Towards an ultra-low emission York

Air Quality Action Plan 3

(2015 to 2020)

Public Protection
(Regulatory Support and Advice)
Communities and Neighbourhoods
November 2015

CITY OF YORK COUNCIL

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Executive Summary

Introduction

This is City of York Council's (CYC) third Air Quality Action Plan (AQAP3), setting out how York intends to continue to deliver its' ambitious and pioneering overarching Low Emission Strategy (LES), and to work towards becoming an internationally recognised ultra- low emission city.

York's overarching LES (published in October 2102) was the first document of its kind in the UK and has already changed the way York delivers public transport and plans for future transport trips. Since the publication of the LES, York has:

- delivered a new fully electric Park & Ride site at Poppleton Bar
- introduced electric buses at the existing Monks Cross Park & Ride site
- retrofitted the world's first electric double decker sightseeing bus
- converted around 7% of the taxi fleet (50+ vehicles) to low emission alternatives (Euro 5+ hybrid or electric)
- implemented an extensive 'pay as you go' fast charge public electric vehicle recharging network
- established 11 publicly accessible rapid chargers
- achieved a 34% reduction in 'grey fleet[1]' trips by council staff, reducing CO_2 emissions by 47%
- developed low emission planning guidance

At the same time York continues to deliver on walking, cycling and public transport improvements, maintaining its' national reputation as a leader in sustainable transport.

York already has much to celebrate in relation to reducing emissions and protecting and improving the health of its residents. However, with an increasing population and thriving local economy, preventing further emission growth and improving air quality remain significant and difficult challenges for the foreseeable future.

This new AQAP3 for York sets out the emission reduction and air quality improvement measures to be delivered in York over the next 5 years (2015 to 2020). It will firmly build on what has been achieved so far, and with further external investment, could become the foundation for creating an internationally recognised ultra- low emission city.

[1] Grey fleet trips are those business trips undertaken by staff in their privately owned vehicles. The council has no control over the age or emission standards of these vehicles so is actively shifting these trips to smaller, lower emission car club vehicles

Air Quality and Public Health in York

CYC has declared 3 Air Quality Management Areas (AQMAs) where the health based national objectives for nitrogen dioxide (NO_2) are currently exceeded. CYC has a statutory duty to try to reduce NO_2 concentrations within these AQMAs, but also has wider obligations in relation to the protection of public health and reduction of greenhouse gas emissions. There is increasing evidence that the health impacts of NO_2 may be greater than previously been recognised[2].

Based on national estimates, pro rata, between 94 and 163 people die prematurely in York each year due to the impacts of poor air quality[3]. This is more than the combined estimate of those who die prematurely from obesity and road accidents. Public health framework indicator 3.01 states that the fraction of mortality in York attributable to anthropogenic (man-made) $PM_{2.5}$ particulate air pollution is 4.8% of all deaths (82 deaths). The average for this indicator across England is 5.1%.

It is widely accepted that fine particulate matter has a significant impact on both morbidity and mortality[4] and diesel emissions have been classified as carcinogenic by the International Agency for Research on Cancer[5] (part of the World Health Organisation)[6]. There is particular concern about the 'black carbon' fraction of particulate matter due to its health impacts, and its strong ability to absorb light energy and increase global warming. Black carbon emissions in urban environments arise predominantly from diesel transport, but are also a product of biomass combustion, used increasingly for energy production and space heating.

Emissions of oxides of nitrogen (NO_x) and man-made particulate must be reduced to meet the health based national air quality objectives in York and improve public health. The main source of NO_x and man-made particulate in York is traffic, particularly diesel vehicles.

Improving Air Quality in York – Progress to date

CYC has previously produced two AQAPs in 2004 and 2006. These were primarily modal shift and congestion reduction based plans with an emphasis on reducing vehicle trips.

Despite the introduction of the two AQAPs, air quality in York continued to deteriorate between 2004 and 2010. In response, York published an overarching Low Emission Strategy in 2012. This document was the first of its kind in the UK and set out a new approach to local air quality management based on reducing tailpipe emissions from individual vehicles. The approach seeks to encourage the uptake of alternative fuels and low emission vehicle technologies, and to ensure that all

[2] Statement on the evidence for the effects of nitrogen dioxide, COMEAP (2015)
[3] Committee on medical effects of air pollution (COMEAP, 2009) estimate 29,000 premature deaths each year in UK. Environmental Audit committee estimate up to 50,000 premature deaths (Environmental Audit Committee Report, March 2010). UK population in 2010 - 62,262,000, York population in 2010 – 202,400 (Office of National Statistics 2011)
[4] The mortality effects of long term exposure to particulate air pollution in the UK, COMEAP (2010)
[5] IARC No 213, June 2012
[6] Statement on the evidence for the effects of nitrogen dioxide, COMEAP (2015)

vehicles are well maintained and driven as efficiently as possible. It is particularly effective at tackling emissions from essential service vehicles such as buses, taxis and HGVs which fall outside the scope of trip reduction based modal shift improvement measures.

Modal shift and congestion reduction measures remain fundamental to the delivery of air quality improvement and emission reduction in York. The primary local delivery programmes for these measures are the Local Transport Plan (LTP3) and the I-Travel York (Local Sustainable Transport Fund (LSTF) programme). These programmes include many measures to encourage the uptake of walking, cycling and public transport in the city. They are supported by planning policies that ensure sustainable travel is embedded into all new developments in York.

It is intended that York's congestion reduction and sustainable transport measures will be enhanced, but not replaced, by the low emission technology and eco-driving measures included in AQAP3.

AQAP3 aims

AQAP3 has four main aims:

1. To achieve compliance with the health based national air quality objectives at all relevant locations in York
2. To prevent the need for further AQMA declarations.
3. To allow eventual revocation of all current AQMAs.
4. To minimise emissions to air across the whole York area to prevent further background 'emission creep'[7] and improve public health outcomes.

The AQMAs to be addressed by the plan are:

- **AQMA order number 2**
  A19 south (including Fulford Main Street) (April 2010)
- **AQMA order number 3**
  Salisbury Terrace and surrounding areas (May 2012)
- **AQMA order number 4**
  City Centre AQMA (July 2012) (revoked and replaced AQMA order number 1)

AQMA orders 2 and 3 declared due to exceedance of the health based annual average objective for NO_2.

AQMA order number 4 declared due to exceedance of the long term annual average NO_2 objective and the short term hourly NO_2 objective.

[7] A continuous and gradual increase in emissions across the city due to the cumulative impact of ongoing development

Drivers for AQAP3 development

AQAP3 builds upon and replaces all previous AQAPs for York. The development of AQAP3 has been driven mainly by:

- The failure of current vehicle emission standards ('Euro' standards) to deliver the level of NO_x reduction expected at the time AQAP2 was developed.
- The increasing number of diesel vehicles in York (which have increased primary emissions of NO_2 and carcinogenic diesel particulate)
- The need to manage development related 'emission creep'
- The need to reduce unnecessary vehicle idling

These factors are primarily responsible for the continued existence of elevated NO_2 concentrations in York and the main reasons for the current AQMA declarations.

Whilst emission reduction and prevention is the main aim of AQAP3, there is an increasing body of evidence to show that in some circumstances green infrastructure can help to reduce the impact of air pollution. In direct response to the public consultation on AQAP3, this final version acknowledges the contribution green infrastructure can make towards air quality improvement.

AQAP3 development process

The measures in AQAP3 are drawn mainly from York's Local Transport Plan (LTP3) and Low Emission Strategy (LES). Both documents were developed by internal officer working groups and have been subject to public consultation.

The AQAP3 development process has focussed on:

- Obtaining a better understanding of emission sources and traffic compositions within York's AQMAs
- Assessing the level of NO_2 and NO_x reduction needed within the AQMAs
- Undertaking feasibility studies to assess the cost benefit of low emission options and using the results of this work to further refine ideas and aspirations included in LTP3 and the LES
- Developing timescales and assigning responsibilities for the delivery of AQAP3 measures
- Assessing the potential for compliance with the health based national air quality objectives as a result of implementing the AQAP3 measures
- Developing targets and indicators against which to monitor delivery and success of the AQAP3 measures

AQAP3 has been developed in conjunction with the following CYC plans and policies:

- **York's Sustainable Community Strategy** - *'Strategy for York'* and accompanying '*City Action Plan'*
    - This covers the issues that affect people's lives and can be divided into seven areas covering the creation of a sustainable, thriving, learning, cultural, safe, healthy and inclusive city. Delivering air quality improvement and carbon reduction are key elements for delivery of the SCS vision
- **Draft Council Plan (2015 - 2019) –** sets out the Council's priorities until 2019. AQAP3 will contribute towards the draft council plan by:
    - Improving air quality
    - Helping residents to live healthy lives
    - Encouraging and supporting a green economy
    - Providing efficient and affordable transport links
    - Helping to deliver an environmentally sustainable city
    - Protecting York's unique heritage
- **York's Health and Well Being Strategy (2013 to 2016) -** a plan to help people living and working in York live full, healthy and happy lives.
- **City of York Council's third Local Transport Plan (LTP3) (2011)** - sets out the transport policies and measures that will contribute to the city's economic prosperity over the next 20 years, whilst meeting challenging national and local targets for reducing emissions.
- **City of York Council's overarching Low Emission Strategy (October 2012)** – sets out additional technology based emission reduction measures for York. It builds upon the emission reduction measures contained in LTP3, Climate Change Framework and Action Plan (CCFAP) and previous AQAPs.
- **City of York Council emerging draft Local Plan –** York is currently developing a new citywide Local Plan that will help shape future development in York up to 2030 and beyond.
- **Climate Change Framework and Action Plan (2010) –** sets out measures to be taken to reduce carbon emissions and tackle climate change in York (currently under review)

Summary of AQAP3 measures

AQAP3 must:

(a) Tackle as a priority the disproportionate impact that buses and HGVs have on air quality in the city by:

- Rapidly reducing the number of diesel buses operating in the city (whilst maintaining current or better levels of service)
- Tackling unnecessary idling emissions
- Providing funding opportunities and infrastructure to allow vehicle operators to switch to alternative fuels (e.g. electric, CNG / biomethane)
- Progressing delivery of a freight transhipment centre to reduce the number of diesel HGVs entering the city centre
- Providing recognition and reward to those operators that lead by example

(b) Encourage and incentivise the use of low emission taxis

(c) Ensure CYC continues to lead by example by undertaking further emission reduction measures within its own fleet

(d) Minimise further increases in emissions as the result of future development (by requiring greater emission mitigation by developers)

(e) Encourage and facilitate a reduction in the number of diesel vehicles used by individuals and other private fleets by:

- Linking and highlighting the emission consequences of vehicle choice and driving style to impacts on public health
- Providing information, advice and training to help people make more informed vehicle purchase / lease choices and drive more responsibly (eco-driver training)
- Providing access to grants and other incentives to support cleaner vehicle choice by the general public and other fleets
- Providing easy public access to alternative refuelling and recharging infrastructure
- Recognising and rewarding those who lead by example

(f) Continue to support modal shift and network improvement measures

(g) Continue to minimise emissions from sources other than traffic (through continued enforcement of smoke control legislation and regulation of industries which emit significant levels of pollutants to air)

(h) Use green infrastructure to help remove pollution from the atmosphere

AQAP3 must also continue to recognise the important role climate change policies have in delivering air quality improvements and identify how air quality improvement policies can help to support economic growth and job creation.

Summary of AQAP3 measures

Number	Measure	AQMAs where emissions are expected to reduce due to measure			Timescale
Direct actions that can be implemented now to reduce emissions from existing vehicles					
1	a. Development of a Clean Air Zone (CAZ); b. Implementation of a CAZ	City Centre	Fulford	Salisbury Terrace	2015 2018
2	Development and implementation of anti-idling measures	City Centre			2015 to 2016
3	Further development of Eco-stars fleet recognition scheme	City Centre	Fulford	Salisbury Terrace	ongoing
Plans and actions that will be implemented over the next 6 years to reduce emissions					
4	Planning and delivery of CNG refuelling infrastructure in York	City Centre	Fulford	Salisbury Terrace	ongoing
5	Reducing emissions from freight	City Centre	Fulford	Salisbury Terrace	ongoing
6	Development and implantation of LES based planning guidance	City Centre	Fulford	Salisbury Terrace	2015 to 2016
7	Reducing emissions from taxis	City Centre	Fulford	Salisbury Terrace	ongoing
8	Planning and delivery of a strategic EV charging network	City Centre	Fulford	Salisbury Terrace	ongoing
9	Reducing emissions from CYC fleet	City Centre	Fulford	Salisbury Terrace	ongoing
Plans and action that will help to win 'hearts and minds' and encourage local engagement in AQAP3 delivery					
10	Marketing and communications strategy	Supports AQAP delivery	Supports AQAP delivery	Supports AQAP delivery	2016 onwards
11	Local incentives for low emission vehicles and alternative fuel use	City Centre	Fulford	Salisbury Terrace	2016 onwards
12	Attracting low emission industries, business and jobs to York	Supports AQAP delivery	Supports AQAP delivery	Supports AQAP delivery	ongoing
Plans and actions that will continue to tackle congestion and deliver sustainable transport improvements					
13	Modal shift and network improvement measures	City Centre	Fulford Salisbury Terrace		ongoing LTP3 and LSTF delivery
Plans and actions that will deliver other air quality improvement measures					
14	Regulation of industrial and domestic emissions	City Centre	Fulford	Salisbury Terrace	ongoing

15	Provide more green infrastructure in the city	Supports AQAP delivery	Supports AQAP delivery	Supports AQAP delivery	ongoing

Expected emission impact of AQAP3 and compliance with annual average NO_2 objective

AQAP3 aims to reduce all emissions to air with an emphasis on NO_2 and particulate emissions from traffic (especially diesel vehicles).

Reducing NO_2 is important to ensure compliance with the health based national air quality objectives for NO_2 that are currently breached in some areas of the city.

Minimising particulate emissions (especially PM_{10} and $PM_{2.5}$ arising from diesel vehicles) is essential for the longer term protection of public health and improvement in local health outcome indicators.

The exact emission impact of the air quality action plan is difficult to predict as there are many factors which may influence future emission levels in the city. These include:

- The extent to which the AQAP measures are delivered locally
- The real life on-road performance of individual vehicles on the road, especially in congested urban environments (compared with Euro emission standards for new vehicles which are tested under laboratory conditions under set drive cycles)
- The age and rate of replacement of vehicles in York compared with national averages
- Future trip demand on the York road network, influenced by factors such as the state of the economy and development allocations in the emerging draft local plan (currently unadopted and subject to further change)

Indicative predictions of future emissions in York in 2021 (with and without the AQAP3 measures in place) have been undertaken using:

- DEFRA's Low Emission Factor Toolkit – this enables predictions to be made about future vehicle emissions based on current and future Euro emission vehicle standards
- Locally collected traffic data relating to the age and type of vehicles currently operating in York
- Predictions of future traffic levels in York for 2021 (including development related traffic expected to arise from allocations in the draft Local Plan as it stood at the end of 2014)[8].

[8]. Based on total projected long term development targets of an additional 17,503 residential units and 266466m^2 of employment use by 2031. For the 2021 modelling scenario it was assumed that only 8724 housing units and 115,506m^2 of employment use would have been delivered. The modelling also assumes delivery of a number of key transport projects by this date. Targets for new housing provision and site allocations are currently under review and are expected to be reduced. The traffic impact of new development in the city by 2021 is therefore likely to be lower than the modelling undertaken during the development of AQAP3 suggests. New emission reduction figures for AQAP3 will be calculated once revised traffic growth figures for the city become available and these may show compliance with the air quality objectives at all locations in the city by 2021.

- Assumptions about the number of ultra low emission vehicles operating in the city by 2021 based on upper and lower estimates of what the AQAP3 measures may deliver in terms of local fleet changes

Assuming that all vehicles operating in York meet current and future national emission standards[9], and that all the AQAP3 measures are delivered in full, it is anticipated that by 2021 there could be up to a 47% reduction in NO_x emissions and a 16% reduction in PM_{10} emissions in York by 2021. This level of emission reduction should be enough to deliver the health based national air quality objectives for NO_2 in all but one of the current AQMA technical breach areas by 2021.

The possible exception to this is Nunnery Lane where the current emissions modelling data suggests that the low emission measures in AQAP3 will not be enough to completely off-set the current predicted development led traffic growth in this area (expected under the emerging draft Local Plan proposals as they stood at the end of 2014). If the housing delivery rates in final Local Plan are lower than those assumed in the current emissions modelling work then the AQAP3 measures may also be able to deliver compliance with the health based air quality objectives in Nunnery Lane. This will however depend on the final allocation of development sites and how fast they are brought forward for development.

The emissions modelling work for AQAP3 will be updated once the emerging draft Local Plan has been finalised and revised traffic growth data for the city becomes available.

Further details on the emission modelling assumptions and outputs can be found in Chapter 8 of the main report.

Recent monitoring results for the Nunnery Lane AQMA indicate that the majority of the area (including Bishopthorpe Road and Scarcroft Road) currently meets the air quality objectives. There are two remaining 'hotspots' on Nunnery Lane and Prices Lane where very slight exceedances of the annual average NO_2 objective have been recorded in recent years (up to 42µg/m^3). This is due to the regular occurrence of queuing traffic and poor dispersion in these two particular locations.

[9] Recent evidence suggests that 'on-road' emissions from many vehicles, particularly current Euro V diesel cars may be considerably higher than national emission factors used in the York modelling work suggest. This is further exacerbated due to the recent discovery of emission test 'defeat' devices in some vehicles. As stated in the recent consultation on the National Air Quality Action Plan (September 2015) the government is to take steps to remedy this situation as soon as possible. York will need to further assess the impact of the AQAP3 measures if new emission factors for 'in-use' vehicles are provided in the future.

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Introduction

1.0 Background to AQAP3

York currently has 3 Air Quality Management Areas (AQMAs), declared due to exceedances of the health based national air quality objectives for nitrogen dioxide (NO_2). CYC has a statutory duty to try to reduce NO_2 concentrations within the AQMAs, but also has wider obligations in relation to the protection of public health and reduction of greenhouse gas emissions.

Public health framework indicator 3.01 states that the fraction of mortality in York attributable to anthropogenic (man-made) $PM_{2.5}$ particulate air pollution is 4.8% of all deaths (82 deaths). This means that between 94 and 163 people die prematurely in York each year due to the impacts of poor air quality[10]. This is more than the combined estimate of those who die prematurely from obesity and road accidents.

Diesel emissions have been classified as carcinogenic by the International Agency for Research on Cancer[11] (part of the World Health Organisation) and there is growing evidence that the health impacts of NO_2 may be greater than previously recognised[12]. There is particular concern about the 'black carbon' fraction of particulate matter due to its health impacts, and its strong ability to absorb light energy and increase global warming. Black carbon emissions in urban environments arise predominantly from diesel transport, but are also produced by biomass combustion, used increasingly for energy production and space heating.

Therefore emissions from vehicles (particularly diesel vehicles) must be reduced to meet the health based national air quality objectives in York and improve and protect public health.

CYC has previously produced two AQAPs (2004 and 2006). These were primarily modal shift and congestion reduction based plans with an emphasis on reducing vehicle trips. Despite these AQAPs, air quality in York continued to steadily deteriorate between 2004 and 2010. To address this, York published an overarching Low Emission Strategy in 2012 setting out a new approach to local air quality management based on reducing tailpipe emissions from individual vehicles.

The LES approach seeks to encourage the uptake of alternative fuels and low emission vehicle technologies and to ensure that all vehicles are well maintained and are driven as efficiently as possible. It is particularly effective at tackling emissions from essential service vehicles such as buses, taxis and HGVs which fall outside the scope of trip reduction based modal shift improvement measures.

This new AQAP (AQAP3) sets out how York intends to continue to deliver its' ambitious and pioneering overarching Low Emission Strategy (LES), and to work

[10] Committee on medical effects of air pollution (COMEAP, 2009) estimate 29,000 premature deaths each year in UK. Environmental Audit committee estimate up to 50,000 premature deaths (Environmental Audit Committee Report, March 2010). UK population in 2010 - 62,262,000, York population in 2010 – 202,400 (Office of National Statistics 2011)

[11] IARC No 213, June 2012

[12] Statement on the evidence for the effects of nitrogen dioxide, COMEAP (2015)

towards becoming an internationally recognised ultra- low emission city. It has been prepared in line with CYC's statutory obligations under Section 84 [2] of the Environment Act 1995. It builds upon and replaces all previous AQAPs for York. The development of AQAP3 has been driven primarily by:

- The failure of current vehicle emission standards ('Euro' standards) to deliver the level of NO_x reduction expected at the time AQAP2 was developed.
- The increasing number of diesel vehicles in York (which have increased primary emissions of NO_2 and other carcinogenic diesel emissions)
- The need to manage development related 'emission creep'
- The need to reduce unnecessary vehicle idling

These are the main factors responsible for elevated NO_2 concentrations in York and the existence of the current AQMAs.

The AQAP3 measures have been drawn mainly from York's Local Transport Plan (LTP3) and Low Emission Strategy (LES). Both documents were originally developed by an internal officer working group and subject to widespread public consultation. The AQAP3 development process has concentrated mainly on refining timescales and responsibilities for delivery of air quality improvement measures, assessment of what the revised air quality improvement measures might achieve and development of suitable indicators against which to monitor progress.

Whilst emission reduction and prevention is the main aim of AQAP3, there is an increasing body of evidence to show that in some circumstances green infrastructure can help to reduce the impact of air pollution. In direct response to public consultation on AQAP3, this final version acknowledges the contribution green infrastructure can make towards air quality improvement.

1.1 Report Content and Structure

AQAP3 has been developed with due regard to DEFRA Policy Guidance note LAQM.PG(09). This states that as a minimum an AQAP is expected to include the following:

- quantification of the source contributions to the predicted exceedences of the relevant health based objectives; this will allow the Action Plan measures to be effectively targeted;
- evidence that all available options have been considered;
- information on how the local authority will use its powers and also work in conjunction with other organisations in pursuit of the health based air quality objectives;
- clear timescales in which the authority and other organisations and agencies propose to implement the measures within its plan;
- 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 health based air quality objectives. Where feasible, data on emissions could be included as well as data on concentrations where possible; and

- how the council intends to monitor and evaluate the effectiveness of the plan.

The remainder of this report is structured as follows:

- **Chapter 2** provides a brief overview of the review and assessment process in York, the declaration of the AQMAs and a summary of the existing plans and strategies which may influence air quality within York;

- **Chapter 3** presents a summary of the source apportionment studies and detailed traffic counts undertaken since AQAP2. It includes results from a coupled traffic micro-simulation and emissions modelling studies undertaken by the University of Leeds

- **Chapter 4** summarises the required reduction in NO_2 concentrations and NO_x emissions within the AQMA areas

- **Chapter 5** describes the background to the development of AQAP3 including the development of previous AQAPs and York's Low Emission Strategy (LES)

- **Chapter 6** describes the additional feasibility and cost-benefit work undertaken to inform the development of AQAP3. It includes an overview of the Low Emission Zone (LEZ), anti-idling and electric bus feasibility studies.

- **Chapter 7** summarises the AQAP3 measures

- **Chapter 8** summarises the expected emission impact of the AQAP3 measures

- **Chapter 9** sets out the progress monitoring indicators for AQAP3 to be used in future progress reporting

- **Chapter 10** summarises the consultation exercise undertaken by CYC in relation to AQAP3

Air Quality Management in York

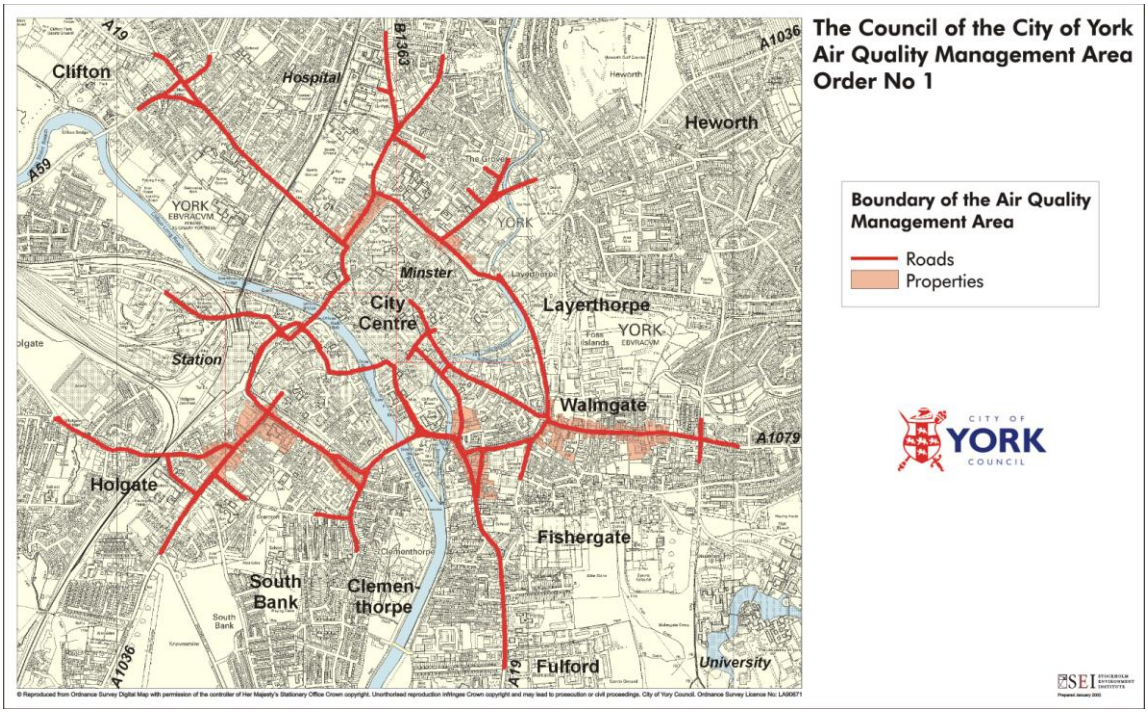
2.0 Review and Assessment in York

Air quality monitoring has been undertaken in York since 1999. In 2001 the Second and Third Stage Review and Assessment of Air Quality in York concluded that there were five areas of the city around the busy inner ring road where it was unlikely the health based long term objective for NO_2 would be met.

The long term annual average objective for NO_2 is aimed at protecting the most vulnerable members of society (the young, old and those already suffering from respiratory illnesses) from the long term (chronic) impacts of poor air quality. The five areas of 'technical' breach were incorporated into a single Air Quality Management Area (AQMA) declared in 2002.[13]

The extent of AQMA order no.1 is shown in Figure 1 below:

Figure 1: Extent of AQMA order no. 1



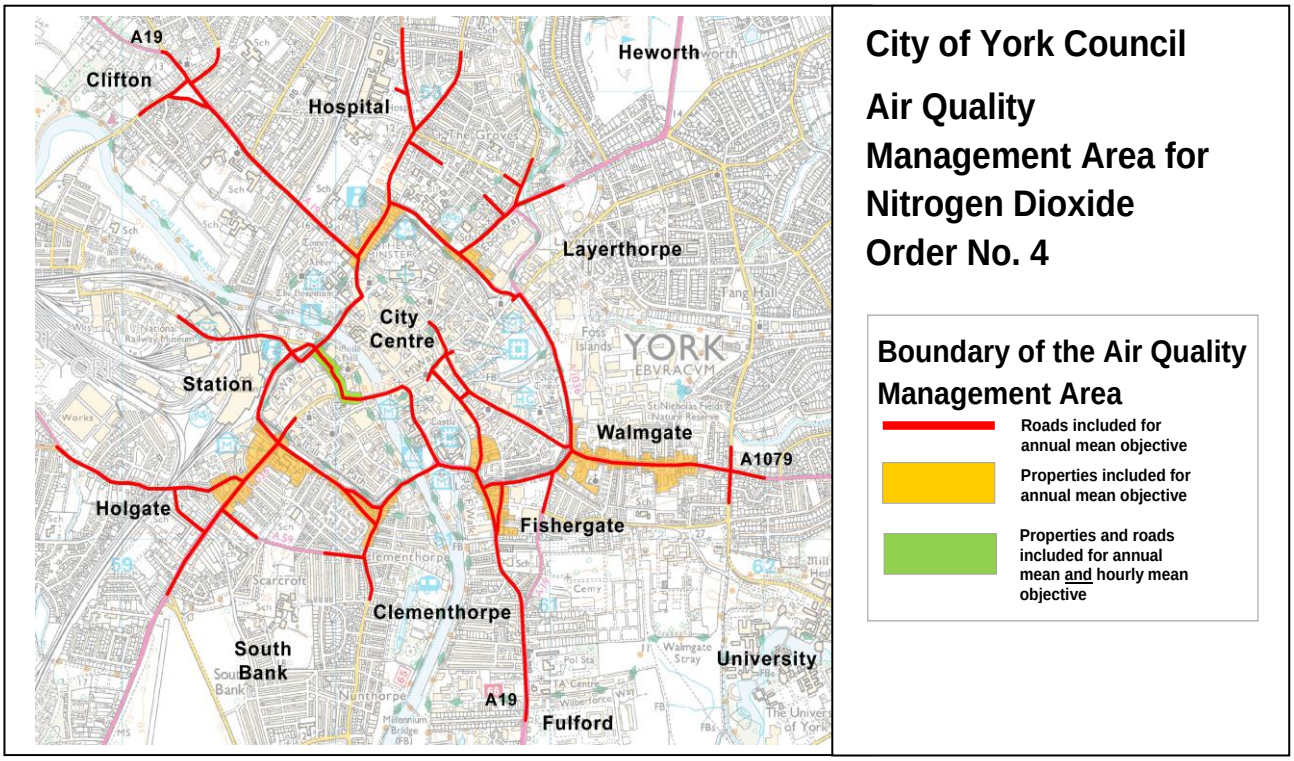
[13] *City of York Council Executive Meeting, 30th November 2001 – Agenda Item 8 Declaration of Air Quality Management Area(s)*

Within the five areas of technical breach 'relevant' locations[14] were included within the AQMA boundary. Outside the technical breach areas only the roads were included in the AQMA.

In April 2012 an Update and Screening report identified a number of additional relevant locations around the inner ring road that were breaching the health based annual average air quality objective for NO_2. Diffusion tube evidence also suggested that the health based hourly objective was being breached in some locations.

In September 2012 AQMA order no.1 was revoked and replaced with AQMA order no.4. The revised order reflects the wider area of the city centre now known to be affected by breaches of the health based annual average NO_2 objective and includes the additional areas where breaches of the hourly objective for NO_2 have been detected. The extent of AQMA order no.4 is shown in Figure 2.

Figure 2: AQMA order 4 (September 2012 - replaced AQMA order 1)



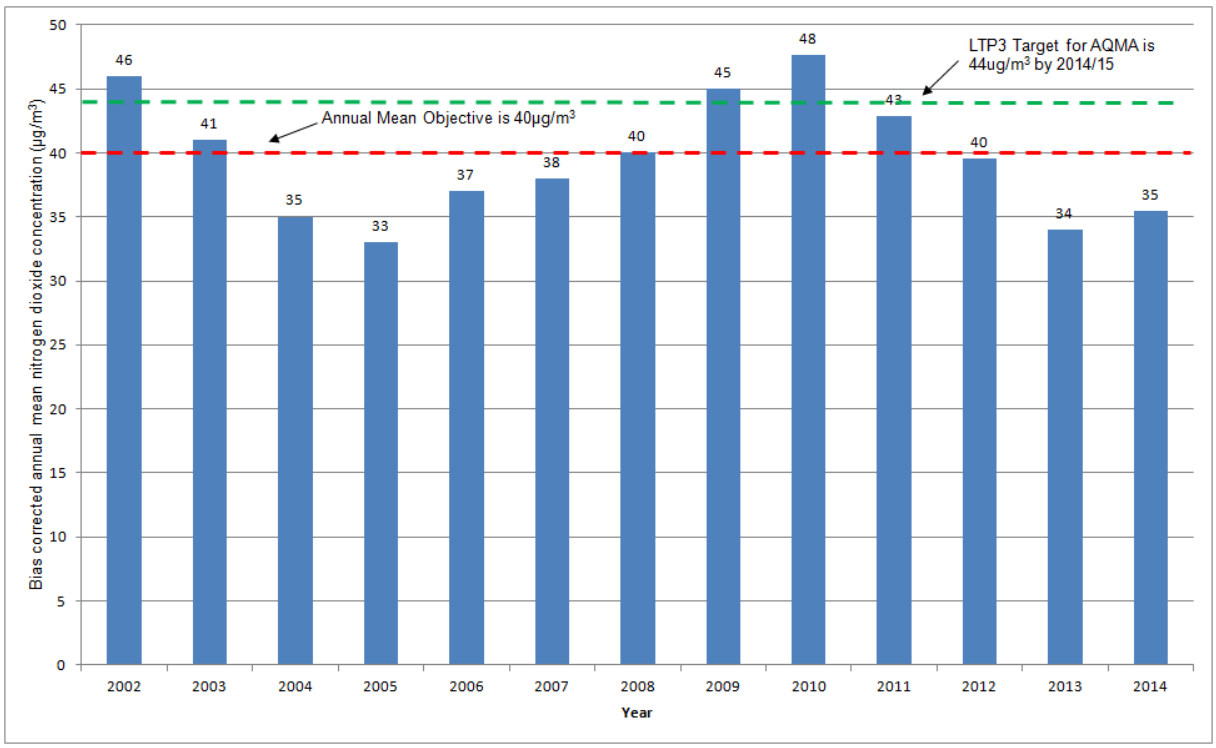
[14] 'Relevant' locations (for the purpose of the health based annual average NO_2 objective) are those places where members of the public are likely to be exposed to air pollution regularly over long periods of time. This includes residential property and other buildings such as nursing homes and schools . Places of work, such as offices, do not fall into the definition of 'relevant locations' unless there is frequent public access. Outside the technical breach areas only roads were included in the AQMA.

2.1 Recent trends in city centre AQMA

Following the declaration of the city centre AQMA in 2002, annual average concentrations of NO_2 in the city centre reduced (Figure 3). This decline continued until 2006 when concentrations started to rise again year on year. This continued until 2010. Data for 2011, 2012 and 2013 showed a general improvement in air quality with levels in 2013 falling to levels similar to those in 2005. The 2014 data showed a very slight increase compared with 2013 but the change was within the margin of error for the monitoring method. It is too early to determine what the longer term air quality trend might be.

Air quality concentrations can be influenced by many factors including fluctuations in weather conditions and levels of economic activity / fuel use. Whilst in general air quality appears to be improving in York there are still a significant number of individual locations within the city centre AQMA where both the health based annual and hourly objectives for NO_2 are exceeded[15].

Figure 3: Average concentrations of NO_2 in city centre (2002 – 2014)



[15] City of York Council Update and Screening Report 2015

2.2 Other AQMA declarations in York

In April 2010 a further AQMA was declared along the A19 corridor to the south of the city (Figure 4). This followed repeated exceedances of the health based annual average NO_2 objective on Main Street, Fulford. Another AQMA was declared for NO_2 on Salisbury Terrace in 2012 (Figure 5).

Figure 6 summarises NO_2 concentrations in each of York's technical breach areas between 2010 and 2014.

Between 2010 and 2013 there appears to have been a general reduction in NO_2 concentrations within each of the technical breach areas. During 2014 some sites showed a slight increase compared with 2013 but in all cases the 2014 levels were well below those monitored in 2010.

There were no breaches of the health based annual average NO_2 air quality objective in the Fulford and Salisbury Terrace AQMAs during 2013 or 2014, but levels in these areas currently remain elevated. Monitoring continues in both these areas and the requirement for the AQMA orders in these areas will be reviewed again in 2016.

Figure 4: York's Second Air Quality Management Area (declared April 2010)

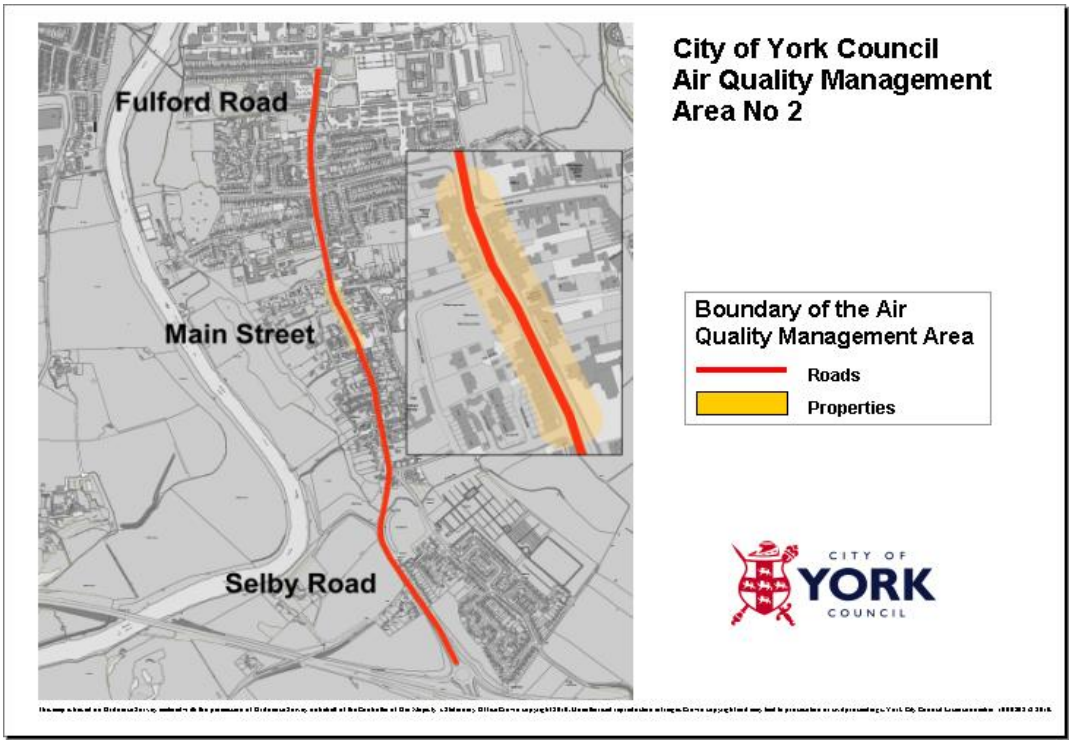


Figure 5: York's Third Air Quality Management Area (declared May 2012)

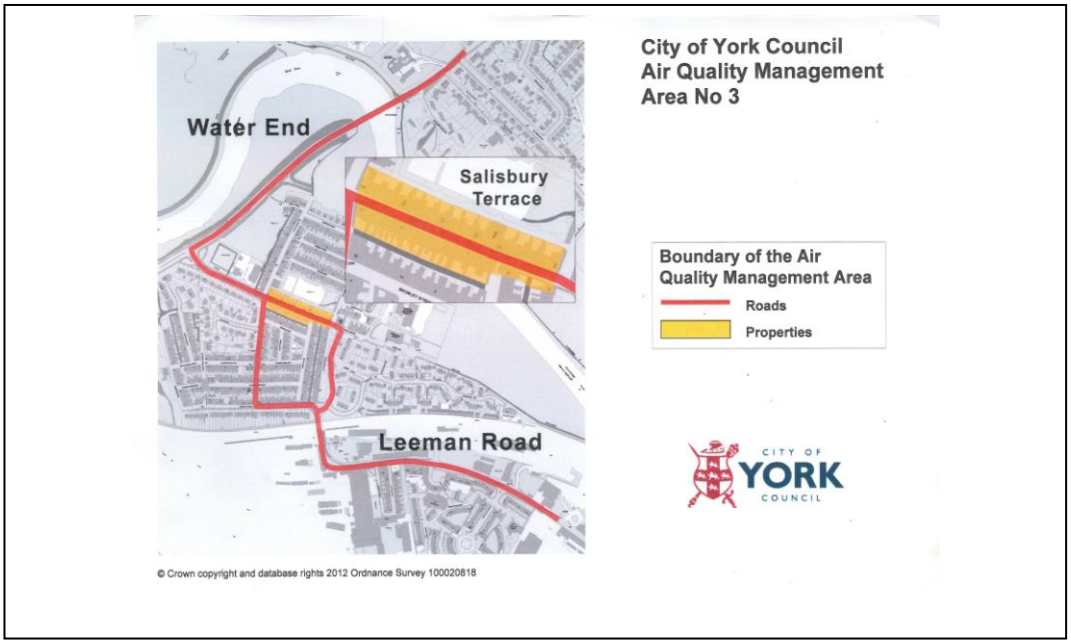
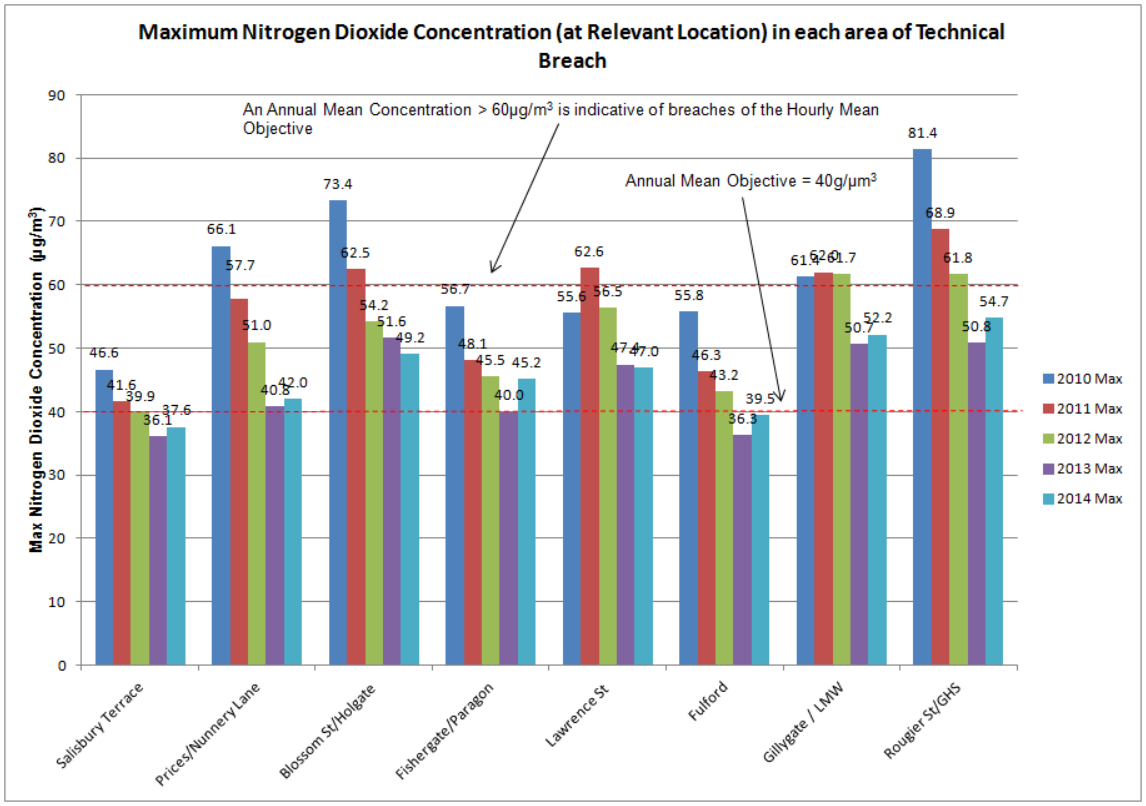


Figure 6: Air quality trends in York technical breach areas (2010 to 2014)



2.3 Existing Strategies and Policies

AQAP3 has been developed with due consideration to the following policies and strategies which have the potential to impact directly on York's air quality, and / or influence the scope of measures likely to be acceptable to the city.

2.3.1 The Strategy for York 2008 to 2025 - *A city making history*

York's Sustainable Community Strategy (SCS) '*A city making history'* is the overarching strategic plan for York. It provides a framework for every other strategy and plan that CYC puts in place setting out a long term vision for the city and a set of immediate priorities. Delivering air quality improvement and carbon reduction are key elements for delivery of the SCS vision

2.3.2 Draft Council Plan 2015 – 2019

The new draft Council Plan sets out the Council's priorities until 2019. AQAP3 will contribute towards the draft council plan by:

- Improving air quality
- Helping residents to live healthy lives
- Encouraging and supporting a green economy
- Providing efficient and affordable transport links
- Helping to deliver an environmentally sustainable city
- Helping to protect York's unique heritage

2.3.3 York's Health and Well Being Strategy (2013 to 2016)

This strategy aims to create '*a community where all residents enjoy long, healthy and independent lives'.* AQAP3 has an important role to play in delivering this vision by minimising and reducing public exposure to air pollutants and raising public awareness about the impacts of air pollution on health. AQAP3 will also help to ensure new developments provide a safe and healthy environment for occupants, support active travel initiatives and help to address health inequalities in the city.

2.3.4 York Low Emission Strategy

In 2012 CYC developed and adopted an 'overarching' Low Emission Strategy (LES) to holistically reduce air pollution and carbon emissions in the city . The LES built upon the existing congestion reduction and modal shift approach to air quality improvement in York, by encouraging the uptake of low emission fuels and technologies and encouraging better vehicle maintenance and driving techniques.

The York LES places a particular emphasis on reducing emissions from diesel vehicles, especially the heavy goods vehicles (HGVs), buses and taxis which form an essential part of York's transport network. Emissions from these vehicles can not

be dealt with effectively through modal shift. AQAP3 is the main delivery mechanism for the measures outlined in York's LES. Further information on the development of the LES is provided in chapter 5.

2.3.5 Local Transport Plan 2011-2031 (LTP3)

York's most recent LTP3 (2011-2031) (LTP3) is based around five themes:

- Theme 1 - Provide Quality Alternatives
- Theme 2 - Provide Strategic Links
- Theme 3 - Implement and Support Behavioural Change
- Theme 4 - Tackle Transport Emissions
- Theme 5 - Improve Public Streets and Spaces.

AQAP3 contains elements from each of these themes, particularly Theme 4 – Tackle transport emissions. This theme encompasses the actions required to reduce emissions of CO_2 and oxides of nitrogen (NO_x), particularly NO_2, attributable to transport. Together LTP3 and AQAP3 are the main delivery documents for York's LES.

2.3.6 Draft Local Plan

CYC is in the process of developing a new Local Plan that will respond to the issues facing York today. These include the need to improve local air quality and reduce climate change. The plan will reflect the city's economic ambitions and help to deliver its continued economic success, whilst building strong communities and protecting and enhancing its unique environment. AQAP3 contains a number of measures that relate directly to the new draft Local Plan. These include adoption of new LES planning guidance to ensure that the emission impacts of new development are adequately mitigated.

2.3.7 Climate Change Framework and Action Plan

York is committed to reducing carbon emissions and tackling the impacts of climate change. In addition to the statutory CO_2 reduction targets set out in the Climate Change Act (2008), York aims to reduce city-wide CO_2 emissions by 40% by 2020 and 80% by 2050.

To help residents and businesses play a vital role in tackling climate change, CYC and the local strategic partnership (Without Walls), have produced a Climate Change Framework and Action Plan (CCFAP) for York. The Climate Change Framework will enable York to accelerate actions over-time to reduce carbon emissions across the city. It demonstrates the actions already on-going and highlights the key areas the city needs to begin to drive forward for coordinated action to tackle climate change. The Climate Change Action Plan is currently being refreshed and will contain new actions to be delivered between 2015 and 2018. Whilst care has been taken to avoid unnecessary duplication between the CCFAP and AQAP3 there remain a number of areas of cross over between the two action plans and each must be implemented with due regard for the other.

Sources of nitrogen dioxide in York

3.0 Sources of nitrogen dioxide in York

Nitrogen dioxide arises from a number of different sources in York. These include:

- Localised 'point source' emissions: emissions from large industrial chimney stacks which can be quantified.
- Localised 'line source' emissions: transport related emissions arising mainly from road transport, but also including a small contribution from rail.
- Localised 'area source' emissions: emissions from domestic and commercial space heating, and any other source of emissions which arise locally that cannot be easily quantified.

During the development of York's previous AQAPs the computer model ADMS-Urban was used to estimate the contribution each type of source makes to total NO_2 concentrations in each of the city centre technical breach areas in York. These studies clearly identified traffic as the main source of NO_2 in the city centre with between 50 to 70% of NO_2 believed to be arising from transport in the city centre technical breach areas.

The contribution traffic makes to total NO_2 concentrations varies between locations depending on the proximity to other sources and the make up of the vehicle fleet in each area, for example some areas have a greater proportion of buses or HGVs than others. Determining which sources / vehicle types contribute the most to pollutant concentrations within AQMAs is an important aspect of air quality action planning as it allows the most important sources to be identified and appropriate improvement measures to be identified and assessed. Table 1 summarises previous source apportionment work.

Table 1: Source apportionment of nitrogen dioxide in the city centre AQMA technical breach areas

Technical breach area	Industry	Traffic	Other (including domestic and commercial space heating)
Gillygate	8%	58%	34%
Lawrence Street	4%	72%	24%
Holgate Road	4%	66%	30%
Nunnery Lane	4%	52%	44%
Fishergate	3%	57%	40%

Since the completion of AQAP2 (2006) there have been some changes to point source emission sources in the city. These include closure of British Sugar in 2007 and establishment of a number of small scale biomass heating plants at various locations around the city. These changes will have resulted in some small variations to the contribution industry makes to localised NO_2 concentrations, but overall traffic remains the greatest source of emissions in York and the main focus of AQAP3.

The source apportionment work undertaken in relation to the development of AQAP3 has concentrated on:

1. Detailed source apportionment studies for the most recently declared AQMAs at Fulford Road and Salisbury Terrace.
2. Obtaining a better understanding of the contribution individual vehicles make to air quality in the city taking into account their type, age, fuel use, abatement equipment and the way they are driven

3.1 Fulford Road source apportionment study

Following the declaration of an AQMA in Fulford in April 2010 a further assessment of air quality[16] was undertaken to:

- confirm the exceedence of the annual average health based objective for NO_2
- define what improvement in air quality and corresponding reduction in emissions was required to attain the health based objective
- provide information on source contributions.

The source apportionment study was undertaken in conjunction with Dr James Tate of the Institute of Transport Studies, University of Leeds, using a coupled traffic micro-simulation (PARAMICS) and emissions model (PHEM) to derive detailed traffic emission estimates for the area.

The traffic model was calibrated using ANPR traffic count data for the area (collected July 2010) and GPS tracking of real life vehicle movements through the area. The source apportionment study took into account regional background, local background and local emission sources. In November 2011 the source apportionment work was further updated to take account of more recent traffic counts (May 2011) and refinements to the modelling technique.

3.1.1 Results of Fulford Road source apportionment study

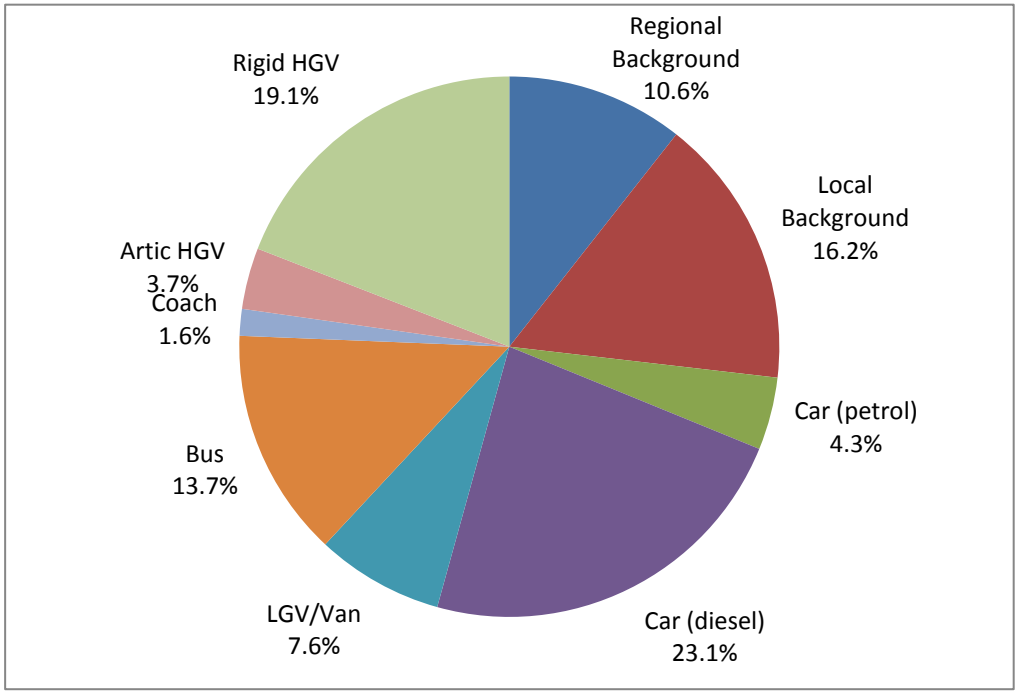
Figure 7 shows the results of the source apportionment undertaken for the Fulford AQMA in November 2011. This was undertaken in accordance with Example 7.1 in LAQM.TG(09).

Traffic emissions in Fulford are estimated to account for 73% of the total NO_2 concentration. This is slightly higher than for other parts of the city and reflects the lack of industrial emissions in this area and the smaller amounts of commercial activity.

[16] Further Assessment for Fulford Main Street, CYC, April 2011

Domestic emissions have the potential to influence NO_2 concentrations in Fulford as parts of the village are not covered by a smoke control order. However, observations of domestic smoke emissions and the results of a questionnaire about domestic fuel use in the area suggest this is unlikely to be a major contributor.

Figure 7: Apportioned local contributions to total NO_2 in Fulford (November 2011).



3.1.2 Impact of traffic emissions in Fulford

Figure 8 shows the daily average vehicle fleet proportions in Fulford recorded during traffic counts undertaken in May 2011. Passenger cars make up the majority of the vehicle fleet with petrol cars more prevalent than diesel. The percentages of buses and HGVs in the fleet are relatively small making up around 3% and 4% of the total fleet respectively.

Figure 9 shows the total NO_x and NO_2 emissions from different vehicle types in Fulford[17]

[17] calculated by the Institute of Transport Studies using the coupled traffic microsimulation and PHEM emissions model.

Figure 8: Daily average fleet proportions for Fulford (%)

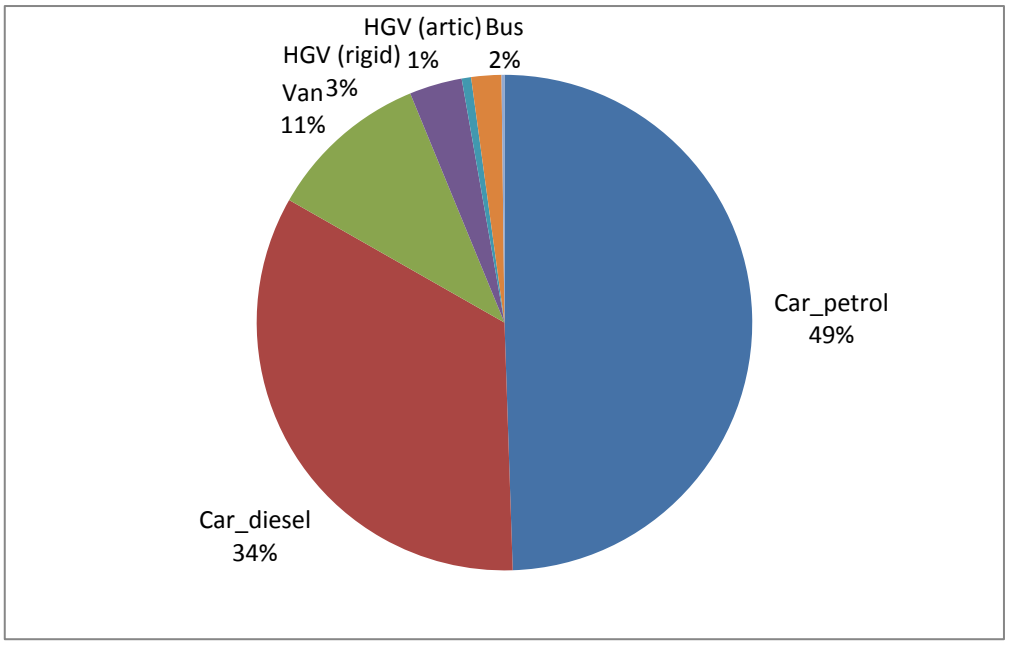
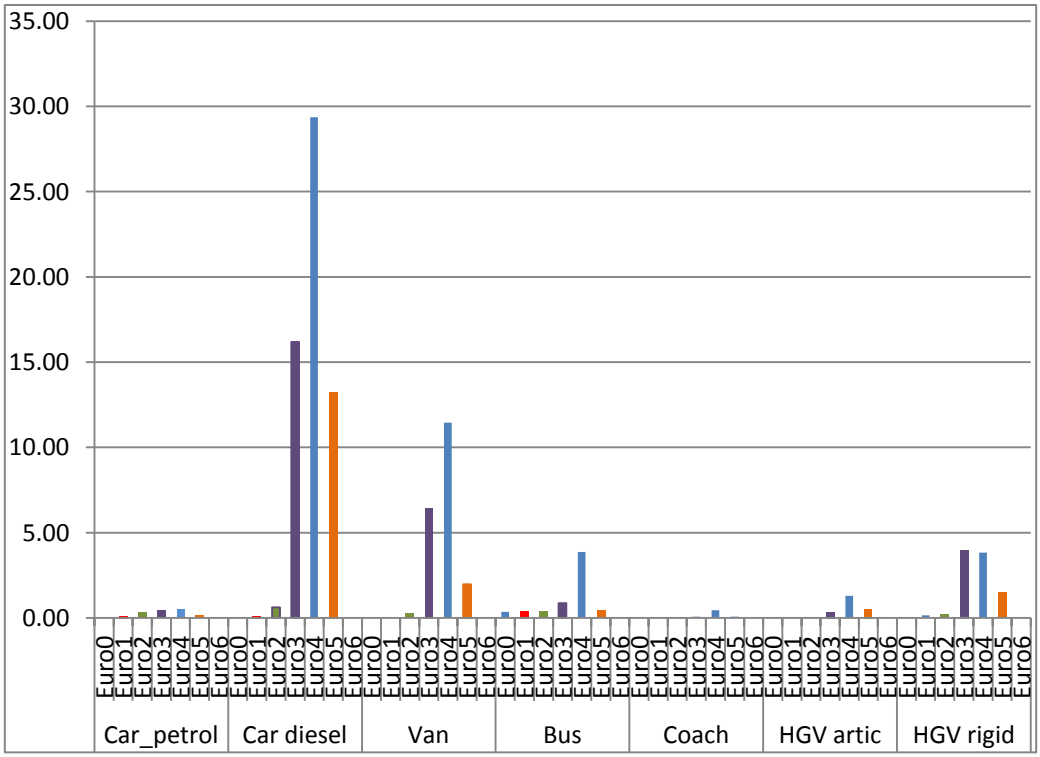


Figure 9: % contribution of individual vehicle types to total NO_2 emissions from traffic in Fulford (Nov 2011)



The majority of the traffic derived NO_2 emissions in Fulford can be attributed to diesel cars. Although diesel cars make up the minority of the total car fleet in Fulford, collectively they give rise to 40 times more NO_2 emissions than the petrol vehicles. Diesel cars produce more NO_2 than petrol equivalents and their emissions have been classified as carcinogenic.

Recent research clearly shows that NO_x emissions from diesel vehicles have not declined as expected with successive Euro standards[18] and that in many cases the fraction of NO_x emitted as primary NO_2 (directly from the tailpipe) has increased significantly. For passenger cars, emissions of NO_x from Euro 5 diesel cars are in many cases equivalent to those from pre-Euro vehicles (i.e. pre 1992 vehicles).

It has also been found that diesel cars emit increased emissions of NO_x with increasing power and engine capacity. The current trend is towards larger and more powerful diesel cars, particularly within taxi fleets that operate predominantly within city centre environments.

Under a '*business as usual'* scenario the emission impact of diesel cars is set to increase across York due to recent growth in diesel car sales. Interventions have been included in AQAP3 to try and off set and reduce the emission impact of diesel passenger cars. These include provision of infrastructure and incentives to encourage the uptake and use of electric and hybrid passenger cars. A particular emphasis has been placed on trying to reduce the number of diesel vehicles in the York taxi fleet as these vehicles operate predominantly in the city centre and generate a high number of trips through York's AQMAs.

Whilst cars are the main source of NO_2 in Fulford (due to their large numbers compared with other vehicle types) in terms of emissions per vehicle km travelled they are relatively low emitters.

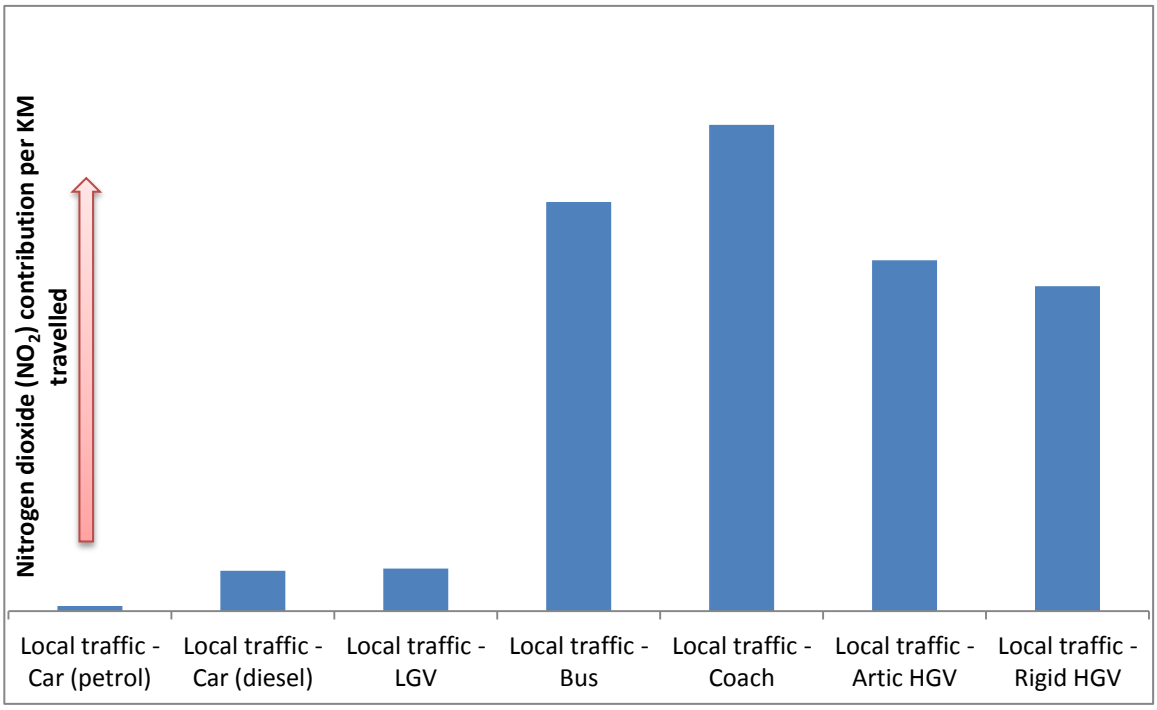
Buses, coaches and HGVs make up only small proportions of the total vehicle fleet in Fulford but their emission impact per vehicle km travelled is much greater than that of individual cars[19] (Figure 10). Due to their high emissions per km travelled buses, coaches and HGVs have a disproportional impact on local air quality compared to their prevalence in the vehicle fleet. Measures to reduce emissions from HGVs and buses are therefore also included in AQAP3. These include plans to introduce a Clean Air Zone (CAZ) for buses, the use of the Eco-stars scheme to promote cleaner HGV operations and longer term plans to establish a Compressed

[18] Remote sensing of NO_2 exhaust emissions from road vehicles (a report to DEFRA), Carslaw et al (April 2013)

[19] It is important to recognise that buses are capable of moving many more people per vehicle than a car and take up less space on the road than numerous private cars. The emission rate per passenger on a bus with high occupancy levels may be similar or even less than the emission rate per passenger for a car, but if bus occupancy rates are consistently low then the emission rate per passenger will go up substantially. As a scheduled bus service will operate irrespective of the number of passengers on board it is important to ensure that emissions from all buses are as low as they can possibly be at all times. Bus operators can therefore contribute twice to emission reduction strategies 1) By removing as many private car journeys from the road as possible; 2) By reducing their own emissions as far as possible

Natural Gas (CNG) refuelling station in the city along with a freight transhipment centre.

Figure 10: Relative NO_2 contribution per km travelled by vehicles in Fulford



3.2 Salisbury Terrace source apportionment study (November 2012)

Following the declaration of the AQMA in Salisbury Terrace in May 2012 a further assessment of air quality[20] was undertaken to:

- confirm the exceedence of the health based objective
- determine what improvement in air quality and corresponding reduction in emissions was required to attain the health based objective
- provide information on source contributions.

The methodology used for the Salisbury Terrace source apportionment work was a refined version of the coupled traffic micro-simulation and emissions model (PHEM) work undertaken for the Fulford AQMA. The traffic model was calibrated using ANPR traffic count data for the area (collected May 2011). As for Fulford the source apportionment study took into account regional background, local background and local emission sources.

[20] Further Assessment of Nitrogen Dioxide (NO_2) on Salisbury Terrace, CYC, November 2012

3.2.1 Results of Salisbury Terrace source apportionment study

Figure 11 shows the results of the source apportionment undertaken for the Salisbury Terrace AQMA. This was undertaken in accordance with Example 7.1 in LAQM.TG(09).

The source apportionment study for Salisbury Terrace shows that buses make a significant contribution to NO_2 concentrations in this area, significantly more than in Fulford. The Salisbury Terrace source apportionment work therefore built upon the Fulford Road coupled traffic and emissions modelling study with an emphasis on attributing emissions to individual bus types. Further details of this work can be found in the 'Further Assessment for Salisbury Terrace' submitted to DEFRA in November 2012.

3.2.2 Impact of traffic emissions in and around Salisbury Terrace

Figure 12 shows the average vehicle fleet proportions in the Salisbury Terrace area based on traffic counts undertaken in May 2011.

Like the Fulford study, passenger cars make up the majority of the vehicle fleet with petrol cars more prevalent than diesel. The percentages of buses and HGVs in the fleet were again relatively small (3% and 2% of the total fleet respectively).

Using the results from the coupled traffic micro-simulation and emissions model (PHEM) the contribution of individual vehicle types to total vehicle derived NO_2 have been calculated. These are shown in Figure 13.

Figure 11: Apportioned local contributions to total NO_2 in the Salisbury Terrace AQMA

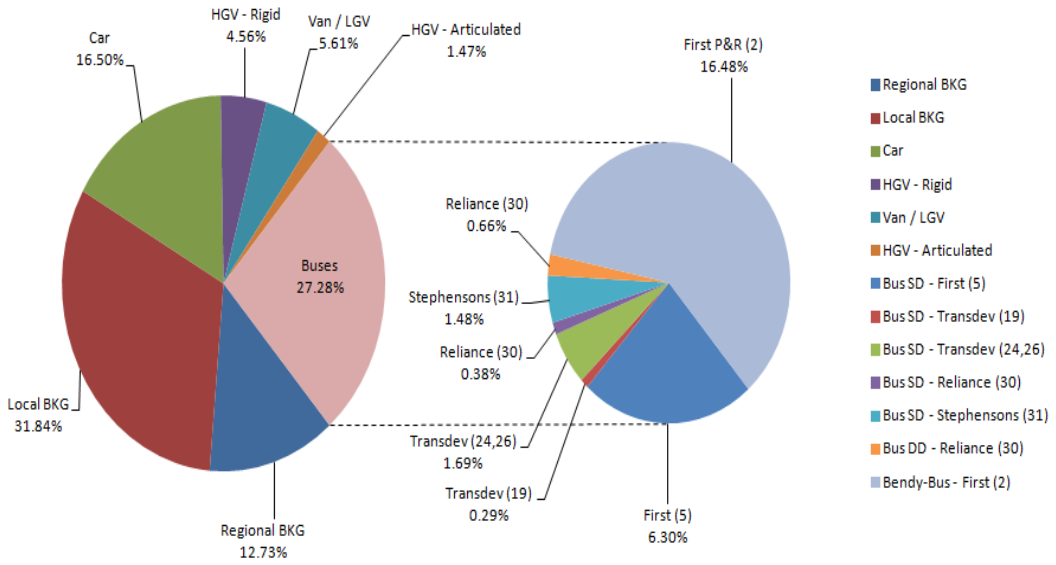


Figure 12: Vehicle fleet proportions in Salisbury Terrace and surrounding area (%)

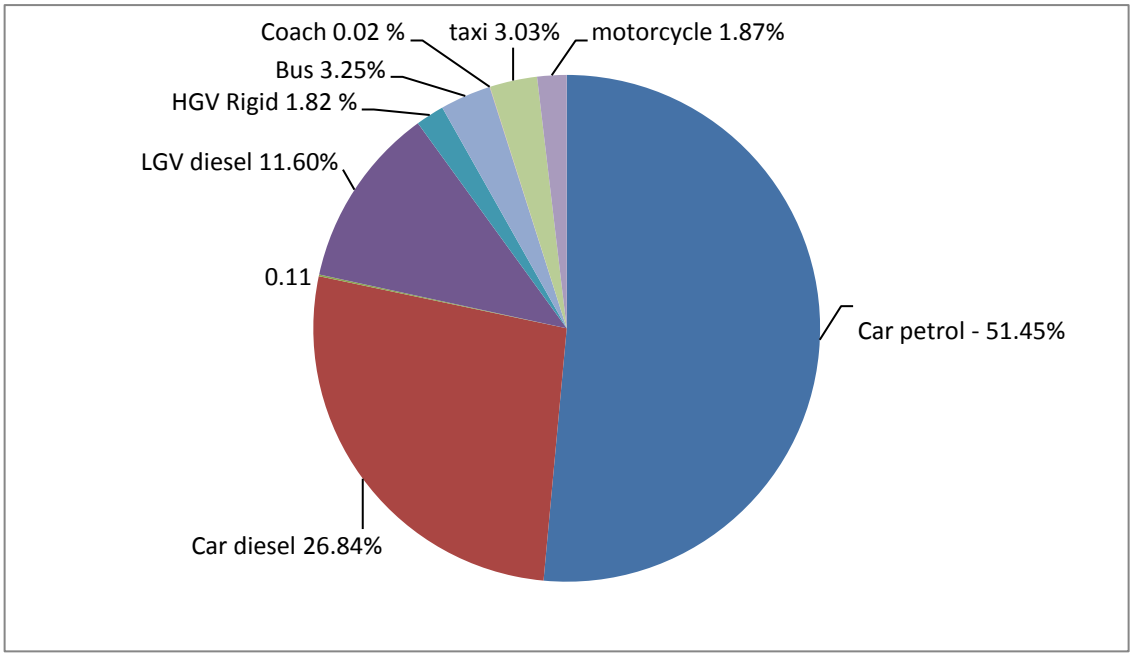
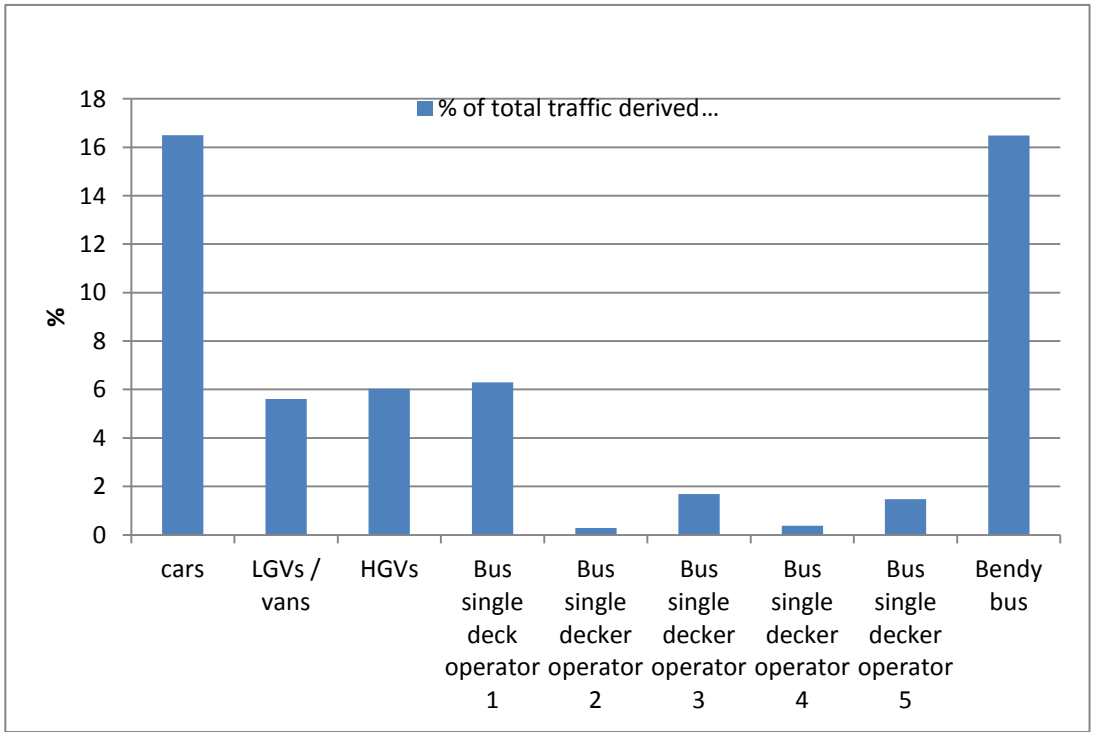


Figure 13: % contribution of individual vehicle types to total NO_2 from traffic in the Salisbury Terrace area



Although buses only make up approximately 3% of the vehicle fleet in this area they are responsible for 27% of the total traffic derived NO_2. This is more than the total contribution from cars (16.5%) even though cars make up over 78% of the vehicle fleet. A further analysis of the impact of individual bus services has identified Park & Ride bendy buses as the major contributor to traffic derived NO_2 in the Salisbury Terrace area, even though this service is operated by relatively new vehicles.

The Salisbury Terrace source apportionment study highlighted the importance of considering both the frequency and age of vehicles when developing AQAP measures. This approach forms the basis of the proposed Clean Air Zone (CAZ) which aims to convert the most frequent bus movements to electric by 2018. The first fully electric P&R service in York opened in June 2014 at Poppleton Bar and the second at Monks Cross in May 2015; other P&R services will be converted to electric as soon as possible, including the route through Salisbury Terrace.

3.3 Additional source data for York

In addition to the detailed source apportionment studies undertaken for the Fulford and Salisbury Terrace AQMAs, further analysis has been undertaken of traffic in all the York AQMAs for the purpose of informing the development of AQAP3.

In May 2011 CYC commissioned Nationwide Data Collection (NDC) to undertake manual classified counts (MCC) and ANPR (Automatic Number Plate Recognition) surveys at each of the following locations:

- MCC Site 1 – Gillygate
- MCC Site 2 – Lawrence Street
- MCC Site 3 – Blossom Street
- MCC Site 4 – Bishopgate Street
- MCC Site 5 – Paragon Street
- MCC Site 6 – Fishergate (N) /Fawcett Street (S)
- MCC Site 7 – Salisbury Street
- MCC Site 8 – Main Street, Fulford

The count locations are shown in Figure 14.

Figure 14: Location of manual classified counts (May 2011)

3.3.1 Summary results from manual and ANPR traffic counts (May 2011)

Figure 15 shows the mix of vehicles identified in each of the 8 locations.

Figure 16 shows the petrol to diesel split for each of the different vehicle types at the 8 locations.

Figures 17 a, b, c and d show the Euro standard mix across the main vehicle types in each of the count areas.

Figure 15: Vehicle mix at 8 locations in York (May 2011)

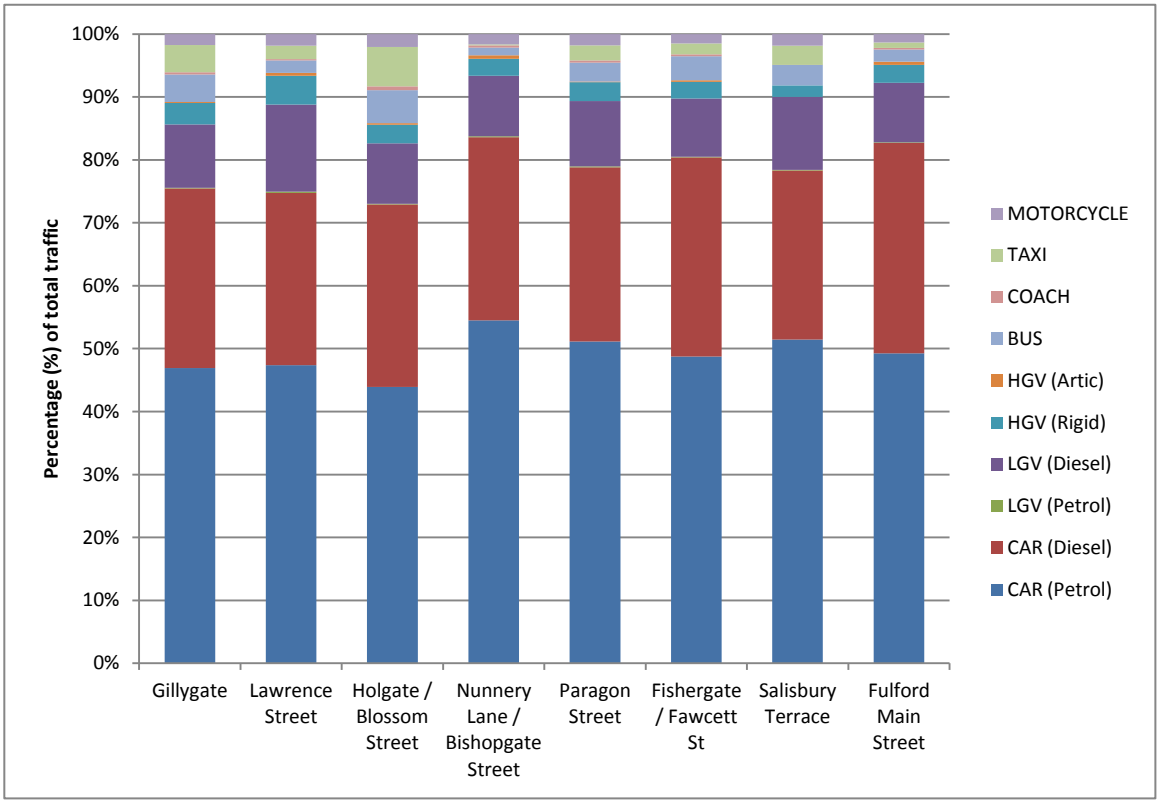


Figure 16: Petrol / diesel split across all vehicle types

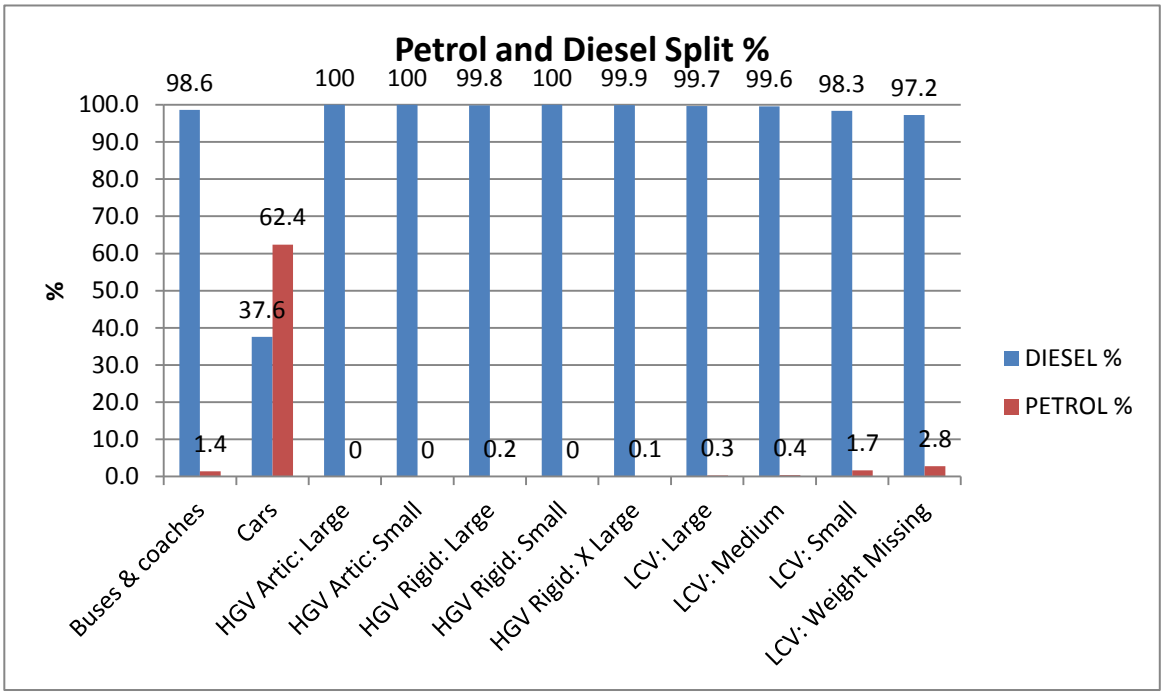


Figure 17(a): Euro classification of cars (petrol and diesel combined)

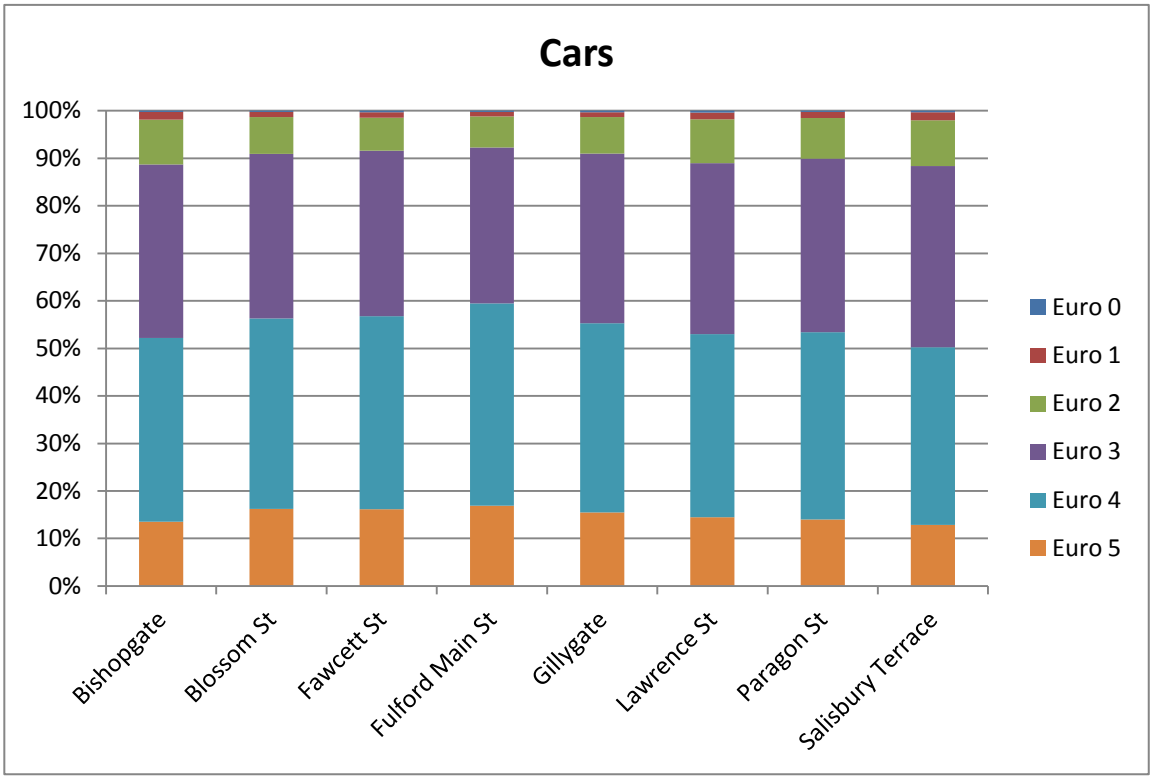


Figure 17(b): Euro classification of buses and coaches

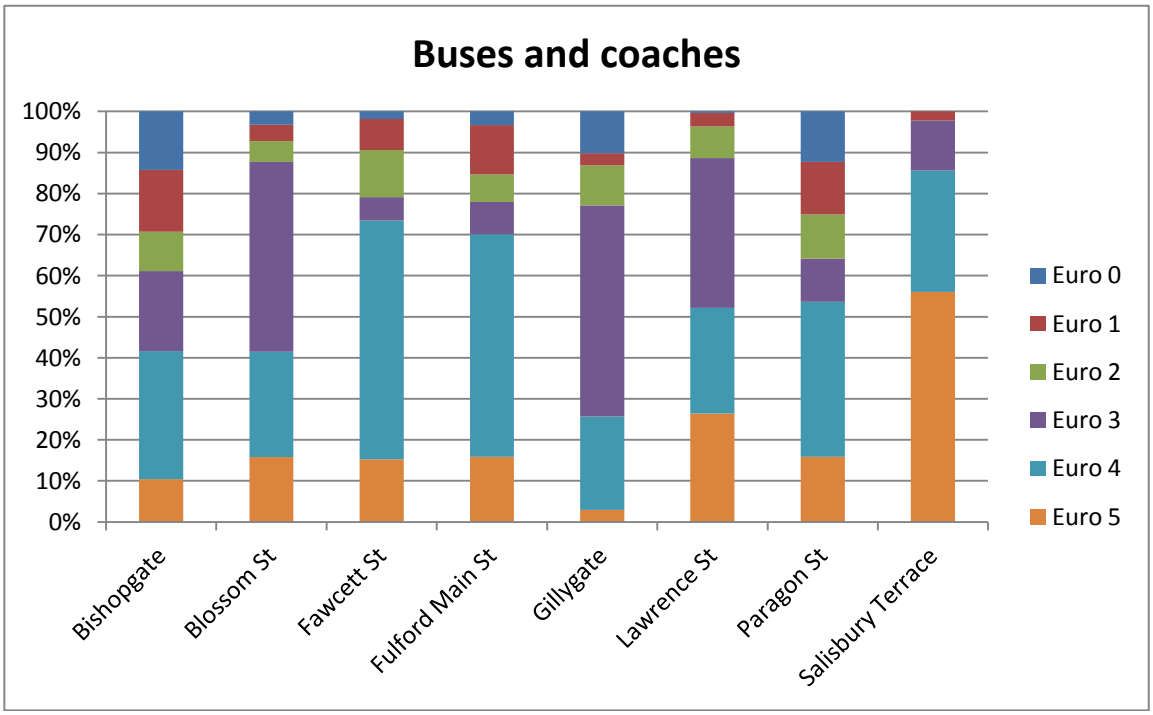


Figure 17(c): Euro classification of rigid HGVs

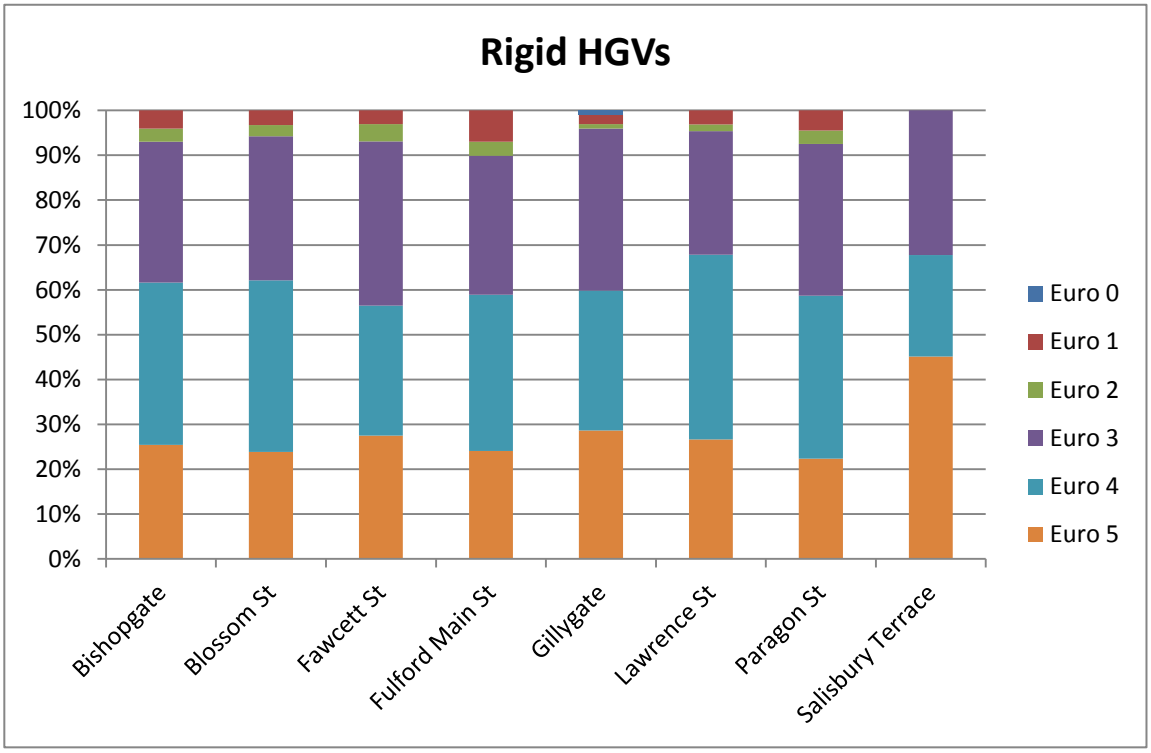
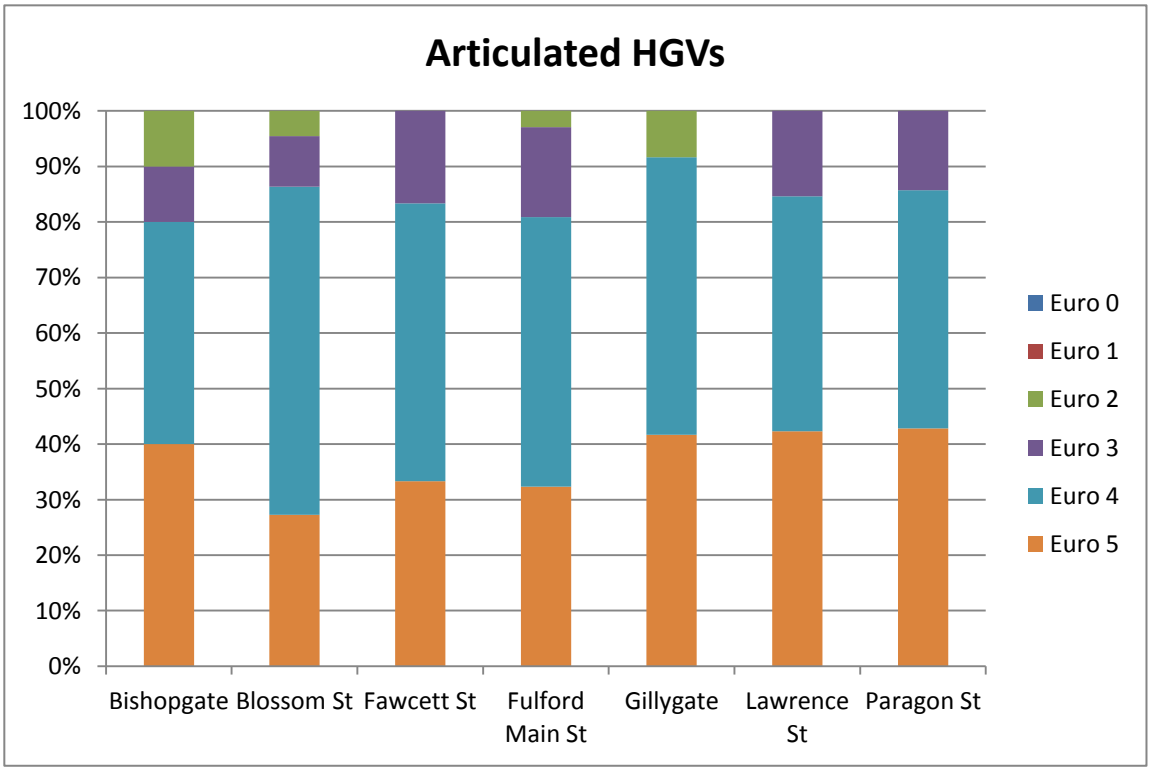


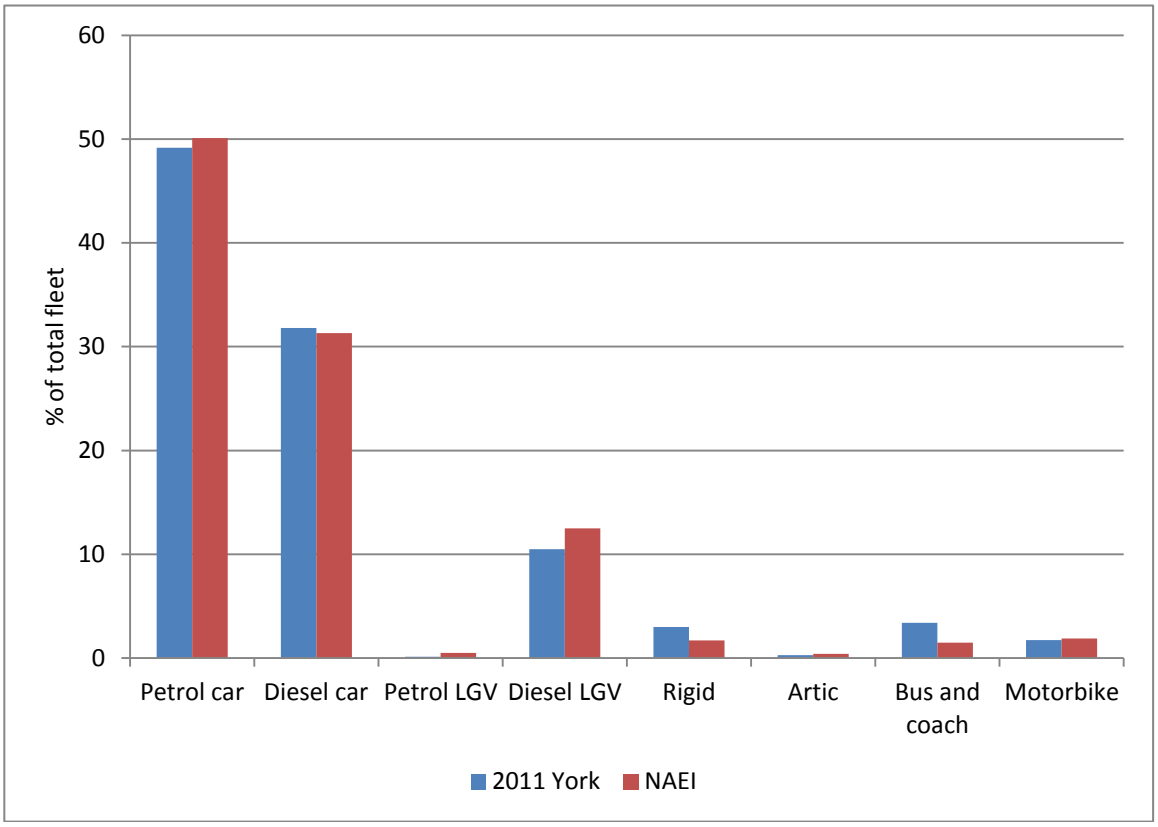
Figure 17(d): Euro classification of articulated HGVs



3.3.2 Comparison of York traffic data with NAEI statistics

To understand how traffic in York compares with that in other cities the 2011 traffic mix data for York has been compared with NAEI traffic data for 2011 (for urban centres outside London) (figure 18).

Figure 18: % of total traffic mix - York traffic data (2011) vs NAEI urban centres outside London (2011)



3.3.3 Comparison of York traffic data (2011) with previous York traffic data(2006)

To understand how traffic in York has changed in recent years, the 2011 traffic count data has been compared with similar data collected in York during 2006 (Figures 19 and 20).

Figure 19: % of total traffic mix for York traffic data (2006) compared with York data (2011)

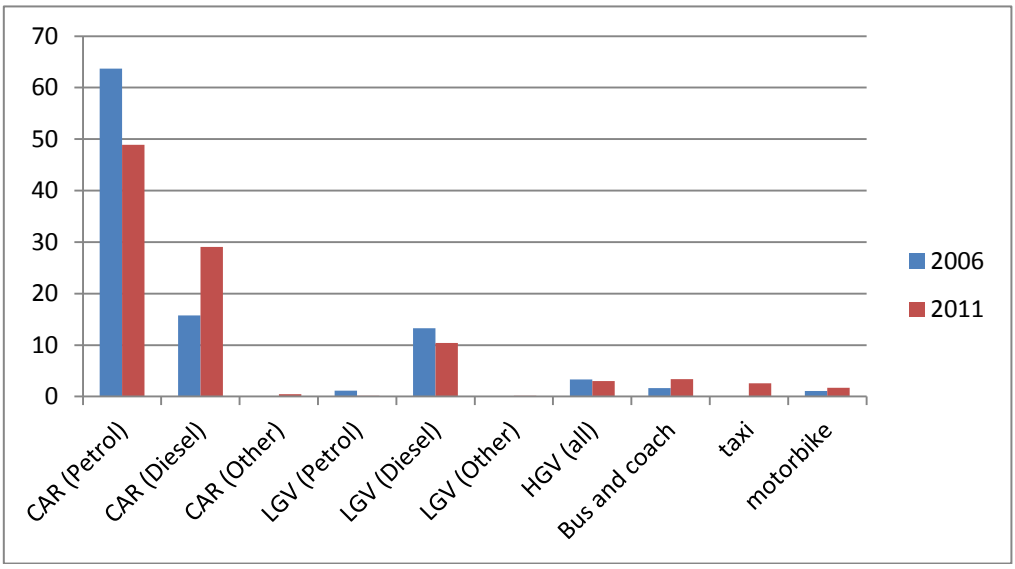
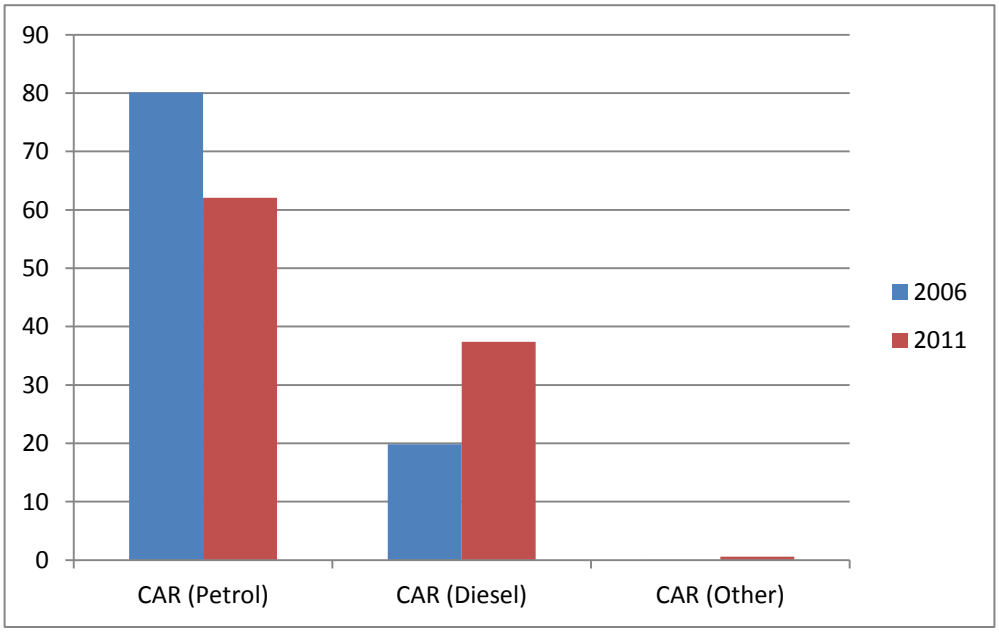


Figure 20: % petrol v diesel split (cars only) (York 2006 v York 2011)



3.4 Analysis of additional source data

3.4.1 General Fleet composition

The fleet composition in York varies between different locations. At all locations passenger cars make up the majority of the traffic (between 72 and 83%) with petrol cars making up the greatest proportion. The greatest variations in the percentage vehicle mix occur for buses and taxis which are more prevalent in some areas of the city than others.

The majority of cars operating in York are Euro 3 and Euro 4 with the next largest group being Euro 5. There are very few pre-Euro 2 cars operating in the city.

The Euro standard of buses operating in the city varies depending on the location. This reflects the tendency for bus operators to run specific vehicles on certain routes, the newer buses tending to be used on the most frequent and profitable routes.

There appears to be a higher proportion of Euro III buses operating through the Gillygate area than the other AQMAs, whilst Salisbury Terrace has a higher proportion of Euro V and VI buses than the other AQMA areas. However, as the Salisbury Terrace source apportionment work has clearly shown, the impact of buses on local air quality is determined by both the frequency and emission standard of the vehicles. It should not be assumed that a newer diesel bus fleet will automatically equate to improved air quality.

Fleet percentages and Euro standards of LGVs and HGVs are fairly consistent across the city. Articulated HGVs tend to be newer than rigid HGVs.

3.4.2 Comparison of York with national fleet

York has a slightly higher proportion of diesel cars, rigid HGVs and buses than other cities. As diesel vehicles are known to be significant emitters of primary NO_2 the above average numbers of these vehicles in York is likely to be contributing significantly to the city's air quality issues. The implementation of the low emission measures within York's AQAP3 will help to reduce the impact of diesel vehicles in the city and bring the proportion of diesel vehicles in the local fleet down to become more in line with national averages. In the longer term York would like to have a lower than average number of diesel vehicles operational in the city and above average numbers of alternatively fuelled vehicles.

3.4.3 Changes in the York vehicle fleet

The percentage of diesel cars in York has risen dramatically since 2006. In 2011 diesel cars made up 37.4% of the total car fleet compared with just 20% in 2006. The shift towards diesel cars is a national phenomenon driven by carbon based vehicle taxation policies and the car scrappage scheme. The latter resulted in many older petrol cars being replaced with new diesel vehicles. AQAP3 aims to address

the growth in diesel passenger cars by encouraging the uptake of lower emission alternatives such as battery operated electric cars and hybrids.

3.5 Summary of source emissions and priorities for AQAP3

York has higher than average proportions of diesel cars, HGVs and buses than other cities and the proportion of diesel cars in the fleet has increased significantly in recent years. The air quality issues in York's most recent AQMAs are due mainly to the influence of diesel car emissions and the frequency of bus movements. These are therefore priority areas for AQAP3.

HGVs generally have less of an impact on air quality in York's AQMAs than diesel cars and buses but on a km by km basis they still have a disproportional impact on NO_2 emissions across the wider York area. HGVs also contribute significantly to emissions of diesel particulate. York currently has a higher than average number of rigid HGVs operating in and around the city centre so additional AQAP3 measures have been developed to address this issue and to encourage the uptake of alternative fuels (particularly CNG) by HGV operators.

Required reductions in NO_2 and NO_x

4.0 Required reduction in NO_2 and NO_x

4.1 Relationship between NO_x and NO_2

Calculating the reduction in pollutant emissions required to attain the health based air quality objectives allows local authorities to judge the scale of effort required within an Air Quality Action Plan (AQAP).

For roadside NO_2, the required reduction in NO_2 concentration can be simply stated as the required $\mu g/m^3$ reduction in the NO_2 concentration in order to meet the health based air quality, for example a $5\mu g/m^3$ reduction from 45 to $40\mu g/m^3$. This provides an indication of the scale of the air quality challenge faced by a local authority but it is not a suitable parameter for assessing the actual level of emission reduction needed.

The required percentage reduction in local transport emissions should be expressed in terms of NO_x. NO_2 is both a primary and a secondary pollutant with some emitted directly from source (vehicle exhaust) and some formed in the atmosphere from other pollutants (including nitric oxide, NO). A reduction in NO_2 concentration therefore requires a reduction in both NO and NO_2 emissions. Together these are referred to as NO_x. There is a non-linear relationship between primary NO_x emissions and resultant roadside NO_2 concentrations.

4.2 Required reduction in NO_x emission

DEFRA's air quality guidance note LAQM.TG(09) provides a methodology for estimating the required reduction in NO_x (from road traffic) necessary to meet the health based annual mean NO_2 objective. This method has been used as the basis for calculations to determine the required level of traffic NO_x reduction in each of York's areas of air quality technical breach. Advice on the approach used for these calculations was sought from the Local Authority Air Quality Support Helpdesk[21]. The latest version (version 4.1) of the NO_x to NO_2 calculator was used for the calculations.

Estimates of background concentrations of NO_x and NO_2 in each of the areas of air quality technical breach were made using DEFRA's air quality background maps. These background concentrations are shown in tables 2 and 4. DEFRA publish and regularly update the background maps to assist local authorities in carrying out review and assessment of local air quality. The maps can be used in air quality assessments to better understand the contribution of local sources to total pollutant concentrations. The maps provide information on how pollutant concentrations change over time and across a wide area; they also provide an estimated breakdown of the relative sources of pollution. The background maps available on the DEFRA

[21] The methodology was approved by Anna Czerska, on behalf of the Helpdesk, on 13th June 2014 (e-mail correspondence)

website during May 2014 were used for the calculations, with the year set to 2012 or 2013 as appropriate.

Levels of pollution measured in 2012 were generally the highest recorded in the last three years. Levels of pollution measured in 2013 were generally the lowest recorded in the last three years. 2014 results generally fell within these upper and lower limits (with the exception of the Blossom Street / Holgate Road site where the 2014 value was slightly lower than that recorded in 2013). By using the 2012 and 2013 data the best estimate of the upper and lower levels of NO_x reduction needed in these areas taking into account 'normal' annual variations due to weather etc have been obtained. The results of these calculations are shown in tables 3 and 5 below. A graph summarising the results is presented in Figure 22.

4.2.1 Calculations based on 2012 monitoring data

The background concentrations and required reduction in pollutant concentrations based on worst case monitoring undertaken in 2012 are shown in tables 2 and 3.

Table 2: Background data used for 2012 calculations

Technical Breach Area	X-Coordinate of required grid square	Y-Coordinate of required grid square	Background NO_x ($\mu g/m^3$)	Background NO_2 ($\mu g/m^3$)
Fulford	460 500	449 500	21.5	15.1
Fishergate	460 500	451 500	34.4	22.0
Gillygate	460 500	452 500	30.9	20.2
Salisbury Terrace	458 500	452 500	25.1	16.9
Nunnery Lane	460 500	451 500	34.4	22.0
Lawrence Street	461 500	451 500	26.2	17.6
Holgate Road	459 500	451 500	40.0	24.5
George Hudson St	459 500	451 500	40.0	24.5

Table 3: Required reductions in pollutant concentrations based on 2012 worst-case monitoring data

Technical Breach Area	2012 Required Reduction in NO_2 (µg/m3)	2012 Required Reduction in NO_2 (%)	2012 Required Reduction in Road NO_x (µg/m3)	2012 Required Reduction in Road NO_x (%)
Fulford	3.2	7.3	8.7	13.3
Fishergate	5.5	12.1	14.7	26.5
Gillygate	21.7	35.1	66.0	59.5
Salisbury Terrace	0.0	0.0	0.0	0.0
Nunnery Lane	11.0	21.5	30.4	42.8
Lawrence Street	16.5	29.2	49.2	49.2
Holgate Road	14.2	26.2	39.8	53.1
George Hudson St	21.8	35.2	64.3	64.7

Note on the table above - where a figure of zero is given for the required reduction, this indicates that that the health based objective is already met in that particular location, for that particular year

In 2012, the health based annual mean nitrogen dioxide objective was met in the Salisbury Terrace technical breach area. Required reductions in NO_2 ranged from 7.3% along Fulford Main Street to 35.2% at along George Hudson Street. Corresponding required reductions in NO_x ranged from 13.3% to 64.7% along Fulford Main Street and George Hudson Street respectively.

4.2.2 Calculations based on 2013 monitoring data

The background concentrations and required reduction in pollutant concentrations based on worst case monitoring undertaken in 2013 are shown in tables 4 and 5 below:

Table 4: Background data used for 2013 calculations

Technical Breach Area	X-Coordinate of required grid square	Y-Coordinate of required grid square	Background NO_x (µg/m^3)	Background NO_2 (µg/m^3)
Fulford	460 500	449 500	20.77	14.62
Fishergate	460 500	451 500	33.18	21.41
Gillygate	460 500	452 500	29.85	19.63
Salisbury Terrace	458 500	452 500	24.48	16.51
Nunnery Lane	460 500	451 500	33.18	21.41
Lawrence Street	461 500	451 500	25.29	17.11
Holgate Road	459 500	451 500	38.74	23.91
George Hudson St	459 500	451 500	38.74	23.91

Table 5: Required reductions in pollutant concentrations based on 2013 worst-case monitoring data

Technical Breach Area	2013 Required Reduction in NO_2 (µg/m3)	2013 Required Reduction in NO_2 (%)	2013 Required Reduction in Road NO_x (µg/m3)	2013 Required Reduction in Road NO_x (%)
Fulford	0.0	0.0	0.0	0.0
Fishergate	0.0	0.0	0.0	0.0
Gillygate	10.7	21.1	29.4	39.3
Salisbury Terrace	0.0	0.0	0.0	0.0
Nunnery Lane	0.8	2.0	2.1	4.8
Lawrence Street	7.4	15.7	20.4	28.4
Holgate Road	11.6	22.5	31.1	46.5
George Hudson St	10.8	21.3	29.0	44.7

Note on the table above - where a figure of zero is given for the required reduction, this indicates that that the health based objective is already met in that particular location, for that particular year

In 2013, the health based annual mean NO_2 was met along Fulford Main Street, in Fishergate and in the Salisbury Terrace technical breach areas. Required reductions in NO_2 ranged from 2.0% at Lawrence Street to 22.5% at Holgate Road. Corresponding required reductions in NO_x ranged from 4.8% to 46.5% at Nunnery Lane and Holgate Road respectively.

Figure 22 summarise the NO_x and NO_2 reduction required in each of the York AQMAs based on 2012 and 2013 monitoring data.

4.3 Implications for Air Quality Action Planning

The required road NO_x reduction calculations summarised in this chapter have important implications for air quality action planning in York.

4.3.1 Fulford and Salisbury Terrace

In the Fulford and Salisbury Terrace AQMAs, background concentrations of NO_x are lower than those in the city centre AQMA. This is likely to be due to the more isolated nature of these AQMAs (which are located away from the main city centre) and the fact that pollution displaced from the inner ring road is less likely to impact on these areas. In these technical breach areas the quantity and type of local traffic has a major influence on the ability to meet/maintain the health based air quality objectives.

The source apportionment data presented in chapter 3 suggests that in Fulford and Salisbury Terrace reducing emissions from frequent bus services may be a particularly effective way of reducing NO_x emissions in these areas. Additional HGV NO_x reduction measures may also be advantageous in Fulford.

Based on the latest monitoring figures (from 2013 and 2014) the health based annual mean NO_2 objective is currently being met in both Fulford and Salisbury

Terrace (although NO_2 concentrations in excess of 36µg/m^3 still remain). This suggests that relatively minor reductions in emissions in these areas may be enough to deliver lasting long term compliance with the health based air quality objectives allowing eventual revocation of these AQMA orders.

4.3.2 Lawrence Street

As with Fulford Road and Salisbury Terrace, Lawrence Street appears to experience lower background concentrations of NO_x than the other city centre technical breach areas. The reasons for this are unclear but may be related to the distance from other major roads, prevailing wind directions and the orientation of the street which limits the importing of pollution into this area from other locations. Like Fulford and Salisbury Terrace the local traffic make-up in Lawrence Street is likely to be having a major influence on the ability to meet the health based air quality objectives.

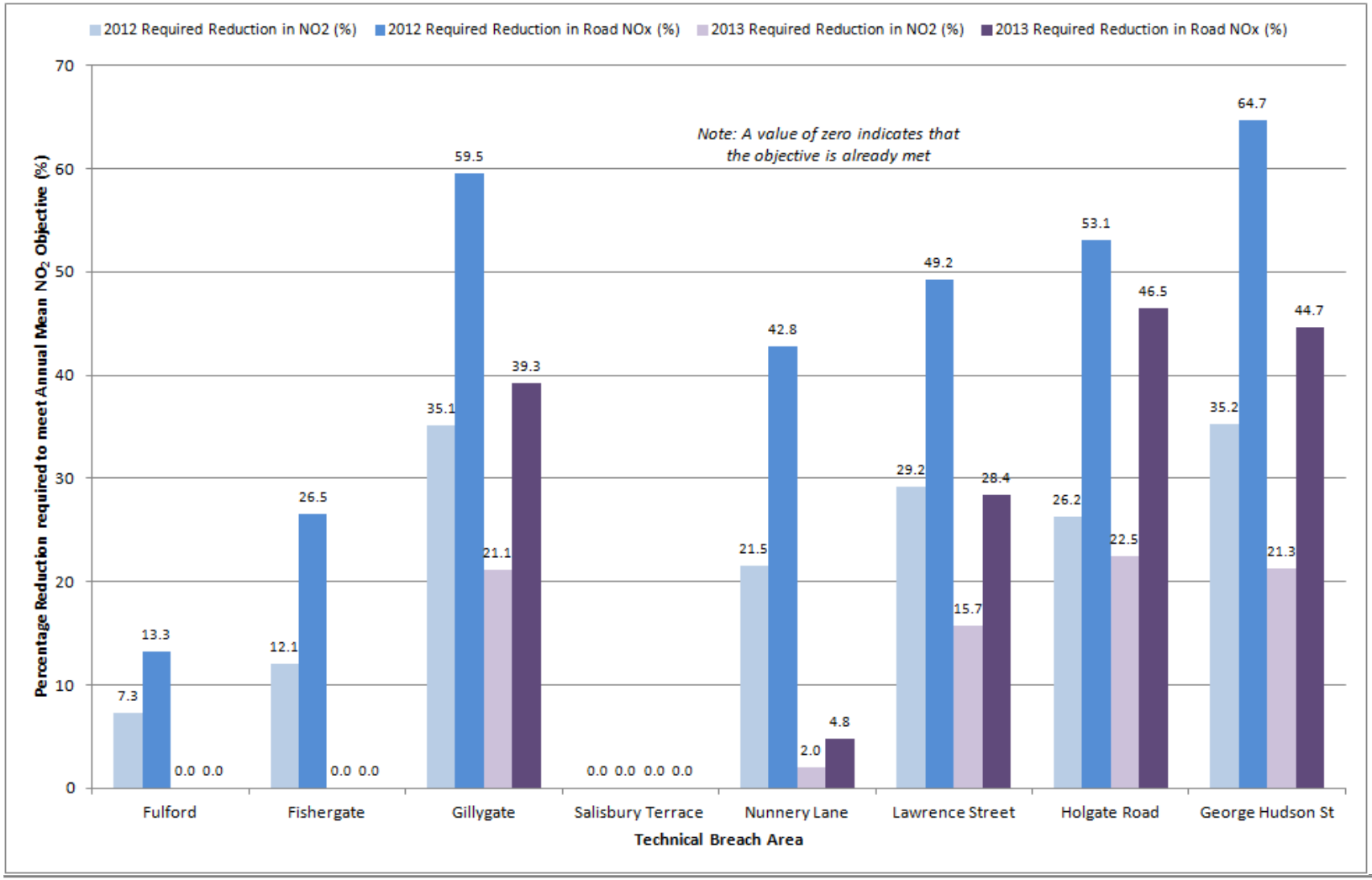
Lawrence Street experiences slightly higher levels of bus traffic then other areas of the city because it is one of the major routes back to a large bus depot on James Street where many buses return for overnight storage and servicing. It is anticipated that as the Clean Air Zone (CAZ) is established (in accordance with this action plan) the emission characteristics of the general York bus fleet will improve and that this will result in some air quality improvements on Lawrence Street.

4.3.3 Other technical breach areas

In the other city centre technical breach areas background concentrations of NO_x are much higher than at Lawrence Street, Fulford and Salisbury Terrace. There are no major industrial processes, significant point sources or domestic smoke emissions in York city centre so the high background concentration of NO_x in the other city centre technical breach areas must be due mainly to traffic pollution dispersed into these areas from other parts of the city centre. It is likely that even if all local traffic was removed from some of the city centre AQMAs, elevated NO_2 concentrations would still remain due to traffic pollution dispersed from other roads in the vicinity. This has previously been observed during short-term closures of major sections of the inner ring road.

To improve air quality in the other city centre AQMAs where background NO_x levels are high and pollution is known to be imported from other areas a more holistic approach to air quality improvement is needed that reduces emissions across the city centre and beyond. The Low Emission Strategy approach adopted by CYC (and reflected within this revised AQAP) aims to reduce emissions (particularly from vehicles) across the whole of the York area, both to help deliver health based air quality objectives within AQMAs and to minimise the public health impacts of air pollution across the wider York area. The expected impact of this approach is considered further in chapter 8.

Figure 21: **Required reduction in NO_x and NO_2 in all areas of technical breach (based on monitoring undertaken in 2012 and 2013)**



Background to development of AQAP3

5.0 Background to development of AQAP3

5.1 Development of previous AQAPs

DEFRA Policy Guidance LAQM.PGS(09) states that Air Quality Action Plans must focus on 'effective, feasible, proportionate and, quantifiable measures' and provide 'evidence that all available options have been considered on the grounds of cost effectiveness and feasibility'. A wide range of potential options are available to City of York Council and other stakeholders to improve local air quality and have been considered at various stages throughout the action planning process in York. These have included:

- Public transport measures (e.g. bus improvements)
- Alternative transport systems (eg. trams, water buses)
- Car-sharing
- Promotion and provision of alternative fuels
- Cycling measures
- Traffic management measures e.g. congestion charge, low emission zone
- Parking based measures
- Planning based measures
- Promotional activities e.g. travel planning, advice leaflets
- Anti-idling campaigns
- Roadside emission testing
- Energy efficiency measures

York has previously developed two AQAPs:

AQAP1: Action Plan for reducing nitrogen dioxide concentrations in York (July 2004)

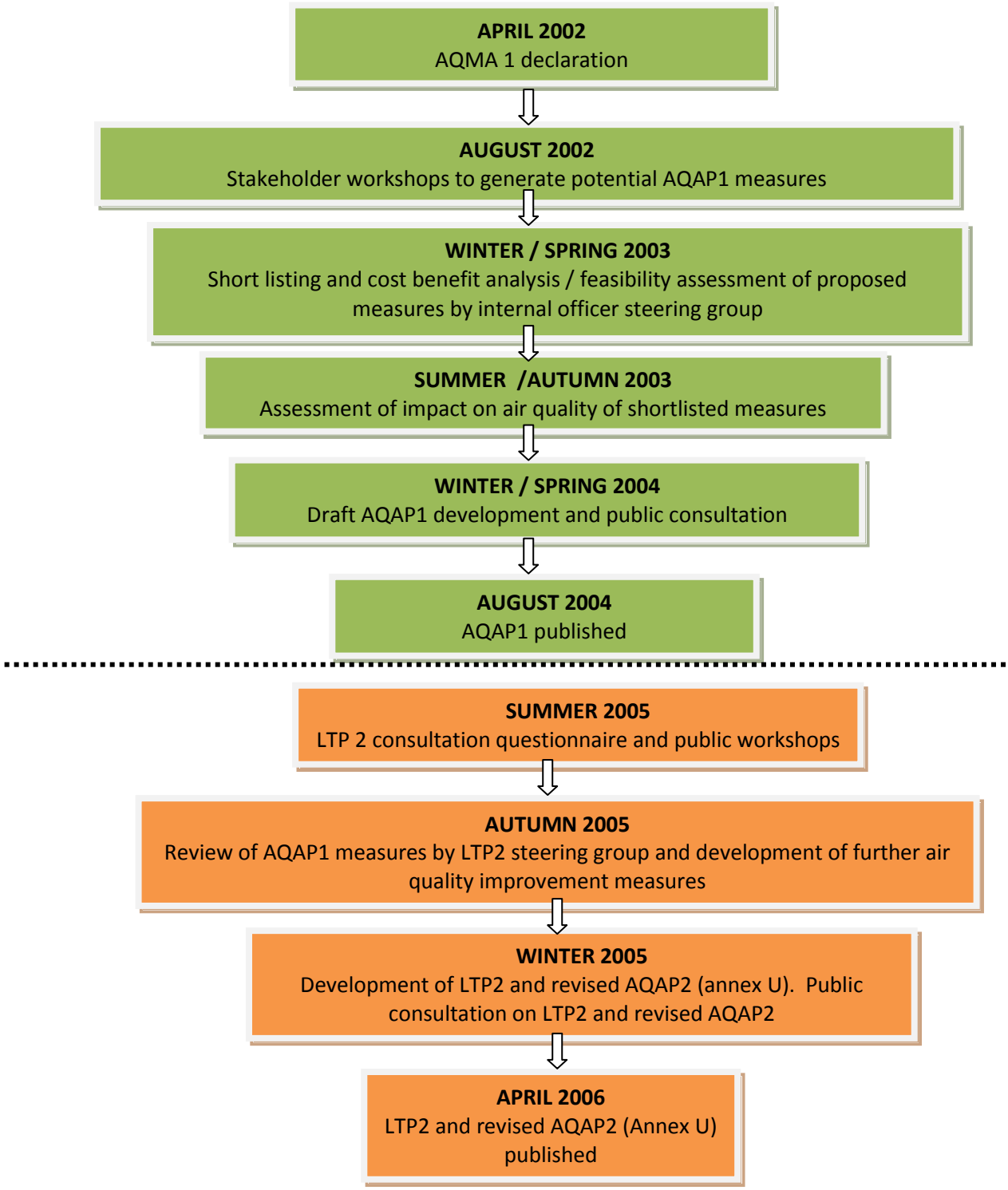
AQAP2: City of York Council Transport Plan 2006-2001 – Annex U (Air Quality Action Plan) (March 2006)

The development of these AQAPs (including cost / benefit analysis) has previously been reported in full (AQAP1 and AQAP2) and is summarised in Figure 23.

AQAP1 was mainly a modal shift based AQAP including the measures that were considered affordable at the time.

AQAP2 built upon AQAP2 and included some of the more expensive measures initially excluded from AQAP1. AQAP2 also started to introduce the concept of alternative vehicles and fuels into air quality action planning in York but little progress was made with delivery in this area between 2006 and 2009 due to prioritisation of other LTP2 measures during this period.

Figure 22: Previous AQAP development in York



5.2 Drivers for the development of the LES and AQAP3

The York Air Quality Update and Screening Report (April 2009) drew two main conclusions:

1. AQAP1 and AQAP2 had failed to achieve an improvement in air quality within the city centre AQMA
2. The declaration of a further AQMA in Fulford was likely

In response to this report the York AQAP officer steering group was reconvened to review the content of AQAP1 and AQAP2 and determine what further steps could be taken to improve air quality in York. At the same time there was increasing interest nationally around the concept of LES Planning Strategies and how the use of alternative vehicle technologies and alternative fuels could help prevent further deterioration in local air quality due to the cumulative impacts of development.

The York AQAP steering group determined that to improve air quality in York AQAP measures needed to go beyond a modal shift approach and start to tackle emissions at the tailpipe. Of particular concern were emissions from taxis, buses and HGVs that had not been previously been addressed through the modal shift approach to air quality action planning. The cumulative long term impact of ongoing development in the city was also recognised as another threat to long term air quality improvement.

The steering group review concluded that a new Low Emission Strategy (LES) approach to air quality improvement was needed that would encourage the uptake of cleaner vehicles and technologies and ensure that existing vehicles were operated as cleanly and efficiently as possible. This approach would follow the principles of LES planning being developed in other local authorities but would be more holistically applied in York to cover existing fleets and developments as well as those being brought forward through the planning system.

5.3 Development of the York LES

The York LES was developed over a 3 year period between October 2009 and October 2012.

The vision, aims and objectives of the LES were developed by the reconvened AQAP steering group that included planners, transport planners, sustainability officers, highways engineers, environmental protection officers and economic development staff.

The long term vision for York's overarching LES is:

'To transform York into a nationally acclaimed low emission city'

- where the population, and the business and development community particularly, are aware of their impact on the environment and health and play an active role in reducing all emissions in the city
- where new development is designed to minimise emissions and maximise sustainable transport access

- where there are noticeably higher rates of walking and cycling than in other UK cities and rates are comparable to those in exemplar European cities
- where there are noticeably greater numbers of alternatively fuelled vehicles (electric, gas and hybrid) than in other UK cities and widespread eco-driving behaviour
- where there is a well developed infrastructure to support low emission (alternatively fuelled) vehicles
- where the number of vehicles accessing air quality hotspots and risk areas are minimised and where lorries, buses and taxis meet minimum emission standards and embrace new emission reduction technologies
- where the council leads by example, operating the lowest emission fleet affordable and seeking to minimise emissions from procured services
- where local air quality and global warming issues are considered and tackled together
- where inward investment by low emission technology providers is actively sought, encouraged and supported
- where innovation and investment in infrastructure and services that reduce emissions are actively sought, encouraged and promoted.
- where as a result of the above there are no exceedances of air quality limits

The vision is supported by the following objectives:

i. To raise public and business awareness and understanding of emissions to air in order to protect public health and meet the city's ambitious carbon reduction targets.

ii. To minimise emissions to air from new developments by encouraging highly sustainable design (via the sustainable design aspects of the emerging Local Development Plan) and the uptake of low emission vehicles and fuels on new developments (via LES and LTP3)

iii. To minimise emissions to air from existing vehicles by encouraging eco-driving, optimising vehicle maintenance and performance (including that of abatement equipment) and providing businesses, residents and visitors with incentives and opportunities to use low emission vehicles and fuels

iv. To lead by example by minimising emissions from council buildings (via CCFAP), fleet and other activities and to showcase low emission technologies whenever possible

v. To encourage inward investment by providers of low emission technology, fuels and support services

vi. To maximise sustainable transport and reduce localised air quality breaches through traffic demand management, smart travel planning, and potentially

regulatory control (via LTP3, the emerging Development Plan, LES and revisions to the AQAP).

Each objective in the LES is supported by a number of delivery measures which have formed the basis for development of AQAP3 (Chapter 6).

A full public consultation on the York LES was undertaken in summer 2012 prior to its adoption in October 2012.

The York LES has been fully integrated into wider CYC policies including the Council Plan, the emerging draft Local Plan and LTP 3 (April 2011). A Low Emission Officer was appointed in March 2012 to oversee the roll out of the main LES measures.

The York LES can be viewed in full at www.jorair.co.uk/index.php?page=reports

Development of AQAP3

6.0 Development of AQAP3

6.1 Purpose of AQAP3

AQAP3 is the main delivery document for the air quality improvement measures originally set out in the LES. It aims to set out a clear timetable for delivery of these measures and to provide a better understanding of what they are likely to achieve in terms of emission reduction and compliance with the health based national air quality objectives. Targets and indicators are included to ensure delivery of air quality improvement measures remains on track and that the impact of the plan can be adequately monitored and reported.

6.2 AQAP3 development process

The York LES contained two types of measures:

1. Those that were fully agreed, costed and starting to be implemented at the time the LES was completed.
2. Those that were conceptual at the time the LES was completed and required further investigation, feasibility testing and cost benefit analysis prior to being progressed.

Where possible the LES measures have been transposed directly into AQAP3 and an update provided on progress and expected timescales for further delivery. Where additional development / feasibility work has been undertaken AQAP3 has been developed to reflect this improved evidence base and in some cases the LES measures have changed significantly from those originally suggested.

The final content of AQAP3 has been highly influenced by the following pieces of development work:

1. The York Low Emission Zone feasibility study (July 2013)
2. The York electric bus feasibility study (July 2013)
3. The York Anti-idling study (January 2014)

An overview of the main findings of these reports and how they have influenced the final content of AQAP3 is summarised here. Further detail about each of the studies can be found in Annex 1.

6.2.1 The York Low Emission Zone feasibility study (July 2013)

The detailed and further assessment work undertaken in Fulford and Salisbury Terrace highlighted the disproportional impact bus emissions of NO_x have in York's AQMAs.

Measure 9G in the LES was to '***Undertake a low emission bus corridor feasibility study'.***

In 2011/12 CYC obtained a DEFRA air quality grant to progress this study. The study was undertaken by Halcrow and the Institute of Transport Studies (ITS) at Leeds University. The study utilised and further developed the coupled PARAMICS traffic micro-simulation and PHEM emission model used initially to undertake the detailed and further assessment work in Fulford and Salisbury Terrace.

The LEZ study examined the potential impact of introducing a variety of blanket emission controls (Euro 3, Euro 4 or Euro 5) to all buses operating along the Ouse Bridge / George Hudson Street/ Rougier Street / Lendal Bridge corridor. The study assumed that a single emission standard would be applied to all buses entering the LEZ corridor irrespective of their frequency or age. An emission standard control of this type would require as a minimum the replacement of all older diesel buses with newer diesel models or the fitting of exhaust abatement equipment to ensure compliance with the specified emission standard. As a separate scenario, the LEZ study also considered what would happen if all Park & Ride buses were able to operate on electric within the LEZ corridor and other AQMAs.

The LEZ study indicated that blanket style application of Euro 4 or Euro 5 emission controls to buses could result in some sizeable reductions in NO_2 at some locations in the city centre. However, even with these emission controls in place, exceedances of the health based annual average NO_2 air quality objective would still exist in some areas. The study also showed that applying a zero emission standard (electric bus requirement) to a smaller number of frequent bus services might be more effective than requiring the whole fleet to upgrade to Euro 4.

6.2.2 Electric bus feasibility study (July 2013)

The detailed and further assessment work undertaken for Salisbury Terrace showed that in this location the Euro V Park & Ride bus passing through the area on a 10 minute frequency is responsible for a considerable proportion of the NO_2 emissions in this area. Coupled with the conclusions drawn from the LEZ bus corridor study it was evident that a LEZ for all buses based on imposition of a blanket Euro emission standard would be unlikely to deliver the health based air quality objectives in York and may cause unnecessary expense for smaller operators that only enter the city a few times per day. A system that incorporated ultra low emission standards for the most frequent bus services looked like being potentially a more effective option but the feasibility and cost of this required further investigation. ARUP were commissioned in January 2013 to undertake an electric bus feasibility study.

The electric bus feasibility study identified around 65 scheduled bus routes currently operating through the city centre. These routes are operated by approximately 200 buses of varying type, age and emission standard. 82% of all bus movements are carried out by only 49% of the buses and these buses operate on only 20 routes (including all the P&R services). These ‘frequent’ flyer services have a disproportionate impact on local air quality. Those with short, frequent duty cycles are generally well suited to the adoption of electric bus technology.

The electric bus feasibility study showed that converting the majority of the frequent flyer services to electric could offer substantial benefits for air quality as well as providing a 60% reduced greenhouse gas impact and reduced noise levels. A 'roadmap' for reducing emissions from buses in York was included in the electric bus feasibility study that demonstrated that the widespread introduction of electric buses into the city could become a reality by 2018 with the right level of investment and incentives in place. This roadmap has formed the basis of the proposals for a 'Clean Air Zone (CAZ)' incorporated into AQAP3. Initial proposals for the scope of a CAZ can be found in Annex 2. These will be subject to further consultation, especially with bus operators.

Significant progress has already been made towards the widespread introduction of electric buses in York. A brand new P&R site was opened in June 2014 that utilises battery operated electric buses and further electric buses were introduced to the existing Monks Cross P&R site in May 2015. A battery operated electric bus is operational on the University bus route and six city centre tour bus are scheduled for retrofitting with electric drive trains following the successful completion of a demonstration project in 2014. All these projects have been made possible through Greener Bus Fund (GBF) and Cleaner Bus Technology Funds (CBTF). CYC is continuing to work closely with bus operators to bring further low emission buses to the city.

6.2.3 York anti-idling feasibility study

Anti-idling policies aim to prevent unnecessary emissions from stationary vehicles and can take a variety of forms ranging from provision of basic advice and signage through to adoption of anti-idling legislation.

Measure 4F in the LES was to '***Undertake a feasibility study to consider cost implications and likely level of air quality improvement associated with potential adoption of anti-idling legislation in York.'***

In 2011/12 CYC obtained a DEFRA air quality grant to progress this study. The study was undertaken by TTR Ltd. The purpose of the study was to determine the extent of idling emissions in York and to consider the cost-effectiveness of introducing anti-idling policies.

The anti-idling study identified a number of areas in York where idling is regularly taking place and concluded that where a vehicle is expected to be stationary (parked, waiting or loading) for more than 1 minute it is both economically and environmentally advantageous to switch off the engine. By adopting basic anti-idling policies, a significant reduction in emissions (both local air pollutants and CO_2) could be achieved, along with even greater fuel cost savings for operators.

The draft AQAP3 proposed introduction of a basic anti-idling strategy for York that would involve working with transport operators to highlight the air quality impacts and fuel costs associated with idling. Following feedback from the consultation process

this will now also be supported by the erection of anti-idling signage in some locations.

The consultation process also highlighted some degree of local support for the introduction of anti-idling enforcement. However, due to the costs associated with adopting and enforcing this type of legislation, and the fact that the CAZ will remove the majority of diesel buses from the city centre by 2021, it is recommended that the need for enforcement of anti-idling powers is kept under review throughout the lifetime of AQAP3 (as originally planned).

6.3 Evidence base for the development of AQAP3

The final framework for AQAP3 has been developed to reflect current levels of understanding about sources of air pollution in York and the relative contribution these sources make to York's air quality issues.

The supporting evidence base has been drawn from:

- Detailed ANPR traffic counts undertaken within all the AQMA technical breach areas in 2011
- Results of air pollution monitoring undertaken in York and reported in recent Progress Reports (2012, 2013)
- Detailed and further assessments of air quality and emission sources in the Fulford and Salisbury Terrace AQMAs using coupled traffic micro-simulation and emissions modelling
- The York Low Emission Zone feasibility study
- The York Electric bus study
- The York anti-idling feasibility study

This evidence base clearly shows that:

(a) Diesel vehicles (particularly newer diesel cars) are the main source of NO_2 and man-made $PM_{2.5}$ in York. NO_2 emissions from these vehicles continue to rise due to an increase in the total number of diesel vehicles in the city and an increase in the primary NO_2 fraction emitted from individual vehicles (as a result of abatement technology fitted to control emissions of PM_{10} and CO_2).

(b) Buses and HGVs make up only a small proportion of the total vehicle fleet but have a disproportionate impact on total traffic derived NO_2 emissions. Emissions from these vehicles have not been adequately addressed through previous AQAPs.

(c) When tackling vehicle emissions the frequency of vehicle trips as well as the emission standard of the vehicle is an important consideration. High frequency bus services and other vehicles making frequent trips within AQMAs, such as taxis, HGVs and commuter cars, must therefore be tackled as a priority. A step change in air quality within York's AQMAs can only be achieved if the vehicles regularly accessing these areas are replaced with low and ultra low emission

technologies, such as battery electric, electric hybrid and CNG based technologies.

(d) There is currently widespread vehicle idling in the city which adds unnecessary emissions to the existing air quality problems. Raising awareness about the cost and environmental impact of vehicle idling could help to significantly reduce emissions in the city.

6.4 The role of green infrastructure in improving York's air quality

Measures to prevent emissions arising are the main focus of AQAP3 because emission reduction and prevention is likely to return the greatest public health benefits. However, it is not possible to prevent all emissions to air and in some circumstances it may be possible to reduce and mitigate the health impacts of emissions through the provision of green infrastructure.

Green infrastructure in the form of trees and other plants has been shown in numerous studies[22] to be capable of removing pollutants from the environment and reducing the impacts of the 'urban heat island effect'[23].

The types of trees must be carefully chosen to avoid species that produce lots of pollen or emit large quantities of volatile organic compounds (VOCs). The size and shape of the leaf is also an important factor in how efficient a plant will be at removing pollution from the atmosphere. In a city such as York where the worst air pollution conditions often occur during the winter period evergreen species may be more effective at year round pollution removal than deciduous alternatives, although some evergreens are high VOC emitters and should be avoided.

In recognition of the role green infrastructure can play in helping to reduce pollution levels in the city (as highlighted in the responses received to the public consultation on the draft plan) AQAP3 now includes a commitment to support the future development of green infrastructure in the city.

It is recommended that a Green Infrastructure Assessment is undertaken for the city and that the use of green infrastructure is recognised as a valid emission mitigation measure on new developments. As well as reducing pollutant concentrations green infrastructure can have many other benefits for health and well being.

[22] A good balanced account of the impact of green infrastructure on local air quality can be found in 'Urban Air Quality', The Woodland Trust, April 2012 by Jim Smith

[23] The urban heat island occurs in towns and cities because the buildings, concrete and other hard surfaces absorb heat during the day and release it at night. Higher city centre temperatures can increase ground-level ozone (providing more opportunity for the formation of NO_2) and exacerbate the symptoms of chronic lung conditions. High temperatures can also bring on heart or respiratory failure or dehydration, particularly amongst the elderly.

6.5 AQAP3 Framework

The key components of AQAP3 are:

6.5.1 Headline Measures

These are the direct actions that can be taken now to reduce emissions from vehicles frequently entering the AQMAs and reduce incidence of vehicle idling. The main headline measures are:

Measure 1: Development and implementation of a Clean Air Zone (CAZ)

The development of the ***Clean Air Zone (CAZ)*** replaces the concept of a corridor based Low Emission Zone (based on Euro emission standards) originally included in the LES.

Within the CAZ bus emissions will be regulated based on the frequency at which individual vehicles enter the inner ring road. Ultra low emission bus standards will be introduced for the most frequent buses (entering the CAZ 10 times per day or more) ensuring that by 2018 over 80% of bus movements in York will be made by ultra low emission buses. Less frequent buses will be initially exempt from the ultra low emission CAZ requirements but will be set a more gradual timetable for emission improvement based on Euro emission standards. The CAZ will be developed in partnership with local bus operators and if necessary enforced through a Traffic Regulation Condition (TRC).

The move away from a Euro emission standard based LEZ reflects the evidence base developed through the York Low Emission Zone feasibility study and the York electric bus feasibility study. These have clearly shown that both the frequency of a bus service and the emission standard of the vehicles operated on the service are important factors for consideration in the development of any bus emission reduction strategy. At this stage the CAZ proposals are only for buses as these are a locally defined fleet for which emission standards can be regulated by the Traffic Commissioner through the use of a Traffic Regulation Condition (TRC).

Expansion of the CAZ concept to other vehicles that do not form part of a local fleet or make routine journeys through the city would require the use of a camera or manual based enforcement system. Implementing a scheme of this type would involve considerable costs and is not a cost-effective option for the city at the present time.

In the longer term other fleet improvement measures included within AQAP3 may make it possible to roll out the CAZ requirements to other ‘fleet’ vehicles such as taxis, delivery vehicles and the CYC fleet. For example, entry into the CAZ could require use of a certain type of fuel and/or specified Eco-star rating. The first step will be to provide the support and encouragement needed to increase the uptake of low emissions vehicles within these fleets. This is the main priority for AQAP3.

Measure 2: Development and implementation of anti-idling measures

The LES recommended a feasibility study to be undertaken to investigate the incidence of idling in York and to consider the cost-effectiveness of anti-idling

enforcement measures. The anti-idling measures included in AQAP3 directly reflect the findings of this study.

In the first instance anti-idling measures will be limited to promotional and educational work with transport operators to highlight both the economic and environmental impacts of idling. This will be supported by the provision of anti-idling signage in some locations, particularly those locations used by coach operators.

Promotional and educational work was highlighted as the most cost-effective approach to reducing idling emissions in the anti-idling feasibility study and has been proven to work in many other cities. The anti-idling signage will be provided in direct response to concerns about idling coaches raised during the public consultation on the draft AQAP3.

Consultation on the draft AQAP3 identified some support for use of anti-idling enforcement powers by CYC. However the costs associated with adopting and using such powers are significant and are likely to be of limited use once the majority of the bus fleet is converted to electric under the terms of the planned CAZ. The need for anti-idling enforcement powers will be kept under review during the lifetime of AQAP3.

Measure 3: Further development of Eco-stars fleet recognition scheme

Eco-stars is a fleet recognition scheme aimed at recognising good environmental practice by fleet operators. The York Eco-stars scheme was launched in March 2012 and currently has over 50 members.

Currently Eco-stars is a completely voluntary scheme. This can make it difficult to engage with smaller local operators and those whose fleets are unlikely to obtain the higher star ratings. Linking the Eco-star scheme to local procurement requirements could encourage a greater range of operators to sign up. In the first instance only membership of the Eco-stars scheme would be a mandatory requirement with potential to extend the scheme later to ensure certain service providers meet minimum Eco-stars standards. Further development of the ECO-stars scheme will be dependant on additional funding being found to support the scheme.

6.5.2 Future Measures

These are measures that will be rolled out over the next 6 years to help reduce emissions. In many cases work on these measures has already commenced.

Measure 4: Planning and delivery of CNG refuelling infrastructure in York

Vehicles that operate on compressed natural gas (CNG) offer considerable reductions in emissions of NO_2 and particulate when compared with conventional diesel engines. CNG is the same fossil fuel derived methane gas that is used in domestic heating and cooking. Under the right pressure conditions (available at limited locations) CNG can be taken directly from gas mains and put into vehicles at purpose built re-fuelling stations.

Methane gas can also be derived from the anaerobic digestion of waste, under these conditions it is referred to as 'bio-methane' and offers considerable additional CO_2 savings above the use of natural gas. Gas mains already routinely carry a blend of natural gas and bio-methane.

CNG and/or bio-methane offer a lower emission solution than diesel for vehicles that travel long distances and / or have power requirements that currently exceed those deliverable through battery based electric technology. Gas operated vehicles are generally also much quieter then their diesel counterparts. HGVs and long distance bus services are generally suited to the use of CNG.

A CNG feasibility study has been undertaken for York and a site suitable for the development of a gas refuelling plant has been identified within the emerging draft Local Plan. Discussions have already commenced with potential site users and third party investors. The identified site also offers scope for development of an anaerobic digester (for the production of biomethane) and freight consolidation opportunities.

Measure 5: Reducing emissions from freight

A freight improvement study was completed in 2013. The study made recommendations under the following headings:

- Access restrictions
- Loading and unloading facilities
- Out of hours deliveries
- Low emission zone
- Delivery and service plans
- Marketing , promotion and best practice
- Freight consolidation

The recommendations from the freight improvements study will be incorporated into the delivery programme for LTP3.

Measure 6: Development and implementation of LES based planning guidance

New development often results in increased vehicle trips and emissions. Previously air quality assessments have only been undertaken for the largest developments and have focused on changes in ambient air pollution concentrations. There are very few developments that considered in isolation can be shown to give rise to a 'significant' change in ambient air pollution concentration, yet almost every development has a 'hidden' emission increase associated with it. If not controlled this emission 'creep' gives rise to cumulative impacts on local air quality and may counteract the effectiveness of other AQAP emission reduction measures.

The LES recommended the development of new LES based planning guidance to address the issue of emission 'creep'. The policy hooks to support the development of this guidance have been incorporated into the emerging draft Local Plan and a new LES planning guidance document has been prepared (Annex 5). The York LES planning guidance builds upon best practice included in similar documents already being used in West Yorkshire, West Midlands, Sussex and Mid-Devon and is likely to form the basis of a new national DEFRA planning guidance note.

Under this new planning system most developments will be required to make some provision for electric vehicle recharging and ensure suitable emission controls during the development phase. Larger developments will be required to undertake emission impact assessments and provide suitable on-site emission mitigation measures to off-set the additional emissions. Contributions towards city wide emission reduction projects may also be sort in some instances.

Measure 7: Reducing emissions from taxis

The current focus of emission reduction work with taxis is the successful local incentive scheme through which taxi drivers can access grants to help upgrade their vehicles to lower emission alternatives. The incentive scheme gives 10% discount off a hybrid taxi capped at £2000 or 15% off a plug-in taxi capped at £3000.

When the incentive scheme began in 2013 there was only 1 hybrid (Euro 4) taxi in the entire taxi fleet (approximately 755 vehicles). This has now increased to over 50 (Euro 5+ hybrid or electric taxis).

The taxi and private hire trade are regularly consulted and made aware of the offer and there is still considerable interest in the scheme. This project has produced significant financial and emissions savings for taxi drivers. Funding through the Local Sustainable Transport Fund (LSTF) is available for a further 13 to 14 taxis in 2014/15 and 15 to 16 taxis in 2015/16.

OLEV has recently created an 'Ultra Low Emission Taxi' fund of value £20 million to incentivise the uptake of ULEVs in the sector by discounting purchase price in a similar way to the York pilot scheme and includes infrastructure funding.

A review of local taxi licensing emission standards has recently taken place. It is to be recommended to members that all new taxis should meet a minimum Euro 5 standard for petrol and hybrid vehicles and a Euro 6 standard for diesel vehicles. The adoption of these recommended minimum emission standards will be subject to local consultation with the taxi trade prior to a report to the taxi licensing committee.

Measure 8: Planning and delivery of strategic EV charging network

The Office for Low Emission Vehicles (OLEV) strategy '*Driving the Future Today'* states that by 2040 almost every new car and van in the UK fleet will be an ultra low emission vehicle[24]. This means that vehicles that operate solely or partially on

[24] OLEVs definition of an Ultra Low Emission Vehicle (ULEV) is one which emits less than 75g/km of CO_2

electric will form an increasing proportion of the vehicle fleet and it is anticipated that the demand for EV recharging points will rise considerably in coming years.

York has already made significant progress towards a strategic EV charging network in the city and is leading the way within the Yorkshire region. Eleven rapid charge and twelve fast charge 'pay as you go' public EV charging points are already available in public car parks in York and at Park & Ride sites (each able to charge two vehicles simultaneously). There are around 20 additional privately owned sites at hotels, supermarkets and other developments around the city. Further publicly accessible EV charging points have been achieved through a planning condition at the Vanguard site and Clifton Moor development and many other privately owned recharging points have been conditioned for delivery at domestic properties.

The draft AQAP3 framework sets out timescales for further EV charging provision in York and the development of a strategic EV charging map against which the need for further developer based EV provision will be considered.

Measure 9: Reducing emissions from CYC fleet

CYC must lead the way in reducing emissions of local air pollutants and CO_2 from its own vehicle fleet and from those of contractors. Over the past three years grey fleet mileage (that undertaken by staff in their own vehicles for which mileage payments are made) has been cut by 34 per cent and transport carbon dioxide emissions reduced by 47%. This has been achieved mainly by transferring staff journeys to smaller petrol and hybrid car club vehicles. In recognition of this CYC was recently awarded the EST Fleet Heroes Award for grey fleet management.

CYC is now moving towards the provision of electric vehicles for staff use with infrastructure to support 12 CYC electric pool vehicles recently installed at the council depot. These vehicles will be in addition to the fully electric Nissan Leaf pool car already in use. Other low emission measures being pursued by CYC include trial of a 'Light Foot' system to warn against excessive breaking and acceleration, a programme of ECO-driver training for CYC staff and further measures to reduce grey fleet use and minimise overall mileage and emissions.

6.5.3 Supporting Measures

These are measures that provide a more indirect route to emission reduction or are already routinely delivered and monitored via other council strategies and programmes. They fall into three broad categories:

1. Those that will help to win '*hearts and minds'* and encourage local engagement in delivery of AQAP3 measures.
2. Those that will lead to congestion reduction and wider transport improvements
3. Those that will reduce emissions from non-transport sources

Measure 10: Marketing and communications strategy

Delivering a clear message to the public about the aims and objectives of the LES and how they can engage in emission reduction is an essential aspect of the AQAP3 delivery programme.

A marketing and communications campaign is planned that will:

a) Highlight the impacts of vehicle pollution on health
b) Provide advice on how to choose vehicles that are better for local air quality and cheaper to operate
c) Become a mechanism for promoting incentives available to operators of low emission vehicles (as and when these are developed)

This campaign will support and build upon the existing I-travel York campaign that promotes sustainable travel http://www.itravelyork.info/

Measure 11: Local incentives for low emission vehicles and alternative fuel use

As low emission vehicles and associated recharging / refuelling infrastructure become more prominent in the city the next phase of LES/AQAP3 development process will focus on encouraging the wider uptake and use of the facilities provided. Development of the incentive plan has not yet commenced but it is likely to include a package of financial incentives and rewards for the use of low emission vehicles. These might be linked to access rights, parking charges, parking locations, shopping vouchers, attraction entrance fees etc. The incentive plan will be closely linked to the marketing strategy and must be sustainable in the longer term as the numbers of electric vehicles grows and more people want to access the incentives provided.

Measure 12: Attracting low emission industries, business and jobs to York

York is looking to create a designated ‘green hub’ development area to encourage investment by ‘green’ and ‘low emission’ industries, in line with the new council plan. The measures in AQAP3 will support this ambition.

Already a recognised leader in the delivery of low emission measures, York has the potential to attract growth in the areas of low emission vehicle sales and maintenance, EV charging point manufacture, installation and maintenance, CNG refuelling, production of bio-methane from waste and low emission tourism. The electric buses recently introduced in York are Optare vehicles built locally at Sherburn in Elmet, an example of how the LES has already helped to support manufacturing jobs within the Leeds City Region.

Measure 13: Modal shift and network improvement measures

The LES and the measures included in this new AQAP3 are focussed predominantly on tackling emissions from vehicles that remain on the network after development control and sustainable transport planning measures have been applied. However, measures to reduce trips, encourage modal shift and reduce congestion are the most important first steps in any air quality improvement programme as recognised in the previous AQAP1 and AQAP2.

Local Transport Plan (LTP3) remains an intrinsic part of the overall approach to air quality improvement and emission reduction in York. The air quality improvement, trip reduction and congestion reduction targets and indicators included in LTP3 are equally important to air quality action planning in York as the 'additional' LES based measures presented here. For completeness and to avoid duplication only the major local transport based schemes that support air quality action planning in York have been included in this revised AQAP3. Further information on trip reduction, modal shift and congestion reduction measures can be found in LTP3 available at the following link
http://www.york.gov.uk/info/200230/ltp3/319/ltp3/3

Measure 14: Other air quality improvement measures

Whilst traffic is the main source of air pollution in York, industrial and domestic emissions also contribute to the total emissions and resultant air quality in the city. CYC Public Protection officers help to minimise the impact of these by:

- Controlling emissions from some industrial premises (IPPC)
- Enforcing smoke control orders (domestic emissions)
- Prevention of dark smoke emissions (Clean Air Acts)

Additionally, the Environment Agency regulates emissions to air from larger industrial processes in the city.

Research suggests that once released into the environment, some pollutants can be removed through the use of 'green infrastructure'. Opportunities for the use of green infrastructure in York as a means of removing air pollutants have not yet been fully exploited. AQAP3 therefore includes a recommendation to introduce more green infrastructure into the city.

6.6 Prioritisation of AQAP3 measures

Guidance on air quality action planning requires that the measures in an AQAP should be ranked and prioritised based on their cost and overall benefit for local air quality.

The measures included in AQAP3 have been assessed as follows:

Stage 1

Individual measures were assessed in terms of their impact on the following criteria to ensure they were suitable for inclusion in AQAP3:

- Local economy
- Feasibility
- Congestion
- Local Air Quality
- Greenhouse gas emissions
- Planning and Development
- Socio-economic impacts
- Communities
- Public perception
- Other benefits

In each case the impact was described as either Positive, Neutral or Negative using the following key.

Impact	
	Positive impact
	Neutral impact
	Negative impact

Where a measure was determined to have a negative impact on any of the criteria consideration was given as to whether the positive benefits outweigh any negative implications before progressing to stage 2. The results of the stage 1 screening can be found in Annex 3.

Stage 2

Individual measures were assessed further in terms of delivery cost, impact on air quality in AQMAs and total emission reduction potential.

The cost assessment took into account both capital and revenue costs. Each measure was defined as falling into one of the following cost categories

Cost		Description
£	**< £10,000**	**Low cost**
££	**>10,000 < 50,000**	**Medium cost**
£££	**>50,000 < 100,000**	**High cost**
££££	**>100,000**	**Very high cost**

The air quality impact in AQMAs and total emission reduction potential were identified as follows:

Impact	
✓✓✓	**High impact**
✓✓	**Medium impact**
✓	**Low impact**

Those measures that have the potential to yield high air quality and emission reduction benefits will be given priority in the AQAP3 delivery process. Where measures have similar air quality and emission improvement potential the lower cost options will be prioritised if necessary. Chapter 7.0 summarises the ranked AQAP3 measures.

AQAP3 Framework and Measures

7.0 AQAP3 Framework and Measures

The following tables provide a summary of the AQAP3 measures ranked according to the methodology outlined in Chapter 6.

TABLE 6A: DIRECT ACTIONS THAT CAN BE IMPLEMENTED NOW TO REDUCE EMISSIONS FROM EXISTING VEHICLES									
Number	**Measure**	**AQMAs affected**	**Timescale**	**Cost**	**Expected AQ impact in AQMAS**	**Expected overall emission impact**	**Progress**	**Next steps**	**Responsibility**
1	Development and implementation of a Clean Air Zone (CAZ)	City Centre Fulford Salisbury Terrace	2015 to 2021	**££££** (High costs are associated with purchase or retrofitting of vehicles not the physical implementation of the CAZ. Anticipated that vehicle costs will be offset by grant applications)	✓✓✓	✓✓✓	Supporting feasibility studies completed Electric bus technology operational in York	Development of TRC	CYC Air quality CYC Sustainable Transport
2	Development and implementation of anti-idling measures	City Centre	2015 to 2016	**££**	✓✓	✓✓✓	Feasibility study completed	Development of implementation programme	CYC Air quality CYC Sustainable Transport
3	Further development of Eco-stars fleet recognition scheme	City Centre Fulford Salisbury Terrace	ongoing	**£££**	✓✓	✓✓✓	Eco-stars scheme launched March 2013 First target of 40 members achieved June 2014 Cost benefit assessment of Eco-stars in York Dec 2014	Linking of Eco-stars to local procurement	CYC Air quality CYC Procurement TTR Ltd

TABLE 6B : PLANS AND ACTIONS THAT WILL BE IMPLEMENTED OVER THE NEXT 6 YEARS TO REDUCE EMISSIONS									
Number	**Measure**	**AQMAs affected**	**Timescale**	**Cost**	**Expected AQ impact in AQMAS**	**Expected overall emission impact**	**Progress**	**Next steps**	**Responsibility**
4	Planning and delivery of CNG refuelling infrastructure in York	City Centre Fulford Salisbury Terrace	ongoing	**£££££** (It is anticipate that the majority of these cost will be met by third party investors)	✓✓	✓✓✓	CNG feasibility study completed Possible CNG refuelling site identified in Local Plan Potential investors identified	Encourage and facilitate investment at the site	CYC Air quality CYC City Development Make it York
5	Reducing emissions from freight	City Centre Fulford Salisbury Terrace	ongoing	**£££££** (It is anticipated that the majority of the freight improvement costs will be met by third party investors e.g freight consolidation centre)	✓✓	✓✓✓	Freight improvement study completed	Develop and implement freight action plan	CYC Sustainable Transport
6	Development and implementation of LES based planning guidance	City Centre Fulford Salisbury Terrace	2015 to 2016	**££**	✓	✓✓✓	LES planning principles embedded into draft Local Development Plan Review of existing LES planning guidance undertaken Development of new York LES planning guidance completed June 2015	Application, testing and review of new LES planning guidance at a local level	CYC Air quality CYC City Development

TABLE 6B CONTINUED

Number	Measure	AQMAs affected	Timescale	Cost	Expected AQ impact in AQMAS	Expected overall emission impact	Progress	Next steps	Responsibility
7	Reducing emissions from taxis	City Centre Fulford Salisbury Terrace	ongoing	**£**	✓✓	✓✓	Local financial incentive for hybrid and electric taxis developed and implemented. Review of taxi licensing emission standards completed York's largest private hire firm have committed to providing a low emission fleet	Consultation with taxi trade on proposed new emission standards and report to licensing committee by April 2016 ULEV bid for further low emission taxi funding by end of 2015	CYC Air quality CYC Taxi licensing
8	Planning and delivery of strategic EV charging network	City Centre Fulford Salisbury Terrace	ongoing	**£** (The initial EV charging network has already been implemented using grant funding. Future costs for infrastructure will be met through grant applications and third party investment)	✓	✓✓	EV charging provided at 12 hotels in conjunction with Zero Carbon World Public Pay as You Go EV charging network implemented in CYC car parks 11 Rapid charging points deployed	Identify further EV charging requirements and identify delivery mechanism	CYC Air quality
9	Reducing emissions from CYC fleet	City Centre Fulford Salisbury Terrace	ongoing	**£££££** (High costs are associated with purchase of vehicles. Some of this may be offset by accessing low	✓	✓✓	CYC grey fleet trips already reduced by 34% (diverted to car club) Electric leaf pool car in operation and a further 24 vehicles on	Trial light foot system Eco-driver training for staff Further route	CYC Fleet Manager

				emission vehicle grants)			order. EV charging for pool cars installed at CYC depot.	optimisation and reduction in grey fleet trips	

TABLE 6C PLANS AND ACTIONS THAT WILL ENCOURAGE LOCAL ENGAGEMENT IN AQAP3 DELIVERY

Number	Measure	AQMAs affected	Timescale	Cost	Expected AQ impact in AQMAS	Expected overall emission impact	Progress	Next steps	Responsibility
10	Marketing and communication strategy	Supports AQAP delivery	2014 to 2016	**££**	✓	✓✓	Communication strategy under development with Public Health	Completion and delivery of communication strategy	CYC air quality CYC Public Health CYC Marketing and Communications
11	Local incentives for low emission vehicles and alternative fuel use	City Centre Fulford Salisbury Terrace	2016 onwards	**££**	✓	✓✓	Currently focusing on delivery of low emission infrastructure and uptake of low emission vehicles in fleets e.g. buses, taxis, HGVs. Incentives to encourage uptake of low emission vehicles by the general population will follow. A successful public low emission vehicle event was held in April 2012.	Identify staffing and budget resources to support this work	CYC air quality CYC Sustainable Transport CYC Marketing and Communications
12	Attracting low emission industries, business and jobs to York	Supports AQAP delivery	ongoing	**£**	✓	✓	Work has commenced on creation of a 'green hub' development area	Further develop 'green hub' aspirations and identify other ways to create e high value / high productivity jobs in the 'green' business sector	Make It York

TABLE 6D: PLANS AND ACTIONS THAT WILL CONTINUE TO TACKLE CONGESTION AND DELIVER SUSTAINABLE TRANSPORT IMPROVEMENTS									
Number	**Measure**	**AQMAs affected**	**Timescale**	**Cost**	**Expected AQ impact in AQMAS**	**Expected overall emission impact**	**Progress**	**Next steps**	**Responsibility**
13	Modal shift and network improvement measures	City Centre Fulford Salisbury Terrace	Ongoing LTP3 delivery (2011 to 2015 and beyond	**££££** (LTP3 capital programme)	✓✓	✓✓	Implementation of access York Phase 1 scheme – Poppleton and Askham Bar P&R sites Delivery of I-travel York sustainable travel programme	Continued delivery of I-travel York programme Continued delivery of bus improvement programme	CYC Transport Planning

TABLE 6E: PLANS AND ACTIONS THAT WILL DELIVER OTHER AIR QUALITY IMPROVEMENT MEASURES									
Number	**Measure**	**AQMAs affected**	**Timescale**	**Cost**	**Expected AQ impact in AQMAS**	**Expected overall emission impact**	**Progress**	**Next steps**	**Responsibility**
14	Regulation of industrial and domestic emissions	City Centre Fulford Salisbury Terrace	Ongoing	**££** (continued staff resources)	✓	✓✓	Enforcement of relevant air quality legislation is currently undertaken by the Environmental Protection Unit (CANS)	Continued enforcement of air quality legislation within new CANS structure	CYC Transport Planning
15	Provide more green infrastructure in the city	City Centre Fulford Salisbury Terrace	Ongoing	**£**	✓	No emission reduction	The draft York Local Plan Policy GI1 deals with Green Infrastructure in relation to new development. There are plans already in place to develop an Green Infrastructure Strategy in the form of an SPD. A Business Improvement District (BID) is currently being created in York. Improving the existing green infrastructure could be a possible project for this organisation	Develop a green infrastructure SPD Investigate inclusion of green infrastructure in BID programme	City Strategy to produce green infrastructure strategy following adoption of York Local Plan. York BID to consider future activity in relation to green infrastructure provision

Expected impact of AQAP3

8.0 Expected impact of AQAP3

AQAP3 aims to reduce all emissions to air with an emphasis on NO_2 and particulate emissions from traffic (especially diesel vehicles).

Reducing NO_2 is important to ensure compliance with the health based national air quality objectives for NO_2 that are currently breached in some areas of the city.

Minimising particulate emissions (especially PM_{10} and $PM_{2.5}$ arising from diesel vehicles) is essential for the longer term protection of public health and improvement in local health outcome indicators.

The exact emission impact of the air quality action plan is difficult to predict as there are many factors which may influence future emission levels in the city. These include:

- The extent to which the AQAP measures are delivered locally
- The real life on-road performance of individual vehicles on the road (compared with Euro emission standards for new vehicles which are tested under laboratory conditions under set drive cycles)
- The age and rate of replacement of vehicles in York compared with national averages
- Future trip demand on the York road network, influenced by factors such as the state of the economy and development allocations in the draft local development plan (currently unadopted and subject to further change)

Indicative predictions of future emissions in York in 2021 (with and without the AQAP3 measures in place) have been undertaken using:

- DEFRA's Low Emission Factor Toolkit – this enables predictions to be made about future vehicle emissions based on current and future Euro emission vehicle standards
- Locally collected traffic data relating to the age and type of vehicles currently operating in York
- Predictions of future traffic levels in York for 2021 (including development related traffic expected to arise from allocations in the draft Local Plan as it stood at the end of 2014)[25].

[25] Based on total projected long term development targets of an additional 17,503 residential units and 266466m^2 of employment use by 2031. For the 2021 modelling scenario it was assumed that only 8724 housing units and 115,506m^2 of employment use would have been delivered. The modelling also assumes delivery of a number of key transport projects by this date. Targets for new housing provision and site allocations are currently under review and are expected to be reduced. The traffic impact of new development in the city by 2021 is therefore likely to be lower than the modelling undertaken during the development of AQAP3 suggests. New emission reduction figures for AQAP3 will be calculated once revised traffic growth figures for the city become available and these may show compliance with the air quality objectives at all locations in the city by 2021.

- Assumptions about the number of ultra low emission vehicles operating in the city by 2021 based on upper and lower estimates of what the AQAP3 measures may deliver in terms of local fleet changes

8.1 Modelling approach

The Emissions Factors Toolkit (EFT v 4.2) published by Defra and the Devolved Administrations has been used to assess the likely levels of NO_x and PM_{10} reduction from some of the measures included in AQAP3.

City of York Council's strategic transport model (SATURN) was used to estimate Annual Average Daily Traffic flows (AADTs) on each of the road links contained within the areas of air quality technical breach for a 2014 base year and a 2021 future year scenario. The 2021 future year scenario included the predicted traffic impact of planned traffic schemes and development in the city (based on the emerging draft local plan as it stood at the end of 2014 – see footnote on page 62).

A range of traffic composition scenarios for 2021 have been modelled to determine which AQAP3 measures are likely to have the greatest emissions impact. These included:

- Base 2014
- Base 2021Business as usual (no AQAP3 interventions)
- 2021 with various levels of AQAP3 intervention including:
    - 2021 (with 1.5% and 5% electric cars in the fleet respectively)
    - 2021 with 90% hybrid buses in the fleet
    - 2021 with 90% electric buses in the fleet
    - 2021 with various % combinations of electric cars and electric buses

Full details of this modelling study including the major assumptions and full range of modelled scenarios can be found in Annex 4.

8.2 Modelling outputs

8.2.1 Impact of 'business as usual scenario (BAU) – (do nothing)

Table 7 shows the total expected emission change within York's AQMAs under a do-nothing scenario. This is the expected situation if all planned schemes and development continues in the city (as per emerging draft local development plan at the end of 2014) and no further action is taken to reduce vehicle emissions at a local level.

The 'worst case' scenario assumes that vehicles in 2021have similar emissions to those in 2014 i.e. the expected national reduction in emissions due to improved vehicle technology does not arise. Under this scenario emissions increase because local traffic levels are expected to increase in 2021 due to development.

The 'best case' scenario assumes that national improvements to vehicle emission technology fully meet expectations. Under this scenario emissions decrease because the impact of the traffic level increase will in most cases be off-set and exceeded by the emission improvement per vehicle.

In practice the actual emission levels in the York AQMAs in 2021 (without local interventions) is likely to be somewhere between these upper and lower estimates.

Table 7: Baseline modelling results

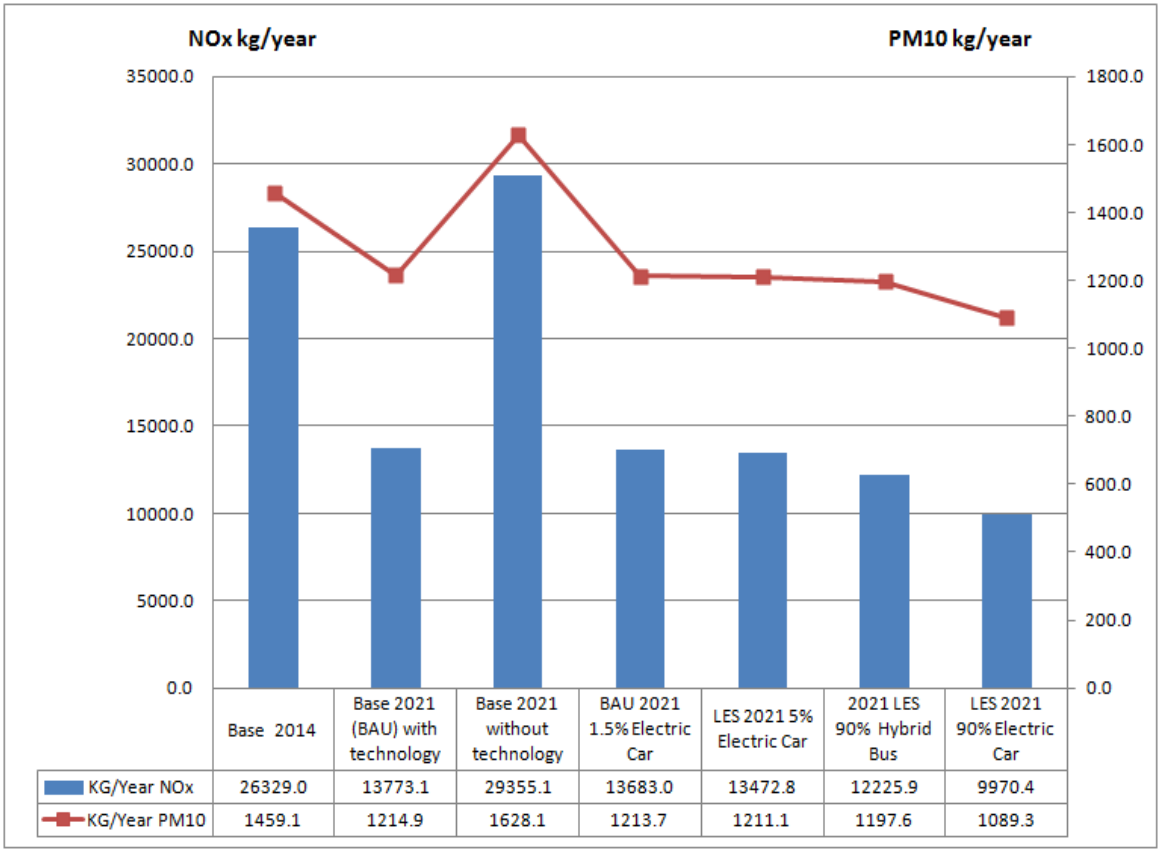
Scenario	Description	NO_x (KG/Year)	PM_{10} (KG/Year)
A	Base 2014	26329.0	1459.1
B	Base 2021(best case)	13773.1	1214.9
C	Base 2021 (worst case)	29355.1	1628.1
A-B	Impact of additional traffic and cleaner vehicle technology in 2021(assuming emission reduction technology works as expected)	12556.0 (47.5% reduction)	244.2 (16.7% reduction)
A-C	Impact of additional traffic in 2021 (assuming national emission technology doesn't work)	-3026.1 (11.5% increase)	-169.0 (11.6% increase)

Note on table above – figures highlighted in red indicate where emissions have increased relative to the base case. Figures highlighted in green indicate where emissions have decreased relative to the base case.

8.2.2 Impact of 'do-something' scenarios

Figure 23 compares the impact of changes in traffic composition that could be pursued locally through implementation of AQAP3 measures to different extents.

Figure 23: Comparison of different approaches to emission reduction for cars and buses

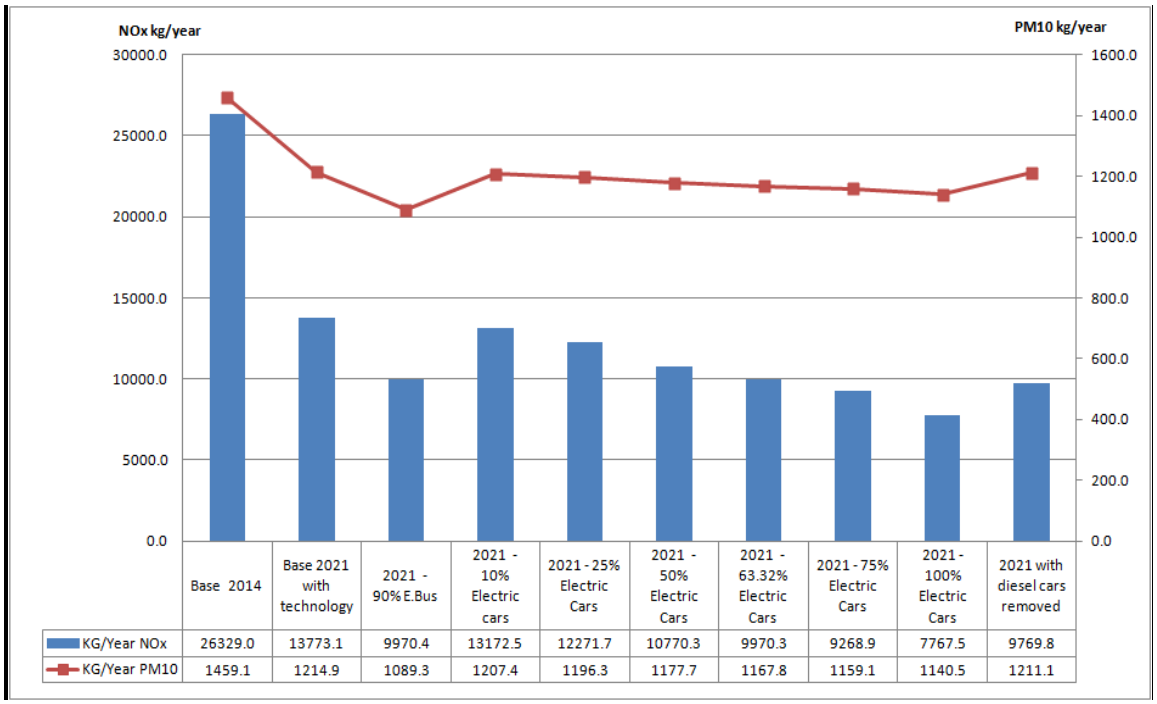


	Base 2014	Base 2021 (BAU) with technology	Base 2021 without technology	BAU 2021 1.5% Electric Car	LES 2021 5% Electric Car	2021 LES 90% Hybrid Bus	LES 2021 90% Electric Car
KG/Year NOx	26329.0	13773.1	29355.1	13683.0	13472.8	12225.9	9970.4
KG/Year PM10	1459.1	1214.9	1628.1	1213.7	1211.1	1197.6	1089.3

When compared to the impact of improved vehicle emission technology at a national level (*Base 2021 (BAU) with technology*) the additional emission impact of local measures is likely to be relatively small. Electric bus scenarios are predicted to yield greater emission reductions than hybrid bus scenarios (for both PM_{10} and NO_x) and converting 90% of the bus fleet to electric is likely to be far more effective than converting a smaller percentage of all cars to electric (even though the actual number of cars would be far higher). This provides strong evidence to support the concept of a bus based CAZ in York and the setting of zero emission standards for the most 'frequent flyer' buses.

Figure 24 further examines the percentage of cars needing to be converted to electric to provide an equivalent emission reduction to that likely to be delivered by the CAZ.

Figure 24: Electric Car and electric buses sensitivity testing



	Base 2014	Base 2021 with technology	2021 - 90% E.Bus	2021 - 10% Electric cars	2021 - 25% Electric Cars	2021 - 50% Electric Cars	2021 - 63.32% Electric Cars	2021 - 75% Electric Cars	2021 - 100% Electric Cars	2021 with diesel cars removed
KG/Year NOx	26329.0	13773.1	9970.4	13172.5	12271.7	10770.3	9970.3	9268.9	7767.5	9769.8
KG/Year PM10	1459.1	1214.9	1089.3	1207.4	1196.3	1177.7	1167.8	1159.1	1140.5	1211.1

The introduction of electric buses is estimated to deliver a 27.6% reduction in NO_x and a 10.3% reduction in PM_{10} compared with a 2021 do-nothing situation (with national technology improvements in place). It can be seen from figure 25 that 63% of the car fleet would need to be converted to electric in order to obtain a NO_x emission reduction similar in magnitude to that achievable through the introduction of electric buses. None of the electric car scenarios are able to deliver the same level of PM_{10} reduction as the electric bus scenario.

As detailed in Annex 4 further modelling work has been undertaken to determine the impact of converting all the diesel cars in the fleet to petrol. It is estimated that by removing the diesel cars a 21% reduction in NO_x emissions and a 0.2% reduction in PM_{10} emissions could be achieved (compared to a 2021do-nothing situation with all diesel cars still in place).

Replacement of diesel cars with petrol alternatives offers scope for significant reductions in NO_x emissions but is unlikely to be as effective at reducing PM_{10} emissions as the widespread introduction of electric buses and cars. The widespread introduction of electric vehicles therefore offers the best opportunity to reduce both NO_x and PM_{10} emissions in York for the purpose of meeting the health based air quality objectives and delivering longer term public health improvements.

8.3 Expected level of compliance with national air quality objectives for NO_2

In February 2014 the European Commission formally launched infraction proceedings against the UK government for breach of NO_2 limit values under the EU Air Quality Directive. This was followed in April 2015 by a UK Supreme Court ruling requiring the UK government to provide new plans to meet the health based nitrogen dioxide air quality objective by the end of 2015 (the result of a 5 year legal battle by Client Earth http://www.clientearth.org/news/latest-news/)

Whilst overall responsibility for complying with the EU air quality obligations remains with the UK government, Defra has written to local authorities warning of possible fines being passed on to those with elevated NO_2 concentrations to pay all or part of the infraction fine, using a discretionary power in Part 2 of the Localism Act. No details have been released to date about how these fines will be imposed, but it is understood these will be recurring annual fines.

To minimise the chance of receiving fines it is essential that CYC can demonstrate that it is taking all reasonable steps to improve air quality and that it has fully assessed the likelihood of complying with the health based national air quality objectives as a result of locally delivered air quality improvement measures. For this purpose DEFRA's Emission Factor Toolkit (EFT) has been used to predict changes in NO_x emission levels in York's AQMA areas in 2021 (compared with a 2014 baseline) for 'do-nothing' and 'do-something' scenarios.

The 'do-nothing' scenario assumes that between 2014 and 2021 the only improvement in vehicle emissions in York will arise from national improvements in vehicle emissions driven by higher Euro emission standards. These estimates include the impact of local traffic growth (associated with the emerging draft Local Plan as it stood at the end of 2014)[26].

The 'do-something' scenario assumes that the proposed AQAP3 measures (including the CAZ) are implemented alongside the national measures such that the equivalent of 90% of the local bus fleet is assumed to be running on electric and 5% of the local car fleet.

The resulting % change in NO_x emissions arising from the 'do-nothing' and 'do-something' scenarios have been compared with the % NO_x reduction needed to meet the health based air quality objectives in each of the AQMAs at the present time (see chapter 4.0). The results of this work are shown in Figure 25.

[26] Traffic growth due to development is currently expected to offset some of the emission benefit that would otherwise arise from national emission technology improvements, but a net reduction in NO_x emissions is still expected at most locations. Housing targets within the draft Local Plan are still under review and the resultant growth in traffic may not actually be as great as that predicted using the 2014 projections. The figures presented here should therefore be considered a 'worst-case' scenario in terms of traffic growth impacts.

Figure 25: Expected level of NO_x reduction under 'do-something' and 'do-nothing' AQAP3 scenarios compared with required level of NO_x reduction to meet the AQ objectives

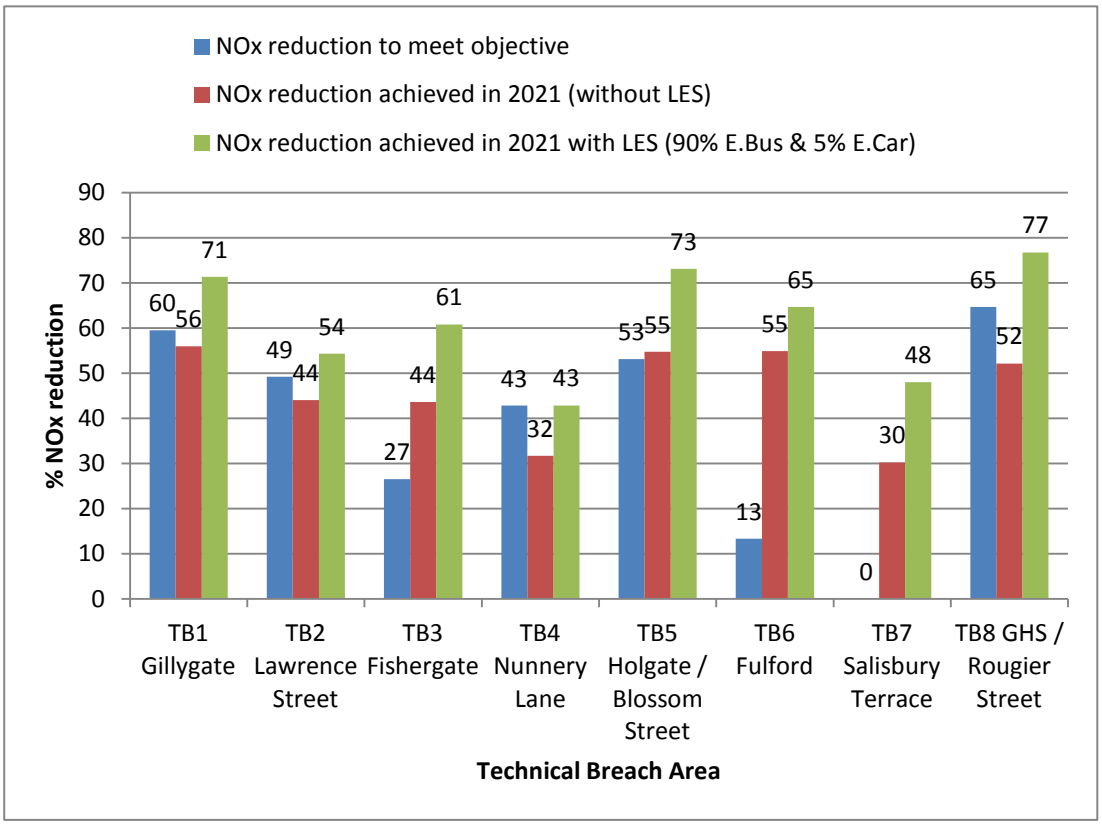


Figure 25 shows that by 2021under a 'do-nothing' scenario (without the AQAP3 measures in place) the health based annual mean NO_2 air quality objective is likely to be met in Fishergate and Fulford Road due to national improvements in vehicle emission technology alone. There is also a possibility that this might be the case for Holgate Road but the modelling suggests a more borderline outcome in this location without the additional impact of local AQAP3 measures.

Recent air quality data for Salisbury Terrace has already shown an improvement in air quality such that the health based annual average NO_2 objective was met in this location during 2012, 2013 and 2014. This improvement is expected to continue further as the AQAP3 measures start to be delivered and revocation of the Salisbury Terrace AQMA may soon be possible.

In Gillygate, Lawrence Street, Nunnery Lane and George Hudson Street the health based national air quality objectives are unlikely to be met through national vehicle improvement measures alone. Here the additional impact of the local AQAP3 measures will be essential to deliver the health based air quality objectives by 2021.

By rolling out AQAP3 to the extent that it delivers an equivalent of 90% electric buses and 5% electric cars, there is potential for the health based annual mean NO_2 objective to be met in all the current AQMAs by 2021. The possible exception to this is Nunnery Lane where the current emissions modelling data suggests that the low emission measures in AQAP3 will not be enough to completely off-set the current predicted development led traffic growth in this area (expected under the emerging draft Local Plan proposals as they stood at the end of 2014). If the housing delivery rates in final Local Plan are lower than those assumed in the current emissions modelling work then the AQAP3 measures may also be able to deliver compliance with the health based air quality objectives in Nunnery Lane. This will however depend on the final allocation of development sites and how fast they are brought forward for development.

Recent monitoring results for the Nunnery Lane AQMA indicate that the majority of the area (including Bishopthorpe Road and Scarcroft Road) currently meets the air quality objectives. There are two remaining 'hotspots' on Nunnery Lane and Prices Lane where very slight exceedances of the annual average NO_2 objective have been recorded in recent years (up to 42µg/m^3). This is due to the regular occurrence of queuing traffic and poor dispersion in these two particular locations.

The emission reduction figures presented here assume that national vehicle emission improvements will be delivered in full and that AQAP3 will be fully implemented at a local level. Past experience has shown that vehicle emission factors for future years have a high level of uncertainty associated with them, particularly in relation to national vehicle emission standards where the standard expected to be met by a new vehicle at point of sale is often not reflected by the actual emissions from that vehicle once it is operational within an urban street environment. Recently it has emerged that emission test 'defeat devices' have been incorporated into some new vehicles and this adds to this uncertainties around vehicle emission levels.

Whilst it is impossible to predict exact levels of air pollution in 7 years time it is certain that the implementation of the proposed AQAP3 measures will deliver significant emission improvements over and above those that will arise under a 'do-nothing' scenario. Without the proposed AQAP3 measures compliance with the health based national air quality objectives in at least four of York's current technical breach areas is unlikely.

AQAP3 is an ambitious, targeted and quantified air quality improvement plan that tackles the main sources of pollution in the city and is supported by a detailed evidence base. It represents the best possible course of action that CYC can be reasonably be expected to take at this time to improve air quality and must be supported by continued action at a national level to reduce vehicle emissions.

AQAP3 Targets and Indicators

9.0 AQAP3 Targets and Indicators

Delivery of the AQAP3 measures over the next three years will be monitored against the targets and indicators shown in Table 10. These will be used as the basis for annual statutory AQAP Progress Reporting to DEFRA and will also be used to keep the local Environment Board up to date on progress with AQAP3 delivery.

In addition to the indicators shown in Table 10 progress with meeting the health based air quality objectives within each of the current AQMAs will continue to be reported annually to DEFRA via Progress reports and update and screening reports. Figure 26 shows the position at the end of 2014.

Figure 26: Compliance with the annual average air quality objectives within each of the AQMAs (to December 2014)

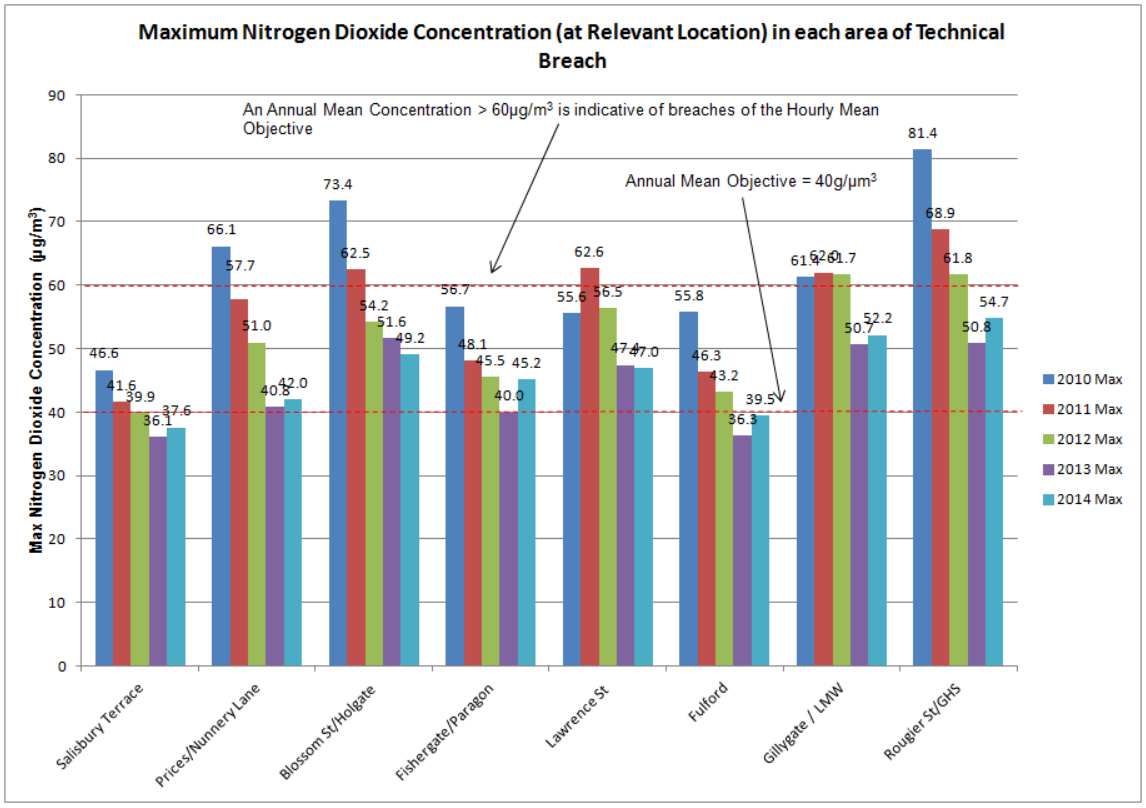


Table 8: AQAP3 Targets and Indicators

Indicator	Intended outcome	Delivery Mechanism	Data source	Baseline		Targets			
				12/13	13/14	14/15	15/16	17/18	18/19
Indicator 1 Number of publicly accessible electric vehicle parking bays available in York. Includes parking bays on private land that are accessible to the general public in their capacity as a customer e.g. supermarket charging points, hotel charging points. (Excludes charging points provided for domestic and employee use only)	Development of a comprehensive EV charging network to support increased uptake of electric vehicles in York	Planning conditions Infrastructure grants Low emission vehicle grants and projects Parking incentives	Internal LES delivery spreadsheet Public information on charging points available at http://www.itravelyork.info/driving/electric-vehicles/electric-vehicle-recharging-network	**20**	**36**	*66* achieved 70	*74*	*100*	*130*

Indicator	Intended outcome	Delivery Mechanism	Data source	Baseline		Targets			
				12/13	13/14	14/15	15/16	17/18	18/19
Indicator 2 Number of registered taxis (private and hackney) which have emissions of less than 100g CO_2/km (currently Band A VED) (These are high end targets that assume continuation of hybrid taxi incentive scheme and development of new taxi licensing policy in accordance with AQAP3)	Increase in number of low emission taxis registered in York (Hackney and Private Hire)	Taxi incentive scheme Development of taxi emission strategy	CYC taxi licensing database	**1**	**13**	*35* achieved 44	*61*	*114*	*208*
Indicator 3 Number of electric buses operating in York (These are high end targets assuming CAZ is introduced and electric buses become mandatory for P&R operations after 2017 when contracts are due for	Increase in number of zero emission buses operating in York	Implementation of Clean Air Zone (CAZ) Joint funding bids with local bus operators	QBP contacts	0	8	*14* achieved 14	*16*	*40*	*90*

Indicator	Intended outcome	Delivery Mechanism	Data source	Baseline		Targets			
				12/13	13/14	14/15	15/16	17/18	18/19
renewal)									
Indicator 4 Number of LGV and cars in CYC fleet with which have emissions of less than 100g CO_2/km (currently Band A VED**.** Includes car club vehicles block booked for CYC use during office hours.	Increase in number of zero and low emission vehicles within CYC fleet	Procurement of single provider for pool cars. Procurement will be based on successful provider using all EV or Hybrid vehicles. To be implemented early in 2015/16 In 17/18 a number of the LCV vehicles in building repairs are due for replacement. Trials show that EVs and hybrids fit this portfolio very well.	CYC Fleet management	-	10	*32* *achieved 32*	*32*	*72*	*80*

Indicator	Intended outcome	Delivery Mechanism	Data source	Baseline		Targets			
				12/13	13/14	14/15	15/16	17/18	18/19
Indicator 5 Number of fleets signed up to York ECO-stars scheme (Future targets will be set once funding for continuation of ECO-stars scheme has been confirmed.)	Increase in number of fleet operators accessing free advice on how to reduce emissions from their vehicles	Continued expansion of York ECO-stars scheme Linking of ECO-stars membership to CYC service procurement	Eco-stars members database	14	34	*53* achieved 53	TBA	TBA	TBA
Indicator 6 Annual average NO_2 concentration measured within city centre AQMA (This is the average result obtained across a number of fixed monitoring locations in the city centre. Annual average concentrations at individual sites will vary from this figure and may still be in excess of 40ug/m^3 by 2019. Indicator already used for monitoring LTP3 progress)	City wide compliance with health based annual average NO_2 air quality objective	AQAP3 and LTP3 implementation	LTP3 funded diffusion tube monitoring in city centre AQMA (fixed locations)	40	34	*34* achieved 35	*32*	*31*	*30*

AQAP3 Consultation

10.0 Consultation process

As detailed in Chapter 6 the majority of the measures included in AQAP3 have been drawn from LTP3 and the LES. Both these documents were subject to extensive public consultation both internally and external to CYC.

A public consultation on the first draft of AQAP3 was undertaken from 21 November to 2 January 2015. An online questionnaire and electronic version of the draft AQAP3 were made available on the CYC website and the consultation period was advertised locally via a general press release, the main council website, JorAir and Buzz (CYC staff magazine). Posters, copies of the draft AQAP3 and copies of the questionnaire were also placed in all the York libraries and at West Offices reception.

Additional email notification of the consultation was sent out directly to:

- all statutory consultees
- all local authorities within the Yorkshire region
- local health professionals (including NHS practitioners and members of the Health and Well being board)
- bus operators
- taxi operators
- local 'Breathe Easy' group
- University of York and University of Leeds
- Business / other stakeholder contacts from previous LES consultation work
- consultants involved in the LEZ, anti-idling and electric bus feasibility studies
- members of the Low Emission Strategy Partnership (LESP)
- air quality journals

A full report on the response to the public consultation was taken to York members in September 2015.

The main changes made to this AQAP3 document as a direct result of the draft AQAP3 consultation responses are:

- Better recognition of the role green infrastructure can play in removing pollutants from the environment

- A commitment to further investigate the provision of anti-idling signage at some locations in the city

- Further clarification that AQAP3 builds upon, but does not replace, the sustainable transport and congestion management programmes already in

place in the city and that walking, cycling and public transport improvement schemes remain an essential part of York's approach to local air quality improvement.

During the refining of the AQAP3 measures CYC officers have attended a number of Quality Bus Partnership (QBP) meetings to disseminate information about York's LEZ study and electric bus project and to commence initial discussions around the Clean Air Zone (CAZ) concept. CYC will continue to work in partnership with local bus operators to develop and deliver the CAZ and anti-idling aspects of AQAP3.

The development of AQAP3 has also resulted in closer links being established with colleagues in public health, economic development, fleet management, taxi licensing and marketing and communications. Colleagues in these areas will continue to be consulted on the AQAP3 measures as they are further developed and implemented.