored Total NO_2	Monitored Road NO_X	Adj Bknd NO_2	Monitored Road Contribution NO_2 (tot-bgd)	Monitored Road Contribution NO_X (tot-bgd)	Modelled Road Contribution NO_X (excl bgd)	Area
D81	41.1	45.8	20.6	20.5	45.8	10.7	Claypath
D82	33.2	26.8	20.6	12.6	26.8	13.8	Claypath
D83	25.9	10.8	20.6	5.3	10.8	8.4	Elvet
D84	31.9	23.8	20.6	11.3	23.8	4.2	Elvet
D91	44.2	53.8	20.6	23.5	53.8	10.7	Crossgate
D97	26.8	12.7	20.6	6.2	12.7	7.7	Elvet
D98	33.8	28.0	20.6	13.1	28.0	11.1	Claypath
D99	34.2	29.1	20.6	13.6	29.1	9.8	Claypath
D102	36.1	33.4	20.6	15.4	33.4	17.0	Nevilles Cross Bank
D103	34.6	30.0	20.6	14.0	30.0	14.4	Nevilles Cross Bank
D104	38.7	39.7	20.6	18.0	39.7	14.5	Nevilles Cross Bank
D105	33.6	27.7	20.6	13.0	27.7	17.2	Nevilles Cross Bank
D106	51.0	95.4	11.6	39.4	95.4	17.7	Gilesgate
D107	35.3	31.5	20.6	14.6	31.5	9.6	Nevilles Cross Bank
DUR2	49.6	68.9	20.6	29.0	68.9	11.2	Crossgate

The following sites were excluded from the verification calculation as it was not possible to calculate a close relationship between the modelled and monitored values due to the complex localised street canyoning effects; D8, D13, D20, D45, D46, D57, D58, D71, D78, D79, D96.

However, these were included in the verified table of results, (Table), which demonstrates the locations where a good relationship was achieved.

Figure 11: R-NO_X for All Monitoring Sites

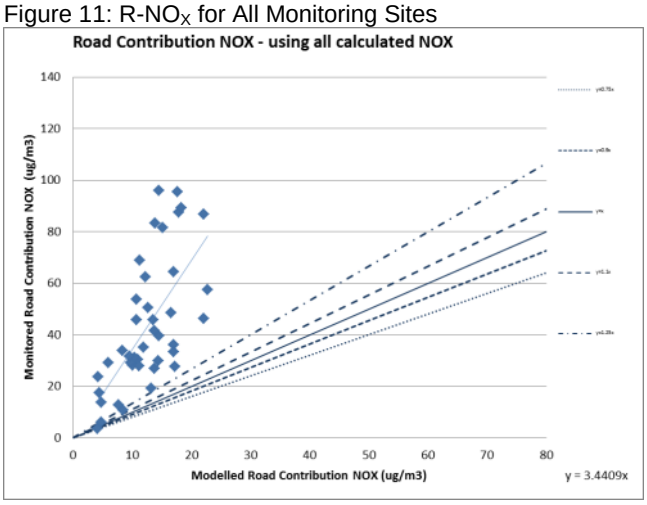


Figure 12: R-NO_X for Gilesgate

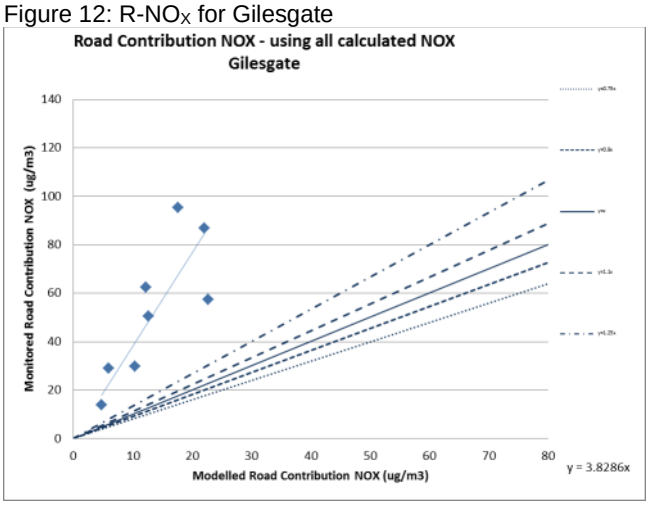


Figure 13: R-NO_X for Claypath

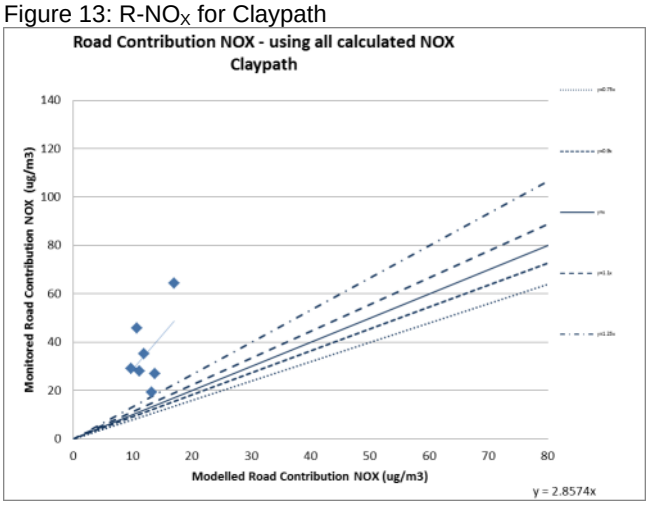


Figure 14: R-NO_X for Crossgate

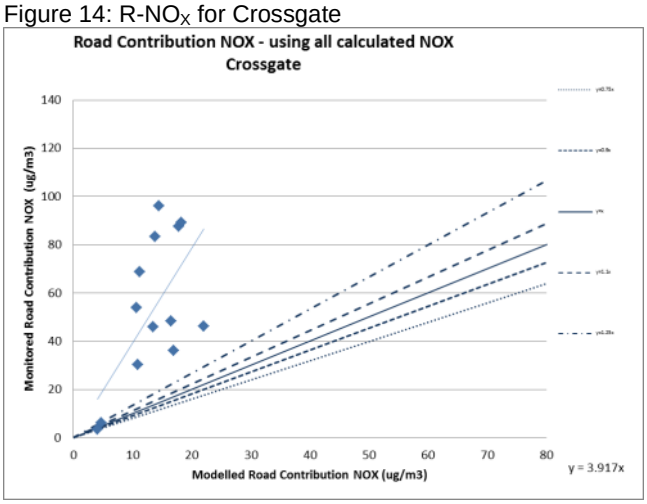


Figure 15: R-NO_X for New Elvet

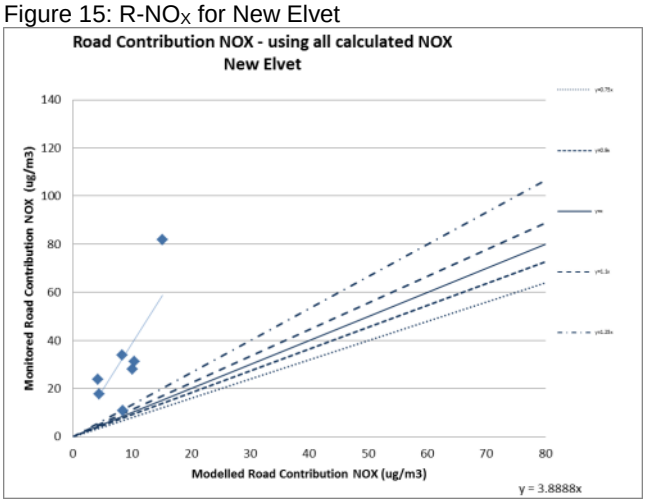
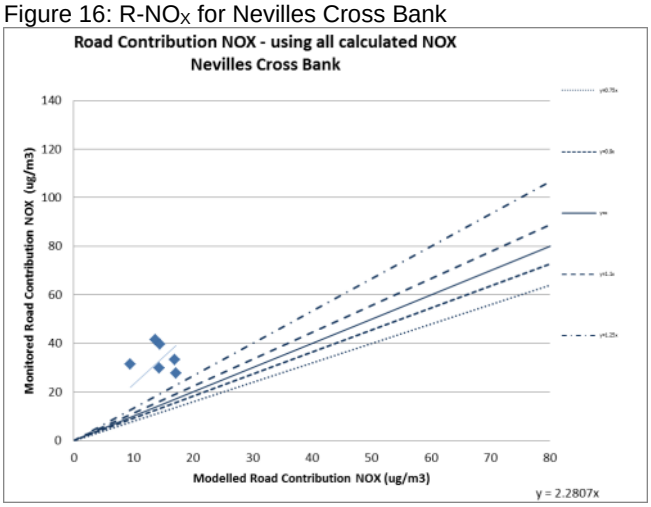


Figure 16: R-NO_X for Nevilles Cross Bank



Adjustment factors were calculated as follows for NO_X:

monitored, traffic contribution = total monitored – background

modelled, traffic contribution] = total modelled – background

Adjustment Factor = monitored, traffic contribution / modelled, traffic contribution

The following adjustment factors were applied to the NO_X results:

All sites 3.4409
Gilesgate 3.8286
Claypath 2.8574
Crossgate 3.917
New Elvet 3.7888
Nevilles Cross Bank 2.2807

The adjustment factors were subsequently applied to the modelled concentrations, and background added to give the adjusted concentrations:

model adjusted, traffic contribution = modelled, traffic contribution x Adjustment Factor

model adjusted = model adjusted, traffic contribution + background

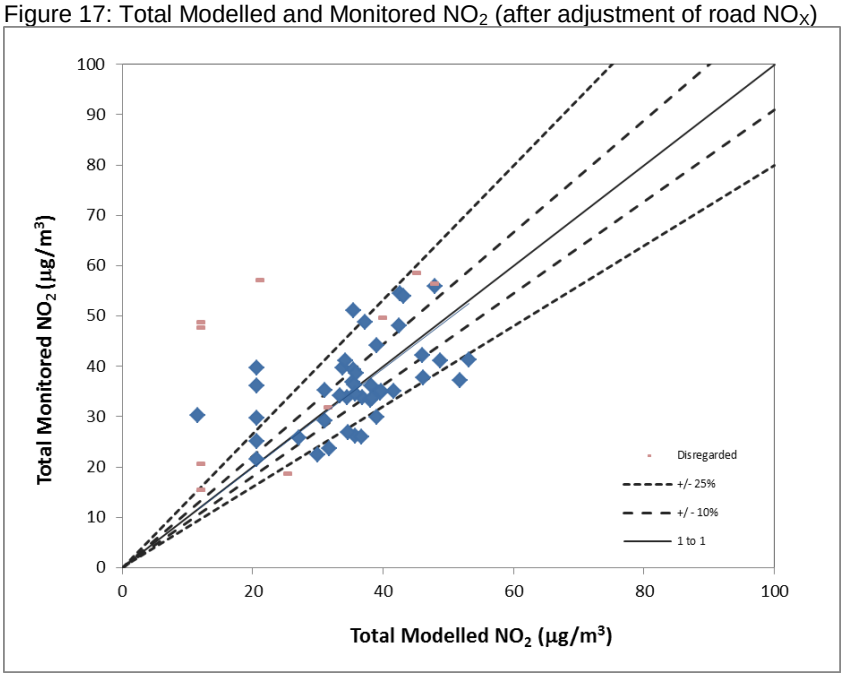
The adjusted NO_X concentrations were converted to NO_2 using version 3.2 of the 'NO_2 to NO_X' calculator published by Defra in accordance with the technical guidance, LAQM.TG(09).

Table 43: Determination of the Adjustment Factor and Total Adjusted NO_2

ID	Adjustment factor for modelled road contribution	Adjusted Modelled Road Contribution NOX	Adjusted Modelled Total NO_2	Monitored Total NO_2	% Difference [(mod-mon)/mon]
D1	3.8286	84.3	37.2	48.8	-24%
D2	3.8286	48.3	41.6	35.0	19%
D3	2.8574	37.6	39.1	29.8	31%
D4	2.8574	33.9	35.4	36.8	-4%
D5	3.8286	39.7	35.8	26.1	37%
D7	3.8286	46.6	33.8	39.6	-15%
D8			11.6	47.6	-76%
D10	3.9170	42.8	39.6	34.8	14%
D11	3.9170	64.9	46.0	42.1	9%
D12	3.9170	54.3	42.6	54.5	-22%
D13			20.6	29.7	-30%
D14	3.8286	87.1	46.1	37.7	22%
D15	3.9170	66.6	51.8	37.2	39%
D16	3.7888	38.2	36.8	33.8	9%
D17	3.7888	39.3	39.7	35.1	13%
D18	3.7888	16.7	31.1	29.1	7%
D19	3.7888	57.3	43.2	53.9	-20%

ID	Adjustment factor for modelled road contribution	Adjusted Modelled Road Contribution NOX	Adjusted Modelled Total NO_2	Monitored Total NO_2	% Difference [(mod-mon)/mon]
D20			11.6	48.8	-76%
D21	3.8286	22.9	27.1	25.9	5%
D42	2.8574	48.6	42.5	48.0	-11%
D43	3.9170	56.9	44.7	58.5	-24%
D45			20.6	25.1	-18%
D46			11.6	30.3	-62%
D56	3.8286	18.0	25.0	18.7	33%
D57			11.6	15.4	-25%
D58			11.6	20.6	-44%
D70	3.9170	53.0	48.8	41.1	19%
D71			20.6	39.8	-48%
D72	3.9170	69.9	48.0	55.9	-14%
D73	3.9170	86.6	53.2	41.3	29%
D74	3.7888	31.6	35.6	36.3	-2%
D75	3.9170	18.5	31.7	23.7	34%
D76	3.9170	15.9	30.0	22.4	34%
D77	3.9170	71.4	47.4	56.4	-16%
D78			20.6	36.2	-43%
D79			20.6	57.2	-64%
D80	2.2807	31.3	35.4	39.4	-10%
D81	2.8574	30.6	34.2	41.1	-17%
D82	2.8574	39.3	38.1	33.2	14%
D83	3.7888	31.9	36.7	25.9	42%
D84	3.7888	16.0	31.1	31.9	-3%
D91	3.9170	41.7	39.1	44.2	-12%
D96			20.6	21.5	-4%
D97	3.7888	29.0	34.6	26.8	29%
D98	2.8574	31.8	34.6	33.8	2%
D99	2.8574	27.9	33.5	34.2	-2%
D102	2.2807	38.8	38.2	36.1	6%
D103	2.2807	32.8	35.8	34.6	3%
D104	2.2807	33.1	35.9	38.7	-7%
D105	2.2807	39.2	38.4	33.6	14%
D106	3.8286	67.6	35.5	51.0	-30%
D107	2.2807	21.8	31.2	35.3	-12%
DUR2	3.9170	43.8	39.5	49.6	-20%

Figure 17: Total Modelled and Monitored NO_2 (after adjustment of road NO_X)



Note: Red points denote monitoring locations that were not used for verification.

Statistical Analysis

The data in Table indicate the statistical confidence attributed to the model. The data show that the verification significantly improves the accuracy of the model.

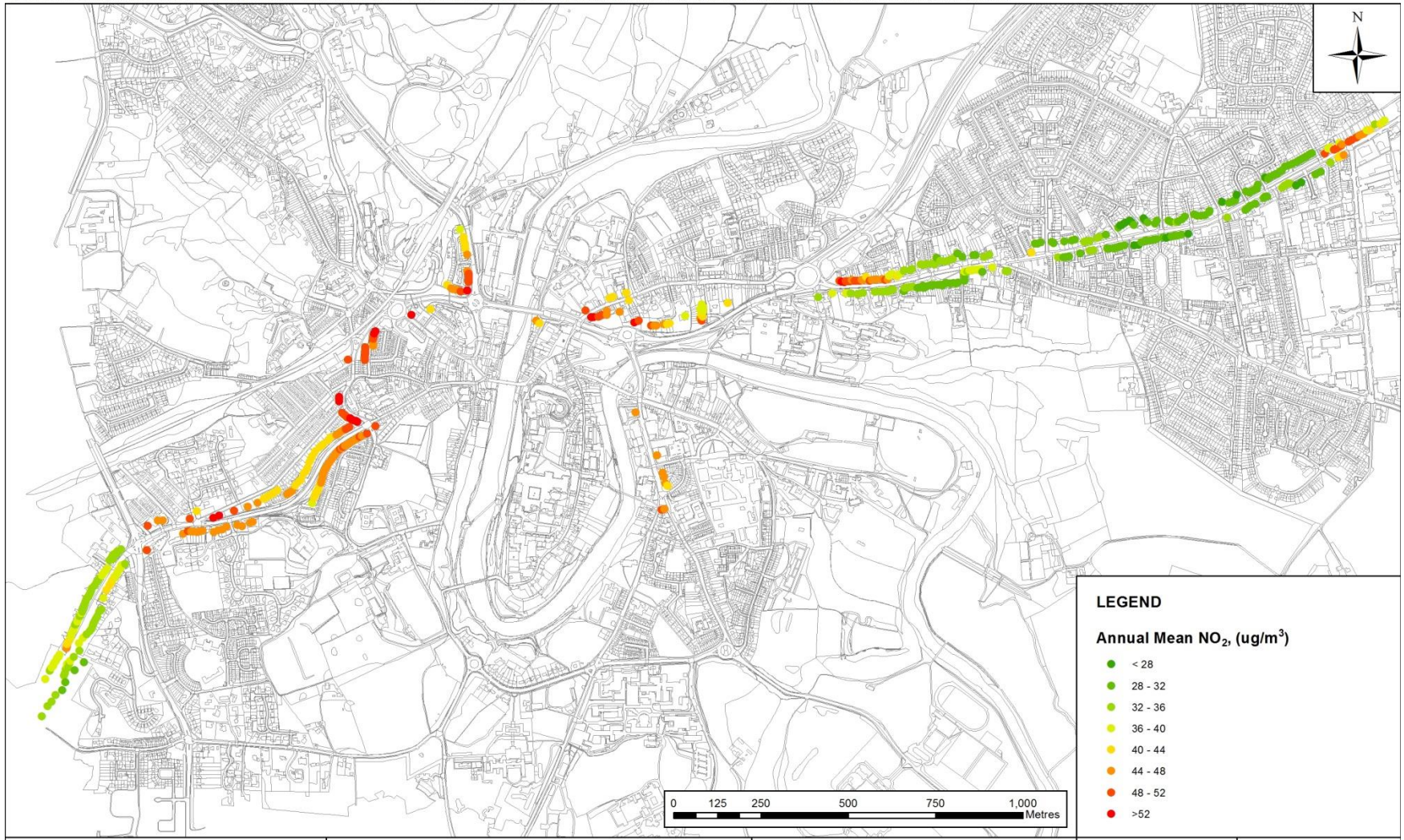
However, the verified RMSE for NO_2 is relatively high at ~15% of the annual mean objective, which indicates that the model may potentially be over or under predicting by this amount. This is due to the considerable variability of monitored concentrations in relatively small areas, such as opposite sides of the road, caused by street-canyon characteristics. The correlation coefficient for NO_2 also reflects this high variability, whilst the fractional bias indicates that the model may be over-predicting slightly more than un-predicting.

Table 44: Statistical Analysis of Model

	Ideal Value	Unverified	Verified					
			All Sites	Gilesgate	Claypath	Crossgate	New Elvet	Nevilles Cross Bank
Correlation coefficient	1	0.55	0.65					
RMSE	0	14.81	7.30	7.71	5.21	9.52	6.40	3.40
fractional bias	0	0.40	-0.02	-0.06	0.00	0.00	-0.06	0.01

Appendix E: Model Baseline Results

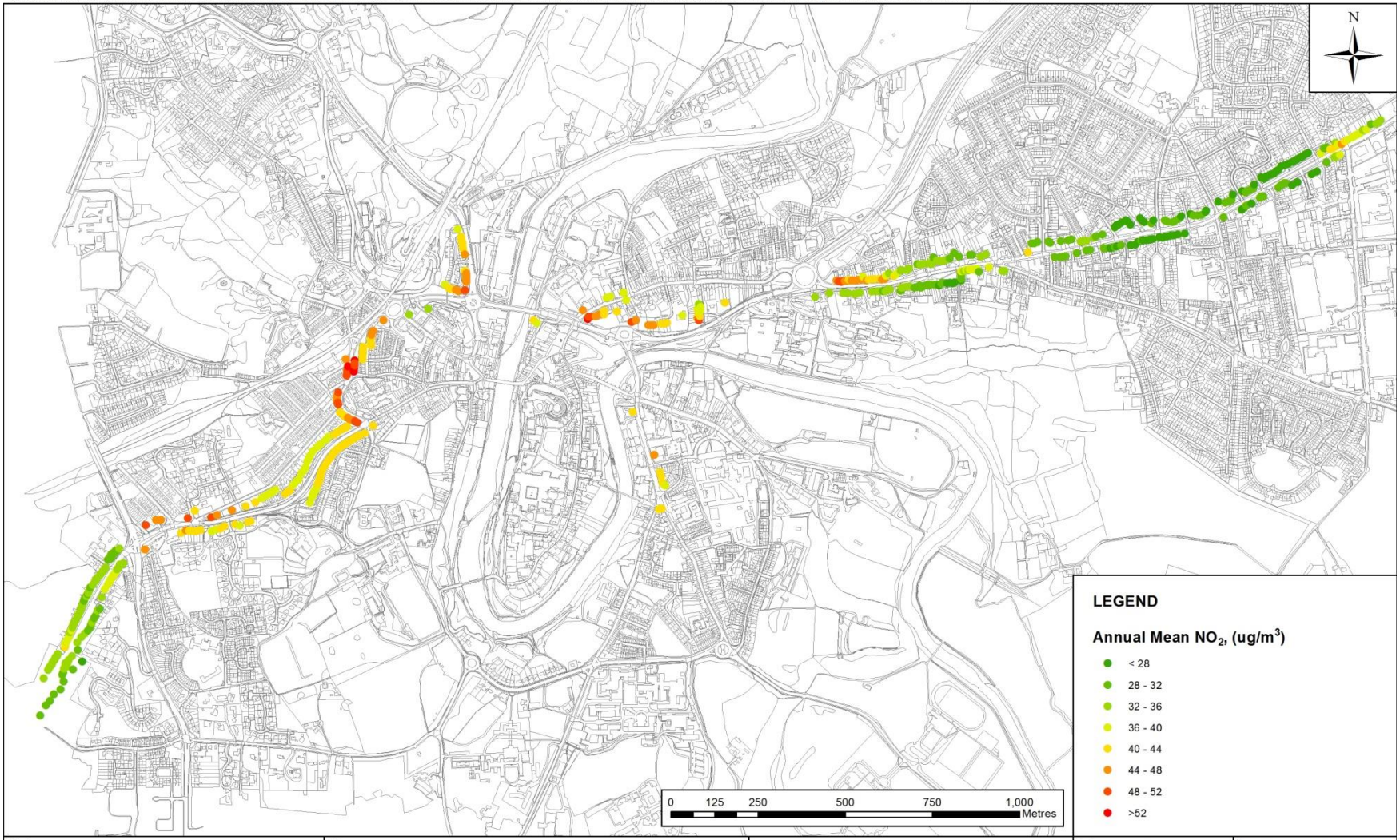
Figure 18: Predicted Annual Mean NO_2 Concentration, 2013



Client: DURHAM CITY COUNCIL	Title: 2013 ANNUAL MEAN NO_2	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Note: The receptor locations represent relevant exposure at residential properties within the AQMA, based on address point data.

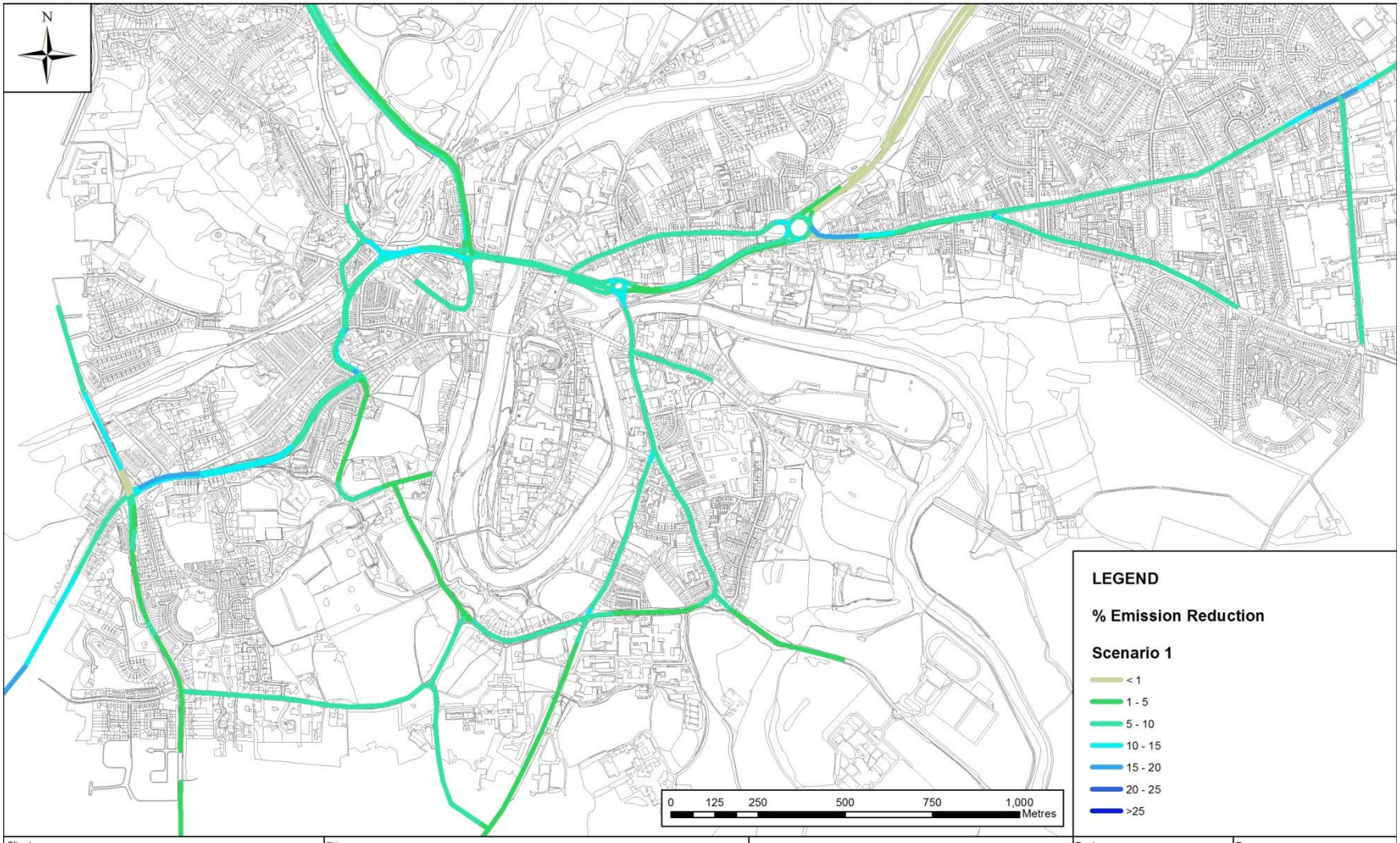
Figure 19: Predicted Annual Mean NO_2 Concentration, 2017



Client: DURHAM CITY COUNCIL	Title: 2017 ANNUAL MEAN NO_2	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

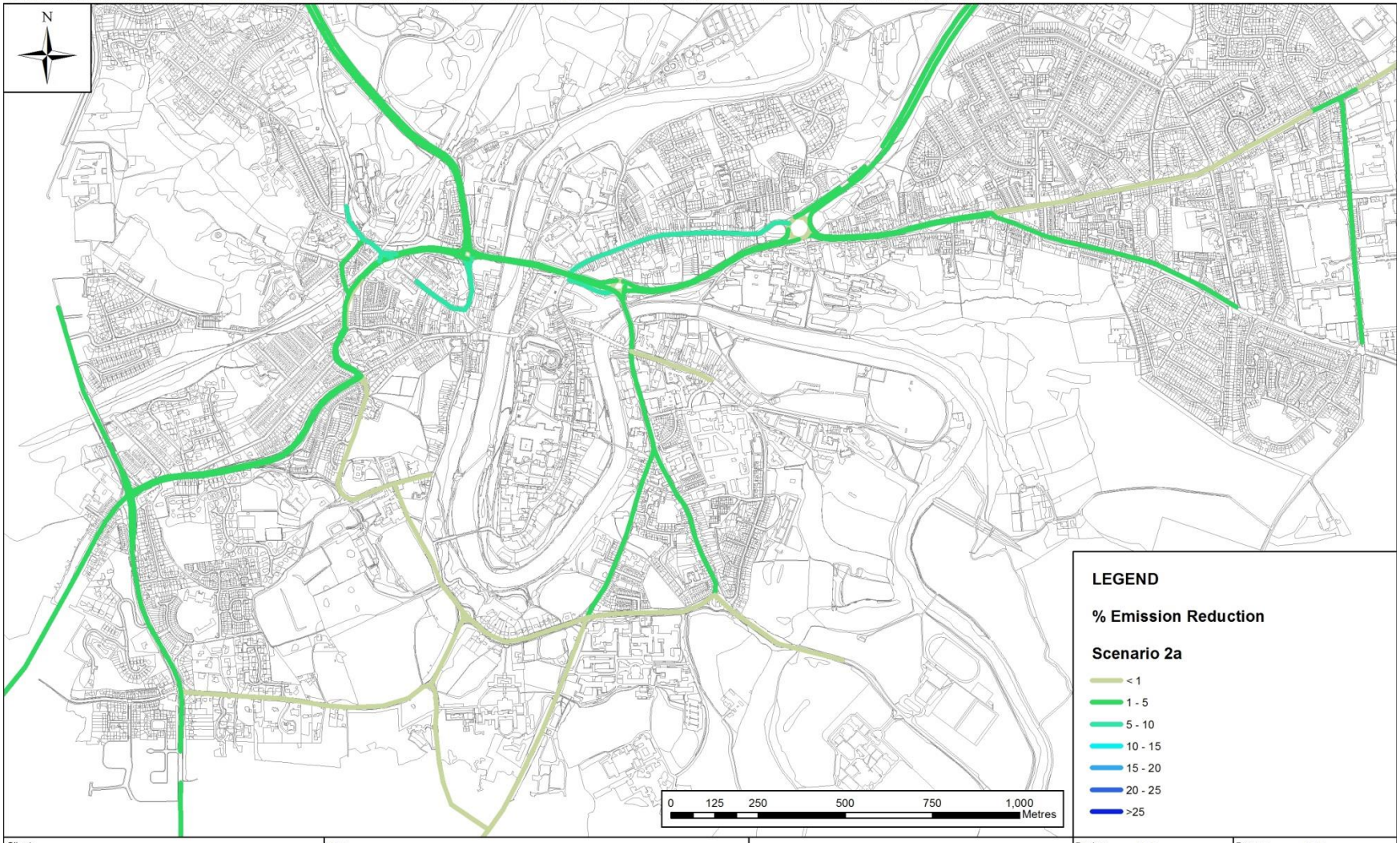
Appendix F: Model Appraisal Results

Figure 20: Option 1, SCOOT Traffic Management System



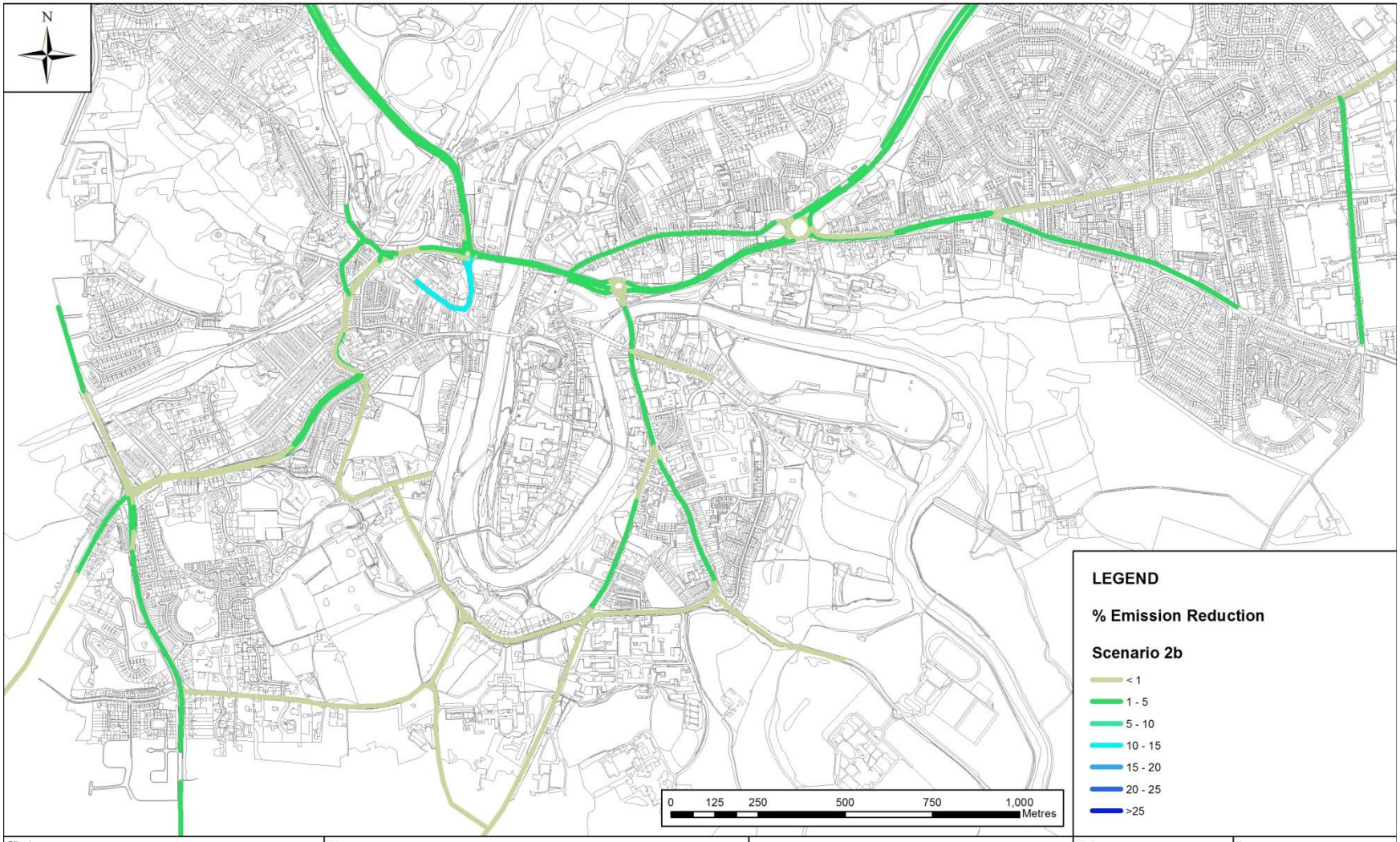
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 1	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 21: Option 2a, Buses to Euro IV



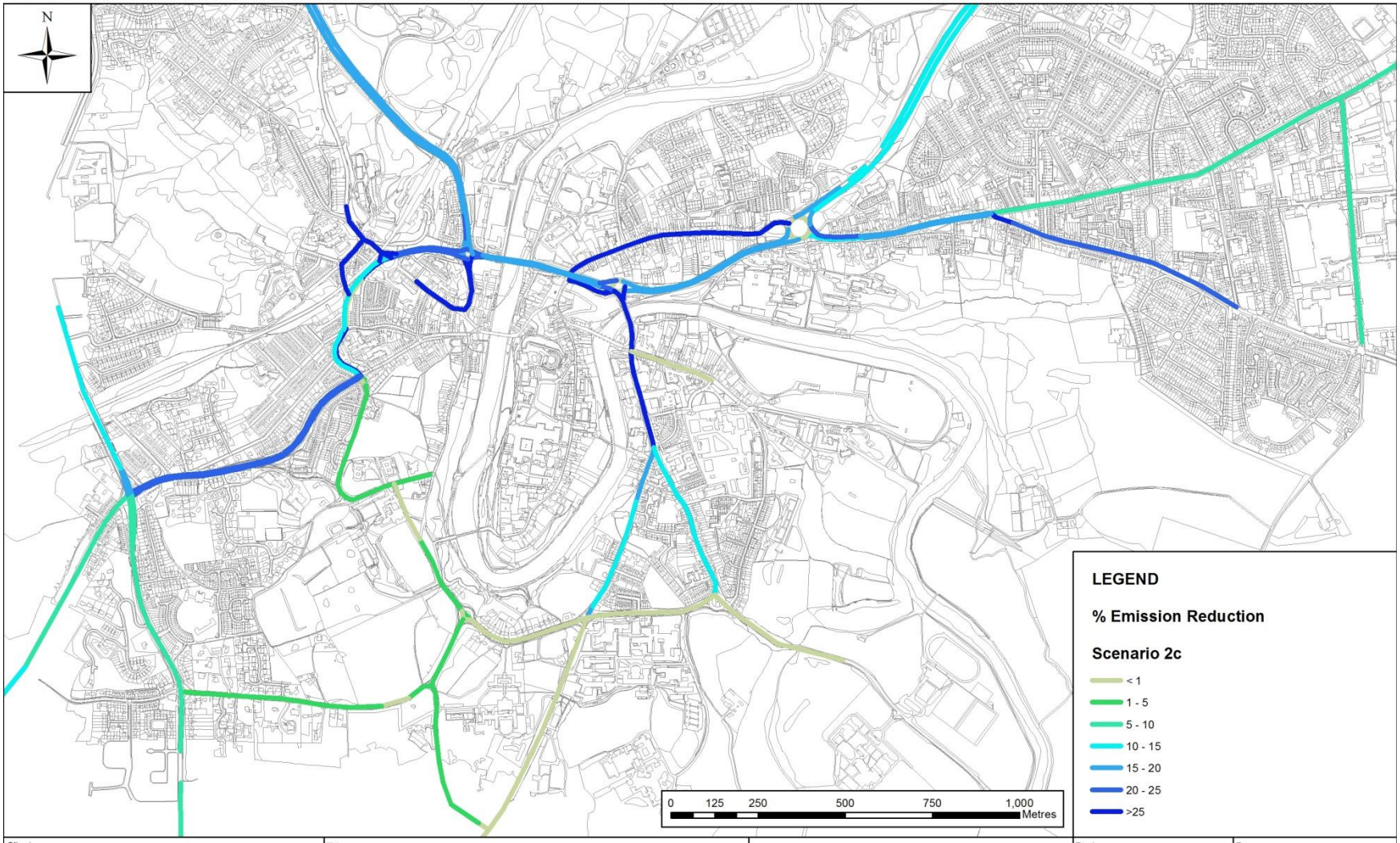
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 2A	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 22: Option 2b, Buses to Euro V



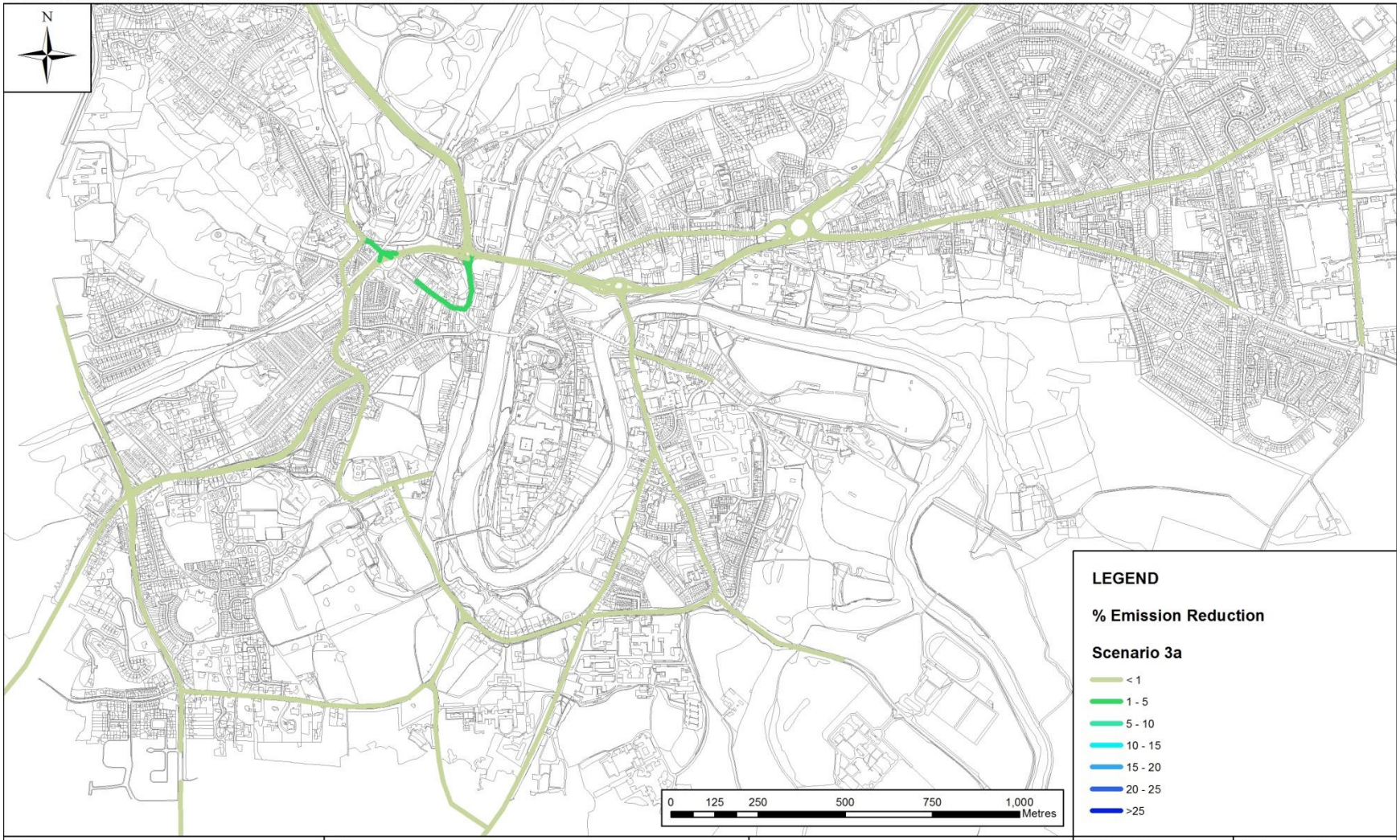
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 2B	AECOM	Design: ARP / Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU / App'd: TS Date: 20/04/2015 / Scale at A3: 1:10,000m Drawing Number: 60297500 / A3

Figure 23: Option 2c, Buses to Euro VI



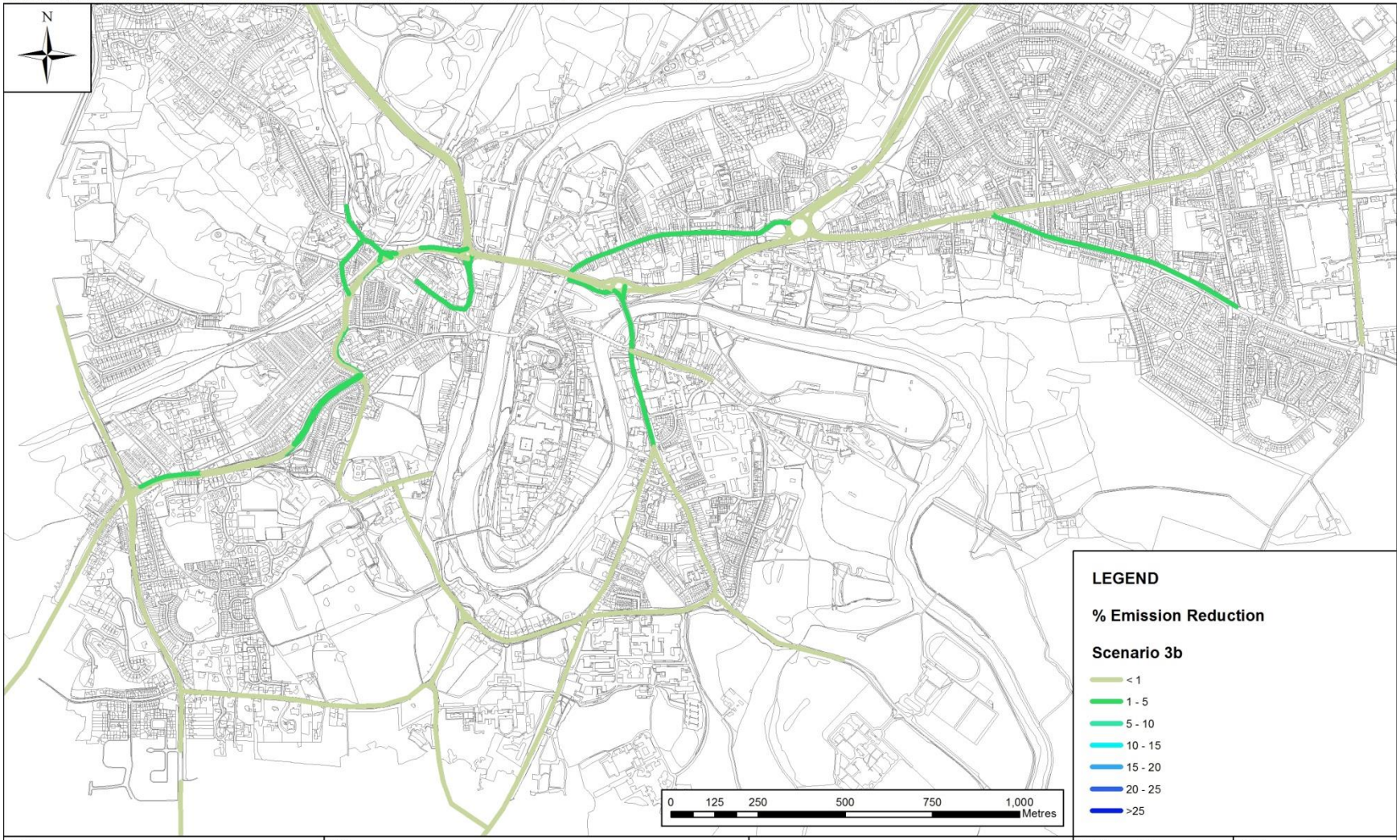
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 2C	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 24: Option 3a, 5% hybrid



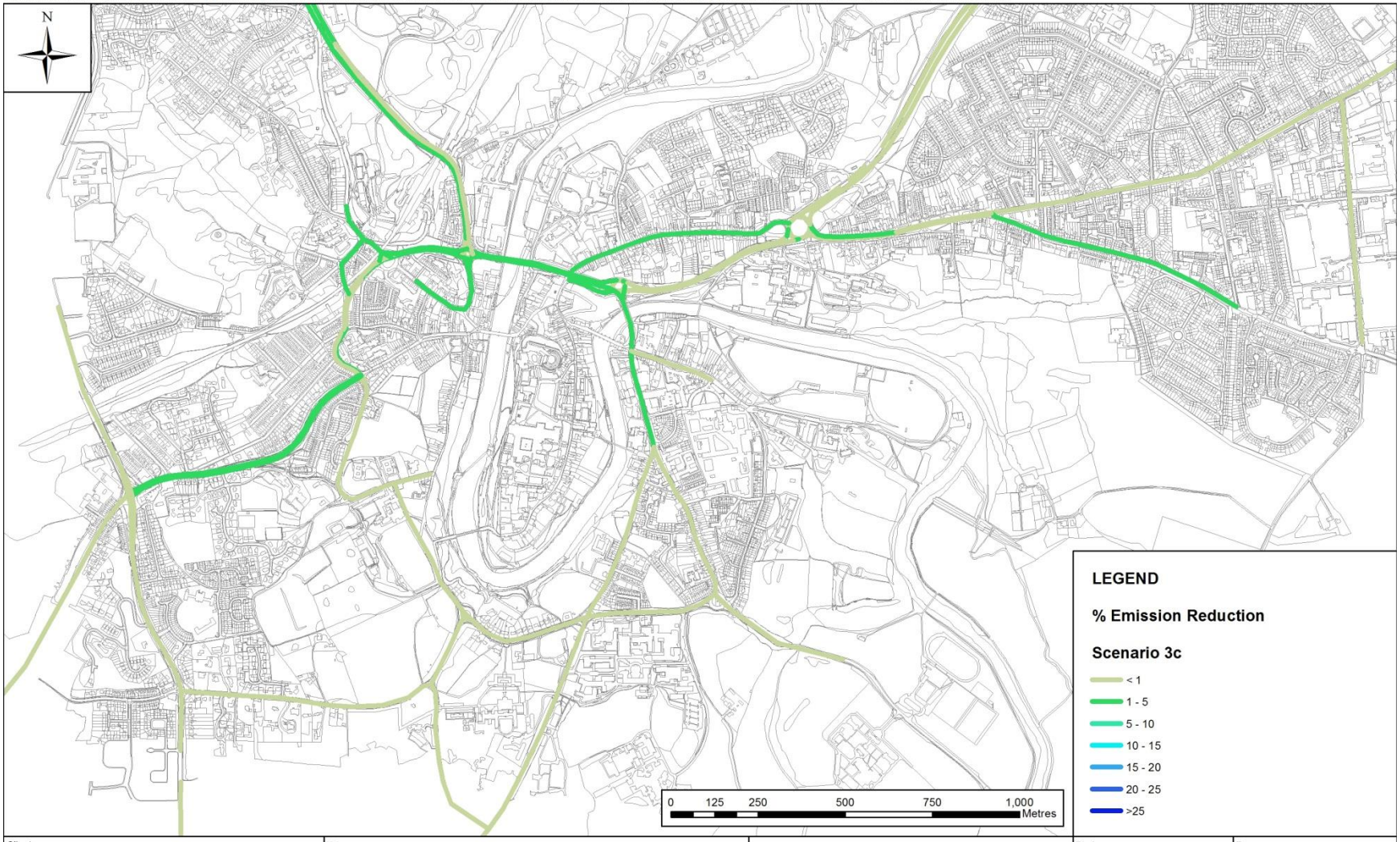
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 3A	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 25: Option 3b, 10% hybrid



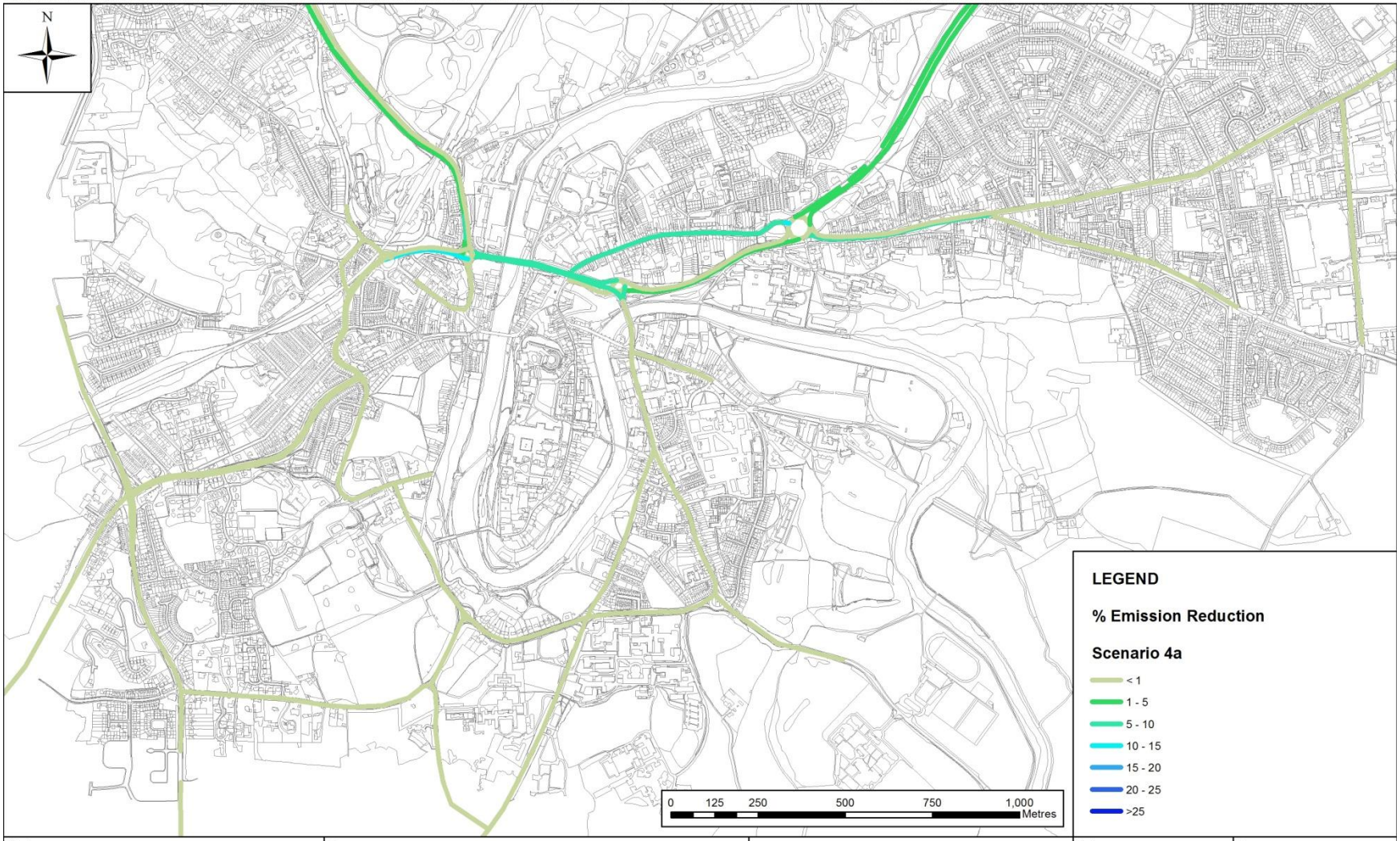
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 3B	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 26: Option 3c, Reduce buses by 5%



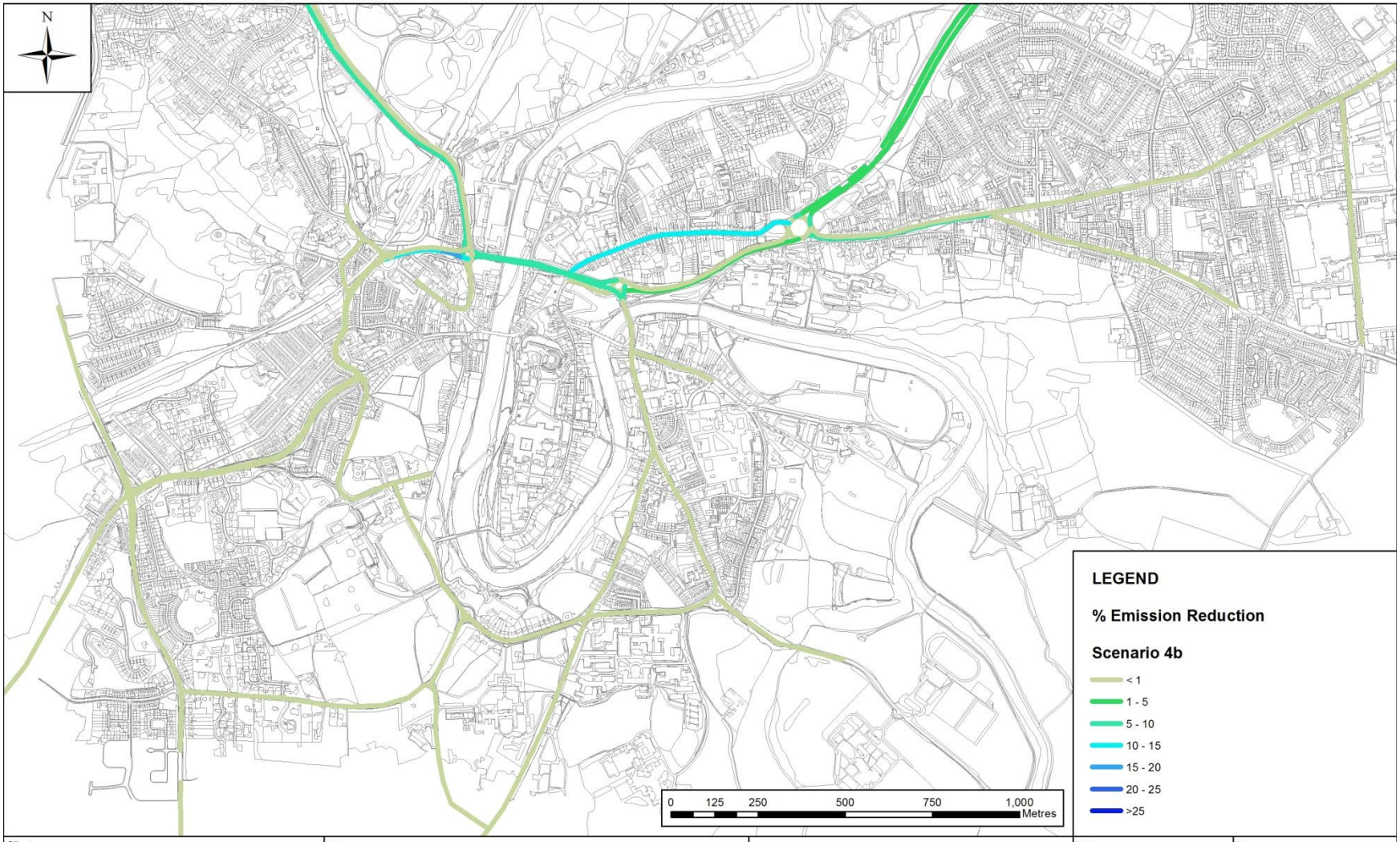
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 3C	AECOM	Design: ARP / Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU / App'd: TS Date: 20/04/2015 / Scale at A3: 1:10,000m Drawing Number: 60297500 / A3

Figure 27: Option 4a, All P&R buses to be Euro VI



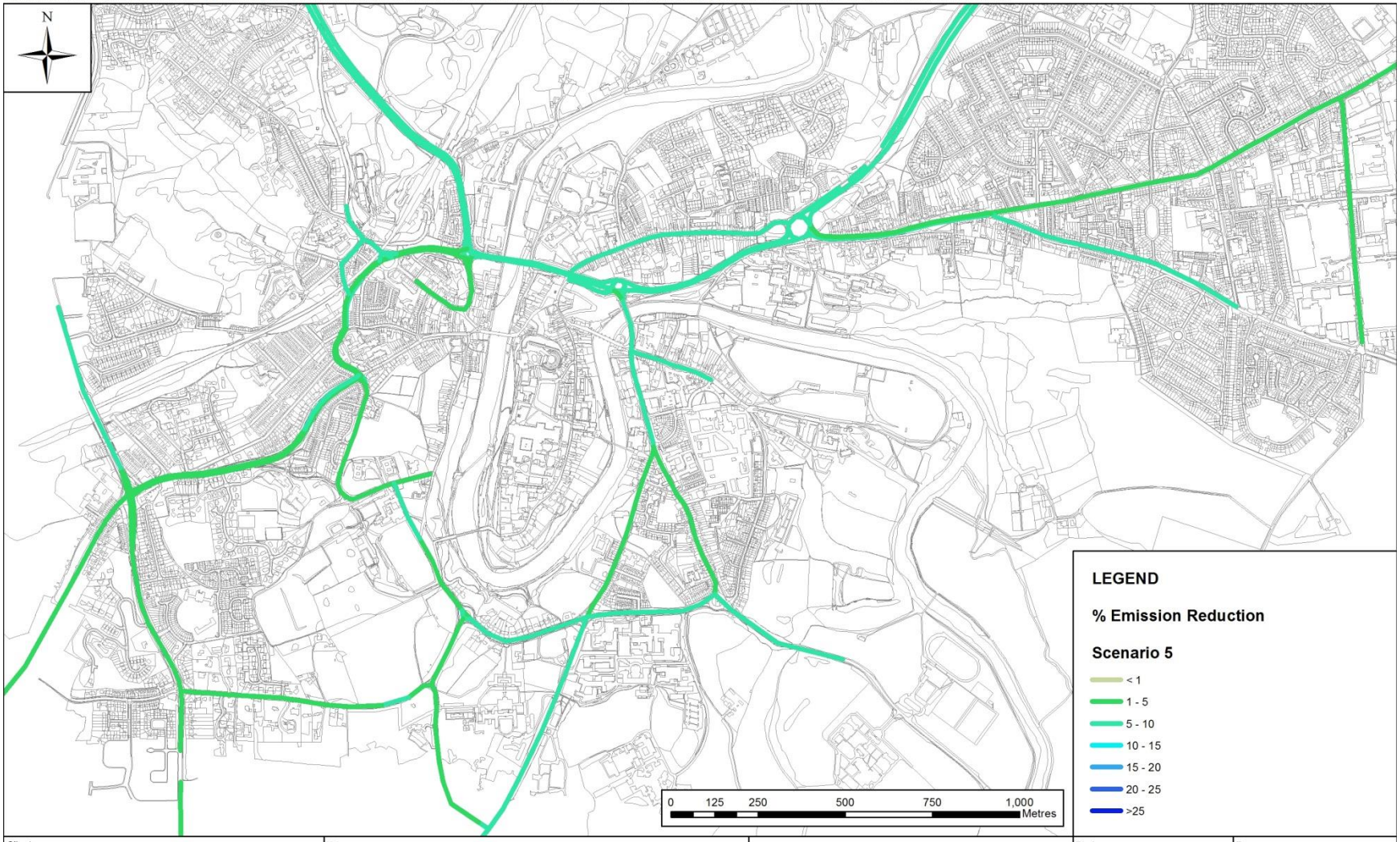
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 4A	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 28: Option 4b, P&R buses to be EV



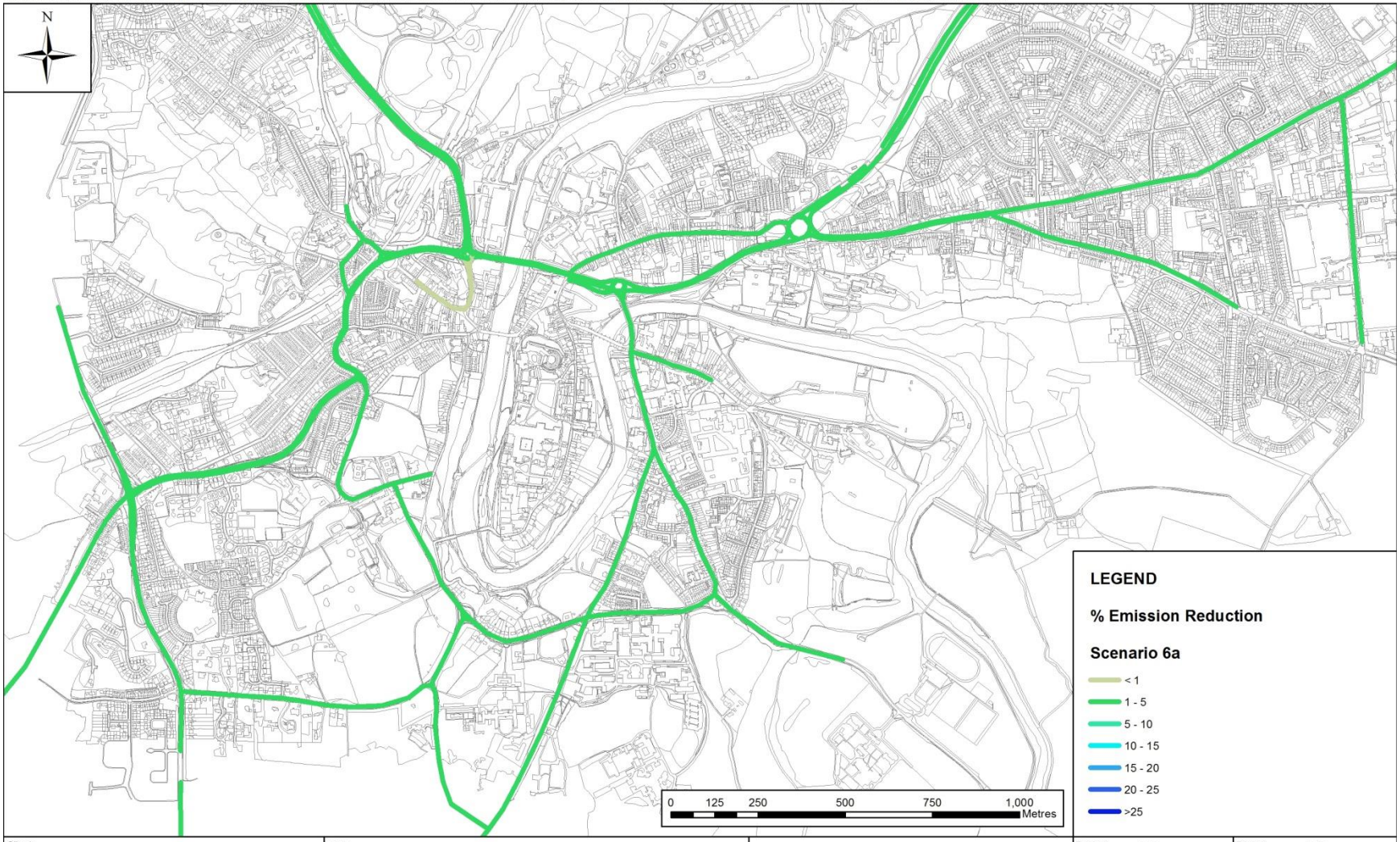
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 4B	AECOM	Design: ARP / Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU / App'd: TS Date: 20/04/2015 / Scale at A3: 1:10,000m Drawing Number: 60297500 / A3

Figure 29: Option 5, 7% modal shift to cycling



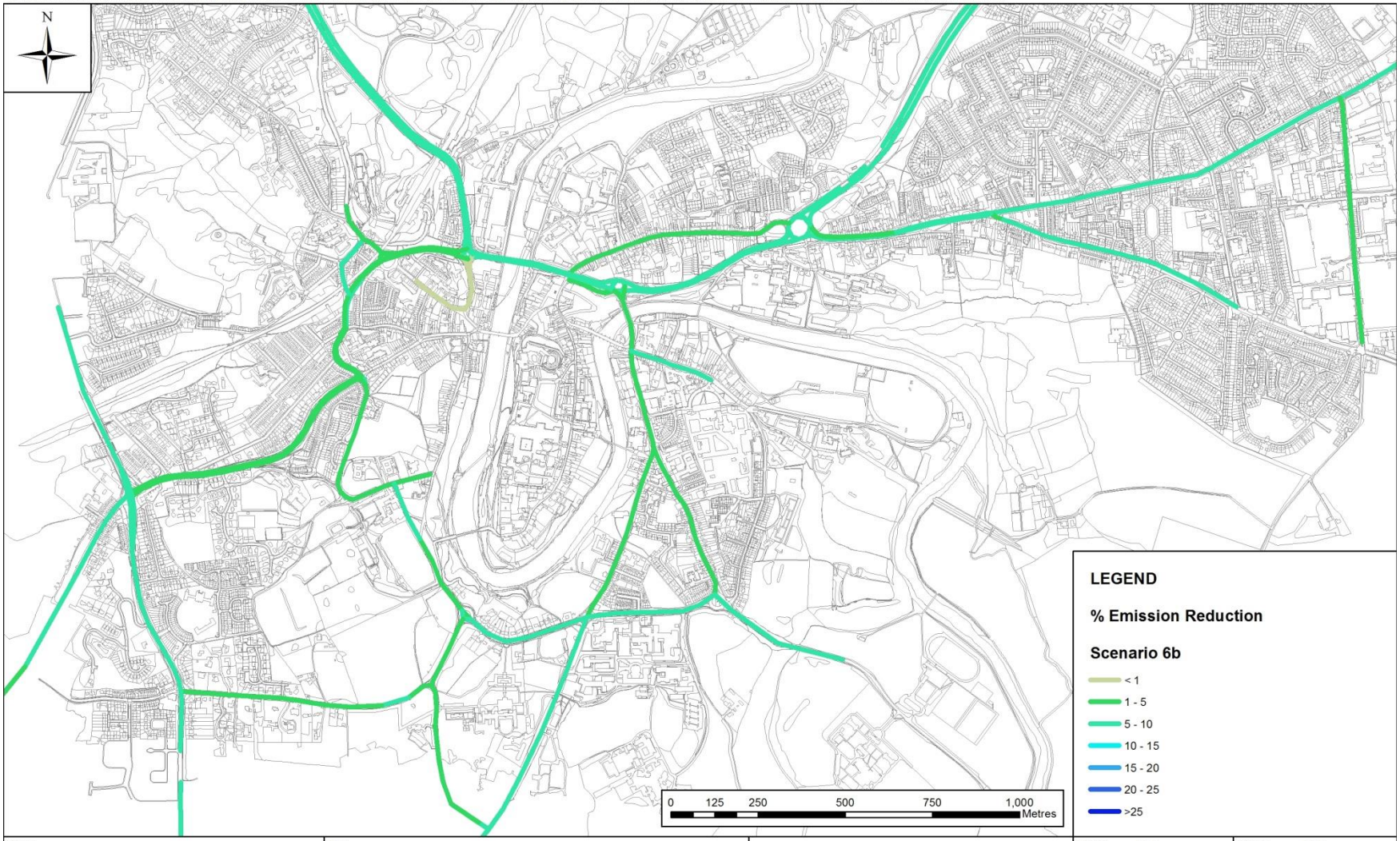
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 5	AECOM	Design: ARP / Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU / App'd: TS Date: 20/04/2015 / Scale at A3: 1:10,000m Drawing Number: 60297500 / A3

Figure 30: Option 6a, Smarter choices, cars -5%



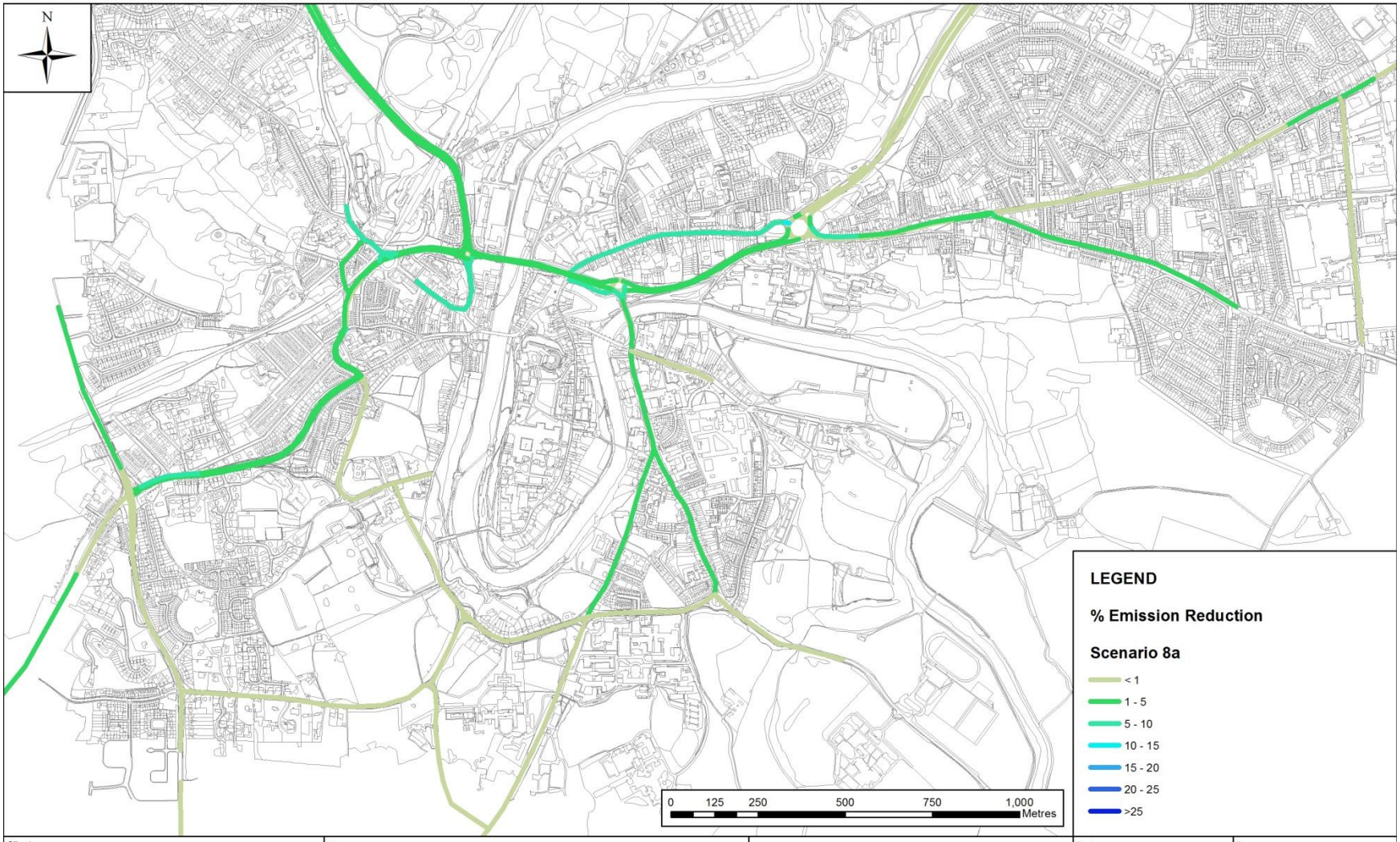
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 6A	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 31: Option 6b, Smarter choices, cars -10%



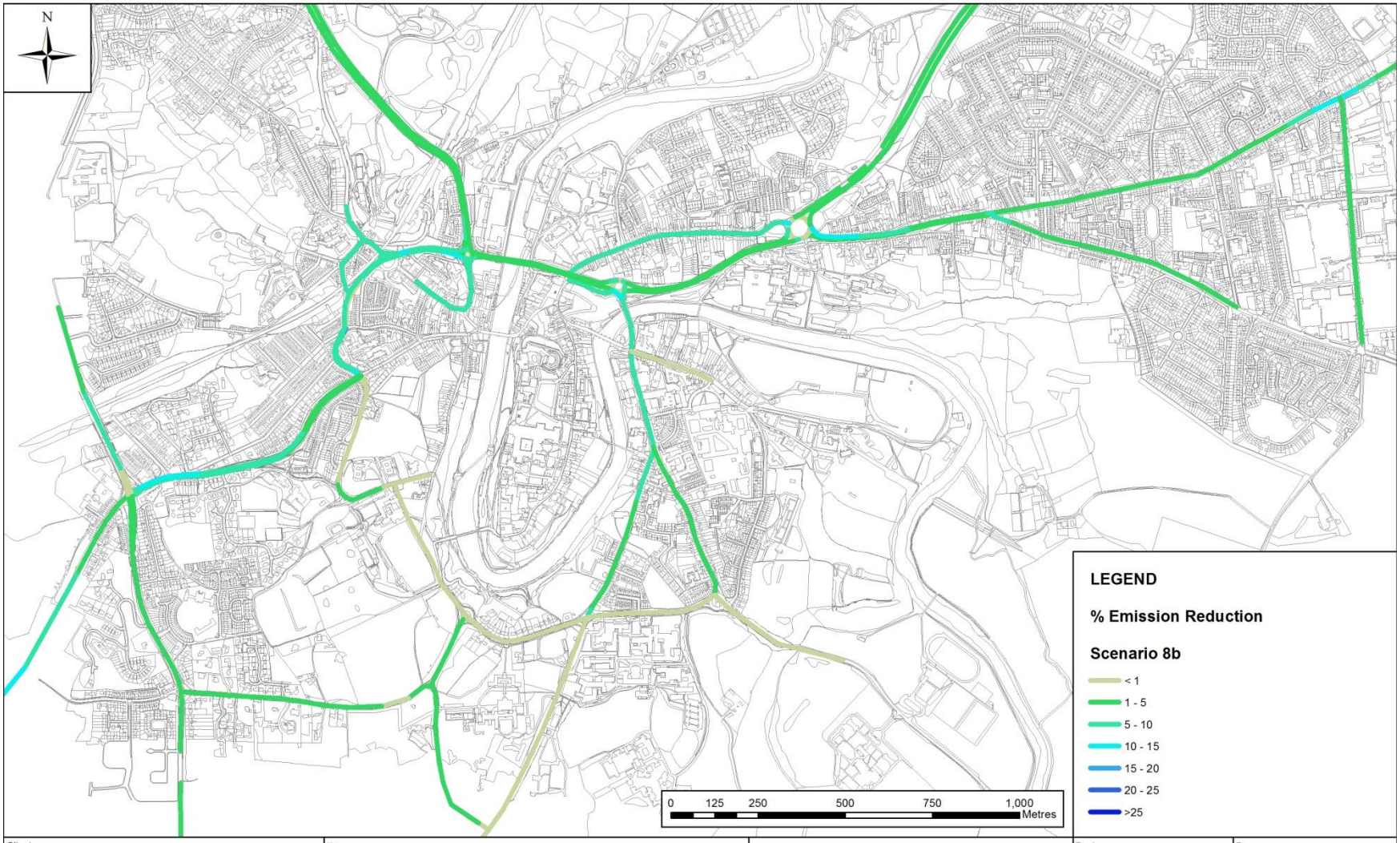
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 6B	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 32: Option 8a, Increase bus speed +5km/hr



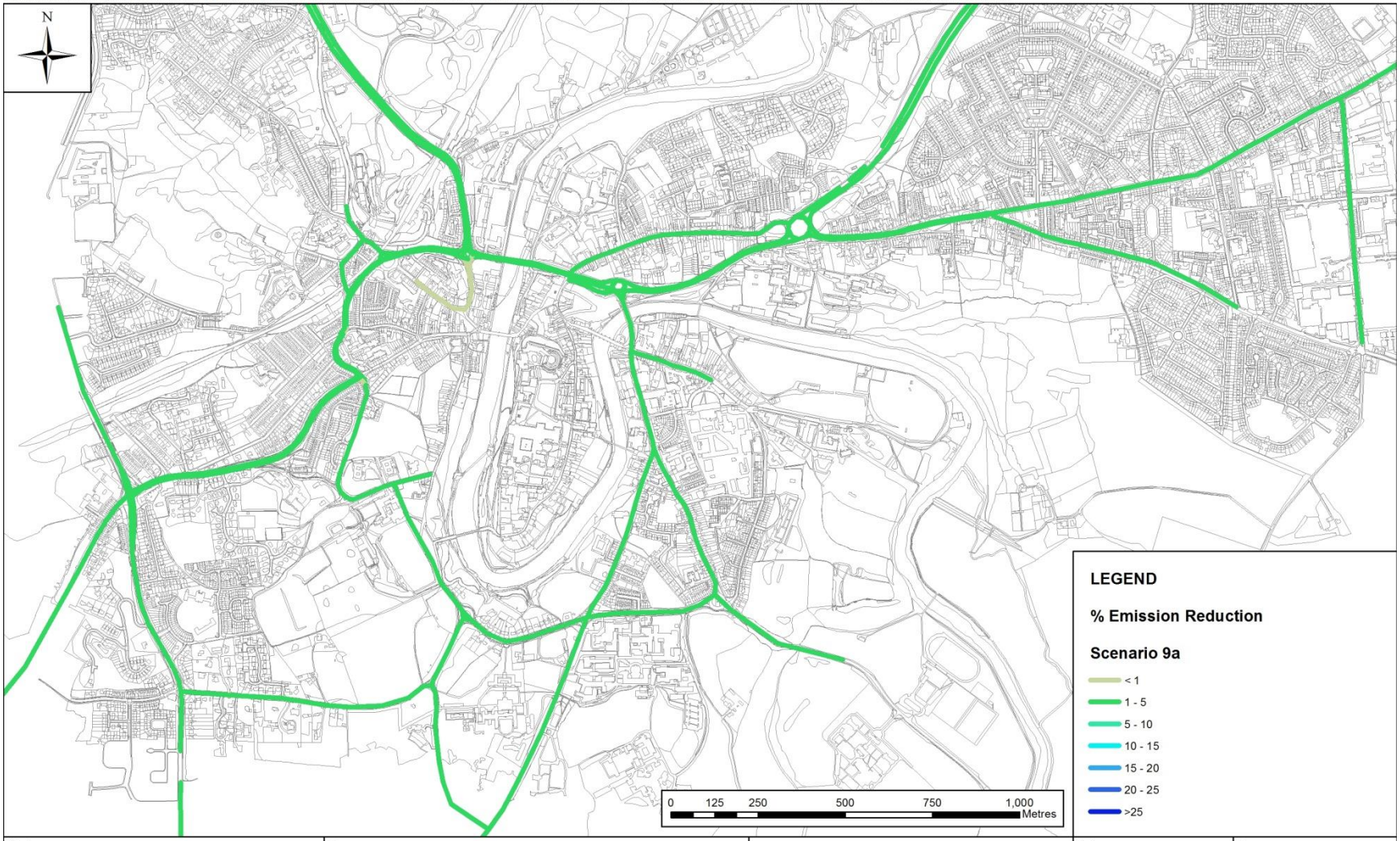
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 8A	AECOM	Design: ARP / Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU / App'd: TS Date: 20/04/2015 / Scale at A3: 1:10,000m Drawing Number: 60297500 / A3

Figure 33: Option 8b, increase bus and HGV speed +5 km/hr



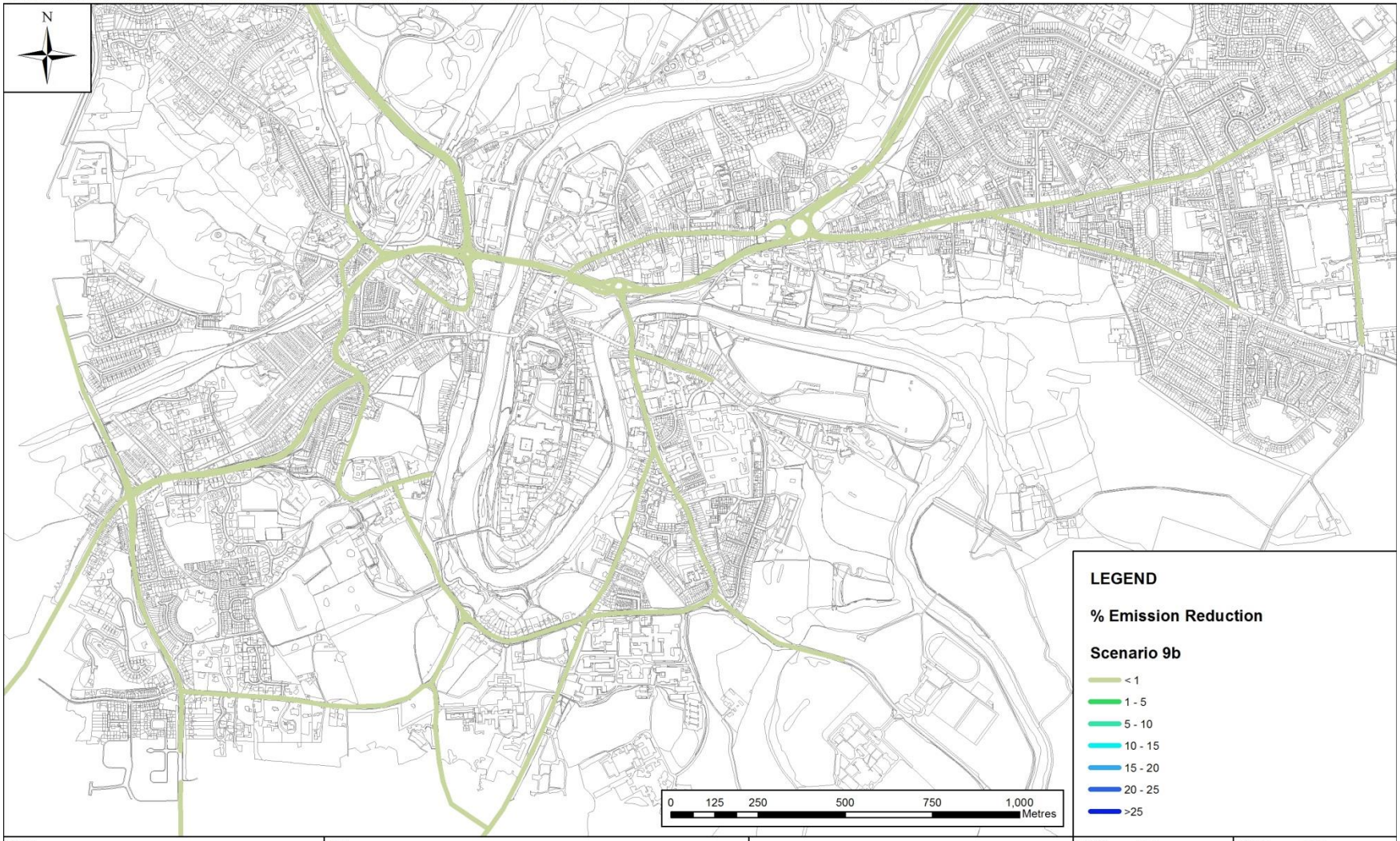
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 8B	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 34: Option 9a, 5% hybrid electric cars



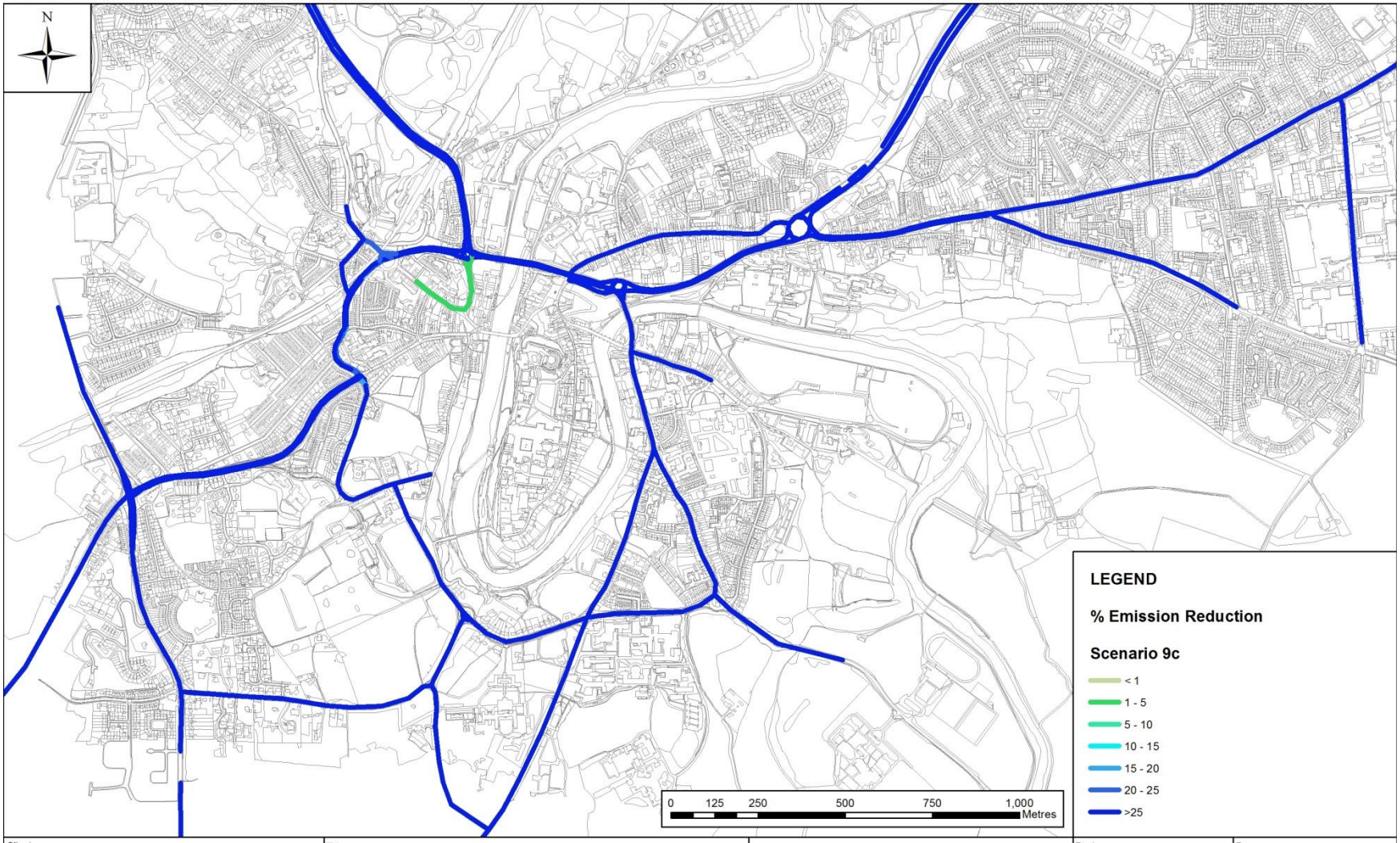
Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 9A	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 35: Option 9b, Change all cars to <2litre



Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 9B	AECOM	Design: ARP	Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU	App'd: TS
			Date: 20/04/2015	Scale at A3: 1:10,000m
			Drawing Number: 60297500	A3

Figure 36: Option 9c, Change all diesel cars to petrol



Client: DURHAM CITY COUNCIL	Title: PREDICTED CHANGE IN NO_X EMISSIONS SCENARIO 9C	AECOM	Design: ARP / Drawn: ARP
Project: DURHAM CITY AIR QUALITY ACTION PLAN APPRAISAL 2014		5th Floor, 2 City Walk, LEEDS, LS11 9AR Tel: +44 (0) 113 391 6800 Fax: +44 (0) 113 391 6899 www.aecom.com	Chk'd: DU / App'd: TS Date: 20/04/2015 / Scale at A3: 1:10,000m Drawing Number: 60297500 / A3

Appendix G: Actions

Table 45: Air Quality Actions

Action ID	Description of Action Measure	Owner	Measure	Completion Date	AQ Target
Action 1:	The introduction of a UTMC or SCOOT system to coordinate traffic through a network of junctions within Durham City and reduce congestion.	DCC Traffic Management	Operating the UTMC	2017	13% average emissions reduction and up to 30-40% reduction on Castle Chare and Gilesgate. Maximum 8 μg/m^3 NO_2 near affected junctions. *The extent to which these effects are realised is uncertain, and so the cumulative effects may be dependent on both the option, and also how the effects interact with the other options.*
Sub-Action:	The replacement of the roundabouts at Gilesgate and Leazes Bowl with signalised junctions that are controlled by SCOOT.				
Action 2:	The retrofitting of emissions abatement systems on diesel engines on buses using routes within the declared AQMA, using SCR exhaust catalysts and DPF to achieve minimum Euro IV emission standard.	Lead: DCC Sustainable Transport Support from Bus Companies (Arriva, Go North East) and DCC Pollution Control	Report number of vehicles retrofitted	Ongoing Subject to available funding.	10% emissions reduction on North Road, or 2 μg/m^3 NO_2
Sub-Action:	To assess the feasibility of tuning vehicles to achieve optimal emission performance during operation under local conditions.				
Action 3:	Encourage the operation of hybrid buses using routes within the declared AQMA.	Lead: DCC Sustainable Transport Team Support from Bus Companies (Arriva, Go North East) and DCC Pollution Control	Report number of hybrid buses and services per hour operating within the AQMA	Ongoing Subject to available funding.	1% emissions reduction on North Road, or <1 μg/m^3 NO_2
Sub-Action:	To liaise with the bus operators to promote driver training and to ensure optimal performance of the electric 'hybrid' system fitted to buses operating within the AQMA.				
Action 4:	Ensuring the park and ride buses are compliant with Euro VI emission standard.	DCC Sustainable Transport	Procurement of new buses	2015	Greatest impacts of 10% on Claypath, or 2 μg/m^3 NO_2
Sub-Action:	To ensure future policy is focussed on identifying opportunities for reducing emissions of air pollutant by 'harvesting energy' or other means to achieve further upgrades to the bus fleets operating within Durham City.				
Action 5:	The development of cycle-ways to encourage modal shift across Durham city that link into national and county cycle routes in accordance with the sustainable transport strategy.	DCC Sustainable Transport	Length of cycle route created compared to the overall strategic objective	Ongoing	Greatest impacts of 7% on most affected roads, or <1 μg/m^3 $NO_{2.,}$ although these maximum effects are unlikely to be achieved by 2017.
Action 6:	The promotion of Smarter Travel Choices with businesses in the city to encourage large employers within the city to implement car sharing and pooling or the use of alternative forms of travel.	DCC Sustainable Transport Support from DCC Pollution Control	Report number of individuals and businesses registered to use the service	2017	Greatest impacts of 5% on most affected roads, or 1 μg/m^3 NO_2
Sub-Action:	To identify Travel Plans and/or Car Sharing programmes already in place and to use these as 'best practice' with other businesses in the city.			Ongoing	Greatest impacts of 10% on most affected roads, or 2 μg/m^3 NO_2
Action 7:	To undertake detailed dispersion modelling of air quality emissions from any development growth and infrastructure in and around Durham City in the	Lead: DCC Traffic	Includes new development and	Ongoing	NA

Action ID	Description of Action Measure	Owner	Measure	Completion Date	AQ Target
	emerging Local Plan that may potentially have an impact on air quality within and on the periphery of the declared AQMA. The outcome of this will enable opportunities to mitigate any detrimental impacts and potential benefits.	Management Support from DCC Spatial Planning Team and DCC Pollution Control	infrastructure schemes.		
Action 8:	The establishment and development of the current Air Quality and Planning Guidance Note as a Supplementary Planning Document (SPD). This sets out the requirements on developers and incorporates a low emissions approach when dealing with proposals for new development within the city and its environs set out in the emerging Local Plan.	Lead: DCC Pollution Control Support from DCC Spatial Planning	Publish the SPD	Autumn 2018	NA
Sub-Action:	To assess the possibility and, if feasible, to incorporate 'damage costs' in the criteria used to assess the impact of new development on air quality.				
Action 9:	The establishment of an Air Quality Strategy (AQS) that will integrate the strategic policies covering air quality in the emerging Local Plan, the measures detailed within the LTP, the draft Sustainable Transport Strategy and the carbon reduction strategy in focusing and addressing air quality issues in Durham City.	Lead: DCC Pollution Control Support from DCC Spatial Planning, Sustainable Transport and Climate Change	Publish the LES	2017	NA
Sub-Action:	To integrate the Air Quality Strategy with an implementation plan for the actions in the Air Quality Action Plan (AQAP), the draft sustainable transport strategy, strategic policies in the emerging Local Plan and the Carbon Reduction Strategy.				
Action 10:	To raise awareness of air quality by undertaking a campaign that will integrate with and will involve other campaigns elsewhere in the Council to improve air quality.	Lead: DCC Pollution Control Team Support from DCC Neighbourhood Communications and Sustainable Transport.	Update the existing website Create an online air quality portal	2017	NA
Sub-Action:	To improve the information available on the existing air quality website to create an online resource for the provision and sharing of information, resources that are integrated with the Smarter Choices Travel Scheme together with an online portal for registering Travel Schemes.				
Sub-Action:	To develop the air quality web pages to provide a dedicated section on air quality for schools that can be easily accessed and utilised.				
Action 11:	The installation of variable message and a car park direction signing system to direct traffic to available parking	DCC Traffic Management	Install variable messaging signs	2017 Follows the UTMC.	NA
Action 12:	Explore the provision of travel and driver information integrated with the UTMC and to explore the feasibility of providing information on air quality through the use of texts, email alerts and social networking.	Lead: DCC Traffic Management Support from Pollution Control	To look at the feasibility of showing local air quality information on variable messaging signs	2017 Follows the UTMC.	NA

Action ID	Description of Action Measure	Owner	Measure	Completion Date	AQ Target
Action 13	To explore whether it is viable or not to progress the introduction of variable residential car parking charges with preferential rates for low polluting vehicles, the extension of the Park and Ride routes and the provision of further Park and Ride sites as air quality action measures.	Lead: DCC Traffic Management	The completion of a viability assessment.	To be confirmed	
Action 14	To explore whether it is viable or not to extend existing park and ride routes and/or the provision of further park and ride sites, taking into consideration the emerging County Durham Plan and Sustainable Travel Strategy for Durham City.	Lead: DCC Traffic Management	The completion of a viability assessment.	To be confirmed	
Action 15	Explore the options for additional highway infrastructure in line with the Durham Sustainable Transport Strategy, taking into account environmental, financial and planning considerations to enable the removal of through traffic from the City Centre and contribute to the overall reduction of traffic emissions.	Lead: DCC Traffic Management	To look at whether it is viable or not to progress specific infrastructure schemes taking account of environmental, financial and planning considerations.	To be confirmed	

Appendix H: Durham City Air Quality Action Plan Consultation Strategy

The purpose of this document is to set out a strategy for consulting on the draft Air Quality Action Plan that has been prepared to improve air quality within the Durham City Air Quality Management Area.

The requirements of the consultation have been discussed with the Council Communications Team. A consultation plan has therefore been drawn up and this provides more detail on how the strategy will be delivered.

The Objectives of the Consultation

A consultation exercise to obtain the views of stakeholders on the identified and prioritised options put forward to improve air quality is a key stage in developing the Action Plan. The consultation exercise will invite comments on the proposed options on the draft Air Quality Action Plan and in addition will provide an opportunity for alternative ideas and proposals to be put forward for consideration

The consultation is considered to form part of an ongoing process of raising the profile of local air quality within the city. It is important that stakeholders have a sense of involvement in local air quality within the city. Therefore, in going forward, the consultation will also seek to outline ways in which stakeholders can participate in the development and implementation stages of the Air Quality Action Plan.

The Legal Requirement for Consultation

The Council is required to consult on the preparation of the Air Quality Action Plan under Schedule 11 of the Environment Act 1985.

As a minimum the consultation must cover named persons and organisations as is the case with all completed air quality review and assessment work. This comprises of the Government (DEFRA), the Environment Agency, the Highways Agency, neighbouring local authorities, and business organisations and trade associations that are represented in Durham city. There is also further discretion for the Council to consult as and with whom it considers necessary.

Background to Air Quality in Durham City

The outcome of previous assessment of air quality at locations within the city determined levels of nitrogen dioxide above the National Air Quality Objective for this pollutant. (An Annual Mean of 40µg/m^3). This pollutant occurs from vehicle exhaust emissions and levels above the objective have been measured at residential receptors that are in close proximity to congested sections of the A690, the principal route across the city.

The Council declared an Air Quality Management Area that incorporated the Highgate, Millburngate, Gilesgate areas in the city centre and the Dragon Lane junction with Sunderland Road in 2011. This was extended in July 2014 to include the western section of the A690 through the Neville's Cross junction to the Stonebridge roundabout together with sections of Claypath and New Elvet.
Following the declaration of the Air Quality Management Area the Council is required to prepare an Air Quality Action Plan. To facilitate the involvement of key officers both within and external to the Council in determining appropriate options for improving the air quality within the city this task was undertaken by an Air Quality Technical Working Group. A further Air Quality Corporate Steering Group was also established to oversee this work. The Action Plan is a detailed document that sets out the proposals put forward to improve air quality through a variety of ways involving transport planning, the encouragement of sustainable development, less polluting travel options and environmental initiatives.

A timetable for the completion of the work project for establishing a draft Air Quality Action Plan by March 2015 has been drawn up. Following this a full consultation exercise is required before the Air Quality Action Plan can be finalised and approved.

The Scope and Extent of the Consultation

The boundary of the extended declared Air Quality Management Area now includes almost the entire length of the A690 across the city. Consequently, local air quality is an issue that needs to be considered on a city wide basis. Therefore the scope and extent of the consultation exercise will need to reflect this and be more involved than previous Local Air Quality Management consultation that, in the main, has been undertaken to fulfil the legal requirements set out in Schedule 11 of the Environment Act 1995.

The proposals on the draft Air Quality Action Plan are wide ranging and are the responsibility of both sections internally within the Council and external stakeholders. It will therefore be necessary to involve the following internal sections within the Council: Spatial Planning, Travel Planning, Traffic Engineers and Planning, and the Pollution Control Team (Air Quality) together with representatives from external stakeholders including the bus companies operating within the city (Go Northeast and Arriva), the Highways Agency, local freight companies operating within the city and groups that promote walking and cycling.

The proposals on the draft Air Quality Action Plan will potentially have an impact on a variety of groups within the city. It is therefore important these are included in the consultation process and have been identified as business organisations and trade associations together with representatives of the principal businesses within the city and in particular the university. Further the consultation will not only need to target the residents with properties within or in close proximity to the declared Air Quality Management Area but also needs to engage with the public over a wider area of the city.

The final group that needs to be involved are those that represent the interests of residents within the city. These are the elected Councillors and representatives of town and parish councils together with residents associations.

The Form of the Consultation

It is important that the form of consultation used will enable the participants to understand the options included on the draft Air Quality Action Plan and the impact they will have on improving air quality within the city in the context of previously completed local air quality assessment work. Therefore during the early stages of the consultation process it will be necessary to clearly explain each of the options together with the benefit on air quality they will achieve. This will include the outcome of Further Assessment of the air quality within the declared Air Quality Management Area since this identifies the principal sources of air pollution within the city. The Further Assessment Report is therefore a key document that has been used to form the basis for the inclusion of the proposed options on the draft Air Quality Action Plan.

A forum that will assist with this is the undertaking of workshops since these will provide an opportunity to explain the objectives and scope of the consultation. Those attending can also be given the opportunity to ask any questions on the proposals as well as being invited to provide additional feedback by completion of a questionnaire.

Another way of involving and obtaining feedback from stakeholders is by establishing exhibitions within buildings across the city that are accessed by the public. This will provide a further opportunity for the public to view the proposals and again to invite feedback by completion of a questionnaire.

The main way of obtaining feedback from stakeholders, it is intended, will be by the completion of a questionnaire that will be provided in both a typed and electronic form. This can be made available, as detailed above, at both a workshop and exhibitions but also circulated with letters to targeted areas. In addition a section on the consultation will be included on the web pages that cover air quality within Durham city on the County Council website and this will provide a link to access an electronic version of the questionnaire.

In addition to the above forms of consultation that can be expected to invite a wider feedback other more focussed or targeted communication with particular groups will be undertaken. This, initially, will involve letters to the elected Councillors of the areas that are within the declared Air Quality Management Area as well as fulfilling the statutory consultation requirements. It will then be intended to write to the residents of the properties with facades onto the declared Air Quality Management Area and therefore most directly impacted by the proposals.

Going Forward: Further Development and Implementation of the Measures on the Air Quality Action Plan

The consultation on the draft Air Quality Action Plan will not be viewed as a single isolated exercise. It is important that the Council continues to maintain consultation with stakeholders as the development, implementation and evaluation of the air quality improvement measures progresses. There is an ongoing requirement that the Council consults following the completion of further local air quality review and assessment work that is carried out.

In addition, it is intended to include an option on the draft Air Quality Action Plan to cover the implementation of an air quality campaign. An objective of the campaign will be to raise the profile of air quality issues and to encourage the public together with other groups to participate in ways that may assist in improving the air quality across the city. This will also involve developing the web pages on air quality so that they are more inviting and interactive to users and the undertaking of promotional events or projects.

The Council will also be required to undertake a further detailed consultation exercise if it decides to review and revise the Air Quality Action Plan at some stage in the future.